

#### COUNCIL MEETING AGENDA

Date: July 6, 2021 Time: 9:00 AM Location: https://www.rockyview.ca/

Pages

A. CALL MEETING TO ORDER

| в. | UPDATES/APPROVAL OF AGENDA                                                                                                                                                                                                 |                                                                                           |     |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|-----|
| C. | APPROVAL OF MINUTES                                                                                                                                                                                                        |                                                                                           |     |
|    | 1.                                                                                                                                                                                                                         | June 22, 2021 Council Meeting Minutes                                                     | 3   |
| D. | FINA                                                                                                                                                                                                                       | NCIAL REPORTS                                                                             |     |
| Ε. | PUBLIC HEARINGS / APPOINTMENTS                                                                                                                                                                                             |                                                                                           |     |
|    | The following public hearings were advertised on June 8, 2021 and June 15, 2021 on the Rocky View County website in accordance with the <i>Municipal Government Act</i> and <i>Public Notification Bylaw C-7860-2019</i> . |                                                                                           |     |
|    |                                                                                                                                                                                                                            | MORNING PUBLIC HEARINGS / APPOINTMENTS 9:00 AM                                            |     |
|    | 1.                                                                                                                                                                                                                         | Division 9 - Bylaw C-8073-2020 - Redesignation Item – Aggregate Extraction and Processing | 11  |
|    |                                                                                                                                                                                                                            | File: PL20200066 (06818002/8003/8004; 06913001/3003/4001/4002/5001, 06913002              |     |
|    |                                                                                                                                                                                                                            | Note: this item should be considered in conjunction with item F-1.                        |     |
| F. | GENE                                                                                                                                                                                                                       | RAL BUSINESS                                                                              |     |
|    | 1.                                                                                                                                                                                                                         | Division 9 - Master Site Development Plan – West Cochrane Gravel Pit                      | 317 |
|    |                                                                                                                                                                                                                            | File: PL20200067 (06818002/8003/8004, 06913001/3003/4001/4002/5001, 06913002)             |     |
|    |                                                                                                                                                                                                                            | Note: this item should be considered in conjunction with item E-1.                        |     |
| G. | BYLA                                                                                                                                                                                                                       | WS                                                                                        |     |
|    | 1.                                                                                                                                                                                                                         | Division 9 - Bylaw C-8189-2021 - First Reading Bylaw – Residential<br>Redesignation       | 706 |
|    |                                                                                                                                                                                                                            | File: PL20210041 (07805013)                                                               |     |
| н. | UNFINISHED BUSINESS                                                                                                                                                                                                        |                                                                                           |     |
| I. | COUNCILLOR REPORTS                                                                                                                                                                                                         |                                                                                           |     |

1. All Divisions - Calgary Metropolitan Region Board (CMRB) Update

File: N/A

#### J. MANAGEMENT REPORTS

|    | 1.                   | All Divisions - 2021 Council Priorities and Significant Issues List                                                            | 716 |
|----|----------------------|--------------------------------------------------------------------------------------------------------------------------------|-----|
|    |                      | File: N/A                                                                                                                      |     |
| к. | NOTI                 | CES OF MOTION                                                                                                                  |     |
|    | 1.                   | All Divisions - Councillor Kissel and Reeve Henn - Withdrawal of Appeal of<br>Kissel et al v. Rocky View County, 2020 ABQB 406 | 719 |
|    |                      | File: N/A                                                                                                                      |     |
| L. | PUBLIC PRESENTATIONS |                                                                                                                                |     |
| м. | CLOSED SESSION       |                                                                                                                                |     |

N. ADJOURN THE MEETING



**COUNCIL MEETING MINUTES** 

Tuesday, June 22, 2021

9:00 AM

Held Electronically in accordance with the Meeting Procedures (COVID-19 Suppression) Regulation, Alberta Regulation 50/2020

| Present:      | Reeve D. Henn<br>Deputy Reeve K. McKylor<br>Councillor M. Kamachi (participated electronically)<br>Councillor K. Hanson (participated electronically) (arrived at 9:02 a.m.)<br>Councillor A. Schule (participated electronically)<br>Councillor J. Gautreau (participated electronically)<br>Councillor G. Boehlke<br>Councillor S. Wright (participated electronically)<br>Councillor C. Kissel (participated electronically)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Also Present: | <ul> <li>K. Robinson, A/Chief Administrative Officer</li> <li>S. Seroya, A/Executive Director, Operations</li> <li>G. Kaiser, Executive Director, Community and Business</li> <li>B. Beach, A/Executive Director, Community Development Services</li> <li>A. Zaluski, Director, Legislative Services</li> <li>B. Bateman, A/Manager, Financial Services</li> <li>D. Kazmierczak, Manager, Planning Policy</li> <li>D. Lang, A/Manager, Recreation, Parks and Community Support</li> <li>G. Nijjar, Manager, Planning and Development Services</li> <li>J. Lee, Supervisor Engineering, Planning &amp; Development Services</li> <li>J. Lee, Supervisor Engineering, Planning &amp; Development Services</li> <li>L. Cox, Planner, Planning &amp; Development Services</li> <li>D. Newmen, Planner, Planning &amp; Development Services</li> <li>S. Fontaine, Community Project Coordinator, Recreation, Parks and Community Support</li> <li>B. Manshanden, Intergovernmental Affairs Coordinator, Legislative Services</li> <li>C. Anderson, Legislative Officer, Legislative Services</li> <li>M. Mitton, Legislative Officer, Legislative Services</li> <li>T. Andreasen, Legislative Officer, Legislative Services</li> </ul> |

#### A Call Meeting to Order

The Chair called the meeting to order at 9:00 a.m. with all members present, with the exception of Councillor Hanson who arrived to the meeting at 9:02 a.m.



#### B Updates/Approval of Agenda

MOVED by Deputy Reeve McKylor that the June 22, 2021 Council meeting agenda be accepted as presented.

Carried

#### C-1 June 8, 2021 Council Meeting Minutes

MOVED by Deputy Reeve McKylor that the June 8, 2021 Council meeting minutes be approved as presented.

Carried

#### E-1 <u>Division 9 - Bylaw C-8115-2020 - Road Closure Application</u> File: PL20200159 (06935001, 06936001/2, 07901003/4)

MOVED by Councillor Kissel that the public hearing for item E-1 be opened at 9:05 a.m.

| Person(s) who presented:                                                                                                                                                                                                              | Ryan Riddell, IDEA Group (Applicant)          |         |  |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|---------|--|--|
| Pre-recorded audio/video<br>presentations in support:                                                                                                                                                                                 | None                                          |         |  |  |
| Pre-recorded audio/video submissions in opposition:                                                                                                                                                                                   | None                                          |         |  |  |
| The Chair made the final call for email submissions and called for a recess at 9:20 a.m. The Chair called the meeting back to order at 9:25 a.m. with all previously mentioned members present and declared email submissions closed. |                                               |         |  |  |
| Email submissions in support:                                                                                                                                                                                                         | None                                          |         |  |  |
| Email submissions in opposition:                                                                                                                                                                                                      | None                                          |         |  |  |
| Person(s) who presented rebuttal:                                                                                                                                                                                                     | None                                          |         |  |  |
| MOVED by Councillor Kissel that the public                                                                                                                                                                                            | c hearing for item E-1 be closed at 9:26 a.m. | Carried |  |  |
| MOVED by Councillor Kissel that Bylaw C-8                                                                                                                                                                                             | 8115-2020 be given first reading.             | Carried |  |  |
| MOVED by Councillor Kissel that Bylaw C-8<br>Transportation.                                                                                                                                                                          | 8115-2020 be forwarded to the Minister of     | Carried |  |  |
|                                                                                                                                                                                                                                       |                                               | Curricu |  |  |



#### E-2 <u>Division 4 - Bylaw C-8141-2021 - Agricultural Use</u> File: PL20210003 (02320029)

MOVED by Councillor Schule that the public hearing for item E-2 be opened at 9:30 a.m.

Carried

| Person(s) who presented:                                                                                                                                                                                                              | Bart Carswell, Carswell Planning (Applicant)         |         |  |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|---------|--|--|
| Pre-recorded audio/video<br>presentations in support:                                                                                                                                                                                 | None                                                 |         |  |  |
| Pre-recorded audio/video<br>submissions in opposition:                                                                                                                                                                                | None                                                 |         |  |  |
| The Chair made the final call for email submissions and called for a recess at 9:39 a.m. The Chair called the meeting back to order at 9:45 a.m. with all previously mentioned members present and declared email submissions closed. |                                                      |         |  |  |
| Email submissions in support:                                                                                                                                                                                                         | None                                                 |         |  |  |
| Email submissions in opposition:                                                                                                                                                                                                      | None                                                 |         |  |  |
| Person(s) who presented rebuttal:                                                                                                                                                                                                     | Bart Carswell, Carswell Planning (Applicant)         |         |  |  |
| MOVED by Councillor Schule that the publi                                                                                                                                                                                             | ic hearing for item E-2 be closed at 9:50 a.m.       | Carried |  |  |
| MOVED by Councillor Schule that Bylaw C-                                                                                                                                                                                              | -8141-2021 be given second reading.                  | Carried |  |  |
| MOVED by Councillor Schule that Bylaw C-                                                                                                                                                                                              | -8141-2021 be given third and final reading.         | Carried |  |  |
| The Chair called for a recess at 9:51 a.m. with all previously mentioned members pr                                                                                                                                                   | and called the meeting back to order at 10:01 esent. | a.m.    |  |  |

#### F-1 <u>Divisions 2 & 4 - Springbank and Langdon Stakeholder Engagement Framework Terms</u> of Reference File: N/A

Main Motion:

MOVED by Deputy Reeve McKylor that Administration be directed to return to Council at the July 13, 2021 Council meeting with a new terms of reference on the Springbank and Langdon Stakeholder Advisory Group and that Council submit any suggested changes to Administration by Friday, June 25, 2021.



#### Amending Motion:

MOVED by Councillor Hanson that the main motion be amended as follows:

THAT Administration be directed to return to Council at the July 13, 2021 Council meeting with a new terms of reference on the Springbank and Langdon Stakeholder Advisory Group and that Council submit any suggested changes to Administration by Monday, June 28, 2021 Friday, June 25, 2021.

Carried

The Chair then called for a vote on the main motion as amended.

#### Main Motion as Amended:

MOVED by Deputy Reeve McKylor that Administration be directed to return to Council at the July 13, 2021 Council meeting with a new terms of reference on the Springbank and Langdon Stakeholder Advisory Group and that Council submit any suggested changes to Administration by Monday, June 28, 2021.

Carried

The Chair called for a recess at 11:01 a.m. and called the meeting back to order at 11:07 a.m. with all previously mentioned members present.

#### F-2 <u>Division 8 - Damkar Applications – Request to Waive 6 Month Waiting Period for Re-</u> <u>Application</u> File: PL20200050-1 (05618459)

MOVED by Councillor Wright that the waiver of the six month waiting period for re-application be denied.

#### Defeated

MOVED by Deputy Reeve McKylor that the requirement of a six month waiting period for reapplication under Section 48 of Land Use Bylaw C-8000-2020 be waived by resolution.

Carried

The Chair called for a recess at 11:38 a.m. and called the meeting back to order at 11:43 a.m. with all previously mentioned members present, with the exception of Councillor Hanson who returned to the meeting at 11:44 a.m.

#### F-3 <u>Division 2 - Late Tax Payment Penalty Cancellation Request</u> File: 05708078

MOVED by Deputy Reeve McKylor the request for late tax penalty cancellation in the amount of \$474.39 be denied.

Carried

#### F-4 <u>Division 3 - Late Tax Payment Penalty Cancellation Request</u> File: 04714106

MOVED by Councillor Boehlke the request for late tax penalty cancellation in the amount of \$1,009.32 be denied.

#### F-5 <u>Division 9 - Late Tax Payment Penalty Cancellation Request</u> File: 10013186

MOVED by Deputy Reeve McKylor that the request for late tax penalty cancellation in the amount of \$488.06 be denied. Carried

#### F-6 <u>Division 7 - Late Tax Payment Penalty Cancellation Request</u> File: 06404026

MOVED by Councillor Boehlke that the request for late tax penalty cancellation in the amount of \$277.90 be denied.

#### F-7 <u>Division 5 - Late Tax Payment Penalty Cancellation Request</u> File: 04324022

MOVED by Deputy Reeve McKylor that the request for late tax penalty cancellation in the amount of \$1,802.77 be denied.

Carried

Carried

#### F-8 <u>Division 5 - Late Tax Payment Penalty Cancellation Request</u> File: 04324016

MOVED by Deputy Reeve McKylor that item F-8 be lifted from the table.

MOVED by Deputy Reeve McKylor that the request for late tax penalty cancellation in the amount of \$571.50 be denied.

I-1 <u>All Divisions - Calgary Metropolitan Region Board (CMRB) Update</u> File: N/A

The Calgary Metropolitan Region Board (CMRB) Update for June 22, 2021 was provided as information.

The Chair called for a recess at 11:58 a.m. and called the meeting back to order at 1:00 p.m. with all previously mentioned members present, with the exception of Councillor Gautreau.

#### E-3 <u>Division 3 - Bylaw C-8011-2020 - Residential Use</u> File: PL20190140 (04702011)

MOVED by Councillor Hanson that the public hearing for item E-3 be opened at 1:03 p.m.

Carried Absent: Councillor Gautreau

Councillor Gautreau returned to the meeting at 1:08 p.m.





|     | Person(s) who presented:                                                                                                              | Rod Potrie, Planning Protocol 3 (Applicant)<br>Cam Wallace, Catalyst Group Inc.<br>Mike Kitchen, Osprey Engineering Ltd. |                 |
|-----|---------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|-----------------|
|     | Pre-recorded audio/video<br>presentations in support:                                                                                 | None                                                                                                                     |                 |
|     | Pre-recorded audio/video submissions in opposition:                                                                                   | None                                                                                                                     |                 |
|     | The Chair made the final call for email sub<br>Chair called the meeting back to order at<br>present and declared email submissions cl | pmissions and called for a recess at 1:31 p.m. Th<br>1:36 p.m. with all previously mentioned member<br>osed.             | ne<br>rs        |
|     | Email submissions in support:                                                                                                         | None                                                                                                                     |                 |
|     | Email submissions in opposition:                                                                                                      | None                                                                                                                     |                 |
|     | Person(s) who presented rebuttal:                                                                                                     | Rod Poitrie (Applicant)                                                                                                  |                 |
|     | MOVED by Councillor Hanson that the pub                                                                                               | lic hearing for item E-3 be closed at 1:37 p.m C                                                                         | Carried         |
|     | MOVED by Councillor Hanson that Bylaw C<br>Attachment C.                                                                              | C-8011-2020 be amended in accordance with                                                                                | arried          |
|     | MOVED by Councillor Hanson that Bylaw C                                                                                               | C-8011-2020 be given second reading, as amend<br>C                                                                       | led.<br>Carried |
|     | MOVED by Councillor Hanson that Bylaw C amended.                                                                                      | C-8011-2020 be given third and final reading, as                                                                         |                 |
|     |                                                                                                                                       | C                                                                                                                        | Carried         |
| G-1 | <u>Division 8 - Bylaw C-8177-2021 - Firs</u><br>File: PL20210055 (05607084)                                                           | <u>t Reading Bylaw – Residential Redesignatio</u>                                                                        | <u>n</u>        |
| G-2 | <u>Division 9 - Bylaw C-8183-2021 - Firs</u><br>File: PL20210070 (03230002)                                                           | <u>t Reading Bylaw – Agricultural Redesignatic</u>                                                                       | <u>on</u>       |
| G-3 | <u>Division 5 - Bylaw C-8187-2021 - Firs</u><br>File: PL20210076 (04330005)                                                           | t Reading Bylaw – Business Redesignation                                                                                 |                 |
| G-4 | <u>Division 2 - Bylaw C-8186-2021 - Firs</u><br>File: PL20200136 (05714039)                                                           | <u>t Reading Bylaw – Residential Redesignatio</u>                                                                        | <u>n</u>        |
|     |                                                                                                                                       |                                                                                                                          |                 |

MOVED by Deputy Reeve McKylor that the following Bylaws receive first reading:

- Bylaw C-8177-2021
- Bylaw C-8183-2021
- Bylaw C-8187-2021
- Bylaw C-8186-2021

#### F-9 <u>All Divisions - Vacation Time Management</u> File: N/A

MOVED by Deputy Reeve McKylor that the report on Vacation Time Management be received for information.

Carried

#### M-1 <u>Closed Session Item - Grader Replacement</u> File: RVC2021-18

#### M-2 <u>Closed Session Item - Calgary Metropolitan Region Board Communications Plan</u> File: RVC2021-21

MOVED by Deputy Reeve McKylor that Council move into closed session at 2:01 p.m. to consider the following item under the following sections of the *Freedom of Information and Protection of Privacy Act*:

#### M-1 – Grader Replacement

- Section 16 Disclosure harmful to business interests of a third party
- Section 24 Advice from officials
- Section 25 Disclosure harmful to the economic or other interests of a public body.

#### M-2 – Calgary Metropolitan Region Board Communications Plan

- Section 21 Disclosure harmful to intergovernmental relations
- Section 24 Advice from officials

Carried

Council held the closed session for confidential item M-1 with the following additional people in attendance:

Rocky View County: K. Robinson, A/Chief Administrative Officer

- S. Seroya, A/Executive Director, Operations
- G. Kaiser, Executive Director, Community and Business
- B. Beach, A/Executive Director, Community Development Services
- S. Hulsman, Manager, Transportation Services
- B. Scott, Executive Coordination





Council held the closed session for confidential item M-2 with the following additional people in attendance:

- Rocky View County: K. Robinson, A/Chief Administrative Officer
  - S. Seroya, A/Executive Director, Operations
  - G. Kaiser, Executive Director, Community and Business
  - B. Beach, A/Executive Director, Community Development Services
  - D. Kazmierczak, Manager, Planning Policy
  - B. Scott, Executive Coordination
  - B. Manshanden, Intergovernmental Affairs Coordinator, Legislative Services

MOVED by Deputy Reeve McKylor that Council move into open session at 3:30 p.m.

Carried

#### M-1 **Closed Session Item - Grader Replacement** File: RVC2021-18

Council rose from the closed session without report.

#### M-2 **Closed Session Item - Calgary Metropolitan Region Board Communications Plan** File: RVC2021-21

Council rose from the closed session without report.

#### J-1 All Divisions - 2021 Council Priorities and Significant Issues List File: N/A

The 2021 Council Priorities and Significant Issues List for June 22, 2021 was provided as information.

#### Ν Adjourn the Meeting

MOVED by Councillor Boehlke that the June 22, 2021 Council Meeting be adjourned at 3:31 p.m.

Carried

Reeve or Deputy Reeve

Chief Administrative Officer or Designate



# PLANNING AND DEVELOPMENT SERVICES

| TO:      | Council                                                                                                  |                         |  |
|----------|----------------------------------------------------------------------------------------------------------|-------------------------|--|
| DATE:    | July 6, 2021                                                                                             | DIVISION: 9             |  |
| TIME:    | Morning Appointment                                                                                      |                         |  |
| FILE:    | 06818002/8003/8004;06913001/3002/<br>3003/ 06914001/4002/5001                                            | APPLICATION: PL20200066 |  |
| SUBJECT: | Redesignation Item – Aggregate Extraction and Processing                                                 |                         |  |
|          | NOTE: This application should be considered in conjunction with application PL20200067 (agenda item F-1) |                         |  |

**APPLICATION:** To redesignate portions of three (3) quarter sections and five (5) full quarter sections; totaling ± 391.10 hectares (± 966.43 acres) from Agricultural - General District to Special - Natural Resources for aggregate extraction.

**GENERAL LOCATION:** Located on the south side of Highway 1A, beginning at 0.8 kilometres (0.5 mile) from the intersection of Range Road 53 and Highway 1A to approximately 1.6 kilometres (1.0 mile) east of Range Road 50; with the exception of NW-13-26-05-W05M.

LAND USE DESIGNATION: Agricultural – General District (A-GEN)

**EXECUTIVE SUMMARY:** The purpose of this application is to redesignate the subject lands from Agricultural, General District (A-GEN) to Special – Natural Resources District (S-NAT) to support the expansion of an existing aggregate extraction operation on the subject lands. In accordance with the policies of the County Plan, a Master Site Development Plan (MSDP) has been submitted along with the land use application (PL20200067). NW-13-25-06-W5M, totaling 150.88 acres, is designated Special – Natural Resource District and is operated by BURNCO as an active gravel pit (the McDougall Ranch Pit). This application is seeking to add ± 966.43 acres to expand the aggregate extraction operations.

The applicant has requested redesignation to S-NAT, which restricts new lands from being added to this district. This request is not supported by the Land Use Bylaw. In recognition of this, the applicant has provided a Direct Control District as a secondary option, though citing a preference for the S-NAT land-use option.

Council gave first reading to Bylaw C-8073-2020 on September 1, 2020.

The subject lands are not located within an Area Structure Plan, and the application was therefore assessed in accordance with the policies of the County Plan. This report focuses primarily on the compatibility with relevant statutory plans, while the associated MSDP application focuses on the technical aspects of the proposal.

This proposal was circulated to 37 adjacent landowners within a one (1) mile radius; in response, 14 letters were received in opposition and 24 were received in support (see Attachment 'E'). The application was also circulated to several internal and external agencies; those responses are available in Attachment 'B'.

The following is a summary of the application assessment:

- 1. The proposal is consistent with the County Plan;
- 2. As proposed by the applicant (S-NAT), the proposal is inconsistent with the Land Use Bylaw; however, would be consistent if the Direct Control were selected; and

#### Administration Resources

Oksana Newmen, Planning and Development Services



3. The technical aspects of the proposal would be addressed at the Development Permit stage.

Comments were recently received in response to the Public Hearing notice from the Town of Cochrane stating concerns related to traffic safety and environmental considerations. These comments were provided subsequent to the November 2020 Intermunicipal Committee Meeting (IMC) which yielded concerns with respect to traffic generation. After the IMC, Administration and the applicant held an additional meeting and shared information regarding their concerns. The comment letter included in Attachment "B" was also received subsequent to the June 2021 IMC meeting.

Regarding comments from the Stoney Nakoda Nations, the letter in response to the public hearing notice was received after multiple attempts over several months by Administration in early 2021 to obtain their concerns, with no response.

Based on the extensive area proposed, Administration suggests reducing the area for redesignation to an area more commensurate with existing aggregate operations in the County, as well as the total area proposed for the disturbance at any one time. In addition, Administration recommends Council refer the application back to the applicant in order to prepare a Direct Control.

**ADMINISTRATION RECOMMENDATION:** Administration recommends referring the application back to Administration, in accordance with Option #3.

#### **OPTIONS**

| Option # 1: | Motion #1                                                                                                                                                                                                                                                         | THAT Bylaw C-8073-2020 be given second reading.          |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|
|             | Motion #2                                                                                                                                                                                                                                                         | THAT Bylaw C-8073-2020 be given third and final reading. |
| Option #2:  | 2: THAT the application be referred to Administration to work with the applicant to prepare<br>Direct Control District for the entirety of the lands.                                                                                                             |                                                          |
| Option #3:  | THAT the application be referred to Administration to work with the applicant to prepare a Direct Control District for an area located between Beaupre Creek and Grand Valley Creek to be no greater than 400 acres in size, excluding the existing S-NAT parcel. |                                                          |

Option # 4: THAT application PL20200066 be refused.

#### AIR PHOTO & DEVELOPMENT CONTEXT:





## **APPLICATION EVALUATION:**

The application was evaluated based on the technical reports submitted with the application and the applicable policies and regulations.

| APPLICABLE POLICY AND REGULATIONS:                                                               | TECHNICAL REPORTS SUBMITTED:                                                                                              |
|--------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| <ul> <li><i>Municipal Government Act;</i></li> <li>Town of Cochrane/Rocky View County</li> </ul> | Biophysical Impact Assessment prepared by<br>Matrix Solutions Inc. dated September 2019                                   |
| <ul> <li>Nunicipal Development Plan;</li> <li>Municipal Development Plan;</li> </ul>             | <ul> <li>Historical Resources Impact Assessment<br/>prepared by Lifeways of Canada Limited<br/>date April 2019</li> </ul> |
| <ul> <li>County Servicing Standards.</li> </ul>                                                  | Visual Impact Assessment (VIA) prepared by<br>Matrix Solutions Inc. dated November 2019                                   |
|                                                                                                  | Noise Impact Assessment, prepared by ACI     Acoustical Consultants Inc. dated June 2019                                  |
|                                                                                                  | Air Quality Assessment prepared by Matrix<br>Solutions Inc. dated May 2019                                                |
|                                                                                                  | Hydrogeological Assessment Report prepared<br>by Matrix Solutions Inc. dated January 18, 2019                             |
|                                                                                                  | Traffic Impact Assessment (TIA) prepared by<br>Schaffer Andrew Ltd. dated October 2013                                    |
|                                                                                                  | Conceptual Stormwater Management Report<br>prepared by Matrix Solutions Inc. dated<br>April 2020                          |

#### POLICY ANALYSIS:

#### County Plan

Section 15.0 Natural Resources of the County Plan states that the County is responsible for approving land use and issuing development permits for all aggregate extractions. Additionally, aggregate pits of all sizes are subject to Provincial legislation.

The goals of the Natural Resource policies are to support the extraction of natural resources in a manner that balances the needs of residents, industry, and society, and to support environmentally responsible management.

The County currently does not have a comprehensive set of performance standards or spatial policies against which aggregate development can be assessed, though outlines for MSDP requirements are provided. That being said, the overall size of the proposed redesignation, in addition to the fact that two pits will effectively be operating simultaneously, is greater than the majority of extraction sites in the County. As such, Administration suggests the area for aggregate expansion be limited to an additional 400 acres between Beaupre Creek and Grand Valley Creek, excluding the existing operational area. This will still yield approximately 550 acres of land for extraction. This number is based on creating some additional buffer to the residents to the northwest of the site, and additional distance from the Town of Cochrane. Future expansion to the east of Grand Valley Creek could be explored in the future.

Technical assessments provided and the resulting policies presented in the MSDP effectively address how the adverse impact of aggregate extraction on existing residents, adjacent land uses, and the environment would be managed and mitigated to an acceptable level. In accordance with policies 15.1 and 15.6, the MSDP provides specific policies to address potential offsite impacts of the operation, including hours of operation, dust control, noise mitigation, and access improvements. In addition, policies are provided to



require proximity monitoring of site conditions and response strategies should the operations exceed the agreed-upon limitations.

Policy 15.2 requires collaboration between the County, the aggregate extraction industry, and affected residents to develop mutually agreeable solutions to mitigate the impacts of extraction activities. The Applicant held open houses and considered stakeholder input to develop policies to effectively address the concerns of adjacent landowners. The Applicant submitted their proposal in accordance with the County's requirements and proposes the use of an overland conveyor to reduce traffic, noise, and environmental impacts.

#### Land Use Bylaw

Sections 297(f) and 464 of the Land Use Bylaw require the proposal to be accommodated through a Direct Control district that would provide a customized site-specific district for the parcel with regulations that are specifically catered to the site and surrounding area. Examples of the types of regulations that could be included in a Direct Control and are not included in the Special – Natural Resources District (S-NAT) are:

- specific technical requirements at the Development Permit stage,
- reporting requirements for noise, air quality, and groundwater monitoring,
- limiting the area to be disturbed at any one time,
- operation and hauling hour limitations,
- specific access requirements,
- customized the setbacks and development standards, and
- Council as the Development Authority.

The applicant is seeking redesignation to the S-NAT, noting that the application submission pre-dates the current land use bylaw and that an existing area of that designation with a current operation exists on site.

#### ADDITIONAL CONSIDERATIONS:

While not detailed in the policy, Administration has concerns in granting land use redesignation over such a large expanse of land. As  $\pm 61.06$  ha ( $\pm 150.88$  ac) of land is currently designated S-NAT, this redesignation would increase the lands designated for extraction by approx. 640% for a total of  $\pm 452.16$  ha ( $\pm 1,117.31$  ac). Administration, therefore, recommends that the area of redesignation be reduced to an area approximately 400 acres in size, excluding the existing S-NAT parcel.

Responses were received from both the Town of Cochrane and the Stoney Nakoda First Nations. The Town of Cochrane has stated concerns regarding traffic and environmental considerations while the Stoney Nakoda is seeking additional consultation on the project. The information was forwarded to the applicant who has indicated that they continue to work with both parties.

Regarding the Town of Cochrane, the comments were provided subsequent to the November 2020 Intermunicipal Committee Meeting (IMC) that had yielded concerns with respect to traffic. After the IMC, Administration and the applicant held an additional meeting and shared information regarding their concerns. The comment letter at the end of Attachment "B" was received subsequent to the recent IMC meeting in June 2021.

In terms of the Stoney Nakoda First Nations, Administration had reached out to a group of recipients several times in the first quarter of 2021 to request their concerns in writing in advance of holding a meeting. No response was received. The Stoney Nakoda subsequently send a response to a secondary circulation of the file in May 2021 requesting a consultation. This information was provided to the applicant, who indicates that they have an open consultation file. A recent letter from the Stoney Nakoda First Nations has been received and is included at the end of Attachment "B".



Respectfully submitted,

"Brock Beach"

Acting Executive Director Community Development Services

ON/IIt

#### ATTACHMENTS

ATTACHMENT 'A': Application Information ATTACHMENT 'B': Application Referrals ATTACHMENT 'C': Bylaw C-8073-2020 and Schedule A ATTACHMENT 'D': Map Set ATTACHMENT 'E': Public Submissions Concurrence,

"Kent Robinson"

Acting Chief Administrative Officer



#### **ATTACHMENT 'A': APPLICATION INFORMATION**

| <b>APPLICANT:</b><br>Burnco Rock Products Ltd. (Travis Coates) | <b>OWNERS:</b><br>David H. McDougall Ranch Ltd., Tricycle Lane<br>Ranches Ltd.                                                               |
|----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| DATE APPLICATION RECEIVED:<br>June 6, 2020                     | DATE DEEMED COMPLETE:<br>June 6, 2020                                                                                                        |
| GROSS AREA: ± 391.10 hectares<br>(± 966.43 acres)              | LEGAL DESCRIPTION: portions of NE/NW-15-<br>26-05W5M, N/2-14-26-05W5M, NE/NW/SE-13-<br>26-05W5M, SE-24-26-05W5M, NW/SW/SE/NE-<br>18-26-04W5M |

#### SOILS (C.L.I. from A.R.C.):

6T, W60 - Production is not feasible due to adverse topography, also excessive wetness/poor drainage

5H, R40 – Very severe limitations due to temperature, also shallowness to bedrock

4 H, M, E – Severe limitations due to temperature, low moisture holding, adverse texture, and erosion damage

7 T, E, R – No capability due to adverse topography, erosion damage, and shallowness to bedrock

4H – Severe limitations due to temperature

4 H, M, P – Severe limitations due to temperature, low moisture holding, adverse texture, and excessive surface stoniness

#### HISTORY:

September 1, 2020: Council gave first reading to the application.

**November 30, 2016:** PL20160151 Certificate of Completion and Compliance (CCC) for Road Right of Way Construction Agreement for the upgrade of Range Rd 51 to a Paved Standard to connect with the updated intersection of Highway 1A and Range Road 51 (per 2012-DP-15078).

**May 10, 2011:** Council approved application 2009-RV-039 to redesignate the lands on a portion of SE 19-28-28-W4M from Ranch and Farm District to Natural Resource Industrial District to facilitate the development of a  $\pm$ 71.4 acre sand and gravel mining operation (the existing S-NAT with the current mining operation to be expanded by this application).

**May 23, 2018:** Permit for PRDP20175123 was issued for the first renewal of the natural resource extraction/processing for sand and gravel extraction (Phase 2 of 3 phases).

**May 4, 2016:** Permit for 2012-DP-15078 (Phase I) was issued for natural resource extractions/processing for sand and gravel.

**December 19, 2012:** Subdivision & Development Appeal Board upheld the decision of the Development Officer.

**December 4, 2012:** Development permit was appealed.

November 12, 2012: 2012-DP-15078 was approved.



## **PUBLIC & AGENCY SUBMISSIONS:**

The application was circulated to 37 adjacent landowners. Fourteen responses were received in opposition and 24 were received in support. The responses have been included in Attachment 'E.'

The application was also circulated to a number of internal and external agencies, as depicted in Attachment 'B'; relevant comments are addressed within 'Additional Considerations' above.



# ATTACHMENT B: APPLICATION REFERRALS

| AGENCY                  | COMMENTS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Province of Alberta     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Alberta Transportation  | In reviewing the application, the proposed development falls within<br>the control distance of a provincial highway as outlined in the<br>Highways Development and Protection Act / Regulation, and will<br>require a roadside development permit from Alberta<br>Transportation.                                                                                                                                                                                                                                                                                                                                                                                                          |
|                         | The application form and instructions can be obtained from the department's website at                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                         | https://www.alberta.ca/roadside-development-permits.aspx                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                         | The department has the following additional comments on the referral:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                         | <ol> <li>A geometric assessment must be prepared for the Highway<br/>intersection (Highway 1A / Range Road 45), based on traffic<br/>from the existing background condition, the proposed<br/>development traffic, and post-development in the 20-year<br/>horizon. This geometric assessment must also provide a<br/>comprehensive design report, including pavement design and<br/>intersection design, to allow a permit to be issued for its<br/>construction. All related work must be completed to the<br/>standards of, and at no cost to, Alberta Transportation. This<br/>must be completed and constructed prior to operations<br/>requiring access at this location.</li> </ol> |
|                         | <ol> <li>Any peripheral lighting (yard lights/area lighting) that may be<br/>considered a distraction to the motoring public or deemed to<br/>create a traffic hazard will not be permitted.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Alberta Health Services | We have reviewed The Burnco Aggregates - West Cochrane<br>MSDP and also looked at Google Earth. The adjacent area is<br>primarily being ranched and the distances from the proposed<br>mining operation to the closest residents are considerable. The<br>potential health impacts on surrounding residential receptors from<br>this site (e.g. noise, dust, truck traffic, diesel emissions, etc.) are<br>expected to be low. AHS, therefore, has no concern about the<br>application.                                                                                                                                                                                                    |
|                         | With respect to the <i>Alberta Public Health Act</i> , a property must be maintained in accordance with the <i>Nuisance and General Sanitation Regulation</i> (AR 243/2003) which stipulates,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                         | • No person shall create, commit or maintain a nuisance. A person who creates, commits, or maintains any condition that is or might become injurious or dangerous to the public health or that might hinder in any manner the prevention or suppression of disease is deemed to have created, committed, or maintained a nuisance.                                                                                                                                                                                                                                                                                                                                                         |



| AGENCY                | COMMENTS                                                                                                                                                                                                                                                                                                                                                                   |
|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                       | If any evidence of nuisance conditions is noted during any phase<br>of the development, AHS wishes to be notified. It is recommended<br>to have a complaint response protocol in place for logging and<br>responding to residents' complaints (both around the pit and along<br>the access/egress road) if it hasn't been developed.                                       |
| Adjacent Municipality |                                                                                                                                                                                                                                                                                                                                                                            |
| Stoney Nakoda         | Note: upon receipt of a Direct Control District (which has<br>subsequently been removed from this application), separately<br>circulated on May 7, 2021, the following comments were received<br>on May 7, 2021:                                                                                                                                                           |
|                       | On behalf of the Stoney Nakoda Nation, we are advising you that<br>we are in receipt of your notification for the above-cited project. As<br>per our Consultation guidelines, we are providing you with a Letter<br>of Acknowledgement and a Stoney Information Letter (SIL). We<br>will need a completed SIL form returned to our office at your<br>earliest convenience. |
|                       | The next steps for Consultation will involve scheduling a meeting<br>(video conference call) with yourself and/or others in your<br>organization to meet with the Consultation Team. Please provide<br>some available dates over the next 2 weeks, and we will<br>coordinate a meeting.                                                                                    |
|                       | In addition, this email is providing you with a copy of our Rate<br>Schedule, and maps of our Traditional Territory as well, our Title<br>Case map for your review.                                                                                                                                                                                                        |
|                       | If you have any questions, you may contact Bill Snow, Acting-<br>Director of the Stoney Consultation Office: <u>bills@stoney-</u><br>nation.com                                                                                                                                                                                                                            |
|                       | We look forward to hearing from you soon and receiving your completed SIL.                                                                                                                                                                                                                                                                                                 |
|                       | Note 1: Stoney Nakoda indicated a desire to submit comments and<br>have a meeting in December 2020. Administration followed up with<br>Stoney Nakoda over many months to request comments on the file<br>to prepare for a meeting; no reply was received prior to<br>advertisement of the public hearing.                                                                  |
|                       | Note 2: After circulation of the application and advertisement of the<br>Public Hearing, Administration received a letter from Stoney<br>Nakoda. This letter has been included as part of this attachment,<br>after the Application Referrals table.                                                                                                                       |
| Town of Cochrane      | Comments dated January 7, 2021:                                                                                                                                                                                                                                                                                                                                            |
|                       | The Town appreciates the presentation and information provided<br>to our Council members at the IMC meeting in November. There<br>are no additional comments from the Town resulting from that                                                                                                                                                                             |



| AGENUI | COMMENTS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|        | meeting. Also, we have reviewed Burnco's letter and are generally<br>satisfied with the responses provided to the concerns raised.<br>However, we would like to offer the following concerning the<br>response to the Town's request for additional assessment of traffic<br>impacts of the portion of Highway 1A within the Town's boundary.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|        | We appreciate Burnco completing the additional assessment and<br>acknowledge the results indicate a minor traffic increase at the<br>intersections resulting from the gravel pit. The Town is wondering if<br>the assessment also included a safety analysis for the heavy<br>gravel truck traffic related to the posted highway speeds and<br>intersections?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|        | Comments dated September 1, 2020:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|        | The Town of Cochrane has concerns with the proposed re-<br>designation application related to the size and scale of the<br>resulting future gravel extraction development. The proposed +/-<br>391.10 ha site will likely support over 30 years of gravel extraction<br>activity and this will result in long-term impacts on our community.<br>The permanency of the development and the potential long-lasting<br>effects of its impacts on Cochrane are concerning and warrant<br>further information and engagement between the applicants,<br>Rocky View County, and the Town. We understand County Council<br>has already proceeded with the formal bylaw adoption process and<br>are troubled this has occurred prior to the comment submission<br>deadline. The Town requests a meeting between RVC Staff,<br>representatives from Burnco, and the Town of Cochrane Staff prior<br>to any further formal bylaw proceedings. We also recommend this<br>item be referred to the Town and County IMC for discussion.<br>Referral Letter Comments Based on the information received in the<br>referral, the gravel extraction development will result in increased<br>gravel truck traffic traveling on Highway 1A into Cochrane. The<br>traffic impact assessment (TIA) referenced in the package is dated<br>2013 and therefore would not account for the updates that have<br>occurred for Highway 1A. These include two new traffic signals at<br>the intersections of Horse Creek Road and Heritage Gate along<br>HWY 1A, the future signalized intersection east of Heritage Gate,<br>and the revised design of the interchange at HWY 1A and HWY<br>22. Given the TIA is now seven years old, the Town requests the<br>scope of the TIA be updated and expanded over and above the<br>current limited analysis of site access on and off HWY 1A and<br>consider and address the impacts to the Province's road network<br>and municipal neighbours. Also, through the North Calgary<br>Regional Transportation Study (NCRTS), for which Rocky View<br>County was a primary sponsor, the corridor of HWY 1A was not<br>identified for good movements, or to serve as a regional benefit. As<br>a result, the known r |



| AGENCY                  | COMMEN                                                                                                          | ITS                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                    |                                                            |                                                          |                                                                                          |                                                                               |                                                                                   |
|-------------------------|-----------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|------------------------------------------------------------|----------------------------------------------------------|------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
|                         | including<br>Town. We<br>provide co<br>meeting w<br>discuss th<br>earliest co                                   | including the future gravel truck users, would fall solely on the<br>Town. We appreciate the opportunity to review the application and<br>provide comments, however would like to restate our request for a<br>meeting with County Staff, the applicants, and Town Staff to<br>discuss the proposed application. Please contact me at your<br>earliest convenience to schedule a meeting. |                                                                                                    |                                                            |                                                          |                                                                                          |                                                                               |                                                                                   |
|                         | Note: Afte<br>Public He<br>Cochrane<br>after the A                                                              | er circul<br>aring, A<br>. This la<br>Applicat                                                                                                                                                                                                                                                                                                                                            | ation of th<br>Administra<br>etter has k<br>ion Referi                                             | e app<br>tion i<br>been<br>rals ta                         | plicatio<br>receivo<br>incluo<br>able.                   | on and a<br>ed a leti<br>led as p                                                        | advertis<br>ter from<br>art of th                                             | ement of<br>the Towr<br>his attachr                                               |
| Other External Agencies |                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                    |                                                            |                                                          |                                                                                          |                                                                               |                                                                                   |
|                         | Shell is no<br>lands (see<br>Alberta Pr<br>PAPL cur<br>PAPL in d<br>assets, pl<br>Manager<br>(587) 392<br>Wells | the lis<br>of the lis<br>oduction<br>rently. The<br>lue course<br>of PAPI<br>-9349.                                                                                                                                                                                                                                                                                                       | the licens<br>t below), t<br>on Ltd. (PA<br>The licens<br>rse. Shoul<br>ontact Mr.<br>L, at terry. | ee of<br>hese<br>APL)<br>es of<br>Id you<br>Terry<br>gotte | f seve<br>asset<br>last ye<br>these<br>u have<br>y Gotte | ans to f<br>ral oil al<br>ts were<br>ear, and<br>assets<br>any qu<br>enbos, s<br>@pierid | and gas a<br>sold to<br>l are op<br>will be<br>uestions<br>Surface<br>aeenerg | Pieridae<br>Pieridae<br>erated by<br>transferre<br>about the<br>Land<br>gy.com or |
|                         | UWI                                                                                                             | Numbe                                                                                                                                                                                                                                                                                                                                                                                     | r Name                                                                                             |                                                            | Mode                                                     | Loc                                                                                      | ation                                                                         |                                                                                   |
|                         | 100/10-15-<br>026-05W5/0                                                                                        | 023821                                                                                                                                                                                                                                                                                                                                                                                    | 4 SHELL E                                                                                          | T AL.<br>26-5                                              | Abando<br>d                                              | one 1000<br>00                                                                           | 081502605                                                                     | W5                                                                                |
|                         | 100/09-16-<br>026-05W5/0                                                                                        | 000742                                                                                                                                                                                                                                                                                                                                                                                    | 6 SHELL<br>JUMPING<br>POUND U<br>NO. 13                                                            | )<br>JNIT                                                  | Flowing                                                  | ) 1000<br>00                                                                             | 081602605                                                                     | W5                                                                                |
|                         | Pipelines                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                    |                                                            |                                                          |                                                                                          |                                                                               |                                                                                   |
|                         | License<br>Number                                                                                               | Line<br>Number                                                                                                                                                                                                                                                                                                                                                                            | From<br>Location                                                                                   | To<br>Loc                                                  | ation                                                    | From<br>Facility                                                                         | To<br>Facility                                                                | Status                                                                            |
|                         | 3320                                                                                                            | 4                                                                                                                                                                                                                                                                                                                                                                                         | 08-16-026-<br>05W5                                                                                 | 07-1<br>05W                                                | 16-026-<br>V5                                            | Well                                                                                     | Pipeline                                                                      | Operating                                                                         |
|                         | 23826                                                                                                           | 3                                                                                                                                                                                                                                                                                                                                                                                         | 03-21-026-<br>05W5                                                                                 | 07-1                                                       | 16-026-<br>V5                                            | Pipeline                                                                                 | Pipeline                                                                      | Operating                                                                         |
|                         | 23826                                                                                                           | 4                                                                                                                                                                                                                                                                                                                                                                                         | 07-16-026-<br>05W5                                                                                 | 02-1                                                       | 16-026-                                                  | Pipeline                                                                                 | Pipeline                                                                      | Operating                                                                         |
|                         | 23826                                                                                                           | 5                                                                                                                                                                                                                                                                                                                                                                                         | 08-16-026-<br>05W5                                                                                 | 07-1<br>05W                                                | 16-026-<br>V5                                            | Well                                                                                     | Pipeline                                                                      | Operating                                                                         |

Facility

23826

23826

21

23

| License<br>Number | Туре    | Category       | Facility<br>Name       |
|-------------------|---------|----------------|------------------------|
| F29157            | Battery | Gas<br>Battery | SCL 08-16-026-<br>05W5 |

02-16-026-

02-16-026-

05W5

05W5

12-16-026-

08-09-026-

05W5

05W5

Blind

end

Pipeline

Blind

end

Pipeline

Discontinu

Operating

ed



| AGENCY    | COMMENTS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TC Energy | From discussions with Burnco, it was determined that a crossing<br>over TC's pipeline south of Phase A5 is likely required within ~2<br>years, which will be used for hauling water by truck from the Bow<br>River. Gravel extraction is anticipated to take place in A1 & A2 (the<br>first phase) over the next few years, A5 & A6 in 10-15 years, and<br>between F27 & G28 (which will also require a pipeline crossing)<br>will be ~25 years away. Within the pink "Borrow Areas," nothing is<br>planned or likely to happen, but Burnco wants to keep them open<br>to use if needed. No blasting is proposed as this is a sand and<br>gravel pit. Burnco had assumed a 3m setback would be required<br>from TC's pipeline right-of-way (ROW). Burnco also connected<br>directly with two TC representatives. |
|           | Regarding employees, Burnco advised that there would be a maximum of 25 people working on the site (crusher crew of 5-6, 2 for sales loader, 5-6 for the wash plant, and 5-10 doing earthworks). They are anticipating the operations to be 24/7, though earthworks and other operations would not take place at night.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|           | Please refer to Attachment 01:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|           | Approximate Location of TC Infrastructure for maps that show<br>the site in relation to the approximate location of TC's<br>infrastructure.<br>Assessment of Proposed Development:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|           | As shown in <b>Attachment 01</b> , a TC pipeline runs east-west directly through the middle of the site, and just south of the current operations. A TC facility is located just to the west.<br>Based on a review of the information provided and correspondence to date, TC has advised of several specific requirements that shall be adhered to in addition to the following General Requirements section which contains further details:                                                                                                                                                                                                                                                                                                                                                                    |
|           | <ul> <li>A minimum 7m development/mining setback from the edge of<br/>TC's pipeline ROW must be adhered to. This should be shown in<br/>the MSDP.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|           | • A minimum 3:1 back sloping for excavation parallel to the edge of the 7m development setback is required. This should be shown in the MSDP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|           | <ul> <li>Please provide all relevant technical plans to TC Energy for their<br/>review, including the revised MSDP, Development / Operating<br/>Plan, Reclamation Plan, Geotechnical Plans, etc. Please advise<br/>of any increase in the number of employees working on the site,<br/>and where they will be working.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|           | <ul> <li>Burnco shall continue to consult with TC Energy throughout this<br/>process and especially in advance of any activities taking place<br/>within the Pipeline Assessment Area. The main point of contact</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |



#### COMMENTS

will be Stephen Viola, TC Energy | Right-of-way Management: stephen\_viola@tcenergy.com / 587-933-0580.

#### **General Requirements**

For your reference for this development and all future developments in proximity to TC infrastructure, the following shall be adhered to:

 In order to confirm the precise alignment of the pipelines on the subject lands, a Locate Request must be made prior to any ground disturbance taking place. Locate requests can be made online at www.clickbeforeyoudig.com or by calling your local One-Call Centre.

Locate requests generally take 72 hours to be completed.

- 2. No work may take place within TC's pipeline right-of-way without a TC representative on site.
- 3. All permanent or temporary crossings of pipelines require written consent from TC Energy. Written consent may be obtained online through TC's Canadian Third Party Crossing Application Portal at writtenconsent.tcenergy.com or by calling 1-877-872-5177.
  - If the proponent plans to cross the pipeline in the future and applies through the online application portal noted above, please advise them to send the application # ("D#") associated with that application to tcenergy@bapg.ca for our records.
- 4. Ground disturbance is any work, operation, or activity that results in an addition to or reduction of the earth cover on the ground, including but not limited to excavating, digging, ditching, plowing, stripping topsoil, etc. Any ground disturbance within 30 m of the pipeline, known as the "prescribed area," requires written consent from TC Energy.

Written consent may be obtained online at writtenconsent.tcenergy.com or by calling 1-877-872-5177.

- 5. Permanent structures shall not be installed anywhere on the ROW. TC's preference is that permanent structures should be placed at least seven (7) metres from the edge of the ROW and twelve (12) metres from the edge of the pipeline.
- 6. Temporary structures shall not be installed anywhere on the ROW. TC's preference is that temporary structures should be placed at least three (3) metres from the edge of the ROW and eight (8) metres from the edge of the pipeline.
- 7. As per the requirements of the CER, TC is required to monitor all new development in the vicinity of their pipelines that result in an increase in population or employment. Therefore, please



| AGENCY | COMMENTS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|        | keep us informed regarding any additional development within<br>the Pipeline Assessment Area indicated in <b>Attachment 01</b> .<br>Requirements and guidelines for development on or near TC's<br>pipelines and infrastructure are included within <b>Attachment 02</b><br><b>Development Within Proximity to TC Energy Infrastructure</b><br>( <i>Note: sent to the applicant but not included in this report</i> ) and<br><b>Attachment 03 Work Safely Booklet</b> . We recommend that they<br>be reviewed in full.<br>( <i>Note: sent to the applicant but not included in this report</i> )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|        | S3500         S35000         S3500         S3500 <t< th=""></t<> |
|        | Edgend     Edgend     Edgend     Edgend     Edgend     Frescribed Area (30m)     C Energy Infrastructure     Plan of Land Use Amendment     To Energy Pipeline     Pipeline Assessment Area (20m)     Conservent Area (20m)     Conceptual alignment only. Artial Source: ESRI     Read     May 2021                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |



| AGENCY                                     | COMMENTS                                                                                                                                                                                                                                                                                       |  |  |  |  |
|--------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|
| Internal Departments                       |                                                                                                                                                                                                                                                                                                |  |  |  |  |
| Recreation, Parks and<br>Community Support | PL20200066- Redesignation                                                                                                                                                                                                                                                                      |  |  |  |  |
|                                            | There are no planned recreation, park, or active transportation improvements associated with the lands subject to this application.                                                                                                                                                            |  |  |  |  |
|                                            | If applicable, comments pertaining to the dedication of reserves will<br>be provided if the lands are considered for subdivision. As such,<br>there are no concerns with this application as presented.                                                                                        |  |  |  |  |
|                                            | PL20200067- Local Plan/MSDP                                                                                                                                                                                                                                                                    |  |  |  |  |
|                                            | There is no planned recreation, park, or active transportation<br>improvements associated with the subject lands described in the<br>draft West Cochrane Gravel Pit draft MSDP. As such, there are no<br>concerns with this application as presented                                           |  |  |  |  |
| Planning and Development                   | General                                                                                                                                                                                                                                                                                        |  |  |  |  |
| Services - Engineering                     | • At the future Development Permit stages, the application is for aggregate mining, the applicant is to provide payment of the Community Aggregate Payment Levy in accordance with Bylaw C-7748-2018, as amended, in the amount of \$0.40 per ton of aggregate extracted and removed.          |  |  |  |  |
|                                            | <ul> <li>It is to be noted that NW 13-26-05-W5M is an existing gravel<br/>pit operation with all applicable approval in place complete<br/>with an upgraded Type IVb intersection at RR 51 and Hwy<br/>1A.</li> </ul>                                                                          |  |  |  |  |
|                                            | <ul> <li>At the time of extraction activities within the Phases C13,<br/>C15, D16, D17, G28, F27 areas, the applicant will be<br/>required to apply to close and consolidate the undeveloped<br/>road allowance prior to proceeding with any extraction<br/>activities.</li> </ul>             |  |  |  |  |
|                                            | • The MSDP proposed to limit the maximum disturbed area on the west to 70 acres, and 51 acres to the east side at any given time.                                                                                                                                                              |  |  |  |  |
|                                            | <ul> <li>As a condition of the future DP, the applicant will be required<br/>to provide a detailed Operations Plan. The plan shall<br/>include:</li> </ul>                                                                                                                                     |  |  |  |  |
|                                            | <ul> <li>Noise, emissions, dust, and air quality monitoring plans<br/>providing the location of any offsite monitoring stations,<br/>monitoring intervals, mitigation practices and procedures<br/>to be followed by the pit operators if prescribed limits<br/>have been exceeded;</li> </ul> |  |  |  |  |
|                                            | <ul> <li>Dust control plan showing the location of any offsite air<br/>quality measurement stations including procedures to be<br/>followed if air quality limit exceedances have occurred;</li> </ul>                                                                                         |  |  |  |  |



| AGENCY | COMMENTS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|        | <ul> <li>Emissions Mitigation Plan addressing air quality and duant<br/>mitigation practices, monitoring intervals and locations;</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|        | <ul> <li>Identify any potential environmental impacts inclusive of<br/>mitigation measures to address the impacts;</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|        | <ul> <li>Strategy on the release of pit water via the recharge<br/>pond.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|        | <ul> <li>As a permanent condition of the future DP, the applicant will<br/>be required to provide the County with the EPEA registratio<br/>for the proposed extraction site.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|        | • As a condition of the future DP, for any extraction activities<br>east of Grand Valley Creek, the applicant is required to<br>provide a Construction Management Plan for the<br>construction of the access intersection at Range Road 45<br>and Highway 1A to provide access to the extraction activitie<br>east of Grand Valley Creek. The Plan shall address noise<br>mitigation measures, traffic accommodation, sedimentation<br>and dust control, management of stormwater during<br>construction, erosion and weed control, construction<br>practices, waste management, firefighting procedures,<br>evacuation plan, hazardous material containment, and all<br>other relevant construction management details. |
|        | • As a condition of future DP, the applicant will be required to provide a detailed Weed Control Plan, which meets the requirements of the Weed Control Act and the County's Land Use Bylaw. The recommendations of the plan are to be implemented during extraction activities.                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|        | • The applicant provided a Historical Resources Impact<br>Assessment prepared by Lifeways of Canada Limited date<br>April 2019. The assessment took into consideration the<br>significant historical resource values for the subject lands<br>and have identified locations within the subject land that will<br>require additional mitigation prior to disturbance. As a<br>condition of future DP, the applicant will be required to<br>obtain clearance under the Historical Resources Act prior to<br>commencing with mining activities in areas that have been<br>identified in this report.                                                                                                                        |
|        | • The applicant previously submitted a Visual Impact<br>Assessment (VIA) prepared by Matrix Solutions Inc. dated<br>November 2019. The assessment concluded that the visual<br>impact for Highway 1A is expected to be mitigated<br>successfully with the construction of the proposed berms<br>along the south side of the Highway. In some areas, further<br>mitigations beyond the berms will be required through<br>various planting and screening.                                                                                                                                                                                                                                                                  |



| AGENCY | COMMENTS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|        | <ul> <li>As a condition of the future DP, the applicant is required to<br/>provide a comprehensive landscaping plan, prepared by a<br/>qualified Landscape Architect for subsequent phases<br/>including area showing the landscaping elements that are to<br/>be incorporated into the berm, setback, and entrance areas.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                             |
|        | <ul> <li>The applicant previously submitted a Noise Impact<br/>Assessment, prepared by ACI Acoustical Consultants Inc.<br/>dated June 2019. The report indicated that the noise<br/>modeling scenario indicated a relatively higher west of the<br/>site compares to the east at 51.5 dBA versus 35.9 dBA<br/>respectively within 2 km of the site boundary.</li> </ul>                                                                                                                                                                                                                                                                                                                                                           |
|        | <ul> <li>As a condition of the future DP, the applicant is required to<br/>provide an updated Noise Impact Assessment, through the<br/>proposed noise monitoring program, prepared by a qualified<br/>professional, demonstrating compliance with the Alberta<br/>Energy Regulator's 'Directive 038'.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                  |
|        | • The applicant provided an Air Quality Assessment prepared<br>by Matrix Solutions Inc. dated May 2019. The assessment<br>concluded that the proposed mining operation is not<br>expected to exceed air quality objectives beyond the subject<br>lands and have minimal impact to nearby residences. As a<br>condition of future DP, the applicant will be required to<br>provide an updated Air Quality Assessment, prepared by a<br>qualified professional, for proposed phases provide a<br>strategy that will allow the pit to remain in compliance with<br>the Canadian Ambient Air Quality Standards (CAAQS) and<br>Alberta Ambient Air Quality Objectives (AAAQO).                                                         |
|        | Geotechnical:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|        | <ul> <li>The applicant provided a Hydrogeological Assessment<br/>Report prepared by Matrix Solutions Inc. dated January 18,<br/>2019. The report concludes that the mining of the<br/>aggregate resources will be extracted to a maximum of<br/>1.0m above the maximum level of the groundwater table.<br/>As a condition of future DP, the applicant will be required to<br/>implement a groundwater measurement program and<br/>provide the County with new groundwater readings at the<br/>boundaries of the Phase I area to record all fluctuations in<br/>groundwater levels to ensure gravel extraction activities<br/>remain a minimum of 1.0m above the highest recorded<br/>groundwater reading at all times.</li> </ul> |
|        | <ul> <li>As a condition of future DP, the applicant will be required to<br/>provide a Geotechnical Assessment which provides slope<br/>stability recommendations for individual phases of the<br/>gravel pit. The assessment is to provide recommendations<br/>for slope design and setbacks around the active pit areas</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                               |

as well as for final reclaimed conditions.



| AGENCY | COMMENTS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|        | Transportation:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|        | <ul> <li>The application provided a Traffic Impact Assessment (TIA) prepared by Schaffer Andrew Ltd. dated October 2013. The report was completed for the assessment of the existing operation of NW 13-26-5-W5M that required the upgrade of the intersection of Range Road 51 and Highway 1A. The intersection was constructed and FAC was issued by the County on January 24, 2020.</li> </ul>                                                                                                                                                                                                                                                        |
|        | <ul> <li>The MSDP has indicated that the future operation of the site could increase traffic by four (4) times what is currently. Engineering will require that the TIA be updated to include the proposed subject land to determine the timeline of the improvements that may be required to gain a holistic understanding of the traffic impact on the road network. The TIA should include an intersection illumination warrant analysis, prepared by a qualified professional, to determine if any illumination is warranted at the intersection of Range Road 51 &amp; Hwy 1A and the new proposed access at Range Road 45 &amp; Hwy 1A.</li> </ul> |
|        | <ul> <li>As a condition of the future DP, the applicant will be<br/>required to enter into a Development Agreement with the<br/>County for any improvements to the road network that may<br/>be required based on the outcome of the updated Traffic<br/>Impact Assessment.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                   |
|        | <ul> <li>As a condition of future DP, the applicant is required to<br/>obtain a Roadside DP from AT and implement the<br/>intersectional improvement as required by the Traffic<br/>Impact Assessment and Alberta Transportation.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                             |
|        | <ul> <li>As a condition of future DP, the applicant will be required to<br/>provide a Traffic Management Plan which shall address:</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|        | <ul> <li>measures to control driving behaviour of aggregate<br/>haulers;</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|        | <ul> <li>use and monitoring of in-vehicle monitoring<br/>systems;</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|        | <ul> <li>turning movements onto the Highway to provide<br/>recommendations to optimize the safety of Highway<br/>users; and</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|        | <ul> <li>measures to be implemented to prevent the transfer<br/>of aggregate and other detritus materials onto the<br/>Highway and local road network.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|        | <ul> <li>As a condition of the future DP, the applicant will be<br/>required to provide a transportation network assessment,<br/>prepared by a qualified professional, of the haul routes to<br/>the proposed aggregate markets taking into consideration<br/>the truck traffic from the proposed pit and other pits in the</li> </ul>                                                                                                                                                                                                                                                                                                                   |



| AGENCY | COMMENTS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|        | area. The assessment shall take into consideration the<br>existing constraints of the haul routes and provide<br>recommendations to improve road safety to the satisfaction<br>of the County and AT. The applicant may be required to<br>implement the necessary highway safety improvements<br>along its identified haul routes as identified by the County<br>and AT prior to issuance of the future development permit.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|        | • As a condition of future DP, the applicant will be required to provide payment of the Transportation Offsite Levy, in accordance with the current levy at the time of DP, for the total gross acreage of the gravel pit and areas associated with gravel extraction activities.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|        | Sanitary/Waste Water:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|        | • Engineering has no concerns at this time. As per policy 449, the county recommends the use of sewage holding tanks and a trucked service for all industrial, commercial and institutional lands.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|        | Water Supply And Waterworks:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|        | <ul> <li>Engineering has no concerns at this time however<br/>recommends the use of cisterns and a trucked service for<br/>all industrial, commercial, and institutional applications.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|        | Stormwater Management:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|        | • The applicant provided a Conceptual Stormwater<br>Management Report prepared by Matrix Solutions Inc.<br>dated April 2020, which provides the overall stormwater<br>management concept for the gravel pit. As a condition of<br>future DP, the applicant will be required to provide a<br>detailed stormwater management plan for each of the<br>Phases of the pit area, which follows the stormwater<br>management concepts outlined in the Matrix Solutions Inc.<br>dated April 2020 and meets the requirements of the County<br>Servicing Standards. The concept relies on a series of<br>ditches and dewatering exaction pits that pumps to the<br>recharge pond assuming that only one mining phase is<br>expected at a time. Please note that AEP approval will be<br>required for the implementation of the discharge pump or<br>for any release exceeding the pre-development volume to<br>the Bow River. |
|        | <ul> <li>As a condition of the future DP, the applicant will be<br/>required to provide a detailed Stormwater Management<br/>Plan for each future phase of the subject site in accordance<br/>with the Conceptual Stormwater Drainage Management<br/>Plan prepared by Matrix Solutions Inc. dated April 2020 to<br/>the satisfaction of the County.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |



| AGENCY                                | COMMENTS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                       | <ul> <li>As a condition of the future DP, the applicant will be<br/>required to provide an Erosion &amp; Sedimentation Control<br/>Plan (ESC) prepared by a qualified professional, providing<br/>the ESC measures to be implemented onsite during the<br/>operation of the pit in accordance with the MSDP and the<br/>requirements of the County Servicing Standards.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                 |
|                                       | Environmental:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                                       | • The applicant provided a Biophysical Impact Assessment (BIA) prepared by Matrix Solutions Inc. dated September 2019. The report indicated that there are existing wetlands, riparian, rivers, etc. that are located on the subject site. As a condition of the future DP, the applicant will be required to provide a wetland impact assessment, prepared by a qualified professional, identifying the classification and all other relevant characteristics of the impacted wetlands, provide and implement the mitigation strategy as outlined in the BIA within each phase of mining/extraction. The applicant will be required to obtain all permits and approvals from AEP under the <i>Water Act</i> for the loss of the wetlands due to the gravel extraction activities. |
| Agriculture & Environment<br>Services | It may be of benefit to the applicant to create a Weed Management<br>Plan and have a contractor available (or be personally prepared) to<br>control any regulated weeds. The applicant will need to ensure<br>compliance with the Alberta Weed Control Act.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

Circulation Period: July 31, 2020, to September 1, 2020; Direct Control District circulated May 7 to May 31, 2020.

Agencies that did not respond, expressed no concerns, or were not required for distribution, are not listed.

TOWN OF COCHRANE

101 RancheHouse Rd. Cochrane, AB T4C 2K8 P: 403-851-2500 F: 403-932-6032 www.cochrane.ca



June 23, 2021

Ms. Oksana Newmen 262975 Rocky View Point Rocky View County, AB T4A 0X2

Via E-mail: onewman@rockyview.ca

#### SUBJECT: Town of Cochrane Public Hearing comments regarding Bylaw C-8073-2020

Dear Ms. Newmen,

Thank you for the opportunity to provide comments on **Bylaw C-8073-2020**, scheduled for Public Hearing on Tuesday, July 6, 2021. I am writing to confirm that the Town of Cochrane continues to have outstanding concerns related the proposed gravel pit expansion west of our community, and the potential detrimental impacts that this future development could have upon Cochrane and its citizens. Therefore, the Town of Cochrane respectfully requests that Rocky View Council consider the following submission during the Public Hearing process and table proposed bylaw until such time as these outstanding matters can be addressed.

The Town of Cochrane and Rocky View County have a strong and long standing intermunicipal relationship, highlighted by the RancheHouse Accord, a Municipal Affairs Collaborative Governance Initiative, intended to be a model of how to proactively improve municipal business and intermunicipal relations. The Town of Cochrane strives to continue to build upon this important intermunicipal relationship, but also recognize the importance of gravel resource development that helps support the construction and development of our community, as well as others within the Calgary region. However, the Town of Cochrane cannot support proposals for development that fail to properly address and mitigate their potential detrimental impacts upon our community.

The Town of Cochrane would like to highlight several key areas of concern for Rocky View County Council's formal consideration including:

#### Traffic Safety

The Town has diligently worked with the Province of Alberta regarding the upgrade of the Highway 1a/22 interchange that is anticipated to commence construction in 2022. The Town is confident this major infrastructure project will result in significant transportation improvements in Cochrane and western Rocky View County. However, Highway 1a west of the interchange remains a single lane in each direction with growing traffic and congestion issues related to both regional traffic and our rapidly growing communities of Heartland and Heritage Hills. The addition of heavy gravel truck traffic presents an additional safety concerns for Cochrane residents and other travellers using this stretch of Highway 1a, both in the long-term and during the anticipated highway upgrade period. Through our engagement process on this file, the Town inquired as to whether a safety analysis for the heavy gravel truck traffic related to the posted highway speeds and intersections had occurred. To date the Town has not received a response related to this issue.

The Town acknowledges the traffic generated in accordance with the traffic impact assessment may not warrant additional infrastructure improvements at this time. However, the Town remains concerned with the potential long-

## E-1 - Attachment B Page 15 of 39

term impacts on our community as the proposed traffic volumes generated by the gravel extraction site may change over time. The Town requests to be notified and provided the opportunity to collaborate on any proposed operational changes to the gravel extraction site in accordance with Rocky View County MDP policy 15.5 that states *Where aggregate activities are located in proximity to an adjacent municipality, the County should co-operate with that jurisdiction to ensure co-ordination of major haul routes and mitigation of impacts on adjacent land uses.* 

#### **Environmental Considerations**

Given the proximity of the proposed development to the Bow River and Cochrane's western boundary, the Town of Cochrane also maintains significant concerns related to source water protection and dust control/mitigation. The Town's water treatment facility that provides drinking water to our growing population of 32,000 residents is located only a few kilometres downstream from this proposal. As a result, it is imperative that the Town is provided confirmation that this proposal will not impact the Town's water resources, nor those of our regional partners downstream.

With the predominant westerly winds in this area, it will also be critical that dust control and mitigation are addressed to ensure adjacent residents in both Rocky View County and the Town of Cochrane are not impacted by this proposed development.

The Town recognizes the County's MDP goals to support the extraction of natural resources in a manner that balances the needs of residents, industry, and society, and the to support the environmentally responsible management and extraction of natural resources. However, the Town would respectfully request that the County to prioritize Section 15.1 of the MDP which states the County will *minimize the adverse impact of aggregate resource extraction on existing residents, adjacent land uses, and the environment.* 

To date, these two key concerns remain outstanding and the Town cannot support the County proceeding with the proposed bylaw until further information and reassurances can be provided.

The Town of Cochrane would also like to take the opportunity to emphasize the importance of two critical initiatives to Rocky View County Council that will be negatively impacted by the proposed development, Cochrane's Community Vision and The Great Trail.

The Cochrane Community Vision is a long-term blueprint for how Cochrane will develop and evolve over the next decade and was formally adopted by Council in November 2019. This guiding document is very important to our Council and reflects Cochrane's aspirations for the future of the community, including the adjacent rural character areas that help define the unique identity of Cochrane and Rocky View County. Through the Community Vision document the Town is seeking to collaborate with Rocky View County to ensure future developments within this area only help to reinforce this rural character for the benefit of both municipalities. As predominantly agricultural lands characterize the land use along the Highway 1a corridor and in the absence of an Area Structure Plan, the Town remained confident our vision was aligned with the County Plan. The introduction of an industrial operation of this magnitude in this area represents a departure from this vision and will have direct impacts upon Cochrane, and our Community Vision.

The Great Trail is a community-based project that envisions a regional trail along the Bow Corridor adjacent to Highway 1a that will eventually connect Canmore, the Stoney Nakoda Nation and the Town of Cochrane. This initiative is anticipated to have a similar tourism multiplier effect that the Banff to Canmore Legacy Trail had following its construction and eventually become a regional and global tourism draw within Alberta. As currently proposed, a large berm is proposed adjacent to this development will be directly impact future users of The Great Trail. Therefore, the Town is seeking an opportunity to collaborate with the County on potential solutions.

#### ATTACHMENT 'B': APPLICATION REFERRALS

#### E-1 - Attachment B Page 16 of 39

In closing, we trust Rocky View County Council appreciates that the Town of Cochrane is focused upon protecting the long-term interests of Cochrane and its residents and recognize that the concerns raised are significant to the future of our community. We look forward to opportunity to explore collaborative solutions with Rocky View County regarding these concerns to ensure that the respective interests of both jurisdictions are adequately reflected. In the meantime, the Town is respectfully requesting that Rocky View County Council consider the following submission during the Public Hearing process and table proposed bylaw until such time as these outstanding matters can be addressed.

Sincerely,

Drew Hyndman General Manager, Development & Community Services Town of Cochrane

Cc: Mike Derricott, CAO, Town of Cochrane Town Council, Town of Cochrane

## **Rocky View County**

## **Council Meeting and Public Hearing – First Notice**

## Tuesday, July 6, 2021

# IN THE MATTER OF Proposed Amendments to Land Use Bylaw C-8000-2020 and other statutory public hearings

Reference: DIVISION 9 – Public hearing to consider Bylaw C-8073-2020 to portions of NE-15-26-5-W5M, NW/NE-14-26-5-W5M, SE/NW/NE-13-26-5-W5M, SW/NW/E-18-26-4-W5M from Agricultural, General District (A-GEN) to Special, Natural Resources (S-NAT) to facilitate aggregate extraction. Located approximately 1.8 km (1.1 miles) northwest of the Town of Cochrane; located on the south side of Highway 1A, beginning at 0.8 km (0.5 mile) from the intersection of Range Road 53 and Highway 1A to approximately 1.6 km (1.0 mile) east of Range Road 50; with the exception of NW-13-26-05-W05M.

File: PL20200066 (06818002/8003/8004; 06913001/3003/4001/4002/5001, 06913002)

#### SUBMISSION OF THE STONEY NAKODA NATIONS AND WOSTE IGIC NABI LTD.

| Stoney Consultation                   | Woste Igic Nabi Ltd.        |
|---------------------------------------|-----------------------------|
| PO Box 120                            | PO Box 40                   |
| Morley, AB T0L 1N0                    | Morley, AB T0L 1N0          |
| Attention: William Snow               | Attention: Joseph Stepaniuk |
| email: <u>bills@stoney-nakoda.com</u> | Email: joes@nakodaog.com    |

# **Table of Contents**

| INTRODUCTION                             | 1  |
|------------------------------------------|----|
| FAILURE TO CONSULT                       | 3  |
| HISTORICAL RESOURCES                     | 3  |
| WATER                                    | 5  |
| NEED FOR THE PROJECT                     | 6  |
| DEFICIENCY OF THE PUBLIC HEARING PROCESS | 7  |
| RECONCILIATION AND UNDRIP                | 8  |
| COVID-19                                 | 10 |
| CONCLUSION                               | 11 |
|                                          |    |

## Introduction

- This submission regarding Bylaw C-8073-2020 is made on behalf of the Stoney Nakoda Nations (the "Stoney Nakoda") and its wholly-owned subsidiary Woste Igic Nabi Ltd.
- The Stoney Nakoda are comprised of the Bearspaw First Nation, Chiniki First Nation, and Wesley First Nation whose main reserve is Morley IR 142, 143, 144, (undivided). The Stoney Nakoda are also known as the Îyârhe Nakoda (People of the Mountains). The Stoney Nakoda were signatories to Treaty No. 7 in 1877.
- 3. The Chiefs and Councils of the Stoney Nakoda have the authority to protect the collective rights and interests of the Stoney Nakoda as recognized by Treaty No. 7 & the *Natural Resources Transfer Act*, *1930* and protected by Section 35 of the *Constitution Act*, *1982*.
- 4. The Stoney Nakoda continue to exercise their Aboriginal rights and treaty rights throughout their traditional lands (collectively, "Section 35 Rights")<sup>1</sup>. The Stoney Nakoda are seeking judicial recognition of these Section 35 Rights, including Aboriginal title as being claimed in the Court of Queen's Bench of Alberta, Action No. 0301-19586.<sup>2</sup>
- 5. These Section 35 Rights are exercised by Stoney Nakoda members within Rocky View County.
- 6. The Stoney Nakoda traditional territory extends along, in part, the eastern slopes of the Rocky Mountains and the Foothills; therefore, the Town of Cochrane and Rocky View County lie within this traditional territory.
- 7. The Stoney Nakoda have not surrendered or ceded the use of waters originating and flowing throughout Stoney Nakoda traditional territory, including the bed and banks

<sup>&</sup>lt;sup>1</sup> "territories, over which a First Nation traditionally hunted, fished, and trapped and continues to do so today" (see para 48 of *Mikisew Cree First Nation v. Canada (Minister of Canadian Heritage)*, 2005 SCC 69 (CanLII), [2005] 3 SCR 388, online: <<u>https://canlii.ca/t/1m1zn</u>>, retrieved on 2021-02-24).

<sup>&</sup>lt;sup>2</sup> Appendix "A": Maps showing Aboriginal title lands and the traditional lands of the Stoney Nakoda.
of those waters. The Stoney Nakoda have enjoyed since time immemorial continuous use of water in their traditional lands by way of hunting, fishing & trapping and camping, gathering, cultural & spiritual activities.

- 8. Since 1911, the Stoney Nakoda have been one of the oldest producers of hydro power in Alberta. The water rentals that have been paid yearly since 1911 by the Calgary Power Company, now TransAlta, are a testament to the Stoney Nakoda leadership who fought for Stoney water rights in the early 20<sup>th</sup> Century. The Stoney Nakoda continued work to advance their water rights for the duration of the last century and will continue to do so moving forward into the 21<sup>st</sup>.
- 9. Stoney water rights are enshrined in the Natural Resources Transfer Agreement between Canada and the province of Alberta, specifically in the 1945 amendment and its reference to the Ghost Reservoir.<sup>3</sup>
- 10. The Stoney Nations require their traditional lands to continue to exercise their cultural and traditional practices. Importantly, the Stoney Nations require their traditional lands to be ecologically functional to pass on their cultural and traditional practices to subsequent generations. In this way, their culture and traditions are inextricably linked to their traditional lands:

[80] It is critical to consider the nature of the potential loss from an Aboriginal perspective. From that perspective, the relationship that Aboriginal peoples have with the land cannot be understated. The land is the very essence of their being. It is their very heart and soul. No amount of money can compensate for its loss. Aboriginal identity, spirituality, laws, traditions, culture, and rights are connected to and arise from this relationship to the land. This is a perspective that is foreign to and often difficult to understand from a non-Aboriginal viewpoint.<sup>4</sup>

11. Woste Igic Nabi Ltd., a wholly-owned subsidiary of the Stoney Nakoda, owns land in Rocky View County at NE-8-25-5-W5M.

 <sup>&</sup>lt;sup>3</sup> <u>An Act to Ratify Certain Agreements Between the Government of the Dominion of Canada and the Government of the Province of Alberta, SA 1946, c 2, Schedule I</u> (online: retrieved on 2021-06-11).
 <sup>4</sup> <u>Platinex Inc v Kitchenuhmaykoosib Inninuwug First Nation</u>, 2006 CanLII 26171 (ON SC), at para 80 (online: retrieved on 2021-06-11).

- 12. The land owned by Woste Igic Nabi Ltd. is a mere quarter-section west of the Landowner Circulation Area shown in Appendix 'B' of Bylaw C-8073-2020.
- Going forward in this submission, all references of "Stoney Nakoda" shall include Woste Igic Nabi Ltd.

# Failure to Consult

- 14. While the Stoney Nakoda have had communications with Rocky View County since January regarding Application PL20200066, BURNCO Rock Products Ltd. ("BURNCO") has not reached out to the Stoney Nakoda who are the nearest First Nations to redesignation lands.
- 15. The Stoney Nakoda Consultation package was forwarded to BURNCO; however, the Stoney Nakoda have not received a reply. For the BURNCO project, the consultation process with Stoney Nakoda Nation is incomplete.
- 16. As stated in the introduction, Woste Igic Nabi Ltd. is a landowner near the redesignation lands in Rocky View County.

# **Historical Resources**

- 17. The Stoney Nakoda are concerned that the historical resource study conducted by Lifeways of Canada Limited in 2019 did not take into account any indigenous perspective since the redesignation lands are privately owned. That is, there was no field work performed in conjunction with the Stoney Nakoda or their knowledge keepers.
- 18. The lands at issue are within the traditional territory of the Stoney Nakoda and could therefore contain gravesites, artifacts and other cultural resources important to the Stoney people, especially since there are 28 tipi rings located in the project area.

- 19. The Stoney Nakoda historically travelled through this area<sup>5</sup> and also have oral history and traditional stories of the area. See the attached maps in Appendix 'B' that give context to the Stoney Nakoda's pre-settlement use of the area where the tipi rings are located.<sup>6</sup>
- 20. Without consultation with and contribution from the Stoney Nakoda, any historical use studies will fall short. Stoney Nakoda gravesites, artifacts and cultural resources on private land are equally as important to the Stoney Nakoda as they are on Crown land within our traditional territory.
- 21. With respect to Lifeways of Canada Limited's recommendation that additional mitigation be required for the archaeological sites in Disturbance Areas 1, 3 and 4 prior to development, the Stoney Nakoda should at the very least be engaged in the process and study because of their historical presence in the area.
- 22. By way of example, Altalink was decommissioning an electrical transmission line on private land located south of the Town of Ponoka in 1966. When the power poles were removed, human remains were unearthed and an archaeological excavation was subsequently conducted. These remains were of the disbanded Sharphead Indian Band, one of the Nakoda speaking Bands in Alberta.
- 23. At that time, 26 different human remains were unearthed and eventually taken to University of Alberta and City of Edmonton facilities. In later years, 2 additional bone sets were uncovered, bringing the total to 28 sets of human remains.
- 24. In 2007, the Government of Alberta contacted 15 First Nations in order to decide how to rebury the human remains. It was not until 2014 that a special plot of Crown land, west of Ponoka, was set aside for a reburial ceremony that included Stoney Nakoda and Cree ceremonial leaders, according to First Nation protocols.

<sup>&</sup>lt;sup>5</sup> *Chaps and Chinooks: a history west of Calgary*, vol 1 (Calgary, Alberta: Foothills Historical Society, 1976).

<sup>&</sup>lt;sup>6</sup> *Ibid* at pages 6, 66 and 67; and *Big Hills Country: Cochrane and Area* (Cochrane and Area Historical Society, 1977) at page 74.

- 25. Today, the First Nations consultation policies still do not apply to private land. This is no longer an appropriate approach when major projects, such as gravel pits, disturb multiple sections of land, especially where there is already such clear evidence of First Nations presence.
- 26. Presently there is no legislation in place to protect gravesites of First Nations in Alberta and there should be. Legislation would allow for the necessary protections for gravesites in a proactive manner as opposed to risking the chance that these sites are disturbed once a project has already been approved.
- 27. BURNCO's MSDP doesn't address this legislative gap and Rocky View County should take into consideration this lack of adequate protection of First Nation grave sites when contemplating the redesignation of the lands for aggregate extraction.
- 28. In 2000, Alberta enacted the *First Nations Sacred Ceremonial Objects Repatriation Act*, RSA and in 2004 passed the *Blackfoot First Nations Sacred Objects Repatriation Regulations*, Alta Reg 96/2004. The Stoney Nakoda do not have the benefit of similar legislation to repatriate and protect its own ceremonial and sacred objects. This has created a gap in the acknowledgement of and the protection specifically for the Stoney Nakoda.

# Water

- 29. While the Bow River runs through the Stoney Nakoda reserve upstream of the project development area, the Stoney Nakoda are concerned about the overall health of the Bow River system.
- 30. The removal of an estimated 15,000,000 tonnes of aggregate along the Bow River would cause significant damage to the aquifer and compromise the aquifer's ability to filter contaminants resulting from the development.
- 31. Considering the importance and the interconnectedness of the ecosystem and watershed of the Bow River Basin both upstream and downstream from the lands for

redesignation, landowners further along the Bow River, specifically in the Seebe to Bearspaw Sub-Basin, should have been informed about the project.

32. Woste Igic Nabi Ltd. should have been included in the notification to the landowners.

# Need for the project

- 33. The Stoney Nakoda do not support the redesignation of the lands shown in Schedule A of Bylaw C-8073-2020. The Stoney Nakoda regard BURNCO's development as direct competition with the Goodstoney Gravel Pit at Morley.
- 34. The Master Site Development Plan ("MSDP") lists four other pits operated by BURNCO; however, Council cannot to ignore the many other pits in operation or proceeding through the approvals process within Rocky View County and the neighbouring M.D. Foothills and M.D. Bighorn. For example, Bylaw C-8027-2020 regarding the rezoning of lands for Mountain Ash Limited Partnerships' Summit Pit also located within Rocky View County and more specifically within the Big Hill Springs area was recently approved by Council. How many simultaneous 30-year operations do there need to be in Rocky View County?
- 35. The Stoney Nakoda's own Goodstoney Gravel Pit, once opened, will operate for approximately 25 years and will supply aggregate for the Highway 1A upgrade/expansion and also for the Springbank Off-Stream Reservoir & Highway 22 project.
- 36. It is conceivable that BURNCO may be hoping to supply Alberta Transportation with aggregate for the aforementioned projects. Alberta Transportation has undertaken that the required aggregate for the Highway 1A expansion will be will be supplied by the Stoney Nakoda.
- 37. With the likelihood that BURNCO's pit will not be suppling aggregate to these major projects, the need for a new aggregate pit in the area is questionable.
- 38. To minimize the impact to the environment and reduce the overall cumulative effects of multiple aggregate extraction projects, the Rocky View County needs to delay the

project until such time there is a justifiable need for more aggregate extraction in the Bow Valley Corridor.

39. Bylaw C-8073-2020 should not be approved or proceed to second reading.

# **Deficiency of the Public Hearing process**

- 40. The minimal requirements for notice and public hearings pursuant to the *Municipal Government Act*<sup>7</sup> do not satisfy public demand for early and better engagement for amendments to bylaws.
- 41. Further, these minimal requirements make no concession for the unique nature of consultation required with the Stoney Nakoda. While the Stoney Nakoda are not landowners in the traditional sense (aside from the land owned by Woste Igic Nabi Ltd.), the Stoney Nakoda are immediate residents to these lands and as First Nations hold unique interest in development projects in the area, regardless of whether those projects are on private or Crown Land.
- 42. The following map shows the Stoney Nakoda reserve lands are, at certain locations, less than 1 km from the development area on the north side of the Bow River. The Stoney Nakoda on the south side of the river on the eastern side would be affected by noise, light and air pollution resulting from the development.

<sup>&</sup>lt;sup>7</sup> RSA 2000, c M-26.



43. A thorough cultural and traditional use study should be done for this area and is needed now under the current consultation and constitutional guidelines, before any additional encroachment on traditional territory is incurred by the development.

# **Reconciliation and UNDRIP**

- 44. In the spirit of reconciliation, applicants to the Rocky View County in this case, BURNCO Rock Products Ltd. – and the County itself have an obligation to take into consideration the Truth and Reconciliation Commission's (the "TRC") calls to action to provide a more inclusive approach when it comes to the Stoney Nakoda neighbours.
- 45. BURNCO Rock Products Ltd. and Rocky View County ought to address the following TRC calls to action:

43. We call upon federal, provincial, territorial, and municipal governments to fully adopt and implement the United Nations Declaration on the Rights of Indigenous Peoples as the framework for reconciliation.

92. We call upon the corporate sector in Canada to adopt the United Nations Declaration on the Rights of Indigenous Peoples as a reconciliation framework and to apply its principles, norms, and standards to corporate policy and core operational activities involving Indigenous peoples and their lands and resources. This would include, but not be limited to, the following:

i. Commit to meaningful consultation, building respectful relationships, and obtaining the free, prior, and informed consent of Indigenous peoples before proceeding with economic development projects.

ii. Ensure that Aboriginal peoples have equitable access to jobs, training, and education opportunities in the corporate sector, and that Aboriginal communities gain long-term sustainable benefits from economic development projects.

iii. Provide education for management and staff on the history of Aboriginal peoples, including the history and legacy of residential schools, the United Nations Declaration on the Rights of Indigenous Peoples, Treaties and Aboriginal rights, Indigenous law, and Aboriginal–Crown relations. This will require skills based training in intercultural competency, conflict resolution, human rights, and anti-racism.<sup>8</sup>

- 46. The Stoney Nakoda submit that Rocky View County ought to interpret and apply its bylaw approvals and Master Site Development Plan processes through the lens of the United Nations Declaration on the Rights of Indigenous Peoples ("UNDRIP").
- 47. The Government of Canada acknowledges UNDRIP as "a road map to advance lasting reconciliation with Indigenous peoples".<sup>9</sup> Again here, a shift in perception needs to reach the municipal level.

Article 19 – States shall consult and cooperate in good faith with the indigenous peoples concerned through their own representative institutions in order to obtain their free, prior and informed consent before adopting and implementing legislative or administrative measures that may affect them.

Article 25 – Indigenous peoples have the right to maintain and strengthen their distinctive spiritual relationship with their traditionally owned or otherwise occupied and used lands, territories, waters and coastal seas and other resources and to uphold their responsibilities to future generations in this regard.

<sup>&</sup>lt;sup>8</sup> Online: https://nctr.ca/assets/reports/Calls\_to\_Action\_English2.pdf.

<sup>&</sup>lt;sup>9</sup> Online: https://www.justice.gc.ca/eng/declaration/index.html.

Article 27 – States shall establish and implement, in conjunction with indigenous peoples concerned, a fair, independent, impartial, open and transparent process, giving due recognition to indigenous peoples' laws, traditions, customs and land tenure systems, to recognize and adjudicate the rights of indigenous peoples pertaining to their lands, territories and resources, including those which were traditionally owned or otherwise occupied or used. Indigenous peoples shall have the right to participate in this process.<sup>10</sup>

- 48. UNDRIP is no longer an aspirational document. Already, certain levels of government are reviewing legislation to address UNDRIP.
- 49. The Senate recently passed Bill C-15 to align Canada's laws with UNDRIP. The Stoney Nakoda encourage Rocky View County to anticipate the trickle-down effect of this change in Canada's laws, act progressively, and adopt a framework for the implementation of UNDRIP when it comes to Bylaw C-8073-2020 and other bylaws that affect its First Nation neighbours, the Stoney Nakoda.

# COVID-19

- 50. While the Stoney Nakoda continue working to overcome administrative and productivity interruptions as a result of the COVID-19 pandemic and the corresponding provincial health restrictions, they are facing additional issues on reserve and recent spike in cases. Health outcomes are more severe for the Stoney Nakoda community; therefore, the Stoney Nakoda must remain vigilant and keep community restrictions in place until the vast majority of members are fully vaccinated. With the threat of the Delta variant on the rise, the Stoney Tribal Council does not relish declaring a third state of local emergency due to another sharp increase in COVID-19 cases within the community or having to impose once again safety measures stricter than that of the province.
- 51. As a result of stricter measures on reserve, most of Stoney Nakoda's offices remain closed and various key personnel are still under reassignment to prioritize community support. The Stoney Nakoda will continue to have limited resources to properly

<sup>&</sup>lt;sup>10</sup> UN General Assembly, <u>United Nations Declaration on the Rights of Indigenous Peoples</u>: *resolution/adopted by the General Assembly*, 2 October 2007, A/RES/61/295.

review, analyze and prepare a thorough cultural study because opening on reserve will be done prudently.

- 52. Until many of the Stoney Nakoda members are fully vaccinated and operations can return more toward *normal*, the fieldwork required for a full cultural assessment is unfeasible. The health risks are too great, particularly for Elders, because the health outcomes are notably worse for the Stoney Nakoda community.
- 53. If the Stoney Nakoda do not have a chance to do a study now under the current consultation and constitutional guidelines, their continued cultural history in the area cannot be properly represented in relation to the Land Use Bylaw or Bylaw C-8073-2020.

# Conclusion

- 54. The Stoney Nakoda attempted to engage with BURNCO but received no reply or invitation to meet. As a result, the Stoney Nakoda have had no opportunity to express their concerns with respect to possible damage to the known tipi rings, to undiscovered gravesites, and cultural resources.
- 55. The Rocky View County Council ought to expand its process for public engagement. The Stoney Nakoda believe that more in-depth engagement and an improved public participation policy would lead to better solutions for the community. Late and minimal engagement is dissatisfying. Concerns are often ignored or glossed-over because what is being considered is in an advanced stage of planning.
- 56. Some municipalities, such as Calgary and Lethbridge, have developed engagement processes with an aim to work more collaboratively with their First Nation neighbours. Why not Rocky View County?
- 57. The Stoney Nakoda stress the need for traditional environmental knowledge studies specific to the land use, and particularly extraction, to accompany western scientific studies for a more comprehensive understanding of environmental and cultural issues.

- 58. In the spirit of reconciliation, Rocky View County or BURNCO should fully support and fund the Stoney Nakoda in traditional environmental knowledge and cultural assessments of the area before redesignation may be granted, any further development occurs, and any further aggregate extraction is allowed.
- 59. The Land Use Bylaw should be amended to reflect the Calls to Action, UNDRIP and, more specifically, the Stoney Nakoda's Aboriginal rights and title.
- 60. The Stoney Nakoda object to Bylaw C-8073-2020 for the foregoing reasons.
- 61. The Stoney Nakoda object to Bylaw C-8073-2020 proceeding to a second reading.
- 62. For the foregoing reasons, the Stoney Nakoda want to present to Council during the Public Hearing.
  - a. Joe Stepaniuk, William Snow and three elders, one from each of the Bearspaw, Chiniki and Wesley First Nations, would appreciate the opportunity to present to Council on July 6, 2021.

Respectfully submitted this 23<sup>rd</sup> day of June 2021.



E-1 - Attachment B





Location: Central and Southern Alberta Scale: 1: 1,000,000

Title: Stoney Nakoda Nations, Aboriginal Title

Date: March 2013







January, 2008







#### ATTACHMENT 'B': APPLICATION REFERRALS

E-1 - Attachment B Page 36 of 39



1

Page 53 of 719



8

E-т - Attachment B Page 38 of 39

# A HISTORY OF OLDS AND AREA



#### **ATTACHMENT 'B': APPLICATION REFERRALS**

E-1 - Attachment B Page 39 of 39

## 1980

ISBN 088925-146-0

published by OLDS HISTORY Committee for the Town of Olds Box 189 Olds, Alberta T0M 1P0

printed and bound in Canada by Friesen Printers 5720 Macleod Trail S. Calgary, Alberta T2H 0J6 Head Office: Altona, Manitoba



# **BYLAW C-8073-2020**

# A Bylaw of Rocky View County, in the Province of Alberta, to amend Rocky View County Bylaw C-8000-2020, being the *Land Use Bylaw*.

The Council of Rocky View County enacts as follows:

#### Title

1 This Bylaw may be cited as *Bylaw C-8073-2020*.

### Definitions

- 2 Words in this Bylaw have the same meaning as those set out in the *Municipal Government Act* except for the definitions provided below:
  - (1) "Council" means the duly elected Council of Rocky View County;
  - (2) "*Municipal Government Act*" means the *Municipal Government Act,* RSA 2000, c M-26, as amended or replaced from time to time; and
  - (3) **"Rocky View County"** means Rocky View County as a municipal corporation and the geographical area within its jurisdictional boundaries, as the context requires.

#### Effect

- 3 THAT Schedule B, Land Use Maps No. 68, 68-SW, 69 of Bylaw C-8000-2020 be amended by redesignating portions of NE-15-26-5-W5M, NW/NE-14-26-5-W5M, SE/NW/NE-13-26-5-W5M, SW/NW/E-18-26-4-W5M from Agricultural, General District (A-GEN) to Special, Natural Resources (S-NAT) as shown on the attached Schedule 'A' forming part of this Bylaw.
- 4 THAT portions of NE-15-26-5-W5M, NW/NE-14-26-5-W5M, SE/NW/NE-13-26-5-W5M, SW/NW/E-18-26-4-W5M are hereby redesignated to Special, Natural Resources (S-NAT) as shown on the attached Schedule 'A' forming part of this Bylaw.

# Transitional

5 Bylaw C-8073-2020 is passed and comes into full force and effect when it receives third reading and is signed in accordance with the *Municipal Government Act*.

| READ A FIRST TIME IN COUNCIL this  | day of | , 2021 |
|------------------------------------|--------|--------|
| PUBLIC HEARING HELD this           | day of | , 2021 |
| READ A SECOND TIME IN COUNCIL this | day of | , 2021 |
| READ A THIRD TIME IN COUNCIL this  | day of | , 2021 |

Reeve

Chief Administrative Officer or Designate

Date Bylaw Signed





#### E-1 - Attachment D Page 1 of 5 ROCKY VIEW COUNTY

# Location & Context

#### **Redesignation Proposal**

Development Proposal: To redesignate portions of 3 parcels, and 5 whole parcels totaling ± 391.10 hectares (± 966.43 acres) from Agricultural - General District to Special - Natural Resources for aggregate extraction (File: PL20200066)

A Master Site Development Plan has been submitted in support of this development proposal (File: PL20200067), to include the existing S-NAT parcel.

Division: 09 Roll: 06915001/06914002/069140 01/06913001 /06913002/06913003/06818 002/06818003/06818004 File: PL20200066 Printed: Mar 1, 2021 Legal: NE-15-26-05-W05M, NWPHE 4: 60-051W750 SE/NW/NE-13-26-05-W05M, SW/NW/E-18-26-04-W05M

#### **ATTACHMENT 'D': MAP SET**



Page 2 of 5 ROCKY VIEW COUNTY **Development** Proposal

#### **Redesignation Proposal**

Development Proposal: To redesignate portions of 3 parcels, and 5 whole parcels totaling ± 391.10 hectares (± 966.43 acres) from Agricultural - General District to Special - Natural Resources for aggregate extraction (File: PL20200066)

A Master Site Development Plan has been submitted in support of this development proposal (File: PL20200067), to include the existing S-NAT parcel.

Division: 09 Roll: 06915001/06914002/069140 01/06913001 /06913002/06913003/06818 002/06818003/06818004 File: PL20200066 Printed: Mar 1, 2021 Legal: NE-15-26-05-W05M, NWP # 9 24-66-05 10/05/0 SE/NW/NE-13-26-05-W05M, SW/NW/E-18-26-04-W05M

#### **ATTACHMENT 'D': MAP SET**



E-1 - Attachment D Page 3 of 5 ROCKY VIEW COUNTY

# Environmental

#### **Redesignation Proposal**

Development Proposal: To redesignate portions of 3 parcels, and 5 whole parcels totaling ± 391.10 hectares (± 966.43 acres) from Agricultural - General District to Special - Natural Resources for aggregate extraction (File: PL20200066)

A Master Site Development Plan has been submitted in support of this doublement Subject Lands Contour - 2 meters Riparian Setbacks Alberta Wetland Inventory Surface Water

Division: 09 Roll: 06915001/06914002/069140 01/06913001 /06913002/06913003/06818 002/06818003/06818004 File: PL20200066 Printed: Mar 1, 2021 Legal: NE-15-26-05-W05M, NW/NE-452005/W750 SE/NW/NE-18-26-05-W05M, SW/NW/E-18-26-04-W05M

#### ATTACHMENT 'D': MAP SET



Page 4 of 5 ROCKY VIEW COUNTY

# Soil Classifications

#### **Redesignation Proposal**

Development Proposal: To redesignate portions of 3 parcels, and 5 whole parcels totaling ± 391.10 hectares (± 966.43 acres) from Agricultural - General District to Special - Natural Resources for aggregate extraction (File: PL20200066)

A Master Site **Development Plan has** been submitted in support of this development proposal (File: PL20200067), to include the existing S-NAT parcel.

Division: 09 Roll: 06915001/06914002/069140 01/06913001 /06913002/06913003/06818 002/06818003/06818004 File: PL20200066 Printed: Mar 1, 2021 Legal: NE-15-26-05-W05M, NWP # 68 05 fW 05 19 SE/NW/NE-13-26-05-W05M, SW/NW/E-18-26-04-W05M



SW/NW/E-18-26-04-W05M

| From:    |                                                        |
|----------|--------------------------------------------------------|
| То:      | Oksana Newmen; Dominic Kazmierczak                     |
| Cc:      |                                                        |
| Subject: | [EXTERNAL] - Re: Update on Burnco Aggregate Submission |
| Date:    | March 9, 2021 11:14:31 AM                              |

Do not open links or attachments unless sender and content are known.

Hi Oksana,

After discussing with several parties, Rocky View and the latest hearings have set precedences on several areas that we believe Administration is responsible to include:

- water security: Lehigh and Mtn Ash agreed on water monitoring of neighbour wells, the latest up to 1.5 miles.

Darryl's well is only 40 feet deep and in the gravels.

Our dry holes immediately across from the pit showed water formation in the gravels. Without water security, we have nothing.

Hydrogeological studies are complex for all the areas. The applicant reports are not validated by third party experts.

The opposition hydrogeological experts showed significant evidence.

Alberta Environment process doesn't involve or circulate to adjacent landowners who water security is critical!

- performance measures and standards: Lehigh discussed. Mtn Ash agreed to monitoring and reporting

- size of pit: the approved Mtn Ash pit was a portion of 320 acres or about 150-160 acres in size. McKyler said she might have approved a smaller Lehigh pit?

As our largest neighbour and experienced business said phases of 10 years for the Burnco pit. Current pit was approved 2011 for 10 year pit of six phases.

Market conditions and transportation and other factors show the pit is still processing the first phase and has large piles of gravel stored waiting.

Councillor 9 has changed 3 times in 10 years. Only one councillor was on RV Council 2011 when the pit of 10 years was approved.

- since covid the tourists, traffic and area have seen significant increases. The Bow River Valley is a significant corridor and provides water security to millions downstream!

There are more points that we and our neighbours will be submitting once we know the applicant timelines and get the revised reports.

The applicant has over 4.5 months to review and revise. We expect to be given reasonable time frames of 60-90 days too.

Appreciate this topic is extremely important to our family for now and future generations!

Ann McKendrick McNabb

On Mar 8, 2021, at 11:52 AM, ONewmen@rockyview.ca wrote:

Hi Ann,

Sorry, I've not forgotten you! And Happy International Women's Day to you as well 😊

I'll send an update by the end of today.

Warm regards, ~Oksana

 From: Ann McNabb

 Sent: March 8, 2021 11:35 AM

 To: Oksana Newmen <<u>ONewmen@rockyview.ca</u>>

 Cc: Will McNabb P.E.

Subject: [EXTERNAL] - Re: Update on Burnco Aggregate Submission

Do not open links or attachments unless sender and content are known.

Hello Oksana,

Happy International Women's day! Hope you have a special day.

Just wondering if you have any answers?

Please confirm that you have received my requests? I do not know if you are working or if I should send my requests to Dominique?

Appreciate,

Ann

On Mar 1, 2021, at 13:40 PM, Ann McNabb wrote:

Hello Oksana,

Hope all is going well.

I submitted a video to the Feb 16, 2021 MDP hearing and

recommended some motions.

I am wondering if you have received an update for the Cochrane West pit from Burnco?

Will the parties who submitted and adjacent landowners be circulated and given adequate time of 8-12 weeks to comment?

Is there an anticipated time that there will be a public hearing? or any date established?

Are you involved with the Mt Ash March 2, 2021 hearing?

I have yet to hear from Alberta Environment appeal. There is growing evidence from all the Lehigh Hanson and Mtn Ash hearings technical experts that there is significant potential for impact on the water aquifer.

That is what we stated in 2009-2011 hearing for the West Cochrane now Burnco pit.

Appreciate your feedback.

Ann

Ann McKendrick McNabb President McKendrick Ranches Ltd.

| From:    | PAA Development                                                  |
|----------|------------------------------------------------------------------|
| To:      | Oksana Newmen                                                    |
| Subject: | FW: [EXTERNAL] - Public comment, Burnco West Cochrane gravel pit |
| Date:    | June 14, 2021 9:12:28 AM                                         |

Hi Oksana,

Some feedback regarding your upcomoing burnco gravel pit file west of Cochrane.

Best regards,

EVAN NEILSEN Development Assistant | Planning Services

ROCKY VIEW COUNTY 262075 Rocky View Point | Rocky View County | AB | T4A 0X2 Phone: 403-520-7285 ENeilsen@rockyview.ca | www.rockyview.ca

This e-mail, including any attachments, may contain information that is privileged and confidential. If you are not the intended recipient, any dissemination, distribution or copying of this information is prohibited and unlawful. If you received this communication in error, please reply immediately to let me know and then delete this e-mail. Thank you.

-----Original Message-----From: Christine Harrison <CHarrison@rockyview.ca> Sent: June 14, 2021 9:02 AM To: PAA\_Development <Development@rockyview.ca> Cc: Brenda Shute <BShute@rockyview.ca> Subject: FW: [EXTERNAL] - Public comment, Burnco West Cochrane gravel pit.

Hello,

We have received this email in our general mailbox for your department, please respond to this inquiry.

We respectfully request you confirm contact when this inquiry is completed.

Thank you.

CHRISTINE HARRISON Call Centre Representative || Customer Care and Support

ROCKY VIEW COUNTY 262075 Rocky View Point | AB | T4A 0X2 Phone: 403-230-1401 charrison@rockyview.ca | www.rockyview.ca

This e-mail, including any attachments, may contain information that is privileged and confidential. If you are not the intended recipient, any dissemination, distribution or copying of this information is prohibited and unlawful. If you received this communication in error, please reply immediately to let me know and then delete this e-mail. Thank you.

-----Original Message-----From: Andrew Woolley Sent: June 13, 2021 10:27 PM To: Questions <questions@rockyview.ca> Subject: [EXTERNAL] - Public comment, Burnco West Cochrane gravel pit.

Do not open links or attachments unless sender and content are known.

(Can you please pass this on ready for the hearing?)

"Yes, but not until after the Highway 1A and 22x new junction has been completed. It is already horribly difficult to manage to cross at various times of the day and the truck traffic will make it much, much worse."

Thank you.

Andrew Woolley Ghost Lake June 2, 2021

Via Email

Rocky View County 262075 Rocky View Point Rocky View County, Alberta T4A0X2

Attention: Oksana Newman, Planner

Re: Burnco West Cochrane Proposed Bylaw C-8073-2020 Application PL20200066 to amend Rocky View Land Use Bylaw (the "Proposed Bylaw Amendment")

McKendrick Ranches Ltd. (MRL), McNabb Developments Limited (MDL), and Ann McKendrick McNabb, are opposed to the Proposed Bylaw Amendment, which was presented to Rocky View (RV) Council and received first reading September 1, 2020.

**Our first and primary concern is the size of the proposed pit**. If approved, this Land Use and subsequent mine expansion would create 452 hectares (1,117 acres) of contiguous lands zoned as NRI for a gravel mining and aggregate processing expansion. The proposed land use would rezone approximately 6.5 km of lands south of the highway 1A along the Bow River.

Rezoning an area this large for resource extraction without a Rocky View gravel strategy is risky and unwise. Rocky View has not developed a gravel strategy and policies to allow a mix of land uses in a developing a community for the next 120 years. Policies need to be established to allow growth, planning, operating, reclamation, and environmental standards to protect surrounding residents from the harmful health, water, and numerous concerns. Currently the County approves land use assuming the extensive regulatory approvals which don't engage the community. Approving decades (or potentially a century +) of gravel with current policies and practices is not be in the best interests of future Councils and future generations of Rocky View residents. At a recent Council meeting, it was stated Rocky View has 50 or more years of gravel supply, so taking the time now to get this right is imperative.

Burnco has advised their current operations are 125,000 tonnes per year. At this rate, the current zoned 151 ac pit allows for 20 years of supply. At this time we feel there is no need to expand. The proposed total expanded pit is estimated to be 15 million tonnes would take 120 years of gravel extraction at the current yearly sales. Burnco's proposed MSDP states that they plan to increase the production to 500,000 tonnes per year over the next few years but these numbers are purely speculative. If these rates were ever to be achieved, Burnco proposes the pit will result in 30-35 years of aggregate extraction, which based on past performance we feel are not achievable.

Our concern is that if Rocky View approves between 30-120 years of gravel production, spanning 6.5 km along a critical county and tourist highway corridor, the County and the Community will lose the ability to apply good planning principals, will sterilize the entire area, and impact the highest and best use of this area along the beautiful Bow River west of Cochrane. This is directly contrary to Rocky View new Municipal Development Plan (MDP).

**Recommend that Council grant Aggregate Land Use for an area that can be mined and reclaimed in a ten-year period or for an additional 160acres.** This would allow Burnco to continue development and minimize impact to adjacent property owners, allow review of the environmental impact and critical Bow River water aquifer, and understand the performance monitoring Burnco has identified in the MSDP and proposed Direct Control monitoring measures. The Land Use timeframe should be defined for a specific period so that the County, adjacent properties, and the community can plan for future land use and development growth with the County's and Bow River Community's best interest in mind.

Recommend Rocky View table the bylaw until third party reviews of water quality are conducted and presented to Rocky View given concerns of water aquifer needs to adjacent owners, First Nations, and downstream water intakes by Cochrane and Calgary. A scientific study done by Jon Fennel (attached) shows the current 151 ac Burnco pit, has water samples with concentrations of these constituents: aluminum, chromium, arsenic, lead, cadmium, cobalt, copper, iron, and zinc were found to be in excess of guidelines for the protection and freshwater aquatic life in Alberta's surface waters (Alberta Environment 2018). Some were also in excess of Health Canada's 2020 Guidelines for Canadian Drinking Water Quality, those being: aluminum, arsenic, lead, iron, mercury and manganese. Further reviews should ensure biophysical impact and environmental sensitive setbacks of Grand Valley Creek are adequate before consideration of rezoning.

**Recommend Rocky View table the bylaw until the MSDP is updated to not impact neighbouring properties.** We ask that Burnco revise their MSDP to not impact neighbouring properties when it comes to impacts such as dust. Currently Burnco shows dust impacts extending onto neighbouring properties, we feel that is unfair and unnecessary and needs to be remedied before rezoning is considered as the MSDP forms part of the bylaw being contemplated by Council.

In summary, we are opposed to a gravel development of 1117 ac and 6.5 km along the Bow River 1A corridor which contain some of the most picturesque views in all of Rocky View County. We urge Rocky View Council to limit Burnco to the amount of land that can be developed and reclaimed in a ten-year time frame.

We also urge Council to table this bylaw until third party reviews are completed to validate the potential impact of the current and any future expansion of the Burnco pit on the drinking water quality for adjacent properties, Cochrane, Calgary, downstream users, and the aquatic life of this ecosystem.

Sincerely,

Ann McKendrick McNabb, President McKendrick Ranches Ltd. William McNabb, President McNabb Developments Kari-Ann McNabb, Vice President McNabb Developments

# Summary of a scientific experiment by Dr. Fennell, M.Sc., Ph.D., P.Geol. Hydrogeologist & Geochemist, see attached report and data for the complete results.

An experiment was conducted on a sample of sand and gravel obtained from Burnco's current West Cochrane Pit. This pit is part of a large development currently under review by Rocky View County. The area extends for 6 or more kilometers along the Bow River approximately 7km west on Highway 1A from the Highway 1A/22 intersection. The purpose of this experiment was to assess what type of changes to water quality might occur after flowing deionized water these sediments. The purpose was to mimic the infiltration of snowmelt and/or rainfall through a thin (1.25m) column of soil (see Figure 1).



Figure 1. Experimental setup, execution, and sample turbidity noted.

Test results showed a significant increase in turbidity (0 to >4000 NTU), pH (5 to 9.1), and the chemical quality of the effluent water. The most notable changes were related to metals and trace elements, many exceeding published guidelines to protect humans and aquatic receptors (see the following table).
| Parameter            | Soil flush<br>#1 | Soil flush<br>#2 | AB Tier<br>1                                                                       | AB<br>FWAL | CDWQ        |
|----------------------|------------------|------------------|------------------------------------------------------------------------------------|------------|-------------|
| Turbidity (NTU)      | >4000            | 1600             |                                                                                    | 2          |             |
| Aluminum (mg/L       | 6.1              | 4.0              | 0.                                                                                 | 05         | <0.1 og     |
| Arsenic (mg/L        | 0.019            | 0.009            | 0.005                                                                              | 0.005      | 0.010 alara |
| Cadmium (µg/L)       | 0.53             | 0.44             | 0.3                                                                                | 34*        |             |
| Chromium (mg/L)      | 0.013            | 0.020            | 0.001 <sup>+</sup> 0.001 <sup>+</sup><br>0.0049 <sup>++</sup> 0.0089 <sup>++</sup> |            | 0.05 мас    |
| Cobalt (mg/L)        | 0.0095           | 0.0071           | 0.0                                                                                | 015*       |             |
| Copper (mg/L)        | 0.0150           | 0.0097           | 0.0070                                                                             | 0.0390     | 2 ao        |
| Iron (mg/L)          | 17               | 12               | 0                                                                                  | .3         | ≤0.3 ao     |
| Lead (mg/L)          | 0.010            | 0.0073           | 0.0                                                                                | 07*        | 0.005 alara |
| Manganese (mg/L)     | 0.81             | 0.74             | 0.05                                                                               |            | 0.12 мас    |
| Mercury-total (mg/L) | Not              | 0.030            | 0.000005                                                                           |            | 0.001 MAC   |
| Zinc (mg/l)          | 0.120            | 0.073            | 0.030                                                                              |            | 5.0 AO      |

Notes:

1. Values indicated for protection of freshwater aquatic life relate to long-term exposure.

2. \* Assumes a groundwater hardness of 250 mg/L (as CaCO<sub>3</sub>).

3. + = hexavalent; ++ = trivalent.

3. MAC = maximum acceptable value; ALARA = as low as reasonably achievable; AO = aesthetic value; OG = operational guidance value.

The proposed development of the West Cochrane Pit by Burnco will significantly, and permanently, alter the natural landscape of this picturesque area and forever change the conditions by eliminating the filtering capacity of the soils to contaminants mobilized or introduced during pit operation and following site reclamation. And given the estimate groundwater flow rates, based on available site information ( from around 150 to more than 500 m/yr) the threat of impact to nearby receptors is notable.



Exposing sand, gravel, and bedrock to weathering and flushing has the potential to increase risk to the local environment from mobilized or introduced contaminants. Not only will fish-bearing streams like the Bow be put at risk, but also the drinking water supplied of downstream communities. If this is not properly assessed we are placing these receptors at risk. Unfortunately, we are left with more questions than answers. And for such a highly intrusive, visually unappealing, and extremely disruptive project wouldn't you want to know?

The concern with the current application before Rocky View County is that it does nothing to assess the impacts that may occur around a VERY LARGE gravel pit development, despite the opportunity to clarify these outstanding questions and concerns.

# Why is it always have to be left up to the public to seek the truth about such gravel developments?

# Why can't proponents do a more thorough job of assessing the risks?

June 5, 2021

Attention: To whom it may concern

### Re: West Cochrane Pit soil column flushing experiment

The following is a summary of the experiment conducted on a sample of sand and gravel obtained from Burnco's currently operating West Cochrane Pit, located approximately 7 km west on Highway 1A from the Highway 1A/22 intersection. The purpose of this test was to assess the possible physical and chemical changes that may occur to water (i.e. precipitation) flowing through these sediments and entering the local groundwater.

## <u>Methodology</u>

A sample of sand and gravel was procured from the Burnco West Cochrane Pit for testing. Once delivered, a subset of that sand and gravel was placed in a newly purchased, and cleaned, plastic 20L pail for delivery to the point of testing. On 08 May 2021 a representative aliquot of the sand and gravel, comprising a mixture of clay, silt, sand and cobbles, was loaded into a pre-cleaned 1.5 m x 51 mm ID PVC pipe to mimic a vertical soil column beneath the Burnco pit area. A pre-cleaned plastic container was used to load the sample into the PVC pipe to avoid the use of any metallic equipment. Prior to loading the sample, the base of the PVC pipe was covered with clean fibreglass mesh to retain the soil sample the pipe. Once in place, settling of the sediment was achieved by tapping the outside of the pipe with a small hammer to compact the material towards natural in-situ conditions.

Laboratory-grade deionized water was obtained from the contacted laboratory (Bureau Veritas, BV) to react with the soil column. Prior to adding the deionized water to the soil, the length of the sediment column was measured indicating a 1.25 m vertical thickness. When ready the soil column was slowly hydrated with the deionized water to mimic infiltration of precipitation. Once the water began draining from the base of the PVC pipe, unfiltered samples were collected into sample bottles provided by BV (i.e. HDPE and glass, where required).

An initial set of samples (Soil flush #1) was collected on 08 May 2021 at 11:30AM. Once obtained and properly labelled the samples were placed in a refrigerator. The soil column was then allowed to drain over-night and a second set of samples (Soil flush #2) was collected the following day, 09 May 2021 at 10:45AM, using the same deionized water flow-through procedure.



Figure 1. Experimental setup, execution, and sample turbidity noted.

Upon completion of testing, both sample sets were placed in an ice-filled cooler to maintain their integrity while in transit to BV in northeast Calgary AB. Stand chainof-custody (CoC) protocols were followed to track the shipping and handling process. Delivery was made within 48 hours for the first set of samples, and 24 hrs for the second set. A copy of the completed CoC is provided in Appendix 1. During the testing procedure, photographs were taken to document the process. Visual turbidity of the samples was noted at the time, as indicated in the photographs provided in Figure 1.

### **Analytical program**

A relatively comprehensive analytical program was executed to assess changes to the deionized water quality following its transit through the soil column. Analysis was completed for the following:

- pH, alkalinity, and hardness,
- major ions (calcium, magnesium. sodium, potassium, bicarbonate + carbonate, sulphate, and chloride),
- nitrate and nitrite,
- metals and trace elements (including mercury), and
- turbidity.

All samples were received in good order, as documented by BV on the CoC. Sample temperatures were logged in at less than the require 10°C threshold and were received within the required time limit for sensitive parameters including turbidity and nitrate+ nitrite. The high quality of the deionized water was confirmed by BV (Appendix 1). A Certificate of Analysis for the two tests was provided (Appendix 2).

### **Results**

As noted in Appendix 1, the deionized water used for the testing was devoid of any particulate or dissolved constituents, much like natural precipitation. Measurement with a hand-held TDS meter confirmed a "zero" mineralization. The pH and temperature were also measured at the time of testing with a combination

3 | Page

hand-held meter and returned values of 5 to 6 and 13°C to 14°C, respectively, on both days.

After confirming the starting conditions of the deionized water, the water was slowly flowed through the sediment column. Samples collected from the base were very different in appearance compared to the water that was added at the top. Of particular note was the colour and turbidity as noted in the lower right image of Figure 1. The occurrence of such turbidity is surprising considering the assumption often made that fine particles will be strained or filtered out as the water flows through the subsurface. However, this was obviously not the case. Measured values for Soil flush #1 and Soil flush #2 were >4000 NTU and 1600 NTU, respectively (Appendix 2).

In addition to turbidity, the chemical quality of the deionized water was also notably changed after reacting with the soil mixture. For example, the total dissolved solids (TDS) content increased from a pre-test value of 0 mg/L to 47 mg/L for Soil flush #1 and to a value of 39 mg/L for Soil flush #2. The laboratory pH also increased significantly to 9.1 for both tests. This represents a change from mildly acidic to alkaline conditions following a rather short reaction time and is indicative rapid reactions occurring as the water flowed through the soil mixture (e.g. ion exchange).

Prior to conducting further data evaluation a check on the correctness of analysis was performed. This included a review of the anion-cation charge balance to confirmed acceptability. The values obtained for both samples (-1.1% and 1.9%, respectively) were within the recommended standard of  $\pm 2\%^1$ . An additional test was performed where the ratio of reported TDS versus calculated TDS was compared. The range of acceptability is between 1.0 to 1.2<sup>1</sup>, and the values obtained for the two soil flush tests were 1.01 and 1.00, respectively. Based on these confirmations the results from both tests were considered acceptable for further evaluation.

Other changes that occurred to the deionized water were less visual and more chemical in nature, with some of the constituents returning values in excess of

<sup>&</sup>lt;sup>1</sup> Standard Methods for the Examination of Water and Wastewater

published water quality criteria. The criteria used for comparison is this study included:

- Alberta Tier 1 Soil and Groundwater Remediation Guidelines for agricultural land (Alberta Government 2019)
- Environmental Quality Guidelines for Alberta Surface Waters for the protection of freshwater aquatic life - FWAL (Alberta Government 2018)
- Guidelines for Canadian Drinking Water Quality CDWQ (Health Canada 2020)

The following table summarizes a number of parameters in the soil flush effluent that exhibited values in excess of the above-noted criteria:

| Parameter            | Soil flush<br>#1 | Soil flush<br>#2 | AB Tier<br>1                                                                       | AB<br>FWAL  | CDWQ               |
|----------------------|------------------|------------------|------------------------------------------------------------------------------------|-------------|--------------------|
| Turbidity (NTU)      | >4000            | 1600             |                                                                                    | 2           | 1                  |
| Aluminum (mg/L       | 6.1              | 4.0              | 0.0                                                                                | 05          | <0.1 <sub>OG</sub> |
| Arsenic (mg/L        | 0.019            | 0.009            | 0.005                                                                              | 0.005 0.005 |                    |
| Cadmium (µg/L)       | 0.53             | 0.44             | 0.3                                                                                | 34*         |                    |
| Chromium (mg/L)      | 0.013            | 0.020            | 0.001 <sup>+</sup> 0.001 <sup>+</sup><br>0.0049 <sup>++</sup> 0.0089 <sup>++</sup> |             | 0.05 mac           |
| Cobalt (mg/L)        | 0.0095           | 0.0071           | 0.00                                                                               | )15*        |                    |
| Copper (mg/L)        | 0.0150           | 0.0097           | 0.0070                                                                             | 0.0390      | 2 <sub>AO</sub>    |
| Iron (mg/L)          | 17               | 12               | 0                                                                                  | .3          | ≤ <b>0.3</b> ao    |
| Lead (mg/L)          | 0.010            | 0.0073           | 0.0                                                                                | 07*         | 0.005 alara        |
| Manganese (mg/L)     | 0.81             | 0.74             | 0.05                                                                               |             | 0.12 мас           |
| Mercury-total (mg/L) | Not .            | 0.030            | 0.00                                                                               | 0005        | 0.001 mac          |
| Zinc (mg/l)          | 0.120            | 0.073            | 0.0                                                                                | )30         | 5.0 ao             |

Notes:

1. Values indicated for protection of freshwater aquatic life relate to long-term exposure.

2. \* Assumes a groundwater hardness of 250 mg/L (as CaCO<sub>3</sub>).

3. + = hexavalent; ++ = trivalent.

3. MAC = maximum acceptable value; ALARA = as low as reasonably achievable; AO = aesthetic value; OG = operational guidance value.

Measured values for the other constituents analyzed are provided in Appendix 2. However, those listed in the preceding table represent the most notable in terms of risk to human and ecological receptors.

### **Discussion**

The proposed development of the West Cochrane Pit by Burnco will significantly, and permanently, alter the natural landscape of this picturesque area. Although Burnco indicates that the anticipated change to the local groundwater and surface water will be negligible, that claim has not actually been substantiated. Baseline groundwater quality was established by Burnco back in 2018, but no follow-up water quality monitoring has been conducted since. This includes in and around the currently operating pit area, which was commissioned following the 2018 program.

In light of the results generated by this experiment, concern exists that particulate matter and dissolved constituents will be mobilized from disturbed areas into the local groundwater and any receiving water bodies. Given the range of hydraulic conductivity values measured for the sand and gravel at the site (pdf page 773-75 of the Burnco's MSDP: 4.8 to 25.6 m/d), a calculated lateral hydraulic gradient of 0.028 from the Matrix's supporting report, and an assumed effective porosity of 30%, the flow of groundwater beneath the site could range anywhere from around 150 m/yr to more than 600 m/yr (depending on local conditions). Therefore the transit time for a substance release to a receptors would be relatively short at less than a year to perhaps a year or so.

Stripping of the overlying topsoil and removal of a substantial amount (if not all) of the sand and gravel beneath will inevitably reduce the filtering capacity of the subsurface and allow contaminants that occur during the mining process (natural or other) to move more quickly down to the water table. This is shown in conceptual manner in Figure 2 on the following page, and is reinforced by a statements made by Matrix Solutions in an excerpt from Burnco's 2020 Master Site Development Plan (MSDP pdf page 682 of 1882):

The removal of the silty clay (where present) at site, will remove a natural barrier to potential contamination of the groundwater from surface spills. Any contaminant spilled at surface during or after operations would preferentially flow either vertically through the porous gravel and bedrock to the water table or along preferentially pathways (secondary permeability/fractures) in the bedrock. From below the water table it would follow groundwater flow direction (south to southeast), likely ending up in the Grande Valley Creek, Beaupré Creek, and the Bow River. Any contamination could potentially flow into the underlying bedrock, posing a risk to any residential well users in the area.





Recharging precipitation (snow melt or rai) entering the subsurface will enhance the ability to move particulate and dissolved matter into the groundwater. By removing the filtering capacity of sediment this will only exacerbate the condition. It is clear from this experiment that turbidity can be produced from flushing water thought a 1.25 m soil column, not to mention notable changes to the chemical quality of the effluent.

The findings of this study suggest that the action of mining gravel from a very large development area will ultimately expose the remaining sand and gravel, as

7 | Page

well as the underlying bedrock aquifers, to weathering reactions and enhanced flushing by annual snow melt and rainfall events.

As such, any contaminants (solid or dissolved) mobilized and flushed from these exposed sediments will increase the risk of impact to the local environment. Proximity to receptors will be a major factor, not to mention how the mobilized contaminants move through the subsurface. However, this aspect has not been assessed by Burnco, and the fact that the groundwater flow velocity has not been assessed makes any statements about risk very difficult, if not impossible. The receptors at greatest risk include:

- local springs and water wells,
- Grand Valley Creek,
- Beaupre Creek, and
- the Bow River.

With the exception of the Bow River, most of the local surface water features in the study area are not believed to be fish-bearing. However, they do likely have environments that will sustain aquatic habitat that supports downstream aquatic systems. From a federal *Fisheries Act* perspective this is pertinent. The potential introduction of harmful constituents into aquatic systems is an obvious threat, and the waters from the site eventually drain into the fish-bearing Bow River. The Bow River is also used as a source of drinking water by the Town of Cochrane, as well as Calgary, so some assessment of the potential discharge of harmful substances into the river should have been conducted. However, it was not.

The turbidity guideline for protection of aquatic life in Alberta requires that the maximum long-term average for "clear" water systems, like the West Cochrane Pit area, be kept within 8 NTU above background values for any short-term exposure (e.g. up to 24 hours). Over the longer-term the increase should be no more than 2 NTU above background levels (Alberta Government 2018).

The way in which Burnco mines the sand and gravel deposit will dictate the end result regarding risk to the local groundwater and connected systems. It is unclear whether the plan is to mine down to the bedrock surface or whether a thin veneer of sand and gravel deposit will be left in place. All of this granular material rests in contact with fractured bedrock as noted in Burnco's MSDP, submitted in June 2020. Based on the findings of this study, mobilization of turbidity from any residual sand and gravel left above the bedrock is a risk. Once in bedrock it will have a reduced chance of being attenuated, as fracture flow is very different than flow though the porous media. Again, this aspect was not assessed.

If Burnco decides to operate a wet pit instead, and mine below the water table without dewatering, this will likely occur via bailing operations. The effect of this extraction method will be to create very turbid water due to the churning action of the equipment. Again, the migration of mobilized particulate matter through the sediments is likely. Mobilization of turbidity in local groundwater has been documented before, with measurable effects being noted as far as 1.8 km downgradient. The following quote is taken from a report authored by Mead (1995):

"This DEQ [Department of Environmental Quality] study found a turbidity plume that extended more than a mile to the north (downgradient) of the gravel operation. The average turbidity of the water being discharged from the washing operation into the pond at the site was 2,737 nephelometric turbidity units (NTUs). Nearly all wells sampled within the first 6,000 feet of the turbidity plume were measured at 5 NTU or more. Many wells within the first 3,000 feet of the plume had turbidity levels of 10 NTU or more. Nearly all wells outside the plume had turbidities of 2 NTU or less."

Additionally, the release of harmful metals and trace elements is of concern. This is not only associated with the type of metal or trace element mobilized, but also the form it is in when present in the water. Given the anticipated groundwater conditions beneath the Burnco development area (i.e. well oxygenated and at a pH of 7 to 8, as noted on pdf page 699 in Burnco's MSDP) the speciation of chromium, for example, would favour the more mobile chromate ion (i.e.  $CrO_4^2$ -).

When present as chromate, and at the groundwater conditions described previously, it will be present in the hexavalent form. This is shown in the Eh-pH diagram provided in Figure 3. Hexavalent chromium is a highly toxic species, and can influence aquatic life at values as low as 0.001 mg/L. The other metals and

trace elements noted in the summary table on page 5 will have their own unique toxicity and mobility characteristics.



**Figure 3.** Eh-pH diagrams for chromium (left) and selenium (right)<sup>2</sup>. Note: red shaded area represents conditions expected in well-oxygenated groundwater system.

Unfortunately, none of the required information to assess this aspect has been provided. In fact, there is no monitoring data available for any of the wells around the working gravel pit to determine what constituents may have been mobilized so far. The only location assessed for metals and trace elements back in 2018 was a monitoring well located upgradient of the operating pit and adjacent to Highway 1A, that being MW18-02(B2).

The concern with the Burnco's current application to Rocky View County is that it does nothing to assess the impacts to groundwater and connected surface water environments that could occur around a working gravel pit. Although there are monitoring wells established around the current open pit, no up-to-date information is available to assess what has occurred since commissioning of that pit. Of equal

<sup>&</sup>lt;sup>2</sup> Geological Survey of Japan

importance is the lack of assessment done to determine what the full impact of the West Cochrane Pit will look like once development is complete and reclamation has occurred.

Given the results of this soil column test there should be cause for concern. The pit mining activities will be located very close to aquatic receptors and therefore pose a threat to their existence and future viability. At the very least Burnco should be required to conduct a proper risk assessment and account for the potential mobilization, transport, and fate of contaminants like the ones documented in this experiment. It would also be informative for Burnco to assess conditions around their existing West Cochrane Pit via the series of dedicated monitoring wells installed there. This should include a proper assessment of water quality and geochemical conditions to better understand the risks involved if mining is to be extended across the larger proposed development area. Unfortunately, none of this work has been completed or provided for decision makers to rely on. This begs the questions:

"To what degree will Burnco's proposed development impact the groundwater quality across the larger area?"

and

"How will this impact downgradient receptors like Grand Valley Creek, Beaupre Creek, and ultimately the Bow River?"

## <u>Closure</u>

This report has been prepared to summarize results of a soil column flushing experiment designed to mimic infiltration of snowmelt and rainwater through sand and gravel deposits beneath the West Cochrane Pit area. The content is meant to inform decision makers so that unintended consequences to the environment and downstream communities can be avoided. If there are any questions regarding the methodology or interpretation of findings provided herein, the reader should contact the undersigned for clarification.

Respectfully submitted by:

Jon Fennell, M.Sc., Ph.D., P.Geol. Hydrogeologist & Geochemist

# **References**

Alberta Government (2018). Environmental Quality Guidelines for Alberta Surface Waters. Water Policy Branch, Alberta Environment and Parks, March 28, 2018, ISBN (PDF) 978-1-4601-3873-1, 58 pp. <u>https://open.alberta.ca/publications/9781460138731</u>

Alberta Government (2019). Alberta Tier 1 Soil and Groundwater Remediation Guidelines. AEP, Land Policy, 2019, No. 1, ISBN 978-1-4601-2695-0, <u>https://open.alberta.ca/dataset/842becf6-dc0c-4cc7-8b29-</u> <u>e3f383133ddc/resource/a5cd84a6-5675-4e5b-94b8-</u> 0a36887c588b/download/albertatier1guidelines-jan10-2019.pdf

Burnco Rock Products Ltd. (2020). Land Use Redesignation Application: Project Activities Plan - Master Site Development Plan, West Cochrane Gravel Pit. Prepared for submission to the Rocky View County for consideration and approval, 1882 pp.

Geological Survey of Japan (2005). Atlas of Eh-pH diagrams: Intercomparison of thermodynamic databases, Open File Report No.419, National Institute od Advanced Industrial Science and Technology – Research Center for Deep Geological Environments, 287 pp, https://www.nrc.gov/docs/ML1808/ML18089A638.pdf.

Health Canada (2020). Guidelines for Canadian Drinking Water Quality – Summary Table. Prepared in collaboration with the Federal-Provincial-Territorial Committee on Drinking Water of the Federal-Provincial-Territorial Committee on Health of the Environment, September 2020, 28 pp. <u>https://www.canada.ca/en/health-</u>

<u>canada/services/environmental-workplace-health/reports-publications/water-</u> <u>quality/guidelines-canadian-drinking-water-quality-summary-table.html</u>

Mead R.D. (1995). The Direct and Cumulative Effects of Gravel Mining on Groundwater within Thurston County, Washington. Ground Water Management Program, Environmental Health Division, Thurston County Public Health and Social Services Department, Appendix A of Technical Memorandum #33 (August 2018), 65 pp. <u>https://www.thurstoncountywa.gov/planning/planningdocuments/3%20-</u> %20Tech%20Memo%2033%20-

%20Hydrogeologic%20review%20of%20Mineral%20Extraction%20Code%2008152018.p

# <u>Websites</u>

Standard Methods for the Examination of Water and Wastewater, accessed May 24, 2021, pdf page 39 of 541, https://beta-static.fishersci.com/content/dam/fishersci/ en\_US/documents/programs/scientific/ technical-documents/white-papers/aphawater-testing-standard-methods-introduction-white-paper.pdf

# **APPENDIX 1**

Deionized water quality (from Bureau Veritas):

| QA/QC Batch | QC Type      | Parameter                | Date Analyzed | Value    | UNITS   |
|-------------|--------------|--------------------------|---------------|----------|---------|
|             |              |                          |               |          |         |
| A221986     | Method Blank | Turbidity                | 2021/05/12    | <0.10    | NTU     |
|             |              | Total Mercury (Hg)       | 2021/05/12    | <0.0019  | ug/L    |
|             |              | Total Barium (Ba)        | 2021/05/16    | <0.010   | mg/L    |
|             |              | Total Boron (B)          | 2021/05/16    | <0.020   | mg/L    |
|             |              | Total Calcium (Ca)       | 2021/05/16    | <0.30    | mg/L    |
|             |              | Total Iron (Fe)          | 2021/05/16    | <0.060   | mg/L    |
|             |              | Total Lithium (Li)       | 2021/05/16    | <0.020   | mg/L    |
|             |              | Total Magnesium (Mg)     | 2021/05/16    | <0.20    | mg/L    |
|             |              | Total Manganese (Mn)     | 2021/05/16    | <0.0040  | mg/L    |
|             |              | Total Phosphorus (P)     | 2021/05/16    | <0.10    | mg/L    |
|             |              | Total Potassium (K)      | 2021/05/16    | <0.30    | mg/L    |
|             |              | Total Silicon (Si)       | 2021/05/16    | <0.10    | mg/L    |
|             |              | Total Sodium (Na)        | 2021/05/16    | <0.50    | mg/L    |
|             |              | Total Strontium (Sr)     | 2021/05/16    | <0.020   | mg/L    |
|             |              | Total Sulphur (S)        | 2021/05/16    | <0.20    | mg/L    |
|             |              | Total Aluminum (Al)      | 2021/05/14    | <0.0030  | mg/L    |
|             |              | Total Antimony (Sb)      | 2021/05/14    | <0.00060 | mg/L    |
|             |              | Total Arsenic (As)       | 2021/05/14    | <0.00020 | mg/L    |
|             |              | Total Beryllium (Be)     | 2021/05/14    | <0.0010  | mg/L    |
|             |              | Total Chromium (Cr)      | 2021/05/14    | <0.0010  | mg/L    |
|             |              | Total Cobalt (Co)        | 2021/05/14    | <0.00030 | mg/L    |
|             |              | Total Copper (Cu)        | 2021/05/14    | <0.00020 | mg/L    |
|             |              | Total Lead (Pb)          | 2021/05/14    | <0.00020 | mg/L    |
|             |              | Total Molybdenum (Mo)    | 2021/05/14    | <0.00020 | mg/L    |
|             |              | Total Nickel (Ni)        | 2021/05/14    | <0.00050 | mg/L    |
|             |              | Total Selenium (Se)      | 2021/05/14    | <0.00020 | mg/L    |
|             |              | Total Silver (Ag)        | 2021/05/14    | <0.00010 | mg/L    |
|             |              | Total Thallium (TI)      | 2021/05/14    | <0.00020 | mg/L    |
|             |              | Total Tin (Sn)           | 2021/05/14    | <0.0010  | mg/L    |
|             |              | Total Titanium (Ti)      | 2021/05/14    | <0.0010  | mg/L    |
|             |              | Total Uranium (U)        | 2021/05/14    | <0.00010 | mg/L    |
|             |              | Total Vanadium (V)       | 2021/05/14    | <0.0010  | mg/L    |
|             |              | Total Zinc (Zn)          | 2021/05/14    | <0.0030  | mg/L    |
|             |              | Dissolved Sodium (Na)    | 2021/05/13    |          | %       |
|             |              | Dissolved Calcium (Ca)   | 2021/05/13    | <0.30    | mg/L    |
|             |              | Dissolved Iron (Fe)      | 2021/05/13    | <0.060   | mg/L    |
|             |              | Dissolved Magnesium (Mg) | 2021/05/13    | <0.20    | mg/L    |
|             |              | Dissolved Manganese (Mn) | 2021/05/13    | <0.0040  | mg/L    |
|             |              | Dissolved Potassium (K)  | 2021/05/13    | < 0.30   | mg/L    |
|             |              | Dissolved Sodium (Na)    | 2021/05/13    | <0.50    | mg/L    |
|             |              | Dissolved Calcium (Ca)   | 2021/05/13    | <0.30    | mg/L    |
|             |              | Dissolved Iron (Fe)      | 2021/05/13    | <0.060   | mg/L    |
|             |              | Dissolved Magnesium (Mg) | 2021/05/13    | <0.20    | mg/L    |
|             |              | Dissolved Manganese (Mn) | 2021/05/13    | <0.0040  | mg/l    |
|             |              | Dissolved Potassium (K)  | 2021/05/13    | <0.30    | mg/L    |
|             |              | Dissolved Sodium (Na)    | 2021/05/13    | <0.50    | mg/l    |
|             |              | Dissolved Nitrite (N)    | 2021/05/12    | <0.00    | mg/I    |
|             |              | Alkalinity (PP as CaCOR) | 2021/05/14    | <1.010   | mg/l    |
|             |              | Conductivity             | 2021/05/14    | ~2.0     | us/cm   |
|             |              | Dissolved Chlorida (Cl)  | 2021/05/14    | <1.0     | mg/l    |
|             |              | Dissolved Chonde (CI)    | 2021/05/14    | <1.U     | IIIB/ L |

# **APPENDIX 2**

(see attached PDF)

17 | Page



Your C.O.C. #: 635648-01-01

#### **Attention: John Fennell**

COMMERCIAL ACCOUNTS - CALGARY BUREAU VERITAS CANADA (2019) INC. 4000 19th Street NE Calgary, AB CANADA T2E 6P8

> Report Date: 2021/05/31 Report #: R3026392 Version: 3 - Revision

#### **CERTIFICATE OF ANALYSIS – REVISED REPORT**

#### BV LABS JOB #: C130760

Received: 2021/05/10, 08:10

Sample Matrix: Water # Samples Received: 2

|                                            |          | Date       | Date       |                                 |                      |
|--------------------------------------------|----------|------------|------------|---------------------------------|----------------------|
| Analyses                                   | Quantity | Extracted  | Analyzed   | Laboratory Method               | Analytical Method    |
| Alkalinity @25C (pp, total), CO3,HCO3,OH   | 2        | N/A        | 2021/05/14 | AB SOP-00005                    | SM 23 2320 B m       |
| Cadmium - low level CCME (Total)           | 2        | N/A        | 2021/05/14 |                                 | Auto Calc            |
| Chloride/Sulphate by Auto Colourimetry     | 2        | N/A        | 2021/05/15 | AB SOP-00020                    | SM23-4500-Cl/SO4-E m |
| Conductivity @25C                          | 2        | N/A        | 2021/05/14 | AB SOP-00005                    | SM 23 2510 B m       |
| Hardness                                   | 1        | N/A        | 2021/05/14 |                                 | Auto Calc            |
| Hardness                                   | 1        | N/A        | 2021/05/16 |                                 | Auto Calc            |
| Mercury (Total) by CV                      | 1        | 2021/05/12 | 2021/05/12 | AB SOP-00084                    | BCMOE BCLM Oct2013 m |
| Elements by ICP-Dissolved-Lab Filtered (1) | 2        | N/A        | 2021/05/13 | AB SOP-00042                    | EPA 6010d R5 m       |
| Elements by ICP - Total                    | 2        | 2021/05/12 | 2021/05/16 | AB SOP-00014 / AB SOP-<br>00042 | EPA 6010d R5 m       |
| Elements by ICPMS - Total                  | 2        | 2021/05/12 | 2021/05/13 | AB SOP-00014 / AB SOP-<br>00043 | EPA 6020b R2 m       |
| Ion Balance                                | 1        | N/A        | 2021/05/15 |                                 | Auto Calc            |
| Ion Balance                                | 1        | N/A        | 2021/05/16 |                                 | Auto Calc            |
| Sum of cations, anions                     | 1        | N/A        | 2021/05/14 |                                 | Auto Calc            |
| Sum of cations, anions                     | 1        | N/A        | 2021/05/16 |                                 | Auto Calc            |
| Nitrate and Nitrite                        | 2        | N/A        | 2021/05/14 |                                 | Auto Calc            |
| NO2 - NO2 + NO3 (N) in Water               | 2        | N/A        | 2021/05/12 | AB SOP-00091                    | SM 23 4500 NO3m      |
| Nitrate (as N)                             | 2        | 2021/05/11 | 2021/05/14 |                                 | Auto Calc            |
| pH @25°C (2)                               | 2        | N/A        | 2021/05/14 | AB SOP-00005                    | SM 23 4500-H+B m     |
| Total Dissolved Solids (Calculated)        | 1        | N/A        | 2021/05/15 |                                 | Auto Calc            |
| Total Dissolved Solids (Calculated)        | 1        | N/A        | 2021/05/16 |                                 | Auto Calc            |
| Turbidity                                  | 2        | N/A        | 2021/05/12 | CAL SOP-00081                   | SM 23 2130 B m       |

#### Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement



Your C.O.C. #: 635648-01-01

#### <u>Attention: John Fennell</u> COMMERCIAL ACCOUNTS - CALGARY BUREAU VERITAS CANADA (2019) INC.

INC. 4000 19th Street NE Calgary, AB CANADA T2E 6P8

> Report Date: 2021/05/31 Report #: R3026392 Version: 3 - Revision

#### **CERTIFICATE OF ANALYSIS – REVISED REPORT**

#### BV LABS JOB #: C130760

#### Received: 2021/05/10, 08:10

Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

\* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Dissolved > Total Imbalance: When applicable, Dissolved and Total results were reviewed and data quality meets acceptable levels unless otherwise noted.

(2) The CCME method requires pH to be analysed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the CCME holding time. Bureau Veritas Laboratories endeavours to analyze samples as soon as possible after receipt.





Please direct all questions regarding this Certificate of Analysis to your Project Manager. Customer Solutions, Western Canada Customer Experience Team Email: customersolutionswest@bureauveritas.com Phone# (403) 291-3077

------

BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



COMMERCIAL ACCOUNTS - CALGARY BUREAU VERITAS CANADA (2019) INC.

#### **ROUTINE WATER -LAB FILTERED (WATER)**

| BV Labs ID                         |       | ZT5148           | ZT5149           |        |
|------------------------------------|-------|------------------|------------------|--------|
| Sampling Date                      |       | 2021/05/08       | 2021/05/09       |        |
|                                    |       | 11:30            | 10:45            |        |
|                                    |       | 635648-01-01     | 635648-01-01     |        |
|                                    | UNITS | SOIL FLUSH<br>#1 | SOIL FLUSH<br>#2 | RDL    |
| Calculated Parameters              |       |                  |                  |        |
| Anion Sum                          | meq/L | 0.93             | 0.81             | N/A    |
| Cation Sum                         | meq/L | 0.91             | 0.78             | N/A    |
| Hardness (CaCO3)                   | mg/L  | 39               | 35               | 0.50   |
| Ion Balance (% Difference)         | %     | NC               | NC               | N/A    |
| Dissolved Nitrate (N)              | mg/L  | 0.10             | 0.058            | 0.010  |
| Dissolved Nitrate (NO3)            | mg/L  | 0.45             | 0.26             | 0.044  |
| Dissolved Nitrite (NO2)            | mg/L  | <0.033           | <0.033           | 0.033  |
| Calculated Total Dissolved Solids  | mg/L  | 47               | 39               | 10     |
| Misc. Inorganics                   |       |                  |                  |        |
| Conductivity                       | uS/cm | 89               | 76               | 2.0    |
| рН                                 | рН    | 9.15             | 9.11             | N/A    |
| Anions                             |       |                  |                  |        |
| Alkalinity (PP as CaCO3)           | mg/L  | 3.5              | 3.8              | 1.0    |
| Alkalinity (Total as CaCO3)        | mg/L  | 34               | 33               | 1.0    |
| Bicarbonate (HCO3)                 | mg/L  | 32               | 31               | 1.0    |
| Carbonate (CO3)                    | mg/L  | 4.2              | 4.6              | 1.0    |
| Hydroxide (OH)                     | mg/L  | <1.0             | <1.0             | 1.0    |
| Dissolved Chloride (Cl)            | mg/L  | 2.8              | 1.7              | 1.0    |
| Dissolved Sulphate (SO4)           | mg/L  | 8.4              | 4.7              | 1.0    |
| Nutrients                          |       |                  |                  |        |
| Dissolved Nitrite (N)              | mg/L  | <0.010           | <0.010           | 0.010  |
| Dissolved Nitrate plus Nitrite (N) | mg/L  | 0.10             | 0.058            | 0.010  |
| Lab Filtered Elements              |       |                  |                  |        |
| Dissolved Calcium (Ca)             | mg/L  | 4.8              | 4.5              | 0.30   |
| Dissolved Iron (Fe)                | mg/L  | <0.060           | <0.060           | 0.060  |
| Dissolved Magnesium (Mg)           | mg/L  | 6.6              | 5.6              | 0.20   |
| Dissolved Manganese (Mn)           | mg/L  | <0.0040          | <0.0040          | 0.0040 |
| Dissolved Potassium (K)            | mg/L  | 1.4              | 1.2              | 0.30   |
| Dissolved Sodium (Na)              | mg/L  | 2.1              | 1.4              | 0.50   |
| RDL = Reportable Detection Limit   |       |                  |                  |        |
| N/A = Not Applicable               |       |                  |                  |        |



COMMERCIAL ACCOUNTS - CALGARY BUREAU VERITAS CANADA (2019) INC.

#### **REGULATED METALS (CCME/AT1) - TOTAL**

| BV Labs ID                   |        | ZT5148       | ZT5149       |         |
|------------------------------|--------|--------------|--------------|---------|
|                              |        | 2021/05/08   | 2021/05/09   |         |
| Sampling Date                |        | 11:30        | 10:45        |         |
| COC Number                   |        | 635648-01-01 | 635648-01-01 |         |
|                              | LINITS | SOIL FLUSH   | SOIL FLUSH   |         |
|                              | UNITS  | #1           | #2           | NUL     |
| Elements                     |        |              |              |         |
| Total Cadmium (Cd)           | ug/L   | 0.53         | 0.44         | 0.020   |
| Total Aluminum (Al)          | mg/L   | 6.1          | 4.0          | 0.0030  |
| Total Antimony (Sb)          | mg/L   | 0.00076      | <0.00060     | 0.00060 |
| Total Arsenic (As)           | mg/L   | 0.019        | 0.0094       | 0.00020 |
| Total Barium (Ba)            | mg/L   | 0.35         | 0.24         | 0.010   |
| Total Beryllium (Be)         | mg/L   | <0.0010      | <0.0010      | 0.0010  |
| Total Boron (B)              | mg/L   | <0.020       | <0.020       | 0.020   |
| Total Calcium (Ca)           | mg/L   | 180          | 210          | 0.30    |
| Total Chromium (Cr)          | mg/L   | 0.013        | 0.020        | 0.0010  |
| Total Cobalt (Co)            | mg/L   | 0.0095       | 0.0071       | 0.00030 |
| Total Copper (Cu)            | mg/L   | 0.015        | 0.0097       | 0.00020 |
| Total Iron (Fe)              | mg/L   | 17           | 12           | 0.060   |
| Total Lead (Pb)              | mg/L   | 0.010        | 0.0073       | 0.00020 |
| Total Lithium (Li)           | mg/L   | 0.021        | <0.020       | 0.020   |
| Total Magnesium (Mg)         | mg/L   | 39           | 45           | 0.20    |
| Total Manganese (Mn)         | mg/L   | 0.81         | 0.74         | 0.0040  |
| Total Molybdenum (Mo)        | mg/L   | 0.0020       | 0.0025       | 0.00020 |
| Total Nickel (Ni)            | mg/L   | 0.024        | 0.016        | 0.00050 |
| Total Phosphorus (P)         | mg/L   | 0.73         | 0.63         | 0.10    |
| Total Potassium (K)          | mg/L   | 3.5          | 2.5          | 0.30    |
| Total Selenium (Se)          | mg/L   | 0.00037      | 0.00022      | 0.00020 |
| Total Silicon (Si)           | mg/L   | 12           | 8.1          | 0.10    |
| Total Silver (Ag)            | mg/L   | <0.00010     | <0.00010     | 0.00010 |
| Total Sodium (Na)            | mg/L   | 2.2          | 1.4          | 0.50    |
| Total Strontium (Sr)         | mg/L   | 0.21         | 0.21         | 0.020   |
| Total Sulphur (S)            | mg/L   | 2.0          | 1.4          | 0.20    |
| Total Thallium (Tl)          | mg/L   | <0.00020     | <0.00020     | 0.00020 |
| Total Tin (Sn)               | mg/L   | <0.0010      | <0.0010      | 0.0010  |
| Total Titanium (Ti)          | mg/L   | 0.045        | 0.032        | 0.0010  |
| Total Uranium (U)            | mg/L   | 0.0014       | 0.0012       | 0.00010 |
| Total Vanadium (V)           | mg/L   | 0.021        | 0.015        | 0.0010  |
| Total Zinc (Zn)              | mg/L   | 0.12         | 0.073        | 0.0030  |
| RDL = Reportable Detection I | imit   |              |              | -       |



E-1 - Attachment E Page 32 of 252

COMMERCIAL ACCOUNTS - CALGARY BUREAU VERITAS CANADA (2019) INC.

#### **RESULTS OF CHEMICAL ANALYSES OF WATER**

| BV Labs ID                                                       |        | ZT5148              | ZT5149            |      |
|------------------------------------------------------------------|--------|---------------------|-------------------|------|
| Compling Date                                                    |        | 2021/05/08          | 2021/05/09        |      |
| Sampling Date                                                    |        | 11:30               | 10:45             |      |
| COC Number                                                       |        | 635648-01-01        | 635648-01-01      |      |
|                                                                  | LINUTC | SOIL FLUSH          | SOIL FLUSH        |      |
|                                                                  |        |                     |                   | IKUL |
|                                                                  |        | #1                  | #2                |      |
| Physical Properties                                              |        | #1                  | #2                |      |
| Physical Properties<br>Turbidity                                 | NTU    | <b>#1</b>           | <b>#2</b><br>1600 | 0.10 |
| Physical Properties<br>Turbidity<br>RDL = Reportable Detection L | NTU    | <b>#1</b> >4000 (1) | <b>#2</b>         | 0.10 |



E-1 - Attachment E Page 33 of 252

COMMERCIAL ACCOUNTS - CALGARY BUREAU VERITAS CANADA (2019) INC.

#### **MERCURY BY COLD VAPOR (WATER)**

| BV Labs ID                       |       | ZT5149              |        |  |
|----------------------------------|-------|---------------------|--------|--|
| Sampling Date                    |       | 2021/05/09<br>10:45 |        |  |
| COC Number                       |       | 635648-01-01        |        |  |
|                                  | UNITS | SOIL FLUSH<br>#2    | RDL    |  |
| Elements                         |       |                     |        |  |
| Total Mercury (Hg)               | ug/L  | 0.0030              | 0.0019 |  |
| RDL = Reportable Detection Limit |       |                     |        |  |



E-1 - Attachment E Page 34 of 252

COMMERCIAL ACCOUNTS - CALGARY BUREAU VERITAS CANADA (2019) INC.

#### **GENERAL COMMENTS**

Each temperature is the average of up to three cooler temperatures taken at receipt

| Package 1 | 5.7°C |
|-----------|-------|
| Package 2 | 7.3°C |

Version #3: Report reissued only with sample Soil Flush #1 & #2 as per client request. 20210531

Version #2: Report reissued due to typo error with email address. 20210519

Sample ZT5148 [SOIL FLUSH #1] : Turbidity completed within 48h after laboratory receipt to a maximum of five days from sampling. Data are satisfactory for compliance purposes. NO2 - NO2 + NO3 (N) in Water completed within 48h after laboratory receipt to a maximum of five days from sampling. Data are satisfactory for compliance purposes.

#### Results relate only to the items tested.



QUALITY ASSURANCE REPORT

COMMERCIAL ACCOUNTS - CALGARY BUREAU VERITAS CANADA (2019) INC.

|          |                       |            | Matrix     | Spike     | Spiked     | Blank     | Method E | Blank | RPI       | )         |
|----------|-----------------------|------------|------------|-----------|------------|-----------|----------|-------|-----------|-----------|
| QC Batch | Parameter             | Date       | % Recovery | QC Limits | % Recovery | QC Limits | Value    | UNITS | Value (%) | QC Limits |
| A221986  | Turbidity             | 2021/05/12 |            |           | 102        | 80 - 120  | <0.10    | NTU   | 0.83      | 20        |
| A223437  | Total Mercury (Hg)    | 2021/05/12 | 93         | 80 - 120  | 97         | 80 - 120  | <0.0019  | ug/L  | NC        | 20        |
| A223560  | Total Barium (Ba)     | 2021/05/16 | 96         | 80 - 120  | 106        | 80 - 120  | <0.010   | mg/L  | 5.4       | 20        |
| A223560  | Total Boron (B)       | 2021/05/16 | 103        | 80 - 120  | 107        | 80 - 120  | <0.020   | mg/L  | 2.2       | 20        |
| A223560  | Total Calcium (Ca)    | 2021/05/16 | NC         | 80 - 120  | 108        | 80 - 120  | <0.30    | mg/L  | 3.3       | 20        |
| A223560  | Total Iron (Fe)       | 2021/05/16 | 118        | 80 - 120  | 107        | 80 - 120  | <0.060   | mg/L  | 3.4       | 20        |
| A223560  | Total Lithium (Li)    | 2021/05/16 | 108        | 80 - 120  | 112        | 80 - 120  | <0.020   | mg/L  | 4.7       | 20        |
| A223560  | Total Magnesium (Mg)  | 2021/05/16 | NC         | 80 - 120  | 113        | 80 - 120  | <0.20    | mg/L  | 0.90      | 20        |
| A223560  | Total Manganese (Mn)  | 2021/05/16 | 109        | 80 - 120  | 105        | 80 - 120  | <0.0040  | mg/L  | 2.5       | 20        |
| A223560  | Total Phosphorus (P)  | 2021/05/16 | 104        | 80 - 120  | 104        | 80 - 120  | <0.10    | mg/L  | NC        | 20        |
| A223560  | Total Potassium (K)   | 2021/05/16 | NC         | 80 - 120  | 110        | 80 - 120  | <0.30    | mg/L  | 2.4       | 20        |
| A223560  | Total Silicon (Si)    | 2021/05/16 | 113        | 80 - 120  | 113        | 80 - 120  | <0.10    | mg/L  | 5.4       | 20        |
| A223560  | Total Sodium (Na)     | 2021/05/16 | NC         | 80 - 120  | 107        | 80 - 120  | <0.50    | mg/L  | 1.4       | 20        |
| A223560  | Total Strontium (Sr)  | 2021/05/16 | 94         | 80 - 120  | 106        | 80 - 120  | <0.020   | mg/L  | 3.1       | 20        |
| A223560  | Total Sulphur (S)     | 2021/05/16 | NC         | 80 - 120  | 109        | 80 - 120  | <0.20    | mg/L  | 0.77      | 20        |
| A223574  | Total Aluminum (Al)   | 2021/05/13 | 112        | 80 - 120  | 116        | 80 - 120  | < 0.0030 | mg/L  | 6.4       | 20        |
| A223574  | Total Antimony (Sb)   | 2021/05/13 | 113        | 80 - 120  | 116        | 80 - 120  | <0.00060 | mg/L  | 1.3       | 20        |
| A223574  | Total Arsenic (As)    | 2021/05/13 | 103        | 80 - 120  | 102        | 80 - 120  | <0.00020 | mg/L  | 0.17      | 20        |
| A223574  | Total Beryllium (Be)  | 2021/05/13 | 114        | 80 - 120  | 108        | 80 - 120  | <0.0010  | mg/L  | NC        | 20        |
| A223574  | Total Chromium (Cr)   | 2021/05/13 | 104        | 80 - 120  | 105        | 80 - 120  | <0.0010  | mg/L  | NC        | 20        |
| A223574  | Total Cobalt (Co)     | 2021/05/13 | 101        | 80 - 120  | 104        | 80 - 120  | <0.00030 | mg/L  | 3.2       | 20        |
| A223574  | Total Copper (Cu)     | 2021/05/13 | 97         | 80 - 120  | 104        | 80 - 120  | <0.00020 | mg/L  | 14        | 20        |
| A223574  | Total Lead (Pb)       | 2021/05/13 | 100        | 80 - 120  | 106        | 80 - 120  | <0.00020 | mg/L  | NC        | 20        |
| A223574  | Total Molybdenum (Mo) | 2021/05/13 | 117        | 80 - 120  | 110        | 80 - 120  | <0.00020 | mg/L  | 5.2       | 20        |
| A223574  | Total Nickel (Ni)     | 2021/05/13 | 98         | 80 - 120  | 105        | 80 - 120  | <0.00050 | mg/L  | 11        | 20        |
| A223574  | Total Selenium (Se)   | 2021/05/13 | 113        | 80 - 120  | 115        | 80 - 120  | <0.00020 | mg/L  | 0.93      | 20        |
| A223574  | Total Silver (Ag)     | 2021/05/13 | 102        | 80 - 120  | 105        | 80 - 120  | <0.00010 | mg/L  | NC        | 20        |
| A223574  | Total Thallium (TI)   | 2021/05/13 | 108        | 80 - 120  | 113        | 80 - 120  | <0.00020 | mg/L  | NC        | 20        |
| A223574  | Total Tin (Sn)        | 2021/05/13 | 109        | 80 - 120  | 103        | 80 - 120  | <0.0010  | mg/L  | NC        | 20        |
| A223574  | Total Titanium (Ti)   | 2021/05/13 | 110        | 80 - 120  | 103        | 80 - 120  | <0.0010  | mg/L  | NC        | 20        |
| A223574  | Total Uranium (U)     | 2021/05/13 | 103        | 80 - 120  | 105        | 80 - 120  | <0.00010 | mg/L  | 2.6       | 20        |
| A223574  | Total Vanadium (V)    | 2021/05/13 | 107        | 80 - 120  | 105        | 80 - 120  | <0.0010  | mg/L  | 5.9       | 20        |
| A223574  | Total Zinc (Zn)       | 2021/05/13 | 100        | 80 - 120  | 106        | 80 - 120  | <0.0030  | mg/L  | NC        | 20        |

Page 8 of 11

Bureau Veritas Laboratories Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468



QUALITY ASSURANCE REPORT(CONT'D)

COMMERCIAL ACCOUNTS - CALGARY BUREAU VERITAS CANADA (2019) INC.

|          |                                    |            | Matrix     | Spike     | Spiked     | Blank     | Method E | Blank | RPI       | 5         |
|----------|------------------------------------|------------|------------|-----------|------------|-----------|----------|-------|-----------|-----------|
| QC Batch | Parameter                          | Date       | % Recovery | QC Limits | % Recovery | QC Limits | Value    | UNITS | Value (%) | QC Limits |
| A223796  | Dissolved Calcium (Ca)             | 2021/05/16 | NC         | 80 - 120  | 99         | 80 - 120  | <0.30    | mg/L  | 1.1       | 20        |
| A223796  | Dissolved Iron (Fe)                | 2021/05/16 | 111        | 80 - 120  | 104        | 80 - 120  | <0.060   | mg/L  | NC        | 20        |
| A223796  | Dissolved Magnesium (Mg)           | 2021/05/16 | NC         | 80 - 120  | 102        | 80 - 120  | <0.20    | mg/L  | 1.9       | 20        |
| A223796  | Dissolved Manganese (Mn)           | 2021/05/16 | 108        | 80 - 120  | 102        | 80 - 120  | <0.0040  | mg/L  | 3.3       | 20        |
| A223796  | Dissolved Potassium (K)            | 2021/05/16 | 104        | 80 - 120  | 104        | 80 - 120  | <0.30    | mg/L  | 1.3       | 20        |
| A223796  | Dissolved Sodium (Na)              | 2021/05/16 | NC         | 80 - 120  | 96         | 80 - 120  | <0.50    | mg/L  | 1.4       | 20        |
| A223798  | Dissolved Calcium (Ca)             | 2021/05/14 | NC         | 80 - 120  | 101        | 80 - 120  | <0.30    | mg/L  | 1.8       | 20        |
| A223798  | Dissolved Iron (Fe)                | 2021/05/14 | 110        | 80 - 120  | 105        | 80 - 120  | <0.060   | mg/L  | NC        | 20        |
| A223798  | Dissolved Magnesium (Mg)           | 2021/05/14 | NC         | 80 - 120  | 103        | 80 - 120  | <0.20    | mg/L  | 2.8       | 20        |
| A223798  | Dissolved Manganese (Mn)           | 2021/05/14 | 109        | 80 - 120  | 103        | 80 - 120  | <0.0040  | mg/L  | 1.1       | 20        |
| A223798  | Dissolved Potassium (K)            | 2021/05/14 | 104        | 80 - 120  | 105        | 80 - 120  | <0.30    | mg/L  | 2.7       | 20        |
| A223798  | Dissolved Sodium (Na)              | 2021/05/14 | NC         | 80 - 120  | 99         | 80 - 120  | <0.50    | mg/L  | 2.3       | 20        |
| A223899  | Dissolved Nitrate plus Nitrite (N) | 2021/05/12 | 122 (1)    | 80 - 120  | 99         | 80 - 120  | <0.010   | mg/L  | 1.1       | 20        |
| A223899  | Dissolved Nitrite (N)              | 2021/05/12 | 100        | 80 - 120  | 104        | 80 - 120  | <0.010   | mg/L  | NC        | 20        |
| A225434  | Alkalinity (PP as CaCO3)           | 2021/05/14 |            |           |            |           | <1.0     | mg/L  | NC        | 20        |
| A225434  | Alkalinity (Total as CaCO3)        | 2021/05/14 |            |           | 98         | 80 - 120  | <1.0     | mg/L  | 1.5       | 20        |
| A225434  | Bicarbonate (HCO3)                 | 2021/05/14 |            |           |            |           | <1.0     | mg/L  | 2.0       | 20        |
| A225434  | Carbonate (CO3)                    | 2021/05/14 |            |           |            |           | <1.0     | mg/L  | NC        | 20        |
| A225434  | Hydroxide (OH)                     | 2021/05/14 |            |           |            |           | <1.0     | mg/L  | NC        | 20        |
| A225437  | рН                                 | 2021/05/14 |            |           | 100        | 97 - 103  |          |       | 0.16      | N/A       |
| A225438  | Conductivity                       | 2021/05/14 |            |           | 101        | 90 - 110  | <2.0     | uS/cm | 0.65      | 10        |
| A226330  | Dissolved Chloride (Cl)            | 2021/05/15 | 99         | 80 - 120  | 105        | 80 - 120  | <1.0     | mg/L  | NC        | 20        |
| A226330  | Dissolved Sulphate (SO4)           | 2021/05/15 | 105        | 80 - 120  | 106        | 80 - 120  | <1.0     | mg/L  | NC        | 20        |

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

Page 9 of 11

Bureau Veritas Laboratories Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

ATTACHMENT 'E': PUBLIC SUBMISSIONS



E-1 - Attachment E Page 37 of 252

COMMERCIAL ACCOUNTS - CALGARY BUREAU VERITAS CANADA (2019) INC.

#### VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Sandy Yuan, M.Sc., QP, Scientific Specialist

BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



Page 11 of 11

Carrenou Varitan Connude (2019) imi.

Johnson Kwan 32 Horseshoe Crescent Cochrane, AB June 13, 2021

#### Rocky View County Council Letter of Concern – Burnco West Cochrane Gravel Pit Expansion (Bylaw 8073-2020)

Dear Rocky View County Council :

Thank you for your time in reviewing our letter submission. Our family is located  $\pm$  1.6 km from the proposed gravel pit development, at the eastern border of Rocky View County.

We have three major concerns about this application and included our recommendations for each of the concern for Council's consideration.

 Scale and Direction of Expansion: The proposed gravel pit is over 1,116 acres in size, which is far greater than all of the gravel pits in the area combined (Hillstone: 163 acres; Lafarge Hughes: 160 acres; Summit: 323 acres). We question the necessity and the scale of such excessive expansion given that there are multiple gravel pit operations already approved in this area.

In addition to the scale of the proposed development, we are also concerned about the direction of the proposed gravel pit expansion. Heavy industrial development of this scale is incompatible with residential development and should be locate away from existing residences to minimize their adverse impact.

Instead of encroaching the existing residences to the east, the proposed expansion would be more appropriate towards the west where the existing Wildcat Hills gas plant is located.

**Recommendation:** We respectfully recommend Council to amend the MSDP and the associated land use redesignation application to reduce the scope of the expansion by excluding the proposed gravel pit operation east of Grande Valley Creek towards the existing residential areas (See Figure 1 – Phasing Plan from the proposed MSDP – Areas E22-24, F25-27, G28-31, and H30).

The remaining expansion areas toward the west is still significant in size ( $\pm$  600 acres including Areas A1-6, B8-11, C12-15, and D16-21), and would allow the operation to continue for years to come.

Figure 1 - Phasing Plan from proposed MSDP



 Traffic Impact: According to the MSDP, the proposed expansion represents an increase of four times the volumes currently being shipped from the site as it ramps up to full production. The haul route will remain unchanged from Range Road 51 to Highway 1A.

Given that Highway 1A is the only haul route towards the targeted market (Calgary and Cochrane area), it is surprising that the Traffic Impact Assessment (TIA) submitted for this application did not investigate any offsite impacts along Highway 1A and the associated intersections (e.g., Horse Creek Road, Heritage Gate, and Highway 22 intersections).

Based on our firsthand experience, traffic often back up from the Highway 1A & 22 intersection to Heritage Gate during rush hours ( $\pm$  1.3 km) and sometimes all the way to Horse Creek Road during the weekends ( $\pm$  2 km).

**Recommendation:** We respectfully recommend Council to amend the MSDP (Section 3.9) to include a policy that requires an updated Traffic Impact Assessment at future development permit stage. The updated TIA shall be prepared to the County and Alberta Transportation's satisfaction and should examine the offsite impact along Highway 1A and the associated intersections for each phase of the expansion. The applicant/developer shall be responsible for any necessary upgrades, intersection improvements, and/or cost contribution for the improvements as identified by the TIA.



Figure 2 - Context Map (Highway 1A and associated intersections)

3) Inadequate Landscaping and Screening: As noted in the first section, heavy industrial development of this scale is incompatible with residential development. For this reason, we recommend Council to exclude the proposed expansion east of Grande Valley Creek, towards the existing residential areas.

If the application is able to proceed to its full extent, we recommend Council to require additional landscaping and site screening along the eastern portion of the site to mitigate the proposed gravel pit operation's adverse impacts (i.e., dust, noise, and visual impacts).

Given the magnitude of the proposed expansion, the limited landscaping proposed by the applicant is inadequate to serve as a shelter belt to protect the existing residences (See Figure 3 – Proposed Landscaping & Site Screening).

**Recommendation:** We respectfully recommend Council to amend the MSDP (Section 3.14 and Figure 39) to include the requirement for a treed shelter belt with additional landscaping and site screening along the eastern portion of the site.

Sample policy wording as follows: 'the applicant/developer shall provide a treed shelter belt with additional landscaping and site screening along the eastern portion of the site and submit an updated Landscaping and Site Screening Plan at the development permit stage to the County's satisfaction.'



Figure 3 - Proposed Landscaping & Site Screening

Lastly, we would like to express our disappointment in the level of engagement conducted by the applicant given the magnitude of this application. There were only two open houses held for this proposal in the last three years – one in April 2018 before the majority of the residents moved into the area, and another in March 2020 when the COVID-19 pandemic first started. We did not receive any notification from the applicant in the last three years.

To conclude, we respectfully request Council to consider the three amendments suggested in this letter submission. The proposed amendments would enable a more responsible approach to resource development in proximity to the existing residential areas.

We sincerely thank you for taking the time to review our letter submission and taking our recommendations into consideration.

Sincerely,

Johnson Kwan

| From:    | Joan Owen                                                       |
|----------|-----------------------------------------------------------------|
| To:      | Oksana Newmen                                                   |
| Subject: | [EXTERNAL] - Application #PL20200066 - Burnco Rock Products Ltd |
| Date:    | September 22, 2020 6:23:40 PM                                   |

Do not open links or attachments unless sender and content are known.

Greetings,

Thank you for your Notice of Application referenced in application #PL202000066 and dated September 10, 2020.

Big Hill Creek Ranches Ltd. is an adjacent land owner, owning the property described as 25 acres +/- SW17-26-4-W5 in Rockyview County. As Highway 1A divides Section 17, we are in the position of having a small portion of land adjacent to the proposed S-NAT development by Burnco Rock Products Ltd.

It is our understanding that Burnco Rock Products Ltd. intends to build a 7 metre high berm that will run along the east boundary of the project and that this berm would be along/adjacent to the west boundary of our property described as 25 acres +/- SW17-26-4-W5. To the best of our understanding, we believe that this structure is required by various regulatory bodies for the development of an aggregate extraction site.

One question we have is: What would be the implications and subsequent results of having the berm begin south of our property at Section 7/8, thus excluding our property from the discussion? Is this a viable consideration? See page 6 of the Land Use Redesignation Application Master Site Development Plan.

It is our belief that good fences make good neighbours. To this end, we would ask that both the County of Rockyview, in its consideration of the application, and that Burnco Rock Products Ltd., in their development of berm, consider the impact of this structure on our property. We would request that Burnco Rock Products Ltd. be asked, by Rockyview County, to give due consideration to the effects of this berm on the use and enjoyment of our property, now and with any implications for future resale value. We would also ask that Burnco Rock Products Ltd. be held to account by Rockyview County to ensure that this berm, should it be built, is constructed in a thoughtful, intentional, purposeful, and neighbourly manner to maintain neighbourly relations between Big Hill Creek Ranches Ltd. and Burnco Rock Products Ltd., The David H. McDougall Ranch Ltd. and Tricycle Lane Ranches Ltd.

Thank you for the opportunity to provide input on this proposal by Burnco Rock Products Ltd. I can be contacted by return email or at 403.877.6441 should you have any questions or require further clarification of anything contained herein.

We look forward to hearing from you regarding the answer to our question.

Warm regards, --Joan Owen Big Hill Creek Ranches Ltd.



# APPLICATION PL20200066

Burnco Land Use Redesignation Application West Cochrane Gravel Pit

# ADJACENT LANDOWNER COMMENTS

Bertrand Levesque and Julie Simard This letter states Bertrand Levesque and Julie Simard's opposition to Application PL20200066
# This letter states Bertrand Levesque and Julie Simard's <u>opposition</u> to the Application PL20200066. Regardless of all mitigations plans proposed by Burnco, the financial impact to property value remains unaddressed.

We, as adjacent landowners, have great concerns regarding the Land Use Redesignation application to expand the extraction area of the West Cochrane gravel pit at NW 13-26-05 W5M.

Our property is a small 17 acres parcel immediately adjacent to the NW corner of the proposed expanded project; we are located on the north side of Highway 1A, uphill from the project area. The area around our property is farm land, acreages, all in a beautiful landscape, with the Rockies as a back drop. The land surrounding the project - including the land under the project scope – is used for grazing cows and horses, as cultivated land or for country residences.

We are aware of the mitigation plans presented by Burnco regarding the following issues:

- Visual Impact
- Noise
- Air Quality
- Traffic increase
- Ground Water impact
- Wildlife corridor

The Burnco Plan is incomplete and offer poor re-assurances in the event of negative impacts to our water well, our health or the enjoyment of our property. There are no mechanism in place to ensure accountability, responsibility or enforcement.

For example, if our water well was impacted, we would have to bear the cost and weight of proving beyond a reasonable doubt that the impact is resulting from the gravel operation. This can be difficult. The same could be said if we developed lungs issues from the dust.

Ultimately, the Burnco proposed mitigations will do nothing to change the fact that no one wishes to live next to an active gravel pit.

But our main area of concern is that Burnco does not address the impact of their operation on the market value of neighboring properties. The issue is not even acknowledged.

Why should we, as adjacent landowners, have to suffer significant financial losses in order for Burnco to expand and prosper? We firmly believe that Burnco should be made fully responsible and have full mitigation/resolution plans for each impact, including and most importantly, the financial impact to neighboring property values.

This financial impact is real and has been reported by numerous studies, both in Canada and USA. This is a topic that is continuously raised when applications are made to introduce or expand gravel operations close to residential areas.<sup>1 2 3 4</sup>

When a new industrial operation is established, its immediate neighbors will see their property values drop. There is a strong relationship between the distance to the operation and the loss in value of a

1

https://www.lanecounty.org/UserFiles/Servers/Server 3585797/File/Government/BCC/2016/2016 AGENDAS/101 116agenda/PublicHearing/testimony%20BCC%20hearing Part7.pdf

<sup>&</sup>lt;sup>2</sup> <u>http://www.killthealbionguarry.org/HOME-VALUES-PLUMMET-FROM-QUARRIES.html</u>

<sup>&</sup>lt;sup>3</sup> <u>https://www.rockyviewgravelwatch.com/</u>

<sup>&</sup>lt;sup>4</sup> <u>http://www.countynewsonline.ca/wp-content/uploads/2017/02/Bearspaw-Gravel-Quarries-Letter-to-MD.pdf</u>

property: the smaller the distance, the greater the loss. The closest properties stand to lose as much as 25 to 39% of their value once a gravel project starts. <sup>5 6</sup>



This impact can be observed as soon as the project is known publicly, and will be more severe as the project becomes tangible and expand. This impact might be reverted if the land is properly reclaimed, but this is beyond our lifespan and cannot be used to justify approval to this project.

Who would want to spend top dollars to buy a nice house located 100 yards away from a noisy, ugly, busy 7/24 industrial gravel pit? Would you?

This project would undeniably make our property extremely hard to sell and leave us with a huge financial loss in the event of a sale.

#### We are therefore in opposition to application PL20200066.

Sincerely, Bertrand Levesque & Julie Simard

<sup>7</sup> Hite, D. 2006.Summary Analysis: Impact of operation gravel pit on house values, Delaware County, Ohio. Dept. Agricultural Economics and Rural Sociology, Auburn University, May. Graph borrowed from <u>http://www.countynewsonline.ca/wp-content/uploads/2017/02/Bearspaw-Gravel-Quarries-Letter-to-MD.pdf</u>

<sup>&</sup>lt;sup>5</sup> Hite, D. 2006.Summary Analysis: Impact of operation gravel pit on house values, Delaware County, Ohio. Dept. Agricultural Economics and Rural Sociology, Auburn University, May.

<sup>&</sup>lt;sup>6</sup> <u>http://www.lansink.ca/downloads/Lansink's%20Case%20Study%20Pit%20or%20Quarry%20Jan%202014.pdf</u>

# Response to Application Number PL20200066 Burnco Land Use Redesignation Application West Cochrane Gravel Pit

McKendrick Ranches Ltd. (MRL) and McNabb Lands

Abstract

The report states MRL and McNabb's opposition to Application Number PL20200066.

September 30, 2020

# Table of Contents

| 1                                                     | Executive Summary2                                                                                                       |                                                                                          |  |
|-------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|--|
| 2                                                     | Responsible Planning                                                                                                     |                                                                                          |  |
|                                                       | 2.1                                                                                                                      | Win-Win-Win3                                                                             |  |
|                                                       | 2.2                                                                                                                      | Planning Required Prior to Approval of Application;3                                     |  |
|                                                       | 2.3                                                                                                                      | Contradiction of RVC Land Use Framework4                                                 |  |
|                                                       | 2.4                                                                                                                      | Proposed MDP Amendment - Aggregate Extraction Section 2.6.1                              |  |
| 3                                                     | Stag                                                                                                                     | ing of Aggregate Mine and Processing Facilities6                                         |  |
|                                                       | 3.1                                                                                                                      | Approval Based on Ten Year Timeframes6                                                   |  |
|                                                       | 3.2                                                                                                                      | Commitment to Standards7                                                                 |  |
| 3.3 Original Pit to New Proposal Comparison           |                                                                                                                          |                                                                                          |  |
|                                                       | 3.4 Water Issues and Environment 9   3.5 Transportation 9   3.6 Larger Permanent Berm Buffer 10   3.6.1 Existing Berm 11 |                                                                                          |  |
|                                                       |                                                                                                                          |                                                                                          |  |
|                                                       |                                                                                                                          |                                                                                          |  |
|                                                       |                                                                                                                          |                                                                                          |  |
|                                                       | 3.6.2                                                                                                                    | 2 Gravel Piled Higher than Berms and Views Blocked11                                     |  |
| 4                                                     | Scale of Mine12                                                                                                          |                                                                                          |  |
| 5                                                     | Conclusion12                                                                                                             |                                                                                          |  |
| Appendix A – Land Ownership Map14                     |                                                                                                                          |                                                                                          |  |
| Арр                                                   | endi                                                                                                                     | k B – County Development Pressure Map15                                                  |  |
| Арр                                                   | endi                                                                                                                     | c C – Original McDougall Land Use Application16                                          |  |
| Appendix D – Pictures of Existing Burnco Operations20 |                                                                                                                          |                                                                                          |  |
| Арр                                                   | endi                                                                                                                     | x E - Cochrane Times July 1, 2020 Public Notice Burnco Rock Products Water Act Notice of |  |
| Dec                                                   | Decision23                                                                                                               |                                                                                          |  |

Page **1** of **23** 

# **1** Executive Summary

BURNCO Rock Products Ltd. (BURNCO) currently operates a gravel pit at NW 13-26-05 W5M located northwest of the Town of Cochrane, Alberta. BURNCO has applied for a Land Use amendment Application Number PL20200066 (the Burnco Application) the purpose of which is to increase the permitted area of aggregate resource extraction to further the expansion of the gravel mining and processing and to secure the long-term future of the existing mine. McKendrick Ranches Ltd. ("MRL") provides the following positions regarding the BURNCO application as currently proposed.

If approved, this Land Use and subsequent mine expansion would create 452 hectares (1,117 acres) of contiguous lands zoned as NRI for a gravel mining and aggregate processing expansion. BURNCO's intention is to secure long-term investment in the mine and then amend the existing Development Permit (DP # PRDP20175123) and Provincial Code of Practice Registration (Registration # 254757-00-00) for NW 13-26-05 W5M to include all the lands subject to this Land Use Amendment. This would create a gravel pit development which BURNCO plans to operate for the long term and will have lasting impacts upon neighbors, the Town of Cochrane, Rocky View County and MRL. **Appendix A** illustrates the MRL and McNabb lands impacted.

**Responsible Planning** of a mine facility and employment base of such a scale should predicate the development of an Area Structure Plan firstly to fully consider the long-term nature of planning and development opportunities and constraints of the mine on its neighbour's future planning. It is important that the County undertake a comprehensive planning exercise for Highway 1A prior to approving a Land Use that has such a major impact on neighbouring lands. Moreover, any adverse impacts that may be experienced on neighbouring properties due to the nature and scale of the mine should be mitigated within the boundaries of the applicant's lands and not impose those restrictions on its neighbours. This could include moving the berm and active face of the mine further away from the neighbouring properties and moving the crushing and washing operations to a location which would not impact the neighbouring properties.

**Staging of Aggregate Mining and Processing Facilities** is a common best practice in AB. Land Use for the application area as proposed is premature without operational performance assessment targets being set by Rocky View County and Alberta Environment from which assurances to Rocky View, Cochrane and neighbors will be met prior to subsequent Land Use approvals and further operational permit expansions. Without those guarantees to the community the Land Use application as proposed is premature.

**Scale of Mine** is largely unprecedented in Rocky View County. Burnco's Indus pit is approximately the same size; however, there is no record of an MSDP for this pit on Rocky View County's website. This should constitute requirements for higher levels of Land Use approval assessment, community consultation, neighboring owners Land Use policy and planning considerations to mitigate impacts.

Page **2** of **23** 

A comprehensively prepared and approved gravel strategy adopted by Rocky View County is also a must and, like other Counties in Alberta, is a best practice to avoid ad hoc mining approvals and subsequent appeals.

McKendrick Ranches respects the right of an owner such as the Applicant to pursue highest and best uses for their property; however, given the scale and long term nature of the Application, it must be conducted with forethought and on good Land Use planning practices with a responsibility not to negatively impact neighbors and the community from pursuing the enjoyment and economic advancement of their interests as well.

# 2 Responsible Planning

# 2.1 Win-Win-Win

BURNCO's sustained mining and processing ability is a win for Burnco. Rocky View County wins by additional revenues generated form the mine to further advance towards Rocky View County's goal of 35% nonresidential taxes base. Making an effort to properly plan the Hwy 1A Corridor area and engaging residents in that planning exercise allows both Rocky View County and the residents to not lose on additional opportunities available within this corridor and also to thoroughly evaluate the benefits of development planning on their lands as well as to mitigate mining impacts. An Area Structure Plan developed along the Highway 1A corridor will allow for Rocky View County, the applicant and the residents to understand the full potential of this area and to determine strategies that will allow for the development of resource extraction in concert with the development potential of this locale.

In February 2019, McNabb presented a strategy for the development of Section 8 which is located between the Town of Cochrane and the proposed gravel pit to the Rocky View County Governance and Priorities Committee (GPC). GPC supported recognition of commercial and residential growth pressure in this area for consideration of upcoming updates to the County Plan as shown in **Appendix B**.

McNabb has also discussed this plan with the Town of Cochrane.

# 2.2 Planning Required Prior to Approval of Application

- **Prepare Hwy 1A ASP:** Planning of corridor can take place in a fully considered format versus spot zoning of 1,200 acres of mining and processing operations.
- Regional Significance: Plan should be circulated to CMRB.
- **Restrictions on Adjacent Landowner Uses**: Rezoning the entire area as NRI restricts neighbouring development for decades and potentially for the next century or longer due to setback requirements from extraction mines. Any restrictions on development within the MRL lands such as additional setbacks due to adverse effects from the extraction operation should be accommodated within the property of the applicant and not within the MRL property.

Page 3 of 23

In particular, the Burnco Report indicates that exceedances of Alberta Ambient Air Quality Objectives will occur for fine particulate matter and for total suspended particles for a distance of 100 metres outside the boundaries of the site. It is requested that Land Use not be granted on those lands that will affect the adjacent landowners until such time as Burnco can demonstrate that its operations will not have any adverse effect on neighbouring lands and that no additional setbacks will be required on the MRL property as a result of the Burnco operations.

# 2.3 Contradiction of RVC Land Use Framework

The Application contradicts RVC's Land Use Framework:

**1.** Land Use Framework Strategy, which encourages conservation, land stewardship, healthy ecosystems, and the efficient use of land.

Zoning for long term use of 1,200 acres of gravel mining operations plus requiring setbacks from future uses is not efficient use of land and contributes to sprawling development patterns.

2. Provide for a safe, secure, and reliable drinking water supply.

Protection of neighbouring groundwater sources is important. Operational practices for de-watering is known to affect adjacent landowner wells.

- Retain rural landscapes, dark skies, open vistas, and agriculture lands. The 1,200 acres of gravel mine operations does not support any of these policies.
- 4. Development shall be planned, designed, and constructed to protect alluvial aquifers. Dewatering operations required to support the mine do not protect Alluvial Aquifers. MRL has many springs and wells that are difficult to monitor and protect.

## 5. Avoid Development of Wetlands and Riparian Areas

Protection of Bow River watershed and aquifer, for which the Land Use is adjacent, may place downstream communities' water at risk. The Land Use change and economic viability is dependent on dewatering a complex aquifer. The complexity of the local hydrology and the impact of aggregate mining, contamination and use of water for washing gravel over the lifespan of the mine requires performance measures be met prior to future Land Use expansion.

Page **4** of **23** 

# 2.4 Proposed MDP Amendment - Aggregate Extraction Section 2.6.1

The proposed MDP wording is:

## 2.6.1 Aggregate Extraction

a) Minimize the adverse impact of aggregate resource extraction on existing residents, adjacent Land Uses, and the environment.

The impact of the Burnco application should be minimized by requiring that all adverse impacts from the Burnco operation, including dust and noise should be retained within the boundaries of the Burnco lands.

b) Encourage collaboration between the County, the aggregate extraction industry, and impacted residents and landowners to develop mutually agreeable solutions that mitigate impacts of extraction activities.

At present, the collaboration between Burnco and MRL has not yet been apparent. Impacts of the extraction activities clearly impact MRL from a noise, dust and visual perspective. MRL should be allowed to pursue its objectives without undue interference from a neighbor. MRL concerns about de-watering and mining in the aquifer for the benefit of Burnco have been ignored.

 c) Discourage residential development that may be impacted by future aggregate extraction when proposed outside of an adopted area structure plan.
 The adoption of an Area Structure Plan in this area would serve to maximize the

development potential in this corridor and determine the Land Uses that would be complementary to each other. Moreover, the adoption of an Area Structure Plan would provide some certainty as to the phasing of both the aggregate extraction and the adjacent development. This is one of the purposes of an ASP.

- d) Where aggregate activities are located in proximity to an adjacent municipality, the County should co-operate with that jurisdiction to ensure co-ordination of major haul routes and mitigation of impacts on adjacent Land Uses
   Major haul routes may become problematic without the construction of upgrades on Highway 1A and the intersection of Highway 22 and Highway 1A.
- *e)* Consider co-locating other complimentary industrial uses adjacent to aggregate extraction sites

An Area Structure Plan would provide some direction as to which complementary uses could be located in proximity to the aggregate extraction site and determine the phasing of same.

Page **5** of **23** 

## **Request:**

- That Rocky View County prepare an Area Structure Plan along the Highway 1A Corridor prior to considering the Burnco Application.
- That the Burnco Application be circulated to CMRB.
- That all additional setback requirements due to noise, dust or other nuisances be accommodated within the Burnco property.
- Burnco be required to engage adjacent landowners directly impacted by dewatering.

# **3** Staging of Aggregate Mine and Processing Facilities

# 3.1 Approval Based on Ten Year Timeframes

The current NRI Land Use for 151.21 acres was started in 2009 and **Appendix C** shows the original McDougall application. In 2012 a Development Permit was granted for phased development. See **Appendix D** for pictures of Burnco's existing sites in the area. Burnco continues to work on the first 20-30 acres phase with no mining below the aquifer water level. However, with dewatering practices there will be more aggregate available within the water aquifer which would slow the horizontal expansion need of the mine

Given this timing 20 acres has been in mining operations over about a 10-year period. This questions the need to obtain zoning of a mine requiring 1,200 acres at this time. It is premature to zone that much land for a future mine. Alternatively, a Land Use strategy to conduct mining in stages ensures that performance criteria is met and does not preclude other growth along the 1A corridor or Cochrane.

The initial Land Use should be considered on the east side of the Burnco property. This is the land that is closest to Section 8 near Cochrane. By approving a smaller Land Use footprint, the Applicant will be incentivized to work only the gravel deposits in that location, thereby removing the resource prior to the time when MRL is ready to develop, thus eliminating conflict,

The decisions made today for such a scale of mining operations maybe detrimental for the 1A Corridor area and the Bow River Watershed.

# **Request:**

 That Council grant Land Use for ten-year time frames for mining needs. The initial Land Use should be granted for the lands that are in closest proximity to Section 8 near Cochrane. Future mining needs would be accommodated through subsequent Land Use applications once the applicant demonstrates adherence to appropriate performance standards and reclamation requirements.

Page 6 of 23

# 3.2 Commitment to Standards

Rocky View County needs to have assurance that the Land Use approval of aggregate extraction will be followed up with performance measures once mining is taking place. This could be conducted by Council providing direction to administration to enable periodic review of the measures and required amendments to align with cumulative impact assessments evaluated at the time of Land Use approval. The performance measurements should be brought before Council on a regular basis, available to the public upon request and circulated to adjacent land owners. Should the applicant not meet the performance criteria, then the permit should be cancelled

Precedence and examples have been developed. Refer to Ponoka County Development Permit D-19-53 revised November 26, 2019.

# 3.3 Original Pit to New Proposal Comparison

Table 1 compares the 2009 proposed McDougall pit and the 2020 Burnco Cochrane West pit. The comparison shows a significant change in scope, practice, and impact. This illustrates how cumulative impacts must be assessed and monitored as operations change?

- **1.** Water: Protect the aquifers and Bow River watershed for neighbors use and downstream communities. Water licensing requirements of Burnco.
- 2. Environment and Tourism: Bow River Valley natural scenery.
- **3. Gravel Extraction Volume:** Council should consider business need case study by the applicant to support need for current and future proposed Land Use and mine extraction growth. The applicant (operating since 2016) and previous operator (since the original application in 2009) have been working on the 160-acre pit for the past 11+ years and is only partly completed, which at this pace would give the lifespan of this additional rezoning a project life of potentially 100 years.

Page **7** of **23** 

|  | Table 1: Burnco | West Cochrane | <b>Gravel Pit since</b> | 2009 Proposal |
|--|-----------------|---------------|-------------------------|---------------|
|--|-----------------|---------------|-------------------------|---------------|

|                | McDougall Pit Proposal             | 2020 Burnco Pit MSDP               |
|----------------|------------------------------------|------------------------------------|
| Land Use       | Dutchik 2009-01 first draft        | Burnco MSDP 2020-06-01             |
|                | approve 2011 17ac first phase      |                                    |
|                | Dutchik to operate pit             |                                    |
| Land Use       | 10 years                           | 30-35 years                        |
|                | volume sold to-date?               | 400% increase 500,000 T/yr         |
|                |                                    | 28 tandem trucks per hour          |
| Approved       | 2011 Public Hearing                | 2020 fall Public Hearing?          |
|                | Reeve and Council approve except   |                                    |
|                | Area Councilor Paul McLean opposed |                                    |
| Size           | 151.21 ac                          | New 994.4 ac plus 151.21           |
|                |                                    | Total 1,145.61 ac                  |
|                |                                    | plus, SE13 Bow R water site        |
|                |                                    | Maybe 1200 acres?                  |
| Mine           | stay 1m above water                | dewater McDougall pit              |
|                |                                    | dewater east and west pits         |
| Phase          | 2011: one phase 17ac mine          | Phase 1 and 2 are permanent        |
|                | reclaim to start next phase        | Several phases open                |
|                |                                    | East and West sites in parallel?   |
| Develop Permit | July 12. 2012 Fig 1                |                                    |
| Appeal Board   | Max Area 12 ha.                    |                                    |
|                | Phase 1: 7ha Phase 2: 4.9ha        |                                    |
|                | SDAB change from Council approval  |                                    |
| Develop Permit | 2012-DP-15078                      |                                    |
|                | Burnco now operator                |                                    |
| Process        | crush, market gravel               | crush, wash, market gravel         |
|                |                                    | Water pipeline from Bow River      |
|                |                                    | Access road to Bow River           |
|                |                                    | Potential for cement? Cochrane pit |
|                |                                    | Potential for aspnait?             |
| Dama           | face 100m atoms                    | Potential for other commercial?    |
| Berm           | Tew 100metres                      | 7-8 miles?                         |
| CADD           | Not permanent                      | Permanent                          |
| SADB           | PRDBP20175123                      |                                    |
| Appeal Board   | Burnco appeal levy, hours          |                                    |
| After Mine     | 2009 proposed Agriculture          | Historically Burnco redevelops     |
|                | Potential development?             | Greystone, others                  |
|                |                                    | Not returned to agriculture        |
|                |                                    | Best invest value                  |
| Zoning Changes |                                    | potentially change zoning anytime  |
|                |                                    | based on economics with approval   |

Page **8** of **23** 

# **Request:**

• That the applicant be requested to prepare a business case to support the aggregate extraction application which provides support for the 1200-acre extraction operation and the projected operating timeline of 30 – 35 years.

# 3.4 Water Issues and Environment

The Land Use change proposed by Burnco takes the existing pit that was proposed to last 10 years (see **Appendix C**) and expands the area to include another 994.4 acres. This is the prime watershed area for all downstream communities' water supply: Cochrane, Calgary, Carseland and more. The new proposal 2020-06 shows a Master Site Development Plan that mines below the ground water. Currently the development permit is for mining a metre above the ground water. This requires Alberta Environment and Parks (AEP) approval and needs extensive consultation with adjacent landowners, downstream users and the Calgary Region. In particular MRL is concerned with the following:

- Water issue dispute resolution needs to be established to ensure the process does not drag out for quite some time
- Third Party water monitoring of adjacent MRL and McNabb wells and springs paid for by Burnco including a predefined frequency.

MRL was just notified Burnco applied to AEP to mine in the water aquifer for the current pit (McDougall 2011) during COVID-19. Burnco advised they put a public notice advertisement in Cochrane Times July 1, 2020 with a seven-day appeal period see **Appendix E.** Cochrane Times is circulated to Cochrane residences and no longer to MRL's rural Rocky View County mailbox.

# **Request:**

- That this application be held in abeyance by Council until such time as AEP has completed its review of the project.
- That the County determine a dispute resolution mechanism.
- That third-party water monitoring be established and paid for by the Applicant.

# 3.5 Transportation

Transportation in the area is very challenging especially during peak times. Burnco proposes 400% increase to 500,000 T/yr and 28 tandem trucks per hour. At present, Alberta Transportation and the Town of Cochrane have indicated that development potential within the Town is limited due to capacity constraints imposed by the intersection of Highway 22 and Highway 1A. As this is likely a major haul route for Burnco, the capacity of this intersection should be examined to determine whether there is enough capacity to support the Burnco application. The timeline for the upgrade of this intersection should also be determined so that it aligns with the Applicant's proposal.

Page **9** of **23** 

An upgrade of Highway 1A should also be requested to allow for the extra capacity required on the section of roadway adjacent to the applicant's proposal.

## **Request:**

• That Alberta Transportation be consulted regarding expansion of 1A highway and the upgrade of the intersection of Highway 22 and Highway 1A.

# 3.6 Larger Permanent Berm Buffer

A larger buffer between the gravel pit and Section 8 allows both parties to achieve their objectives with no conflicts. The current proposed berms require additional setback on MRL's Section 8 lands to provide a buffer for future development and from Highway 1A for future expansion. Increasing the buffer between the applicant's operation and the MRL property allows the Applicant to retain all potential harmful effects within its property. Additionally, it is anticipated that Highway 1A will likely need to be widened. The location of the berm on Burnco's property should be located to accommodate any potential widening required on the south side of the highway. In the long term it is anticipated that a berm will also be required on the north side, similar to Highway 8. The figures and pictures attached indicate the location and visual effect of the installation of berms along Highway 1A and adjacent to Section 8

## **Request:**

• Increase the setback to Permanent Berms from Section 8 and from Highway 1A.



Figure 1: West Cochrane Mine Phase Plan from Burnco's Application Number PL20200066

Page **10** of **23** 

# 3.6.1 Existing Berm



# 3.6.2 Gravel Piled Higher than Berms and Views Blocked

The following image illustrates that the gravel is piled higher than the berms and blocks views unless a multi-story building is built.



Page **11** of **23** 

# 4 Scale of Mine

Gravel pits are being approved on an ad-hoc basis at various scales of operations in Rocky View County. A comprehensive gravel strategy with periodic reviews within Rocky View would provide clarity regarding the responsible planning of a larger areas of gravel aggregates and certainty for both the mining operators and the community impacted by the cumulative effects.

Below is a link to an example that could be referenced for another municipality that have done studies in order to provide information on where gravel developments are best suited as opposed to ad hoc development:

# https://mdpeace.com/wp-content/uploads/2014/04/Gravel-Pit-Study.pdf

# Request:

• Complete a Comprehensive Gravel Strategy prior to Land Use approval.

# 5 Conclusion

The application is in contradiction to RVC's planning documents and approving the Land Use change is a conflict with RVC's own planning documents.

Decisions today made by Rocky View Council today will impact trends, growth, environment, wildlife, water, resources, health, and economic factors for the foreseeable future.

What are the needs twenty years from now? Does Rocky View need more gravel pits now, ten years or twenty years? What infrastructure is needed for health and technology and are those compatible with gravel pits?

MRL recognizes the importance of business assessment for Rocky View taxes and the County success. MRL understands Burnco desire to profit, provide jobs and be a good corporate citizen by claims to monitor and perform; however, this should not be at the expense of MRL.

In summary MRL and McNabb have made the following requests:

- That Rocky View County prepare an Area Structure Plan along the Highway 1A Corridor prior to considering the Burnco Application.
- That the Burnco Application be circulated to CMRB.
- That all additional setback requirements due to noise, dust or other nuisances within the Burnco property.
- Burnco be required to engage adjacent landowners directly impacted by dewatering.

Page **12** of **23** 

- That Council grant Land Use for ten-year time frames for mining needs. The initial Land Use should be granted for the lands that are in closest proximity to Section 8 near Cochrane. Future mining needs would be accommodated through subsequent Land Use applications once the applicant demonstrates adherence to appropriate performance standards and reclamation requirements.
- That the applicant be requested to prepare a business case to support the aggregate extraction application which provides support for the 1200-acre extraction operation and the projected operating timeline of 30 35 years.
- That this application be held in abeyance by Council until such time as AEP has completed its review of the project.
- That the County determine a dispute resolution mechanism.
- That third-party water monitoring be established and paid for by the Applicant.
- That Alberta Transportation be consulted regarding expansion of 1A highway and the upgrade of the intersection of Highway 22 and Highway 1A.
- Increase the setback to Permanent Berms from Section 8 near Cochrane and from Highway 1A.
- Complete a Comprehensive Gravel Strategy prior to Land Use approval.

# Appendix A – Land Ownership Map



# **Appendix B – County Development Pressure Map**



County Plan Growth & Servicing Strategy

Page 18 of 27

Page 15 of 23

# Appendix C – Original McDougall Land Use Application

Land Use Redesignation Application Report David H. McDougall Ranches Ltd.

EXECUTIVE SUMMARY

Dennis Twerdoff, P.Geol. P.Ag., 715964 Alberta Ltd., was retained by David H. McDougall Ranches Ltd. (McDougall) to prepare a Land Use Redesignation Application Report for a proposed sand and gravel operation.

The proposed development is located on NW 13-26-5-W5M within the Municipal District of Rockyview. McDougall wishes to apply for Land Use Redesignation from Ranch and Farm District (RF) to Natural Resource Industrial District (NRI) to allow for sand and gravel operations. The land is currently hayland/pasture.

McDougall is proposing to undertake dry excavations, crushing and screening.

Although the life span of the sand and gravel pit is estimated to be approximately ten years, the timeframe is highly dependent upon gravel demand in the area. Excavations will occur in several phases with topsoil stockpiled along the edge of each phase. The site will be progressively reclaimed to pasture/hayland as each phase is depleted.

McDougall is committed to running a quality operation and minimizing potential impacts to local residence and the environment.

Page 16 of 23

# E-1 - Attachment E Page 64 of 252

Application Number: PL20200066 MRL and McNabb Comments



Page 17 of 23

# E-1 - Attachment E Page 65 of 252

Application Number: PL20200066 MRL and McNabb Comments



# E-1 - Attachment E Page 66 of 252

#### Application Number: PL20200066 MRL and McNabb Comments



# Appendix D – Pictures of Existing Burnco Operations Gravel View



Night Operation is 24 hours/day Impacting Dark Skies, Neighbours, and Wildlife



Page **20** of **23** 

# **Restored Greystone Site**



Additional View of Restored Greystone Site



Page **21** of **23** 

Application Number: PL20200066 MRL and McNabb Comments

# Additional Gravel View



Page **22** of **23** 

# Appendix E - Cochrane Times July 1, 2020 Public Notice Burnco Rock Products Water Act Notice of Decision

Part 9 of the Water Act provides the right to appeal this decision. Any person who is directly affected by this decision may submit a notice of appeal, within seven (7) days of the providing of this notice, to: Chair Environmental Appeals Board

| Public Notices                                                                                                                                                                                                                                                                                     |  |  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| PUBLIC NOTICE                                                                                                                                                                                                                                                                                      |  |  |
| BUBNCO Bock Products I td                                                                                                                                                                                                                                                                          |  |  |
| WATER ACT                                                                                                                                                                                                                                                                                          |  |  |
| NOTICE OF DECISION                                                                                                                                                                                                                                                                                 |  |  |
| NOTICE OF DECISION                                                                                                                                                                                                                                                                                 |  |  |
| Notice is given that <b>BURNCO</b> Rock<br><b>Products</b> Ltd. has been issued an<br>approval under the provisions of the <i>Water</i><br><i>Act</i> , on June 8, 2020, to extract aggregate<br>from below the water table of an existing<br>sand and gravel site located at NW<br>13-026-05-W5M. |  |  |
| Further information may be obtained from:                                                                                                                                                                                                                                                          |  |  |
| Regulatory Assurance Division<br>Southern Region<br>2nd Floor, 2938 11 Street NE<br>Calgary, Alberta T2E 7L7<br>Telephone: 403-297-7605<br>Fax: 403-297-2749                                                                                                                                       |  |  |
| Please quote file number: 00430788                                                                                                                                                                                                                                                                 |  |  |
| Part 9 of the Water Act provides the right<br>to appeal this decision. Any person who is<br>directly affected by this decision may<br>submit a notice of appeal, within seven (7)<br>days of the providing of this notice, to:                                                                     |  |  |
| Chair                                                                                                                                                                                                                                                                                              |  |  |
| Environmental Appeals Board                                                                                                                                                                                                                                                                        |  |  |
| 10011 109 Street                                                                                                                                                                                                                                                                                   |  |  |
| Edmonton, Alberta T5J 3S8                                                                                                                                                                                                                                                                          |  |  |
| Telephone: 780-427-6207                                                                                                                                                                                                                                                                            |  |  |
| www.eab.gov.ab.ca/index.htm                                                                                                                                                                                                                                                                        |  |  |
| For contact purposes, please include your<br>name, phone number, address, land<br>location, and a statement respecting how<br>this decision will directly affect you or your                                                                                                                       |  |  |

water supply.

Page 23 of 23

# 8. Opposition - Storms Cornish September 2020 Burnco Land Use Redesignation Application West Cochrane Gravel Pit

# **Reginald Storms and Kathleen Cornish**

The report states Storms and Cornish's opposition to Application Number PL20200066.

September 30, 2020

BURNCO Rock Products Ltd. (BURNCO) currently operates a gravel pit at NW 13-26-05 W5M located northwest of the Town of Cochrane, Alberta. BURNCO has applied for a Land Use amendment Application Number PL20200066 (the Burnco Application) the purpose of which is to increase the permitted area of aggregate resource extraction to further the expansion of the gravel mining and processing and to secure the long-term future of the existing mine. Reginald Storms and Kathleen Cornish (Storms/Cornish), owners of neighbouring property located at NW 15 26 R5 W5M, Municipal address 262144 Range Rd 53, provide the following positions regarding the BURNCO application as currently proposed.

If approved, this Land Use and subsequent mine expansion would create 452 hectares (1,117 acres) of contiguous lands zoned as NRI for a gravel mining and aggregate processing expansion. BURNCO's intention is to secure long-term investment in the mine and then amend the existing Development Permit (DP # PRDP20175123) and Provincial Code of Practice Registration (Registration # 254757-00-00) for NW 13-26-05 W5M to include all the lands subject to this Land Use Amendment. This would create a gravel pit development which BURNCO plans to operate for the long term and will have lasting impacts upon neighbors, the Town of Cochrane, Rocky View County and Storms/Cornish.

**Responsible Planning** of a mine facility and employment base of such a scale should predicate the development of an Area Structure Plan firstly to fully consider the long-term nature of planning and development opportunities and constraints of the mine on its neighbour's future planning. It is important that the County undertake a comprehensive planning exercise for Highway 1A prior to approving a Land Use that has such a major impact on neighbouring lands. Moreover, any adverse impacts that may be experienced on neighbouring properties due to the nature and scale of the mine should be mitigated within the boundaries of the applicant's lands and not impose those restrictions on its neighbours. This could include moving the berm and active face of the mine further away from the neighbouring properties and moving the crushing and washing operations to a location which would not impact the neighbouring properties.

**Staging of Aggregate Mining and Processing Facilities** is a common best practice in AB. Land Use for the application area as proposed is premature without operational performance assessment targets being set by Rocky View County and Alberta Environment from which assurances to Rocky View, Cochrane and neighbors will be met prior to subsequent Land Use approvals and further operational permit expansions. Without those guarantees to the community the Land Use application as proposed is premature.

**Scale of Mine** is largely unprecedented in Rocky View County. Burnco's Indus pit is approximately the same size; however, there is no record of an MSDP for this pit on Rocky View County's website. This should constitute requirements for higher levels of Land Use approval assessment, community consultation, neighboring owners Land Use policy and planning considerations to mitigate impacts.

Page **1** of **20** 

A comprehensively prepared and approved gravel strategy adopted by Rocky View County is also a must and, like other Counties in Alberta, is a best practice to avoid ad hoc mining approvals and subsequent appeals.

Storms/Cornish respect the right of an owner such as the Applicant to pursue highest and best uses for their property; however, given the scale and long term nature of the Application, it must be conducted with forethought and on good Land Use planning practices with a responsibility not to negatively impact neighbors and the community from pursuing the enjoyment and economic advancement of their interests as well.

BURNCO's sustained mining and processing ability is a win for Burnco. We assume that Rocky View County benefits financially from the project, and it would be useful to see what the financial benefits are compared with the costs that will be incurred by having such a large development with its environmental issues. Making an effort to properly plan the Hwy 1A Corridor area and engaging residents in that planning exercise allows both Rocky View County and the residents to not lose on additional opportunities available within this corridor and also to thoroughly evaluate the benefits of development planning on their lands as well as to mitigate mining impacts. An Area Structure Plan developed along the Highway 1A corridor will allow for Rocky View County, the applicant and the residents to understand the full potential of this area and to determine strategies that will allow for the development of resource extraction in concert with the development potential of this locale.

# Planning Required Prior to Approval of Application

- **Prepare Hwy 1A ASP:** Planning of corridor can take place in a fully considered format versus spot zoning of 1,200 acres of mining and processing operations.
- **Regional Significance**: Plan should be circulated to CMRB.
- **Restrictions on Adjacent Landowner Uses**: Rezoning the entire area as NRI restricts potential use and enjoyment of neighbouring properties as well as affecting property values for agriculturally zoned properties for decades and potentially for the next century or longer.

In particular, the Burnco Report indicates that exceedances of Alberta Ambient Air Quality Objectives will occur for fine particulate matter and for total suspended particles for a distance of 100 metres outside the boundaries of the site. It is requested that Land Use not be granted on those lands that will affect the adjacent landowners until such time as Burnco can demonstrate that its operations will not have any adverse effect on neighbouring lands and that no additional setbacks will be required on the Storms/Cornish property as a result of the Burnco operations.

# **Contradiction of RVC Land Use Framework**

The Application contradicts RVC's Land Use Framework:

- Land Use Framework Strategy, which encourages conservation, land stewardship, healthy ecosystems, and the efficient use of land.
   Zoning for long term use of 1,200 acres of gravel mining operations plus requiring setbacks from future uses is not efficient use of land and contributes to sprawling development patterns.
- Provide for a safe, secure, and reliable drinking water supply.
  Protection of neighbouring groundwater sources is important. Operational practices for de-watering is known to affect adjacent landowner wells.
- Retain rural landscapes, dark skies, open vistas, and agriculture lands.
  The 1,200 acres of gravel mine operations does not support any of these policies.
- 4. Development shall be planned, designed, and constructed to protect alluvial aquifers. Dewatering operations required to support the mine do not protect Alluvial Aquifers.
- 5. Avoid Development of Wetlands and Riparian Areas

Protection of Bow River watershed and aquifer, for which the Land Use is adjacent, may place downstream communities' water at risk. The Land Use change and economic viability is dependent on dewatering a complex aquifer. The complexity of the local hydrology and the impact of aggregate mining, contamination and use of water for washing gravel over the lifespan of the mine requires performance measures be met prior to future Land Use expansion.

# Proposed MDP Amendment - Aggregate Extraction Section 2.6.1

The proposed MDP wording is:

## 2.6.1 Aggregate Extraction

a) Minimize the adverse impact of aggregate resource extraction on existing residents, adjacent Land Uses, and the environment.

The impact of the Burnco application should be minimized by requiring that all adverse impacts from the Burnco operation, including dust and noise should be retained within the boundaries of the Burnco lands.

b) Encourage collaboration between the County, the aggregate extraction industry, and impacted residents and landowners to develop mutually agreeable solutions that mitigate impacts of extraction activities.

At present, the collaboration between Burnco and at least one neighbouring landowner has not yet been apparent. Impacts of the extraction activities clearly impact this neighbouring landowner from a noise, dust and visual perspective. All neighbouring landowners should be allowed to pursue their objectives without undue interference from a neighbor. Concerns of neighbouring landowners about de-watering and mining in the aquifer for the benefit of Burnco have been ignored.

 c) Discourage residential development that may be impacted by future aggregate extraction when proposed outside of an adopted area structure plan.
 The adoption of an Area Structure Plan in this area would serve to maximize the

development potential in this corridor and determine the Land Uses that would be complementary to each other. Moreover, the adoption of an Area Structure Plan would provide some certainty as to the phasing of both the aggregate extraction and the adjacent development. This is one of the purposes of an ASP.

- d) Where aggregate activities are located in proximity to an adjacent municipality, the County should co-operate with that jurisdiction to ensure co-ordination of major haul routes and mitigation of impacts on adjacent Land Uses Major haul routes may become problematic without the construction of upgrades on Highway 1A and the intersection of Highway 22 and Highway 1A.
- *e)* Consider co-locating other complementary industrial uses adjacent to aggregate extraction sites

An Area Structure Plan would provide some direction as to which complementary uses could be located in proximity to the aggregate extraction site and determine the phasing of same.

Page **4** of **20** 

**Request:** 

- That Rocky View County prepare an Area Structure Plan along the Highway 1A Corridor prior to considering the Burnco Application.
- That the Burnco Application be circulated to CMRB.
- That all additional setback requirements due to noise, dust or other nuisances be accommodated within the Burnco property.
- Burnco be required to engage adjacent landowners directly impacted by dewatering.

# **Staging of Aggregate Mine and Processing Facilities**

# **Approval Based on Ten Year Timeframes**

The current NRI Land Use for 151.21 acres was started in 2009. In 2012 a Development Permit was granted for phased development. Burnco continues to work on the first 20-30 acres phase with no mining below the aquifer water level. However, with dewatering practices there will be more aggregate available within the water aquifer which would slow the horizontal expansion need of the mine

Given this timing 20 acres has been in mining operations over about a 10-year period. This questions the need to obtain zoning of a mine requiring 1,200 acres at this time. It is premature to zone that much land for a future mine. Alternatively, a Land Use strategy to conduct mining in stages ensures that performance criteria is met and does not preclude other growth along the 1A corridor or Cochrane.

The initial Land Use should be considered on the east side of the Burnco property. By approving a smaller Land Use footprint, the Applicant will be incentivized to work only the gravel deposits in that location.

The decisions made today for such a scale of mining operations may be detrimental for the 1A Corridor area and the Bow River Watershed.

# **Request:**

 That Council grant Land Use for ten-year time frames for mining needs. The initial Land Use should be granted for the lands that are in closest proximity to Section 8 near Cochrane. Future mining needs would be accommodated through subsequent Land Use applications once the applicant demonstrates adherence to appropriate performance standards and reclamation requirements.

Page **5** of **20** 

# **Commitment to Standards**

Rocky View County needs to have assurance that the Land Use approval of aggregate extraction will be followed up with performance measures once mining is taking place. This could be conducted by Council providing direction to administration to enable periodic review of the measures and required amendments to align with cumulative impact assessments evaluated at the time of Land Use approval. The performance measurements should be brought before Council on a regular basis, available to the public upon request and circulated to adjacent land owners. Should the applicant not meet the performance criteria, then the permit should be cancelled

Precedence and examples have been developed. Refer to Ponoka County Development Permit D-19-53 revised November 26, 2019.

# **Original Pit to New Proposal Comparison**

Table 1 compares the 2009 proposed McDougall pit and the 2020 Burnco Cochrane West pit. The comparison shows a significant change in scope, practice, and impact. This illustrates how cumulative impacts must be assessed and monitored as operations change?

- **1. Water:** Protect the aquifers and Bow River watershed for neighbors use and downstream communities. Water licensing requirements of Burnco.
- 2. Environment and Tourism: Bow River Valley natural scenery.
- **3. Gravel Extraction Volume:** Council should consider business need case study by the applicant to support need for current and future proposed Land Use and mine extraction growth. The applicant (operating since 2016) and previous operator (since the original application in 2009) have been working on the 160-acre pit for the past 11+ years and is only partly completed, which at this pace would give the lifespan of this additional rezoning a project life of potentially 100 years.

Page **6** of **20** 

| Table 1: Burnco | West Cochrane | e Gravel Pit since | 2009 Proposal |
|-----------------|---------------|--------------------|---------------|
|                 |               |                    |               |

|                | McDougall Pit Proposal              | 2020 Burnco Pit MSDP               |
|----------------|-------------------------------------|------------------------------------|
| Land Use       | Dutchik 2009-01 first draft         | Burnco MSDP 2020-06-01             |
|                | approve 2011 17ac first phase       |                                    |
|                | Dutchik to operate pit              |                                    |
|                |                                     |                                    |
| Land Use       | 10 years                            | 30-35 years                        |
|                | volume sold to-date?                | 400% increase 500,000 T/yr         |
|                |                                     | 28 tandem trucks per hour          |
| Approved       | 2011 Public Hearing                 | 2020 fall Public Hearing?          |
|                | Reeve and Council approve except    |                                    |
|                | Area Councilor Paul MicLean opposed |                                    |
| Size           | 151.21 ac                           | New 994.4 ac plus 151.21           |
|                |                                     | Total 1,145.61 ac                  |
|                |                                     | plus, SE13 Bow R water site        |
|                |                                     | Maybe 1200 acres?                  |
|                |                                     |                                    |
| Mine           | stay 1m above water                 | dewater McDougail pit              |
| Dhasa          | 2011, and phase 17ac mine           | Desce 1 and 2 are permanent        |
| Phase          | zoll. One phase 17ac mine           | Soveral phases open                |
|                | reclaim to start next phase         | Fast and West sites in parallel?   |
|                |                                     |                                    |
| Develop Permit | July 12. 2012 Fig 1                 |                                    |
| Appeal Board   | Max Area 12 ha.                     |                                    |
|                | Phase 1: 7ha Phase 2: 4.9ha         |                                    |
|                | SDAB change from Council approval   |                                    |
| Douolon Dormit | 2012 DD 15079                       |                                    |
| Develop Permit | Burnco now operator                 |                                    |
| Process        | crush market gravel                 | crush wash market gravel           |
| 11000035       |                                     | Water pipeline from Bow River      |
|                |                                     | Access road to Bow River           |
|                |                                     | Potential for cement? Cochrane pit |
|                |                                     | Potential for asphalt?             |
|                |                                     | Potential for other commercial?    |
|                |                                     |                                    |
| Berm           | few 100metres                       | 7-8 miles?                         |
|                | Not permanent                       | Permanent                          |
| SADB           | PRDBP20175123                       |                                    |
| Appeal Board   | Burnco appeal levy, hours           |                                    |
| After Mine     | 2009 proposed Agriculture           | Historically Burnco redevelops     |
|                | Potential development?              | Greystone, others                  |
|                |                                     | Not returned to agriculture        |
|                |                                     | Best invest value                  |

Page **7** of **20** 

| Zoning Changes | potentially change zoning anytime based on economics with approval |
|----------------|--------------------------------------------------------------------|

## **Request:**

• That the applicant be requested to prepare a business case to support the aggregate extraction application which provides support for the 1200-acre extraction operation and the projected operating timeline of 30 – 35 years.

# Water Issues and Environment

The Land Use change proposed by Burnco takes the existing pit that was proposed to last 10 years and expands the area to include another 994.4 acres. This is the prime watershed area for all downstream communities' water supply: Cochrane, Calgary, Carseland and more. The new proposal 2020-06 shows a Master Site Development Plan that mines below the ground water. Currently the development permit is for mining a metre above the ground water. This requires Alberta Environment and Parks (AEP) approval and needs extensive consultation with adjacent landowners, downstream users and the Calgary Region. In particular MRL is concerned with the following:

- Water issue dispute resolution needs to be established to ensure the process does not drag out for quite some time
- Third Party water monitoring of adjacent Storms/Cornish wells paid for by Burnco including a predefined frequency.

Storms/Cornish were just notified Burnco applied to AEP to mine in the water aquifer for the current pit (McDougall 2011) during COVID-19. Burnco advised they put a public notice advertisement in Cochrane Times July 1, 2020 with a seven-day appeal period see **Appendix E.** Cochrane Times is circulated to Cochrane residences and not to Storms/Cornish's rural Rocky View County mailbox.

#### **Request:**

- That this application be held in abeyance by Council until such time as AEP has completed its review of the project.
- That the County determine a dispute resolution mechanism.
- That third-party water monitoring be established and paid for by the Applicant.

Page 8 of 20

# Transportation

Transportation in the area is very challenging especially during peak times. Burnco proposes 400% increase to 500,000 T/yr and 28 tandem trucks per hour. At present, Alberta Transportation and the Town of Cochrane have indicated that development potential within the Town is limited due to capacity constraints imposed by the intersection of Highway 22 and Highway 1A. As this is likely a major haul route for Burnco, the capacity of this intersection should be examined to determine whether there is enough capacity to support the Burnco application. The timeline for the upgrade of this intersection should also be determined so that it aligns with the Applicant's proposal.

An upgrade of Highway 1A should also be requested to allow for the extra capacity required on the section of roadway adjacent to the applicant's proposal.

## **Request:**

• That Alberta Transportation be consulted regarding expansion of 1A highway and the upgrade of the intersection of Highway 22 and Highway 1A.



Figure 1: West Cochrane Mine Phase Plan from Burnco's Application Number PL20200066
Application Number: PL20200066 Storms/Cornish Comments

# Scale of Mine

Gravel pits are being approved on an ad-hoc basis at various scales of operations in Rocky View County. A comprehensive gravel strategy with periodic reviews within Rocky View would provide clarity regarding the responsible planning of a larger areas of gravel aggregates and certainty for both the mining operators and the community impacted by the cumulative effects.

Below is a link to an example that could be referenced for another municipality that have done studies in order to provide information on where gravel developments are best suited as opposed to ad hoc development:

## https://mdpeace.com/wp-content/uploads/2014/04/Gravel-Pit-Study.pdf

## **Request:**

• Complete a Comprehensive Gravel Strategy prior to Land Use approval.

## Conclusion

The application is in contradiction to RVC's planning documents and approving the Land Use change is a conflict with RVC's own planning documents.

Decisions today made by Rocky View Council today will impact trends, growth, environment, wildlife, water, resources, health, and economic factors for the foreseeable future.

What are the needs twenty years from now? Does Rocky View need more gravel pits now, ten years or twenty years? What infrastructure is needed for health and technology and are those compatible with gravel pits?

Storms/Cornish recognize the importance of business assessment for Rocky View taxes and the County success. Storms/Cornish understand Burnco desire to profit, provide jobs and be a good corporate citizen by claims to monitor and perform; however, this should not be at the expense of Storms/Cornish.

In summary Storms/Cornish have made the following requests:

- That Rocky View County prepare an Area Structure Plan along the Highway 1A Corridor prior to considering the Burnco Application.
- That the Burnco Application be circulated to CMRB.
- That all additional setback requirements due to noise, dust or other nuisances within the Burnco property.
- Burnco be required to engage adjacent landowners impacted by dewatering.

Page **10** of **20** 

- That Council grant Land Use for ten-year time frames for mining needs. The initial Land Use should be granted for the lands that are in closest proximity to Section 8 near Cochrane. Future mining needs would be accommodated through subsequent Land Use applications once the applicant demonstrates adherence to appropriate performance standards and reclamation requirements.
- That the applicant be requested to prepare a business case to support the aggregate extraction application which provides support for the 1200-acre extraction operation and the projected operating timeline of 30 35 years.
- That this application be held in abeyance by Council until such time as AEP has completed its review of the project.
- That the County determine a dispute resolution mechanism.
- That third-party water monitoring be established and paid for by the Applicant.
- That Alberta Transportation be consulted regarding expansion of 1A highway and the upgrade of the intersection of Highway 22 and Highway 1A.
- Complete a Comprehensive Gravel Strategy prior to Land Use approval.

Page 11 of 20

Application Number: PL20200066 Storms/Cornish Comments

## **Appendix A – County Development Pressure Map**



County Plan Growth & Servicing Strategy

Page 18 of 27

Page 12 of 20

Application Number: PL20200066 Storms/Cornish Comments

## **Appendix B – Original McDougall Land Use Application**

Land Use Redesignation Application Report David H. McDougall Ranches Ltd.

EXECUTIVE SUMMARY

Dennis Twerdoff, P.Geol. P.Ag., 715964 Alberta Ltd., was retained by David H. McDougall Ranches Ltd. (McDougall) to prepare a Land Use Redesignation Application Report for a proposed sand and gravel operation.

The proposed development is located on NW 13-26-5-W5M within the Municipal District of Rockyview. McDougall wishes to apply for Land Use Redesignation from Ranch and Farm District (RF) to Natural Resource Industrial District (NRI) to allow for sand and gravel operations. The land is currently hayland/pasture.

McDougall is proposing to undertake dry excavations, crushing and screening.

Although the life span of the sand and gravel pit is estimated to be approximately ten years, the timeframe is highly dependent upon gravel demand in the area. Excavations will occur in several phases with topsoil stockpiled along the edge of each phase. The site will be progressively reclaimed to pasture/hayland as each phase is depleted.

McDougall is committed to running a quality operation and minimizing potential impacts to local residence and the environment.

22.10 Son Conversion and Dration Control
 MCDCrossic Statistics Meeting
 2.2.2 Fuel Statement and Refueling
 2.2.3 Still Control of Refueling
 2.2.3 Still Control of Refueling
 2.2.3 Still Control of Refueling
 2.2.4 References
 2.2.5 References
 2.2.5

Page 13 of 20

## E-1 - Attachment E Page 85 of 252

Application Number: PL20200066 Storms/Cornish Comments



## E-1 - Attachment E Page 86 of 252

### Application Number: PL20200066 Storms/Cornish Comments



## E-1 - Attachment E Page 87 of 252

#### Application Number: PL20200066 Storms/Cornish Comments



Page 16 of 20

Application Number: PL20200066 Storms/Cornish Comments

# Appendix C – Pictures of Existing Burnco Operations Gravel View



Night Operation is 24 hours/day Impacting Dark Skies, Neighbours, and Wildlife



Page **17** of **20** 

Application Number: PL20200066 Storms/Cornish Comments

## **Restored Greystone Site**



Additional View of Restored Greystone Site



Page **18** of **20** 

Application Number: PL20200066 Storms/Cornish Comments

## Additional Gravel View



Page **19** of **20** 

# Appendix D - Cochrane Times July 1, 2020 Public Notice Burnco Rock Products Water Act Notice of Decision

Part 9 of the Water Act provides the right to appeal this decision. Any person who is directly affected by this decision may submit a notice of appeal, within seven (7) days of the providing of this notice, to: Chair Environmental Appeals Board

| Public Notices                                                                                                                                                                                                                                                                                     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PUBLIC NOTICE                                                                                                                                                                                                                                                                                      |
| BURNCO Bock Products Ltd.                                                                                                                                                                                                                                                                          |
| WATER ACT                                                                                                                                                                                                                                                                                          |
| NOTICE OF DECISION                                                                                                                                                                                                                                                                                 |
|                                                                                                                                                                                                                                                                                                    |
| Notice is given that <b>BURNCO</b> Rock<br><b>Products</b> Ltd. has been issued an<br>approval under the provisions of the <i>Water</i><br><i>Act</i> , on June 8, 2020, to extract aggregate<br>from below the water table of an existing<br>sand and gravel site located at NW<br>13-026-05-W5M. |
| Further information may be obtained from:                                                                                                                                                                                                                                                          |
| Regulatory Assurance Division                                                                                                                                                                                                                                                                      |
| Southern Region                                                                                                                                                                                                                                                                                    |
| Calgary, Alberta T2E 7L7                                                                                                                                                                                                                                                                           |
| Telephone: 403-297-7605                                                                                                                                                                                                                                                                            |
| Fax: 403-297-2749                                                                                                                                                                                                                                                                                  |
| Please quote file number: 00430788                                                                                                                                                                                                                                                                 |
| Part 9 of the Water Act provides the right                                                                                                                                                                                                                                                         |
| to appeal this decision. Any person who is                                                                                                                                                                                                                                                         |
| directly affected by this decision may                                                                                                                                                                                                                                                             |
| days of the providing of this notice, to:                                                                                                                                                                                                                                                          |
| Chair                                                                                                                                                                                                                                                                                              |
| Environmental Appeals Board                                                                                                                                                                                                                                                                        |
| 3rd Floor, Peace Trust Tower                                                                                                                                                                                                                                                                       |
| Edmonton Alberta T5 1358                                                                                                                                                                                                                                                                           |
| Telephone: 780-427-6207                                                                                                                                                                                                                                                                            |
| Fax: 780-427-4693                                                                                                                                                                                                                                                                                  |
| www.eab.gov.ab.ca/index.htm                                                                                                                                                                                                                                                                        |
| For contact purposes, please include your                                                                                                                                                                                                                                                          |
| name, phone number, address, land                                                                                                                                                                                                                                                                  |
| this decision will directly affect you or your                                                                                                                                                                                                                                                     |

water supply.

Page 20 of 20

| From:    | Natalie Robertson                                    |
|----------|------------------------------------------------------|
| To:      | Oksana Newmen                                        |
| Cc:      | Christine Harrison                                   |
| Subject: | FW: [EXTERNAL] - Burnco Development West of Cochrane |
| Date:    | October 1, 2020 2:22:36 PM                           |

Hi Oksana,

I believe this is your file... they made the deadline!

Regards,

#### NATALIE ROBERTSON, MEDES

Development Assistant | | Planning and Development

#### **ROCKY VIEW COUNTY**

262075 Rocky View Point | AB | T4A 0X2 Phone: 403-520-6333 nrobertson@rockyview.ca | www.rockyview.ca

This e-mail, including any attachments, may contain information that is privileged and confidential. If you are not the intended recipient, any dissemination, distribution or copying of this information is prohibited and unlawful. If you received this communication in error, please reply immediately to let me know and then delete this e-mail.

From: Diane Young
Sent: September 30, 2020 8:26 PM
To: Questions <<u>questions@rockyview.ca</u>>
Subject: [EXTERNAL] - Burnco Development West of Cochrane

#### Do not open links or attachments unless sender and content are known.

We would like to have some points looked at in regards to the Burnco Development West of Cochrane and understand the deadline is October 1<sup>st</sup>.

Wendell and Diane Young Division 9 NE Section 16 26 west of 5<sup>th</sup>

We live in the same area where all the proposed development will occur. Our biggest concern is the water issue; Burnco should look after all the neighbors by measuring the water pre start of any work, during the work and continue to work with the neighborhood once they start the production of the pits. Water is life here in the county and we want to make sure that our livelihoods in our homes, farms and ranches continue to be of the same quality pre- development.

Water that flows from the Bow /Grand Valley Creek should not be touched. The Ghost Dam with all of its changing levels is not something that should be relied on for water.

The second thing we would like addressed is the berms. Currently the first pad that has been built has the berm too close to the highway. If there is any need to widen the highways, it would automatically go to the farm/ranch lands. When I see where highway 22X has placed their berms far from the main highway, why cannot this be done on Highway 40?

Sincerely,

Wendell and Diane Young

Sent from Mail for Windows 10

| From:        | Glenn Makwich                                                            |
|--------------|--------------------------------------------------------------------------|
| To:          | Oksana Newmen                                                            |
| Cc:          | Shawn Belecki; John Simpson; Luke Simpson; Christie Simpson; Jeff Beaton |
| Subject:     | Re: [EXTERNAL] - Burnco West Cochrane Development                        |
| Date:        | September 30, 2020 1:12:15 PM                                            |
| Attachments: | 2020 09 30 LTR RVC Objection - Burnco West Cochrane Pit 02 SIGNED.pdf    |
|              | FW Burnco West Cochrane Development Comment Sheet Letter.msg             |
|              | Letter to Burnco - West Cochrane Pit Rev 1 pdf                           |

Oksana, on behalf of Simpson Ranching Ltd. please see attached their letter of objection to proposed bylaw C-8073-2020 to amend Rocky View County Land Use Bylaw.

Also find attached our letter dated April 30, 2020 addressed to Burnco with our concerns following their open house of March 9, 2020 and their emailed response from May 8, 2020 to our concerns. Please review the attached and keep us apprised of any further developments, especially scheduled public hearing.

Glenn Makwich Senior Project Manager

<u>Please note that I am away/unavailable on Fridays and may not return emails until the</u> <u>following week.</u>

#### **IDEA Group Inc.**

4034-4th Street SE Calgary, AB T2G 2W3 ph. 403.274.4556 cell. 403-835-2133 fax. 403.206.7295 email. g.makwich@ideagroupinc.ca web.www.ideagroupinc.com

From: Oksana Newmen <ONewmen@rockyview.ca>
Date: Thursday, September 17, 2020 at 11:26 AM
To: Glenn Makwich <g.makwich@ideagroupinc.ca>
Subject: RE: [EXTERNAL] - Burnco West Cochrane Development

Hi Glenn,

No discussion of potential public hearing dates. And I believe the request for comments is October

1<sup>st</sup>, but if you need more time, just let me know. We appreciate having feedback within a reasonable amount of time so things aren't trickling in over a long period of time, but we are of course sensitive to people's need for time to review.

Warm regards, ~Oksana

From: Glenn Makwich <g.makwich@ideagroupinc.ca>
Sent: September 17, 2020 10:55 AM
To: Oksana Newmen <ONewmen@rockyview.ca>
Cc: Shawn Belecki <Shawn.Belecki@cana.ca>; Jeff Beaton <j.beaton@ideagroupinc.ca>

**Subject:** Re: [EXTERNAL] - Burnco West Cochrane Development

Oksana, we see a unanimous decision on the September 1 council meeting first reading. A couple of quick questions if I may. Any idea yet of when public hearing will be held? Secondly, is there a deadline to submit a letter of objection?

Glenn Makwich Senior Project Manager

<u>Please note that I am away/unavailable on Fridays and may not return emails until the</u> <u>following week.</u>

IDEA Group Inc. 4034-4th Street SE Calgary, AB T2G 2W3 ph. 403.274.4556 cell. 403-835-2133 fax. 403.206.7295 email. g.makwich@ideagroupinc.ca web.www.ideagroupinc.com

From: Oksana Newmen <<u>ONewmen@rockyview.ca</u>>
Date: Friday, July 24, 2020 at 8:25 AM
To: Glenn Makwich <<u>g.makwich@ideagroupinc.ca</u>>
Subject: RE: [EXTERNAL] - Burnco West Cochrane Development

Glenn,

That's correct. I'm guessing you/your client spotted the McNair pit first reading item on July 28<sup>th</sup> – different site, different project entirely. Also much smaller at 26 acres.

Warm regards, ~Oksana

From: Glenn Makwich <g.makwich@ideagroupinc.ca>
Sent: Thursday, July 23, 2020 5:23 PM
To: Oksana Newmen <<u>ONewmen@rockyview.ca</u>>
Subject: [EXTERNAL] - Burnco West Cochrane Development

Do not open links or attachments unless sender and content are known.

Oksana, our client wanted us to confirm that the land use redesignation for the above subject site is not on the July 28<sup>th</sup> council agenda.

I couldn't find it on the agenda but he also wanted me to confirm with you. Can you help?

Glenn Makwich Senior Project Manager <u>Please note that I am away/unavailable on Fridays and may not return emails until the</u> <u>following week.</u>

IDEA Group Inc. 4034-4th Street SE Calgary, AB T2G 2W3 ph. 403.274.4556 cell. 403-835-2133 fax. 403.206.7295 email. g.makwich@ideagroupinc.ca web.www.ideagroupinc.com



## SIMPSON RANCHING LIMITED

#100, 5720 4th Street S.E., Calgary, Alberta T2H 1K7

## E-1 - Attachment E Page 97 of 252 PHONES

RANCH (403) 932-2897 OFFICE (403) 255-5521 FAX (403) 255-0944 www.simpsonranching.ca

September 30, 2020

**VIA EMAIL** 

Rocky View County 262075 Rocky View Point Rocky View County, Alberta T4A 0X2

Attention: Oksana Newmen (Planner)

# Re: Burnco West Cochrane Development Proposed Bylaw C-8073-2020 to amend Rocky View County Land Use Bylaw (the "Proposed Bylaw Amendment")

Simpson Ranching Limited ("SRL"), is hereby writing to object to the Proposed Bylaw Amendment which was presented to Rocky View Council and received first reading on September 1, 2020.

SRL's concerns respecting the Proposed Bylaw Amendment, as set forth more fully below, were formulated after reviewing the detailed response we received from Burnco respecting questions submitted by SRL after attending Burnco's open house on March 9, 2020 (the "Burnco Response"), and our review of Burnco's presentation boards from that open house. Copies of SRL's initial inquiries of Burnco and the Burnco Response have been enclosed with this letter of objection.

SRL's first and primary concern with the Proposed Bylaw Amendment relates to the amount of land impacted by this proposed change. In the Burnco Response, Burnco informed SRL that current yearly sales from the current operations of this West Cochrane site range from 100,000 to 150,000 tonnes and that if the Proposed Bylaw Amendment is passed, the total estimated reserves available would amount to 15 million tonnes. These numbers suggest that the Proposed Bylaw Amendment would allow for 120 to 150 years of gravel extraction at the current yearly sales volume. The Burnco Response also indicates that Burnco hopes to increase extraction over a 10-year period to 500,000 tonnes per year. If achieved, this would result in a site capacity range of between 30 to 35 years.

As stated, SRL is concerned that greenlighting between 30-150 years of gravel production today, will result in a scenario where the County loses all ability to apply prudent planning principals that address future county needs in a critical county highway corridor, and we would urge the County to avoid.

## E-1 - Attachment E Page 98 of 252

Oksana Newmen I Rocky View County September 30, 2020 Page 2 of 3

This and, there is no guarantee that any current development or production will result from an approved amendment.

After the Burnco open house, SRL inquired about the reclamation timeline for current and future pits, what commitments were in place respecting reclamation, and what certainty County landowners would have respecting open land based on the next stages of operation and development of Burnco's operation. With a timeframe for completion between 30 and 150 years, SRL remains unclear how these requirements will be managed and staged, or how there would be any prudent municipal control or approvals over future activities if the application is approved.

A secondary concern related to magnitude of the proposed amendment is that because several decades of gravel reserves will be preserved and protected by the Proposed Bylaw Amendment, the amendment will likely result in grandfathering and potentially avoidance of future requirements respecting environmental protections, surface reclamation, and resource development requirement and regulations respecting operations. Accordingly, SRL objects to a re-designation of this magnitude. Burnco's primary response to this concern is that they desire long term supply security for their concrete and asphalt plants for long term business certainty. As stated previously, long term remains undefined and a reasonable time frame should be provided based on current performance, taking into account this site together with the complete complement of Burnco gravel reserves in the County.

Burnco should provide a plan to phase development and ensure minimal impact to the surrounding landowners, the environment, and define extraction completion in a manner suitable for future land use and development growth within Rocky View County. On page 5 of the presentation boards it appears that the mining, and more importantly the borrow areas, indicated on the site map are tight to the top of the Grande Valley Creek escarpment. It is important to define and protect these boundaries at land use stage and adhere to them during the mining and borrow operations of the pit. A setback from the top of escarpment is required to minimize the erosion impact to Grande Valley Creek.

On page 17 of the presentation boards, the Biophysical Impact, it states that a 30m buffer from a water course is recommended for a Riparian Zone. When the map and legend are referenced, it appears as though the Riparian Zone is defined incorrectly, in fact Grande Valley Creek seems to be protected on one side at the North end of the map, but not the other.

The reclamation timeline of the current and future pits and how that relates to the amount of open land based on the next stages of operation and completion is critical to understand – with a timeframe for completion between 30 and 150 years, we do not understand how this will be managed, or how there would be any prudent municipal control or approvals over future activities if. the application is approved.

## E-1 - Attachment E Page 99 of 252

Oksana Newmen I Rocky View County September 30, 2020 Page 3 of 3

We do not feel that a gravel development application of this size is the best use of this land along a highway corridor, along the Bow River, with mountain views, and access to major urban centers, at this time or in the future. We urge Rocky View County to limit Burnco and their application to the amount of land feasibly developed and reclaimed in a ten-year period prior to approval by council.

Sincerely, Simpson Ranching Limited

J. Luke Simpson

So

Enclosures (2): SRL's Initial Inquiries of Burnco The Burnco Response



E-1 - Attachment E Page 100 of 252

> 4034 4 Street SE Calgary, AB T2G2W3 (t)403.274.4556 (f)403.206.7295 www.ideagroupinc.com

30 April 2020

IDEA File: 20000

**IDEA GROUP INC.** 4034-4<sup>th</sup> Street SE Calgary AB T2G 2W3

Attention: Travis Coates - via email

### RE: BURNCO West Cochrane Development

On behalf of Simpson Ranching Limited we are writing to comment on your project as requested at your open house of March 9, 2020.

Our concerns and comments listed below were formulated by responses to our questions at the open house as well as review of your presentation boards that were forwarded to us.

We would appreciate a response to our questions and concerns.

Our first concern would be the amount of land that BURNCO is trying to get Land Use on. For us to clearly understand this we need to know the production of each of your operating pits and the timeline of estimated pit depletion. You say that this proposed West Cochrane development should ramp up to 500,000 tonnes per year within the next 10 years. That compares with Indus from 2016. What is the West Cochrane current pit production and what is the estimated gravel reserve in this first phase? As well, we would like to know the forecast on your depletion of these anticipated reserves for the entire application area.

It appears as though this application is protecting Burnco against future changes in zoning regulations, environmental protections or surface resource development. Why is it necessary to rezone so much land now?

How does Burnco plan to phase development to least impact surrounding landowners, the environment and to complete extraction in a pattern that is suitable to a future land use and development growth.

Another concern would be the reclamation timeline of this current pit and how that relates to the amount of open land based on the next stages of operation. We are sure that there has been a considerable amount of research and input into the proper way to stage this project.

How does a gravel development application of this size provide for the highest and best use of this land (along a highway corridor, along the Bow river, with mountain views and access to major urban centers) now and in the future?

On page 5 it appears that the mining and more importantly the borrow areas indicated on your site map are quite tight to the top of the escarpment of the Grande Valley Creek. We believe that it is quite important to define and protect these boundaries at land use stage and stick to them during your mining and borrow operations. There must be a setback from the top of escarpment to minimize the erosion impact to this creek valley.

On page 17, the Biophysical Impact, it states that a 30-meter buffer from a water course is the recommendation for a Riparian Zone. When we look at the map and if we are interpreting the





BURNCO West Cochrane Development Rocky View County AB

30 April 2020 Page 2 of 2

legend properly it doesn't appear to be drawn correctly. The creek itself seems to be protected on one side and not the other.

Further to the above, we did not see any reference to a wildlife corridor study, yet we did see some significant sized culverts in the area, can you please clarify?

We would urge Burnco to limit their application to the amount of land feasibly developed in a tenyear period prior to submission to the county.

Sincerely,

IDEA Group Inc.

Glenn Makwich Tel. 403.274.4556 Fax 403.206.7295

CTJ/ctj

CC: Jeff Beaton, IDEA Shawn Belecki, CANA Group of Companies John Simpson, Simpson Ranching Luke Simpson, Simpson Ranching Christie Simpson, Simpson Ranching

| From:        | Travis Coates                                                                                              |
|--------------|------------------------------------------------------------------------------------------------------------|
| To:          | Glenn Makwich                                                                                              |
| Cc:          | John Simpson; Shawn Belecki; Luke Simpson; Christie Simpson; Jeff Beaton; Thomas Tyler; Ulrich Scheidegger |
| Subject:     | FW: Burnco West Cochrane Development Comment Sheet & Letter                                                |
| Date:        | May 8, 2020 10:50:19 AM                                                                                    |
| Attachments: | Comment Sheet.pdf                                                                                          |
|              | Letter to Burnco - West Cochrane Pit Rev. 1.pdf                                                            |

CAUTION: This email originated from outside your organization. Exercise caution when opening attachments or clicking links, especially from unknown senders.

Glen,

Thanks again for the correspondence. I have included this letter in our open house feedback and it will help assist us as we put the final touches on our Land Use Submission. As mentioned in my previous email, I would be more than happy to have a call with your group to provide further opportunity for discussion.

Please see below. I have provided responses to your questions in red.

We would appreciate a response to our questions and concerns.

Our first concern would be the amount of land that BURNCO is trying to get Land Use on. For us to clearly understand this we need to know the production of each of your operating pits and the timeline of estimated pit depletion. You say that this proposed West Cochrane development should ramp up to 500,000 tonnes per year within the next 10 years. That compares with Indus from 2016. What is the West Cochrane current pit production and what is the estimated gravel reserve in this first phase? As well, we would like to know the forecast on your depletion of these anticipated reserves for the entire application area. Current sales from our existing West Cochrane site are in the range of 100,000 to 150,000 tonnes per year. As stated on the slides, the total estimated reserve of this project is 15 million tonnes. Based on the anticipated extraction rate of 500,000 tonnes plus ramp up time, the project would have a life span of around 30-35 years. BURNCO has a number for gravel production sites around Calgary and supply from this site would form part of that network.

It appears as though this application is protecting Burnco against future changes in zoning regulations, environmental protections or surface resource development. Why is it necessary to rezone so much land now? BURNCO operates a number of asphalt and concrete plants. Having secure supply of aggregate for those plants is critical. The reason to rezone all portions of the project at current time is to provide some assurance that this site can be relied upon in future to supply aggregate to those facilities. Gravel pits are subject to continuous permit renewals at the municipal and provincial levels so the inclusion of areas is not an attempt to avoid future regulation changes, but rather, driven by a need for long term business certainty.

How does Burnco plan to phase development to least impact surrounding landowners, the environment and to complete extraction in a pattern that is suitable to a future land use and development growth. The open house included phasing details of the project. I would draw your attention to the plan for phased construction of the screening berm. This will allow the screening berm to mitigate visual impacts of the project as it proceeds. Feedback form the first open house has also led us to plan phasing on the eastern portion of the project (those lands east of Grande Valley Creek) so that operations progress from east to west. This will mean that operations at the site are moving away from the town of

#### Cochrane over time.

Another concern would be the reclamation timeline of this current pit and how that relates to the amount of open land based on the next stages of operation. We are sure that there has been a considerable amount of research and input into the proper way to stage this project. Not all lands will be open and disturbed at one time. The Permitted land base is there to ensure access to gravel, it is not needed as operational space at one time. Reclamation will be progressive.

How does a gravel development application of this size provide for the highest and best use of this land (along a highway corridor, along the Bow river, with mountain views and access to major urban centers) now and in the future? Gravel pits are an interim land use. As stated above, the life of this project is expected to be in the range of 30-35 years. After that, the lands will be ready for the future. Some areas before that time as operations progress. We think this fits well for the area given its close proximity to urban centers as you noted (but which are still no less than 1 mile away from the east extent of our project boundary). Though we remain unsure what exactly the future will bring as definition of highest and best use often depends who you are talking to.

On page 5 it appears that the mining and more importantly the borrow areas indicated on your site map are quite tight to the top of the escarpment of the Grande Valley Creek. We believe that it is quite important to define and protect these boundaries at land use stage and stick to them during your mining and borrow operations. There must be a setback from the top of escarpment to minimize the erosion impact to this creek valley. Planning has been very careful in relation to this point. Natural drainage flows down the escarpment at present. Mining activities must restore this drainage and ensure ponding is not being created. A couple of key sections of the escarpment must be excavated to facilitate this. The concern about sediment is appreciated and BURNCO has very detailed and thorough planning related to erosion and sediment control for these areas.

On page 17, the Biophysical Impact, it states that a 30-meter buffer from a water course is the recommendation for a Riparian Zone. When we look at the map and if we are interpreting the legend properly it doesn't appear to be drawn correctly. The creek itself seems to be protected on one side and not the other. A 30m buffer is being maintained form all riparian areas. Further a 60m setback is being maintained from the Bow River and Grande Valley Creek. These setbacks were mapped, and sometimes overlap. The most stringent setback was utilized in all cases. Please note that many riparian areas do not have bed or banks (ie active river channel to map) they just hold water periodically at some point throughout the year. As a result, setbacks are generally based of centerline. Other streams have bed and banks to go off, and setbacks in those cases are based of those.

Happy to follow up on this if I am misunderstanding the question.

Further to the above, we did not see any reference to a wildlife corridor study, yet we did see some significant sized culverts in the area, can you please clarify? Impacts to wildlife was reviewed as part of our Biophysical Impact Assessment. As stated above, not all areas of the site will be active at one time. That will greatly assist in maintaining wildlife mobility across the lands. Setbacks form riparian areas will also help to achieve this goal. I am a little unsure with regard to the culvert reference. BURNCO has proposed a number of culverts within its screening berm. These will be located and sized in a similar fashion to those under highway 1A and are there to ensure stormwater flows can continue as most storm water in the area is moving from north to south and toward the Bow River. They are not there to serve a wildlife function specifically. Our screening berms have 3:1 sloping and would be easily navigated by all wildlife.

We would urge Burnco to limit their application to the amount of land feasibly developed in a ten- year period prior to submission to the county. Thank you for this comment however that approach just would not provide BRUNCO with meaningful business certainty.

Working remotely in adherence with COVID-19 social distancing measures. Contact me via email or phone @ (403) 640-9217.

Thank you and take care,

| ? |  |
|---|--|
|   |  |

Travis Coates, P. Eng Land and Resource Manager Alberta and Saskatchewan Phone: (403) 640-9217 Email: <u>travis.coates@burnco.com</u> *Excellence · Integrity · Passion* 

From: Glenn Makwich <g.makwich@ideagroupinc.ca>

Sent: Wednesday, May 6, 2020 11:02 AM

To: Travis Coates < Travis.Coates@burnco.com>

**Cc:** John Simpson <simpsonj@cana.ca>; Shawn Belecki <Shawn.Belecki@cana.ca>; Luke Simpson

<Luke.Simpson@cana.ca>; Christie Simpson <Christie.Simpson@atco.com>; Jeff Beaton

<j.beaton@ideagroupinc.ca>

Subject: Burnco West Cochrane Development Comment Sheet & Letter

[External Email]

Travis, please see attached.

Glenn Makwich Senior Project Manager

#### <u>Please note that I am away/unavailable on Fridays and may not return emails until the</u> <u>following week.</u>

#### **IDEA Group Inc.**

4034-4th Street SE Calgary, AB T2G 2W3 ph. 403.274.4556 cell. 403-835-2133 fax. 403.206.7295 email. g.makwich@ideagroupinc.ca web.www.ideagroupinc.com

## **Caitlyn T. Anderson**

| From:    | Alex Reed                                                                        |
|----------|----------------------------------------------------------------------------------|
| Sent:    | June 18, 2021 4:13 PM                                                            |
| То:      | Legislative Services Shared                                                      |
| Subject: | [EXTERNAL] - Opposition to the Burnco West Cochrane Gravel Pit Bylaw C-8073-2020 |

Do not open links or attachments unless sender and content are known.

I wish to voice, and have recorded as a matter of record, my opposition to the Burnco West Cochrane Gravel Pit Bylaw C-8073-2020.

Aside from the fact that I don't believe that this gravel is needed, my concerns are about the traffic and air quality, but my major concern is about what will become of the water quality for the Town of Cochrane. 30,000+ residents of the Town of Cochrane depend of that water and the Town's intake value is just downstream from this monster gravel pit.

I plead with the Rockyview County Council to not approve this Bylaw.

Respectfully,

Alex Reed

Town of Cochrane Resident

137 Gleneagles View

June 23, 2021

Via Email

Rocky View County 262075 Rocky View Point Rocky View County, Alberta T4A0X2

Attention: Oksana Newman, Planner

Re: Oppose Burnco West Cochrane Proposed Bylaw C-8073-2020 Application PL20200066 to amend Rocky View Land Use Bylaw (the "Proposed Bylaw Amendment")

# Burnco Land Use and proposed MSDP Policies Lack specific visible performance measures for adjacent landowners and the Community

McKendrick Ranches Ltd and Ann McKendrick McNabb, are opposed to the Proposed Bylaw Amendment, which was presented to Rocky View (RV) Council and received first reading September 1, 2020.

# Land use for additional Aggregate use should be conditional on proving that the Bow River water quality will not be impacted by the current or future pits.

**Our first and primary concern is the size of the proposed pit**. If approved, this Land Use and subsequent mine expansion would create 452 hectares (1,117 acres) of contiguous lands zoned as NRI for a gravel mining and aggregate processing expansion. The proposed land use would rezone approximately 6.5 km of lands south of the highway 1A along the Bow River.

Rocky View has not developed a gravel strategy, performance measures and policies to allow a mix of land uses in a developing community for the next 120 years. Given current markets, the proposed pit could last **120 years with no visible measures to ensure the community is not impacted**.

Are aggregate company consultant reports reviewed by unbiased experts? Is the air quality and dusts measured to ensure no impact on neighbours and animals health regardless of residences or distances? Are visible tests required yearly or frequently to ensure the drinking water of a few million people are reviewed by qualified experts and the data available to the public? The answers to many of these questions: NO, there is no proactive performance measures available to the public to the public to ensure practices are safe and the pits are timely reclaimed to environmental or current standards.

Rocky View County (RVC) and Council have jurisdiction over the public decision and the land use planning. RVC Bylaws State: "practice sound land use planning in order to protect agriculture operations, native habitat, environmentally sensitive areas and retain rural landscapes, dark skies, open vistas and agriculture lands." In the Natural resource policy **basically RVC give all the authority to Alberta Environment and Parks (AEP) or other regulatory groups.** AEP will only consider the application if the County is willing to allow the land use in the environmentally sensitive Bow River Valley corridor. The **AEP process does not** require adjacent property owner notification, engagement and provide for performance monitoring visible to the adjacent property owners. AEP are not elected.

Once Land Use is approved by RVC, Alberta Environment and Parks cannot change the zoning even if that means the Bow River Valley water is destroyed. (Discussed in AE Appeal of a Burnco northern gravel operation). AEP has not required third party testing to ensure aggregate mining doesn't impact the water aquifer and drinking water standards. Any monitoring or measurements are not provided to the adjacent property owners impacted by the decisions and are not public. We have to go through a lengthy and challenging Appeal process and perhaps Public Hearing. All after the fact. After the problems are experienced and real. Impacted Bow River water aquifers are not easily reclaimed. The selenium problems caused by Coal Mining have created huge issues not easily or maybe never resolved. "For years the BC failed to address selenium pollution in the Elk Valley. Now no one knows how to stop it." By Carol Linnitt Dec 4, 2018.

The process needs changing. Rocky View is recommending Land Use change with a Direct Control District. Then the Direct Control needs to allow for performance measures reported regularly to the community impacted. See the attached example Ponoka Aggregate Appendix A. This was provided by a Red Deer lawyer who worked with our hydrogeologist Water Line Resources and other consultants on developing performance measures to support the Community and responsible Aggregate development.

To ensure the Policies stated by Burnco, summarized in Burnco's Appendix 2: MSDP Policy Summary are effective then the Direct Control Bylaws or other practices need to be specific and allow for mutual discussion and collaboration. Land Use changes need to set the process to ensure the Direct Control is written to provide visible and measurable guidance.

### Policy not discussed

RV Direct Control **Recommend that Council grant Aggregate Land Use for an area that can be mined and reclaimed in a ten-year period only after proof the Bow River drinking water will not be impacted.** see the Ponoka Appendix A established 10-year time frames to address the concerns of the Community.

**RV Direct Control should establish setbacks** on the Burnco proposed lands, so the Aggregate resource does not impact the Land Use and residential developments on neighbours' property or the community. RV Municipal Develop Plan does not address planning for the 15 km west of Cochrane. Approving decades (or potentially a century +) of gravel with current policies and practices is not in the best interests of future Councils and future generations of Rocky View residents.

RV Direct Control need Policies to allow growth, planning, operating, reclamation, and environmental standards to protect surrounding residents from the harmful health, water, and numerous concerns.

Policy 1: Burnco will secure from AEP ...

RV Direct Control (DC) Bylaws will engage the community directly impacted in the Registration from AEP under the code of Practice for Pits. DC will ensure water, air, noise and other quality measures are agreed and mitigation agreed in advance versus the current Appeal and complaint process after the negative impact to the health and quality of life occur.

Policy 3, 8, 9: Burnco operating Hours allow for 24-hour crushing.

The Direct Control will propose better positioning of crushing operations and reduce the negative impact on residences and animals. Note 2012-12 Development Appeal Board changed the RV Administration recommended and property owners preferred crush hours to suite the Applicant (24 hours/day).

## Policy 6,9: Noise measures

DC will require peaks and not averages and be visible and reported regularly to the community impacted. Rural standards will be applied.

Policy 7: Dust control measures need to be reported to the community.

Rocky View Land Use and Direct Control (DC) policies should require setbacks to prevent dust impacting the neighbours and health. Burnco reports show our property is impacted 100m. and maybe more given different wind conditions, see Appendix B. Regardless of residence, we and our animals use the space and do not want cancer or other health risks that normally are not present. Only when Aggregate Land Use is approved do the health risks occur. We are not compensated for this contamination and our property reclaimed. Rocky View Land approval should not allow this practice to occur.

**Policy 10, 11,12,13:** Burnco will monitor water levels in the network of 18 monitoring wells...follow direction from AEP. Water act approvals for dewatering, bailing, or other activities in the ground water.

RV Direct Control District should require neighbour water monitoring see Appendix C as proposed by other Aggregate operators and agreed by Burnco provided we agreed to Land Use for 1117 ac. We have expressed concerns about the water aquifer in the first RV hearing 2009-2011, to Burnco and have an Appeal to AEP concerning the probable impact on the water aquifer. 2011 RV approved the current McDougall now Burnco 151 ac pit with mining to one metre above the water aquifer. Burnco got approval from AEP June 2020 to mine in the water aquifer without our involvement or any monitoring of our wells or prevention. Our Appeal has not been addressed after six months. No-one restores the potential water we lost.

Rocky View Direct Control should require quarterly third-party reviews of water quality of the existing pit and all areas disturbed for concerns of drinking water standards for impact to the Bow River and a few million residences. Land use for additional Aggregate use should be conditional on proving that the Bow River water quality will not be impacted.

## Policy 14, 15,16,17: Transportation and safety

RV Direct Control should provide for community and adjacent property owner input plus proper setbacks. Alberta Transportation advised that there should be no permanent berms within 30 m of the property lines. The current pit has 3m high berms to the property line. During the construction our access to SW24-26-5W5 was being removed and later replaced by Burnco as we were not consulted.

**Policy 18,19,20:** Storm water, drainage, reclamation, water quality issues RV Direct Control needs to establish policies to ensure water quality and neighbours are protected.

### Policy 21,23: Setbacks

RV Direct Control should ensure the 3-metre-high berms do not adversely impact wildlife, future road widening and community planning. The Trans Canada trail system is planning a trail along the 1A similar to the one from Canmore to Banff. The views will be significantly altered by 3 m high berms for 6.5 km along the proposed Burnco pit.

## Policy 24, 25, 26, 27, 28, 29, 30: Reclamation...

Direct Control will establish guidelines to allow land use and reclamation occurs in ten-year time frames to ensure that the surrounding community is not directly impacted with a lack of Municipal Plan for the area. A large aggregate area of 6.5 km long and 1117ac establishes a direction of commercial – industrial and spot zoning without planning for the highest and best use.

### Appendix A: see attached policies from Ponoka County

Development Permit D-19-53 – Revised November 26, 2019

Attached as separate document

## Appendix B: from Burnco MSDP



Figure 25: Maximum Predicted 24-hr PM<sub>2.5</sub> Concentration

Figure 26: Maximum Predicted 24-hr TSP Concentration



## Appendix C: Draft of Water Monitoring

Baseline Water Monitoring.

BURNCO will retain a third-party consultant to complete the following activities to establish baseline groundwater information. Such baseline water monitoring shall be completed for a period of two (2) years which will include the following:

(i) Testing will be completed on each of the following wells as shown in Figure 2 below Well in SE22 (1), SE22 (2), SE23, SE22 (3), SW23, Spring (1) in NE22.

(iv) A drive-point piezometer will be installed at Spring (1) in NE22.

(v) A two-hour pumping test will be completed at all water wells and a slug test will be completed at the spring to characterize groundwater flow rates in relation to aquifer drawdown. These pumping tests will be completed once at the start of the baseline testing program.

(vi) Automatic water level recorders will be installed at each water well and the spring to determine the baseline water levels and seasonal fluctuations.Water levels will be collected for a period of two years and downloaded biannually.(vii) Groundwater samples will be collected to characterize the water quality, including hydrocarbons, dissolved metals, general chemistry parameters and turbidity. Samples will be collected bi-annually for a period of two years (4 samples per location).

(viii) During operation of the West Cochrane Gravel Pit, BURNCO will complete baseline water monitoring at an additional 4 locations if requested by McKendrick Ranches. Such baseline monitoring shall be completed on wells installed by McKendrick Ranches or at spring locations as desired by McKendrick Ranches and done in accordance with the above protocol.
(c) Ongoing Water Monitoring

During operation of the West Cochrane Gravel Pit, BURNCO will retain a thirdparty consultant to collect ongoing groundwater information in addition the data collected as part of the baseline water monitoring:

(i) Automatic water level recorders will be maintained at four (4) water well and/or spring locations to monitor water levels and seasonal fluctuations. Data will be collected annually.

(ii) Groundwater samples will be collected at four (4) water well and/or spring locations to characterize the water quality, including hydrocarbons,

(iii) Ongoing water monitoring will be completed in locations as requested by McKendrick Ranches as part of the annual data collection.

dissolved metals, general chemistry parameters and turbidity. Such sampling will be completed once every three (3) years;



## Appendix C: Draft of Water Monitoring cont'd Figure 2 Water testing map

## Appendix C: Draft of Water Monitoring cont'd

#### 3. Complaint Protocol

For as long as the West Cochrane Gravel Pit is in operation, and in the event McKendrick Ranches believes that there has been surface water or groundwater interference as a result of the gravel pit, McKendrick Ranches may submit a written complaint to BURNCO setting out in sufficient detail the suspected surface water or groundwater interference and, if known, the suspected cause. In the event BURNCO receives a complaint BURNCO agrees as follows: (a) To investigate, as soon as practicable, the written complaint alleging the Gravel Pit operation has caused the reported surface water or groundwater interference. (d) If the Complaint is related to disruption of water to a residence such that the residence is without potable water, then BURNCO will provide an alternative source of water for use in residential needs within 48 hours of receiving the Complaint. BURNCO shall continue to supply this alternative water until resolution of the compliant has been completed.

(e) Within a commercially reasonable timeframe of receiving the Complaint, to provide McKendrick Ranches with a written report containing the following:

(i) description of the complaint;

(ii) detailed complaint investigation notes;

(iii) conclusion as to whether surface water or groundwater interference has occurred, and whether such interference has occurred as a result of the Gravel Pit operation; and

(iv) if interference has occurred as a result of the Gravel Pit operation, recommendations for remediation and/or mitigation of the impact(s), which

may include among other recommendations:

a. lowering the intake of the pump to compensate for a drop-in water level;

b. re-drilling the water well to an increased depth so as to allow the pump to be installed at a lower depth;

c. drilling a new well; or

d. providing an alternate water supply.

(f) In the event a complaint report concludes that surface water or groundwater interference has occurred as a result of the Gravel Pit operation, BURNCO shall be responsible to remediate and/or mitigate such interference at BURNCO's sole cost and expense. Such recommendations for remediation and/or mitigation shall be discussed and agreed between the Parties acting reasonably.

4

(g) It is mutually acknowledged that at any time during this process, McKendrick Ranches shall be at liberty to file a complaint with Alberta Environment and BURNCO agrees to abide by any corrective actions ordered resulting therefrom.

E-1 - Attachment E Page 114 of 252





## DEVELOPMENT PERMIT D-19-53 - REVISED November 26, 2019

A Permit has been approved and is hereby issued to:

VCD AGGREGATES LTD. (the "Applicant") #2 – 53050 RR 220 ARDROSSAN, AB T8E 2C7

FOR Development & Operation of a SAND & GRAVEL PIT (Liddle-McKelvie Pit)

As Described on Application No. D-19-53

LEGAL: NW 36-43-25-W4 NW 1-44-25-W4 SW 1-44-25-W4 SE 11-44-25-W4

#### CONDITIONS OF APPROVAL:

| CONDITION #1 | The Applicant must remit to Ponoka County a Community Aggregate Levy in the amount                                      |
|--------------|-------------------------------------------------------------------------------------------------------------------------|
|              | By-Law 24-06-CAPL (according to the terms, and in the amount as amended or repealed<br>and replaced from time to time). |

**CONDITION #2** The Applicant shall comply with the approved application, reports, (including the Golder Air Quality Report, the Golder Noise Impact Report and the Golder Operations Plan) and plans submitted to Ponoka County and the Ponoka County SDAB (unless altered by these conditions); non-compliance with the reports, plans, and conditions shall be considered a contravention of the development permit. If there is a breach of any requirement of the development permit the County may barricade <u>all</u> or any access between the Site and County controlled roads or pursue any other available enforcement options.

| <b>CONDITION #3</b> | Hours of operation shall be:                                                                                                                                                                                              |  |  |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
|                     | Earthworks: 7:00 a.m. to 7:00 p.m.; Monday-Friday;                                                                                                                                                                        |  |  |
|                     | <ul> <li>Processing/Crushing: 7:00 a.m. to 7:00 p.m.; Monday-Friday;</li> </ul>                                                                                                                                           |  |  |
|                     | <ul> <li>Sales/Hauling: 7:00 am to 5:00 p.m.; Monday-Saturday</li> </ul>                                                                                                                                                  |  |  |
|                     | except as altered pursuant to Road Use Agreement (see below)                                                                                                                                                              |  |  |
|                     | No operations (earthworks, processing/crushing, sales, hauling) shall be undertaken on<br>Sundays or Statutory Holidays (including but not limited to, New Year's Day, Alberta                                            |  |  |
|                     | Family Day, Good Friday, Easter Monday, Victoria Day, Canada Day, Heritage Day, Labour Day, Thanksgiving Day, Remembrance Day, Christmas Day and Boxing Day), unless prior approval has been obtained from Ponoka County. |  |  |





## DEVELOPMENT PERMIT D-19-53 - REVISED November 26, 2019

| <b>CONDITION #4</b> | The extraction of sand and gravel that is the subject of this development permit is to be                                                                                                                                                   |  |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|                     | commenced within thirty-six (36) months of the effective date of all regulatory approvals. Prior to this thirty-six (36) months, the Applicant is entitled to commence preparatory work such as the construction of the berms and/or walls. |  |

| CONDITION #5 | The Applicant shall inform the Ponoka County Development Officer of the date when<br>sand and gravel extraction from the Site commences. This permit shall expire 7 years<br>from the date that sand and gravel extraction from the Site commences. At the<br>expiration of the 7-year period the development permit shall be subject to an extension<br>of a period of 3 years, subject to the Development Authority determining that there has<br>been reasonable compliance with the requirements (including conditions of this<br>development permit). If the permit is not renewed following the authorized extraction<br>of sand and gravel (either within the 7-year period or the extension of a maximum of 3<br>years), the Applicant is granted no more than 3 years to complete reclamation of all<br>disturbed areas (not only within the pit, but on all areas within the Site). |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|              | All extraction activity, excluding reclamation work, must cease upon the expiration of the development permit, unless a new development permit has been applied for and approved by Ponoka County. Final reclamation work of grading and seeding must be completed to the point of a reclamation certificate within the greater of 3 years of all authorized extraction activities ceasing on the Site, or 3 years from the expiry of this or the extended development permit.                                                                                                                                                                                                                                                                                                                                                                                                                |
|              | No extraction or development shall commence within Phase Two of the Site, as described in Section 2.1 Active Mining of the Golder Operations Plan submitted to the Ponoka County SDAB as Exhibit 21, until the Development Authority is satisfied that it has been provided with modelling information indicating that the Applicant can meet, for Phase Two:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

a) The Air Quality Standard; and

b) The Noise Standard.

**CONDITION #6** Any application to extend extraction of sand and gravel beyond the approved 7-year period (whether for the 3-year extension of the development permit, or any renewal of the development permit beyond the term of the development permit) is subject to review by the Development Authority, who shall be notified in writing of any request for an extension. Such requests shall be accompanied by the appropriate development permit application fee, if required. It is expected that any request for an extension or renewal shall be made no less than six (6) months prior to the expiry date of this development permit or any renewed development permit. At the option of Ponoka County, the Applicant (at the Applicant's expense) will also be required to provide an audit by a third party expert providing a review as set out in Ponoka County's direction; it





## DEVELOPMENT PERMIT D-19-53 - REVISED November 26, 2019

| would be anticipated that the audit would review compliance with the requirements of this permit, and impact on neighboring roads, lands and occupants. Beyond the first 3- |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| year development permit extension period, any renewal may be on different terms/conditions than referenced in this permit.                                                  |

| <b>CONDITION #7</b> | At the option of Ponoka County, the Applicant shall provide (prior to commencing           |
|---------------------|--------------------------------------------------------------------------------------------|
|                     | excavation at the Site) a letter of credit or other acceptable security to Ponoka County's |
|                     | Development Officer to ensure compliance with any Road Use Agreement or                    |
|                     | Development Agreement required by Ponoka County. The security taken under the              |
|                     | Development Agreement shall be returned to the Applicant once the terms of the             |
|                     | Development Agreement have been fulfilled.                                                 |

| CONDITION #8 | The following shall be provided prior to any construction at the Site (unless Ponoka                                                                                                         |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|              | County agrees to defer the timing to a later date).                                                                                                                                          |
|              | a) Development permit fees;                                                                                                                                                                  |
|              | <ul> <li>b) Entry into a Development Agreement (and any additional work/requirements as set<br/>out in the Development Agreement, including the provision of financial security);</li> </ul> |
|              | c) Entry into a Road Use Agreement (and any additional work/requirements as set out in the Road Use Agreement, including the provision of financial security);                               |
|              | d) Installation of perimeter fencing and all site security to prohibit all unauthorized access to the site;                                                                                  |
|              | e) Placement of signage;                                                                                                                                                                     |
|              | f) Emergency Response Plan;                                                                                                                                                                  |
|              | g) Fire Prevention and Protection Plan; and                                                                                                                                                  |
|              | h) Baseline Groundwater Study.                                                                                                                                                               |

| CONDITION #9 | <ul> <li>The Applicant shall during the currency of this development permit:</li> <li>a) Ensure compliance with all current and updated conditions/requirements of federal, provincial and municipal legislation (including regulations of Alberta Environmental Protection, Land Reclamation Division and the guidelines set under the Environmental Protection and Enhancement Act), including a provincial Roadside Development Permit;</li> <li>b) Ensure compliance with all current and updated conditions/requirements of any easement, covenant, building scheme, or development agreement affecting the Site;</li> <li>c) Obtain and comply with all necessary approvals from Alberta Transportation and Canadian Pacific Railway; and</li> <li>d) Authorize other regulatory authorities to share information with Ponoka County.</li> </ul> |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|




| CONDITION #10 | The Applicant must provide all required federal and provincial approvals to Ponoka<br>County within sixty (60) days of approval. The Applicant shall notify Ponoka County<br>within sixty (60) days if the Applicant applies for a change and/or if any change to<br>any provincial approval related to the operations is approved by the Province. |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

#### Mine Site and Related Operations:

| CONDITION #11 | Mining shall commence in the areas closest to the residences within the SW 12-<br>44-25-W4. The area of active mining shall not exceed 20 acres at any given time<br>with progressive reclamation as the project moves from one area to another.<br>The area of active mining excludes the stockpile and truck loading area, and the<br>processing and conveyor area. The maximum area where initial reclamation<br>respecting mining is being performed shall not exceed 20 acres at any given<br>time (where overburden is being placed from a new area of active mining). The<br>area where medium or long term reclamation is being performed shall not<br>exceed 60 acres at any given time (where overburden was placed in a prior<br>calendar year). The Applicant shall provide related information (including a |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|               | survey report by a licensed surveyor or other qualified professional acceptable<br>to Ponoka County) in regards to areas of active mining and all reclamation to<br>Ponoka County at the request of Ponoka Country.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

| CONDITION #12 | This development permit includes the following maximum for accessory buildings, namely scales, a scale house, two (2) trailers, and two small buildings for lubricant and fuel storage. Any additional accessory buildings required for the Site shall |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|               | require a separate development permit from Ponoka County.                                                                                                                                                                                              |

| <b>CONDITION #13</b> | Operations on Site shall not rely on generators, unless in an emergency situation |
|----------------------|-----------------------------------------------------------------------------------|
|                      | where there is a failure of the connection from a utility service provider.       |

| <b>CONDITION #14</b> | No aspł | alt plants | shall  | be  | permitted  | on | the | Site | without | first | obtaining | а |
|----------------------|---------|------------|--------|-----|------------|----|-----|------|---------|-------|-----------|---|
|                      | develop | nent permi | t from | Pon | oka County |    |     |      |         |       |           |   |

| CONDITION #15 | No portable structures, scales, equipment or parked vehicles etc. shall be located within the greater of the following setbacks (unless authorized by the Development Authority): |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|               | a) 40 meters of the right of way of the nearest constructed road/highway/railway line or within 10 meters of the quarter lines unless otherwise relaxed; and                      |





| b) The setbacks shown on Figures 2 and 3 and described in Section 2.2 Structures<br>and Setbacks of the Golder Operations Plan submitted to the Ponoka County |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SDAB as Exhibit 21.                                                                                                                                           |
| Any noise attenuation berm and/or wall may be located within the noted setbacks if                                                                            |
| authorized by the Development Authority.                                                                                                                      |

| CONDITION #16 | The Site must be secured by perimeter fencing (6 foot chain link or temporary steel construction fence) along the following 3 areas: |  |  |  |  |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|
|               | a) The active mining area;                                                                                                           |  |  |  |  |
|               | <li>b) The processing area on the west side of the Site; and</li>                                                                    |  |  |  |  |
|               | c) The stockpile/sale area on the northwest of the Site.                                                                             |  |  |  |  |
|               | The Applicant shall ensure that the lands are securely gated and locked when not in use by the Applicant.                            |  |  |  |  |

| <b>CONDITION #17</b> | The Applicant shall provide (and obtain approval of) a copy of the Emergency                                                                                    |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                      | Response Plan for the Site prior to commencing extraction activity. The Emergency<br>Response Plan shall be subject to the approval of the Regional Fire Chief. |

| CONDITION #18 | The Applicant shall provide (and obtain approval of) a Fire Prevention and       |
|---------------|----------------------------------------------------------------------------------|
|               | Protection Plan prior to commencing any extraction activity. The Fire Prevention |
|               | and Protection Plan shall be subject to the approval of the Regional Fire Chief. |

| CONDITION #19 | The Applicant shall ensure that there is appropriate lighting to the satisfaction of<br>Ponoka County's Development Officer so as to provide security/safety. Lighting<br>standards and fixtures shall be located and arranged so that no light is directed at<br>residences on adjacent lands and so that it does not interfere with the effectiveness<br>of any traffic control device |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|               | of any traine control device.                                                                                                                                                                                                                                                                                                                                                            |

**CONDITION #20** The Applicant shall keep the area subject to the development permit in a clean and tidy condition, free from rubbish and non-aggregate debris. The Applicant shall remove all garbage, waste and recyclables from the lands and dispose of such materials in an approved disposal facility. The Applicant shall keep the lands in a clean and orderly manner, at the Applicant's own expense, including but not limited to, ensuring appropriate waste receptacles are located on the lands, that no garbage or waste is imported onto the lands, and that any trees that may be required to be removed from the excavation site are properly piled.

| <b>CONDITION #21</b> | The Applicant shall supply, at the Applicant's own expense, portable commercially |
|----------------------|-----------------------------------------------------------------------------------|
|                      | serviced toilets to be used on the lands during the entire term of the permit.    |





| CONDITION #22 | Aggregate shall be moved across the Battle River by a covered conveyor bridge with no footprint within the river channel.                                 |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| CONDITION #23 | Aggregate shall be transported under Highway 2A through a tunnel by a covered conveyor to a loading site on the west side of Highway 2A.                  |
| CONDITION #24 | A conveyor system shall be used to move aggregate within the pit. The system will have covered dropping points, with spray bars at those dropping points. |

#### Storage/Hydrocarbons:

| CONDITION #25 | 1. No highly explosive materials used for blasting will be used or stored on the Site.                                                                                                                                                                               |
|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|               | <ol> <li>No activity shall be allowed that would interfere or compromise the quality of<br/>any broadcast or communication system including, but not limited to, radio,<br/>television, internet, phone, and any wireless local area network in the area.</li> </ol> |
|               | <ol> <li>There shall be no offensive odour, heat, or glare noticeable at or beyond the<br/>boundary for the Site.</li> </ol>                                                                                                                                         |

| CONDITION #26 | Only CSA-approved double walled fuel containment vaults shall be allowed on-site |
|---------------|----------------------------------------------------------------------------------|
|               | at any time.                                                                     |

| CONDITION #27 | Secondary containment, not less than 100% of the largest container, shall be provided to all areas where lubricating oil is stored on-site.                                                                                                                                   |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CONDITION #28 | Vehicles will be properly maintained to reduce the potential for hydraulic fluids/fuel leaks or spills. Only biodegradable hydraulic fluids shall be used for vehicles or infrastructure within the pit, unless such fluids are not supported by manufacturer specifications. |

| CONDITION #29 | The Applicant shall ensure that there is suitable disposal methods for liquid wastes generated on the site and that there shall be no hazardous liquids stored on the site (i.e. waste oils, glycol containers etc.). Waste oil shall be removed from the site as it is extracted and taken to an appropriate disposal facility. |
|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CONDITION #30 | Any permanent refueling area shall ensure that the fuel is stored in a container that<br>is surrounded by an impermeable secondary containment that is capable of<br>containing the full volume of fuel that is stored in the tank (e.g.: a dyke lined with an                                                                   |

E-1 - Attachment E





|               | impermeable geomembrane or plastic containment tray). There shall be no servicing of vehicles in the pit, unless absolutely necessary.                                                                                        |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CONDITION #31 | Refuelling shall occur only in the following areas, namely a permanent refuelling area in:<br>a) The active mining area (Phase I or Phase II as the case may be);<br>b) The processing area on the west side of the Site; and |

c) The stockpile/sale site on the northwest of the Site.

#### **Reclamation:**

| CONDITION #32 | Unless these standards are modified by a provincial regulatory authority, the Applicant shall ensure that reclamation of the Site occurs as follows:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|               | <ul> <li>a) All aspects of the extraction and reclamation operation take place in full<br/>compliance with any requirements or recommendations contained within any<br/>professional's report submitted as part of this development permit or provincial<br/>approvals.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                     |
|               | b) If operations under the development permit are abandoned prior to the expiration of the development permit, the Applicant shall complete the reclamation of the Site within three (3) years of the abandonment of the operations on the Site. For the purposes of this condition, the operation of the use shall be deemed to be abandoned if the Applicant fails to haul aggregate from the Site for a period of more than one (1) year.                                                                                                                                                                                                                           |
|               | <ul> <li>c) Progressive reclamation techniques will be implemented as the mine sequence progresses. <ol> <li>The Applicant will salvage all topsoil and replace evenly with an average depth of 0.15m.</li> <li>If subsoil is encountered, it will be salvaged and replaced evenly throughout the Site.</li> <li>Once reclamation is complete, there will be four water body areas;</li> <li>These water bodies will have side slopes of 5:1 both 1m above and 1m below the full water supply. The water bodies will collect the majority of the surface runoff within the pit boundaries</li> <li>Phase 1 will drain into Water Body #1 and #2</li> </ol> </li> </ul> |





#### **Development Agreement:**

| CONDITION #33 | The Applicant shall enter into (prior to performing any site excavation) and comply with a development agreement pursuant to Section 650 of the <i>Municipal Government Act</i> with Ponoka County, if such agreement is deemed necessary by Ponoka County the agreement shall contain terms satisfactory to Ponoka County. Without limiting the generality of the foregoing, the development agreement may include: |
|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6             | <ul> <li>a) requirements relating to accesses to and from the Site; and</li> <li>b) paving or other upgrading to municipal roads (including Range Road 251 from the Junction of Highway #2A to the Menaik Road (Township Road 442)).</li> </ul>                                                                                                                                                                      |

#### **Road Use Agreement:**

| CONDITION #34 | <ul> <li>The Applicant shall enter into and comply with a Road Use Agreement with Ponoka County on terms satisfactory to Ponoka County if such agreement is deemed necessary by Ponoka County during the currency of the development permit. Note that Ponoka County may require the terms of the agreement to be amended from time to time. If Ponoka County does not require a Road Use Agreement initially it may require one at a later point during the currency of the development permit. These terms may include (without limiting the generality of the foregoing) the following requirements at the option of Ponoka County: <ul> <li>a) All loads leaving the pit loading area must be tarped;</li> <li>b) All gravel trucks used in the operation of the pit are registered with the Alberta Sand &amp; Gravel Association;</li> <li>c) Dust control measures and road maintenance;</li> <li>d) Financial security requirements;</li> <li>e) Hours of operation for hauling;</li> <li>f) Haul routes;</li> <li>g) Maximum truck numbers and volume;</li> <li>h) The haul route may be amended from time to time, when in the opinion of Ponoka County circumstances warrant the haul route to be amended;</li> <li>i) Restrictions on hauling in relation to school buses (for example, No gravel trucks shall enter or exit the Site when a school bus is within 300.0 m (984.25 ft.) of the access to the Site);</li> <li>j) The Applicant shall, prior to undertaking any work on County roads, obtain the consent of Ponoka County to do such work. This shall include but shall not be</li> </ul></li></ul> |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|               | <ul> <li>j) The Applicant shall, prior to undertaking any work on County roads, obtain the consent of Ponoka County to do such work. This shall include but shall not be limited to the installation of signage on County road right-of-way's;</li> <li>k) The Applicant shall provide regular gravel truck counts to Ponoka County for every vehicle once every quarter, in a manner suitable to Ponoka County,</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |





during the operation of the pit;

- The Applicant shall ensure that all trucks used in connection with the development are clearly marked as per the applicable federal, provincial, or municipal requirements;
- m) Noise mitigation measures;
- n) Prohibitions or restrictions respecting accessing the Site;
- Prohibitions respecting parking on any municipal road. In this regard, an on-site parking area shall be provided to accommodate all vehicles waiting to load materials (for example prohibitions respecting no trucks allowed to stage on RR 251 or any municipal road. Including that there must be no access into the loading area until 6:30 a.m. and no trucks shall leave the Site prior to 7:00 a.m.);
- p) The placement and location of any required signage. This may include emergency contact numbers to warn of possible Site or operational hazards and dangers such as but not limited to: prohibiting the use of engine retarder brakes; advising of the gravel haul in progress; advising of trucks turning; warning of open pit excavation).

#### Visual Mitigation:

| <b>CONDITION #35</b> | The Applicant shall provide 4 berms and/or walls to address visual and noise |
|----------------------|------------------------------------------------------------------------------|
|                      | mitigation as further described in these conditions.                         |

#### **Noise Mitigation:**

| CONDITION #36 | The Applicant shall ensure that all operations at the Site, from the date that excavation of sand and gravel commences until completion of reclamation, meet or exceed the requirements of the following (the "Noise Standard") namely compliance with AER Directive 38, with measurements being at the Site boundary, subject to the following interpretations and modifications: |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|               | receptors that are beyond the Site. For clarity, the residence represented by<br>Receptor R05 as referred to throughout the Noise Report need not meet the<br>requirements of the Noise Standard;                                                                                                                                                                                  |
|               | <ul> <li>b) the Noise Standard applies to the operations within the Site and does not apply<br/>to noise emanating from the haul route;</li> </ul>                                                                                                                                                                                                                                 |
|               | <ul> <li>c) baseline testing may include mitigative measures such as berms and/or walls;</li> <li>d) the modelling for the Noise Standard may include the noise emanating from the existing feedlot within the site.</li> </ul>                                                                                                                                                    |





| The Applicant shall install noise mitigative measures similar to the four (4) noise                                                                              |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| attenuation berms referenced in the Noise Report on p. 10 and in Figure 1. That                                                                                  |
| said, the final design of these features shall be designed in accordance with the                                                                                |
| Noise Standard, and the final design is subject to the approval of the Development                                                                               |
| Authority. They may be designed to be a berm and/or wall. Each of these features                                                                                 |
| (i.e. the berm and/or wall) shall be constructed prior to extraction of sand and gravel in the vicinity of the area where they are serving as noise attenuation. |
| The Applicant shall be subject to submitting periodic reports to Ponoka County detailing compliance with the Noise Standard, as provided for in Condition 46.    |
|                                                                                                                                                                  |

| CONDITION #27 | The Applicant shall undertake additional poise mitigation measures satisfactory to                                                                                       |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CONDITION #37 | the Development Officer, in order to ensure that noise does not unduly impact<br>occupants of residences in the vicinity of the Site, including:                         |
|               | a) avoiding unnecessary revving of engines and switch off equipment when not required;                                                                                   |
|               | <ul> <li>b) ensuring plant and vehicles are properly maintained, and regularly checking<br/>silencers and bearings to ensure noise is minimized;</li> </ul>              |
|               | <ul> <li>c) using rubber linings where possible in chutes and dumpers to reduce impact of<br/>noise;</li> </ul>                                                          |
|               | d) prohibiting the use of engine retarder brakes (both on the Site and when hauling off-site);                                                                           |
|               | e) enclosing pumps and crushers with sound absorbing blanket systems;                                                                                                    |
|               | <ul> <li>f) positioning crushers behind stockpiles or in low lying areas (e.g. pit bottom) to<br/>provide acoustic screening;</li> </ul>                                 |
|               | g) installing and maintaining muffler systems on engine-driven equipment (e.g., trucks, dozers, shovels);                                                                |
|               | h) restricting pit operations to the daytime period (e.g., between 7:00 a.m. and 7:00 p.m.);                                                                             |
|               | i) processing/crushing infrastructure shall only be located in the processing/crushing area along the western boundary of the Site, and out of view from the public; and |
|               | <ul> <li>j) other measures as required to ensure compliance with AER Directive 038 at the<br/>perimeter of the Site.</li> </ul>                                          |

#### Air Quality:

| <b>CONDITION #38</b> | The Applicant shall ensure that all operations at the Site, meet or exceed the    |
|----------------------|-----------------------------------------------------------------------------------|
|                      | requirements of the following (the "Air Quality Standard") at the boundary of the |
|                      | Site, namely compliance with the Alberta Ambient Air Quality Objectives ("AAAQO") |

E-1 - Attachment E





| 2227622000                                       | Averaging Period                                   | Accepted AAAQO<br>Concentration       |
|--------------------------------------------------|----------------------------------------------------|---------------------------------------|
| TCD                                              | 24 hour                                            | [μg/m]<br>100                         |
| ISP                                              | 24-nour                                            | 60                                    |
| DNA                                              | 24 hour                                            | 29                                    |
| PIVI2.5                                          | 1-bour                                             | 300                                   |
| NO <sub>2</sub>                                  | Appual                                             | 45                                    |
| For clarity, any reside<br>requirements of the A | nce within the boundary of<br>ir Quality Standard. | the Site need not meet th             |
| The Applicant shall oncure                       | that continuous ground leve                        | I monitoring of PM <sub>25</sub> take |





| <ul> <li>c) installation of spray bars at crushers and conveyor transfer points where dust generation is anticipated (season appropriate);</li> <li>d) shrouding where spray bars are insufficient; and</li> </ul> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| e) installation of a texas gate with integrated spray bars (season appropriate) at<br>the truck exit to Range Road 251.                                                                                            |
| Results from the air quality monitoring program will be submitted to Ponoka County to make available for public access as indicated below.                                                                         |

#### **Complaints:**

| CONDITION #39 | If Ponoka County receives complaints relating to air quality or noise, Ponoka County<br>through its Development Officer may request the Applicant to provide a third party<br>study of Ponoka County's choice (at the Applicant's expense) on operations and<br>additional mitigative measures that could be taken to improve air quality or reduce<br>noise levels; Ponoka County may during the currency of the development permit<br>impose additional recommended requirements for these mitigative measures which<br>shall be complied with by the Applicant within the timeframe imposed by the |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|               | County.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

| CONDITION #40 | If an affected party has a complaint relating to the Applicant's operations under this Development Permit, the affected party shall submit a written (or email) complaint concurrently to: |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|               | The Applicant: VCD Aggregates                                                                                                                                                              |
|               | and                                                                                                                                                                                        |
|               | The County's Development Officer                                                                                                                                                           |
|               | At the following addresses:                                                                                                                                                                |
|               | VCD Aggregates Ltd.                                                                                                                                                                        |
|               | #2 – 53050 RR 220                                                                                                                                                                          |
|               | ARDROSSAN, Alberta                                                                                                                                                                         |
|               | T8E 2C7                                                                                                                                                                                    |
|               | Ponoka County Development Officer                                                                                                                                                          |
|               | 4205 Hwy #2A                                                                                                                                                                               |
|               | PONOKA, Alberta                                                                                                                                                                            |
|               | T4J 1V9                                                                                                                                                                                    |





Surface Water:

| CONDITION #41 | The Applicant shall ensure that the development does not cause any adverse draining impact on adjacent property or flooding of nearby ditches in excess of their capabilities.                                                                                                                                                                           |
|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CONDITION #42 | Any required <i>Water Act</i> approvals must be obtained prior to any excavation or soil disturbance on the site.                                                                                                                                                                                                                                        |
| CONDITION #43 | Alberta's <i>Water Act</i> requires that an approval and/or license be obtained before<br>undertaking a construction activity in a waterbody or before diverting and using<br>water (surface water and groundwater). It is the Applicant's responsibility to contact<br>Alberta Environment to ensure that the development complies. Call (403)340-7052. |

| <b>CONDITION #44</b> | All portions of the Site that will not be excavated shall be landscaped in a manner |
|----------------------|-------------------------------------------------------------------------------------|
|                      | that all surface run off is contained onsite, unless Water Act approval has been    |
|                      | granted stating otherwise. Portions of the site that will be excavated shall be     |
|                      | landscaped in accordance with a reclamation plan. The reclamation plan shall detail |
|                      | how surface run-off will be managed.                                                |

#### Ground Water:

| CONDITION #45 | The Applicant shall be required to take reasonable steps, as determined by Ponoka<br>County to ensure that the development does not cause any adverse groundwater<br>impacts on adjacent existing water users, aquifers, or the natural environment.<br>The Applicant shall provide a baseline study (to the satisfaction of Ponoka County's<br>Development Officer) of all wells within 1,600m of the perimeter of the Site<br>including water quantity and quality.                                                                                                                                                                                                                               |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|               | a second s |

#### Access and Information:

| CONDITION #46 | The Applicant shall according to the frequency set out as follows supply a report to Ponoka County for review indicating: |
|---------------|---------------------------------------------------------------------------------------------------------------------------|
|               | a) Compliance with the Noise Standard;                                                                                    |
|               | b) Compliance with the Air Quality Standard; and                                                                          |

{B3387597.DOCX;1}Page 13 of 15

Phone: (403) 783-3333





 c) Compliance with the other requirements of this development permit including the progress of pit operations and a drawing showing current pit boundaries, stockpile locations, reclaimed areas and overall Site development status.

During the first two years following the extraction of sand and gravel, the Applicant shall provide the Report on a quarterly basis (or more frequently on the County's request). After the first two years following the extraction of sand and gravel, the Applicant shall provide the Report on an annual basis (or more frequently on the County's request).

**CONDITION #47** The Site including processing, reclamation or other areas involving related activities may be subject to inspection at any time deemed necessary by Ponoka County.

| CONDITION #48 | <ul> <li>The Applicant shall provide Ponoka County (and its agents) with access to the lands and all records necessary and beneficial to satisfy Ponoka County that the Applicant has complied with this development permit, the terms and requirements of the Road Use Agreement, and the requirements of the Development Agreement, including without limiting the generality of the foregoing:</li> <li>a) All information that verifies the details in the aggregate shipped tonnage roll for the lands; and</li> <li>b) Tonnage of aggregate stockpiled on the lands or elsewhere; and tonnage of aggregate removed from the lands.</li> </ul> |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

#### Other:

| CONDITION #49 | The Applicant shall ensure that weed and invasive species control measures are in place for the life of the pit, which shall be at the Applicant's sole expense. The Applicant shall work with Ponoka County's Manager of Agricultural Services and the land owners of the Site to develop and implement an active weed control program for the development. |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**CONDITION #50** The Applicant shall ensure that the lands are seeded, and vegetation maintained, where possible, or planted, at the Applicant's sole expense, as required by Ponoka County. The Applicant may work with Ponoka County's Manager of Agricultural Services and the land owners of the Site to develop and implement a seeding and vegetation program for the development.

| <b>CONDITION #51</b> | It is the Applicant's responsibility to locate all underground utilities and rights-of- |
|----------------------|-----------------------------------------------------------------------------------------|
|                      | way prior to construction or excavation. Contact ALBERTA ONE-CALL at 1-800-242-         |
|                      | 3447 or online at http://www.alberta1call.com.                                          |

Phone: (403) 783-3333

E-1 - Attachment E





This Permit is issued in compliance with the requirements of Ponoka County Land Use By-Law 07-08-LU. It is the permittees' responsibility to examine the Title in order to ascertain if a RESTRICTIVE COVENANT exists that would further restrict the type of construction or land use.

The Permittee is hereby authorized to proceed with the specified development providing that there is complete adherence to all of the above noted conditions. Should an appeal be made against this decision to the Court of Appeal, this Permit shall be rendered NULL and VOID. **REMOVED** 

Date of Issuance of Permit: November 18, 2019

Signature of Chairman, Subdivision & Development Appeal Board:

Paul McLauchlin

NOTES:

- 1. The issuance of a Permit in accordance with the Notice of Decision is subject to the condition that it does not become effective until 14 days after the date the order, decision or permit is issued.
- 2. This Permit is issued in accordance with the Notice of Decision and is valid for a period as set out in the conditions. If at the expiry of this period, the development has not been commenced or carried out with reasonable diligence, this Permit shall be NULL and VOID.
- 3. Any affected person may appeal this decision within 30 days of the issuance of the Permit, to the Court of Appeal on a question of law or jurisdiction, in accordance with Section 688 of *the Municipal Government Act*.

Phone: (403) 783-3333

#### Caitlyn T. Anderson

| From:    |
|----------|
| Sent:    |
| To:      |
| Cc:      |
| Subject: |

June 23, 2021 11:50 AM Legislative Services Shared

[EXTERNAL] - BYLAW C-8073-2020: Letter of OPPOSITION (application PL20200066)

Do not open links or attachments unless sender and content are known.

To Legislative Services,

#### We, Bertrand Levesque and Julie Simard, owners of 17 acres property located at NW 15 TWP26 RGE 5 W of 5, OPPOSE the proposed BYLAW C-8073-2020 (application PL20200066) to facilitate aggregate extraction.

We are located on the north side of Highway 1A, uphill from the project area. We are X06 in the Burnco Proposed BYLAW documents.

The area around our property is farm land, acreages, all in a beautiful landscape, with the Rockies as a back drop. We have worked very hard to be in a position to purchase our property and it represents our largest asset. We enjoy our acreage surrounded by horses and country life.

We have reviewed the documents provided by Burnco and are left with deep concerns. Our reasons to OPPOSE BYLAW C-8073-2020 (application PL20200066) are numerous:

1- Very negative visual Impact: as we are overlooking the existing pit on Highway 1A, we already have first row seats to watch it progress towards the west until it ultimately reaches us (60m between the edge of our property and the edge of the Project). Our house and acreage being at higher elevation than the proposed project already allows us to see the present exploitation work with existing berms already in place (tops of piles are visible). We can be guaranteed of an even better view as it continues it's expansion through the years even with the 7m berm in place. Berms and trees are suppose to help but they would need to be in place to have a chance to work. The berms around the existing exploitation still have no trees and trees need time to gain significant height and width necessary to create a barrier for dust, noise and limit the visual impact.

2- Increase noise with trucking, crushing, machinery etc. Burnco has a crushing plant planned 350m from our property. According to the proposed plan, no full time monitoring until work is within 200m of an occupied residence... So pretty much no full time monitoring at all since we are the closest residence. Trucking is meant to increase to 28 tandem trucks per hour 6 days/week representing a much increased traffic for our road.

3- Deteriorating Air quality as we are immediately north west of the present and future exploitation areas along the Hwy 1A. We were shocked to see that the Air Quality model produced for the Burnco proposal shows PM2.5 levels above 25 for our location and 552 just across the road. These particles directly impact health of humans and animals. Of course the model is run with all berms in place. This will only be true at the final stage of the operations since Burnco plans to build the berms as they move west. This leaves us completely open to the operations as soon as they start Phase B. To add to this, Burnco presented no plans for full time air quality monitoring as long as the exploitation work is not within 200m of an occupied residence. This implies that as long as they are not actively working within D19 (across from us) there will be no monitoring although we will have been living in increased dust from the gravel pit for over 10-15 years! This is unacceptable!

4- Impacts on water all around us: impacts on our water well, the potential risk of increased flooding of the Beaupre Creek which passes through our property upstream from the proposed Burnco crossing and we can not forget the

#### ATTACHMENT 'E': PUBLIC SUBMISSIONS

### E-1 - Attachment E Page 130 of 252

impacts on the water of the Bow River with increased concentrations of constituents already seen from the present 151 ac West Burnco Pit. The proposed exploitation expansion of another 966.4 acres can only lead to much more pronounced increase of these constituents in the Bow River which will affect all downstream residents and municipalities of Cochrane and Calgary and beyond.

5- Impacts on wildlife... we are blessed with a varied and healthy wildlife around us particularly along the Beaupre Creek. Gravel exploitation from both the east and west bank will be very detrimental to all. Just last week I witnessed a Great Blue Heron by the creek just east of our house! Over the past 7 years we have lived here, we observed coyotes, bears, cougars, elks, deers, fox, owls, herons, eagles, osprey and so many other varieties of birds. The required setback from the creek will not change the fact that the Beaupre Creek will be a small island of vegetation surrounded by a large gravel operation running 24/7. It will not protect any current and future wildlife which inhabits this area.

6- **Negative Impact on adjacent/nearby Property Value**. This is of extreme concern to us since Burnco does not address the impact of their operation on the market value of neighboring properties. The issue is not even acknowledged.

Obviously, we are not the first property owners having to deal with such situation and many studies were done on this topic here in Canada and in the USA. Whenever a gravel pit, a mine or other industrial operation moves into a neighborhood, neighboring properties suffer a loss in resale value. This can be observed many kms away from the operation. The loss of value is noticeable as soon as the project is publicly known, well ahead of the arrival of the machinery and is measurable only if the properties are sold. In extreme situations, the impact on the property can be so severe that the property becomes un-sellable but unrecorded loss (no sell price data).

Furthermore, there is a direct relationship between the Property Value Decrease and its distance to the operation. In other words, the closer the property is to the pit, the greater the negative impact to its value. Our Property is located **60m** from the North West corner of the planned project area. Reported Property Value Decrease in such close proximity to operations range from **30 to 40%**. How are we supposed to absorb a \$300,000-\$400,000 loss?

Why should we, as adjacent landowners, have to suffer significant financial losses in order for Burnco to expand and prosper? We firmly believe that Burnco should be made fully responsible and have full mitigation/resolution plans for each impact, including and most importantly, the financial impact to neighboring property values

At the West Cochrane location, Burnco has the "benefit" of having very few neighbors to deal with, essentially only a handful of people opposing their plan and who can easily be dismissed. We may represent a smaller deterrent for Burnco but we stand to be 100% affected by them, financially as well as having to live with the direct impacts on our environment for the rest of our lives (we are already too old to see the end of the operations). Yet, we find ourselves having very little recourse to protect us.

If you took a few minutes to truly put yourself in our shoes (or in our house), you would be filled with disbelief, helplessness, anger and panic as this Burnco train coming full speed ahead with apparently no one to slow them down. The life long savings you put into your property are now being seriously threatened and you are easily dismissed by the company responsible. You are being told not to worry, trees will be planted... and you will see no change in your property value!

These are lies! Any realtor looking after their buyers interest will recommend to avoid buying a property next to a gravel pit whether existant or proposed. This is a no brainer and no one will argue on that.

We are facing our biggest single financial loss, having to reconsider retirement plans because of Burnco's imposition around us. It is time for companies to be held fully accountable for the impacts of their business.

#### ATTACHMENT 'E': PUBLIC SUBMISSIONS

### E-1 - Attachment E Page 131 of 252

In summary, we find the proposed mitigation plans to be insufficient and also late in their execution to truly mitigate the impacts on water, noise, air, wildlife and view. We also fail to see why such a large area should be considered for land use redesignation at once. Small

And above all, that no efforts are made to alleviate the imposed financial burden this will cause us.

We fully OPPOSE BYLAW C-8073-2020

Regards,

Bertrand Levesque and Julie Simard

# Fish & Habitat Concerns from Burnco's Proposed West Cochrane Gravel Mine

David W. Mayhood



## FWR Freshwater Research Limited

Technical Note No. 2021/06-1

June 2021 Page 196 of 719 **Cover photo**: Grand Valley Creek as seen from the top of the culvert at Highway 1A, looking downstream, 18 June 2021, showing the fractured bedrock beneath overburden to be mined at the subject pit.

# Fish & Habitat Concerns from Burnco's Proposed West Cochrane Gravel Mine

David W. Mayhood

Prepared on behalf of

Ann McNabb Cochrane, AB

for

Rocky View County Council Rocky View, Alberta

FWR Technical Note No. 2021/06-1 June 2021

## FWR Freshwater Research Limited

1213 Twentieth Street NW, Calgary, Alberta T2N 2K5 Canada FWResearch.ca

403.283.8865 mtk@fwresearch.ca

Aquatic Research Conservation Biology

Fisheries Investigations Impact Assessment Biological Monitoring Baseline Studies Identification Services

Page 198 of 719

# Summary

Burnco Rock Products Ltd. proposes to mine for aggregate across 4.52 km<sup>2</sup> of land extending in two blocks for a total distance of approximately 6-7 km along, and south of, Highway 1A to the Bow River west of Cochrane, Alberta. The principal watercourses to be affected are the Bow River mainstem; its tributaries Beaupre Creek and Grand Valley Creek; and local springs. There are several springs draining groundwater from the proposed mine site to the tributary watercourses and the Bow River. Data on the aquatic habitats and fish populations in the affected watercourses are sparse to non-existent, but it is known that the Bow River above Calgary holds 19 species of fish, of which 9 are sportfish. Many species of fish favour habitats influenced by groundwater discharges into streams for temperature regulation, spawning, egg incubation, juvenile rearing, overwintering, and refuge from other adverse conditions.

Here I comment on the implications for fish and their habitats of a soil flushing experiment conducted by professional hydrogeologist and geochemist Dr. Jon Fennell on a representative sample of the soil to be disturbed by the mining operation. I make additional comments on some other aspects of the proposed mine as they occurred to me in reviewing the available documentation.

Dr. Fennell's experiment is a reasonable attempt to evaluate, at a preliminary level, the likely consequences to groundwater quality of natural precipitation draining through the disturbed above-bedrock deposits in the area to be mined. Dr. Fennell reported one physical characteristic and several chemical constituents in the soil flush effluent that exceeded, and sometimes far exceeded, various regulatory criteria, and so are of concern if they were to reach open-water aquatic habitats and springs via the groundwater system.

It is important to understand that these concerns are not significantly reduced by the dilution power of the receiving watercourses if fish or other organisms are using those sites preferentially, as several species are likely to do. Dilution is not even a viable solution to contaminant releases under prevailing regulations.

Some of the potential problems posed by the elevated parameters are as follows. Several contaminants can bioaccumulate, so may amplify through food webs throughout the aquatic domain and even into terrestrial systems.

**Turbidity** from the experiment effluent water exceeded maximum criteria for the protection of fish and wildlife by 800 to more than 2000 times. Turbidity in this case would have been due to **total suspended solids** almost entirely, and the turbidity levels measured were likely comparable to 1100 to 2800 mg/L of total suspended solids, as a rough estimate. In the field, we should expect these high levels to be persistent over weeks and months, possibly longer. Suspended solids that high and persistent are capable of causing up to 100% mortality of trout eggs and larvae. Adult and juvenile trout would be expected to avoid locations so affected, which leads to the question whether there is suitable alternative habitat for them nearby. Burnco's document provides no data to address this issue, a serious deficiency.

Total Arsenic in effluent water exceeded guidelines for aquatic life by 1.8 to 3.8 times.

Total Cadmium in effluent water exceeded guidelines for aquatic life by 1.3 to 1.6 times.

**Total Chromium** in effluent water exceeded guidelines for aquatic life by 13 to 20 times, if all in the hexavalent form, or 1.5 to 2.2 times, if all in the trivalent form.

Total Cobalt in effluent water exceeded guidelines for aquatic life by 4.7 to 6.3 times.

Total Lead in effluent water equaled or slightly exceeded guidelines for aquatic life.

Total Zinc in effluent water exceeded guidelines for aquatic life by 2.4 to 4 times.

Synergistic effects, in which the toxicity of these and other individual constituents affect the toxicity of each other, are possible, even likely, and need to be assessed to fully understand the risk posed by this proposed development.

Fish move around among the habitats critical for completing their life history. They use different kinds of habitat at different times and life stages. To understand how any disturbance, such as this gravel mine, might affect fish populations, it is essential to understand if, how and when local populations use the emergent groundwater habitat that might be affected by the gravel pit disturbance. Burnco has made no attempt to do this.

Gravel extraction sites are surface mines. Large mines disturb large areas, so roughly speaking, they inevitably impact the local environment more or less in proportion to their size. This proposed aggregate mine is quite large and close to sensitive aquatic receptors, so it needs to be evaluated accordingly.

Burnco's two-paragraph fish and aquatic habitat survey was performed with minimal effort and attention to the risks in question and was not designed for, or capable of, identifying the aquatic biological communities at groundwater discharge sites, or their uses by fishes. Dr. Fennell's simple experiment shows that serious contamination problems from Burnco's gravel mine are possible and could affect any Bow River fish populations that rely upon groundwater discharge habitats in the vicinity of the proposed development. These issues need to be properly evaluated in a thorough environmental assessment of Burnco's desired gravel extraction activities.

# Contents

| Introduction                                  | 4  |
|-----------------------------------------------|----|
| Study Area                                    | 4  |
| Contaminants in Disturbed Soil Water Effluent | 6  |
| Fishes and Habitat Use                        | 7  |
| Conclusion                                    | 7  |
| Acknowledgements                              | 8  |
| References Cited                              | 8  |
| Appendix: DW Mayhood Curriculum Vitae         | 10 |

# Introduction

Burnco Rock Products Ltd. proposes to mine for aggregate across 4.52 km<sup>2</sup> of land extending in two blocks for a total distance of approximately 6-7 km along, and south of, Highway 1A to the Bow River west of Cochrane, Alberta (Burnco 2020). Hydrogeologist and geochemist Dr. Jon Fennell conducted an experimental test to assess the possible physical and chemical changes that may occur to precipitation flowing through these sediments after being disturbed, and entering the local groundwater, as will occur as a result of mining (Fennell (2021). In a 15 June email I was asked by Ann McNabb of Cochrane to comment on the findings and their implications for fishes and their habitats, if any, and more generally on any other possible effects of the proposed gravel mine that I noticed in Burnco's documentation. I agreed to do so in a very limited way due to the short notice, on 16 June.

Here I comment on the potential effects on local fishes and their habitats of Dr. Fennell's findings, based on a reading of his report (Fennell 2021), Burnco's master site development plan (Burnco 2020, as revised May 2021), my understanding of the effects of groundwater contamination, the biology of Alberta's fishes, and my reading of relevant scientific literature. I understand that Burnco has produced a voluminous supporting document of some 1800 pages in hard copy, which I could not find on the Rocky View County website, and which was not available to me on short notice.

I am an aquatic ecologist with an M.Sc. and 54 years of experience working on the ecology of the inland waters of western Canada, with emphasis on the fishes, other aquatic organisms, and their habitats of the Eastern Slopes of the Rocky Mountains in Alberta. My curriculum vitae is attached hereto.

# Study Area

The site in question lies within the land description described in Burnco (2020:1), and is mapped in various ways throughout that document. The Bow River mainstem borders the site on the south, and two named tributaries, Beaupre and Grand Valley creeks (cover photo), are incised into the site in the west and centre-east, respectively. Several smaller unnamed watercourses cross or drain the property along its length, emptying primarily into the Bow River, with some emptying into Beaupre and Grand Valley creeks.

I searched Alberta Environment and Parks' online database (Alberta FWMIS, FWIMT) for recent fish inventories, but found none in either named creek within the study area as of 17 June 2021. I could find no recent site-specific fish occurrences within the study area reach of the Bow River in the same database on the same date. Burnco (2020:12) did not report finding any fish in the named creeks or three other unnamed watercourses from a survey they conducted 8 November 2018. They noted that there were no impediments or barriers to fish migration to their confluences with the Bow River. The two most easterly watercourses they visited did not provide fish habitat. Burnco (2020) did not provide any information as to fish or fish habitat in the Bow River.

The most current summarized information available on the fishes occupying the Bow River above Calgary was extracted from Henderson and Peter (1969) by Culp et al. (1992). I believe it reasonably represents the Bow River fauna in the vicinity of the Burnco proposed gravel mine site (Table 1). Of the 19 species listed, nine are considered sportfish species. Several of the remainder are often abundant and therefore must play a large role in the ecology of the river. One, bull trout, is threatened under Canada's *Species at Risk Act*, but is believed to be functionally extirpated in the river below this point (Bighill Springs reach), and at very high risk of extirpation-likely unrecoverable above it in the Ghost Reservoir reach (DFO 2020).

| Species name             | Common name        |
|--------------------------|--------------------|
| Oncorhynchus clarkii     | cutthroat trout    |
| Oncorhynchus mykiss      | rainbow trout      |
| Salvelinus fontinalis    | brook trout        |
| Salvelinus confluentus   | bull trout         |
| Salvelinus namaycush     | lake trout         |
| Salmo trutta             | brown trout        |
| Prosopium williamsoni    | mountain whitefish |
| Esox lucius              | northern pike      |
| Lota lota                | burbot             |
| Catostomus catostomus    | longnose sucker    |
| Catostomus platyrhynchus | mountain sucker    |
| Catostomus commersonii   | white sucker       |
| Culaea inconstans        | brook stickleback  |
| Couesius plumbeus        | lake chub          |
| Rhinichthys cataractae   | longnose dace      |
| Cottus ricei             | spoonhead sculpin  |
| Percopsis omiscomaycus   | trout-perch        |
| Semotilus margarita      | pearl dace         |
| Pimephales promelas      | fathead minnow     |

**Table 1.** Species of fish known to occur in the Bow River above Calgary. Extracted from Henderson and Peter (1969) by Culp *et al.* (1992).

# Contaminants in Disturbed Soil Water Effluent

In a laboratory experiment, Fennell (2021) assessed the possible physical and chemical changes that may occur to water (i.e. precipitation) flowing through the sediments in Burnco's proposed mining area and entering the local groundwater. In measurements of numerous parameters, he found one physical characteristic and several chemical constituents in the soil flush effluent that exceeded, and sometimes far exceeded, various regulatory criteria, and so are of concern if they were to reach open-water aquatic habitats and springs via the groundwater system.

**Turbidity** from the experimental effluent water exceeded maximum criteria for the protection of fish and wildlife (Government of Alberta 2018) by 800 to more than 2000 times. Turbidity in this case would have been due to total suspended solids almost entirely, and the turbidity levels measured were likely comparable to 1100 to 2800 mg/L of total suspended solids, as a rough estimate (D. Mayhood, unpublished data). In the field, we should expect these high levels to persist over weeks and months, possibly longer. Suspended solids that high and persistent are capable of causing up to 100% mortality of trout eggs and larvae (Newcombe and Jensen 1996). Adult and juvenile trout would be expected to avoid locations so affected, which leads to the question whether there is suitable alternative habitat for them nearby. Burnco's document provides no data to address this issue.

Several metals and a metalloid exceeded guidelines for protection of aquatic life (Government of Alberta 2018). Here are a few examples.

Total Arsenic in effluent water exceeded guidelines for aquatic life by 1.8 to 3.8 times.

Total Cadmium in effluent water exceeded guidelines for aquatic life by 1.3 to 1.6 times.

**Total Chromium** in effluent water exceeded guidelines for aquatic life by 13 to 20 times, if all in the hexavalent form, or 1.5 to 2.2 times, if all in the trivalent form.

Total Cobalt in effluent water exceeded guidelines for aquatic life by 4.7 to 6.3 times.

Total Lead in effluent water equaled or slightly exceeded guidelines for aquatic life.

Total Zinc in effluent water exceeded guidelines for aquatic life by 2.4 to 4 times.

All of these elements are toxic to fish, and all bioaccumulate (Chu and Chow 2002, Sevcikova *et al* 2011). For those that survive, the fish may be turned into toxic time bombs that, if consumed by predators, will spread the toxin further into aquatic and terrestrial food webs at even higher concentrations. Synergistic effects, in which the toxicity of these and other individual constituents affect the toxicity of each other, are possible, even likely (Bae *et al*. 2001), and need to be assessed to fully understand the risk posed by this proposed development.

# Fishes and Habitat Use

Many species of fish favour habitats influenced by springs and groundwater discharges into streams for temperature regulation, spawning, egg incubation, juvenile rearing, overwintering, and refuge from other adverse conditions (Cunjak and Power 1986, Power *et al.* 1999, Hitt *et al.* 2017). They will often migrate long distances to take advantage of groundwater. Springs can even be important in establishing genetic differentiation within populations, as shown by rainbow trout in Fall River, California, where certain groups favour specific springs and are evolving different genetic characteristics (Ali *et al.* 2016).

Some of the species of fish occupying the Bow River in the reach affected by Burnco's proposed mine (Table 1) are likely to be essentially sedentary, travelling very little throughout their lifetime. Examples of this group likely include stickleback (Jiang *et al.* 2015) and sculpins (Veillard 2016), that probably remain within a few tens of metres or less of one location. Other small fishes, such as lake chub, are known to move up to 3 km to spawn (Brown *et al.* 1970). Some of the larger species, however, are well-known to travel long distances throughout their lifetimes in riverine habitats, such as white and longnose suckers, and mountain whitefish.

These differences in mobility mean that impacts to use of instream groundwater discharge and springs will affect species differently. Migratory fishes that use such sites near the proposed Burnco mine site, if they become contaminated with elements from the pit, could carry them upstream as far as the Ghost Dam or as far downstream as Bearspaw Dam, spreading the contamination over a large area as they die or enter the food web of predators. On the other hand, they may be less likely to become contaminated if they use the Burnco groundwater discharge sites for only relatively brief periods. In contrast, the less mobile species are at particular risk of contamination if they occupy groundwater discharge sites carrying pollutants from Burnco's pit, and could build up higher concentrations as a result. Finally, all fishes might be displaced from these discharge sites.

Given the great importance of springs and instream groundwater discharge sites to fish, Burnco (2020) should have surveyed springs and groundwater sites, and should have considered the effects from any disruptions to them caused by the proposed aggregate mining operation. At present, it is just not possible to make even an informed guess as to the effects of the proposed mine site on fishes in the Bow River and its tributaries. We simply don't know what fish species use the groundwater discharge sites, if they use them at all, or anything at all about the importance of these sites for fish and how and when they use them.

## Conclusion

Fish move around among the habitats critical for completing their life history (Schlosser 1991). They use different kinds of habitat at different times and life stages. To understand how any disturbance, such as this gravel mine, might affect fish populations, it is essential to understand if, how and when local populations use the emergent groundwater and spring

habitat that might be affected by the gravel pit disturbance. Burnco has made no attempt to do this.

Gravel extraction sites are surface mines. Surface mines disturb large areas, so roughly speaking, they inevitably impact the local environment more or less in proportion to their size. This proposed aggregate mine is quite large and close to sensitive aquatic receptors, so it needs to be evaluated accordingly.

Burnco's two-paragraph fish and aquatic habitat survey was performed with minimal effort and attention to the risks in question and was not designed for, or capable of, identifying the aquatic biological communities at groundwater discharge sites, or their uses by fishes. Dr. Fennell's simple experiment shows that serious contamination problems from Burnco's gravel mine are possible and could affect any Bow River fish populations that rely upon instream groundwater discharge habitats or springs in the vicinity of the proposed development. These issues need to be properly evaluated in a thorough environmental assessment of Burnco's desired gravel extraction activities.

# Acknowledgements

Jon Fennell provided helpful comments and corrections on an earlier summary of this technical note.

# **References Cited**

- Ali, O. A., S. M. O'Rourke, S. J. Amish, M. H. Meek, G. Luikart, C. Jeffres, and M. R. Miller. 2016. RAD capture (Rapture): Flexible and efficient sequence-based genotyping. Genetics 202:389-400. doi:10.1534/genetics. 115.183665
- Bae, D.-S., C. Gennings, W. H. Carter Jr, R. S. H. Yang, and J. A. Campain. 2001. Toxicological interactions among arsenic, cadmium, chromium, and lead in human keratinocytes. Toxicological Sciences 63:132-142.
- Brown, J. H., U. T. Hammer, and G. D. Koshinsky. 1970. Breeding biology of the lake chub, *Couesius plumbeus*, at Lac La Ronge, Saskatchewan. Journal of the Fisheries Research Board of Canada 27:1005-1015.
- Burnco. 2020. Master Site Development Plan, West Cochrane Gravel Pit. Burnco Rock Products Ltd. June 2020 v.3, revised May 2021. 112 p.
- Chu, K. W., and K. L. Chow. 2002. Synergistic toxicity of multiple heavy metals is revealed by a biological assay using a nematode and its transgenic derivative. Aquatic Toxicology 61:53-64.
- Culp, J. M., H. R. Hamilton, A. J. Sosiak, and R. W. Davies. 1992. Longitudinal zonation of the biota and water quality of the Bow River system in Alberta, Canada. pp. 30-49. *in* C. D. Becker, and D. A. Neitzel, editors. Water quality in North American river systems. Battelle Press, Columbus, OH. 304 p.
- Cunjak, R. A., and G. Power. 1986. Winter habitat utilization by stream resident brook trout (*Salvelinus fontinalis*) and brown trout (*Salmo trutta*). Canadian Journal of Fisheries and Aquatic Sciences 43:1970-1981.
- DFO. 2020. Recovery strategy for the bull trout (*Salvelinus confluentus*), Saskatchewan- Nelson rivers populations, in Canada [final]. Species at Risk Act Recovery Strategy Series. Fisheries and Oceans Canada, Ottawa, ON. viii+130 p. <u>https://wildlife-species.canada.ca/species-risk-registry/virtual\_sara/files/plans/Rs-BullTroutOmblesTetePlateSaskNelson-v00-2020Sept-Eng.pdf</u>

- Fennell, J. 2021. West Cochrane Pit soil column flushing experiment. Report submitted to Rocky View County Council, Rocky View County, AB. 13 p.+appendices.
- Government of Alberta. 2018. Environmental quality guidelines for Alberta surface waters. Water Policy Branch, Alberta Environment and Parks, Edmonton, AB. v+53 p. <u>https://bit.ly/3qhMIR6</u>
- Henderson, N. E., and R. E. Peter. 1969. Distribution of fishes of southern Alberta. Journal of the Fisheries Research Board of Canada 26:325-338.
- Hitt, N. P., E. L. Snook, and D. L. Massie. 2017. Brook trout use of thermal refugia and foraging habitat influenced by brown trout. Canadian Journal of Fisheries and Aquatic Sciences 74:406-418. doi:10.1139/ cjfas-2016-0255
- Jiang, Y., L. Torrance, C. L. Peichel, and D. I. Bolnick. 2015. Differences in rheotactic responses contribute to divergent habitat use between parapatric lake and stream threespine stickleback. Evolution 69:2517-2524. doi:10.1111/evo.12740
- Newcombe, C. P., and J. O. T. Jensen. 1996. Channel suspended sediment and fisheries: a synthesis for quantitative assessment of risk and impact. North American Journal of Fisheries Management 16:693-727.
- Power, G., R. S. Brown, and J. G. Imhof. 1999. Groundwater and fish—insights from northern North America. Hydrological Processes 13:401-422.
- Schlosser, I. J. 1991. Stream fish ecology: a landscape perspective. BioScience 41:704-712. doi:10.2307/1311765
- Sevcikova, M., H. Modra, A. Slaninova, and Z. Svobodova. 2011. Metals as a cause of oxidative stress in fish: a review. Veterinarni Medicina 56:537-546.
- Veillard, M. F. 2016. Investigating fine-scale movement patterns and comparative swimming performance of the newly identified and threatened Rocky Mountain sculpin (*Cottus* sp.) across its Canadian distribution.
   MSc thesis, Department of Renewable Resources, University of Alberta, Edmonton, AB. xv+81 p. <u>https://bit.lv/3ivU5Te</u>

#### Online

Alberta Fish and Wildlife Management Information System (FWMIS). <u>https://www.alberta.ca/access-fwmis-data.aspx</u> Access 17 June 2021.

# Appendix: DW Mayhood Curriculum Vitae

### **FWR** Freshwater Research Limited

1213 · 20th Street NW, Calgary, Alberta, Canada T2N 2K5 +1.403.283.8865

# David W. Mayhood

Aquatic Ecologist

dmayhood@fwresearch.ca https://www.fwresearch.ca

## Education

M.Sc. Limnology 1978, University of Calgary

B.Sc. Honours Zoology 1969, University of Calgary

Graduate research projects: Production of trout and their food supplies in Alberta mountain lakes (thesis research); population dynamics of the zooplankton organism *Leptodiaptomus sicilis* in four mountain lakes

## Continuing Professional Development, Specialized Courses

Wildland Hydrology Silva Forest Foundation, Slocan Park, British Columbia 1994

## **Professional Experience**

| since 1981: | Principal & President, FWR Freshwater Research Limited, Calgary                                                                                                |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1979-1981:  | Senior Biologist, Aquatic Environments Limited, Calgary                                                                                                        |
| 1974-1978:  | Contract Biologist, Canadian Wildlife Service/Parks Canada (Banff Na-<br>tional Park), Calgary, and graduate work, University of Calgary                       |
| 1970-1973:  | Fisheries Technician & Project Biologist, Canadian Wildlife Service/Parks<br>Canada, Calgary                                                                   |
| 1967-1969:  | Summer Research Assistant, Fisheries Research Board of Canada (Experi-<br>mental Lakes Area, NW Ontario); Canadian Wildlife Service/Parks Cana-<br>da, Calgary |

## **Professional Memberships & Affiliations**

American Association for the Advancement of Science, American Fisheries Society, Ecological Society of America, International Society of Limnology, Society for Freshwater Science, Society for Conservation Biology, Society of Canadian Limnologists, Canadian Society of Zoologists

Fisheries Investigations

Impact Assessment Baseline **Studies** 

Identification Services

## Honours

Wilderness Defender Award, Alberta Wilderness Association, 23 November 2018. https://albertawilderness.ca/about-us/alberta-wilderness-defenders-awards/ https://albertawilderness.ca/wp-content/uploads/2018/10/20180900\_archive\_awa\_wla-1.pdf

## Areas of Special Interest

- Ecology and conservation biology of western Canadian fishes, with emphasis on mountain trout
- Ecology and natural history of mountain lakes, streams and their watersheds
- Zoogeography and ecology of fishes, zooplankton and benthic invertebrates in lakes and streams of western Canada
- Aquatic biomonitoring and impacts of pipelines, oil & gas wells, roads, railways, strip mines, extraction plants, dams and agriculture on freshwater ecosystems

## **Representative Projects**

## Current Project: Alberta Wilderness Association, funded by Bow River Basin Council

Independent researcher: Sediment loading to selected streams in the McLean Creek ATV area. With University of Calgary Environmental Science student Logan Boyer, identifying the principal sources of total suspended sediment (TSS) to Elbow River tributaries Silvester, McLean, Quirk, and Connop creeks; assessing the relative importance of each to sediment loading and fish habitat in those creeks; quantifying the TSS loading to the Elbow River from the creeks, and to the total TSS load in the Elbow River.

## Alberta Sustainable Resource Development, Fisheries & Oceans Canada

Consulting Biologist: contributed 2 reviews as background references to the provincial recovery plan for threatened westslope cutthroat trout; coauthored background paper and recovery potential assessment for federal recovery program; developed reference parameters for headwater stream stocks of native cutthroat trout; contributed a conceptual framework and guidelines for westslope cutthroat trout recovery in Alberta

## Watershed analysis 1996-present – various clients

Consulting Biologist: Analyzed ecosystem risks in 105 small watersheds in southwestern Alberta; recommended changes in land use and management to correct identified problems.

### Yellowstone to Yukon Conservation Initiative

Consulting Biologist: Compiled information and prepared a technical report on the distribution and conservation status of the fishes of the Y2Y biogeographic region.

### Canadian Parks Service, Banff & Jasper National Parks

Consulting Biologist: in-depth review and analysis of the regulatory and conceptual background for fish conservation and management in Canadian national parks; survey of fish conservation and management in North American parks and reserves; analysis of the origin, history and status of native fish stocks of JNP and BNP; draft of a fish management plan for JNP based on these studies.

### Canadian Wildlife Service/Parks Canada

Project Biologist: eight years of research and management work on aquatic ecology and fisheries in the national parks of western Canada

- 3-year biophysical survey of lakes, streams and fish populations in the Lake Louise area of Banff National Park, Alberta, including habitat morphometry and hydrology, water chemistry, planktonic primary productivity (radiocarbon studies), zooplankton, benthic invertebrates, macrophytes, fish, estimates of fish food organism production, estimates of potential trout production based on the food supply; developed a fisheries management plan based on the estimates.
- 2-year biophysical survey of lakes and streams in southern Prince Albert National Park, Saskatchewan
- fishery management activities in the prairie national parks over a five-year period as a fisheries technician and biologist, including trapping, spawn-taking, marking, field hatchery operations, fry planting, population monitoring and analysis, creel census operation and analysis, and program evaluation

#### Clients: Denison Mines Ltd., Petro-Canada

Biologist & Project Biologist: baseline studies of Rocky Mountain streams in British Columbia's North-East Coal Block as a basis for assessing the potential impact of coal strip mining on fish and their habitats

### **Client:** Canadian Hunter Exploration Limited

Project Biologist: baseline study of stream habitats and fish populations; assessment of potential impacts of gas pipeline construction on fish populations and fish habitat in the foothills region near Grande Prairie, Alberta; monitoring of stream crossings during installation.

# Freshwater Research Limited

Clients: Alberta Wilderness Association, Diamond Hitch Outfitters, Beaver Mines Area Landowners Group, Rocky Mountain Ecosystem Coalition, other NGOs

Expert witness: testimony on fishes and their habitats in the Rocky Mountain and Plains ecoregions at 10 public hearings on feedlot, pipeline, well licence, coal mine and dam applications before federal and provincial regulatory boards.

## **Ongoing Self-directed Studies**

Studies of sediment delivery from roads and off-highway vehicle trails, chemistry of mountain waters, mountain stream temperatures, trout growth in mountain lakes, native cutthroat trout, mountain spring fauna

## Specialized Analytical Services

- expert identification and sample analysis services on fish, benthic invertebrates and zooplankton organisms from throughout northwestern North America numerous contracts with Environment Canada, Alberta Environment, Alberta Forestry, Lands and Wildlife, and several environmental consulting companies.
- computerized statistical analysis of salary data, analysis of student distribution data for the University of Calgary Faculty Association

## Teaching

### University of Calgary

**Environmental Sciences Program** 

Supervised Students

- Logan Boyer: Environmental Science 505; Road and off-highway vehicle trail total surface erosion and sediment delivery into McLean Creek assessed using the WEPP:Road model. Research Project in Environmental Science, Environmental Sciences Program, University of Calgary, Calgary, AB. 2017 Fall Term
- Caitlin Gifford: Environmental Science 504; Natural individual markings for studying fall movements, habitat use and population size in threatened westslope cutthroat trout, Oncorhynchus clarkii lewisi. ENSC 504 Research Project in Environmental Science (unpublished), Environmental Sciences Program, University of Calgary, Calgary, AB. iii+20 p. 2010/2011 Fall/Winter Term. Parts of this work were published by Gifford & Mayhood (2014).
- Heidi Erdle: Environmental Science 504; Effects of ATV use, cattle grazing, logging and petroleum development on westslope cutthroat trout (*Oncorhynchus clarkii lewisi*) habitat in an Alberta foothills stream. ENSC 504 Research Project

# Freshwater Research Limited

in Environmental Science (unpublished), Environmental Sciences Program, University of Calgary, Calgary, AB. iii+35 p. 2010/2011 Fall/Winter Term

Environmental Science 401 - Environmental Science Field Course

• August & September 2018: assisted students on stream ecology field course

Environmental Science 401 - Environmental Science Field Course

• September 2017: advised students on stream ecology and trout habitat

Environmental Science 401 - Environmental Science Field Course

• September 2015: advised students on stream ecology and trout habitat

Environmental Science 502 - Special Problems in Environmental Management, Guest lectures

- November 2011: *Green Science in a brown world: Interpretation hazard in value-based science*
- February 2011: *Bullshit in environmental science* An application of Harry Frankfurt's 2005 philosophical analysis to the field (Frankfurt, H. 2005. On bullshit. Princeton University Press, Princeton, NJ. 67 p.)
- January 2010: Atmospheric, aquatic and terrestrial waste disposal: Issues for inland fish populations
- November 2007: Fish population loss, habitat damage and watershed degradation in southwestern Alberta, 1885 2007
- December 2006: Degradation of fish populations and their habitats in southwestern Alberta, 1885 2006

Department of Biology

Biology 200 - Introductory Biology

1969: Teaching Assistant

### Mount Royal College, Calgary

Department of Chemical, Biological and Environmental Sciences

Biology 1219 - Limnology

*September to December 1989*: As a sabbatical replacement instructor, developed, prepared and taught a credit lecture and field/laboratory course (6 hours weekly) required for the college's 2-year diploma in Environmental Technology/Water Pollution Studies.

various dates, 1988-96: guest lectures, lab and field instruction in aquatic ecology

## Southern Alberta Institute of Technology, Calgary

Guest lectures on watershed ecology to Environmental Technology students

• December 2008, November 2009: *Some effects of human development on watersheds: Problems and solutions* 

## **Related Volunteer Activities**

- Timberwolf Wilderness Society founding director, 2012 present; President 2018-2019; Director 2019-2021
- Rocky Mountain Ecosystem Coalition founding director and treasurer, 1993 1999
- Alberta Wilderness Association Director 1991-92, 1978-79
- Organizer, Wild Rivers Forum, Alberta Wilderness Association Provincial Conference 1978
- Alternate Member, Public Advisory Committee of the Environment Council of Alberta 1978-79
- donated professional services (e.g., technical studies and advice, written and oral technical submissions to regulatory bodies, popular-style articles on fish conservation, computer consulting), various public interest groups including Timberwolf Wilderness Society, Friends of Mount Backus, Yellowstone to Yukon Conservation Initiative, Bragg Creek Environmental Coalition, Canadian Parks and Wilderness Society, Rocky Mountain Ecosystem Coalition, Alberta Wilderness Association, Speak Up for Wildlife Foundation, Trout Unlimited Canada and American Wildlands

## **Publications and Reports**

## Technical Publications (Peer-reviewed)

Fluker, S. C., and D. W. Mayhood. 2020. Environmental stewardship of public lands? The decline of westslope cutthroat trout along the eastern slopes of the Rocky Mountains in Alberta. Public Land & Resources Law Review 42:39-79. <u>https://scholarship.law.umt.edu/plrlr/</u> Temprarily also available online at: <u>https://www.researchgate.net/publication/342978970\_Environmental\_Stewardship\_of\_Public\_Lands\_The\_Decline\_of\_Westslope\_Cutthroat\_Trout\_along\_the\_Eastern\_Slopes\_of\_the\_Rocky\_Mountains\_in\_Alberta</u>

Mayhood, D.W., M. D. Sawyer and W. Haskins. 2004. Historical risk analysis of watershed disturbance in the southern east slopes region of Alberta, Canada, 1910-1996. Pages 23-29 *in* G.J. Scrimgeour, G. Eisler, B. McCulloch, U. Silins and M. Monita, editors. Forest-Land Fish Conference – Ecosystem Stewardship through Collaboration. Proceedings of the Forest-Land-Fish Conference II, 26-28 April 2004, Edmonton, Alberta. x+212 p. <u>http://www.fwresearch.ca/Library.html</u>

# Freshwater Research Limited

Sawyer, M. D. and D. W. Mayhood. 1998. Cumulative effects analysis of land-use in the Carbondale River catchment: implications for fish management. pp. 429-444 *in* M. K. Brewin and D. M. A. Monita, technical coordinators. Proceed-ings of the Forest-Fish Conference: land management practices affecting aquatic ecosystems, Calgary, AB, May 1-4, 1996. Canadian Forest Service, Northern Forest Centre Information Report NOR-X-356, xiii+533 p. <u>http://www.fwresearch.ca/Library.html</u>

Mayhood, D. W. 1998. Is the greater ecosystem concept relevant for conserving the integrity of aquatic ecosystems in the Canadian Rocky Mountains? pp. 772-780. *in* Munro, N. W. P., and J. H. M. Willison, editors. Linking protected areas with working landscapes — conserving biodiversity. Science and Management of Protected Areas Association, Wolfville, NS. xvii + 1018 p. <u>http://www.fwresearch.ca/Library.html</u>

Mayhood, D. W., M. D. Sawyer and W. Haskins. 1998. British Columbia's level 1 watershed assessment procedure as a tool for monitoring potential impacts of development on aquatic ecosystems in Canada's Rocky Mountains. pp. 677-686. *in* Munro, N. W. P., and J. H. M. Willison, editors. Linking protected areas with working landscapes — conserving biodiversity. Science and Management of Protected Areas Association, Wolfville, NS. xvii + 1018 p. <u>http://</u>

#### www.fwresearch.ca/Library.html

Donald, D. B., R. S. Anderson and D. W. Mayhood. 1994. Coexistence of fish and large *Hesperodiaptomus* species (Crustacea: Calanoida) in subalpine and alpine lakes. Canadian Journal of Zoology 72:259-261. doi: 10.1139/z94-035

Donald, D. B., R. S. Anderson and D. W. Mayhood. 1980. Correlations between brook trout growth and environmental variables for mountain lakes in Alberta. Transactions of the American Fisheries Society 109:603-610. doi: 10.1577/1548-8659(1980)109<603:CBBTGA>2.0.CO;2

Herzig, A., R. S. Anderson and D. W. Mayhood. 1980. Production and population dynamics of *Leptodiaptomus sicilis* in a mountain lake in Alberta, Canada. Holarctic Ecology (now Ecography) 3:50-63. doi: 10.1111/j. 1600-0587.1980.tb00708.x

#### Technical Publications (not peer-reviewed)

Mayhood, D. W. 2020. The proposed Grassy Mountain Coal Mine: Effects on trout populations & their critical habitats. Report prepared on behalf of Timberwolf Wilderness Society for submission to Joint Impact Assessment Panel for the Grassy Mountain Mine. Canadian Impact Assessment Agency & Alberta Energy Regulator, FWR Technical Report No. 2020/09-1, Ottawa, ON & Calgary, AB. iv+31 p. <u>https://ln2.sync.com/dl/9359ad130/svnyzuir-shumidvf-rcbr2dgf-9jerxvne</u>

Mayhood, D. W. 2014. Guerrilla ecology: Toward an effective strategy for monitoring Alberta's trout streams in a hostile climate. pp. 316-322. in R. F. Carline, and C. LoSapio, editors. Wild Trout IX: Sustaining wild trout in a changing world. Wild Trout Symposium, Bozeman, MT. 392 p. <u>http://www.wildtroutsymposium.com/proceedings-11.pdf</u>

Gifford, C. M., and D. W. Mayhood. 2014. Natural marks for identifying individual fish in small populations of at-risk westslope cutthroat trout. pp. 275-281. *in* R. F. Carline, and C. LoSapio, editors. Wild Trout IX: Sustaining wild trout in a changing world. Wild Trout Symposium, Bozeman, MT. 392 p. <u>http://www.wildtroutsymposium.com/proceed-ings-11.pdf</u>

Cleator, H., J. Earle, L. Fitch, S. Humphries, M. Koops, K. Martin, D. Mayhood, S. Petry, C. Pacas, J. Stelfox, and D. Wig. 2009. Information relevant to a recovery potential assessment of pure native westslope cutthroat trout, Alberta population. Canadian Science Advisory Secretariat Research Document 2009/036. iv+24 p. Available from: <u>http://www.dfo-mpo.gc.ca/csas/</u>

Mayhood, D. W. 2007. Fishes of the Yellowstone to Yukon region. Technical Report No. 3, Yellowstone to Yukon Conservation Initiative, Canmore, AB. vi+39 p. Available from: <u>http://www.y2y.net</u>

Mayhood, D. W. 2001. Conceptual framework and an action plan for conserving westslope cutthroat trout in Canada (Abstract). p. 265. *in* M. K. Brewin, A. J. Paul, and M. Monita, editors. Bull Trout II Proceedings: Ecology and Management of Northwest Salmonids. c/o Trout Unlimited Canada, PO Box 6270, Stn. D, Calgary, AB T2P 2C3. <u>http://www.fwresearch.ca/Library.html</u>

Mayhood, D. W. 2000. Provisional evaluation of the status of westslope cutthroat trout in Canada. pp 579-585. *in* L. M. Darling, editor. Proceedings of the Biology and Management of Species and Habitats At Risk, Kamloops, B.C., 15 - 19 Feb. 1999. Ministry of Environment, Lands and Parks, Victoria, BC, and University College of the Cariboo, Kamloops, BC. 974 p. Submitted version: <u>http://www.fwresearch.ca/Library.html</u>

7

Sawyer, M., and D. Mayhood. 1998. Cumulative effects of human activity in the Yellowstone to Yukon. pp. 61-63. *in* L.Willcox, B. Robinson and A. Harvey, editors. A sense of place: issues, attitudes and resources in the Yellowstone to Yukon Ecoregion. Yellowstone to Yukon Conservation Initiative, 710 Ninth Street, Studio B, Canmore, AB T1W 2V7. 138 p. <u>http://www.y2y.net</u>

Mayhood, D. W., R. Ament, R. Walker and W. Haskins. 1998. Selected fishes of Yellowstone to Yukon: distribution and status. pp. 77-91. *in* L.Willcox, B. Robinson and A. Harvey, editors. A sense of place: issues, attitudes and resources in the Yellowstone to Yukon Ecoregion. Yellowstone to Yukon Conservation Initiative, 710 Ninth Street, Studio B, Canmore, AB T1W 2V7. 138 p. <u>http://www.y2y.net</u>

Haskins, W., and D. W. Mayhood. 1997. Stream crossing density as a predictor of watershed impacts. Paper 457, Proceedings of the Seventeenth Annual ESRI User Conference, San Diego, CA, July 1997. <u>http://fwresearch.ca/Library.html</u>

#### **Peer-reviewed Technical Reports**

Boyer, L., and D. W. Mayhood. 2018. Erosion & suspended sediment delivery from off-highway vehicle trails & roads in the McLean Creek watershed, Alberta. Report prepared for Alberta Wilderness Association, Calgary, AB. Freshwater Research Limited Technical Report No. 2018/06-01. 92 p. Copy for public review available at <u>https://ln.sync.-com/dl/c2311d1d0/744jprjc-dynznjaw-g4vdkc5s-67g29dsi</u>

Mayhood, D. W., W. Haskins and M. D. Sawyer. 1997. Watershed assessment. pp. 43-74. *in* M. D. Sawyer, D. W. Mayhood, P. Paquet, R. Thomas, C. Wallis and W. Haskins. Southern East Slopes cumulative effects assessment. A report by Hayduke and Associates Ltd., Calgary AB, funded by Morrison Petroleum Ltd. Calgary AB. 207p. + appendices. http://www.fwresearch.ca/Library.html

Mayhood, D. W. W. Haskins and M. D. Sawyer. 1997. Cumulative effects on fish. pp. 173-187. *in* M. D. Sawyer, D. W. Mayhood, P. Paquet, R. Thomas, C. Wallis and W. Haskins. Southern East Slopes cumulative effects assessment. A report by Hayduke and Associates Ltd., Calgary AB, funded by Morrison Petroleum Ltd. Calgary AB. 207p. + appendices. <u>http://www.fwresearch.ca/Library.html</u>

Mayhood, D. W. 1995. Some effects of natural gas operations on fishes & their habitats on Canada's Rocky Mountain East Slopes. Rocky Mountain Ecosystem Coalition Technical Report 95/1:1-35. Reprinted with minor changes 1998. http://www.fwresearch.ca/Library.html

Mayhood, D. W. 1992. To keep every cog and wheel: regulatory and conceptual background for managing the fishes of Jasper National Park. Part 1 of a fish management plan for Jasper National Park. Prepared for Canadian Parks Service, Jasper National Park, Jasper, Alberta, by Freshwater Research Limited, Calgary, Alberta. 80 p. <u>http://www.fwresearch.ca/Library.html</u>

Mayhood, D. W. 1992. Approaches to managing freshwater fishes in North American parks and reserves. Part 2 of a fish management plan for Jasper National Park. Prepared for Canadian Parks Service, Jasper National Park, Jasper, Alberta, by Freshwater Research Limited, Calgary, Alberta. 118 p. <u>http://www.fwresearch.ca/Library.html</u>

Mayhood, D. W. 1992. A preliminary assessment of the native fish stocks of Jasper National Park. Part 3 of a fish management plan for Jasper National Park. Report prepared for the Canadian Parks Service, Jasper National Park, by Freshwater Research Limited. 296 p. + maps. doi: 10.13140/2.1.4015.9044 http://www.fwresearch.ca/Library.html

Walder, G. L., and D. W. Mayhood. 1985. An analysis of benthic invertebrate and water quality monitoring data from the Athabasca River. Alberta Environment Research Management Division Report L-91. 254 p. <u>http://hdl.han-dle.net/10402/era.23615</u>

McCart, P. J., and D. W. Mayhood. 1980. A review of aquatic biomonitoring with particular reference to its possible use in the AOSERP study area. Alberta Oil Sands Environmental Research Program (AOSERP) Project WS 3.5. 117 p. https://era.library.ualberta.ca/downloads/7d278v16p

Mayhood, D. W. 1980. Zooplankton, pp. 141-162. *in* P. J. McCart, (ed.) Effects of siltation on the ecology of Ya-Ya Lake, N. W. T. Environmental Studies No. 13, Northern Affairs Program, Indian and Northern Affairs Canada, Ottawa. Catalogue No. R71-19/13-1979. 286 p.

#### Thesis
Mayhood, D. W. 1978. Production of crustacean plankton, benthic macroinvertebrates and fish in six mountain lakes in Alberta. M.Sc. thesis, Department of Biology, University of Calgary, Calgary, Alberta. 219 p. <u>http://www.fwre-search.ca/Library.html</u>

### Conference Papers & Selected Presentations (presenter in bold)

**Mayhood**, **D. W. 2019.** Recovering native cutthroats: What they need & what they're getting. FWR Freshwater Research Limited and Timberwolf Wilderness Society presentation to the Fish & Forests Roundtable Workshop, Alberta Wilderness Association, Calgary, AB, 14 June 2019.

Boyer, L., and **D. W. Mayhood**, 2018. Sediment loading from off-highway vehicle trails and roads to McLean Creek and its tributaries. FWR Freshwater Research Limited presentation to Bow River Basin Council Stewardship Forum, High River, AB, 12 December 2018.

**Mayhood**, **D**. **W**., 2018. Clearcuts, linear disturbance, & trout habitat: New ways of thinking about forest-fish issues on Alberta's East Slopes. FWR Freshwater Research Limited presentation to Fish-Forest Roundtable Workshop, Alberta Wilderness Association, Calgary, Alberta, 6 December 2018.

**Boyer, L.**, and D. W. Mayhood. 2018. Sediment loading from off-highway vehicle trails and roads to McLean Creek and its tributaries. FWR Freshwater Research Limited presentation to Bow River Basin Council Science Forum, University of Calgary, 2 May 2018.

**Mayhood**, **D. W.**, and L. Boyer. 2018. Effects of roads & trails on critical habitat of threatened cutthroat trout, Silvester Creek, Alberta. FWR Freshwater Research Limited presentation to Bow River Basin Council Science Forum, University of Calgary, 2 May 2018.

Mayhood, D. W. 2018. Recovering Alberta's westslope cutthroat trout to secure status. FWR Freshwater Research Limited presentation to Canadian Council on Freshwater Fisheries Research, Edmonton, Alberta 6 January 2018.

Mayhood, D. W. 2017. Recovering Alberta's native trout. FWR Freshwater Research Limited presentation to Fish-Forest Roundtable Workshop 11, Alberta Wilderness Association, Calgary, Alberta, 9 November 2017.

**Mayhood**, **D. W. 2017**. Roads & OHV trails are destroying east slopes watersheds & streams. FWR Freshwater Research Limited presentation, News conference, Alberta Wilderness Association, Calgary, Alberta, 4 March 2017.

**Mayhood**, **D. W.** 2015. How much road can we fit on Alberta's eastern slopes? FWR Freshwater Research Limited and Timberwolf Wilderness Society presentation to Eastern Slopes Today & Tomorrow Workshop, Alberta Wilderness Association, Calgary, AB, 4 December 2015.

**Mayhood, D. W.** 2014. Guerrilla ecology: toward an effective strategy for monitoring Alberta's trout streams in a hostile climate. FWR Freshwater Research Limited presentation to Wild Trout XI, September 22-25, 2014. West Yellowstone, MT.

Gifford, C. M., and **D. W. Mayhood**. 2014. Natural marks for identifying individual fish in small populations of atrisk westslope cutthroat trout. University of Calgary B.Sc. Program in Environmental Science, and FWR Freshwater Research Limited presentation to Wild Trout XI Proceedings, September 22-25, 2014. West Yellowstone, MT.

Mayhood, D. W. 2014. Not just plumbing: A rationale for rewilding Alberta's rivers. FWR Freshwater Research Limited presentation to Forests, Fish and Floods Forum, Alberta Wilderness Association, Calgary, Alberta, 26 June 2014.

**Mayhood**, **D. W.** 2014. Watersheds as trout habitat: Sediment loading in Silvester Creek. FWR Freshwater Research Limited and Timberwolf Wilderness Society presentation to Westslope Cutthroat Trout Stakeholders Workshop, Municipal District of Ranchlands Administration Building, 26 February, 2014.

**Mayhood, D. W. 2008.** Cumulative impacts on native trout in Petro-Canada's Sullivan Project area. FWR Freshwater Research Limited presentation on behalf of Alberta Wilderness Association to Alberta Energy Resources Conservation Board hearing in the matter of Petro-Canada's Sullivan Pipeline Application, High River, Alberta, 9 December 2008.

**Mayhood**, **D.W.**, M. D. Sawyer and W.Haskins. 2004. Historical risk analysis of watershed disturbance in the southern east slopes region of Alberta, Canada, 1910-1996. Forest-Land Fish Conference – Ecosystem Stewardship through Collaboration. April 26-28, 2004, Edmonton, Alberta.

Mayhood, D. W. 2002. Ecological thresholds in inland fish populations and catchment ecosystems. Devon Canada Biological Thresholds Workshop, Blairmore, AB, 1 May 2002.

**Mayhood**, D. W. 2000. Westslope cutthroat trout in Canada: apparent status and a conceptual framework for conservation. British Columbia Cutthroat Trout Workshop, Harrison Hotsprings, BC, 3-4 February 2000.

Mayhood, D. W. 1999. Provisional evaluation of the status of westslope cutthroat trout in Canada. Paper presented at the Biology and Management of Species and Habitats at Risk Conference, Kamloops, BC, 15-19 February 1999.

**Mayhood**, **D. W.** 1998. A watershed perspective of environmental risk at pipeline water crossings: incorporating concepts of cumulative ecological damage. Presentation to the Meeting of the Canadian Pipeline Water Crossing Committee, Banff, AB 25-27 November 1998.

**Mayhood**, **D. W.** 1997. Is the greater ecosystem concept relevant for conserving the integrity of aquatic ecosystems in the Canadian Rocky Mountains? Paper presented at the Science and Management of Protected Areas Association (SAMPA III) Conference, Calgary, AB, May 1997.

**Mayhood, D. W.**, M. D. Sawyer and W. Haskins. 1997. British Columbia's level 1 watershed assessment procedure as a tool for monitoring potential impacts of development on aquatic ecosystems in Canada's Rocky Mountains. Paper presented at the Science and Management of Protected Areas Association (SAMPA III) Conference, Calgary, AB, May 1997.

Haskins, W., and D. W. Mayhood. 1997. Stream crossing density as a predictor of watershed impacts. Paper presented at the Seventeenth Annual ESRI User Conference, San Diego, CA, July 1997.

**Sawyer, M. D.** and D. W. Mayhood. 1996. Cumulative effects analysis of land-use in the Carbondale River catchment: implications for fish management. Paper presented at the Forest-Fish Conference, Calgary, AB, May 1-4, 1996.

### **Published Popular Articles**

Mayhood, D. W. 2018. The global extinction crisis, Alberta's native cutthroat trout, and wilderness. Wild Lands Advocate 26(4):10-12. <u>https://albertawilderness.ca/wp-content/uploads/2018/12/December-2018-Advocate-Web.pdf</u>

Mayhood, D. W. 2015. Thinking about rivers. Wild Lands Advocate 23:4-7. <u>http://albertawilderness.ca/archive/wla-archive/2015-10-00-vol-23-no-5-wild-lands-advocate</u>.

Mayhood, D. W. 2014. Floods are not a water management problem. Wild Lands Advocate. 22(3):11-12. <u>http://fwre-search.ca/Library\_files/Mayhood%202014c.pdf</u>

Mayhood, D. W. 2014. Silvester Creek: Watershed condition, foothills roads, and native trout. Preserving Our Lifeline [Newsletter of the Bow River Basin Council] 14(6):6-7. <u>http://bit.ly/SYdmxG</u>

Mayhood, D. W. 2008. Exotic fishes in Alberta: paying the price. Wild Lands Advocate 16(4):9-11. Available from <a href="http://www.albertawilderness.ca/AWRC/WLA.htm">http://www.albertawilderness.ca/AWRC/WLA.htm</a>

Mayhood, D., and C. Olson. 2008. Westslope cutthroat trout assessed as "threatened." Wild Lands Advocate 16(2):28. Available from <u>http://www.albertawilderness.ca/AWRC/WLA.htm</u>

Mayhood, D. W. 2005. Ottawa's paperless map plot: bad for libraries, bad for people. CASLIS Special Issues [news-letter of the Canadian Association of Special Libraries and Information Services]16(4):2-3. <u>http://www.fwresearch.-</u> ca/Library.html

Mayhood, D. W. 1998. Following Silver City: westslope cutthroat trout in Canada. On the Wild Side: The Journal of American Wildlands 9(1):7-8. <u>http://www.fwresearch.ca/Library.html</u>

Mayhood, D. W., and M. D. Sawyer. 1997. Yellowstone to Yukon: real or imagined? pp.5-8. *in* B. Robinson and M. Sawyer, editors. A sense of place: issues, attitudes and resources in the Yellowstone to Yukon bioregion. Yellowstone to Yukon Conservation Initiative, Canmore, AB. 31 p. Available from: <u>http://www.y2y.net</u>

Mayhood, D. W., R. Ament and R. Walker. 1997. Fishes of the Yellowstone to Yukon. pp. 21-23. *in* B. Robinson and M. Sawyer, editors. A sense of place: issues, attitudes and resources in the Yellowstone to Yukon bioregion. Yellowstone to Yukon Conservation Initiative, Canmore, AB. 31 p. Available from: <u>http://www.y2y.net</u>

Mayhood, D. W. 1997. Do protected areas work? Research Links 5(1):15. <u>http://publications.gc.ca/site/eng/42057/</u> issues.html

Mayhood, D. W. 1997. How roads kill streams. Rocky Mountain Ecosystem Coalition Home Page.

Mayhood, D. W. 1996. Historical transformation of the fish fauna of the central Canadian Rockies. Research Links 4(2):21,6. <u>http://parkscanadahistory.com/series/rl/R61-16-4-2E.pdf</u>

Mayhood, D. W. 1995. What good is the Earth? Review of Odum, E. P. 1993. Ecology and our endangered life-support systems. Sinauer Associates, Inc., Sunderland, MA. 301p. Wild Lands Advocate 3(1):18,25.

Mayhood, D. W. 1994. Protected areas and conservation. Rocky Mountain News 1(1):3.

Mayhood, D. W. 1992. It was my future: a conversation with Milton Born With A Tooth. Wilderness Alberta 22(1):7-9.

Mayhood, D. W. 1992. A home without walls: ecological principles and proposals for the Canadian constitution. Wilderness Alberta 22(1):15.

Mayhood, D. W. 1991. Keeping our eyes on the prize. Environment Network News 18:17.

Mayhood, D. W. 1989. IJC flattens Flathead mine proposal. Wilderness Alberta 19(2):6.

Mayhood, D. W. 1989. The case against Cabin Creek coal. Wilderness Alberta 19(2):7-8.

Mayhood, D. W. 1989. Nudity on the North Fork. Wilderness Alberta 19(2):8.

Mayhood, D. W. 1989. Restoring the crown. Wilderness Alberta 19(2):9.

Mayhood, D. W. 1989. Going native: a search for roots among the lower vertebrates. pp. 41-52. Book chapter *in*: Norman, J. G., editor. Fish and tell and go to hell: Alberta flyfishing wisdom. Dirtwater Publications, Calgary. 172 p.

Mayhood, D. W. 1987. Epitaph for an unknown fish. Wilderness Alberta 17(3):4-5.

Mayhood, D. W. 1986. Southern Alberta's native trout — are they in trouble? The Riseform 2(2):23-25.

Mayhood, D. W. 1986. Book review: J. R. Butler and R. R. Maw. 1985. Fishing Canada's mountain parks. Lone Pine Publishing, Edmonton. 125 p. The Riseform 2(1):24-25.

### Microcomputer Applications

Mayhood, D. W., and H. B. N. Hynes. 1987-93. Hynes' Bibliography on the Ecology of Running Waters for MS-DOS. Microcomputer database translated from Macintosh, maintained, enhanced and marketed by FWR Freshwater Research Limited for the software package Q&A 3.0 running on MS-DOS computers. Over 15,000 references and 170+ subject keycodes in 4.3 mb, with 98-page operations manual.

### Technical Reports (unpublished)

Mayhood, D. W. 2019. Comments on the 2019 proposed recovery strategy & action plan for the Alberta population of westslope cutthroat trout. Freshwater Research Limited report prepared on behalf of Timberwolf Wilderness Society, Pincher Creek, Alberta, for Species At Risk Directorate, Department of Fisheries, Oceans and the Coast Guard, Ot-tawa, Ontario. FWR Technical Note No. 2019/07-1, iv+29 p. <u>https://ln2.sync.com/dl/69c601e10/uis7dkrz-bycyx9pe-axuzmnv4-enzd8jgw</u>

Mayhood, D. W. 2019. Brief submitted to the Senate Standing Committee on Energy, the Environment and Natural Resources, regarding Bill C-69, specifically the *Impact Assessment Act* provisions. <u>https://sencanada.ca/content/sen/committee/421/ENEV/Briefs/DaveMayhood\_e.pdf</u>

Mayhood, D. W. 2017. Emergency report: Alberta native cutthroat trout populations & critical habitat at risk. Report prepared for Timberwolf Wilderness Society, Pincher Creek, AB, and Alberta Wilderness Association, Calgary, AB. Freshwater Research Limited Technical Note 2017/08-1. iii+32 p. http://fwresearch.ca/Library.html

Mayhood, D. W. 2017. Comments on the Castle Management Plan Revised Draft: Effects on trout & their critical habitats. Report Prepared for Alberta Environment and Parks Edmonton, Alberta on behalf of Timberwolf Wilderness Society Calgary, Alberta. Freshwater Research Limited Technical Note 2017/04-1. 43 p. <u>http://fwresearch.ca/Library.html</u>

Mayhood, D. W. 2016. Overview of alluvial river, riparian, & watershed ecological function, with comments on the effects of gravel mining. Report prepared for Lars Larsen, Fort Assiniboine, Alberta, by FWR Freshwater Research Limited. FWR Technical Note 2016/12-1. 12 p. <u>https://fwresearch.ca/Library.html</u>

Mayhood, D. W. 2015. Upper Silvester Creek sediment source survey 5 August 2013. Freshwater Research Limited Technical Note 2015/10-2. i+40 p. <u>http://fwresearch.ca/Library.html</u>

Mayhood, D. W. 2015. Notes on a proposal to permit off-highway vehicle use in the Castle wilderness parks. Interim report. FWR Freshwater Research Limited Technical Note 2015/10-1. 12 p.

Erdle, H. and Mayhood, D. W. 2014. Anthropogenic effects on the habitat of a critical population of at-risk westslope cutthroat trout assessed using simple monitoring methods. FWR Freshwater Research Limited Technical Report 2014/06-1. v+17 p. http://www.fwresearch.ca/Library.html

Mayhood, D. W. 2014. Conceptual framework and recovery guidelines for restoring westslope cutthroat trout populations in Alberta. Report prepared on behalf of Timberwolf Wilderness Society for Alberta Fish & Wildlife Division and Fisheries & Oceans Canada. Freshwater Research Limited Technical Report 2014/03-1. xii+90 p. doi: 10.13140/2.1.1931.6809 http://www.fwresearch.ca/Library.html

Mayhood, D. W. 2013. Suspended sediment in Silvester Creek and its potential effects on the westslope cutthroat trout population. Report prepared for Timberwolf Wilderness Society. Freshwater Research Limited Technical Report 2013/07-1. iii+50 p. http://www.fwresearch.ca/Library.html

Mayhood, D. W. 2013. Suspended sediment in Silvester Creek and its potential effects on the westslope cutthroat trout population: Photo appendix. Report prepared for Timberwolf Wilderness Society. Freshwater Research Limited Technical Report 2013/07-1 Appendix. 12 p. <u>http://www.fwresearch.ca/Library.html</u>

Mayhood, D. W. 2012. Reference parameters for headwater stream populations of westslope cutthroat trout in Alberta. Report prepared for Fisheries & Oceans Canada, and Alberta Fish & Wildlife Division. Freshwater Research Limited Technical Report 2012/12-1. Calgary, AB. iii+34 p. <u>http://www.fwresearch.ca/Library.html</u>

Mayhood, D. W. 2012. Cutthroat trout length conversion regressions. Report prepared for Fisheries & Oceans Canada, and Alberta Fish & Wildlife Division. Freshwater Research Limited Technical Note 2012/06-1. Calgary, AB. ii+32 p. http://www.fwresearch.ca/Library.html

Mayhood, D. W. and E. B. Taylor. 2011. Contributions to a recovery plan for westslope cutthroat trout (*Oncorhynchus clarkii lewisi*) in Alberta: distribution, population size and trends. Report prepared for Alberta Fish & Wildlife Division. Freshwater Research Limited Technical Report No. 2011/06-1, Calgary, AB. vi+45 p.+appendix. <u>http://www.fwresearch.ca/Library.html</u>

Mayhood, D. W. 2010. An overview of river ecology and its implications for simplified hydropower approvals in Alberta. Report prepared by Freshwater Research Limited for the Alberta Wilderness Association. 38 p.

Mayhood, D. W. 2010. Testing the  $H_{60}$  calculations in the 1998 Carbondale basin Interior Watershed Assessment Procedure. Freshwater Research Limited Technical Note 2010/01-1. 12 p. <u>http://www.fwresearch.ca/Library.html</u>

Mayhood, D. W. 2009. Contributions to a recovery plan for westslope cutthroat trout (*Oncorhynchus clarkii lewisi*) in Alberta: Threats and limiting factors. Report prepared for Alberta Fish & Wildlife Division. Freshwater Research Limited Technical Report No. 2009/05-1, Calgary, AB. ix+68 p. <u>http://www.fwresearch.ca/Library.html</u>

Mayhood, D. W. 2008. Watershed assessments for the southern portion of Petro-Canada's Sullivan Field project. Prepared for Big Loop Landowners Group, Longview, AB, by FWR Freshwater Research Limited, Calgary, AB. 10p.

Mayhood, D. W. 2008. Cumulative human impacts on native trout stocks in relation to Petro-Canada's Sullivan Field development project. Report prepared for Alberta Wilderness Association and Big Loop Landowners Group, by FWR Freshwater Research Limited, Calgary, AB. 19p. including responses to Petro-Canada's information requests. 5 p. + 3 maps.

Mayhood, D. W. 2004. Fishes of Yellowstone to Yukon: overview. FWR Freshwater Research Limited report to the Yellowstone to Yukon Conservation Initiative, Canmore, AB. 44 p.

Mayhood, D. W. 2001. Potential effects of a proposed feedlot on fish and their habitats in Onetree Creek and the Red Deer River, Alberta. Report prepared for the Newell Clean County Coalition, Brooks, AB, by FWR Freshwater Research Limited. 18 p. including addendum. <u>http://www.fwresearch.ca/Library.html</u>

Mayhood, D. W., R. Ament and R. Walker. 1997. The fishes of Yellowstone to Yukon: distribution and status. Interim report submitted to the First Conference of the Yellowstone to Yukon Conservation Initiative, Waterton Lakes National Park, AB, 2-5 October 1997. 21 p.

Mayhood, D. W. 1997. Notes on the proposed Cheviot Mine: effects on biota and their habitats. Submitted to the Cheviot Mine Review Panel on behalf of the Rocky Mountain Ecosystem Coalition. 7 p.

Mayhood, D. W. 1996. Impact of the proposed Express pipeline on fish populations. Report prepared for the Rocky Mountain Ecosystem Coalition by FWR Freshwater Research Limited, Calgary, AB. 33 p. + map.

Mayhood, D. W. 1995. The fishes of the Central Canadian Rockies Ecosystem. FWR Freshwater Research Limited Report No. 950408 prepared for Parks Canada, Banff National Park, P.O. Box 900, Banff, AB T0L 0C0. 59 p. <u>http://www.fwresearch.ca/Library.html</u>

Mayhood, D. W., and J. Paczkowski. 1993. Preliminary fall survey of the fishes of the upper Bow River, Banff National Park. Prepared for Banff National Park, Banff, Alberta, by Freshwater Research Limited, Calgary, Alberta. 39 p.

Mayhood, D. W. 1991. Fishes threatened, vulnerable or of special concern in relation to the Oldman River dam. Oldman River Dam Environmental Assessment Review Panel submission FWR 1-NC-30/11/91, Federal Environmental Assessment Review Office, Panel Secretariat, Suite 1150, 555 West Hastings Street, P.O. Box 12071, Harbour Centre, Vancouver, B.C., by Freshwater Research Limited, Calgary. 50 p.

Mayhood, D. W. 1991. Managing the fishes of Jasper National Park 1991-2000. Report prepared for the Canadian Parks Service, Jasper National Park, by Freshwater Research Limited. 52 p. + appendix. (draft)

Mayhood, D. W. 1988. Fisheries and water quality aspects. pp. 19-26. *in* Submission on behalf of the Beaver Mines Area Land Owners Group, intervenors in respect of Energy Resources Conservation Board Application No. 880983, surface location 11-8-6-2-W5M. Submission prepared by Atkinson McMahon Barristers and Solicitors, Calgary. 48 p. + appendix.

Mayhood, D. W. 1988. Fisheries. Section V.B.2, Concerns of the Alberta Wilderness Association respecting ... ERCB Application - Shell Waterton 6-30-4-1 (Whitney Creek). Intervenor's submission to the Alberta Energy Resources Conservation Board, Calgary, AB. 7 p.

Mayhood, D. W. 1988. Trout populations and streambed condition in Whitney and Mill creeks, Alberta, July 1988. Report prepared for Alberta Wilderness Association, Calgary, by FWR Freshwater Research Limited. 34 p.

Mayhood, D. W. 1987. Preliminary investigation of a fish kill at the Bearspaw Country Club trout pond. Report prepared for Bearspaw Country Club, Calgary, Alberta by FWR Freshwater Research Limited. 10 p.

Mayhood, D. W. 1986. Fisheries. pp. 28-37. *in* Intervenor's submission. Submission of the Alberta Wilderness Association to the Energy Resources Conservation Board in the matter of Shell Canada Ltd. Jutland well application No. 851037. 75 p.

Mayhood, D. W. 1985. Potential impact of a proposed new highway crossing on fish in Altrude Creek, Banff National Park, and possible mitigation measures. Report prepared for Underwood McLellan Limited, Calgary, by FWR Freshwater Research Limited. 25 p.

Mayhood, D. W. 1983. Preliminary report on the invertebrates and cutthroat trout of twelve mountain lakes sampled by the Alberta Fish and Wildlife Division, summer 1981 and 1982. Report prepared for Fish and Wildlife Division, Alberta Energy and Natural Resources, Rocky Mountain House, by FWR Freshwater Research Limited, Calgary. 14 p.

Mayhood, D. W. 1982. Observations on selected stream crossings during installation of the South Wapiti gas gathering system. Report prepared for Western Wildlife Environments Consulting Ltd., Calgary, by FWR Freshwater Research Limited, Calgary. 38 p. + appendix.

Mayhood, D. W. 1981. Late autumn stream habitats and fish populations in the vicinity of the proposed South Wapiti gas gathering system. Report prepared for Canadian Hunter Exploration Limited, Calgary, by Western Wildlife Environments Consulting Ltd., Calgary. 112 p.

Horejsi, B. L., D. Mayhood and P. McNichol. 1981. Environmental report, pipeline development and reclamation application for the South Wapiti gas gathering system. Canadian Hunter Exploration Limited report. 83 p + appendix.

Mayhood, D. W. 1981. An ecological baseline study of Lake Bonavista, Calgary. Report prepared for the Lake Bonavista Homeowners' Association by Aquatic Environments Limited, Calgary. 67 p.

Mayhood, D. W., R. D. Saunders and P. J. McCart. 1981. Aquatic habitats and fish populations in the vicinity of Petro-Canada's Monkman coal project. Report prepared for Petro-Canada, Calgary, by P. McCart Biological Consultants Limited, Nanaimo, B. C. 163 p.

Mayhood, D. W., and L. D. Corkum. 1981. Chemical and biological monitoring of muskeg drainage at the Alsands project site. Volume 1: Review of available data on the Muskeg River. Alberta Environment Research Management Division Report OF-37. 76 p. + appendix. <u>http://hdl.handle.net/10402/era.25523</u>

Mayhood, D. W., G. L. Walder, T. Dickson, R. B. Green, D. E. Reid and R. Stushnoff. 1981. Chemical and biological monitoring of muskeg drainage at the Alsands project site. Volume 2: Monitoring and fish studies. Alberta Environment Research Management Division Report OF-38. 247 p. + appendices. <u>http://hdl.handle.net/10402/era.25542</u>

Mayhood, D. W. 1981. Chemical and biological monitoring of muskeg drainage at the Alsands project site. Volume 3: Program evaluation and suggestions for continued monitoring. Alberta Environment Research Management Division Report OF-39. 25 p. + appendix. <u>http://hdl.handle.net/10402/era.25532</u>

Mayhood, D. W. 1980. Aquatic analysis, pp. 79-97. *in* Hardy Associates (1978) Ltd. An evaluation of the twinning of the CNR line in Mount Robson Provincial Park. Report prepared for Canadian National Railways, Edmonton. 107 p + appendices.

Mayhood, D. W. 1980. Aquatic analysis, pp. 134-168. *in* Hardy Associates (1978) Ltd. An environmental evaluation of the twinning of the CNR line in Jasper National Park. Report prepared for Canadian National Railways, Edmonton. 172 p. + appendices.

Saunders, R. D., and D. W. Mayhood. 1980. Biological survey of a pond affected by an oil spill near Hussar, Alberta. Report prepared for Sundance Oil (Canada) Limited, Calgary, by Aquatic Environments Limited, Calgary. 21 p.

Mayhood, D. W., and P. J. McCart. 1980. A design for biological monitoring of aquatic habitats in the Cold Lake area. Report prepared for Esso Resources Canada Limited, Calgary, by Aquatic Environments Limited, Calgary. 62 p.

McCart, P. J., D. W. Mayhood, M. L. Jones and G. J. Glova. 1980. Stikine - Iskut fisheries studies. Report prepared for British Columbia Hydro and Power Authority, Vancouver, by P. McCart Biological Consultants Limited, Nanaimo, B. C. 136 p.

Cross, P. M., R. D. Saunders, R. B. Green, D. W. Mayhood and P. J. McCart. 1979. Aquatic habitats and acidification of waters in the vicinity of the Kaybob gas plant. Aquatic Environments Limited report to Hudson's Bay Oil and Gas Limited, Calgary. 163 p.

Mayhood, D. W. 1979. Zooplankton, pp. 136-161, and benthic invertebrates, pp. 162-195. *in* P. J. McCart (ed.) Limnological and fisheries surveys of the aquatic ecosystems at Esso Resources' Cold Lake lease. Report prepared for Esso Resources Canada Limited, Calgary, by Aquatic Environments Limited, Calgary. 267 p.

McCart, P. J., and D. W. Mayhood. 1979. Summary of biological data for the Beaver River in the vicinity of Cold Lake. Report prepared for Esso Resources Canada Limited, Calgary, by Aquatic Environments Limited, Calgary. 41 p.

Den Beste, J., D. Mayhood and S. Olson. 1979. Preliminary fisheries and wildlife investigations of Denison Mines Limited's Belcourt lease. Report prepared for Denison Mines Limited, Vancouver, by Aquatic Environments Limited, Calgary. n. p.

Mayhood, D. W., and R. S. Anderson. 1977. An introductory bibliography of whole-lake, secondary and fish productivity studies. Canadian Wildlife Service Report, Edmonton. 28 p.

Mayhood, D. W., and R. S. Anderson. 1976. Limnological survey of the Lake Louise area, Banff National Park. Part 1: General section. Canadian Wildlife Service Report to Parks Canada, Calgary. 81 p.

Mayhood, D. W., and R. S. Anderson. 1976. Limnological survey of the Lake Louise area, Banff National Park. Part 2: The lakes. Canadian Wildlife Service Report to Parks Canada, Calgary. 273 p. doi:10.13140/2.1.3848.4802

Mayhood, D. W., R. S. Anderson, D. B. Donald and R. B. Green. 1976. Limnological survey of the Lake Louise area, Banff National Park. Part 3: The streams. Canadian Wildlife Service Report to Parks Canada, Calgary. 90 p.

Mayhood, D. W., and R. S. Anderson. 1976. Limnological survey of the Lake Louise area, Banff National Park. Part 4: Production estimates and recommendations. Canadian Wildlife Service Report to Parks Canada, Calgary. 76 p.

Mayhood, D. W. 1974. The limnology and fisheries of Prince Albert National Park, Saskatchewan. 80 p. *in* R. E. Scace (ed.) Prince Albert National Park: a literature review. Report prepared for Parks Canada, Calgary, by R. E. Scace and Associates, Calgary. <u>http://fwresearch.ca/Library\_files/Mayhood%201974.pdf</u>

Mayhood, D. W., A. H. Kooyman, R. L. Hare and R. D. Saunders. 1973. A limnological survey of some waters in southern Prince Albert National Park, Saskatchewan. Canadian Wildlife Service Report. 101 p. + appendices.

Mayhood, D. W., and R. E. Smith. 1972. Biological sampling on the Bow and Pipestone rivers near Lake Louise, Banff National Park, Alberta. Canadian Wildlife Service Report. 43 p.

Kooyman, A. H., and D. W. Mayhood. 1971. A limnological survey of Chiniki Lake, Alberta. Canadian Wildlife Service Report. 17 p.

### **Derivative Publications**

Technical publications by corporate authors and others substantially based on my published and unpublished work.

DFO. 2014. Recovery strategy for the Alberta populations of westslope cutthroat trout (*Oncorhynchus clarkii lewisi*) in Canada [Final]. Species at Risk Act Recovery Strategy Series. Fisheries and Oceans Canada, Ottawa, ON. 28 p. <u>http://publications.gc.ca/collection\_2014/mpo-dfo/En3-4-182-2014-eng.pdf</u>

Cove, T., J. E. Earle, L. Fitch, M. Holder, S. Humphries, E. Kulcsar, B. E. Meagher, C. Pacas, M. Percy, S. Petry, S. Rogers, R. Staniland, D. Wig, and L. Winkel. 2013. Alberta westslope cutthroat trout recovery plan 2012 – 2017. Publication No: I/604, Alberta Environment and Sustainable Resource Development, Alberta Species at Risk Recovery Plan No. 28, Edmonton, AB. ix+77 p. <u>http://srd.alberta.ca/FishWildlife/SpeciesAtRisk/SpeciesAtRiskPublications-WebResources/Fish/documents/SAR-WestslopeCutthroatTrout-RecoveryPlan-A-Mar2013.pdf</u>

DFO. 2009. Recovery potential assessment of pure native westslope cutthroat trout, Alberta population. Department of Fisheries and Oceans Canadian Science Advisory Secretariat, Science Advisory Report 2009/050. Available from: <a href="http://www.dfo-mpo.gc.ca/csas">www.dfo-mpo.gc.ca/csas</a>

Anonymous. 2005. The waters of Y2Y. Yellowstone to Yukon Conservation Initiative, Canmore, AB. Map. 1 p. Available from: <u>http://www.y2y.net</u>

Mahr, M. 1999. Y2Y aquatics strategy workshop. Flathead Lake Biological Station, MT USA. 20-22 August, 1999. Yellowstone to Yukon Conservation Initiative, 710 Ninth Street, Studio B, Canmore, AB T1W 2V7. 37 p. Available from: http://www.y2y.net

Anonymous. 1995. Fish. pp. 23-26. *in* White, C., D. Gilbride, M. Scott-Brown. and C. Stewart. Atlas of the Central Rockies Ecosystem: towards an ecologically-sustainable landscape. Status report to the Central Rockies Ecosystem Interagency Liaison Group (CREILG) prepared by Komex International Ltd., Calgary, AB. ii+49 p.

Pharis, V. 1994. A glacial relict with a preglacial fish assemblage: Tutizzi Lake. Global Biodiversity 3(4):26–27.

### **Caitlyn T. Anderson**

From: Sent: To: Subject: Attachments:

June 22, 2021 7:23 AM Legislative Services Shared [EXTERNAL] - Bylaw C-8073-2020: Burnco West Cochrane Pit application Soil column experiment\_JFennell\_June 18\_2021 Rev 1.pdf; Appendix 2\_C130760V3R-R2021-05-31\_15-07-08\_R006-redacted.pdf; 2021-06-05 Exec Summary of scientific experiment by Dr. Jon Fennell.pdf

### Do not open links or attachments unless sender and content are known.

Respected Council Members;

My name is Dr. Jon Fennell. I am a professional hydrogeologist and geochemist registered with APEGA, and have been practicing for over 30 years (both locally and internationally). I was recently asked by a group of local landowners located near the proposed West Cochrane Pit to review Burnco's application. Specifically, I was asked to review the groundwater aspects of this proposed development and the risks to local water resources. Based on work done by Matrix in support of Burnco's application it is clear that Grand Valley Creek, Beaupre Creek, and the Bow River will be receiving entities to any contaminants released during and after this massive development. Although baseline work has been done to understand the groundwater quality pre-development, <u>nothing</u> has been done to assess the risk that stripping of the topsoil and removal of a large amount of gravel will pose to local water bodies and/or water wells.

The assumption that has consistently been made by many is that gravel extraction will not affect local groundwater quality to any degree. To test the validity of that assumption I was asked to perform an scientific experiment to mimic what might occur after a large thickness of the gravel deposit is removed from the area and a thin veneer is left above the fractured bedrock. I have attached a report I prepared for the group summarizing the results of that experiment, as well as the Certificate of Analysis from the contracted lab (Bureau Veritas), and an Executive Summary. I request that your read these documents – at least the short 1-page Executive Summary prepared by the group.

To summarize through, after flowing laboratory-grade, filtered and purified deionized water through a 1.2m soil column (to mimic snowmelt and rainfall infiltrating through a thin veneer of remaining gravel) the results were not consistent with assumption that minimal change will occur. In fact the water contained:

- high levels of turbidity (over 500 times higher than expected background) and
- concentrations of harmful trace elements like arsenic, chromium, and lead (among other things) well in excess of Alberta's guidelines to protect freshwater aquatic life as well as drinking water.

This compromised water would be flowing into fractured bedrock with limited ability to filter out these contaminant before they reached a receptor like Grand Valley Creek, or the Bow River. The concern here, as it is with all gravel pits, is that this aspect has never really been studied before, yet the results are striking and should give cause for concern.

Considering the scale of this development and the proximity to local creeks and the Bow River (that support critical habitat for fish species and provide drinking water for downstream communities) a proper risk assessment should have been conducted by the applicant. Unfortunately, this was <u>not</u> done. And this now places the RVC council members in a disadvantaged position. Having to make a land use decision like this, that will permanently alter the landscape along a picturesque highway and place the environment at risk with less than all the facts is, frankly, unacceptable. And given the results of the soil column experiment, which is **direct evidence** that mobilization of harmful contaminants **is possible**, a more in-depth and proper risk review should be required before any further development is considered.

#### ATTACHMENT 'E': PUBLIC SUBMISSIONS

## E-1 - Attachment E Page 161 of 252

Although all of this may run counter to what Burnco or others who support then feel is necessary (or may be required to do under the currently "limited" guidelines or directives for this activity), what they are asking of the council members is to approve something with less than all the facts. As a resident and tax payer in Rocky View County my request to you is that you consider the possible consequences of this proposed development before you make a final decision. More work is needed to cover off the potential risk associated with this massive land disturbance and ensure that an everyone, and everything, that will be impacted are properly protected. This might mean a different type of development – maybe smaller, maybe phased with performance criteria before further development is approved. It might mean no development if the risk is too high. Whatever the course, what is certainly required is a due diligence to ensure that long-lasting, unintended consequences do not occur as a result of this and other similar developments.

If you have any questions you may contact me at your convenience.

Respectfully,

June 18, 2021

Attention: To whom it may concern

## Re: West Cochrane Pit soil column flushing experiment

The following is a summary of the experiment conducted on a sample of sand and gravel obtained from Burnco's currently operating West Cochrane Pit, located approximately 7 km west on Highway 1A from the Highway 1A/22 intersection. The purpose of this test was to assess the possible physical and chemical changes that may occur to water (i.e. precipitation) flowing through these sediments, both during and after development, and entering the local groundwater.

## **Methodology**

A sample of sand and gravel was procured from the Burnco West Cochrane Pit for testing. Once delivered, a subset of that sand and gravel was placed in a newly purchased, and cleaned, plastic 20L pail for delivery to the point of testing. On 08 May 2021 a representative aliquot of the sand and gravel, comprising a mixture of clay, silt, sand and cobbles, was loaded into a pre-cleaned 1.5 m x 51 mm ID PVC pipe to mimic a vertical soil column beneath the Burnco pit area. A pre-cleaned plastic container was used to load the sample into the PVC pipe to avoid the use of any metallic equipment. Prior to loading the sample, the base of the PVC pipe was covered with clean fibreglass mesh to retain the soil sample the pipe. Once in place, settling of the sediment was achieved by tapping the outside of the pipe with a small hammer to compact the material towards natural in-situ conditions.

Laboratory-grade deionized water was obtained from the contacted laboratory (Bureau Veritas, BV) to react with the soil mixture in the column. Prior to adding the deionized water, the length of the sediment column was measured

1 | Page

## E-1 - Attachment E Page 163 of 252

indicating a 1.25 m vertical thickness. When ready the soil column was slowly hydrated with the deionized water to mimic infiltration of precipitation. Once the water began draining from the base of the PVC pipe, unfiltered samples were collected into bottles provided by BV (i.e. HDPE and glass, where required).

An initial set of samples (Soil flush #1) was collected on 08 May 2021 at 11:30AM. Once obtained and properly labelled the samples were placed in a refrigerator. The soil column was then allowed to drain over-night and a second set of samples (Soil flush #2) was collected the following day, 09 May 2021 at 10:45AM, using the same deionized water flow-through procedure.



Figure 1. Experimental setup, execution, and sample turbidity noted.

Upon completion of testing, both sample sets were placed in an ice-filled cooler to maintain their integrity while in transit to BV in northeast Calgary AB. Stand chainof-custody (CoC) protocols were followed to track the shipping and handling process. Delivery was made within 48 hours for the first set of samples, and 24 hrs for the second set. A copy of the completed CoC is provided in Appendix 1. During the testing procedure, photographs were taken to document the process. Visual turbidity of the samples was noted at the time, as indicated in the photographs provided in Figure 1.

## **Analytical program**

A relatively comprehensive analytical program was executed to assess changes to the deionized water quality following its transit through the soil column. Analysis was completed for the following:

- pH, alkalinity, and hardness,
- major ions (calcium, magnesium. sodium, potassium, bicarbonate + carbonate, sulphate, and chloride),
- nitrate and nitrite,
- metals and trace elements (including mercury), and
- turbidity.

All samples were received in good order, as documented by BV on the CoC. Sample temperatures were logged in at less than the require 10°C threshold and were received within the required time limit for sensitive parameters including turbidity and nitrate+ nitrite. The high quality of the deionized water was confirmed by BV (Appendix 1). A Certificate of Analysis for the two tests was also provided (Appendix 2).

## **Results**

As noted in Appendix 1, the deionized water used for the testing was devoid of any particulate or dissolved constituents, much like natural precipitation. Measurement with a hand-held TDS meter confirmed a "zero" mineralization. The pH and temperature were also measured at the time of testing with a combination

3 | Page

hand-held meter and returned values of 5 to 6 and 13°C to 14°C, respectively, on both days.

After confirming the starting conditions of the deionized water, the water was slowly flowed through the sediment column. Samples collected from the base were very different in appearance compared to the water that was added at the top. Of particular note was the colour and turbidity as indicated in the lower right image of Figure 1. The occurrence of such turbidity is surprising considering the assumption often made that fine particles will be strained or filtered out as the water flows through the subsurface. However, this was obviously not the case. Measured values for Soil flush #1 and Soil flush #2 were >4000 NTU and 1600 NTU, respectively (Appendix 2).

In addition to turbidity, the chemical quality of the deionized water was also notably changed after reacting with the soil mixture. For example, the total dissolved solids (TDS) content increased from a pre-test value of 0 mg/L to 47 mg/L for Soil flush #1 and to a value of 39 mg/L for Soil flush #2. The laboratory pH also increased significantly to 9.1 for both tests. This represents a change from mildly acidic to alkaline conditions following a rather short reaction time, and is indicative rapid reactions occurring as the water flowed through the soil mixture (e.g. ion exchange).

Prior to conducting further data evaluation a check on the correctness of analysis was performed. This included a review of the anion-cation charge balance to confirmed acceptability. The values obtained for both samples (-1.1% and 1.9%, respectively) were within the recommended standard of  $\pm 2\%^1$ . An additional test was performed where the ratio of reported TDS versus calculated TDS was assessed. The range of acceptability is between 1.0 to 1.2<sup>1</sup>, and the values obtained for the two soil flush tests were 1.01 and 1.00, respectively. Based on these confirmations the results from both tests were considered acceptable for further evaluation.

Other changes that occurred to the deionized water were less visual and more chemical in nature, with some of the constituents returning values in excess of

<sup>&</sup>lt;sup>1</sup> Standard Methods for the Examination of Water and Wastewater

published water quality criteria. The criteria used for comparison in this study included:

- Alberta Tier 1 Soil and Groundwater Remediation Guidelines for agricultural land (Alberta Government 2019)
- Environmental Quality Guidelines for Alberta Surface Waters for the protection of freshwater aquatic life - FWAL (Alberta Government 2018)
- Guidelines for Canadian Drinking Water Quality CDWQ (Health Canada 2020)

The following table summarizes a number of parameters in the soil flush effluent that exhibited values in excess of the above-noted criteria:

| Parameter        | Soil flush<br>#1 | Soil flush<br>#2 | AB Tier<br>1       | AB<br>FWAL         | CDWQ            |
|------------------|------------------|------------------|--------------------|--------------------|-----------------|
| Turbidity (NTU)  | >4000            | 1600             |                    | 2                  | 1               |
| Aluminum (mg/L)  | 6.1              | 4.0              | 0.0                | 05                 | <0.1 og         |
| Arsenic (mg/L)   | 0.019            | 0.009            | 0.005              | 0.005              | 0.010 alara     |
| Cadmium (µg/L)   | 0.53             | 0.44             | 0.3                | 34*                |                 |
| Chromium (mg/L)  | 0.013            | 0.020            | 0.001+<br>0.0049++ | 0.001+<br>0.0089++ | 0.05 мас        |
| Cobalt (mg/L)    | 0.0095           | 0.0071           | 0.00               | )15*               |                 |
| Copper (mg/L)    | 0.0150           | 0.0097           | 0.0070             | 0.0390             | 2 AO            |
| lron (mg/L)      | 17               | 12               | 0                  | .3                 | ≤ <b>0.3</b> ao |
| Lead (mg/L)      | 0.010            | 0.0073           | 0.0                | 07*                | 0.005 alara     |
| Manganese (mg/L) | 0.81             | 0.74             | 0.05               |                    | 0.12 мас        |
| Zinc (mg/l)      | 0.120            | 0.073            | 0.0                | )30                | 5.0 AO          |

Notes:

1. Values indicated for protection of freshwater aquatic life relate to long-term exposure.

- 2. Metals and trace elements are reported as "Total". Guidelines for aluminum and iron relate to the "Dissolved" forms.
- 2. \* Assumes a groundwater hardness of 250 mg/L (as CaCO<sub>3</sub>).
- 3. + = hexavalent; ++ = trivalent.
- 4. MAC = maximum acceptable value; ALARA = as low as reasonably achievable; AO = aesthetic value; OG = operational guidance value.

Measured values for the other constituents analyzed are provided in Appendix 2. However, those listed in the preceding table represent the most notable in terms of risk to human and ecological receptors.

## **Discussion**

The proposed development of the West Cochrane Pit by Burnco will significantly, and permanently, alter the natural landscape of this picturesque area. Although Burnco indicates that the anticipated change to the local groundwater and surface water will be negligible, that claim has not actually been substantiated. Baseline groundwater quality was established by Burnco back in 2018, but no follow-up water quality monitoring has been communicated since. This includes in and around the currently operating pit area, which was commissioned following the 2018 program.

In light of the results generated by this experiment, concern exists that particulate matter and dissolved constituents will be mobilized from disturbed areas into the local groundwater and any receiving water bodies. Given the range of hydraulic conductivity values measured for the sand and gravel at the site (pdf page 773-75 of the Burnco's MSDP: 4.8 to 25.6 m/d), a calculated lateral hydraulic gradient of 0.028 from the Matrix's supporting report, and an assumed effective porosity of 30%, the flow of groundwater beneath the site could range anywhere from around 150 m/yr to more than 600 m/yr (depending on local conditions). Therefore the transit time for a substance released to reach a receptors would be relatively short at less than a year to perhaps a year or so.

Stripping of the overlying topsoil and removal of a substantial amount of the sand and gravel beneath will inevitably reduce the filtering capacity of the subsurface and allow contaminants that occur during the mining process (natural or other) to move more quickly down to the water table. This is shown in conceptual manner in Figure 2 on the following page, and is reinforced by a statement made by Matrix Solutions in an excerpt from Burnco's 2020 Master Site Development Plan (MSDP pdf page 682 of 1882):

The removal of the silty clay (where present) at site, will remove a natural barrier to potential contamination of the groundwater from surface spills. Any contaminant spilled at surface during or after operations would preferentially flow either vertically through the porous gravel and bedrock to the water table or along preferentially pathways (secondary permeability/fractures) in the bedrock. From below the water table it would follow groundwater flow direction (south to southeast), likely ending up in the Grande Valley Creek, Beaupré Creek, and the Bow River. Any contamination could potentially flow into the underlying bedrock, posing a risk to any residential well users in the area.





Recharging precipitation (snow melt or rain) entering the subsurface will enhance the ability to move particulate and dissolved matter into the groundwater. By removing the filtering capacity of sediment this will only exacerbate the situation. It is clear from this experiment that turbidity can be mobilized by flushing water thought a 1.25 m soil column, not to mention notable changes to the chemical quality of the effluent.

The findings of this study suggest that the action of mining gravel from a very large development area will ultimately expose the remaining sand and gravel, as

7 | Page

well as the underlying bedrock aquifers, to weathering reactions and enhanced flushing by annual snow melt and rainfall events.

As such, any contaminants (solid or dissolved) mobilized and flushed from these exposed sediments will increase the risk of impact to the local environment. Proximity to receptors will be a major factor, not to mention how the mobilized contaminants move through the subsurface. However, this aspect has not been assessed by Burnco, making any statements about risk very difficult, if not impossible. The receptors at greatest risk include:

- local springs and water wells,
- Grand Valley Creek,
- Beaupre Creek, and
- the Bow River.

With the exception of the Bow River, most of the local surface water features in the study area are not believed to be fish-bearing. However, they do likely have environments that will sustain aquatic habitat that supports downstream aquatic systems. From a federal *Fisheries Act* perspective this is pertinent. The potential introduction of harmful constituents into aquatic systems is an obvious threat, and the waters from the site eventually drain into the fish-bearing Bow River. The Bow River is also used as a source of drinking water by the Town of Cochrane, as well as Calgary, so some assessment of the potential discharge of harmful substances into the river should have been conducted. However, it was not.

The turbidity guideline for protection of aquatic life in Alberta requires that the maximum long-term average for "clear" water systems, like the West Cochrane Pit area, be kept within 8 NTU above background values for any short-term exposure (e.g. up to 24 hours). Over the longer-term the increase should be no more than 2 NTU above background levels (Alberta Government 2018).

The way in which Burnco mines the sand and gravel deposit will also dictate the end result regarding risk to the local groundwater and connected systems. It is understood that a thin veneer of sand and gravel deposit will be left in place. All of this granular material rests in contact with fractured bedrock as noted in Burnco's MSDP, submitted in June 2020. Based on the findings of this study, mobilization of turbidity from any residual sand and gravel left above the bedrock is a risk. Once in the fractured bedrock it will have a reduced chance of being attenuated, as fracture flow is very different than flow though porous media. Again, this aspect was not assessed.

If Burnco decides to operate a wet pit instead, and mine below the water table without dewatering, this will likely occur via bailing operations. The effect of this extraction method will be to create very turbid water due to the churning action of the excavation equipment. Again, the migration of mobilized particulate matter through the sediments is likely. Mobilization of turbidity in local groundwater has been documented before, with measurable effects being noted as far as 1.8 km downgradient. The following quote is taken from a report authored by Mead (1995):

"This DEQ [Department of Environmental Quality] study found a turbidity plume that extended more than a mile to the north (downgradient) of the gravel operation. The average turbidity of the water being discharged from the washing operation into the pond at the site was 2,737 nephelometric turbidity units (NTUs). Nearly all wells sampled within the first 6,000 feet of the turbidity plume were measured at 5 NTU or more. Many wells within the first 3,000 feet of the plume had turbidity levels of 10 NTU or more. Nearly all wells outside the plume had turbidities of 2 NTU or less."

Additionally, the release of harmful metals and trace elements is a concern. This is not only associated with the type of metal or trace element mobilized, like arsenic or lead, but also the form it takes when present in the water. Given the anticipated groundwater conditions beneath the Burnco development area (i.e. well oxygenated and at a pH of 7 to 8, as noted on pdf page 699 in Burnco's MSDP) the speciation of chromium, for example, would favour the more mobile chromate ion (i.e.  $CrO_{4^2}$ ).

When present as chromate, and at the groundwater conditions described previously, it will be present in the hexavalent form (the more toxic form). This is shown in the Eh-pH diagram provided in Figure 3. Hexavalent chromium is a highly toxic species, and can influence aquatic life at values as low as 0.001 mg/L. The

other metals and trace elements noted in the summary table on page 5 will have their own unique toxicity and mobility characteristics.



**Figure 3.** Eh-pH diagrams for chromium<sup>2</sup>. Note: red shaded area represents conditions expected in well-oxygenated groundwater system.

Unfortunately, none of the required information to assess this aspect has been provided. In fact, there is no monitoring data available for any of the wells around the working gravel pit to determine what constituents may have been mobilized so far. The only location assessed for metals and trace elements back in 2018 was a monitoring well located upgradient of the operating pit and adjacent to Highway 1A, that being MW18-02(B2).

The concern with the Burnco's current application to Rocky View County is that it does nothing to assess the impacts to groundwater and connected surface water environments that could occur around a working gravel pit. Although there are monitoring wells established around the current open pit, no up-to-date information is available to assess what has occurred since commissioning of that pit. Of equal importance is the lack of assessment done to determine what the full impact of the

<sup>&</sup>lt;sup>2</sup> Geological Survey of Japan

West Cochrane Pit will look like once development is complete and reclamation has occurred.

Given the results of this soil column test there should be cause for concern. The pit mining activities will be located very close to aquatic receptors and therefore pose a threat to their existence and future viability. At the very least Burnco should be required to conduct a proper risk assessment and account for the potential mobilization, transport, and fate of contaminants like the ones documented in this experiment. It would also be informative for Burnco to assess conditions around their existing West Cochrane Pit via the series of dedicated monitoring wells installed there. This should include a proper assessment of water quality and geochemical conditions to better understand the risks involved if mining is to be extended across the larger proposed development area. Unfortunately, none of this work has been completed or provided for decision makers to rely on. This begs the questions:

"To what degree will Burnco's proposed development impact the groundwater quality across the larger area?"

and

"How will this impact downgradient receptors like Grand Valley Creek, Beaupre Creek, and ultimately the Bow River?"

## <u>Closure</u>

This report has been prepared to summarize results of a soil column flushing experiment designed to mimic infiltration of snowmelt and rainwater through sand and gravel deposits beneath the West Cochrane Pit area. The content is meant to inform decision makers so that unintended consequences to the environment and downstream communities can be avoided. If there are any questions regarding the methodology or interpretation of findings provided herein, the reader should contact the undersigned for clarification.

Respectfully submitted by:



## **References**

Alberta Government (2018). Environmental Quality Guidelines for Alberta Surface Waters. Water Policy Branch, Alberta Environment and Parks, March 28, 2018, ISBN (PDF) 978-1-4601-3873-1, 58 pp. <u>https://open.alberta.ca/publications/9781460138731</u>

Alberta Government (2019). Alberta Tier 1 Soil and Groundwater Remediation Guidelines. AEP, Land Policy, 2019, No. 1, ISBN 978-1-4601-2695-0, <u>https://open.alberta.ca/dataset/842becf6-dc0c-4cc7-8b29-</u> <u>e3f383133ddc/resource/a5cd84a6-5675-4e5b-94b8-</u> 0a36887c588b/download/albertatier1guidelines-jan10-2019.pdf

Burnco Rock Products Ltd. (2020). Land Use Redesignation Application: Project Activities Plan - Master Site Development Plan, West Cochrane Gravel Pit. Prepared for submission to the Rocky View County for consideration and approval, 1882 pp.

Geological Survey of Japan (2005). Atlas of Eh-pH diagrams: Intercomparison of thermodynamic databases, Open File Report No.419, National Institute od Advanced Industrial Science and Technology – Research Center for Deep Geological Environments, 287 pp, https://www.nrc.gov/docs/ML1808/ML18089A638.pdf.

Health Canada (2020). Guidelines for Canadian Drinking Water

Health Canada (2020). Guidelines for Canadian Drinking Water Quality – Summary Table. Prepared in collaboration with the Federal-Provincial-Territorial Committee on Drinking Water of the Federal-Provincial-Territorial Committee on Health of the Environment, September 2020, 28 pp. <u>https://www.canada.ca/en/healthcanada/services/environmental-workplace-health/reports-publications/waterquality/guidelines-canadian-drinking-water-quality-summary-table.html</u>

Mead R.D. (1995). The Direct and Cumulative Effects of Gravel Mining on Groundwater within Thurston County, Washington. Ground Water Management Program, Environmental Health Division, Thurston County Public Health and Social Services Department, Appendix A of Technical Memorandum #33 (August 2018), 65 pp. <u>https://www.thurstoncountywa.gov/planning/planningdocuments/3%20-</u> <u>%20Tech%20Memo%2033%20-</u>

%20Hydrogeologic%20review%20of%20Mineral%20Extraction%20Code%2008152018.p

# <u>Websites</u>

Standard Methods for the Examination of Water and Wastewater, accessed May 24, 2021, pdf page 39 of 541, https://beta-static.fishersci.com/content/dam/fishersci/en\_US/documents/programs/scientific/technical-documents/white-papers/apha-water-testing-standard-methods-introduction-white-paper.pdf

14 | Page

# **APPENDIX 1**

Deionized water quality (from Bureau Veritas):

## ATTACHMENT 'E': PUBLIC SUBMISSIONS

| QA/QC Batch | QC Type      | Parameter                    | Date Analyzed | Value    | UNITS      |
|-------------|--------------|------------------------------|---------------|----------|------------|
|             |              |                              |               |          |            |
| A221986     | Method Blank | Turbidity                    | 2021/05/12    | <0.10    | NTU        |
|             |              | Total Mercury (Hg)           | 2021/05/12    | <0.0019  | ug/L       |
|             |              | Total Barium (Ba)            | 2021/05/16    | <0.010   | mg/L       |
|             |              | Total Boron (B)              | 2021/05/16    | <0.020   | mg/L       |
|             |              | Total Calcium (Ca)           | 2021/05/16    | <0.30    | mg/L       |
|             |              | Total Iron (Fe)              | 2021/05/16    | <0.060   | mg/L       |
|             |              | Total Lithium (Li)           | 2021/05/16    | <0.020   | mg/L       |
|             |              | Total Magnesium (Mg)         | 2021/05/16    | <0.20    | mg/L       |
|             |              | Total Manganese (Mn)         | 2021/05/16    | <0.0040  | mg/L       |
|             |              | Total Phosphorus (P)         | 2021/05/16    | <0.10    | mg/L       |
|             |              | Total Potassium (K)          | 2021/05/16    | <0.30    | mg/L       |
|             |              | Total Silicon (Si)           | 2021/05/16    | <0.10    | mg/L       |
|             |              | Total Sodium (Na)            | 2021/05/16    | <0.50    | mg/L       |
|             |              | Total Strontium (Sr)         | 2021/05/16    | <0.020   | mg/L       |
|             |              | Total Sulphur (S)            | 2021/05/16    | <0.20    | mg/L       |
|             |              | Total Aluminum (Al)          | 2021/05/14    | <0.0030  | mg/L       |
|             |              | Total Antimony (Sb)          | 2021/05/14    | <0.00060 | mg/L       |
|             |              | Total Arsenic (As)           | 2021/05/14    | <0.00020 | mg/L       |
|             |              | Total Beryllium (Be)         | 2021/05/14    | <0.0010  | mg/L       |
|             |              | Total Chromium (Cr)          | 2021/05/14    | <0.0010  | mg/L       |
|             |              | Total Cobalt (Co)            | 2021/05/14    | <0.00030 | mg/L       |
|             |              | Total Copper (Cu)            | 2021/05/14    | <0.00020 | mg/L       |
|             |              | Total Lead (Pb)              | 2021/05/14    | <0.00020 | mg/L       |
|             |              | Total Molybdenum (Mo)        | 2021/05/14    | <0.00020 | mg/L       |
|             |              | Total Nickel (Ni)            | 2021/05/14    | <0.00050 | mg/L       |
|             |              | Total Selenium (Se)          | 2021/05/14    | <0.00020 | mg/l       |
|             |              | Total Silver (Ag)            | 2021/05/14    | <0.00010 | mg/l       |
|             |              | Total Thallium (TI)          | 2021/05/14    | <0.00010 | mg/l       |
|             |              | Total Tin (Sn)               | 2021/05/14    | <0.0010  | mg/l       |
|             |              | Total Titanium (Ti)          | 2021/05/14    | <0.0010  | mg/l       |
|             |              | Total Uranium (II)           | 2021/05/14    | <0.0010  | mg/l       |
|             |              | Total Vanadium (V)           | 2021/05/14    | <0.00010 | mg/L       |
|             |              | Total Zinc (Zn)              | 2021/05/14    | <0.0010  | mg/l       |
|             |              | Dissolved Sedium (No)        | 2021/05/14    | <0.0030  | 0/         |
|             |              | Dissolved Calcium (Na)       | 2021/05/13    | <0.20    | /0<br>mg/l |
|             |              | Dissolved Iron (5a)          | 2021/05/12    |          | mg/L       |
|             |              |                              | 2021/05/13    | <0.060   | mg/L       |
|             |              | Dissolved Managerson (Mg)    | 2021/05/13    | <0.0040  | mg/L       |
|             |              | Dissolved Ivianganese (IVIn) | 2021/05/13    | <0.0040  | mg/L       |
|             |              | Dissolved Folassium (K)      | 2021/05/13    | <0.50    | mg/L       |
|             |              | Dissolved Sodium (Na)        | 2021/05/13    | <0.50    | ing/L      |
|             |              | Dissolved Calcium (Ca)       | 2021/05/13    | <0.30    | rng/L      |
|             |              | Dissolved Iron (Fe)          | 2021/05/13    | <0.060   | mg/L       |
|             |              | Dissolved Magnesium (Mg)     | 2021/05/13    | <0.20    | mg/L       |
|             |              | Dissolved Manganese (Mn)     | 2021/05/13    | <0.0040  | mg/L       |
|             |              | Dissolved Potassium (K)      | 2021/05/13    | <0.30    | mg/L       |
|             |              | Dissolved Sodium (Na)        | 2021/05/13    | <0.50    | mg/L       |
|             |              | Dissolved Nitrite (N)        | 2021/05/12    | <0.010   | mg/L       |
|             |              | Alkalinity (PP as CaCO3)     | 2021/05/14    | <1.0     | mg/L       |
|             |              | Conductivity                 | 2021/05/14    | <2.0     | uS/cm      |
|             |              | Dissolved Chloride (Cl)      | 2021/05/14    | <1.0     | mg/L       |

# **APPENDIX 2**

(see attached PDF)

17 | Page

Page 242 of 719



Your C.O.C. #: 635648-01-01

### Attention: John Fennell

COMMERCIAL ACCOUNTS - CALGARY BUREAU VERITAS CANADA (2019) INC. 4000 19th Street NE Calgary, AB CANADA T2E 6P8

> Report Date: 2021/05/31 Report #: R3026392 Version: 3 - Revision

### **CERTIFICATE OF ANALYSIS – REVISED REPORT**

### BV LABS JOB #: C130760

Received: 2021/05/10, 08:10

Sample Matrix: Water # Samples Received: 2

|                                            |          | Date       | Date       |                                 |                      |
|--------------------------------------------|----------|------------|------------|---------------------------------|----------------------|
| Analyses                                   | Quantity | Extracted  | Analyzed   | Laboratory Method               | Analytical Method    |
| Alkalinity @25C (pp, total), CO3,HCO3,OH   | 2        | N/A        | 2021/05/14 | AB SOP-00005                    | SM 23 2320 B m       |
| Cadmium - low level CCME (Total)           | 2        | N/A        | 2021/05/14 |                                 | Auto Calc            |
| Chloride/Sulphate by Auto Colourimetry     | 2        | N/A        | 2021/05/15 | AB SOP-00020                    | SM23-4500-Cl/SO4-E m |
| Conductivity @25C                          | 2        | N/A        | 2021/05/14 | AB SOP-00005                    | SM 23 2510 B m       |
| Hardness                                   | 1        | N/A        | 2021/05/14 |                                 | Auto Calc            |
| Hardness                                   | 1        | N/A        | 2021/05/16 |                                 | Auto Calc            |
| Mercury (Total) by CV                      | 1        | 2021/05/12 | 2021/05/12 | AB SOP-00084                    | BCMOE BCLM Oct2013 m |
| Elements by ICP-Dissolved-Lab Filtered (1) | 2        | N/A        | 2021/05/13 | AB SOP-00042                    | EPA 6010d R5 m       |
| Elements by ICP - Total                    | 2        | 2021/05/12 | 2021/05/16 | AB SOP-00014 / AB SOP-<br>00042 | EPA 6010d R5 m       |
| Elements by ICPMS - Total                  | 2        | 2021/05/12 | 2021/05/13 | AB SOP-00014 / AB SOP-<br>00043 | EPA 6020b R2 m       |
| Ion Balance                                | 1        | N/A        | 2021/05/15 |                                 | Auto Calc            |
| Ion Balance                                | 1        | N/A        | 2021/05/16 |                                 | Auto Calc            |
| Sum of cations, anions                     | 1        | N/A        | 2021/05/14 |                                 | Auto Calc            |
| Sum of cations, anions                     | 1        | N/A        | 2021/05/16 |                                 | Auto Calc            |
| Nitrate and Nitrite                        | 2        | N/A        | 2021/05/14 |                                 | Auto Calc            |
| NO2 - NO2 + NO3 (N) in Water               | 2        | N/A        | 2021/05/12 | AB SOP-00091                    | SM 23 4500 NO3m      |
| Nitrate (as N)                             | 2        | 2021/05/11 | 2021/05/14 |                                 | Auto Calc            |
| pH @25°C (2)                               | 2        | N/A        | 2021/05/14 | AB SOP-00005                    | SM 23 4500-H+B m     |
| Total Dissolved Solids (Calculated)        | 1        | N/A        | 2021/05/15 |                                 | Auto Calc            |
| Total Dissolved Solids (Calculated)        | 1        | N/A        | 2021/05/16 |                                 | Auto Calc            |
| Turbidity                                  | 2        | N/A        | 2021/05/12 | CAL SOP-00081                   | SM 23 2130 B m       |

#### Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement



Your C.O.C. #: 635648-01-01

Attention: John Fennell COMMERCIAL ACCOUNTS - CALGARY BUREAU VERITAS CANADA (2019) INC. 4000 19th Street NE Calgary, AB CANADA T2E 6P8

> Report Date: 2021/05/31 Report #: R3026392 Version: 3 - Revision

### **CERTIFICATE OF ANALYSIS – REVISED REPORT**

### BV LABS JOB #: C130760

### Received: 2021/05/10, 08:10

Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

\* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Dissolved > Total Imbalance: When applicable, Dissolved and Total results were reviewed and data quality meets acceptable levels unless otherwise noted. (2) The CCME method requires pH to be analysed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are

reported past the CCME holding time. Bureau Veritas Laboratories endeavours to analyze samples as soon as possible after receipt.





Please direct all questions regarding this Certificate of Analysis to your Project Manager. Customer Solutions, Western Canada Customer Experience Team Email: customersolutionswest@bureauveritas.com Phone# (403) 291-3077

-----

BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



COMMERCIAL ACCOUNTS - CALGARY BUREAU VERITAS CANADA (2019) INC.

### **ROUTINE WATER -LAB FILTERED (WATER)**

| BV Labs ID                                               |       | ZT5148              | ZT5149              |        |
|----------------------------------------------------------|-------|---------------------|---------------------|--------|
| Sampling Date                                            |       | 2021/05/08<br>11:30 | 2021/05/09<br>10:45 |        |
| COC Number                                               |       | 635648-01-01        | 635648-01-01        |        |
|                                                          | UNITS | SOIL FLUSH<br>#1    | SOIL FLUSH<br>#2    | RDL    |
| Calculated Parameters                                    |       |                     |                     |        |
| Anion Sum                                                | meq/L | 0.93                | 0.81                | N/A    |
| Cation Sum                                               | meq/L | 0.91                | 0.78                | N/A    |
| Hardness (CaCO3)                                         | mg/L  | 39                  | 35                  | 0.50   |
| Ion Balance (% Difference)                               | %     | NC                  | NC                  | N/A    |
| Dissolved Nitrate (N)                                    | mg/L  | 0.10                | 0.058               | 0.010  |
| Dissolved Nitrate (NO3)                                  | mg/L  | 0.45                | 0.26                | 0.044  |
| Dissolved Nitrite (NO2)                                  | mg/L  | <0.033              | <0.033              | 0.033  |
| Calculated Total Dissolved Solids                        | mg/L  | 47                  | 39                  | 10     |
| Misc. Inorganics                                         |       |                     |                     |        |
| Conductivity                                             | uS/cm | 89                  | 76                  | 2.0    |
| рН                                                       | рН    | 9.15                | 9.11                | N/A    |
| Anions                                                   |       |                     |                     |        |
| Alkalinity (PP as CaCO3)                                 | mg/L  | 3.5                 | 3.8                 | 1.0    |
| Alkalinity (Total as CaCO3)                              | mg/L  | 34                  | 33                  | 1.0    |
| Bicarbonate (HCO3)                                       | mg/L  | 32                  | 31                  | 1.0    |
| Carbonate (CO3)                                          | mg/L  | 4.2                 | 4.6                 | 1.0    |
| Hydroxide (OH)                                           | mg/L  | <1.0                | <1.0                | 1.0    |
| Dissolved Chloride (Cl)                                  | mg/L  | 2.8                 | 1.7                 | 1.0    |
| Dissolved Sulphate (SO4)                                 | mg/L  | 8.4                 | 4.7                 | 1.0    |
| Nutrients                                                |       |                     |                     |        |
| Dissolved Nitrite (N)                                    | mg/L  | <0.010              | <0.010              | 0.010  |
| Dissolved Nitrate plus Nitrite (N)                       | mg/L  | 0.10                | 0.058               | 0.010  |
| Lab Filtered Elements                                    |       |                     |                     |        |
| Dissolved Calcium (Ca)                                   | mg/L  | 4.8                 | 4.5                 | 0.30   |
| Dissolved Iron (Fe)                                      | mg/L  | <0.060              | <0.060              | 0.060  |
| Dissolved Magnesium (Mg)                                 | mg/L  | 6.6                 | 5.6                 | 0.20   |
| Dissolved Manganese (Mn)                                 | mg/L  | <0.0040             | <0.0040             | 0.0040 |
| Dissolved Potassium (K)                                  | mg/L  | 1.4                 | 1.2                 | 0.30   |
| Dissolved Sodium (Na)                                    | mg/L  | 2.1                 | 1.4                 | 0.50   |
| RDL = Reportable Detection Limit<br>N/A = Not Applicable |       |                     |                     |        |



COMMERCIAL ACCOUNTS - CALGARY BUREAU VERITAS CANADA (2019) INC.

### **REGULATED METALS (CCME/AT1) - TOTAL**

| BV Labs ID                   |       | ZT5148       | ZT5149       |         |
|------------------------------|-------|--------------|--------------|---------|
| Compling Data                |       | 2021/05/08   | 2021/05/09   |         |
|                              |       | 11:30        | 10:45        |         |
| COC Number                   |       | 635648-01-01 | 635648-01-01 |         |
|                              |       | SOIL FLUSH   | SOIL FLUSH   | RDI     |
|                              | UNITS | #1           | #2           |         |
| Elements                     |       |              |              |         |
| Total Cadmium (Cd)           | ug/L  | 0.53         | 0.44         | 0.020   |
| Total Aluminum (Al)          | mg/L  | 6.1          | 4.0          | 0.0030  |
| Total Antimony (Sb)          | mg/L  | 0.00076      | <0.00060     | 0.00060 |
| Total Arsenic (As)           | mg/L  | 0.019        | 0.0094       | 0.00020 |
| Total Barium (Ba)            | mg/L  | 0.35         | 0.24         | 0.010   |
| Total Beryllium (Be)         | mg/L  | <0.0010      | <0.0010      | 0.0010  |
| Total Boron (B)              | mg/L  | <0.020       | <0.020       | 0.020   |
| Total Calcium (Ca)           | mg/L  | 180          | 210          | 0.30    |
| Total Chromium (Cr)          | mg/L  | 0.013        | 0.020        | 0.0010  |
| Total Cobalt (Co)            | mg/L  | 0.0095       | 0.0071       | 0.00030 |
| Total Copper (Cu)            | mg/L  | 0.015        | 0.0097       | 0.00020 |
| Total Iron (Fe)              | mg/L  | 17           | 12           | 0.060   |
| Total Lead (Pb)              | mg/L  | 0.010        | 0.0073       | 0.00020 |
| Total Lithium (Li)           | mg/L  | 0.021        | <0.020       | 0.020   |
| Total Magnesium (Mg)         | mg/L  | 39           | 45           | 0.20    |
| Total Manganese (Mn)         | mg/L  | 0.81         | 0.74         | 0.0040  |
| Total Molybdenum (Mo)        | mg/L  | 0.0020       | 0.0025       | 0.00020 |
| Total Nickel (Ni)            | mg/L  | 0.024        | 0.016        | 0.00050 |
| Total Phosphorus (P)         | mg/L  | 0.73         | 0.63         | 0.10    |
| Total Potassium (K)          | mg/L  | 3.5          | 2.5          | 0.30    |
| Total Selenium (Se)          | mg/L  | 0.00037      | 0.00022      | 0.00020 |
| Total Silicon (Si)           | mg/L  | 12           | 8.1          | 0.10    |
| Total Silver (Ag)            | mg/L  | <0.00010     | <0.00010     | 0.00010 |
| Total Sodium (Na)            | mg/L  | 2.2          | 1.4          | 0.50    |
| Total Strontium (Sr)         | mg/L  | 0.21         | 0.21         | 0.020   |
| Total Sulphur (S)            | mg/L  | 2.0          | 1.4          | 0.20    |
| Total Thallium (Tl)          | mg/L  | <0.00020     | <0.00020     | 0.00020 |
| Total Tin (Sn)               | mg/L  | <0.0010      | <0.0010      | 0.0010  |
| Total Titanium (Ti)          | mg/L  | 0.045        | 0.032        | 0.0010  |
| Total Uranium (U)            | mg/L  | 0.0014       | 0.0012       | 0.00010 |
| Total Vanadium (V)           | mg/L  | 0.021        | 0.015        | 0.0010  |
| Total Zinc (Zn)              | mg/L  | 0.12         | 0.073        | 0.0030  |
| RDL = Reportable Detection L | .imit |              |              |         |



COMMERCIAL ACCOUNTS - CALGARY BUREAU VERITAS CANADA (2019) INC.

### **RESULTS OF CHEMICAL ANALYSES OF WATER**

| BV Labs ID                                                       |     | ZT5148              | ZT5149            |      |
|------------------------------------------------------------------|-----|---------------------|-------------------|------|
| Sempling Date                                                    |     | 2021/05/08          | 2021/05/09        |      |
| Sampling Date                                                    |     | 11:30               | 10:45             |      |
| COC Number                                                       |     | 635648-01-01        | 635648-01-01      |      |
|                                                                  |     | SOIL FLUSH          | SOIL FLUSH        | וחם  |
|                                                                  |     |                     |                   |      |
|                                                                  |     | #1                  | #2                |      |
| Physical Properties                                              |     | #1                  | #2                |      |
| Physical Properties<br>Turbidity                                 | NTU | #1<br>>4000 (1)     | <b>#2</b><br>1600 | 0.10 |
| Physical Properties<br>Turbidity<br>RDL = Reportable Detection L | NTU | <b>#1</b> >4000 (1) | #2<br>1600        | 0.10 |



E-1 - Attachment E Page 184 of 252

COMMERCIAL ACCOUNTS - CALGARY BUREAU VERITAS CANADA (2019) INC.

### **MERCURY BY COLD VAPOR (WATER)**

| BV Labs ID                     |       | ZT5149              |        |
|--------------------------------|-------|---------------------|--------|
| Sampling Date                  |       | 2021/05/09<br>10:45 |        |
| COC Number                     |       | 635648-01-01        |        |
|                                | UNITS | SOIL FLUSH          | RDL    |
|                                |       | #2                  |        |
| Elements                       |       | #2                  |        |
| Elements<br>Total Mercury (Hg) | ug/L  | #2<br>0.0030        | 0.0019 |



E-1 - Attachment E Page 185 of 252

COMMERCIAL ACCOUNTS - CALGARY BUREAU VERITAS CANADA (2019) INC.

### **GENERAL COMMENTS**

Each temperature is the average of up to three cooler temperatures taken at receipt

| Package 1 | 5.7°C |
|-----------|-------|
| Package 2 | 7.3°C |

Version #3: Report reissued only with sample Soil Flush #1 & #2 as per client request. 20210531

Version #2: Report reissued due to typo error with email address. 20210519

Sample ZT5148 [SOIL FLUSH #1] : Turbidity completed within 48h after laboratory receipt to a maximum of five days from sampling. Data are satisfactory for compliance purposes. NO2 - NO2 + NO3 (N) in Water completed within 48h after laboratory receipt to a maximum of five days from sampling. Data are satisfactory for compliance purposes.

#### Results relate only to the items tested.



QUALITY ASSURANCE REPORT

COMMERCIAL ACCOUNTS - CALGARY BUREAU VERITAS CANADA (2019) INC.

|                 |            | Matrix     | Spike     | Spiked     | Blank     | Method I | 3lank | RPC       |                        |
|-----------------|------------|------------|-----------|------------|-----------|----------|-------|-----------|------------------------|
|                 | Date       | % Recovery | QC Limits | % Recovery | QC Limits | Value    | UNITS | Value (%) | QC Limits              |
|                 | 2021/05/12 |            |           | 102        | 80 - 120  | <0.10    | NTU   | 0.83      | 20                     |
| rcury (Hg)      | 2021/05/12 | 93         | 80 - 120  | 67         | 80 - 120  | <0.0019  | ng/L  | NC        | 20                     |
| ium (Ba)        | 2021/05/16 | 96         | 80 - 120  | 106        | 80 - 120  | <0.010   | mg/L  | 5.4       | 20                     |
| ron (B)         | 2021/05/16 | 103        | 80 - 120  | 107        | 80 - 120  | <0.020   | mg/L  | 2.2       | 20                     |
| cium (Ca)       | 2021/05/16 | NC         | 80 - 120  | 108        | 80 - 120  | <0.30    | mg/L  | 3.3       | 20                     |
| n (Fe)          | 2021/05/16 | 118        | 80 - 120  | 107        | 80 - 120  | <0.060   | mg/L  | 3.4       | 20                     |
| nium (Li)       | 2021/05/16 | 108        | 80 - 120  | 112        | 80 - 120  | <0.020   | mg/L  | 4.7       | 20                     |
| ignesium (Mg)   | 2021/05/16 | NC         | 80 - 120  | 113        | 80 - 120  | <0.20    | mg/L  | 06.0      | 20                     |
| anganese (Mn)   | 2021/05/16 | 109        | 80 - 120  | 105        | 80 - 120  | <0.0040  | mg/L  | 2.5       | 20                     |
| losphorus (P)   | 2021/05/16 | 104        | 80 - 120  | 104        | 80 - 120  | <0.10    | mg/L  | NC        | 20                     |
| otassium (K)    | 2021/05/16 | NC         | 80 - 120  | 110        | 80 - 120  | <0.30    | mg/L  | 2.4       | 20                     |
| icon (Si)       | 2021/05/16 | 113        | 80 - 120  | 113        | 80 - 120  | <0.10    | mg/L  | 5.4       | 20                     |
| odium (Na)      | 2021/05/16 | NC         | 80 - 120  | 107        | 80 - 120  | <0.50    | mg/L  | 1.4       | 20                     |
| rontium (Sr)    | 2021/05/16 | 94         | 80 - 120  | 106        | 80 - 120  | <0.020   | mg/L  | 3.1       | 20                     |
| ılphur (S)      | 2021/05/16 | NC         | 80 - 120  | 109        | 80 - 120  | <0.20    | mg/L  | 0.77      | 20                     |
| luminum (Al)    | 2021/05/13 | 112        | 80 - 120  | 116        | 80 - 120  | <0.0030  | mg/L  | 6.4       | 20                     |
| ntimony (Sb)    | 2021/05/13 | 113        | 80 - 120  | 116        | 80 - 120  | <0.00060 | mg/L  | 1.3       | 20                     |
| rsenic (As)     | 2021/05/13 | 103        | 80 - 120  | 102        | 80 - 120  | <0.00020 | mg/L  | 0.17      | 20                     |
| eryllium (Be)   | 2021/05/13 | 114        | 80 - 120  | 108        | 80 - 120  | <0.0010  | mg/L  | NC        | 20                     |
| hromium (Cr)    | 2021/05/13 | 104        | 80 - 120  | 105        | 80 - 120  | <0.0010  | mg/L  | NC        | 20                     |
| obalt (Co)      | 2021/05/13 | 101        | 80 - 120  | 104        | 80 - 120  | <0.00030 | mg/L  | 3.2       | 20                     |
| opper (Cu)      | 2021/05/13 | 97         | 80 - 120  | 104        | 80 - 120  | <0.00020 | mg/L  | 14        | 20                     |
| ead (Pb)        | 2021/05/13 | 100        | 80 - 120  | 106        | 80 - 120  | <0.00020 | mg/L  | NC        | 20                     |
| 1olybdenum (Mo) | 2021/05/13 | 117        | 80 - 120  | 110        | 80 - 120  | <0.00020 | mg/L  | 5.2       | 20                     |
| ickel (Ni)      | 2021/05/13 | 98         | 80 - 120  | 105        | 80 - 120  | <0.00050 | mg/L  | 11        | 20                     |
| elenium (Se)    | 2021/05/13 | 113        | 80 - 120  | 115        | 80 - 120  | <0.00020 | mg/L  | 0.93      | 20                     |
| lver (Ag)       | 2021/05/13 | 102        | 80 - 120  | 105        | 80 - 120  | <0.00010 | mg/L  | NC        | 20                     |
| hallium (Tl)    | 2021/05/13 | 108        | 80 - 120  | 113        | 80 - 120  | <0.00020 | mg/L  | NC        | 20 Pa                  |
| n (Sn)          | 2021/05/13 | 109        | 80 - 120  | 103        | 80 - 120  | <0.0010  | mg/L  | NC        | 20 <b>g</b>            |
| tanium (Ti)     | 2021/05/13 | 110        | 80 - 120  | 103        | 80 - 120  | <0.0010  | mg/L  | NC        | 20 0                   |
| ranium (U)      | 2021/05/13 | 103        | 80 - 120  | 105        | 80 - 120  | <0.00010 | mg/L  | 2.6       | <sup>20</sup> 8        |
| anadium (V)     | 2021/05/13 | 107        | 80 - 120  | 105        | 80 - 120  | <0.0010  | mg/L  | 5.9       | <sup>20</sup> <b>0</b> |
| nc (Zn)         | 2021/05/13 | 100        | 80 - 120  | 106        | 80 - 120  | <0.0030  | mg/L  | NC        | <b>of</b> 02           |
|                 |            | Page 8     | of 11     |            |           |          |       |           | 25                     |

Bureau Veritas Laboratories Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

t E 252 Δ++ \ k



QUALITY ASSURANCE REPORT(CONT'D)

COMMERCIAL ACCOUNTS - CALGARY BUREAU VERITAS CANADA (2019) INC.

|                |                                                            |                             | Matrix                  | Spike            | Spiked               | Blank          | Method          | Blank         | RPI              |                     |
|----------------|------------------------------------------------------------|-----------------------------|-------------------------|------------------|----------------------|----------------|-----------------|---------------|------------------|---------------------|
| QC Batch       | Parameter                                                  | Date                        | % Recovery              | QC Limits        | % Recovery           | QC Limits      | Value           | UNITS         | Value (%)        | QC Limits           |
| A223796        | Dissolved Calcium (Ca)                                     | 2021/05/16                  | NC                      | 80 - 120         | 66                   | 80 - 120       | <0.30           | mg/L          | 1.1              | 20                  |
| A223796        | Dissolved Iron (Fe)                                        | 2021/05/16                  | 111                     | 80 - 120         | 104                  | 80 - 120       | <0.060          | mg/L          | NC               | 20                  |
| A223796        | Dissolved Magnesium (Mg)                                   | 2021/05/16                  | NC                      | 80 - 120         | 102                  | 80 - 120       | <0.20           | mg/L          | 1.9              | 20                  |
| A223796        | Dissolved Manganese (Mn)                                   | 2021/05/16                  | 108                     | 80 - 120         | 102                  | 80 - 120       | <0.0040         | mg/L          | 3.3              | 20                  |
| A223796        | Dissolved Potassium (K)                                    | 2021/05/16                  | 104                     | 80 - 120         | 104                  | 80 - 120       | <0.30           | mg/L          | 1.3              | 20                  |
| A223796        | Dissolved Sodium (Na)                                      | 2021/05/16                  | NC                      | 80 - 120         | 96                   | 80 - 120       | <0.50           | mg/L          | 1.4              | 20                  |
| A223798        | Dissolved Calcium (Ca)                                     | 2021/05/14                  | NC                      | 80 - 120         | 101                  | 80 - 120       | <0.30           | mg/L          | 1.8              | <b>AT</b>           |
| A223798        | Dissolved Iron (Fe)                                        | 2021/05/14                  | 110                     | 80 - 120         | 105                  | 80 - 120       | <0.060          | mg/L          | NC               | <b>A</b><br>50      |
| A223798        | Dissolved Magnesium (Mg)                                   | 2021/05/14                  | NC                      | 80 - 120         | 103                  | 80 - 120       | <0.20           | mg/L          | 2.8              | сн<br><sup>02</sup> |
| A223798        | Dissolved Manganese (Mn)                                   | 2021/05/14                  | 109                     | 80 - 120         | 103                  | 80 - 120       | <0.0040         | mg/L          | 1.1              | 02                  |
| A223798        | Dissolved Potassium (K)                                    | 2021/05/14                  | 104                     | 80 - 120         | 105                  | 80 - 120       | <0.30           | mg/L          | 2.7              | 20                  |
| A223798        | Dissolved Sodium (Na)                                      | 2021/05/14                  | NC                      | 80 - 120         | 66                   | 80 - 120       | <0.50           | mg/L          | 2.3              | 20                  |
| A223899        | Dissolved Nitrate plus Nitrite (N)                         | 2021/05/12                  | 122 (1)                 | 80 - 120         | 66                   | 80 - 120       | <0.010          | mg/L          | 1.1              | 20                  |
| A223899        | Dissolved Nitrite (N)                                      | 2021/05/12                  | 100                     | 80 - 120         | 104                  | 80 - 120       | <0.010          | mg/L          | NC               | 20                  |
| A225434        | Alkalinity (PP as CaCO3)                                   | 2021/05/14                  |                         |                  |                      |                | <1.0            | mg/L          | NC               | <b>3LI</b><br>07    |
| A225434        | Alkalinity (Total as CaCO3)                                | 2021/05/14                  |                         |                  | 86                   | 80 - 120       | <1.0            | mg/L          | 1.5              | 20<br>20            |
| A225434        | Bicarbonate (HCO3)                                         | 2021/05/14                  |                         |                  |                      |                | <1.0            | mg/L          | 2.0              | 50                  |
| A225434        | Carbonate (CO3)                                            | 2021/05/14                  |                         |                  |                      |                | <1.0            | mg/L          | NC               | <b>BM</b><br>07     |
| A225434        | Hydroxide (OH)                                             | 2021/05/14                  |                         |                  |                      |                | <1.0            | mg/L          | NC               | 20                  |
| A225437        | pH                                                         | 2021/05/14                  |                         |                  | 100                  | 97 - 103       |                 |               | 0.16             | N/A 013             |
| A225438        | Conductivity                                               | 2021/05/14                  |                         |                  | 101                  | 90 - 110       | <2.0            | uS/cm         | 0.65             | 10                  |
| A226330        | Dissolved Chloride (Cl)                                    | 2021/05/15                  | 66                      | 80 - 120         | 105                  | 80 - 120       | <1.0            | mg/L          | NC               | 20                  |
| A226330        | Dissolved Sulphate (SO4)                                   | 2021/05/15                  | 105                     | 80 - 120         | 106                  | 80 - 120       | <1.0            | mg/L          | NC               | 20                  |
| N/A = Not Ap   | pplicable                                                  |                             |                         |                  |                      |                |                 |               |                  |                     |
| Duplicate: Pa  | aired analysis of a separate portion of the same sample.   | Jsed to evaluate t          | he variance in t        | he measurem      | ent.                 |                |                 |               |                  |                     |
| Matrix Spike:  | : A sample to which a known amount of the analyte of in    | terest has been ac          | ded. Used to e          | valuate sampl    | e matrix interfe     | rence.         |                 |               |                  | E                   |
| Spiked Blank:  | : A blank matrix sample to which a known amount of the     | analyte, usually fr         | om a second so          | urce, has bee    | n added. Used 1      | o evaluate me  | thod accuracy.  |               |                  | P                   |
| Wethod Blan    | k: A blank matrix containing all reagents used in the ana  | lytical procedure.          | Used to identify        | / laboratory co  | ontamination.        |                |                 |               |                  | - A<br>Pag          |
| ONC (Matrix Sp | pike): The recovery in the matrix spike was not calculated | . The relative diffe        | erence between          | the concentry    | ation in the par     | ent sample an  | d the spike amo | ount was too  | small to permit  | a reliable <b>6</b> |
| Gecovery calc  | ulation (matrix spike concentration was less than the nat  | ive sample concer           | itration)               |                  |                      |                |                 |               |                  | ас<br>18            |
| DNC (Duplicate | e RPD): The duplicate RPD was not calculated. The conce    | ntration in the san         | nple and/or dup         | licate was too   | o low to permit      | a reliable RPD | calculation (ab | solute differ | ence <= 2x RDL). | <b>n</b> n<br>37 (  |
| 21) Recovery   | or RPD for this parameter is outside control limits. The o | verall quality cont         | rol for this analy      | ysis meets acc   | eptability criter    | ia.            |                 |               |                  | of                  |
| 19             |                                                            |                             | Page 9 c                | of 11            |                      |                |                 |               |                  | nt<br>25            |
|                | Bureau Veri                                                | as Laboratories Calgary: 20 | 21 - 41st Avenue N.E. T | 2E 6P2 Telephone | (403) 291-3077 Fax ( | 403) 291-9468  |                 |               |                  | Б<br>52             |

ATTACHMENT 'E': PUBLIC SUBMISSIONS



E-1 - Attachment E Page 188 of 252

COMMERCIAL ACCOUNTS - CALGARY BUREAU VERITAS CANADA (2019) INC.

### VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Sandy Yuan, M.Sc., QP, Scientific Specialist

BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.
|                          | INVOICE TO:                                                                                                     |             | -                |            | -      |                         | -                    |                     |      |           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |            |          |       |                        |                                                                                                                                                                                                                                                                                                            |                           |                    |
|--------------------------|-----------------------------------------------------------------------------------------------------------------|-------------|------------------|------------|--------|-------------------------|----------------------|---------------------|------|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|----------|-------|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|--------------------|
| #10311 C                 | #10311 COMMERCIAL ARCOLINTS - CALCARY RUD                                                                       |             |                  |            |        |                         | TO: PROJECT          |                     |      |           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | PROJEC     | TINFORMA | TION: | I phonetext the contra |                                                                                                                                                                                                                                                                                                            |                           |                    |
| tention:                 | CALC ADDODITS - CALC                                                                                            | ARTBUR      | Company Name     | 10.        | NFE    | work                    | SUL                  |                     |      |           | Quotation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | #                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |            |          |       |                        |                                                                                                                                                                                                                                                                                                            | BV Labs Joh #             | Jniy:              |
| Ideese 4000 19th 3       | street NE                                                                                                       |             | Attention        | -          |        |                         |                      |                     |      |           | P.O. #                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |            |          |       |                        |                                                                                                                                                                                                                                                                                                            |                           | bottle Graer #:    |
| Calgary AB               | T2E 6P8                                                                                                         |             | Address          | -          |        |                         |                      |                     |      |           | Project                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |            |          |       |                        |                                                                                                                                                                                                                                                                                                            |                           | 625040             |
| (403) 201 2              | Fax:                                                                                                            |             | Tel              |            |        | 1                       |                      |                     | _    |           | Project Na                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ame:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |          |       |                        |                                                                                                                                                                                                                                                                                                            | COC #:                    | Project Manager:   |
| ait                      |                                                                                                                 | 9           | Email:           |            |        |                         |                      |                     |      |           | Site #                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Bar                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | -          |          |       |                        |                                                                                                                                                                                                                                                                                                            |                           | Customer Solutions |
| tegulatory Critoria      |                                                                                                                 | -           | Special Ins      | tructions  |        | 1                       |                      |                     | AN   | VALYSIS R | EOUESTE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | ED (PLEAS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | SE BE SPEC | IF(C)    |       | 1                      | _                                                                                                                                                                                                                                                                                                          | C#635648-01-01            |                    |
| ATI                      |                                                                                                                 |             |                  |            |        |                         |                      | 2                   |      | 0         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | T                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1          |          | 1     | -                      | -                                                                                                                                                                                                                                                                                                          | Turnaround Time (TAT) Rec | uired:             |
| Other<br>SAMPLES MUST BI | KEPT COOL ( < 10°C ) FROM TIME OF BAN                                                                           | MPLING UNTI | L DELIVERY TO BY | LABS       | MIT    | Is Field Filtered 7 (Y/ | ine Water -Lab Filte | ulated Metals (CCME | dity | FRURY CTO |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |            |          |       |                        | (will be applied if Rush TAT is not specified):<br>Standard TAT = 5-7 Working days for most tests.<br>Please note: Standard TAT for certain tests are > 5 days - contact your Project<br>details<br>Job Specific Rush TAT (if applies to entire submission)<br>Data Required.<br>Rush Continuation Number: |                           |                    |
| Sample Barcode Label     | Sample (Location) Identification                                                                                | Date        | Sampled Tim      | le Sampled | Matrix | Meta                    | Rout                 | Tot                 | urb  | 2         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |            |          |       | #                      | of Botiles                                                                                                                                                                                                                                                                                                 | (C8                       | (lab for #)        |
|                          | SOIL FLUSH #1                                                                                                   | MAY         | 12/21 1          | 1:20       | 14/    | 1                       | 1                    | 1                   | 17   | -         | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | -          |          | -     |                        |                                                                                                                                                                                                                                                                                                            | Comments                  |                    |
|                          | Sall First #2                                                                                                   |             | 014 11           |            | VV     | ~                       | 2                    | V,                  | -    |           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |            |          |       |                        | 3                                                                                                                                                                                                                                                                                                          |                           |                    |
|                          | 30.010031112                                                                                                    | MAY         | 9/2 /1           | 1:45       | w      | N                       | ~                    | ~                   | V    | 2         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |            |          |       |                        | 4                                                                                                                                                                                                                                                                                                          |                           |                    |
|                          |                                                                                                                 | 1           |                  |            | W      | N                       | 1                    | 1                   | V    |           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |            |          |       |                        | 3                                                                                                                                                                                                                                                                                                          |                           |                    |
|                          | Need certificate                                                                                                | 2 Kche      | mistry o         | FDI        | - ward | Fal                     | -                    | 1.00                |      |           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |            |          |       |                        | 2                                                                                                                                                                                                                                                                                                          |                           |                    |
|                          |                                                                                                                 | 1           | /                |            | 0000   | 1                       |                      |                     |      |           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |            |          |       | -                      |                                                                                                                                                                                                                                                                                                            |                           |                    |
|                          |                                                                                                                 |             |                  |            |        |                         |                      |                     | -    |           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |            |          | -     | _                      |                                                                                                                                                                                                                                                                                                            | - 10 Mar. 21 08           | 10                 |
|                          |                                                                                                                 | -           |                  |            |        |                         | -                    | -                   | -    |           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |            |          |       |                        |                                                                                                                                                                                                                                                                                                            | Customor Coluti           |                    |
|                          |                                                                                                                 | -           |                  |            |        |                         |                      |                     |      |           | 1-0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |            |          |       |                        |                                                                                                                                                                                                                                                                                                            |                           |                    |
|                          |                                                                                                                 | -           |                  |            |        |                         |                      |                     |      |           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |            |          |       |                        |                                                                                                                                                                                                                                                                                                            | C130760                   | -                  |
|                          |                                                                                                                 |             |                  |            |        |                         |                      |                     |      |           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |            |          |       | -                      | -                                                                                                                                                                                                                                                                                                          | IVA DID occor             | -                  |
|                          |                                                                                                                 |             |                  |            |        |                         |                      |                     |      | -         | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |            |          |       | -                      |                                                                                                                                                                                                                                                                                                            | - INS-0088                |                    |
|                          | the second se | -           |                  |            |        |                         |                      |                     |      |           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |            |          |       |                        | _                                                                                                                                                                                                                                                                                                          |                           |                    |
| RELINQUISHED BY:         | (Signature/Print) Date: (Y                                                                                      | Y/MM/DD)    | Time             |            |        |                         |                      |                     |      |           | And the second sec | and the second se |            |          |       |                        |                                                                                                                                                                                                                                                                                                            |                           |                    |

П

Ż

Page 189 of 252 Page 253 of 7192

# **Curriculum Vitae**

# Jon Fennell. M.Sc., Ph.D., P.Geol.

# PROFESSIONAL PROFILE

Dr. Jon Fennell has been a practicing consultant in the natural resource sector for over 30 years offering support in the environmental sciences and resource management. His experience includes contaminated sites assessment, development of local and regional-scale groundwater systems, mine dewatering strategies, water supply and disposal, groundwater-surface water interaction assessment, implementation of monitoring and management systems, climate analysis and adaptation strategies, and environmental forensics including applications of:

- i) remote sensing
- ii) downhole, earth-based and airborne geophysical methods
- iii) geochemical assessment & modelling
- iv) stable and radiogenic isotopes to support source water tracing, chemical fingerprinting, and age-dating

The bulk of Jon's experience is associated with various oil & gas and mineral resource development projects in Canada and abroad. Over the last 13 years Jon has worked closely the Alberta Government through various initiatives to support the Water for Life Strategy, Land Use Framework, and Cumulative Effects Management System in the province. A primary area of focus is on developing strategies to ensure water security and communicating the importance of water knowledge as it applies to sustainable development activities.

## **PROJECT EXPERIENCE**

## International support

#### United Nations – Joint Caribbean Climate Change Partnership

Technical lead for the development of UNFCCC-sanctioned National Adaptation Plans for the countries of Belize and Guyana, with the goal of addressing multi-sector impacts from future climate change. Responsibilities included review of existing policies and studies supporting climate change adaptation, assessment of current adaptation plans for major economic, social, and environmental sectors, Incorporation of IPCC model results under various RCP scenarios, delivery of facilitated in-country workshops for various ministries, provision of recommendations to address gaps identified in current plans, liaison with government officials and UNDP organizers, completion of risk assessment and options analysis to identify high-value actions, preparation of capacity-building plan and 10-yr strategic plan, and risk and vulnerability assessment (including spatial aspects under various climate change scenarios – SRES and RCP).

#### Mexican Soda and Water Company – Monterrey Mexico

Lead for a groundwater evaluation project to supplement beverage making operations a large manufacturing plant in the city of Monterrey. Responsibilities included review of background geological, hydrogeological and geochemical information across a large study area centered on the Monterrey Metropolitan Area; assessment of structural fabric of study area including presence of major folds, faults, and other features (e.g. karst), amalgamation of background data with result from Quantum

Geoelectrophysics reconnaissance program to identify prospective drilling targets, completion of a 4C report (compare, contrast, correlate, confirm) and selection of prime drilling target for testing and evaluation.

#### Dept. of Environment & Resource Management – Coal Seam Gas Development, Queensland Australia

Lead for a hydrogeochemical assessment and water fingerprinting exercise in Great Artesian Basin aquifers of the Surat and Bowen basins to support Coal Seam Gas development and cumulative effects analysis. Responsibilities included a comprehensive data and information inventory to facilitate source water fingerprinting and collation of large public-domain data sets to provide a first-of-its-kind database of water quality information, review of major ions, metals and trace elements, stable and radiogenic isotopes and dissolved gases to identify recharge phenomenon, cross-formational flow characteristics and distinct water types, and statistical analysis to assess data groupings and spatial trends.

Additionally, lead for an aquifer vulnerability assessment to assess groundwater and groundwaterdependent ecosystem risks from Coal Seam Gas development in southeast Queensland. Responsibilities included development of a multi-criteria weighting and ranking system linked with GIS to display areas of highest risk to drawdown including areas users and groundwater dependent ecosystems, and facilitation of industry and government workshops to present and vet results.

#### Origin Energy - Coal Seam Gas Development, Queensland Australia

Groundwater lead for a large-scale coal seam gas project (up to 10,000 wells) located in the headwaters of the Murray-Darling Basin and recharge area for the Great Artesian Basin. Responsibilities included, development of a regional-scale groundwater monitoring system using vulnerability and risk mapping, design of a hydrogeological model covering a 173 000 km<sup>2</sup> area (using FEFLOW) to assess cumulative effects from coal seam gas development, completion of supporting Technical Report (including risk mapping, injection feasibility, model development) and Environmental Impact Statement chapter, and liaison with the Queensland Department of Environment and Natural Resources to address needs for the required Environmental Impact Assessment.

#### Texas Petroleum Company – Hydrocarbon Development, Columbia South America

Completion of an onsite environmental assessment of oilfield operations in support of the transfer of the Teca Nare, Cocorná, Velásques Oil Fields and the Velásquez-Galan Pipeline. Responsibilities included phase 1 site assessment of field operations, verification of site conditions at all well sites including soil and vegetation conditions prior to property transfer, assessment of baseline surface water and groundwater chemical conditions, as wells as environmental quality assessment to determine contamination from oilfield operations, and provision of summary report including recommendations.

#### Texas Petroleum Company – Hydrocarbon Development, Ecuador South America

Completion of a baseline groundwater and surface water study in a remote and environmentally sensitive area of the Amazon basin (headwaters area) to support a helicopter-assisted drilling program for oil and gas exploration. Responsibilities included field reconnaissance to establish the suitability of proposed drilling targets, assessment of the suitability of local surface water and groundwater sources for drilling fluid provision (quality and quantity), review of baseline soil quality, site hydrogeology, and geochemical conditions, and development of recommendations for pit construction and site preparation.

#### Canadian International Development Agency – Municipal works, Ecuador South America

Completion of a baseline soil and groundwater study (physical and chemical) around the City of Catamayo to determine the feasibility of siting an engineered wastewater impoundment for the treatment of municipal sewage treatment (project funded by CIDA). Responsibilities included general site reconnaissance, collection of soil and groundwater samples for baseline geochemical quality assessment, review of hydrogeological conditions and processes relating to baseline conditions, and submission of recommendations on the suitability of the proposed location and possible approaches to rectify existing limitations.

#### Government of Yemen – National water supply, Yemen

Hydrogeological and geochemical support for a regional-scale study of water supply potential in the country. Responsibilities included hydrogeological and hydrogeochemical facies mapping, geochemical assessment and flow path evolution modelling, groundwater flow field assessment and modelling, sustainable yield evaluation, and groundwater age dating.

#### Blackbird Mine – Acid Rock Drainage assessment, Idaho USA

Completion of a hydrogeological baseline study and associated stable isotope investigation ( $\delta^{34}$ S,  $\delta^{18}$ O, and  $\delta^{2}$ H) to determine the source of acid mine drainage near active underground workings. Responsibilities included review of existing geochemical data and related mineral equilibria conditions (i.e. baseline and impacted), and assessment of geochemical reactions leading to ARD conditions, including biogeochemical aspects.

## Government support

#### Alberta Environment, Oil Sands Science and Monitoring Division

Preparation of oil sands tailings pond seepage review report. Responsibilities included review of background information pertaining to oil sands produced water (OSPW) seepage research and natural bedrock groundwater discharge studies, review of industry-submitted EPEA compliance reports to assess current "state of affairs" regarding monitoring and OSPW detections, assessment of seepage management systems, review of geological pathways for OSPW migration, and development of seepage risk profiles for all active tailings ponds.

#### Alberta Environment and Parks (AEP)

Provision of external expert review for the Implementation Directive for the Surface Water Body Aggregate Policy (SWBAP). Responsibilities included review of relevant Government of Alberta documents relating to aggregate mining in or near surface water bodies and/or floodplain environments, use of information from relevant policies in other jurisdictions as well as studies and research (aquatic, terrestrial, river morphology, climate risk) regarding impacts of aggregate mining in floodplain areas, identification of gaps regarding goals and objectives of the approval and management process, ,review of

risk assessment approach to approving aggregate mines near surface water bodies, and provision of recommendations for monitoring, evaluating and reporting, and interaction with AEP project team members and presentation of results.

Also, participation on expert hydrogeology panel to development a template for groundwater management frameworks (GMFs) in Alberta. Responsibilities included assessment of background on Alberta groundwater resources and documents highlighting existing GMFs inside and outside of Canada, review of sustainability goals and challenges with groundwater management (quantity and quality), review of prevailing concepts to groundwater management (i.e. surface water capture, risk and vulnerability assessment), identification of data needs and required infrastructure to support cumulative effects management, identification of proposed indicators using DPSIR approach, and participation in external panel and internal AEP team of hydrogeological experts to define aspects of a standardized GMF template.

#### Alberta Environmental Monitoring Evaluation and Reporting Agency (AEMERA)

Assessment of Alberta's groundwater observation well network, including redundancy and gap analysis. Responsibilities included groundwater risk mapping, development of a numerical scoring scheme to prioritize monitoring wells, statistical and spatial analysis of provincial water chemistries using information from the Alberta water well information database, and development of monitoring strategy including analytes and frequency to address key development activities (e.g. hydraulic fracturing, waste disposal, large-scale groundwater extractions).

#### Alberta Environment (AENV)

Various projects include:

- Assistance with scoping, conceptual design and development of approach to Groundwater Management framework template
- Expert review for Implementation Directive for the Surface Water Body Aggregate Policy
- Review and comment on Groundwater Monitoring Directive (2012 draft)
- Technical assistance with development of a guidance framework to respond to the implications of thermal mobilization of constituents at in-situ bitumen recovery projects including facilitation of team workshops to communicate the physical and chemical aspects of thermal mobilization and the risks posed by in-situ operations, development of a risk-based, phased, approach to assessing thermal mobilization to address source-pathway-receptor aspects, development of a draft guidance document and interaction with the AEP communications team, and support for industry and CAPP consultation meetings to review the draft guidance document.
- Completion of vulnerability and risk mapping for the Lower Athabasca Regional Planning area and development of groundwater management framework for the mineable and thermal in situ areas.
- Completion of an inventory of existing quality and quantity issues, water supply conditions and related environmental policy.
- Participation in technical and policy-related work sessions involving various stakeholder representatives.
- Assessment of potential cumulative effects from thermal in-situ bitumen recovery operations and related activities (i.e. water withdrawal for steam generation; fluid waste injection)
- Facilitation of technical and policy-related work sessions to engage stakeholders (operators, AENV and ERCB) directly affected by changes to provincial water management.

## E-1 - Attachment E Page 194 of 252

#### Alberta Environment and Sustainable Resource Development (ESRD)

Various projects include:

- Development of a multi-attribute point-scoring system and ArcGIS tool to assist with optimal siting
  of provincial monitoring wells to address concerns regarding hydraulic fracturing (HF).
  Responsibilities included identification of key risks to groundwater resource from HF activities,
  conceptualization and construction of a subsurface risk assessment, and identification of surface
  access opportunities in an ArcGIS platform to identify prime locations for monitoring in active and
  future development areas.
- Northern Athabasca Oil Sands Region groundwater monitoring program. Responsibilities included development of sampling methodology, data evaluation process and program logistics, communication to technical team comprising oil sands operators, ERCB and AEP representatives, development of an on-line visualization tool, and client liaison.
- Review of LARP management plan, supporting Groundwater Management Frameworks and supporting guidance documents re: Thermal Mobilization of Trace Elements during In Situ Developments and Groundwater Monitoring Directive.
- Preparation of summary document for Scientific Advisory Committee of the Oil sands GW working group, and Alberta Environment.

#### Alberta Land Use Secretariat (LUS)

Assistance with development of land planning scenarios in NE Alberta to guide future development in the Lower Athabasca Regional Plan area pursuant to the goals of the Alberta Land-use Framework. Responsibilities included presentations to the Land Use Secretariat, Regional Planning Team and Regional Advisory Council, development and assessment of modelled results from a cumulative effects simulator, completion of groundwater modelling over a 93 000 km<sup>2</sup> area (using MODFLOW), and development of an approach to deal with groundwater resources in the LARP area.

#### Alberta Utilities Commission (AUC)

Provision of expert review support for a wind power application in the Provost AB area. Responsibilities included review of project concept and environmental implications, assessment of completeness regarding baseline hydrogeological assessment, assessment of impact analysis and proposed mitigation, identification of gaps and provision supplemental information requests.

#### BC Ministry of Energy, Mines and Petroleum Resources

Provision of expert review support for hydraulic fracturing review process. Responsibilities included preparation of background information pertaining to water quality risks and source-pathway-receptor aspects of hydraulic fracturing operations, provision of recommendation regarding geochemical fingerprinting (ion ratios, isotopes, NORMs), risk assessment and mapping techniques, and monitoring, and appearance at in-camera session to discuss water quality aspects with academic panel members including recommendations.

## Agency support

#### Alberta Innovates (AI)

Provision of hydrogeological support services for the following University of Alberta research studies:

- Resolving human versus Industrial Influences on the water quality of the Lower Athabasca River (data synthesis; geophysical and geochemical assessment; isotope geochemistry source water fingerprinting, GW-SW interaction – identification and flux)
- Review of Arsenic in Alberta's groundwater (collation of multiple open source and private data bases, GIS platform design; correlation/cluster/factor analysis to determine source/cause/reasons(s), both physical and geochemical, for elevated concentrations, development of a risk mapping tool to identify existing and potential future high-risk areas and aquifer intervals)
- Predicting Alberta's Water Future (complete estimates of groundwater recharge to Alberta's 2200 sub-basins; determining groundwater use projection by major sector to 2050; assessing baseflow contributions and groundwater stress area based analytic model outputs; project changes to provincial water supplies based on population growth, energy extraction, food production, land use, and climate variability/change; coordinate results with climate change model outputs and SWAT model outputs to generate preliminary Water Risk map for the province.

#### Alberta Water Research Institute (AWRI)

Preparation of a report assessing Alberta's inventory of water and its associated dynamics (natural and human-induced). Responsibilities included the development of a partnership model including participants from Universities and Institutes in Beijing, Switzerland, Edmonton, Calgary and Lethbridge, completion of a complete inventory of surface water, groundwater and fossil water (glaciers and deep groundwater) to identify current and future risks to water supplies in the province, and assessment of climate variability and change implications to provincial groundwater water resources

#### Canada's Oil Sands Innovation Alliance (COSIA)

Completion of a tailing pond seepage risk assessment and preparation of a peer-review journal manuscript to place suspected oil sands impacts into perspective. Responsibilities included review of individual tailings ponds established at the various operating oil sands mines in the Athabasca Oil Sands region, application of source-pathway-receptor model in relation to calculated groundwater flow velocities, stand-off distances from receptors, and natural attenuation properties to assess risk associated with each structure, and preparation of manuscript to place into context natural discharge of low-quality groundwater from bedrock formation versus oil sands seepage.

Other projects include:

- Completion of regional geochemical assessments in NE Alberta (35,000 km<sup>2</sup> area) supporting the Regional Water Management Initiative. Responsibilities included, collation of regional geological, hydrogeological, and geochemical data using public domain and industry information, assessment and interpretation of hydrogeological setting and of conceptual models, assessment of traditional and isotope geochemistry to determine source water chemistry to define flow path phenomena areas of aquifer interactions, statistical analysis of data to determine groupings and associations (PCA analysis), and documentation and presentation of results at various public venues.
- Completion of a water disposal assessment in NE Alberta (153,000 km<sup>2</sup> area) supporting the Regional Water Management Initiative. Responsibilities included collation of regional geological, hydrogeological, and water production data using public domain and industry information, development of a multi-criteria analysis approach to assessing Injection Potential and Theoretical Injection Rates based on a system of weighted and ranked physical and chemical attributes, and development of an ArcGIS platform to identify high-value disposal formations in relation to existing and planned in situ developments and pipelines

 Completion of oil sands industry study assessing the risks and benefits of landfills, salt caverns and disposal wells in liquid waste management. Responsibilities included participation in industry workshops. assessment of liquid waste management options, documentation and presentation of the results to industry members.

#### Cumulative Environmental Management Association (CEMA)

Assessment of baseline hydrological and hydrogeological conditions and development of a regional-scale groundwater quality monitoring network (18 000 km<sup>2</sup> study area) located in the Athabasca Oil Sands Region of northeast Alberta. Responsibilities included refinement of conceptual hydrogeological model, groundwater-surface water interaction assessment, assessment of quality conditions and trends (including statistical analysis), knowledge and data gap analysis, pathway identification and vulnerability assessment for sensitive receptors, field reconnaissance and well selection, isotope interpretation ( $\delta^{18}$ O,  $\delta^{2}$ H,  $\delta^{13}$ C, Carbon-14), groundwater hydrograph analysis, report preparation and presentation, and liaison with government and industry representatives.

Other projects include:

- Preparation of a groundwater monitoring and management plan in support of the State of the Muskeg River Watershed report. Responsibilities included assessment of baseline groundwater quantity and quality conditions in the study area, identification of development stresses and potential short and long-term impacts, identification of proposed physical, chemical and state indicators for monitoring, and interaction in multidisciplinary team.
- Overview of historical, current, and planned groundwater initiatives in the Regional Municipality of Wood Buffalo. Responsibilities included interviews with relevant industry, government, academia, aboriginal, and non-governmental organization groups, identifying and accessing relevant studies, reports, and investigations relating to groundwater and groundwater-surface water interaction, and development of a useable database with relevant descriptors of content and results.

#### Lakeland Industry and Community Association (LICA)

Assessment of the current health of two large watersheds (covering over 8500 km<sup>2</sup>) in response to changing climatic conditions, changing land use practices, and increased pressure on water resources (surface water and groundwater) by agricultural and industrial users. Responsibilities included the assessment of historical Landsat imagery, review of stream and groundwater hydrograph data, assessment of effects of climate phenomena on basin hydrology, development of a hydrogeological framework from over 11,500 water well records, and review of temporal quality data from lakes and water wells.

#### Petroleum Technology Alliance of Canada (PTAC)

Completion of studies and industry workshops assessing environmental net benefit of saline water use versus non-saline water use in unconventional oil and gas development and the role of collaboration in unconventional oil and gas development.

## Municipal and Watershed Stewardship Groups

#### **Butte Action Committee**

Preparation for, and participation in, AEP-led Surface Water Body Aggregate Policy 2017 stakeholder review workshops. Responsibilities included consultation with stakeholder group, provision of support for Leduc workshop, review of AEP materials in advance of Airdrie workshop (AEP policies, guides, codes, risk assessment framework), review of other Canadian and International policies and guides to

aggregate mining near water bodies, review of impact studies related to aggregate mine development near surface water bodies (erosion, pit capture, infrastructure risk, fisheries and riparian area impacts), assessment of climate change implications for streamflow timing and magnitude, as well as intensity, duration, and frequency of storms and related runoff, on 1:100 levels, and documentation of questions to AEP for clarification and response to AEP questions re: climate change implications.

#### Red Deer River Watershed Alliance (RDRWA)

Assistance with development of an Integrated Watershed Management Plan to address future development in the basin. Responsibilities included assessment of aquifer types and groundwater inventory, water use patterns, effects of land use and climate variability/change on basin storage, assessment of water quality conditions, risk and vulnerability analysis, development of beneficial management practices, and development of a conceptual monitoring system to achieve plan goals and objectives.

#### South McDougall Flats Protection Society, Sundre AB

Review of proposed re-zoning for aggregate mine development in historic floodplain of Little Red Deer River in Sundre, AB. Responsibilities included review of proposed gravel pit re-zoning area, air photo assessment and delineation of paleo-floodplain. preparation and presentation of workshop materials at public forums re: pros and cons of gravel mining (including policy framework review), and support for Town Council hearing.

#### Town of Okotoks, AB

Assistance with review of development applications and support for ensuring water security through conjunctive use strategies. Responsibilities included expert review of development applications assessing cumulative drawdown effects and provision of recommendations to manage effects, engagement with Town official on development of a sustainable water management strategy, and provision of support for AENV and Environmental Appeal Board process.

Also, completion of a pre-feasibility study to assess aquifer storage and recovery (ASR) and managed aquifer recharge (MAR) as a solution to water supply challenges. Responsibilities included review of regulatory setting and constraints for ASR and MAR (Canada and international jurisdictions), review of ASR and MAR projects world-wide, assessment of local geological and hydrogeological conditions and identification of potential areas to facilitate ASR and MAR success, modelling to determine optimal placement of MAR system to enhance baseflow conditions, groundwater-surface water interaction assessment, and preparation and presentation of pre-feasibility summary to Town Council and Mayor.

#### Town of High River, AB

Lead for the development of a Water Sustainability Plan predicated on risk identification and alternative storage and management options for a large alluvial aquifer system. Responsibilities included concept and program design, execution of vulnerability mapping approach to assess risk to High River from groundwater impacts (e.g. underground storage tanks), development of conceptual hydrogeological framework, review of groundwater–surface water interaction and climate variability effects, assistance with groundwater model development, and liaison with town officials, MD Foothills official and other project stakeholders.

#### **Tsuut'ina First Nation**

Completion of flood analysis for the Redwood Meadow development on the Elbow River floodplain. Responsibilities included review of river hydrology, flood frequency, and related changes in river

morphology, assistance with hydrological modelling to address groundwater flooding potential to existing and panned development areas, calculation of damage estimates associated with 5-, 20-,100-, 200- and 500-year return periods, and liaison with First Nations representatives, Government of AB, and Canadian Environmental Assessment Agency.

## Industry support

#### Alberta Energy Company (AEC)

Preparation of an Environmental Operations Manual for all aspects of petroleum exploration and development in Alberta. Contents of the manual included environmental procedures for seismic cutline provision and reclamation, siting and construction of drilling leases and processing facilities, siting and construction of pipeline right of ways, spill response and cleanup, and site reclamation.

#### Amoco Canada

Various projects include:

- Numerous gas plant and batter investigations, including the completion of geophysical surveys (EM38, EM31, and EM61), and the design, installation, testing and sampling of groundwater monitoring networks.
- Completion of environmental site assessments and landfill delineation programs for gas plant divestitures. Responsibilities included installation, testing and sampling of groundwater monitoring wells, completion of soil sampling programs, and assessment of the results to determine the liability cost associated with property transfer.
- Completion of a stable isotope study using δ<sup>34</sup>S, δ<sup>18</sup>O, δ<sup>2</sup>H, δ<sup>13</sup>C to determine the source of anomalous groundwater sulphate concentrations (natural vs. anthropogenic), and review of fresh groundwater usage for steam injection. Responsibilities included assessment of historical monitoring well and lake level readings to evaluate local effects resulting from groundwater withdrawal.
- Sounding Lake area monitoring program to determine effects from nearby drilling activity. Responsibilities included interviews with well-owners, assessment of the water delivery system, short-term aquifer testing, sample collection using ultra-clean sampling methods, evaluation of the data, and communication of results to client and owner.

#### Apache Canada

Completion of watershed analysis and intake siting in support of a Water Act Application on Smoky Lake. Responsibilities included assessment of Smoke Lake watershed and water supply potential, water supply modelling to determine availability and reliability of lake water, review of historical flow data and determination of suitable IFN at outlet (i.e. Q80), review of terrestrial, fisheries and water quality data to support water diversion strategy, development of proposed monitoring and response plan, and liaison with AEP and AER representatives.

#### **Bellatrix Exploration Ltd.**

Completion of a Water Sourcing study for Rocky Mountain asset. Responsibilities included review of existing and potential water sourcing options, development MCA and of GIS tool to assess and map high-value water opportunities, and completion of a corporate water security plan.

#### **BP** Canada

Resident well sampling program to determine effects from nearby drilling programs and existing gas wells. Responsibilities included well-owner interviews, assessment of the well conditions and water delivery system, sample collection using ultra-clean sampling methods, and communication of results.

#### **Canadian Occidental**

Completion of a stable isotope studies to determine the source of sulphate impact from two large sour gas processing facilities (Balzac and Okotoks). Responsibilities included drilling, installation, and testing of monitoring wells, development of a conceptual site model , review of site-wide geochemistry (soil and groundwater), and application of  $\delta^{34}$ S,  $\delta^{18}$ O,  $\delta^{2}$ H, and  $\delta^{13}$ C isotopes to resolve natural versus anthropogenic influences.

#### **Devon Canada**

Various projects include:

- Development of a thermal mobilization risk model to support development efforts in the Jackfish and Pike oil sands developments. Responsibilities included review and evaluation of existing geochemical data including metals and trace elements, development of conceptual site model using existing geological picks for various identified formations, design of Spatial MCA approach to map risk of thermal mobilization from artificial ground heating, and preparation of summary document and presentation at various public venues.
- Completion of detailed studies to define baseline hydrogeological and hydrological conditions in support of a CBM project in the Crowsnest Region of the eastern Rocky Mountains. Responsibilities included, completion of detailed field reconnaissance program, establishment of a spring and water well monitoring network, investigation of surface water/groundwater interactions, development of a conceptual hydrogeological framework in a mountainous area using geological and geochemical data, groundwater age dating of regional confined aquifers using radioactive isotopes (i.e. Tritium and Chlorine-36), and public and regulatory liaison.
- Hydrogeological support for D51 disposal application. Responsibilities included refinement of conceptual model and identification of hydrodynamic conditions supporting disposal water entrapment by stagnation zone using geochemical and isotope evidence.

#### **Enerplus**

Completion of a Water Security Plan for the Western Canadian assets. Responsibilities included review of asset operations and water management process, assessment of basin water risk conditions and current mitigations in place, source water and disposal opportunity assessment, and development of multi-criteria assessment (MCA) process to rank water risk profile of each asset and provide recommendations for mitigation.

#### Graymont Western US Inc.

Preliminary development of a mine dewatering and water management strategy for a large limestone quarry located in the eastern from ranges of the Rocky Mountains. Responsibilities included assessment of baseline hydrogeological and hydrogeochemical conditions in a mountain environment, source water fingerprinting and groundwater age-dating, fracture and lineament analysis using structural geology and geophysical analysis (GPR, borehole tele-viewer), groundwater-surface water interaction assessment (i.e., Bow River), conceptualization of dewatering strategy utilizing oriented and horizontal well technology, and issues identification and risk analysis.

## E-1 - Attachment E Page 200 of 252

#### Hammerhead Resources

Completion of watershed analysis, flood assessment and intake siting in support of a Water Act Application on the Smoky River. Responsibilities included assessment of Smoky River watershed and water supply potential, review of historical flow data and assessment of Q80 and Q95, flood assessment to determine 1:10 and 1:25 year event levels, review of fisheries and bank stability assessment in support of intake siting, development of proposed monitoring and response plan, and liaison with AEP and AER representatives.

#### Husky Oil Operations Ltd.

Completion of a water security plan for the Ansell asset, west-central Alberta. Responsibilities included review of project water profile and future requirements for hydraulic fracturing, facilitation of risk review workshop, and review of water source opportunities and development of MCA opportunity ranking process.

Also, completion of a Water Security Plan for a 200,000 barrel per day thermal in situ oil sands operation. Responsibilities included, review of water supply and disposal needs for the duration of the planned project, risk and opportunity analysis using multi-criteria analysis to ensure viability of supply and disposal strategies, and identification of strategies to ensure project viability and project sustainability.

#### Imperial Oil

Various projects include:

- Completion of field and bench-scale tests to determine facilitated mobility of metals, trace elements, and dissolved organics resulting from artificial ground heating around thermal in situ wells. Responsibilities included drilling, installation, testing, and sampling (soil and water) from 22 deep (up to 90 m) monitoring wells at a newly established thermal in situ pad to determine baseline geochemistry and groundwater flow directions, tracer experiment to determine groundwater flow velocities in a deep (>80 m) confined aquifer, collection of sediment samples (under anoxic conditions) for bench-scale heating experiments to determine metals mobility and related kinetics, review of stable isotopes in groundwater and dissolved gases to determine effects of heating from insitu thermal wells on local geochemical conditions (inorganic and organic constituents), reaction path modelling to determine processes influencing changes metals concentrations and biological activity resulting from subsurface heating, determination of activation energies for metals release, and the role of biogeochemical reactions in facilitating metals release, transport and fate modelling to determine the long-term risk of thermal mobilization of metals (and other related constituents) to the surrounding environment, and documentation of result and liaison with client and regulatory agencies.
- Design and implementation of dewatering program for large process water ponds. Responsibilities
  included review of site geological conditions, installation of dewatering wells, acquisition and
  interpretation of aquifer test data, design of dewatering system using appropriate theoretical
  calculations and analytical modelling solution, and development of dewatering plan and associated
  performance monitoring
- Completion of a regional groundwater investigation and development of a regional-scale ground water monitoring network (per EPO 95-07 requirements) in a multi-layer inter-till aquifer system in east-central Alberta. Responsibilities included assessment and interpretation of Quaternary stratigraphy, interpretation of seismic line data and geophysical borehole log analysis, regional groundwater flow mapping, geochemical facies mapping, assessment of regional arsenic concentrations, trends, and potential connection to thermal in situ development activities,

groundwater age-dating and stable isotope analysis ( $\delta^{18}$ O,  $\delta^{2}$ H,  $\delta^{34}$ S,  $\delta^{11}$ B and  $\delta^{13}$ C: dissolved constituents and gases), preparation of investigation report to address EPO questions (i.e. source and cause of groundwater quality issues), and liaison with regulators during investigation and EPO closure process.

- Completion of an environmental liability assessment to determine the cost of decommissioning, abandoning and restoring the area currently occupied by the Norman Wells field. Responsibilities included completion of a Phase 1 audit of production facilities and supporting infrastructure (i.e. wellheads, pipelines, satellites, batteries and former refinery), design and implementation of a late Fall field program to sample a statistically sufficient number of locations to generate realistic liability costing for field shutdown and closure, generation of a summary report, and assistance with design of liability costing model and summary reporting.
- Completion of numerous isotope studies using to determine groundwater flow rates in regional confined aquifers and the source of anomalous groundwater quality conditions and dissolved gas concentrations near a large heavy oil recovery operation using assessment of δ<sup>18</sup>O, δ<sup>2</sup>H, δ<sup>34</sup>S, δ<sup>11</sup>B and δ<sup>13</sup>C and Tritium and Carbon-14 for groundwater age-dating.
- Tritium age dating of groundwater in Norman Wells, NWT to determine vertical groundwater flow characteristics in discontinuous permafrost environment
- Development and implementation of a site characterization program at a former refinery and battery (circa 1930s) located approximately 160 km south of the Arctic Circle. Responsibilities included the design and installation of a monitoring network in discontinuous permafrost, and assistance in development of assessment programs to generate Tier II criteria in support of a human health and ecological risk assessment.
- Support for re-licensing of supply wells for oilfield injection using Alberta Environment "Water Conservation and Allocation Guideline for Oilfield Injection" and "Groundwater Evaluation Guideline." Responsibilities included, completion of field-verified surveys, review of site geological conditions, acquisition and interpretation of aquifer test data, assessment of groundwater/surface water interaction, and determination of long-term sustainable yield using analytical solutions
- Hydrogeological lead for a large oil sands mine EIA (Kearl Oil Sands Mine Project). Responsibilities
  include evaluation and interpretation of water well information and chemical data, defining
  Quaternary stratigraphy, temporal water level assessment to determine potential impact to regional
  groundwater quality and quantity arising from mine development and dewatering, and support at
  Joint Panel hearing.
- Cold Lake area monitoring program (Arsenic Investigation 30 private residents). Responsibilities
  included interviews with well-owners, assessment of the water delivery system, sample collection
  using ultra-clean sampling methods, review of the data, and communication of results to client, well
  owner and Alberta Environment
- Completion of an environmental liability assessment and costing exercise in support of the sale of
  the Judy Creek field to PenGrowth Corp. to statistically sample a sufficient number of facilities to
  generate realistic liability cost for property transfer. Responsibilities included completion of Phase 1
  audits of production facilities and supporting infrastructure (i.e. wellheads, pipelines, satellites, and
  batteries), design and implementation of winter field program to sample facilities to generate realistic
  liability cost for property transfer
- Conceptual model design for dewatering scheme in support of mine development. Responsibilities
  included assessment of geological conditions, boundary assessment, parameter selection and
  optimization, and assessment of model results

- Completion of a groundwater modelling study to determine the sustainable yield of a major deep freshwater aquifer in the Cold Lake area. Responsibilities included the provision of hydrogeological support for model conceptualization and design, input parameter selection, and evaluation and communication of results
- Development and implementation of a regional groundwater quality monitoring network covering an area of 1,200 km<sup>2</sup>. Responsibilities included, regular interaction with environmental regulatory agencies and the local landowners, installation, testing and sampling of deep (up to 230 m) monitoring wells to assess potential impact to confined aquifers due to production well casing failures, design, implementation and interpretation of aquifer tests in support of groundwater remediation programs, and development of cost effective approaches towards restoring water quality conditions in deep aquifers influenced by heavy hydrocarbons and associated production fluids.
- Preparation of an AB environment approved Incident Response Plan to deal with groundwater quality issues identified during routine monitoring activities at a large heavy oil recovery scheme. Responsibilities included design of a cost-effective sampling schedule including rationalization of a 200 well monitoring network to provide a meaningful network of approx. 100 wells, and development of statistical limits for response and mitigation actions.

#### Japan Canada Oil Sands (JACOS)

Execution of hydrogeological section of an expansion EIA for the Hangingstone Thermal In Situ Oil Sands project. Responsibilities included development of baseline hydrogeology, EIA sections, and SIR responses, liaison with project team and governing agencies, and stakeholder consultation with First Nations and 3PC.

Also, completion of a water supply project in support of a heavy oil recovery scheme using Alberta Environment "Water Conservation and Allocation Guideline for Oilfield Injection" and "Groundwater Evaluation Guideline." Responsibilities included assessment of geophysical logs and EM survey results, design and implementation of field programs, step rate test and constant rate test data acquisition and analysis, well screen selection and well design, well efficiency assessment, and use of pertinent analytical equations to predict effect of long-term pumping.

#### Mobil Oil Canada

Completion of a stable isotope study to determine the source of sulphate impact from a large sour gas processing facility. Responsibilities included, drilling and installation of monitoring wells, development of a conceptual site model, review of site-wide geochemistry (soil and groundwater), and application of  $\delta^{34}$ S,  $\delta^{18}$ O,  $\delta^{2}$ H, and  $\delta^{13}$ C isotopes to resolve natural versus anthropogenic influences.

#### **Nexen ULC**

Development of a water strategy to service the Aurora LNG project/Dilly Creek asset. Responsibilities included assessment of development trajectory with respect to water use, identification of feasible water supply source to accommodate up to 6.5 million m<sup>3</sup> per year of water, conceptualization of water storage strategy to reduce pressure on local water sources and minimize physical footprint of development, development of a water conveyance strategy utilizing existing rights of way, including Class 5 cost estimation, and liaison with Fort Nelson first Nations to facilitate development of baseline hydrology monitoring program and facilitation of a Section 10 water licence (following successful EAB appeal of previous licence).

Also, the design and completion of bench-scale testing to determine the mobilization of metals and trace elements under applied heating. Responsibilities included conceptual design of experimental process in

collaboration with AGAT lab representatives, assessment of frozen core samples and selection of appropriate intervals for physical (grain size, mineralogy via XRD) and chemical testing (total metals, leachable metals), assessment of results from sequential batch heating experiments extending from 5-100°C for metals species released to solution, geochemical modelling of kinetic experiment results to determine activation energies of metals release, completion of attenuation experiments to determine potential for mobilized metals to re-associated with sediments under cooled conditions, and preparation of suitable documentation to present to the client and AER.

#### **Pembina Pipeline Corporation**

Provision of expert legal support to review source and cause of industrial chemical contamination at an operating gas plant. Responsibilities included review of existing site investigations, procedures, and documentation, assessment of efficacy of investigations and protocols (field and laboratory), development of conceptual model to explain presence and movement of sulfolane in bedrock deposits, and review of risk assessment findings and provision of recommendations to close data and information gaps.

#### Petro-Canada

Various projects include:

- Completion of detailed regional and local baseline studies, and cumulative impact assessment, to establish regional and local hydrogeological and geochemical characteristics in support of a 30,000 bbl/d heavy oil recovery expansion (MacKay River Project). Responsibilities included defining Quaternary stratigraphy, temporal water level assessment to determine potential impact to regional groundwater quality and quantity arising from bitumen recovery operations, development of a numerical groundwater model to assess long-term effects of water withdrawal and waste disposal to support project activities, and completion of climate change assessment formed part of the assessment for project design.
- Conceptualization and design of field program to assess water supply and water disposal for two
  major heavy oil projects (>30,000 bbl/d). Responsibilities included selection of drilling locations
  based on geophysical reconnaissance, implementation of field programs, step rate test and constant
  rate test data acquisition and analysis, well efficiency assessment, well screen selection and well
  design, and use of pertinent analytical equations.
- Review of fresh groundwater use for a water flood project. Responsibilities included interpretation of historical monitoring well data to determine the effects of the groundwater withdrawal from the local aquifer.
- Assessment of long-term effects of industrial water supply wells used for a water flood scheme. Responsibilities included a review groundwater chemistry and well hydraulic data to determination sustainable production rates.
- Completion of an environmental operations audit and subsequent industrial landfill delineation to determine the source area of possible groundwater contamination. Responsibilities included completion of a comprehensive intrusive landfill delineation and soil sampling program to determine the extent and volume of landfill contamination.
- Completion of an industrial landfill delineation project to determine possible sources of groundwater contamination. Responsibilities included completion of a magnetometer survey, follow-up excavation and soil sampling near a decommissioned landfill to determine the presence, extent and volume of residual landfill material.

#### Procor

Review of operational history of a salt cavern storage facility including an assessment of groundwater quality near the large brine storage ponds and the potential for impact to the Regina Aquifer.

#### **Shell Canada**

Various projects include:

- Completion of watershed analysis and intake siting in support of a Water Act Application on Iosegun Lake. Responsibilities included assessment of Iosegun Lake watershed and water supply potential, water supply modelling to determine availability and reliability of supply, review of historical flow data and determination of suitable IFN at outlet (i.e. Q80), review of terrestrial, fisheries and water quality data to support water diversion strategy, development of proposed monitoring and response plan, and liaison with AEP and AER representatives.
- Hydrogeological support for Jackpine Mine Expansion EIA
- Development of Groundwater Management Plan and annual monitoring support at Shell's Muskeg River Mine. Responsibilities included review of site-wide groundwater monitoring network for applicability to EPEA Approval requirements (including gap analysis, routine monitoring and reporting per EPEA requirements, selection of indicator suites to facilitate routine monitoring, evaluation, and reporting, identification of locations with water quality concerns, development of approach to statically assessing and responding to data excursions and trends, and preparation of the GMP for consideration and acceptance by AEP.
- Support for Carmon Creek EIA and assessment of brackish water supply potential in support of heavy oil operations in the Peace River area. Responsibilities included assessment of baseline hydrogeological conditions and potential impacts from project development, preparation of climate change assessment for project development, support for SIR submissions and EIA team interactions, feasibility assessment of potential for deep formations to produce sustained supplies and conceptual well-field development, and liaison with regulatory agencies
- Development of a regional-scale ground water monitoring network in a multi-layer aquifer system in the Peace River region of Alberta. Responsibilities included assessment of Quaternary stratigraphy, interpretation of seismic line data, geophysical borehole log analysis, and geochemical facies mapping and solution chemistry analysis.
- Assistance with the development and construction of an induced infiltration groundwater supply system for the Shell Caroline Gas Plant industrial water supply project. Responsibilities included drilling and installation of large diameter water production wells, borehole geophysical logging and interpretation. sand quantification testing and analyses to determine sediment production volumes prior to pipeline construction, and liaison with client and local landowners.

#### **Suncor Energy**

Various projects include:

Lead subsurface specialist for a multi-criteria decision analysis and life-cycle value analysis in support of a regional brine management strategy in the Athabasca Oil Sands area. Responsibilities included development of a holistic weighting and ranking approach to address triple-bottom-line assessment of treatment and disposal options for liquid and solid waste streams originating from oil sands mining and in situ assets located across a 30 000 km<sup>2</sup> area, facilitation of, and participation in, workshops to assess viable options for treatment and disposal including Class 4 costing, and

development of a constraints mapping approach (vulnerability, risks and opportunities) using ArcGIS to assist in management and disposal options for liquid and solids waste streams.

- Development of an Athabasca River reconnaissance program to identify and sample natural groundwater-surface water interaction zones discharging waters from the Cretaceous and Devonian formations. Responsibilities included planning/execution and interpretation of a marine-based geophysical program using EM31 imaging and bathymetric readings, development of pore water sampling program including geochemical assessment of waters and source fingerprinting (major ion, trace element, dissolved organics, and stable and radiogenic isotopes), interpretation of results and presentation at various venues (government, industry.
- D51 disposal monitoring at the Firebag Thermal In Situ Project
- Thermal mobilization assessments (Firebag, Lewis, Meadow Creek)
- Development of brine water management strategy including options analysis and Class 4 costing
- Preparation of an oil sands mining closure strategy outlining goals, objectives, tasks, timelines, and consulting and research agencies to execute in support of Life of Mine Closure and Reclamation process
- Assistance with Fort Hills Operational Plan regarding preservation of McClelland Lake and wetland complex; review of physical hydrogeology and geochemical setting; assessment of numerical model design and output; review of cut-of wall design and mitigation system; review of adaptive management processes
- Review of Devonian McMurray interactions at the North Steepbank mine expansion and assistance with investigation program design (including geochemical assessment)
- Completion of geophysical and porewater surveys on the Athabasca and Steepbank Rivers to determine contributions of natural discharge versus industry inputs
- Review of existing water supply for Steepbank and Millennium mine operations and development of contingency supply options. Responsibilities included review of past water resource evaluations, development of geophysical investigation program and interpretation of results, assessment of contingency water supply (groundwater and operations water), client consultation and liaison with Alberta Environment, and implementation of horizontal well technology to provide a secure supply of water for continued operations
- Groundwater age-dating and source area identification in support of active tailings pond seepage investigations. Responsibilities included conceptual site model design, review of traditional geochemistry to determine end-point water types, and application of Tritium, δ<sup>18</sup>O, δ<sup>2</sup>H, δ<sup>34</sup>S, δ<sup>11</sup>B to resolve geochemical setting and potential areas of seepage
- Preparation of an AB Environment approved Groundwater Management Plan at a large oil sands mining operation. Activities included, the design of a cost-effective sampling schedule including rationalization of over 300 wells to establish a meaningful monitoring network of 150 wells, development of statistically established trigger values for response and mitigation, and lliaison with Government of Alberta during review and approval.

#### Syncrude Canada

Participation on expert hydrogeology panel to review Devonian investigation program for Aurora mine and assess mitigation strategies to control high risk areas (Les Gray - UBC, Carl Mendoza, - UofA, Ken Baxter - Golder, Jon Fennell - WP). Responsibilities included review of existing baseline data for active mining site, identification of high-risk areas to consider for future investigation and monitoring, participation in group workshop settings to communicate findings and accumulate input for

recommendations refinement, and participation in internal panel meetings to discuss concepts and develop final recommendations.

#### **Teck Resources Limited**

Evaluation of stream response to groundwater interception in support of fisheries habitat offsetting at Line Creek Mine, BC. Responsibilities included baseline reconnaissance of Line Creek alluvial system and GW-SW water interactions with Line Creek, assessment of area springs, shallow groundwater, and creeks to determine geochemical quality and flow conditions (using drive point well technology and data logger systems), completion of ground penetrating radar survey to map thickness and morphology of alluvial deposits, water quality fingerprinting using major ion, trace elements (in particular selenium) and stable isotopes to determine interaction of groundwater environment with Line Creek, and assessment of selenium mobilization conditions related to active mine workings and development of a conceptual (passive) mitigation strategy to offset impacts to fisheries habitat.

#### Total E&P

Support for Joslyn North Mine EIA submission and development of a mine dewatering strategy for. Responsibilities included development of baseline hydrogeology, EIA sections and SIR responses, liaison with project team and governing agencies, joint Panel hearing support.

Also, selection and phasing of depressurization wells and associated monitoring wells, review of deep well injection potential, including geochemical compatibilities of waters, development of a performance monitoring system, selection of pipeline route, and preparation of a design-based memorandum with related costs (Class 3) of implementation and long-term operation.

#### Various Gas Plants, Batteries and Refineries (Alberta, British Columbia, Saskatchewan)

Completion of piezometer network design at numerous operating facilities to assess the potential impact to local groundwater quality resulting from industrial activities and extent of contaminant migration from known source areas (Imperial Oil, Shell, Mobil, Canadian Occidental); and, provision of hydrogeological services in support of a gas plant decommissioning (ongoing). Responsibilities include, well installation, testing and sampling, involvement in a site-specific risk assessment (ecological and human health), development of sampling protocols, and assessment of cost-effective remediation techniques to address various contaminant situations in both soil and groundwater.

#### Various Oil and Gas Facilities (Alberta, Saskatchewan)

Completion of environmental operations audits and development of waste management plans for numerous operating oil and gas facilities (Amoco, Petro-Canada, Shell). Responsibilities included review of historical operations files (spill reports, waste handling procedures, EUB and AENV records), completion of site inspections and interviews, and historical air photo analysis and interpretation.

## **EDUCATION**

Ph.D. (Geochemistry) - University of Calgary, 2008

M.Sc. (Physical Hydrogeology and Isotope Geochemistry) - University of Calgary, 1994

B.Sc. (Geology: hard rock, sedimentology, mineralogy, structural, geochemical) – University of Saskatchewan, Saskatoon, 1985

## **REGISTRATIONS & AFFILIATIONS**

APEGA (P.Geol. - Alberta)

EGBC (P.Geo. - British Columbia)

APEGS (P.Geo. P.Eng. - Saskatchewan)

NAPEG (P.Geol. – Northwest Territories and Nunavut)

National Ground Water Association (NGWA)

International Association of Hydrogeologists

Canadian Water Resources Association (CWRA)

Sustainable Energy Development Program (Univ. of Calgary) – External Advisory Board – 2017 to present

Bow River Basin Council (Calgary), Board of Directors (2008-2013), Chair of Monitoring and Modelling committee (2008 to 2012), Member of Legislation and Policy Committee (2006-2011), Member of Integrated Watershed Management Group (2007 to 2010)

# SPECIFIC TECHNICAL EXPERTISE

- ICP-MS, GC-MS, Ion chromatography (LC-MS, HPLC, IC)
- SEM, XRD (bulk and clays), XRF, EDS and Synchrotron Light (XANES, and EXAFS)
- Isotope ratio mass spectrometry (IRMS)
- Solid-phase extraction, Alumina fraction, and sequential soil extraction
- Toxicity identification evaluation for metals and organics
- Selection of appropriate inorganic or organic analytical techniques based on Standard Methods for Water and Wastewater
- Statistical analysis (e.g. population testing, trend analysis, control charting, PCA, HCA, spatial analysis)
- Multi-criteria decision analysis (MCDA)
- Vulnerability and risk mapping
- Risk assessment (human and ecological)
- Climate tele-connections assessment, climate model analysis and impact identification, development of adaptation strategies

## PUBLICATIONS

**Fennell J.** and Aciszewski T (2019). Current knowledge of seepage from oil sands tailings ponds and its environmental influence in northeastern Alberta. Science of the Total Environment, 686, p. 968-985.

Birks S.J., **Fennell J.W.**, Gibson J.J., Yi. Y., Moncur M.C., and Brewster M. 2019. Using regional datasets of isotope geochemistry to resolve complex groundwater flow and formation connectivity in northeastern Alberta, Canada. Applied Geochemistry, 101 (2019), p. 140-159.

Hatala R., **Fennell J.**, and Gurba G. 2018. Advances in the realm of Hydrogeophysics: The emerging role of Quantum Geoelectrophysics in Aquifer Exploration. Can. Soc. of Expl. Geoph., RECORDER October Focus - Hydrogeophysics: the Past, Present, and Future. Vo. 43, No. 6, p. 32-36.

## E-1 - Attachment E Page 208 of 252

Birks S.J., Moncur M.C., Gibson J.J., Yi Y., **Fennell J.**, and Taylor E.B. 2018. Origin and hydrogeological setting of saline groundwater discharges to the Athabasca River: Characterization of the hyporheic zone. Applied Geochem., 98, p. 172-190.

**Fennell J.**, 2018. Predictions, perceptions and the precautionary principle: responding to climate change in a realm of uncertainty. Canadian Water Resources Association, Water News, Fall/Winter 2018. Vo. 37, No. 2, p. 6-9.

**Fennell J.,** 2018. Water, Peace, and Global Security: Canada's Place in the World We Want (Sandford and Smakhtin, eds.), Groundwater and Canada's Future – Moving data and information to knowledge and security. Prepared for the United Nations University, Institute for Environment, Water and Health, 17 pp.

**Fennell J.** 2018. Poison Well: Chasing arsenic in Alberta's groundwater. Water Canada, January/February 2018, p. 20-21.

**Fennell J.** 2017. Let's make a deal: Canada's vital role in the Columbia River Treaty. Water Canada, September/October 2017. p. 42-43.

Faramarzi M., K. Abbaspour, V. Adamowicz, W. Lu, **J. Fennell**, A. Zehnder and G. Goss 2017. Uncertainty based assessment of dynamic freshwater scarcity in semi-arid watershed of Alberta, Canada. *Journal of Hydrology: Regional Studies*, 9, p. 48-68.

**Fennell J.** 2015. Disposal in the unconventional oil and gas sector: Challenges and solutions. American Assoc. of Petroleum Geologists, *Environmental Geosciences*, Vol. 22, No. 04, December 2015, p. 127-138.

**Fennell J.** and O. Keilbasinki 2014. Water, food, and our climate: Is California a harbinger of things to come? *WaterCanada*, July/August 2015, p. 24-25.

**Fennell J.** and O. Keilbasinki 2014. Water without Borders: What is Canada's role in water security? *WaterCanada*, November/December 2014, p. 50-51.

Gibson J.J., **J. Fennell**, S.J. Birks, Y. Yi, M. Moncur, B. Hansen and S. Jasechko 2013. Evidence of discharging saline formation water to the Athabasca River in the northern Athabasca oil sands region. *Canadian Journal of Earth Sciences*, 50, p. 1244 - 1257.

M.S. Ross, A.S. Santos Pereira, **J. Fennell**, M. Davies, J. Johnson, L. Sliva, and J.W. Martin 2012. Quantitative and Qualitative Analysis of Naphthenic Acids in Natural Waters Surrounding the Canadian Oil Sands Industry. *Environmental Science and Technology*, 46, p. 12796 – 12805.

**Fennell J.** 2011. Total Water Management – a new and necessary paradigm. Environmental Science and Engineering Magazine, May/June edition.

**Fennell J.**, Klebek M. and Forrest F. 2011. An approach to managing cumulative effects to groundwater resources in the Alberta Oil Sands. World Heavy Oil Congress proceedings, March 2011.

**Fennell J.** 2010. Protecting water supplies in CSG development. *Water Engineering Australia*, Vo. 4, No. 6, September 2010.

**Fennell J.** 2008. Effects of Aquifer Heating on Groundwater Chemistry with a Review of Arsenic and its Mobility. Ph.D. thesis, Department of Geoscience, University of Calgary.

**Fennell J.** Zawadzki A. and Cadman C. 2006. Influence of natural vs. anthropogenic stresses on water resource sustainability: a case study. *Water Science and Technology*. Volume 53, No. 10, p 21-27.

William L.B., M.E. Wieser, **J. Fennell**, I. Hutcheon, and R.L. Hervig 2001. Application of boron isotopes to the understanding of fluid-rock interactions in a hydrothermally stimulated oil reservoir in the Alberta Basin, Canada. *Geofluids*, Vol. 1, p. 229-240.

Kellett R., J. Fennell, A. Glatiotis, W. MacLeod, and C. Watson 1999. An Integrated Approach to Site Investigations in Permafrost Regions: Geophysics, Soils, Groundwater, and Geographical Information Systems. ARCSACC Conference, Edmonton '99.

Gilson E.W., R. Kellett, **J. Fennell**, P. Bauman, and C. Sikstrom 1998. High Resolution Reflection Seismic and Resistivity Imaging of Deep Regional Aquifers for Stratigraphic Mapping. CSEG Conference.

**Fennell J.** and Bentley L. 1997. Distribution of Sulphate and Organic Carbon in a Prairie Till Setting: Natural versus Industrial Sources. *Water Resources Research*, Vol. 34, No. 7, p. 1781-1794.

**Fennell J.** and Sevigny J. 1997. Effects of Acid Conditions on Element Distribution Beneath a Sulphur Base Pad (Acid Mobilization Study). Publication submitted to the Canadian Association of Petroleum Producers (CAPP).

**Fennell J.** 1994. Source and Distribution of Sulphate and Associated Organics at a Sour Gas Plant in Southern Alberta. M.Sc. thesis, Department of Geology and Geophysics, University of Calgary. Hayes B., J. Christopher, L. Rosenthal, G. Los, B. McKercher, D. Minken, Y. Tremblay, and

**J. Fennell** 1994. Atlas of the Western Canadian Sedimentary Basin – Chapter 19: Cretaceous Manville Group. Canadian Society of Petroleum Geologists and Alberta Research Council, ISBN 0-920230-53-9.

## **PRESENTATIONS & LECTURES**

Bow River Basin Council – Technical Series, May 2021, online: Flooding, climate change and the need for a precautionary approach.

Bow River Basin Council – Legislation and Policy Group seminar, April 2021, online: Gravel mining – the physics, chemistry, and risks you need to know.

COSIA Oil Sands Innovation Summit, June 2019 Calgary AB: Fact or fiction – the truth regarding tailings pond seepage in Canada's oil sands (response to a Free Trade Agreement challenge),

CWRA Alberta Branch conference, April 2019 Red Deer: Flooding, climate change, and the need for a precautionary approach.

University of Calgary, Sustainable Energy Development Program. February 2019, Decision support processes and tools in sustainable energy development projects.

Mine Water Solutions, June 2018. Total Water Management: Canada's contribution to sustainable mine development.

Canadian Water Resources Association, April 2018, Red Deer, AB. Arsenic and Alberta's Groundwater: the where and why.

Southern Alberta Institute of Technology (water Initiative), February 2018, Calgary AB. Risky business: understanding Alberta water security

Canadian Society of Unconventional Resources (CSUR), January 2018, Calgary AB. Managing through nature's extremes: ensuring water security for successful UCOG operations.

SEAWA, Nov 2017, Medicine Hat AB. Hydrology of riparian areas: the need for protection and preservation.

CWRA National Conference, June 2017, Lethbridge AB. Climate change, the Columbia River Treaty, and considerations for a successful re-negotiation.

Thermal mobilizations and the regulatory response, May 2017, Calgary AB. CHOA forum.

National Ground Water Association, March 2017, Denver CO. Advances in the realm of hydrogeophysics: the role of Quantum Geoelectrophysics in groundwater exploration

Haskayne School of Business IRIS series, Feb 2017. Following the molecules: the importance of water to Canada's future.

BRBC-CEAC, Feb 2017, Cochrane AB, GW-SW interaction and the implication for development in riparian lands.

Watertech, April 2017, Banff AB. Arsenic in Alberta's Groundwater: the where and why; Isotopes and Geochemistry:

National Ground Water Association, Hydrogeophysics for deep groundwater exploration, March 2017, Denver CO. Advances in the realm of Hydrogeophysics: the role of Quantum Geoelectrophysics in Groundwater Exploration

Haskayne School of Business CPC IRIS seminar series, February 2017, Calgary AB. Following the molecules: the importance of water in Canada's future.

Bow River Basin Council/Cochrane Environmental Action Committee Collaborating for Healthy Riparian Lands Engagement Workshop, February 2017, Cochrane AB. Groundwater-Surface water interaction and the implications of human development in riparian lands.

Watertech, April 2016, Banff AB. Predicting Alberta's Groundwater Future & An Integrated Approach to Resolving Complex Hydrogeological Settings.

Canadian Water Resources Association (CWRA), April 2016, Edmonton AB. Natural discharge and its role in Athabasca River water quality.

Canada's Oil Sands Innovation Alliance (COSIA) Water Forum, March 2016, Calgary AB. Natural discharge and its role in Athabasca River water quality.

Canadian Association of Petroleum Geologists (CSPG), March 2016, Calgary AB. Climate, water availability, and the success of Western Canada's Energy Development & Natural discharge and its role in Athabasca River water quality.

Underground Injection Control (GWPC), February 2016, Denver CO. Disposal in the unconventional oil and gas sector: challenges and solutions.

AGAT Environmental Series, Jan/Feb 2016. Calgary and Edmonton, AB. Climate, water availability and the success of Western Canada's energy industry.

International Water Conference, November 2015, Orlando FL. Disposal in the unconventional oil and gas sector: challenges and solutions.

Chemistry Industry Association of Canada, October 2015, Edmonton AB. Water Sustainability: and its importance to successful industry.

EnviroAnalysis, July 2015, Banff AB. Thermal mobilization and Arsenic: implication for the oil sands.

WaterTech, April 2015, Kananaskis AB. Smart Monitoring to address challenges of Unconventional Gas development and an approach to mapping risk related to thermal mobilization of constituents.

Canadian Water Resources Association, April 2015, Red Deer AB. Water, Energy and Canada's Future (keynote address)

Underground Injection Council, February 2015, Austin TX. Monitoring to address challenges of Unconventional Gas development (invited speaker)

National Ground Water Association, Groundwater monitoring for Shale Gas developments workshop, November 2014, Pittsburgh PA. Smart monitoring to address the challenges of Unconventional Gas Development (invited speaker)

Canadian Water Resources Association, June 2014, Hamilton ON. Water disposal in the Oil Sands: challenges and solutions and What is Water Security and Why is it Important.

Water Management in Mining, May 2014, Vancouver BC. Total Water Management: a necessary paradigm for sustainable mining.

CSPG GeoConvention May 2014, Calgary AB. Water disposal in the Oil Sands: challenges and solutions; Placing the risk of thermal mobilization into perspective; What is Water Security and Why is it Important?

WaterTech, April 2014, Banff AB. Water disposal in the Oil Sands: challenges and solutions and Placing the risk of thermal mobilization into perspective.

Canada's Oil Sand Innovation Alliance (COSIA), March 2014, Edmonton AB. Water disposal in the Oil Sands: challenges and solutions and Placing the risk of thermal mobilization into perspective.

International Assoc. of Hydrogeologists, GeoMontreal 2013, October 2013, Montreal QC. The role of subsurface heating in trace element mobility.

Oil Sands Heavy Oil Technology 2013, July 2013, Calgary AB. The role of subsurface heating in trace element mobility.

Watertech, April 2013, Banff AB. The role of subsurface heating in trace element mobility.

International Assoc. of Hydrogeologists World Congress 2012, September 2012, Niagara ON. Session Chair for Hydrogeological Issues in the Oil Sands and presenter: i) Oil Sands overview – economic and environmental setting; ii) Framing groundwater vulnerability in the oil sands: an approach to identify and discern; and iii) Climate: a driving force affecting water security in the oil sands

Water in Mining 2012, June 2012, Santiago Chile. Total Water Management: a necessary paradigm for sustainability.

BCWWA 2012 Annual Conference, April 2012, Penticton BC. The role of inventory, dynamics, and risk analysis in water management: a case study.

WaterTech, April 2012, Banff AB. Plenary Session. Bringing context to the oil sands debate: understanding the role of nature and its environmental effects.

BCWWA Hydraulic Fracturing Workshop, Fort St. John BC, March 2012. Keynote address: Striking a Balance – water resource management versus economic development (keynote address).

CONRAD 2012, March 2011, Edmonton AB. Bringing context to the oil sands debate: understanding the role of nature and its environmental effects.

Alberta Irrigation Projects Assoc., November 2011, Lethbridge AB. Managing what we have: a review of Alberta's water sources, volumes and trends (invited speaker).

Alberta Innovates Technology Talks, November 2011, Calgary AB. Dynamics of Alberta's Water Supply: a review of supplies, trends and risks.

Red Deer River Watershed Alliance Annual General Meeting, October 2011, Red Deer AB. Water in the Red Deer: volumes, patterns, trends and threats.

Land and Water Summit, October 2011, Calgary AB. Total Water Management: a necessary paradigm for water security.

CEMA Groundwater Working Group, June 2011, Fort McMurray AB. Groundwater in the oil sands: facts, concepts and management processes.

CWRA Alberta / Alberta Low Impact Development Annual Conference, April 2011, Red Deer AB. A Review of Alberta's Water Supply and trends.

WaterTech, April 2011, Banff AB. Managing what we have: a review of Alberta's water supply.

World Heavy Oil Congress 2011, March 2011, Edmonton, AB. An approach to managing cumulative effects to groundwater resources in the Alberta Oil Sands.

Engineers Australia, August 2010, Brisbane Qld. CSG development in Australia: an approach to assessing cumulative effects on groundwater (invited speaker).

Joint IAH/AIG meeting, July 2010, Melbourne Vic. Assessing the effects of coal seam gas development on water resources of the Great Artesian Basin (invited speaker).

18<sup>th</sup> Queensland Water Symposium, June 2010, Brisbane Qld. A cumulative effects approach to assessing effects from coal seam gas development on groundwater resources (invited speaker).

WaterTech, April 2010, Lake Louise AB. Regional Groundwater Monitoring Network Implementation: Northern Athabasca Oil Sands Region.

University of Calgary, December 2009, Calgary AB. What's happening to our water? A review of issues and dynamics.

CSPG Gussow Conference, October 2009, Canmore AB. Water sustainability in the Alberta Oil Sands: managing what we have (invited speaker).

Bow River Basin Council, Legislation and Policy Committee Groundwater Licensing Workshop, March 2009, Calgary AB. Groundwater: the hidden resource

BlueWater Sustainability Initiative, January 2009, Sarnia ON. Planning approaches and forensic tools for large-scale regional monitoring initiatives.

CWRA Technical luncheon session, October 2008, Calgary, AB. Water sustainability in a growing Alberta.

Bow River Basin Council, September 2008, Calgary AB. Basin Monitoring and Management Approaches.

IAH/CGS GeoEdmonton08, Edmonton AB. Coordinator and Chair of Groundwater Development Session.

North American Lake Management Society (NALMS) 2008, Lake Louise AB, Coordinator and Chair of Climate Change Effects to Lakes, Reservoirs and Watersheds section.

EcoNomics<sup>™</sup> Luncheon, May 2008, Calgary AB. Water Sustainability in the Hydrocarbon Industry.

WaterTech, April 2008, Lake Louise AB. Effects of climate and land cover changes on basin water balances.

CWRA Annual Conference, April 2008, Calgary AB. Role of climate change and land cover on water supply sustainability.

Bow River Basin Council, March 2007, Calgary AB. Forest Hydrology and the effects of Climate Change.

ALMS/CWRA, October 2006, Lethbridge AB. Reservoir Maintenance Workshop. Climate teleconnections and their effects on basin water supplies

Bow River Basin Council, June 2006, Calgary AB. Groundwater sustainability: the invisible resource (Climate change and basin sustainability)

Engineering Institute of Canada, May 2006, Ottawa ON. CCC2006 Land use and climate change effects at the basin scale.

International Water Association, Watershed and River Basin Management Specialists Group Conference, Calgary, AB, 2005. Basin Water Management Strategies.

Burgess Shale Geoscience Foundation, August 2004 and 2005, Field BC. Water in a Changing Climate: understanding and adapting.

C-CAIRNS, October 2005, Victoria BC, Climate and Fisheries Impacts, Uncertainty and Responses of Ecosystems and Communities, Effects of Climate and the PDO on Hydrology of a Major Alberta Watershed.

North American Lake Management Society, November 2004, Victoria BC. Climate Change and Effects on Water Resources.

Canadian Institute Conference, June 2004, Calgary AB. Water Management Strategies for the Oil and Gas Industry: The challenge and approach

Canadian Society of Petroleum Geologists, Gussow Conference, March 2004, Canmore AB. Understanding the Effects of Natural and Anthropogenic Forcings on Basin Water Resources.

Alberta Environment and EUB, April 2003, Elk Point AB. Climate and Land Use Change Effects on Basin Water Resources in the Lakeland Region - East-central Alberta.

Joint CGS/IAH Conference, June 2001, Calgary AB. A Multidisciplinary Approach to Resolving Complex Hydrogeologic Systems.

Aquatic Toxicity Workshop, October 1996, Calgary AB. Use of site characterization and contaminant situation ranking to focus a risk assessment evaluation at a decommissioned sour gas plant and associated landfill.

Joint GAC/MAC Conference, April 1995, Waterloo ON. Use of geochemical modelling and stable isotopes to determine the source of groundwater quality impacts near a sour gas processing facility.

Joint GAC/MAC Conference, Edmonton AB, 1994. Assessment of depression-focused recharge as a mechanism for variable groundwater and soil chemistry.

GasRep Conference, Calgary AB, 1994. Use of stable isotopes to determine the source of water quality impacts near a sour gas processing facility.

#### **Caitlyn T. Anderson**

From: Sent: To: Subject: L. McCullough June 23, 2021 2:53 PM Legislative Services Shared [EXTERNAL] - RE: Burnco West Cochrane Gravel Pit Bylaw C-8073-2020

Do not open links or attachments unless sender and content are known.

#### I'M STRONGLY OPPOSED TO POLLUTING BOW RIVER AND OUR DRINKING WATER.

As a new resident of Cochrane, I am learning more about how developing nearby gravel pits are being priortorized before people's health.

**WE CANNOT LIVE WITHOUT CLEAN WATER.** There is a real move now to protect Alberta's water ie. the halt of Grassi Mountain to foreign fuel interests and more to come. The writing is on the wall. It is time Rocky View County get in touch with what is paramount to human and animal health and a *fundamental human right: access to clean water*.

**CONCERN FOR CLEAN WATER SHOULD BE THE GUIDING PRINCIPLE for any and all economic activity anywhere**. Expansion of gravel pits in the area is NOT IN THE PUBLIC'S BEST INTEREST. It may benefit a few (jobs) but it will harm many (water-drinkers, animals, the environment.)

ALSO, I AM CONCERNED ABOUT PROTECTING BIG HILL SPRINGS PARK. If there must be expansion of a nearby gravel pit, it should be given a 5 km berth as recommended by environmental experts. Long-term impacts must be considered and decisions not be made piece-meal. It is not easy but it is necessary.

Thank you for taking this matter under serious consideration.

Signed,

A concerned citizen in Cochrane, AB.

E-1 - Attachment E Page 216 of 252

#### **Michelle Mitton**

From: Sent: To: Subject: Aaron Hamilton June 14, 2021 10:04 AM Public Hearings Shared [EXTERNAL] - Bylaw C-8073-2020

Follow Up Flag: Flag Status:

Follow up Flagged

Do not open links or attachments unless sender and content are known.

Name: Mrs Aaron Hamilton Address: 175 Jumping Pound Terrace, Cochrane, AB T4C 0K5

Dear Council Members:

I am writing to oppose Bill C-8073-2020

Please do NOT proceed with another gravel pit!

Highway 1A is a beautiful highway used by families on their way to the mountains and Ghost Lake with recreation vehicles, boats, Trailers etc. Adding heavy equipment, extra traffic, dust, stone chips just makes for dangerous driving conditions for families.

The very close proximity of the gravel pit to the town of Cochrane is ridiculous! Strong westerly winds blow over Cochrane daily. The toxins and heavy medals stirred up by in the air and water by yet another gravel pit in the area is so unnecessary, not to mention the additional noise.

Please, please do NOT move this redundant gravel pit forward!

Aaron Hamilton

### **Caitlyn T. Anderson**

| From:    |
|----------|
| Sent:    |
| To:      |
| Subject: |

Rick Hayton June 22, 2021 3:26 PM Legislative Services Shared [EXTERNAL] - Comments to Burnco West Cochrane Gravel Pit Bylaw C-8073-2020

Do not open links or attachments unless sender and content are known.

Please find my comments below on the proposed Burnco West Cochrane Gravel Pit Bylaw C-8073-2020.

As a Cochrane resident, I am strongly opposed to the development of the Burnco West Cochrane Gravel Pit.

The potential for toxic ground water runoff into the Bow River from this site is not acceptable. Burnco's proposed setbacks from the Bow River will not prevent eventual leaching from the site into the river. Since Cochrane's water supply is obtained immediately downstream of this site, I do not believe development of this site as a large gravel operation is in the best interests of the Cochrane community.

The increase in activity (noise and dust) and truck traffic from this proposed gravel operation should not be allowed to develop on the edges of a growing metropolitan community. It is not in the best interests of Cochrane. It is bad enough that gravel operations are within the Town of Cochrane on the south side of the river. The dust and noise from this existing gravel operation are excessive and dangerous to health on windy days with dust blowing long distances from the actual operation of screening and stockpiling. Putting a large gravel operation up wind of Cochrane is just plain stupid and extremely bad regional planning.

Sincerely, Rick Hayton, Cochrane, Alberta

#### **Michelle Mitton**

From: Sent: To: Subject: Robert Hamilton June 14, 2021 8:35 AM Public Hearings Shared [EXTERNAL] - Re: Bylaw C-8073-2020

Do not open links or attachments unless sender and content are known.

Name: Robert Hamilton Address: 175 Jumping Pound Terrace, Cochrane, AB T4C 0K5

Dear Council Members:

#### I am writing in opposition to the proposed rezoning.

I was shocked when you approved a gravel pit on the edge of Big Hills Springs provincial park. How could you even consider something like that? Now you are considering a much larger gravel pit on the edge of our town on the way to the Ghost Lake reservoir? How many of these gravel pits do we need in our one small county?

The dust and noise associated with a large gravel mining operation on the edge of our town will impact the quality of life for all residents of Cochrane but especially those with chronic breathing conditions. Coming so soon on the heels of a respiratory pandemic it's astonishing you would want to diminish air quality in any way.

In addition, any run-off from the gravel mining activity will impact water quality in the adjacent waterways. When combined with run-off from proposed coal mines the environmental impact will be significant for all Albertans.

The people of Rockey View County treasure fresh air, clean water and natural beauty. You were elected to protect our way of life and our environment. A gravel pit promotes none of those values. If you continue to approve gravel pits you will be failing in your duty.

For these reasons I strongly oppose the proposed rezoning and I urge you to do the same.

Robert Hamilton 175 Jumping Pound TC Cochrane AB T4C 0K5

# Burnco West Cochrane Gravel Pit Redesignation & Master Site Development Plan RVC Bylaw C-8073-2020 Submission prepared by: Rocky View Gravel Watch June 18, 2021

Rocky View Gravel Watch is opposed to Burnco's application to expand its existing gravel operations west of Cochrane south of Highway 1A from 151 acres to a total of 1,117 acres.

The primary reasons for our opposition to this application are:

- Serious concerns regarding the pit's impact on water quality in the local aquifers, the Bow River, and creeks that flow through the property. Recently performed tests have provided disturbing results that must be addressed.
- No justification has been provided to support the need to add such massive acreage to their existing gravel pit.
- No explanation has been provided to support their assertion that production from the site will increase four-fold once the pit is expanded.
- Serious impacts on significant wildlife corridors.
- Permanent disfiguring of a major tourism attraction in Rocky View the scenic views along Highway 1A between Cochrane and the Rockies.
- Inadequate reclamation plans.

Unlike earlier gravel pit applications that have been considered by Rocky View Council this term, the Burnco application has not provided any of its technical studies for review by the public. This makes an assessment of its application significantly more difficult, especially given that its MSDP is also much more vague on many critical issues relative to MSDPs provided with other gravel pit redesignation applications.

In itself, this shortcoming should be sufficient to require the tabling of this application until Burnco releases its technical studies and the public have had a meaningful opportunity to review them. Of all the gravel applications considered by this Council, Burnco is requesting that significantly more land to be redesignated than any of its competitors have done. As a result, it is only fair and appropriate to hold Burnco to at least the same standard of information sharing as has been provided in other gravel applications.

#### Water Quality Concerns

Burnco is proposing to excavate gravel both above and below the water table. Its MSDP is extremely vague about specifics. This in itself should be completely unacceptable. It is not clear how Council can approve an application when such substantive information is not clearly evident in the applicant's submission.

In a separate submission, Dr. Jon Fennell is presenting the results of a soil column flushing experiment conducted with gravel from the existing Burnco West Cochrane gravel pit. The results from that experiment are disturbing in that they found levels of metals and trace elements above levels that are safe for freshwater aquatic life and for human drinking water. Many of these are toxins that accumulate in the body, rather than being flushed out over time.

The test Dr. Fennell performed mimics the effect of precipitation flowing through what is left after most of the gravel has been extracted from a site. This is the situation that will be present during excavation and quite possibly after reclamation.

Burnco has acknowledged that the bedrock in that area is fractured. As a result, whatever leaches through during and after gravel extraction will end up in the aquifer. This means that any contaminants will end up affecting drinking water for everyone who relies on groundwater wells and on water from the Bow River.

Burnco's technical studies supporting its application do not consider this issue. They have reported on pre-excavation groundwater quality. However, they have done no work to determine the impact their gravel extraction activities might have on that water quality. This is an unacceptable shortcoming.

Simply assuming there will not be a problem is not adequate. Burnco must be required to demonstrate that its proposed gravel extraction activities will not damage water quality before they can proceed.

#### No Demonstrated Need for Pit Expansion

Burnco currently operates a 151-acre pit at its West Cochrane location. Since it opened in 2016, it has produced 125,000 tonnes of gravel per year. This leaves their existing pit with 14 – 15 years remaining reserves, at their current production rate.

Burnco also has over 3,200 acres of operating gravel pits elsewhere in Rocky View. Although they assert that some of these pits are "nearing depletion", they have provided no information on expected remaining reserves at any of their other four pits in Rocky View. Nor have they provided any information on possibilities for expanding any of those pits as an alternative to expanding its West Cochrane operations.

At Burnco's current production rate, the additional reserves at the West Cochrane location would increase the pit's lifespan to well over 100+ years. It is completely irresponsible to consider redesignating land to gravel production that may not be used for such purposes within the next century. This is particularly true given the current lack of any comprehensive policy approach to managing gravel resources within the County. Once such policy is in place, this may be an appropriate location to identify for future gravel extraction. However, until such a policy is in place, permanently redesignating almost 1,000 acres lacks any justification.

Given the water quality concerns raised above, Burnco's explanation for the need for this expansion is particularly worrisome. Burnco indicates that they are looking to this site to replace gravel washing operations they have undertaken at other locations to continue to provide itself with a vertically integrated source of supply for its asphalt and concrete operations in Calgary.

For starters, it is not Rocky View's responsibility to assist Burnco in maintaining its vertical integration. From Rocky View's perspective, the question is whether this is the highest and best use for this land, not whether Burnco can maintain its profitability more easily if this land is redesignated as it desires.

Even more importantly, gravel washing activities this close to the Bow River and on top of fractured bedrock will significantly increase the risks of contamination for critical water sources. Burnco does not appear to have provided any technical studies documenting the potential impacts from gravel washing at this location. Until they have demonstrated that this activity will not increase risks of water quality degradation, their application must not be approved.

# No Explanation for Assumed Four-fold Increase in Production Volumes

Burnco's MSDP assumes that once the additional 966 acres are redesignated, their production rate at the West Cochrane site will suddenly increase from 125,000 tonnes/year to 500,000 tonnes/year. There is no justification provided for this assertion. As a result, it appears to be, at best, an extremely optimistic hope.

The gravel market is highly competitive. According to Burnco's MSDP, its existing West Cochrane pit could be producing 500,000 tonnes/year but has not been doing so. It is difficult to imagine that if they could have sold an additional 375,000 tonnes/year, they would not have been doing so already.

Without any explanation for why they will be able to quadruple their production rate, there is no demonstrated need for such a massive expansion.

Even if there were an explanation, the proposed expansion would extend the pit's expected life to at least 30 years. It would be far more responsible to redesignate the land as it is needed within a 5 – 10-year timeframe, not a 30 - 100-year timeframe. How can any current council determine the highest and best use for land so far into the future?

#### Significant Impacts on Wildlife Habitat and Corridors

Burnco's own MSDP identifies many species at risk that traditionally live in or near its proposed gravel pit expansion. This is not surprising given that the site stretches 6.5 kilometres along the Bow River.

The proposed mitigation measures are totally inadequate to protect the affected wildlife. The wording of Burnco's mitigation measures is full of "should" statements rather than concrete obligations. This makes them meaningless and unenforceable.

As an example, the location includes nesting sites for a number of migratory bird species. Burnco's mitigation measures state that if they find active nesting sites, "site-specific measures **should be** developed" (emphasis added) – that commits them to nothing.

It is also highly disturbing that Burnco's own description of its mitigation measures for riparian areas and wetlands states "if setbacks are adhered to" the mitigation measures should result in no residual impacts on the affected riparian areas and wetlands. This suggests that there is a real possibility that the setbacks will not be adhered to and that, if they are not, there will be permanent damage to these environmentally sensitive areas. Disturbingly, other mitigation measures include commitments to develop plans for activities that occur within setback areas. No explanation is provided for these apparently contradictory mitigation measures.

#### Permanently disfiguring scenic tourist route

The drive through Rocky View County along Highway 1A to the Rockies is an extremely popular tourist route. Many people intentionally choose the slower, more scenic route along Highway 1A rather than the Trans-Canada Highway west from Calgary.

The proposed gravel expansion will permanently disfigure this major tourist attraction. Constructing 6.5 kilometres of berms along the south side of Highway 1A to obscure the presence of heavy industrial open pit mining will

transform a drive with breath-taking scenery to a drive during which one endures a heavy industrial corridor. Few tourists seek out heavy industrial "sites" as part of their vacation plans.

This disfigurement of the scenic corridor would be bad enough if Burnco was removing the berms once the gravel pit is finally reclaimed. However, they are proposing to leave the berms in place forever. As well as the serious negative impact this will have on one of the province's premier tourist routes, it also raises questions about the adequacy of their reclamation plans.

#### Inadequate and/or ineffective reclamation plans

Gravel pit operations typically use berms as a convenient location to store topsoil, subsoil, and overburden so that it will be readily available for use during reclamation at the end of the pit's life. However, Burnco is proposing the retain the screening berms adjacent to Highway 1A permanently. Given this, how is Burnco going to fulfill its reclamation obligations?

Burnco's MSDP asserts that the screening berms will be "constructed with an overburden core". However, for these berms to be landscaped as described, they will need to have topsoil and subsoil as well – without those components, vegetation will not grow or survive.

Despite this basic plant science reality, the MSDP asserts that all topsoil and subsoil will be salvaged and used in reclamation. These statements in its MSDP simply do not fit together. They cannot both have used overburden and soil from the site to construct permanent berms and also use all soil in their reclamation activities.

Burnco is also proposing to maintain far greater disturbed areas as active gravel pit operations than has been proposed by other gravel applications in the County. They are proposing to have 70 acres on the west side of the pit and 51 acres on the east side of the pit as disturbed areas at any one time for a total of 121 acres. In contrast, other gravel operations have proposed active disturbed areas of only 40 acres at any one time. What justification is there for Burnco to be held to a lower standard for its reclamation obligations than its competitors? This is particularly critical given the environmentally sensitive nature of its location and the serious water quality concerns that have been raised.

#### Conclusion

There is no justification for approving this application as submitted. Burnco's existing pit has 15 years remaining reserves at its current production rate. Until Burnco returns with a credible explanation for how it will maintain a quadrupling of its rate of production over the next thirty years, there is no need to redesignate any additional land to meet its production needs in the immediate future. Even if Burnco can realize these optimistic production levels, there is no need to redesignate enough land to provide 30 years of production. It would be far more responsible to redesignate land on an as-needed basis.

Before any further redesignation of land is appropriate at this location, Burnco also must demonstrate that the water quality concerns raised by Dr. Jon Fennell's study are false. Until they can do that, it is irresponsible to approve additional gravel pit operations in this location.

Burnco also needs to address the serious shortcomings in its mitigation measures that should be protecting the highly sensitive environment in which they propose to operate. The inconsistencies in their reclamation plans also must be resolved before any application is approved.
# **Caitlyn T. Anderson**

From: Sent: To: Subject: William McNabb June 23, 2021 1:30 PM Legislative Services Shared [EXTERNAL] - Bylaw C-8073-2020

Do not open links or attachments unless sender and content are known.

Name: William McNabb Address:31 Silver Ridge Rise Nw, Calgary AB T3B 4P6 - Have an option to develop W5M-4-26-8 Bylaw: C-8073-2020

To Rocky View Counsel

Concerning Bylaw C-8073-2020

A lot of things about this application scares me. The first is that this pit could be in the community for 120 years or more if approved as is. The approval needs to be for what can be used in ten years at current rates or max 160 additional acres connected to the current location.

The second is the dewatering of the pit. The pit was not supposed to be dewatered. But over ten years there has been efforts to change this scope through the operating agreement every 5 years that has no elected official on the board. This allows the operator to increase the scope of the operations without the public input that is required. This is ridiculous for planning and holding the surrounding land owner's captive to a temporary land usage that will outlast all living today.

The third is the environmental aspect of the pit. Burnco has chosen to put the plants for their operations on the east and west fence line of the pit. This will spread the contaminants onto the surrounding land owners. They have the land to put the operations where the dust and noise will mostly be on Burnco's land. Yet they have chosen to hurt the surrounding land owners by letting them be the buffers for Burnco's light, noise and dust contamination. This is unacceptable, especially when they have the land to do otherwise.

The fourth is the Health of the surrounding community. Burnco can limit exposure by putting the operations as far away from the city of Cochrane and neighbors as possible. They have chosen to put it as close as possible to the east and west boundaries. Exposure to dust is the cause of ailments that have long term effects. Reducing the exposure is a critical part of having the highest tax benefit with the lowest associated health costs that will occur with the pit. To do otherwise is fiscally and morally wrong.

It comes down to the "why" of this pit. Clearly more gravel is not needed at present, as the current pit still has 20 years of life. I would request that this not be approved until the current pit is used and then max 160 arces. A gravel policy needs to be in place to provide guidance for the residents of Rocky View. Why would people want to live out in Rocky View country when they are under constant threat of a gravel development next to them for 100+ years. With no way to protect their investment, their surrounding environment and their health.

#### ATTACHMENT 'E': PUBLIC SUBMISSIONS

# E-1 - Attachment E Page 226 of 252

Environment is critical. The current protocols allow for data gaps that are crucial for determining the real effect. If the current pit is approved, we want to see real time data from around the property monitored by a third party and complaints filed when they are putting contaminants on the surrounding properties.

Water is critical. If dewatering is taking place a monitor needs to be put in place on the wells within 1 mile of the Burnco pit. This is to allow us data to fight if we lose our water due to the pit and thus lose the agricultural base that has been the lifeblood for 150 years.

Thanks you, William GM McNabb PE P.Eng June , 2021

Legislative Services Rocky View County 262075 Rocky View Point Rocky View County, AB, T4A 0X2

#### Attention: Rocky View County Legislative Services

#### Subject: Letter of Support – Bylaw C-8073-2020

I am writing this letter in support of BURNCO Rock Product's Land Use Amendment Application – Bylaw C-8073-2020.

I currently work as a truck driver in the aggregate industry and I transport aggregate to and from BURNCO's numerous sites in Rocky View County. These aggregate sites allow for me to make a living in the community and are an essential part of continued sustainable development. BURNCO has shown through their current and past projects, that when projects are developed responsibly, they can create a beneficial relationship with the community and the residents that reside there.

It's due to BURNCO's track record in Rocky View County that I can support BURNCO and its application for expansion of the West Cochrane Gravel Pit.

Sincerely,

[Individual's Name] APVINDER GILL [Individual's Address] 164 WILLOWMERE WAY CHESTERMERE AB T1X0E2 June 22, 2021

Legislative Services Rocky View County 262075 Rocky View Point Rocky View County, AB, T4A 0X2

#### Attention: Rocky View County Legislative Services

#### Subject: Letter of Support – Bylaw C-8073-2020

I am writing this letter in support of BURNCO Rock Product's Land Use Amendment Application – Bylaw C-8073-2020.

I currently work as a truck driver in the aggregate industry and I transport aggregate to and from BURNCO's numerous sites in Rocky View County. These aggregate sites allow for me to make a living in the community and are an essential part of continued sustainable development. BURNCO has shown through their current and past projects, that when projects are developed responsibly, they can create a beneficial relationship with the community and the residents that reside there.

It's due to BURNCO's track record in Rocky View County that I can support BURNCO and its application for expansion of the West Cochrane Gravel Pit.

Sincerely,

Beinder Brar 152 Willowmere Way Chesteremere, AB, T1X 0E2 June 16, 2021

Rocky View County

262075 Rocky View Point

Rocky View County, AB

T4A 0X2

Attention: Legislative Services (legislativeservices@rockyview.ca)

# Re: Burnco's West Cochrane Pit (By-Law C-8073-2020)

As the owner of NW and SW 31-26-3 W5M, Mountain Ash Limited Partnership supports the Master Site Development Plan and redesignation from Ranch and Farm District to Natural Resource Industrial District of Burnco's West Cochrane Pit.

Responsible aggregate resource extraction should be encouraged in this area to avoid sterilization of a valuable natural resource and ensure competitive aggregate pricing of aggregate requirements for the benefit of Rocky View County and local business.

Sincerely,

Mountain Ash Limited Partnership Bruce Waterman June 23, 2021

Legislative Services Rocky View County 262075 Rocky View Point Rocky View County, AB, T4A 0X2

#### Attention: Rocky View County Legislative Services

#### Subject: Letter of Support – Bylaw C-8073-2020

I am writing this letter in support of BURNCO Rock Product's Land Use Amendment Application – Bylaw C-8073-2020.

I am the current tenant of BURNCO's Carseland property, located in Wheatland County. Prior to BURNCO's development on this property, they leased the adjacent property from my family for a number of years. Throughout my experience with BURNCO, they have been courteous and professional in their dealings with me and have been very willing to remedy concerns that may arise. During the operation of their sites, they develop and follow excellent mitigation factors that significantly reduce the impacts of their operations. BURNCO strives to be a courteous neighbour in the community and I look forward to working with them in the future.

I believe that BURNCO will continue to follow these practices with their West Cochrane Gravel Pit and because of this I can support this application.

Sincerely,

Clarence Byma 225047 Highway 817, Wheatland County, Alberta, T1P 0S4



June 22, 2021

Legislative Services, Rocky View County, 262075 Rocky View Point, Rocky View County, AB, T4A 0X2

Sent via email to legislativeservices@rockyview.ca

Re: Proposed Amendments to Land Use Bylaw C-8000-2020

Volker Stevin Contracting is in support of the Proposed Amendments to Land Use Bylaw C-8000-2020. We work with Burnco on a regular basis and find that they are the standard that all gravel crushing operations should be held to. We have Burnco crush material in our pits yearly and we are also a partner in the Stoney Trail Aggregate Reserve (STAR) with them along with Lafarge.

After reviewing the Master Site Development Plan for the West Cochrane Gravel Pit it is clear that Burnco is committed to continue to be a great community partner to Rocky View County and an example for other gravel producers in Alberta.

Sincerely,

Corey Stasiuk GM Asphalt Plants Volker Stevin Contracting 7175 12 St SE Calgary, AB, T2H 2S6

> Box 5850 Stn A. Calgary, AB T2H 1Y3 7175 - 12<sup>th</sup> Street SE Calgary, AB T2H 2S6 Main Office: 403- 571-5800 Operations: 403-571-5806 Administration Fax: 403- 571-5851 Operations Fax: 403- 571-5850

#### <mark>June 22, 2021</mark>

Legislative Services Rocky View County 262075 Rocky View Point Rocky View County, AB, T4A 0X2

#### Attention: Rocky View County Legislative Services

#### Subject: Letter of Support – Bylaw C-8073-2020

I am writing this letter in support of BURNCO Rock Product's Land Use Amendment Application – Bylaw C-8073-2020.

I am the current tenant of BURNCO's Aldersyde property, located in Foothills County. Throughout my experience with BURNCO they have been courteous and professional in their dealings with me and have been very willing to remedy concerns that may arise. During operation of their sites, they develop and follow excellent mitigation factors that significantly reduce the impacts of their operations. BURNCO strives to be a courteous neighbour in the community and I look forward to working with them in the future.

I believe that BURNCO will continue to follow these practices with their West Cochrane Gravel Pit and because of this I can support this application.

Sincerely,

Darren Hansma



Hello, my name is David Dutchik.

I'm the owner of lands associated with those areas of the project west of Grand Valley Creek. And as the owner of these lands, I would like to express my support for the proposed gravel pit.

I've known BURNCO since 2011 when they started to get involved in the proposed gravel pit I had on NW13. Since then, they completed the permits for that site. They upgraded the intersection on the 1A. They built a large berm to hide the operation. They've done fencing and signs....They brought that concept into reality. They pay attention to things... to noise, dust and truck traffic. Their site is neat and orderly. BURNCO has always been courteous and professional.

In my opinion, they've done a good job with the existing site and I think they will do a good job with what they are proposing. They have expertise and they have been around long enough to give me confidence.

Change is constant and our Cochrane community is a prime example. The community continues to grow with developments and upgrades and this does not happen without the resources.

Finally, I've just finished building my dream house a half mile away from this project and I wouldn't have done that if I didn't think BURNCO would do a good job. Most importantly, my ranch has been in the family over 100 years and my son plans to make it longer. In no way would I jeopardize his future in agriculture.

Please support this project.

Thank you

I avid lutalik

David Dutchik

Page 297 of 719

# **Caitlyn T. Anderson**

| From:    |  |
|----------|--|
| Sent:    |  |
| To:      |  |
| Subject: |  |

Erik Bakke June 15, 2021 5:25 PM Legislative Services Shared [EXTERNAL] - Burnco / Bylaw C-8073-2020

Do not open links or attachments unless sender and content are known.

To whom it may concern regarding Burnco proposed gravel pit west of Cochrane:

First, I've been a neighbour of Burnco for the past 6 years. Arguably, I am Burnco's closest residential neighbour, although 2 others likely tie for this (map and location can be viewed at your option, 15 Artists View Gate, Calgary, AB online).

I've provided commentary below in support of Burnco's development plans, categorized by "neighbour" and "operations".

First, Burnco is a good neighbour. How can an industrial neighbour be a good neighbour? They, and their employees, act like people who care about neighbourly relations and behave and follow through as such. Examples:

in 2017/18, ATCO refurbished their gas lines in our neighbourhood. They used the corner by our house as a "lay down area" for equipment. This turned it into a reasonably large gravel parking lot, which upon completion, and further prodding, they didn't do a great job remediating. The neighbourly concern was partly aesthetic, but also neighbourhood quality - it wasn't long until this gravel pad screamed "late night parking area" to all kids and others who want to park their cars and do... things... in their cars at night, including littering after the refuse of drinking, smoking, sex, etc.. The residential neighbours got together to plan to remediate it ourselves. We thought it was a long shot to reach out to Burnco, but they were helpful right away (they had experienced equipment theft from people using that same corner to access their lands). We had planned to chip in to get an appropriate amount of topsoil, more than the dusting ATCO did, some seed, and plans to take turns watering it until the seed took. Burnco provided both a loader to bring over a bucket of soil right away, plus a truck to deliver some in a few days time. One could easily expect a large industrial neighbour to just ignore inquiry, or say that's not something they can do. But their actions are neighbourly - just as easy as I could go to the garden shed to grab a spade to help a neighbour, their "garden shed" has larger implements that they are willing to dedicate a few minutes time with to help. That was their offer, not even our ask.

Secondly, their land is posted no trespassing. I respect this. At one point in 2019 our neighbour's (now gone, sadly) dog was in the habit of jailbreaking himself from their yard, then luring one of my dogs out for adventures. He was an Australian Shepard mix, and was both clever and felt he had a broader responsibility to patrol the neighbourhood. This caused me to one day walk over to Burnco through the no trespassing signs to find their security staff to ask if they've seen the adventuring dogs. I walked up to the station of a fellow, whom did ask me what I was doing there as his first question. I explained that I was a neighbour looking for two dogs on the lam, gave my address and phone number, etc. I could have just as easily been brushed off with comments like "our policy doesn't make exception for searching for dogs", "not my problem", etc. but even the security guard said "I think I can help", and "We'II keep an eye out". Think! How many times are you frustrated in life interacting with corporations or other bureaucracies where think is no part of the interaction - where it's defined by rules and procedure - when empowering an employee to think solves problems better while leading to better outcomes, even if they are "just" the security guard. This also stuck with me as a good neighbour concept, it's not just when you contact senior management, but their front line people as well. Good management and attitude have a way of trickling down.

#### ATTACHMENT 'E': PUBLIC SUBMISSIONS

# E-1 - Attachment E Page 235 of 252

It is clear these types of things are not their ongoing obligation, however my experience is simply that as a neighbour, one is greeted with dialogue and thoughtfulness rather than the typical corporate procedures and stonewalling, and it has been appreciated.

Secondly, on the subject of Operations, the 6 years I've been next to them, here are some day to day experiences: - I've never experienced dust

- I've not heard cement or gravel trucks coming or going.

- occasionally, and only if I'm outside and the wind is right, I hear what I have dubbed the "Fred Flintstone whistle" which I think is a shift change or such later in the afternoon, although I don't know for sure. It has never dawned on me whatsoever that this is even close to what a person would call a nuisance or be disturbed by.

Literally that's it.

I don't know if the standard of operation is the same or different from the gravel pit I live next to vs the one being proposed, but that can be ascertained by those in charge of the application. If it's the same, I attest as a neighbour that any future residential neighbours are extremely unlikely to be disappointed by having Burnco as a neighbour.

Submission by Erik Bakke 15 Artists View Gate, Calgary AB T3Z 3N4 June 21, 2021

Legislative Services Rocky View County 262075 Rocky View Point Rocky View County, AB, T4A 0X2

#### Attention: Rocky View County Legislative Services

#### Subject: Letter of Support – Bylaw C-8073-2020

I am writing this letter in support of BURNCO Rock Product's Land Use Amendment Application – Bylaw C-8073-2020.

I am the current tenant of BURNCO's Black Diamond property, located in Foothills County and have leased the same lands from them for 8 years. Throughout my experience with BURNCO they have been courteous and professional in their dealings with me and have been very willing to remedy concerns that may arise. During operation of their sites, they develop and follow excellent mitigation factors that significantly reduce the impacts of their operations. BURNCO strives to be a courteous neighbour in the community and I look forward to continue working with them in the future.

I believe that BURNCO will continue to follow these practices with their West Cochrane Gravel Pit and because of this I can support this application.

Sincerely,

Frank Thomson



RVC Public Hearing, BURNCO, July 6/21

Bylaw C - 8073-2020

File PL 20200066, et al

This letter is for All of Council, in support of the BURNCO APPLICATION, W of Cochrane.

I have lived next to BURNCO's Springbank pit for the past 42 years. They are stellar neighbours in that they use full dust control, and sound control. In addition, they clean along the eastern portion of Old Banff Coach Road of dropped gravel, which is their most used truck route.

In this new location, under application, I am impressed that:

they are working with the Stoney Nakoda Nation to identify archaeological sites such as tipi rings,

their disturbance is all outside the wetlands as per their Biophysical Site Assessment report,

they propose to spend \$1.5M to upgrade the current entry site, both for safety and in cooperation with Alberta Transportation,

and in cooperation with the Town of Cochrane they propose one of their first sites to be at the east end to finish that off earliest.

I take all these points from their submission and from exchanges with BURNCO; in order to point out that this level of thoroughness is typical of my experience with how BURNCO operates.

Respectfully, Gloria Wilkinson Springbank

#### OVER A CENTURY OF QUALITY AND SERVICE ATTACHMENT 'E': PUBLIC SUBMISSIONS

E-1 - Attachment E Page 238 of 252

**Legislative Services** 

**Rocky View County** 

262075 Rocky View Point

Rocky View County, AB, T4A 0X2

# Attention: Rocky View County Legislative Services

# Subject: Letter of Support - Bylaw C-8073-2020

I am writing this letter in support of BURNCO Rock Product's Land Use Amendment Application – Bylaw C-8073-2020.

I currently work as a truck driver in the aggregate industry and I transport aggregate to and from BURNCO's numerous sites in Rocky View County. These aggregate sites allow for me to make a living in the community and are an essential part of continued sustainable development. BURNCO has shown through their current and past projects, that when projects are developed responsibly, they can create a beneficial relationship with the community and the residents that reside there.

It's due to BURNCO's track record in Rocky View County that 1 can support BURNCO and its application for expansion of the West Cochrane Gravel Pit.

Sincerely,

1831626 Alberta Ltd

GURPREET SAINI

he i

Legislative Services

**Rocky View County** 

262075 Rocky View Point

Rocky View County, AB T4A 0X2

#### **Attention: Rocky View County Legislative Services**

#### Subject: Letter of Support – Bylaw C – 8073 2020

I am writing this letter in support of BURNCO Rock Product's Land Use Application – Bylaw C - 8073-2020.

I currently work as a truck driver in the aggregate industry, and I transport aggregate to and from BURNCO'S sites in Rocky View County. These aggregate sites allow for me to make a living in the community and are an essential part of continued sustainable development. BURNCO has shown through their current and past projects, that when projects are developed responsibly they can create a beneficial relationship with the community and the residents that reside there.

It's due to BURNCO's track record in Rocky View County that I can support BURNCO and its application for expansion of the West Cochrane Gravel Pit.

Sincerely,

Harinderpal Kang

45 Martha's Haven Green NE Calgary, AB T3J3X6v

# **GRAY'S LIMITED**

62 Slater Road Strathmore, AB T1P 1J3 Telephone: 403-934-3590 Fax: 403-934-3076 Email: info@graysltd.com

June 17, 2021

Rocky View County 262075 Rocky View Point Rocky View County, AB T4A 0X2

#### RE: Burnco West Cochrane Hearing 2021608 Council Meeting Public Hearing July 6, 2021

Rocky View Council:

I understand that Burnco Rock Products is proposing to develop a gravel operation at a West Cochrane site.

Gray's Limited of Strathmore Alberta in the County of Wheatland has been in business for over seventyfour years. During this period, Burnco has processed various gravel materials for us.

I can confirm that Burnco is responsible, and dependable, and provides a quality product in a safe, and environmentally friendly manner. I wholeheartedly endorse this company.

Yours truly, Gray's Limited lay

Harrison Gray

HG/jw

Y:\HGRAY\HG-Rockyview County Letter.docx

# **Caitlyn T. Anderson**

From: Sent: To: Subject: jagdev deol June 19, 2021 1:04 PM Legislative Services Shared [EXTERNAL] - Letter of Support - BYLAW C- 8073-2020

Do not open links or attachments unless sender and content are known. I am writing this letter in support of BURNCO Product's Land USE Amendment Applicaiton - Byl 8073-2020

I am currently employed as a truck driver in the aggregate industry and I transport aggregate to and from BURNCO's sites in the Rockyview County. These aggregates sites are allowing me to make a living in the community and are a very essential part of continued sustainable development.

BURNCO's past and current projects have shown that, when projects are developed responsibly, they do create a beneficial relationship with the community and the residents that reside there.

It is because of BURNCO's responsibly developed projects and record in Rocky View County I support BURNCO and its application for the expansion of the West Cochrane Gravel Pit.

Sincerely

Jagdev Deol O/A Samaira Deol Trucking Ltd 301 Windermere Drive Chestermere AB T1X1S3

#### ATTACHMENT 'E': PUBLIC SUBMISSIONS

LEYINAUVE DEIVILES

Rocky View County

262075 Rocky View Point

Rocky View County, AB, T4A 0X2

Attention: Rocky View County Legislative Services

# Subject: Letter of Support - Bylaw C-8073-2020

I am writing this letter in support of BURNCO Rock Product's Land Use Amendment Application - Bylaw C-8073-2020.

I currently work as a truck driver in the aggregate industry and I transport aggregate to and from BURNCO's numerous sites in Rocky View County. These aggregate sites allow for me to make a living in the community and are an essential part of continued sustainable development. BURNCO has shown through their current and past projects, that when projects are developed responsibly, they can create a beneficial relationship with the community and the residents that reside there.

It's due to BURNCO's track record in Rocky View County that I can support BURNCO and its application for expansion of the West Cochrane Gravel Pit.

Sincerely,

Jasmal Suri (JHK transport) 149 willanne vo- chefenne

21 June /2021



June 21, 2021

Rocky View County Legislative Services 262075 Rocky View Point Rocky View County, AB T4A 0X2

#### Re: Letter of Support – Bylaw C-8073-2020

This letter is being provided in support of Land Use Amendment Application – Bylaw C-8073-2020.

Aggregates are a key resource in sustaining our way of life. They are used to construct our homes, they are needed for roads, schools and in hospitals. Aggregate production also supports a wide variety of local jobs. These jobs include truck drivers, equipment operators, consultants and engineers. These jobs provide value to our communities and helps to sustain our municipalities and our province.

Responsible aggregate development should be encouraged and supported. We believe that BURNCO Rock Products Ltd. has shown a long history of successful projects that have been operated in a thoughtful and responsible manner. We have no doubt that they will bring the same expertise and stewardship shown at these other locations to this project.

Please accept this letter of support for the West Cochrane Gravel Pit.

Sincerely,

Jennifer Weslowski Land Manager, SAB & WCAN Cement

# **Caitlyn T. Anderson**

| From:    |
|----------|
| Sent:    |
| To:      |
| Subject: |

Jim Burns <jim.burns@burnswest.com> June 21, 2021 11:57 AM Legislative Services Shared [EXTERNAL] - Bylaw C-8073-2020

Do not open links or attachments unless sender and content are known.

TO LEGISLATIVE SERVICES RE: BYLAW C-8073-2020

from BURNSWEST Corporation, Suite 106, 155 Glendeer Circle S.E. Calgary, AB T2H 2S8

TO WHOM IT MAY CONCERN -

I have read through BURNCO's submission for their West Cochrane Pit, and was totally overwhelmed at the extensive detail their staff and consultants have provided in answer to all the pertinent questions which have been asked by the County, as well as some which haven't been asked. Believe me when I say that their follow through in meeting their obligations and satisfying the concerns of the County and the Public goes well beyond expectation in my opinion. I may be prejudiced, but BURNCO's track record is the best in the business.

I was an instrumental part in working with Rocky View Councillors on BURNCO's gravel pit application for the Burma Road Pit, and at that time thought we had gone above and beyond in answering any concerns which could arise from opening that or any other pit. The details in this current application go beyond what was supplied at Burma Road. You will find in checking the County's records on that pit since it opened, that they have lived up to all they said they would do in operating that site, and more. That is also true for their other sites located in Rocky View County and elsewhere.

BURNCO is requesting that the site be operated for 30 to 35 years. To some neighbours and maybe some councillors this may appear to be excessive, but it is not when you consider that during this period dust, noise, and visual perceptions will be controlled and minimal. Again, take a look at the Burma Road Pit for their exemplary performance.

Yours truly, James Burns, Past President, BURNCO, and President, BURNSWEST Corporation. June 22, 2021

Legislative Services Rocky View County 262075 Rocky View Point Rocky View County, AB, T4A 0X2

#### Attention: Rocky View County Legislative Services

#### Subject: Letter of Support – Bylaw C-8073-2020

I have been approached by Burnco to submit a letter in support of their Master Site Development Plan (MSDP) for the West Cochrane Gravel Pit. I accept this request with respect and would like to share some of my experiences with living beside an active gravel pit for the consideration of the decision makers prior to their approval of this MSDP.

I have lived on the east side of Burnco's Springbank Operations for sixteen years, in the community of Cougar Ridge in Calgary. Cougar Ridge is immediately adjacent to the West Calgary Ring Road, and Burnco mined the gravel to the future road grade depth within the transportation utility corridor (TUC) beside Cougar Ridge as an extension of their ongoing Springbank operations. My house overlooks the ring road and gravel pit operations. This pit was already in operation prior to the development of Cougar Ridge as a residential development.

I am also the President of the Cougar Ridge Residents Association<sup>1</sup> (CRRA), and that is how I came to interact with Burnco about their gravel pit operations. Our association was approached by a concerned citizen about the ongoing impacts that the gravel pit was having on his residence, and he initiated an extensive plan to increase the mitigation measures that were in place to reduce these negative impacts (primarily of dust and noise). The CRRA eventually agreed to assist with his push for increased mitigation measures. As this land was owned by Alberta Transportation and those lands were reserved for the ring road, this became quite a lengthy process. To summarize the results, without getting into the details of the process, the CRRA was ultimately successful in obtaining permission from Alberta Transportation to plant a 1 km long shelterbelt in the 10m immediately bordering Cougar Ridge. This shelterbelt was and is the responsibility of the CRRA. It was planted by a group of over 100 community volunteers. When we approached Burnco about this, they not only provided a significant portion of the costs toward trees but many of their staff gave up a weekend and brought their families to help us plant. I remain grateful for that. I would like to note that throughout this process we learned that Burnco had previously planted trees along the top of the screening berm prior to the residential development but was asked to remove them by the authorities, as they didn't want any trees to interfere with the future uses within the Transportation and Utility Corridor.

<sup>&</sup>lt;sup>1</sup> The opinions expressed in this letter are the opinions of the author and are not a representation of the opinions of the Cougar Ridge Residents Association.

I have read through the MSDP and it looks to be very thorough with most, if not all, of the concerns that would arise being identified and addressed. The positive measures of the MSDP that stand out to me the most based on my experience as a neighbour to a gravel pit are the commitment to mitigation measures including screening berms and planting and Burnco's commitment to progressive reclamation. There is also a commitment to periodically reassess aspects of the plan as time goes on and conditions may change, and to implement further measures as needed.

Gravel pits mine a non-renewable resource and permanently alter the landscape over a multiyear process with a significant environmental and social impact. They also provide necessary resources for development and ongoing employment. There are both costs and benefits. With proper management, the benefits can outweigh the costs. As I am not an expert in gravel pits or their impact on the environment, I will defer to the scientists and experts any concerns about the natural creeks, mining below the water table, proximity to the Bow River, the impact on vegetation and wildlife, and Burnco's safety record and operational management.

For myself, when I moved into Cougar Ridge at the edge of town, much of the area was still a greenspace. The area that is now the vast site of ring road and utility construction was once a well-managed gravel pit whose operations were performed in a manner that intentionally minimized its impact on its neighbours and was staged to leave the native vegetation in place until it became necessary to remove it. I can say that the current state of the Ring Road construction and its apparent minimal concern and mitigation of nuisances on its neighbours and the environment is a stark contrast to how Burnco runs its operations. Burnco's plan for progressive reclamation of vegetation and original habitat for the wildlife is extremely important. Within the TUC footprint the land use has been forever changed and Burnco was not responsible for performing any of that reclamation as the area is becoming a highway. The loss of that vegetation and witnessing the impact it is having on the displaced local wildlife is having a greater negative impact on the neighbouring residents than ever expected. This is why the need for proper reclamation and ongoing management of the landscape is critically important.

To summarize my letter, I will quote the MSDP under item 4.0 Cumulative effects. "The impacts related to this development have been mitigated as much as reasonably possible, that the site will not have an undue impact, and that the West Cochrane Gravel Pit be operated in a socially and environmentally responsible manner." As long as Burnco operates the West Cochrane Gravel Pit with the same stewardship and respectful approach that I have experienced at their Springbank site, and I believe they will based on the relationship that I have developed with Burnco, please accept this letter in support of this MSDP.

Kelly G. Smith

98 Cougarstone Court SW, Calgary AB T3H 5R4

June 18th, 2021

Legislative Services

Rocky View County

262075 Rocky View Point

Rocky View County, AB, T4A 0X2

#### Attention: Rocky View County Legislative Services

#### Subject: Letter of Support – Bylaw C-8073-2020

I am writing this letter in support of BURNCO Rock Product's Land Use Amendment Application – Bylaw C-8073-2020.

I currently work as a truck driver in the aggregate industry and I transport aggregate to and from BURNCO's numerous sites in Rocky View County. These aggregate sites allow for me to make a living in the community and are an essential part of continued sustainable development. BURNCO has shown through their current and past projects, that when projects are developed responsibly, they can create a beneficial relationship with the community and the residents that reside there.

It's due to BURNCO's track record in Rocky View County that I can support BURNCO and its application for expansion of the West Cochrane Gravel Pit.

Sincerely, ≮JJJJ Kuljit Dhanda 305 Windermere Drive Chestermere AB

# **Caitlyn T. Anderson**

From: Sent: To: Subject: Larry de Castro June 23, 2021 3:00 PM Legislative Services Shared [EXTERNAL] - Burnco Rock Products

Do not open links or attachments unless sender and content are known.

Legislative Services

Rocky View County

262075 Rocky View Point

Rocky View County, AB, T4A 0X2

# Attention: Rocky View County Legislative Services

# Subject: Letter of Support – Bylaw C-8073-2020

I am writing this letter in support of BURNCO Rock Product's Land Use Amendment Application – Bylaw C-8073-2020.

I currently have worked with Burnco since 1998 as a self employed truck driver in the aggregate industry and I transport aggregate to and from BURNCO's numerous sites in Rocky View County. I am also a resident of RVC near Chestermere. These aggregate sites allow for me to make a living in the community and are an essential part of continued sustainable development. BURNCO has shown through their current and past projects, that when projects are developed responsibly, they can create a beneficial relationship with the community and the residents that reside there.

It's due to BURNCO's track record in Rocky View County that I can support BURNCO and its application for expansion of the West Cochrane Gravel Pit.

Sincerely,

Larry de Castro

DeCastro Trucking Ltd

Larry de Castro DeCastro Trucking Ltd



**HEIDELBERG**CEMENT Group

Lehigh Hanson Materials Limited

222, 885 – 42 Ave SE Calgary, AB T2G 1Y8 Phone 403-531-3000 Fax 403-531-3001 www.lehighhansoncanada.com

June 22, 2021

Attention: Rocky View County Legislative Services Rocky View County 262075 Rocky View Point Rocky View County, AB, T4A 0X2

Via email: legislativeservices@rockyview.ca

#### Subject: Letter of Support – Bylaw C-8073-2020

To whom it may concern,

I am writing regarding BURNCO Rock Products Ltd.'s proposed West Cochrane Gravel Pit. As a landowner of Rocky View County, please accept this letter of support for the land use amendment application Bylaw C-8073-2020.

Aggregates are a critical component of supporting long-term growth and development in the region. They are a scarce, non-renewable resource which, if not extracted prior to the development of an alternative use, will be potentially lost forever.

Responsible aggregate development should be encouraged and supported. BURNCO Rock Products Ltd. has a history of responsible operation in the region. We believe they will continue to be good stewards of the industry with this latest project.

Sincerely,

Mike Smith VP & GM, Materials SAB, SK & MB

Lehigh Hanson Materials Limited Phone: 403-214-4141 June 22, 2021

Legislative Services Rocky View County 262075 Rocky View Point Rocky View County, AB, T4A 0X2

#### Attention: Rocky View County Legislative Services

#### Subject: Letter Of Support – Bylaw C-8073-2020

McNair Sand and Gravel's support of Land Use Amendment Application – Bylaw C-8073-2020.

The owners and management of McNair Sand and Gravel believe responsible aggregate development should be encouraged and supported. We believe that BURNCO Rock Products Ltd. has shown a long history of successful projects that have been operated in a thoughtful and responsible manner. We have no doubt that they will bring the same expertise and stewardship shown at these other locations to this project.

Please accept this letter of support for the West Cochrane Gravel Pit.

Miles McNair

# **Caitlyn T. Anderson**

From: Sent: To: Subject: Muray Poffenroth June 19, 2021 9:00 AM Legislative Services Shared [EXTERNAL] - Burnco west Cochrane project

Do not open links or attachments unless sender and content are known.

I would like to provide a letter of support for this project as our property and our sons property are very close to Burnco Irricana gravel pit and have had no issues with noise or dust we have livestock right next to the pit as well we find Burnco to be considerate and very good neighbours sincerely Murray Poffenroth June 23, 2021

Legislative Services

Rocky View County

262075 Rocky View Point

Rocky View County, AB, T4A 0X2

# Attention: Rocky View County Legislative Services

# Subject: Letter of Support – Bylaw C-8073-2020

We are writing this letter in support of BURNCO Rock Product's Land Use Amendment Application – Bylaw C-8073-2020.

We were the previous owners of the subject lands that are located to the east of the Grand Valley Creek. Our experience with the West Cochrane Gravel Pit, has shown us that BURNCO takes their operations and relationship with the community very seriously. They've shown that through careful planning and development, these operations can have little to no impact on the surrounding neighbours and communities that they operate in. BURNCO has significant experience in Rocky View County and have shown that they are a part of the community.

We believe that BURNCO will continue to follow these practices with their West Cochrane Gravel Pit and because of this we can support this application.

Sincerely,

Russell & Patricia Wiechnik



# PLANNING AND DEVELOPMENT SERVICES

TO: Council

DATE:

July 6, 2021 FILE: 06818002/8003/8004; 06913001/3002/3003/4001/4002/5001

**DIVISION:** 9 APPLICATION: PL20200067

SUBJECT: Master Site Development Plan – West Cochrane Gravel Pit

> NOTE: This application should be considered in conjunction with application PL20200067 (agenda item E-1)

**APPLICATION:** To approve a Master Site Development Plan in support of a land-use redesignation proposing the Special – Natural Resources District, and to provide a policy framework to guide and evaluate the development of aggregate extraction and processing on the site.

**GENERAL LOCATION:** Located on the south side of Highway 1A, beginning at 0.8 kilometres (0.5 mile) from the intersection of Range Road 53 and Highway 1A to approximately 1.6 kilometres (1.0 mile) east of Range Road 50; with the exception of NW-13-26-05-W05M.

LAND USE DESIGNATION: Agricultural – General District (A-GEN) and Special – Natural Resources District (S-NAT)

**EXECUTIVE SUMMARY:** The proposed West Cochrane Gravel Pit operation is located approximately 1.6 kilometres northwest of the Town of Cochrane, south of Highway 1A, across portions of eight quarter-sections totaling approximately 1,117 acres. The lands currently contain an existing permitted gravel extraction, the McDougall Pit (PRDP20175123). The site is approximately 151 acres in size, extracting roughly 125,000 tonnes of material annually. Operations include earthmoving, aggregate crushing, and loading trucks. This operation was permitted in 2012 with the ability to extract up to 500,000 tonnes per year. The pit opened in 2016 after the completion of an intersection upgrade at Range Road 51 required to support the operation.

At present, operations at the existing gravel pit include aggregate crushing, earthmoving, and loading trucks. Washing at the site is expected to commence within the next five (5) years.

The applicant proposes to operate 24 hours per day Monday through Friday, and 7:00 am to 5:00 pm on Saturdays. No operations are proposed on Sundays or Statutory Holidays. Operations during these hours include crushing, washing, and earthworks. Hauling is intended to be restricted from 6:00 am to 7:00 pm Monday through Saturday, with no activities on Sundays or Statutory Holidays.

The proposed hours of operation align with the Subdivision and Development Appeal Board-approved Development Permit (PRDP20175123) for the existing gravel pit.

The application is consistent with the relevant policies of the County Plan and the Land Use Bylaw:

 A redesignation application (PL20200066) was submitted to redesignate the subject lands from Agricultural, General District to Special, Natural Resources District. In accordance with the policies of the County Plan, a Master Site Development Plan (MSDP) has been submitted with the redesignation application.

ROCKY VIEW COUNTY

• The submitted MSDP demonstrates that impacts associated with the proposed aggregate development can be managed to an acceptable level in accordance with existing operating standards established by the County and the provincial government. However, the extensive size of the proposed aggregate extraction exceeds the majority of extraction sites in the County and effectively results in two pits operating simultaneously. Administration suggests Council direct the applicant to work with Administration to amend the MSDP to a smaller area located west of Grand Valley Creek.

All technical considerations have been adequately addressed at this time.

**ADMINISTRATION RECOMMENDATION:** Administration recommends referring the application to Administration in accordance with Option #2.

# OPTIONS

- Option #1: THAT the West Cochrane Gravel Pit Master Site Development Plan be approved as per Attachment 'C'.
- Option #2: THAT the West Cochrane Gravel Pit Master Site Development Plan be referred to Administration to work with the applicant to reduce the area of the Master Site Development Plan for an area located between Beaupre Creek and Grand Valley Creek, to be no greater than 400 acres, excluding the existing S-NAT parcel.
- Option #3: THAT application PL20200067 be refused.

# AIR PHOTO & DEVELOPMENT CONTEXT:



# **APPLICATION EVALUATION:**

The application was evaluated based on the technical reports submitted with the application and the applicable policies and regulations.

| APPLICABLE POLICY AND REGULATIONS:                                                                                                                                                                                                    | TECHNICAL REPORTS SUBMITTED:                                                                                              |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| <ul> <li>Municipal Government Act;</li> <li>Town of Cochrane/Rocky View County<br/>Intermunicipal Development Plan;</li> <li>Municipal Development Plan;</li> <li>Land Use Bylaw; and</li> <li>County Servicing Standards.</li> </ul> | <ul> <li>Biophysical Impact Assessment prepared by<br/>Matrix Solutions Inc. dated September 2019</li> </ul>              |
|                                                                                                                                                                                                                                       | <ul> <li>Historical Resources Impact Assessment<br/>prepared by Lifeways of Canada Limited date<br/>April 2019</li> </ul> |
|                                                                                                                                                                                                                                       | <ul> <li>Visual Impact Assessment (VIA) prepared by<br/>Matrix Solutions Inc. dated November 2019</li> </ul>              |
|                                                                                                                                                                                                                                       | <ul> <li>Noise Impact Assessment, prepared by ACI<br/>Acoustical Consultants Inc. dated June 2019</li> </ul>              |
|                                                                                                                                                                                                                                       | <ul> <li>Air Quality Assessment prepared by Matrix<br/>Solutions Inc. dated May 2019</li> </ul>                           |
|                                                                                                                                                                                                                                       | <ul> <li>Hydrogeological Assessment Report prepared<br/>by Matrix Solutions Inc. dated January 18, 2019</li> </ul>        |
|                                                                                                                                                                                                                                       | <ul> <li>Traffic Impact Assessment (TIA) prepared by<br/>Schaffer Andrew Ltd. dated October 2013</li> </ul>               |
|                                                                                                                                                                                                                                       | <ul> <li>Conceptual Stormwater Management Report<br/>prepared by Matrix Solutions Inc. dated April<br/>2020</li> </ul>    |

### POLICY ANALYSIS:

This report focuses primarily on the technical aspects of the proposal including all developmentrelated considerations, while the report to consider the associated land use application (PL20200066) focuses on the compatibility with the relevant statutory plans.

### MASTER SITE DEVELOPMENT PLAN OVERVIEW:

As directed by the County Plan, the MSDP provides for a comprehensive overview of the proposed development addressing matters such as noise, air quality, stormwater, groundwater, visual and landscape impacts, reclamation, and traffic impacts.

#### **Overview**

The proposed West Cochrane Gravel Pit operation is located approximately 1.6 kilometres northwest of the Town of Cochrane, south of Highway 1A, across portions of eight quarter-sections totaling approximately 1,117 acres. The lands currently contain an existing permitted gravel extraction, the McDougall Pit (PRDP20175123). The site is approximately 151 acres, extracting roughly 125,000 tonnes of material annually. Operations include earthmoving, aggregate crushing, and loading trucks. This operation was permitted in 2012 with the ability to extract up to 500,000 tonnes per year. The pit opened in 2016 after the completion of an intersection upgrade at Range Road 51 required to support the operation.

The lands are located in a primarily agricultural area of the County, with the Stoney Nakoda Nation Reserve across the Bow River to the south. Land use in the area is ranching and farming to the north and east, with some lands holding residences.

The proposed MSDP would expand the existing extraction operation, estimated at 15,000,000 tonnes of aggregate, and is expected to operate for 30 to 35 years. The applicant has indicated there will be no change in the annual extraction amounts, though current operations will increase the available gravel reserves. Additionally, a second processing site will be established on the lands to the east of Grand Valley Creek.



The existing aggregate extraction site is already zoned Special, Natural Resources District, as it was converted from the Natural Resources Industrial designation as a result of the new Land Use Bylaw adoption. The pit has an existing Provincial Code of Practice Registration, as well as two water licenses for the diversion of water from the Bow River to supply water for aggregate washing activities, and a *Water Act* approval which allows for excavation or gravel from within the groundwater table in NW-13-25-06-W5M.

#### Existing Conditions

The subject site consists of lands across eight quarter-sections of land, though only seeking redesignation and development on those lands to the south of Highway 1A. The lands are generally bounded by Highway 1A to the north and rangeland; rangeland with a farmstead to the east; the Bow River to the south; and a mixture of small farmsteads, rangeland, and the Wildcat Gas Plant to the west.

The topography is undulating, with some steep and terraced areas, with slopes ranging from two (2) to 30%, though the majority of the project area contains gently undulating lands with slopes ranging from 0.5 to 5%.

#### Biophysical Impact Assessment

A Biophysical Impact Assessment was prepared, which noted eight vegetative areas within the lands and two seasonal marshes (which are not classified as wetlands). Field surveys did not locate any rare plant species or communities, nor were any federally-listed rare species.

The County's GIS mapping system shows Grand Valley Creek, Beaupre Creek, and an unnamed intermittent stream located within the project site.

Several general and site-specific mitigation measures are recommended and detailed in the MSDP, as well as other mitigation measures based on requirements and guidelines of federal and provincial regulatory agencies, industry standards, and operational experience. Project design, construction techniques, and operational practices were also accounted for as part of the mitigation measures.

The project area passes through three (3) provincially designated wildlife sensitivity zones: sensitive raptor range for the bald eagle, the golden eagle, and the prairie falcon; sharp-tailed grouse survey area; and key wildlife and biodiversity zones associated with the Bow River. Wildlife surveys were conducted, as well as a fish habitat assessment. Details and mitigation measures are included in the MSDP.

#### Development Concept

A Development Permit will be required prior to the commencement of new extraction activities. Mining operations will expand in two areas simultaneously; to the west of Grand Valley Creek (Phases B, C, and D) and east of Grand Valley Creek (E, F, G, and H phases). The west and east side phase groupings will use independent highway accesses.

Screening berms for each phase will occur at the commencement of activity within each phase.

Detailed expectations, operations, and details for phase groupings are outlined within the MSDP.

Aggregate from this site will be used to supply local projects in Rocky View County and the Town of Cochrane. Washing capacity at this site will also allow Burnco to supply premium aggregates to its network of asphalt and concrete plants in the Greater Calgary region.

#### <u>Groundwater</u>

A Hydrogeological Assessment Report was prepared, indicating that the majority of the site is expected to have little to no groundwater. The report indicated a generally low saturation and a deep water table near the base of the gravel deposit, with limited dewatering expected. Water well records indicate that wells in the vicinity are completed in bedrock aquifers at various depths, and dewatering at the site is not expected to impact users in the area.



The report concluded that potential environmental impacts can be mitigated or minimized with proper controls implemented at the extraction stage and as part of ongoing operations, and potential impacts of future aggregate operations on nearby groundwater and surface water diversions are expected to be minimal with the implementation of best management practices.

The applicant notes that diverting groundwater may require a *Water Act* approval, and would secure any authorizations prior to proceeding with such an activity. The MSDP also provides a groundwater complaint protocol should nearby water well users indicate their water supply has been negatively impacted. The protocol includes the provision that should a resident be without water, a temporary alternate water supply would be provided within 24 hours and an outside consultant would be hired within 14 days to determine the cause of the issue. If the issue is determined to be related to the mining operation, the applicant would then provide a permanent alternate water supply solution. It is to be noted that groundwater and all related aspects including enforcement fall under provincial purview; not the County.

At the Development Permit stage, the applicant would be required to submit up to date groundwater readings, detailed stormwater management plans for each phase, an updated noise impact assessment, noise mitigation plan, erosion and sediment control plan, construction management plan, weed control plan, and any other new information and/or updates to various plans and technical reporting prepared in support of the MSDP.

#### Stormwater Management

The applicant provided a Conceptual Stormwater Management Report, where the concept relies on a series of ditches and dewatering pits that pump water to the recharge pond. Overland flows from upstream sources will be directed around active mining operations using interceptor ditches and/or berms. All flows generated in the upstream catchment areas of Grand Valley Creek and/or Beaupre Creek will continue to pass through the project area. In summary, regional stormwater flows will not be impacted, and any stormwater from active mining areas is to be collected and retained within the site. The site will also be reclaimed to not impact local or regional drainage patterns.

As well, conditions of future Development Permits will require the applicant to provide a detailed stormwater management plan for each of the Phases of the pit area, which will follow the stormwater management concepts outlined in the Conceptual Stormwater Management Report.

The applicant is proposing gravel washing but has indicated they will obtain provincial permits for this activity. Sedimentation and erosion control plans will be prepared at the Development Permit stage.

#### <u>Access</u>

As the site is divided into two operational areas, two separate access points are required. The western phases will continue to use Range Road 51 to Highway 1A, and the eastern phases will use Range Road 45 to Highway 1A. Range Road 51 was upgraded to a paved standard as part of the current mining operation.

A Traffic Impact Assessment was completed in 2013 for the assessment of the existing operation of NW 13-26-5-W5M that required an upgrade of the intersection of Range Road 51 and Highway 1A.

In support of this application, a 2021 review of the 2013 TIA was completed. The technical memo concludes that background traffic growth on Highway 1A has been slower than what was assumed in 2013. In addition, Burnco has confirmed that the forecasted number of trips generated by the pit development is still valid. For these reasons, the recommendations from the 2013 TIA are still valid.

Over time, sales are expected to reach 500,000 tonnes per year, which is approved for the existing pit but increases the available extraction area by roughly four (4) times the volumes currently being extracted from the site. This annual amount will utilize the existing access, or, will be split between the existing access and the future access at Range Road 45.



As the development progresses, construction of an intersection will be required at the east side of the property at Range Road 45 to Highway 1A. It is anticipated that this access will be required in a 10 to 15-time horizon. At that time, a TIA will be undertaken to determine the appropriate upgrades.

#### **Reclamation**

The applicant will be implementing a progressive reclamation plan throughout the Project. The size of open areas being used for operations or un-reclaimed would be limited to 51 acres on the east side, and 70 acres on the west side at any single time for a total maximum disturbed area of 121 acres. Currently, the County generally permits aggregate operations to excavate a maximum of 40 acres.

The site will be predominantly reclaimed back to agricultural uses as shown in the reclamation drawings. Screening berms built adjacent to Highway 1A will be left as a permanent reclamation feature. These screening berms will have been constructed with an overburden core and should have mature landscaping at the time of final reclamation.

All topsoil and subsoil on site will be salvaged and used in the final reclamation. Once topsoil has been evenly placed, the reclaimed areas will be re-vegetated to hayland. Once seeding is complete, a program of cutting and fertilizing will take place as necessary to ensure the hayland becomes established.

During periods of inactivity of over six months, pit faces will be sloped no steeper than 2:1. Stockpiles will be vegetated, and the weeds will be sprayed and mowed. The site will be monitored to ensure soil reclamation material is stable, weeds are controlled, and the site is secure. Once complete, the site will be monitored monthly to ensure soil reclamation material is stable, weeds are controlled, and the site is secure.

Weed management during and post reclamation would be in accordance with Land Use Bylaw and the *Weed Control Act*.

#### Offsite Impacts

At present, operations at the existing gravel pit include aggregate crushing, earthmoving necessary to expose aggregate and reclaim disturbed areas, and loading trucks with finished construction aggregates. Washing at the site is expected to commence within the next five (5) years.

The applicant proposes to operate 24 hours per day Monday through Friday, and 7:00 am to 5:00 pm on Saturdays. No operations are proposed on Sundays or Statutory Holidays. Operations during these hours include crushing, washing, and earthworks. Hauling is intended to be restricted from 6:00 am to 7:00 pm Monday through Saturday, with no activities on Sundays or Statutory Holidays.

The proposed hours of operation align with the Subdivision and Development Appeal Board-approved Development Permit (PRDP20175123) for the existing gravel pit.

#### <u>Air Quality</u>

An Air Quality Assessment was completed as part of the application.

The assessment modeled the anticipated worst-case subsection of proposed mining areas as well as the worst-case subsection of operation which placed crushing operations at the eastern and westernmost extents of the project area. These locations were chosen as they placed operations in the closest proximity to existing residents, the Air Assessment Boundary, and the Town of Cochrane. The proposed mitigations were then incorporated into the model, including crusher enclosures, water spray bars, dust control on haul roads and at the plant, progressive reclamation, berms, and separation of operations from receptors.

The air assessment identified that emissions of NO2, PM2.5, TSP, and CO will be emitted from the Project site. While the results predict exceedances of PM2.5 in the Application and Baseline Cases, the maximum values are 8.7 kilometres away from the Air Assessment Boundary and are also



attributed to existing emission sources; not necessarily the Project. The operations, therefore, are not expected to compromise the far-field air quality in the area.

While the air quality assessment does indicate the possibility of exceeding the Alberta ambient air quality objectives (AAQO's) for TPM, it is also important to note that this exceedance is predicted to extend no more than 100 meters beyond the property line. Additionally, the predicted concentrations are calculated using worst-case and highest intensity site operational conditions and are anticipated to only be encountered infrequently. BURNCO is also committed to monitoring the site as necessary to ensure air quality is not adversely affected. As required to meet Alberta ambient air quality objectives, BURNCO will utilize enhanced mitigation measures such as additional dust control (sprinklers, more frequent water truck use, and dust suppressants), reducing site activities during periods of poor air quality, paving of the access road up to and including the scale facility, additional vegetation planting around receptors.

BURNCO has implemented the following measures to reduce dust generated from the operations:

- A 30km/hour speed limit is enforced in the stockpile area;
- A water truck will be available to water the extraction and processing areas as a means of reducing dust;
- During overburden stripping operations, the dust will be controlled by watering the work area as needed;
- All soil stockpiles will be seeded as soon as possible following construction;
- The disturbance associated with the excavation area will be kept to a minimum by progressively reclaiming mined areas thereby reducing the amount of wind-borne dust generated from exposed areas; and
- Each separate major component of the crusher (i.e., the cone, jaw, and screen deck) will be enclosed by a sound and dust retarder blanket system.

At the Development Permit stage, the Applicant would be required to provide an updated Air Quality Assessment, taking into consideration any active new development (neighboring gravel operations) in the vicinity of the site. Given the size and phased nature of the operation, full-time monitoring for dust will occur when gravel pit operations are within 400m of an occupied residence.

#### <u>Noise</u>

The applicant provided an Environmental Noise Impact Assessment which indicates that the noise climate of the area is dominated by traffic-related noise sources (primarily Highway 1A to the north). There are 15 residences within a 2 km radius of the site.

The report did not provide a clear conclusion if the project complies with the Alberta Energy Regulator's 'Directive 038'. 'Directive 038', provides guidelines for new facilities and states that sound levels shall not exceed 40 dBA Leq (night-time) at a distance of 1.5 kilometres from the facility. The assessment indicated a reading of 51.5 dBA within 2.0 kilometres of the west area of the site. The County will require confirmation that the proposed operations can comply with the Alberta Energy Regulator's 'Directive 038', through the mitigation measures provided by the MSDP.

BURNCO intends to minimize the noise of the operation through the following measures:

- The loader backup alarm systems will be maintained at the minimum dBA levels allowable under Alberta Occupational Health and Safety guidelines. When the equipment is operating during darkness, the noise alarm system is turned off and a strobe light warning system is turned on as an alternative to the warning sounds,
- Access roads will be graded and regularly maintained to reduce traffic noise,

**ROCKY VIEW COUNTY** 

- Each separate component of the crusher (i.e. the cone, jaw, and screen deck) will be enclosed with a sound and dust retarder blanket system. Testing has shown that the sound levels drop significantly by 10-15 dBA with the installation of these blankets,
- Any electrical generating sets will have sound-absorbing baffles installed,
- Where feasible, electrical power will be utilized instead of generators for powering the conveyors, crushers, and wash-plant,
- Rubber liners will be used at all conveyor transfer points to reduce the impact noise,
- Where feasible, the use of poly screen decks vs. traditional steel screen decks on the washplant to reduce the sound level,
- All equipment associated with the crusher will be regularly maintained to ensure that it is working properly and that no noise other than normal operating noise is emanating from the equipment,
- Use of engine retarder brakes will not be allowed when trucks are in the stockpile area,
- Strategically place product piles to shield the neighboring areas from the operating equipment,
- Construction of screening berms in strategic locations as detailed in the MSDP.

Currently, there are no standardized methods for conducting aggregate operation noise measurements in the County. The County regulates noise through the Noise Control Bylaw No. C-8067-2020. The Bylaw states that no person shall "make, continue, cause, or allow to be made or continued any excessive, unnecessary, or unusual noise of any type" and that noise must be "minimized as much as practicable." This Bylaw does not provide prescribe quantitative limits for noise emissions.

The existing gravel pit is greater than one kilometer from the nearest occupied residence, though as the proposed operation expands, additional residents will exist closer to active areas. The applicant has not proposed permanent monitoring stations for noise, dust, or other emissions at this time.

BURNCO does intend to deploy full-time noise monitoring for gravel pit operations that occur at night-time and are within 400m of an occupied residence.

### **Conclusion**

The proposed Master Site Development Plan has been evaluated and determined to meet minimum requirements for operation. Technical studies have been reviewed and found sufficient at this time. Future development permit applications will be required for operations, and additional requirements and studies may be required at that time.

Respectfully submitted,

Concurrence,

"Brock Beach"

Acting Executive Director Community Development Services Acting Chief Administrative Officer

"Kent Robinson"

ON/IIt


## ATTACHMENTS

ATTACHMENT 'A': Application Information ATTACHMENT 'B': Application Referrals ATTACHMENT 'C': Master Site Development Plan ATTACHMENT 'D': Map Set ATTACHMENT 'E': Public Submissions



#### **ATTACHMENT 'B': MAP SET**



## G-1 - Attachment B Page 2 of 5 ROCKY VIEW COUNTY

## Development Proposal

## **Redesignation Proposal**

To redesignate the subject lands from Agricultural, Small Parcel District (A-SMLp8.1) to Residential, Rural District (R-RUR) in order to facilitate the creation of a  $\pm$ 1.62 hectare ( $\pm$ 4.00 acre) parcel (Lot 1), a  $\pm$ 1.62 hectare ( $\pm$ 4.00 acre) parcel (Lot 2), with  $\pm$ 5.22 hectare ( $\pm$ 12.91 acre) remainder (Lot 3).

Division: 09 Roll: 07805013 File: PL20210041 Printed: March 10, 2021 Legal: Lot:2 Block:6 FPangl@13012 @fhip 199V-05-27-04-W05M

#### **ATTACHMENT 'B': MAP SET**



G-1 - Attachment B Page 3 of 5 ROCKY VIEW COUNTY

## Environmental

#### **Redesignation Proposal**

To redesignate the subject lands from Agricultural, Small Parcel District (A-SMLp8.1) to Residential, Rural District (R-RUR) in order to facilitate the creation of a  $\pm 1.62$  hectare ( $\pm 4.00$  acre) parcel (Lot 1), a  $\pm 1.62$  hectare ( $\pm 4.00$ acre) parcel (Lot 2), with  $\pm 5.22$  hectare ( $\pm 12.91$ acre) remainder (Lot 3).



Division: 09 Roll: 07805013 File: PL20210041 Printed: March 10, 2021 Legal: Lot:2 Block:6 Franci@13218 wfhith 199/-05-27-04-W05M

#### **ATTACHMENT 'B': MAP SET**



Printed: March 10, 2021 Hangle 13219 within 1991-05-



27-04-W05M



## F 1 - Attachment D Page 1 of 5 ROCKY VIEW COUNTY

# Location & Context

#### **Redesignation Proposal**

Development Proposal: To redesignate portions of 3 parcels, and 5 whole parcels totaling ± 391.10 hectares (± 966.43 acres) from Agricultural - General District to Special - Natural Resources for aggregate extraction (File: PL20200066)

A Master Site Development Plan has been submitted in support of this development proposal (File: PL20200067), to include the existing S-NAT parcel.

Division: 09 Roll: 06915001/06914002/069140 01/06913001 /06913002/06913003/06818 002/06818003/06818004 File: PL20200067 Printed: Mar 1, 2021 Legal: NE-15-26-05-W05M, NPAGYE 13-26-05-W05M, SE/NW/NE-13-26-05-W05M, SW/NW/E-18-26-04-W05M

#### ATTACHMENT 'D': MAP SET



F-1 - Attachment D Page 2 of 5 ROCKY VIEW COUNTY

## Development Proposal

#### **Redesignation Proposal**

Development Proposal: To redesignate portions of 3 parcels, and 5 whole parcels totaling ± 391.10 hectares (± 966.43 acres) from Agricultural - General District to Special - Natural Resources for aggregate extraction (File: PL20200066)

A Master Site Development Plan has been submitted in support of this development proposal (File: PL20200067), to include the existing S-NAT parcel.

Division: 09 Roll: 06915001/06914002/069140 01/06913001 /06913002/06913003/06818 002/06818003/06818004 File: PL20200067 Printed: Mar 1, 2021 Legal: NE-15-26-05-W05M, NPAGYE 13-26-05-W05M, SE/NW/NE-13-26-05-W05M, SW/NW/E-18-26-04-W05M

#### ATTACHMENT 'D': MAP SET



E 1 - Attachment D Page 3 of 5 ROCKY VIEW COUNTY

## Environmental

## **Redesignation Proposal**

Development Proposal: To redesignate portions of 3 parcels, and 5 whole parcels totaling ± 391.10 hectares (± 966.43 acres) from Agricultural - General District to Special - Natural Resources for aggregate extraction (File: PL20200066)

A Master Site Development Plan has been submitted in support of this development Subject Lands Contour - 2 meters Riparian Setbacks Alberta Wetland Inventory Surface Water

Division: 09 Roll: 06915001/06914002/069140 01/06913001 /06913002/06913003/06818 002/06818003/06818004 File: PL20200067 Printed: Mar 1, 2021 Legal: NE-15-26-05-W05M, NPAdge 1326:05/W250 SE/NW/NE-13-26-05-W05M, SW/NW/E-18-26-04-W05M

#### ATTACHMENT 'D': MAP SET



E-1 - Attachment D Page 4 of 5 ROCKY VIEW COUNTY

## Soil Classifications

#### **Redesignation Proposal**

Development Proposal: To redesignate portions of 3 parcels, and 5 whole parcels totaling ± 391.10 hectares (± 966.43 acres) from Agricultural - General District to Special - Natural Resources for aggregate extraction (File: PL20200066)

A Master Site **Development Plan has** been submitted in support of this development proposal (File: PL20200067), to include the existing S-NAT parcel.

Division: 09 Roll: 06915001/06914002/069140 01/06913001 /06913002/06913003/06818 002/06818003/06818004 File: PL20200067 Printed: Mar 1, 2021 Legal: NE-15-26-05-W05M, NP/andre 13-364.05 fW705/9 SE/NW/NE-13-26-05-W05M, SW/NW/E-18-26-04-W05M



SW/NW/E-18-26-04-W05M



# **Master Site Development Plan**

# West Cochrane Gravel Pit

NE 15-26-05 W5M (Title # 141P219) N/2 14-26-05 W5M (Title # 151 199 374) W/2 13-26-05 W5M (Title # 151 199 374 +1) NE 13-26-05 W5M, SE 24-26-05 W5M (Title # 141 167 388) SE 13-26-05 W5M (Title # 141 167 387) SW 18-26-04 W5M (Title # 141 167 389) NW 18-26-04 W5M, SW 19-26-04 W5M (Title # 141 167 390) SE 18-26-04 W5M, NE18-26-04 W5M (Title # 141 167 053)

**BURNCO Rock Products Ltd.** 

June 2020 v.4 Revised June 2021

## **Table of Contents**

| Table of | f Contents                                      | ii   |
|----------|-------------------------------------------------|------|
| Master 8 | Site Development Plan                           | 1    |
| 1.0      | Introduction                                    | 1    |
| 1.1      | The West Cochrane Gravel Pit                    | 1    |
| 1.2      | Location and Ownership                          | 3    |
| 1.3      | Current Land Use                                | 4    |
| 1.4      | Adjacent Lands                                  | 4    |
| 1.5      | Consultation Process and Results                | 7    |
| 2.0      | Site Analysis                                   | 8    |
| 2.1      | Topography                                      | 8    |
| 2.2      | Vegetation and Wildlife                         | 8    |
| 2.3      | Soil                                            | . 13 |
| 2.4      | Resource                                        | . 15 |
| 2.5      | Storm Water                                     | . 16 |
| 2.6      | Groundwater                                     | . 19 |
| 2.7      | Historical Resources                            | . 25 |
| 2        | .7.1 Historical Resources – NW 13-26-05 W5M     | . 25 |
| 2        | .7.1 Historical Resources – Expansion Areas     | . 29 |
| 3.0      | Development / Operating Plan                    | . 34 |
| 3.1      | Overview                                        | . 34 |
| 3.2      | Hours of Operation                              | . 37 |
| 3.3      | Development Phasing                             | . 37 |
| 3.4      | Site Securement, Signage, Buffers               | .41  |
| 3.5      | Noise Assessment and Control                    | . 42 |
| 3.6      | Air Quality Assessment and Control              | . 46 |
| 3.7      | Environmental Monitoring & Complaint Resolution | . 52 |
| 3.8      | Groundwater Assessment and Security             | . 53 |
| 3.       | .8.1 Groundwater Assessment                     | . 53 |
| 3.       | .8.2 Dewatering Activities                      | . 56 |
| 3.       | .8.3 Groundwater Conclusions                    | . 58 |
| 3.       | .8.4 Groundwater Security                       | . 59 |
| 3.       | .8.5 Existing Water Licenses & Approvals        | . 59 |
| 3.9      | I raffic Impact Assessment and Control          | . 59 |
| 3.       | .9.1 Traffic Impact Assessment                  | . 60 |
| 3.       | .9.2 Haul Safety                                | . 61 |
| 3        | .9.3 Haul Monitoring                            | . 61 |
| 3.10     | J Storm Water                                   | .61  |
| 3.1      | 1 Vegetation and Wildlife Controls              | . 64 |
| 3.12     | 2 Hazardous Waste Plan                          | . 72 |
| 3.13     |                                                 | . 12 |
| 3.14     | Lanoscaping and Site Screening                  | . /4 |
| 4.0      | Cumulative Effects                              | . 82 |
| 5.0      |                                                 | . 82 |
| 5.1      | Landscaping and Closure                         | . 82 |

| 5.2 | Soil Salvage                            |  |
|-----|-----------------------------------------|--|
| 5.3 | Subgrade                                |  |
| 5.4 | Soils Placement                         |  |
| 5.5 | Vegetation                              |  |
| 5.6 | Inactive Pit Conservation & Reclamation |  |
| 6.0 | Conclusion                              |  |

## **List of Appendices**

Appendix 1: Supporting Documents Submitted with Land Use Application

- Appendix 2: MSDP Policy Summary
- Appendix 3: Drawings

## List of Figures

Figure 1: Project Map – Parcel and Rezoning Locations

Figure 2: Rocky View County Land Use Zoning Map 1

Figure 3: Rocky View County Land Use Zoning Map 2

Figure 4: Vegetation and Wetlands in the Project Study Area

Figure 5: Wildlife Survey Results

Figure 6: Gravel Pit Soil Inspection Sites

Figure 7: Stormwater Management Plan – Existing Upstream Drainage

Figure 8: Stormwater Management Plan – Existing On-Site Drainage

Figure 9: Groundwater Monitoring Wells

Figure 10: Search Area Water Well Locations

Figure 11: Search Area Water Licenses

Figure 12: Groundwater Flow

Figure 13: Saturated Gravel Thickness

- Figure 14: EhPp-75 Map of 2018 Stone Feature and Block Excavations
- Figure 15: HRIA Areas for Assessment

Figure 16: HRIA Work Undertaken in Disturbance Area 1

Figure 17: HRIA Work Undertaken in Disturbance Areas 2 and 3

Figure 18: HRIA Work Undertaken in Disturbance Area 4

Figure 19: Mine Phase Plan

Figure 20: Mine Phasing Illustration

Figure 21: Baseline Case Leq24 Sound Levels

Figure 22: West Site Operations Leq24 Sound Levels

Figure 23: East Site Operations Leq24 Sound Levels

Figure 24: Maximum Predicted 1-hr Average CO<sub>2</sub> Concentration

Figure 25: Maximum Predicted 24-hr PM<sub>2.5</sub> Concentration

Figure 26: Maximum Predicted 24-hr TSP Concentration

Figure 27: Maximum Predicted 8-hr Average CO Concentration

Figure 28: Area Water Resources

Figure 29: BURNCO Monitoring Well Locations

Figure 30: Saturated Thickness Map



Figure 31: Drainage Management Plan (Recharge Ponds Locations)

- Figure 32: Drainage Management Plan (Culvert Locations)
- Figure 33: Post Development Drainage
- Figure 34: Applicable Riparian Setbacks
- Figure 35: Applicable Wildlife Setbacks
- Figure 36: ESC Plan West
- Figure 37: ESC Plan East
- Figure 38: Visual Impact Assessment Receptor Locations
- Figure 39: Visual Impact Assessment Planting Plan
- Figure 40: View of Berm and Planting Plan (Location #2)
- Figure 41: View of Berm and Planting Plan (Location #3)
- Figure 42: View of Berm and Planting Plan (Location #4)

## **List of Tables**

- Table 1: Land Ownership and Occupancy
- Table 2: Raptors and Raptor Nests Detected During Raptor Stick Nest Survey
- Table 3: Existing Drainage Areas
- Table 4: Groundwater Quality Results
- Table 5: Alberta Ambient Air Quality Objectives (AAAQOs)
- Table 6: Maximum Annual Groundwater Diversion Volume
- Table 7: Recharge Pond Design
- Table 8: Table of Setback and Restricted Activity Periods
- Table 9: Potential Vegetation and Wildlife Impacts, Mitigation Measures, and Residual Effects



## Master Site Development Plan

## 1.0 Introduction

BURNCO Rock Products Ltd. (BURNCO) is a family owned Alberta based company that has been in operation since 1912. Today, BURNCO is a fourth-generation construction materials company with over sixty locations in Alberta, British Columbia, Saskatchewan, Colorado and Texas. BURNCO produces high quality aggregates, paving asphalt, and ready-mix concrete.

BURNCO takes great pride in its sites and works every day to ensure they are having the least possible impact on neighbors and the community while continuing to supply the aggregates needed for local projects.

Sites currently operated in Rocky View County include:

| • | Irricana Gravel Pit   | 304 hectares (751 acres)   |
|---|-----------------------|----------------------------|
| • | Burma Gravel Pit      | 194 hectares (480 acres)   |
| • | Springbank Gravel Pit | 246 hectares (608 acres)   |
| • | Indus Gravel Pit      | 553 hectares (1,368 acres) |
|   |                       |                            |

These sites have been successfully operated for decades. In that time, BURNCO has learned effective strategies for impact assessment and control. This includes a commitment to meaningful noise, dust and traffic control measures. These include screening berms, enclosed equipment, road upgrades, and a willingness to engage with neighbors and stakeholders. BURNCO has had great success with such measures and holds all projects to a high standard of performance.

## **1.1 The West Cochrane Gravel Pit**

BURNCO currently operates a gravel pit at NW 13-26-05 W5M located northwest of the Town of Cochrane, Alberta. This site is 61 hectares in size. It contains an estimated 2,500,000 tonnes of aggregates and is selling roughly 125,000 tonnes of material annually. Operations include earthmoving, aggregate crushing, and loading trucks. This site was permitted in 2012 with a design capacity of 500,000 tonnes per year. It opened in 2016 after the completion of an intersection upgrade at Range Road 51 in support of the project.

BURNCO is now proposing to increase the overall size of the pit to 452 hectares of contiguous lands through the inclusion of adjacent land parcels. In total, the Project Area contains an estimated 15,000,000 tonnes of aggregate and is expected to operate for 30 to 35 years. No change in annual design capacity is being proposed.

The project would include the following parcels:

- Existing Site: NW 13-26-05 W5M (Title # 151 199 374 +1)
- Proposed: NE 15-26-05 W5M (Title # 141P219)
- Proposed: N/2 14-26-05 W5M (Title # 151 199 374)
- Proposed: NE 13-26-05 W5M, SE 24-26-05 W5M (Title # 141 167 388)
- Proposed: SE 13-26-05 W5M (Title # 141 167 387)
- Proposed: SW 18-26-04 W5M (Title 141 167 389)
- Proposed: NW 18-26-04 W5M, SW 19-26-04 W5M (Title # 141 167 390)
- Proposed: SE 18-26-04 W5M, NE18-26-04 W5M (Title # 141 167 053)

#### West Cochrane Gravel Pit – Master Site Development Plan



Figure 1: Project Map – Parcel Locations

Aggregate from this site will be used to supply local projects in Rocky View County and in the Town of Cochrane. Washing capacity at this site will also allow BURNCO to supply premium aggregates to its network of asphalt and concrete plants in the Greater Calgary Area. BURNCO has a number of sites in Rocky View that currently serve this vital role as a supply of premium materials, however they are nearing depletion and BURNCO views the West Cochrane site as a replacement.

In support of this application, BURNCO has spent considerable time and effort planning the West Cochrane Gravel Pit:

- Two open houses held over a period of 24 months,
- Biophysical Assessment,
- Environmental Noise Impact Assessment,
- Air Quality Assessment,
- Groundwater Impact Assessment,
- Visual Resources Assessment,
- Traffic Impact Assessment,
- Historical Resources Impact Assessment,
- Stormwater Management Plan,
- Erosion and Sediment Control (ESC) Plan, and
- Detailed Mining and Reclamation Plans.

#### West Cochrane Gravel Pit – Master Site Development Plan

This planning has been used to develop a Master Site Development Plan which follows in this document. This document provides summary of the development, operation and closure plans for this project.

It is BURNCO's belief that by following the Project Activities Plan for the proposed development, that BURNCO's West Cochrane Gravel Pit can continue to operate in a socially and environmentally responsible manner for many years to come.

## **1.2** Location and Ownership

The lands are located along the Bow River in Rocky View County and are directly northwest of the Town of Cochrane. The total proposed development area is 452 hectares. The various` properties are privately held and BURNCO has entered into lease agreements with the owners for gravel mining. In addition, there are a number of undeveloped road allowances within the project footprint which will need to be addressed prior to any development occurring of these lands.

| Location                                                                                                                                                                                                                                                           | Registered Owners                                                                                                                      | Occupants                                                                                                                                                                                                                                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Municipal Address or<br>1/4-Sec-Twp-Rge-Mer                                                                                                                                                                                                                        | Name, Address and Phone<br>Number                                                                                                      | Name, Address and Phone<br>Number                                                                                                                                                                                                          |
| NE 15-26-05 W5M (Title # 141P219)<br>N/2 14-26-05 W5M (Title # 151 199 374)<br>W/2 13-26-05 W5M (Title # 151 199 374 +1)                                                                                                                                           | David H. McDougall Ranch<br>Limited<br>Box 1172, Cochrane, AB<br>T4C 1B2<br>(David Dutchik)<br>(250) 261-9962                          | Gravel Pit Tenant:<br>( <u>All Lands</u> )<br>BURNCO Rock Products Ltd.<br>Farming:<br>( <u>All Lands</u> )<br>David H. McDougall Ranch<br>Limited<br>Box 1172, Cochrane, AB<br>T4C 1B2<br>(David Dutchik)<br>(250) 261-9962               |
| NE 13-26-05 W5M, SE 24-26-05 W5M (Title #<br>141 167 388)<br>SE 13-26-05 W5M (Title # 141 167 387)<br>SW 18-26-04 W5M (Title 141 167 389)<br>NW 18-26-04 W5M, SW 19-26-04 W5M (Title #<br>141 167 390)<br>SE 18-26-04 W5M, NE18-26-04 W5M (Title # 141<br>167 053) | Tricycle Lane Ranches Ltd.<br>200, 155 Glendeer Circle SE<br>PO Box 1480, Station "T"<br>Calgary, Alberta<br>T2H 2P9<br>(403) 640-9355 | Residential Tenant:<br><u>(SE 18)</u><br>Triple S Cattle Company<br>53193 Highway #1<br>Calgary, Alberta<br>T3Z 3G8<br>Farming Tenant:<br><u>(All Lands)</u><br>Triple S Cattle Company<br>53193 Highway #1<br>Calgary, Alberta<br>T3Z 3G8 |

Table 1: Land Ownership and Occupancy

#### Policy #1

BURNCO will secure appropriate approvals to excavate aggregate and develop within all onsite Road Allowances and will follow applicable terms and conditions as negotiated with the County and Alberta Transportation.



## 1.3 Current Land Use

The land in the proposed expansion area is currently registered as A-GEN (Agricultural – General District). The NE 15-26-05 W5M, NW 14-26-05, and NE 14-26-05 W5M are presently farmed as pasture and cultivated land. The remaining lands are pasture and hayland. There is also a residence on the SE 18-26-04 W5M, which is rented.

The NW 13-25-06 W5M is zoned S-NAT (Special – Natural Resource District) and is operated by BURNCO as an active gravel pit (the McDougall Ranch Pit). This site has a municipal Development Permit (DP # PRDP20175123), a Provincial Code of Practice Registration (Registration # 254757-00-00), as well as two water licenses (No. 00396954-00-00 and No. 00396952-00-00) for the diversion of water from the Bow River, which will supply water for BURNCO's aggregate washing activities. BURNCO also holds a Water Act approval which allows for excavation of gravel from within the groundwater table in NW 13 (No 00430788-00-00). A copy of these permits is provided as part of BURNCO's Land Use Application.

## Policy #2

BURNCO will secure an approved Registration from Alberta Environment & Parks under the Code of Practice for Pits before commencing operations.

## Policy #3

Aggregate development within the MSDP area shall comply with all relevant municipal, provincial and federal legislation, regulations and policies.

## 1.4 Adjacent Lands

Lands to the north and east of the project site are privately held and are currently being ranched. The majority of these lands are owned by either Tricycle Lane Ranches Ltd (which leases BURNCO land for a portion of the gravel pit) or McKendrick Ranches Ltd. Lands to the south of the project site include the Bow River which runs along the southern boundary of the eastern portion proposed expansion area. South of the western portion of the project there is a vacant acreage and a number of private landowners farming and ranching on lands between the river and the project site. The Stoney Nakoda First Nation reserve is located on lands south of the Bow River. Lands to the west of the project site include a number of acreages. Finally, a large gas plant, known as the Wildcat Gas Plant is located one mile to the west of the project site.

#### West Cochrane Gravel Pit – Master Site Development Plan



Figure 2: Rocky View County Land Use Zoning Map 1

## F-1 - Attachment C Page 10 of 113

#### West Cochrane Gravel Pit – Master Site Development Plan





## **1.5 Consultation Process and Results**

Consultation related to the Project Activities Plan for these lands was undertaken over the past thirty-six months. Two open houses were held to provide the community with project information and seek public input. Open house materials and results are provided as part of BURNCO's Land Use Application.

Open House #1:

Event Details:

- April 17, 2018 from 4pm to 8pm held at the Cochrane Ranche House Conference Center,
- 32 invitations were mailed to properties located within 1 mile of the project,
- Invitations extended to Rocky View County staff, Rocky View Councilors, and Town of Cochrane staff,
- Event provided preliminary project information to the public and sought input prior to detailed design work and assessment.

Results:

- 13 attendees on sign in sheet,
- · Event displays communicated by email following the event,
- 2 comment sheets received,
- Top concerns were truck traffic, noise, dust, groundwater, and property values.

## Open House #2:

Event Details:

- March 9, 2020 from 4pm to 8pm held at the Cochrane Ranche House Conference Center,
- 35 invitations were mailed to properties located within 1 mile of the project,
- Invitations extended to Rocky View County staff, Rocky View Councilors, and Town of Cochrane staff,
- Event provided detailed design work and assessment for the project.

Results:

- 16 attendees on sign in sheet,
- Event displays communicated by email following the event,
- 4 comment sheets received,
- Top concerns were truck traffic, biophysical impacts, erosion and sediment control, groundwater, and property values.

In addition, a number of local residents were engaged during the site assessment process as visits were required to their properties in order to gather data on water wells, and capture images for use in the visual impact assessment. The main concerns voiced by residents were:

- Nuisances via increase truck traffic and impacted haul routes,
- Impacts on wetlands and local wildlife,
- Ground water impacts,
- Erosion and sediment control, and
- Property values.

This report will address and speak to the various concerns that residents voiced and illustrate the mitigation measures BURNCO intends to implement to address them.

## 2.0 Site Analysis

## 2.1 Topography

The project site is located north west of the Town of Cochrane, north of the Bow River. The area is characterized by level to hummocky surface expression with some steep and terraced areas with slopes ranging from 2% to 30%. The majority of the Project Area contains gently undulating to hummocky surface expression with slopes ranging from 0.5% to 5%. Small portions of the Project Area (approximately 7%), have rough broken (steep) and terraced (river) surface expressions with slopes between 15% and 30%.

## 2.2 Vegetation and Wildlife

Matrix Solutions Inc. (Matrix) was retained by BURNCO to complete a Biophysical Impact Assessment (BIA) in association with the proposed expansion. The BIA is used to guide project development and to minimize the potential negative effects of the Project on biophysical resources during planning, design, construction, operation, and reclamation stages. The BIA is also intended to support applications for municipal and provincial permits and authorizations required for the operation of this development. This assessment was completed in 2019 and is provided as part of BURNCO's Land Use Application.

Both desktop assessments and field surveys were conducted to assess the vegetation, wetlands, and wildlife. Information gathered was then integrated in to the assessments as appropriate. Summaries on vegetation, wetlands and wildlife from the Matrix report are as follows:

#### Vegetation

Eight vegetation communities were observed within the Project Area (Figure 2). The most extensive vegetation community within the Project Area is grazed native grassland comprising 215.2 ha (58.8%; Table 7; Figure 2). Agricultural land includes cropland, comprised 64.8 ha (17.7%) and tame pasture, comprised 36.8 ha (10.1%). The vegetation community native grassland on slopes encompasses the steep slopes adjacent to the riparian area of the Bow River (15.6 ha, 4.3%). These slopes have a higher potential for rare plants and higher risk of erosion. Dominant species for each vegetation community observed are provided in Table 7. During field surveys, 101 vegetation species were observed. Vegetation species observed according to vegetation community are presented in Appendix F.

Four noxious weeds were observed in the Project Area (Figure 2; Table 8), including common toadflax (Linaria vulgaris), creeping/Canada thistle (Cirsium arvense), perennial sow-thistle (Sonchus arvensis), and hound's tongue (Cynoglossum officinale). Noxious weeds were scattered throughout tame pasture, native grassland, and shrubland areas. No prohibited noxious weeds were observed.

Other non-native and agronomic species observed include smooth brome (Bromus inermis), timothy (Phleum pratense), dandelion (Taraxacum officinale), goat's-beard (Tragopogon dubius) and clover (Trifolium spp.).

An ACIMS desktop database search was completed before the field surveys. There were 98 tracked plant species and 8 tracked vegetation communities with the potential to occur in the Foothills Parkland (Appendix G; AEP 2017b).



Based on the ACIMS desktop search, marsh gentian (Gentiana fremontii) was previously recorded within and near the Project Area and may occur within the planned area of disturbance. Marsh gentian was not observed during field surveys. The Project Area is located within AEP wildlife sensitivity ranges for limber pine (Pinus flexilis). Limber pine was not observed during field surveys.

During the field surveys, no rare plant species or rare plant communities (AEP 2018a; AEP 2017a) were observed within the Project Area. No federally-listed rare species (Government of Canada 2011) were observed in the Project Area.

Direct effects on vegetation will be limited to active access and operational areas, where vegetation will be cleared. Clearing of vegetation communities will be limited to the Project Area most of which are native grasslands; effects will be negative in direction; high in magnitude with a high probability of occurrence. Effects of vegetation clearing will also be long term and continuous during operations. With the implementation of progressive reclamation, effects are reversible in the long term. Native species can be planted in the short and medium term, but restoring the species diversity will be a long-term effect. Prediction confidence is high based on a good understanding of the impacts of vegetation clearing in native prairie. Predicted residual effects on vegetation are rated as not significant.

To ensure that potential environmental effects are reduced or eliminated during Project construction and operation, a number of general and site-specific mitigation measures are recommended and presented in Table 14. Other mitigations are based on requirements and guidelines of federal and provincial regulatory agencies, current industry standards, and professional experience and judgement. Project design, construction techniques, and operational practices are also accounted for as part of these mitigations.

#### <u>Wetlands</u>

Two seasonal (III) graminoid marshes were observed within the Project Area with a total area of 1.1 ha (0.3%; Table 7; Figure 2). Both marshes were adjacent to riparian vegetation communities. The footprint included 7.0 ha of riparian area (1.9%; Table 7; Figure 2). Seasonal drainages observed are areas where water may flow during spring runoff, but are not classified as wetlands or watercourses.

#### West Cochrane Gravel Pit – Master Site Development Plan

Figure 4: Vegetation and Wetlands in the Project Study Area



#### <u>Wildlife</u>

A review of government and scientific research studies and government database queries were conducted to identify wildlife species, including wildlife species at risk (SAR), and sensitive wildlife areas that may occur in the Project Area.

A literature review indicated that 79 wildlife SAR may occur in or near the site, including 3 amphibians, 3 reptiles, 65 birds, and 8 mammals (Appendix H). A review of FWIMT data within approximately 5 km of the Project Area indicated that several wildlife SAR have been historically observed within or adjacent to the Project Area (northern leopard frog, wandering garter snake, trumpeter swan, sora, piping plover, great blue heron, northern pygmy-owl, osprey, peregrine falcon, prairie falcon, barn swallow, Baltimore oriole, least flycatcher, eastern kingbird, western wood-pewee, grizzly bear; Appendix H; AEP 2018b).

The Project Area passes through three provincially designated wildlife sensitivity zones including:

- sensitive raptor range for bald eagle, golden eagle and prairie falcon
- sharp-tailed grouse survey area
- key wildlife and biodiversity zone (KWBZ) associated with the Bow River (AEP 2018c)



#### West Cochrane Gravel Pit – Master Site Development Plan

Wildlife surveys were conducted as per the Sensitive Species Inventory Guidelines (SSIG; GoA 2013a). Surveys were carried out under the appropriate research licences/collection permits provided by Alberta Environment and Parks (AEP).

As per permit requirements, results of the surveys will be submitted to AEP upon completion.

- sharp-tailed grouse surveys (on 7 May and 8 May 2018);
- raptor stick nest survey (on 23 May 2018); and
- breeding bird survey (23 May and 4 June 2018).

During the sharp-tailed grouse surveys, no sharp-tailed grouse or leks were observed. No other SAR or important wildlife features (e.g., dens, hibernacula) were detected.

During the raptor stick nest survey, a total of 20 raptors of four different species were detected (i.e., American kestrel, bald eagle, red-tailed hawk, Swainson's hawk; Table 7). No other SAR or important wildlife features (e.g., dens, hibernacula) were detected.

| Common Name      | Scientific Name             | AEP<br>Status <sup>1</sup> | COSEWIC<br>Status <sup>2</sup> | SARA<br>Status <sup>3</sup> | Number<br>Observed | Number of<br>Associated<br>Nests Detected |
|------------------|-----------------------------|----------------------------|--------------------------------|-----------------------------|--------------------|-------------------------------------------|
| American kestrel | Falco sparverius            | Sensitive                  | -                              | 10.00                       | 5                  |                                           |
| Bald eagle       | Haliaeetus<br>leucocephalus | Sensitive                  | Not at Risk                    | ÷                           | 2                  | 1                                         |
| Red-tailed hawk  | Buteo jamaicensis           | Secure                     | Not at Risk                    |                             | 10                 | 3                                         |
| Swainson's hawk  | Buteo swainsoni             | Secure                     | -                              | -                           | 3                  | -                                         |

Table 2: Raptors and Raptor Nests Detected During Raptor Stick Nest Survey

1. Alberta Wild Species General Status Listing - 2015 (GoA 2017)

2. Species at Risk Public Registry (Government of Canada 2011)

3. SARA (Government of Canada 2018)

During the breeding bird surveys, a total of 337 individuals of 30 breeding bird species were detected including four SAR (i.e., barn swallow, eastern kingbird, least flycatcher, Sprague's pipit; Table I1 of Appendix I; Figure 8). Approximately 53% of the birds detected were located more than 100 m from a survey point.

Incidental species observations included two bird SAR (i.e., great blue heron and American kestrel). No other SAR or other important wildlife habitat features (e.g., hibernacula, leks) were detected during the surveys. All wildlife species (incidental and target) detected during all surveys are included as Table I2 of Appendix I.

Approximately 89% of the habitat within the Project Area has been previously impacted (e.g., cropland, pasture, grazing). The majority of the Project Area consists of native grassland and tame pasture which may be suitable habitat for sharp-tailed grouse, breeding birds, small mammals (e.g., badger, ground squirrel), and grazing ungulates. The native grassland habitat has been impacted by grazing, with 100% of the habitat (215.2 ha) being grazed by cattle, and approximately 80% being heavily grazed. A moderate concentration of ground squirrel burrows was observed during the field assessments. In addition to native prairie and tame pasture, the Project Area includes cropland (64.8 ha) that may provide habitat for breeding birds, but would be impacted during the breeding season by agriculture activities. Land use of the area is summarized in Section 5.1 and Table 3.



A variety of habitat types exist along the Bow River. There are cliffs which contain suitable habitat for cliff nesting birds, although no cliff nests were identified during the field assessments.

Based on a desktop review of habitat within the Project Area, Matrix recommended the completion of a fish habitat assessment. The fish habitat assessment was conducted by a Qualified Aquatic Environmental Specialist on November 8, 2018. Beaupre Creek, Grand Valley Creek, and three unnamed watercourses were assessed during the site visit. The assessment area was accessed via truck, utilizing existing roads or by foot. The weather was sunny with temperatures below -4°C. The assessment utilized the collection of data to: identify and document important fish and fish habitat features within the watercourses, assess the watercourses' sensitivity to the proposed Project activities and develop general and site-specific mitigation measures to avoid or mitigate potential impacts to fish and fish habitat.

A review of aerial imagery of Beaupre Creek, Grand Valley Creek, and the most westerly unnamed watercourse did not identify any impediments or barriers to fish migration to the confluence with the Bow River. Resident fish species from the Bow River, in the vicinity of the confluence, could migrate into the watercourses if suitable species-specific fish habitat (spawning, rearing, feeding, or overwintering) exists. The two most easterly unnamed watercourses exhibit an absence of a defined bed and banks and are not connected to the Bow River. They do not provide fish habitat at any time of the year. anthropocentric disturbances, such as coyotes and small rodents.



Figure 5: Wildlife Survey Results



## 2.3 Soil

In support of the Project, Matrix Solutions Inc. (Matrix) was retained to complete a Biophysical Impact Assessment (BIA) for the Project area, which included an assessment of soils. This assessment was completed in 2019 and is provided as part of BURNCO's Land Use Application. The conclusions of the soils assessment from Matrix are as follows:

The Project Area is located within the Soil Correlation Area (SCA) 8 - Thick Black Soil Zone of Southwestern Alberta. The area is characterized by level to hummocky surface expression with some steep and terraced areas with slopes ranging from 2% to 30%. The majority of the Project Area contains gently undulating to hummocky surface expression with slopes ranging from 0.5% to 5%. Small portions of the Project Area (approximately 7%), have rough broken (steep) and terraced (river) surface expressions with slopes between 15% and 30%. Approximately 87% (318.2 ha) of the proposed Project Area is underlain by glaciolacustrine parent material, and 13% (46.5 ha) of the proposed Project Area is Project Area (0.3% or 1 ha) was characterized by roads and disturbance units.

Soils within the Project Area were classified using field data collected in July 2018. Two soils series were identified within the Project Area and include the Maycroft (MFT) and Lindbrook (LBK) series (99.7% of Project Area). A small portion of the Project Area (0.3%) contained disturbed soils (Table 4; Figure 7). Detailed information, including stripping depths for each soil is provided in Section 5.4.2.1 and 5.4.2.2.

<u>The Maycroft soil series</u>: are moderately fine-textured soils developed on glaciolacustrine parent material and contain moderately well to well-drained Orthic Black Chernozem (87% of the Project Area) and imperfectly drained Gleyed Orthic Black Chernozems soils developed on fine-textured glaciofluvial parent material (0.1% of the Project Area). Surface expression ranges from gently undulating to undulating, hummocky to terraced (river) with slope gradients of 0.5% to 30%. Gleyed (gl) and calcareous (ca) variants were present within the Project Area, indicating imperfect drainage and periodic reduction and alkaline earth carbonates were found in the B horizon, respectively (LCRC et al. 1993).

This soil series was rated 3 (H,M,T) for land suitability for agriculture indicating the soil in this class has slight limitations that could restrict growth of crops or require additional special management practices due to inadequate heat units (H), moisture (M) and slopes steep enough to incur water erosion or to limit or impede cultivation (T) (Appendix D).

The soil suitability for reclamation for topsoil was rated "fair" based on texture and calcium carbonate and "fair" for subsoil based on reaction (slightly alkaline), texture and consistency (Appendix E). The wind erosion potential for the Maycroft soil series is low and slope dependent for water erosion potential; it is rated low on slope gradients <5%, moderate on slopes 5% to 10% and high on slopes greater than 15%. Slopes greater than 15% are found in conjunction with the terraced river areas (LCRC et al. 1993).

<u>The Lindbrook soil series:</u> are well-drained Orthic Regosols developed on coarse glaciofluvial sand parent material (12.5% of the Project Area). Regosolic soils do not contain a recognizable B subsoil horizon and are considered weakly developed soils (SCWG 1998).



Surface expression ranges from gently undulating, inclined-undulating, rough broken (steep) and terraced (river) with slope gradients of 0.5% to 30%. Gleyed (gl) variants were present (0.2% of the Project Area), indicating imperfect drainage and periodic reduction within the soil profile (LCRC et al. 1993).

This soil series had two ratings: Class 4 and 7. Areas rated 4 (H,M,W,T) had limitations such as inadequate heat units (H), moisture (M), excess water limiting to crop production (W) and slopes steep enough to incur water erosion or to limit or impede cultivation (T). Areas with higher stone content were rated Class 7 (H,M,E,P) due to additional limitation such as a thin A horizon (E), and land is sufficiently stony to limit crop production (P) (Appendix D).

The soil suitability for reclamation for topsoil was rated "fair" in areas with reduced stone content based on stoniness and calcium carbonate equivalent. In areas with high stone content, the topsoil was rated "poor" based on stone content and high calcium carbonate equivalent (Appendix E). The wind erosion potential for the Lindbrook soil series was moderate and slope dependent for water erosion potential; it is rated low on slope gradients <5%, moderate on slopes 5% to 10% and high on slopes greater than 15% (LCRC et al. 1993).

Figure 6: Gravel Pit Soil Inspection Sites



## 2.4 Resource

In support of the Project, Matrix Solutions Inc. (Matrix) was retained to complete a Biophysical Impact Assessment (BIA) for the Project area, which included an assessment of soil depths. This assessment was completed in 2019 and is provided as part of BURNCO's Land Use Application. As part of this assessment, Matrix completed 37 inspection sites and was used to determine the following soil depths divided into applicable land parcels:

| ٠ | NE 15 (141P219)             | Topsoil: | <u>14.6 cm</u> | _Subsoil:_ | <u>15.7 cm</u> |
|---|-----------------------------|----------|----------------|------------|----------------|
| ٠ | NW 14 (151 199 374)         | Topsoil: | 15.8 cm        | _Subsoil:  | 16.3 cm        |
| ٠ | NE 14 (151 199 374)         | Topsoil: | 16.6 cm        | _Subsoil:  | 15.7 cm        |
| ٠ | NE 13 / SE 24 (141 167 388) | Topsoil: | 23.3 cm        | _Subsoil:  | 12.3 cm        |
| ٠ | SE 13 (141 167 387)         | Topsoil: | 21.0 cm        | _Subsoil:  | 16.5 cm        |
| ٠ | SW 18 (141 167 389)         | Topsoil: | 18.5 cm        | _Subsoil:  | 25.5 cm        |
| ٠ | NW 18 / SW 19 (141 167 390) | Topsoil: | 15.8 cm        | _Subsoil:  | 24.2 cm        |
| ٠ | SE 18 / NE 18 (141 167 053) | Topsoil: | 17.5 cm        | _Subsoil:  | 15.5 cm        |
|   |                             |          |                |            |                |

The existing operation in NW 13 has been in operation since 2016. A preconstruction soil assessment was completed on these lands by Twerdoff & Associates Inc. in 2013 and is provided as part of BURNCO's Land Use Application. This assessment determined the following soil depths:

NW 13 / SW 13 (151 199 374 +1) Topsoil: <u>12.7 cm</u> Subsoil: <u>13.9 cm</u>

The site has also been tested by auger drill, hammer drill and excavator to determine the depth, extent, and quality of aggregate. In all 79 test holes/pits were logged across the site for use in assessing horizon C (overburden) and gravel depths:

| • | NE 15 (141P219)                | Overburden (OB):  | <u>2.4 m</u> | Gravel: | 6.0 m |
|---|--------------------------------|-------------------|--------------|---------|-------|
| • | NW 14 (151 199 374)            | Overburden (OB):_ | <u>2.2 m</u> | Gravel: | 3.9 m |
| • | NE 14 (151 199 374)            | Overburden (OB):  | <u>2.5 m</u> | Gravel: | 5.4 m |
| • | NE 13 / SE 24 (141 167 388)    | Overburden (OB):  | <u>3.9 m</u> | Gravel: | 5.5 m |
| • | SE 13 (141 167 387)            | Overburden (OB):  | 0.3 m        | Gravel: | 7.6 m |
| • | SW 18 (141 167 389)            | Overburden (OB):  | <u>1.1 m</u> | Gravel: | 5.8 m |
| • | NW 18 / SW 19 (141 167 390)    | Overburden (OB):  | 8.5 m        | Gravel: | 5.2 m |
| • | SE 18 / NE 18 (141 167 053)    | Overburden (OB):  | 3.0 m        | Gravel: | 5.7 m |
| • | NW 13 / SW 13 (151 199 374 +1) | Overburden (OB):  | 1.6 m        | Gravel: | 6.1 m |
|   |                                | · · · ·           |              |         |       |

Averages for the entire project are:

- Topsoil: <u>17.3 cm</u>
- Subsoil: <u>17.3 cm</u>
- Overburden: <u>2.8 m</u>
- Aggregate: <u>5.7 m</u>

## 2.5 Storm Water

In support of the Project, Matrix Solutions Inc. (Matrix) was retained to complete a Stormwater Management Plan (SMP) for the Project. A complete copy of the Matrix report can be found as part of BURNCO's Land Use Application. An overview of the results is as follows:

The development area is located on a large plateau north of the Bow River. The area consists of predominantly pasture and cultivated land. The lands are generally flat to slightly undulating with an overall gradient to the south toward the flood plain of the Bow River. Five water courses have been identified within the project area: Grand Valley Creek, Beaupre Creek, and three unnamed water courses. Several wetlands have also been identified in the project area (Matrix 2019).

Catchment boundaries were delineated using LiDAR data for the project site (provided by BURNCO) and additional topographical data upstream of the project site (20K digital elevation model data provided by AltaLIS Ltd.).

Highway 1A is located directly north of the project area. All offsite drainage originates from areas north of the project site where it crosses the highway, collecting along the highway ditch on the south side of the road prior to entering the project site at various locations. Grand Valley Creek and Beaupre Creek both have large upstream catchment areas (8,971 and 3,096 ha, respectively), resulting in high flows during flood events.

These flows are carried across Highway 1A via large diameter culverts (approximately 3,600 and 3,200 mm, respectively) before draining south to the Bow River. The remainder of the offsite drainage entering the site is conveyed across Highway 1A through several 800 mm diameter culverts (note: all culvert sizes and locations are approximate) and cattle crossings. Drainage from these areas flows along the southern highway ditch before entering the project area as overland flow at low points along the ditch or via channelized flow through the ditches on either side of existing Range Road 51. The existing drainage for the contributing catchments is shown on Figure 3. Figure 4 shows existing onsite drainage. The total areas and Highway 1A crossing details are summarized in Table 2.





Figure 7: Stormwater Management Plan – Existing Upstream Drainage

## F-1 - Attachment C Page 22 of 113 BURNCO

## West Cochrane Gravel Pit – Master Site Development Plan



Figure 8: Stormwater Management Plan – Existing On-Site Drainage

| Table 3: Existing | Drainage Areas |
|-------------------|----------------|
|-------------------|----------------|

| Drainage<br>Area | Total Area<br>(ha) | Area Within Project<br>Boundary<br>(ha) | Highway 1A Crossing                              | Onsite Receiving Water<br>Body |
|------------------|--------------------|-----------------------------------------|--------------------------------------------------|--------------------------------|
| A1               | 3,133.5            | 24.6                                    | 3,200 mm culvert                                 | Beaupre Creek                  |
| A2               | 29.5               | 15.7                                    | N/A                                              | Overland Flow                  |
| A3               | 41.5               | 18.4                                    | 1,900 mm cattle crossing                         | Overland Flow                  |
| A4               | 227.4              | 60.0                                    | 800 mm culvert                                   | Unnamed Watercourse            |
| A5               | 184.3              | 60.1                                    | 800 mm culvert                                   | Overland Flow                  |
| A6               | 9,058.8            | 43.9                                    | 3,600 mm culvert                                 | Grand Valley Creek             |
| A7               | 180.8              | 62.0                                    | 2 × 800 mm culvert                               | Unnamed Watercourse            |
| A8               | 192.3              | 59.6                                    | 3 × 800 mm culvert +<br>1,900 mm cattle crossing | Unnamed Watercourse            |
| A9               | 19.0               | 8.0                                     | N/A                                              | Overland Flow                  |



## 2.6 Groundwater

Matrix Solutions Inc. (Matrix) was retained by BURNCO to conduct a groundwater impact assessment of the proposed development. A complete copy of the Matrix report can be found as part of BURNCO's Land Use Application. The objectives of this evaluation were to describe the hydrology and groundwater resources within the Project area and to evaluate the potential effects on groundwater that may be caused by the Project. An overview of the results is as follows:

Levelton Consultants Ltd. conducted a groundwater evaluation of the McDougal Ranch Gravel Pit and surrounding area in 2014 (Appendix 9). The groundwater evaluation included an existing groundwater monitoring well network located in Sections 13, 14, and 15 of 026-05 W5M. Findings from the Levelton evaluation as well as information from the groundwater monitoring wells were used to support this groundwater impact assessment. Test hole data outlining overburden, gravel thickness, depth to bedrock, and top of gravel and bottom of gravel surfaces were supplied by BURNCO throughout the project area.

Surficial deposits overlie bedrock over most of the assessment area, except where bedrock has been exposed due to erosional processes. A series of boreholes have been installed in the assessment areas, with surficial sediments thicknesses ranging from 2 m more proximal to recent erosional features, up to 16 m in non-eroded areas.

The upper most sediments at the site consist of gravel, sand and gravel, clay, silty clay, and clay till. The main surficial depositional processes in the study area include glacial, glaciolacustrine, glaciofluvial, and recent fluvial deposition of the modern day Bow River (Bayrock and Reimchen 1980; Fisher, T.G. 1999).

The installation of six groundwater monitoring wells (MW18-01, MW18-02, MW18-03, MW18-04, MW18-05, and MW18-06) was completed between 23 July 2018 and 30 August 2018 using a Becker Hammer drill rig by Earth Drilling of Calgary, Alberta. The six new well locations are shown along with the existing 12 monitoring well network in Figure 5, resulting in an 18 monitoring well network to characterize site geology and hydrogeology. Under the supervision of Matrix, 2018 boreholes were drilled to the top of bedrock, with descriptions of soil and rock from the drill cuttings (returns) recorded on field logs.

## F-1 - Attachment C Page 24 of 113

#### West Cochrane Gravel Pit – Master Site Development Plan





Field-verified surveys (FVS) were conducted on June 18, 2018, and between May 28 to September 16, 2019, to supplement the FVS that was conducted by Levelton in 2014 and BURNCO in 2016. The FVS aimed to obtain baseline information about local water users and to establish their proximity to the site. A questionnaire modified from the Alberta Environment Guide to Groundwater Authorization (AENV 2011) was used to conduct an interview with the landowners. A search of well and landowner information from Alberta Environment and Parks (AEP) and AbaData<sup>TM</sup> (Abacus 2018) within a 1.6 km radius of 18-026-04 W5M and N-15-026-05 W5M was conducted to identify residential wells. A review of the county maps and an open house meeting held by BURNCO was used to identify and contact landowners via telephone. At the discretion of the landowners, the surveys were conducted in person at the property, or over the telephone. A portion of the FVS was conducted by Ann McNabb and McKendrick Ranches Ltd. on the water sources at Ann McNabb's and McKendrick Ranches properties.

A 1.6 km search of water wells and licenced water users was conducted by Levelton surrounding the  $N\frac{1}{2}$ -14,  $W\frac{1}{2}$ -13 and NE-15-026-05 W5M study area. Matrix supplemented this by conducting a 5 km radius search at the centre of the western assessment area (area 4) at 18-026-04 W5M and a 1.6 km radius search surrounding N-15-026-05 W5M to identify any new water wells or licences following the Levelton search.

A search of well information from AEP water well database (AEP 2018a) was completed on October 18, 2018 and March 21, 2019 and identified 203 records within a 5 km radius of 18-026-04 W5M and 1.6 km radius of N-15-026-05 W5M (Figure 6). These include 179 water wells, 4 flowing shot holes, and 2 springs.



#### West Cochrane Gravel Pit – Master Site Development Plan

The wells ranged in depth from 6.10 to 260.00 m bgs and the majority of the wells are listed for domestic and stock use. Based on the listed completion information and associated depth to bedrock for the water wells, 166 out of the 179 wells are interpreted to be completed in the bedrock and 3 wells are interpreted to be completed in sand and gravel. The groundwater wells interpreted to be completed in the sand and gravel are located greater than 735 m to the north and west of the west end of the site and are listed as domestic and stock use. The records for the remaining 13 wells did not include adequate information to determine the depth to bedrock. The water well information suggests that the surficial deposits are generally neither a dependable nor significant water supply aquifer in the area. The presence of four flowing shot holes and two springs in the records, and eight springs in the FVS suggest that the site is near or within a groundwater discharge area.

A search of active surface and groundwater licences within a 5 km radius of 18-026-04 W5M and 1.6 km radius of N-15-026-05 W5M identified 50 diversion licenses as of October 19, 2018 and March 21, 2019. The search identified 23 active groundwater licences, sourced from unnamed aquifers, while the remaining 27 licences are granted for surface water use. Out of the 27 surface water licences, 10 are sourced from the Bow River, 10 from unnamed streams, 2 from Cochrane Lake, 2 from Grand Valley Creek, 1 from Beaupré Creek, 1 from Jumpingpound Creek, and 1 from surface runoff.

Of the 23 active groundwater diversion licences, only 1 is located within the project boundary. There are two registered groundwater diversions (water wells) licenses at this location and both are installed within the bedrock. Another registered water well diversion, proximal to the site boundary, is located downgradient and completed within the bedrock. Sixteen of the registered water well diversions are located upgradient of the site and the remaining four registered water well diversions are located downgradient of the site (Figure 7). The groundwater well (GIC 386518) completed within sand and gravel does not have a registered groundwater diversion licence.






Figure 11: Search Area Water Licenses



Matrix manually measured depths to groundwater on November 7, 2018, and are included in Table A. Water levels recorded in pressure transducers installed in the monitoring wells were reviewed and compensated for atmospheric conditions. A total of 11 hydrographs were created based on available and usable data from August 28, 2015 to November 7, 2018 (Appendix D).

The groundwater levels varied across the study area. Generally, the wells displayed seasonal fluctuations ranging between 0.4 to 0.9 m and water levels were near the base of the gravel. MW12-1 had a sudden water level increase in April 2018, MW12-5 had a water sudden water level increase in July 2016 and May 2018. MW12-7 had a sudden water level increase in May 2017 and May 2018. The sudden increases of water suggest local rapid recharge likely from spring snow melt and runoff. Wells MW12-5 and MW12-7 have a veneer of top soil above the gravels, allowing for local recharge at the well.

The groundwater monitoring network encountered shallow groundwater at depths ranging from 0.83 to 15.74 m bgs at wells MW18-05 (D2) and MW18-01 (B1) on November 7, 2018. Groundwater elevations west of Grand Valley Creek, based upon groundwater monitoring well data and test hole data, suggests a groundwater flow to the south to southeast that generally follows topography. In the eastern portion of the site the flow varied from south to southwest with a western component in the northern portion (Figure 7).





# F-1 - Attachment C Page 28 of 113

#### West Cochrane Gravel Pit – Master Site Development Plan

A saturated gravel thickness contour map was generated using water elevation data and the base of sand and gravel surface supplied by BURNCO. The gravels were fully saturated in the northeast portion of the study area near MW18-02 (B2) and were less saturated to the west, ranging from 0 to 3 m (Figure 8). Determining inflow in areas where mining will occur in the saturated thickness zones and estimations of water diversion based upon saturated thickness and mining area is included in Appendix E.

Figure 13: Saturated Gravel Thickness



Groundwater monitoring well MW18-02 (B2) was sampled on August 30, 2018 following purging after drilling. All other wells drilled in 2018 were dry following well installation. The remaining wells, including the existing well network, were sampled on November 7, 2018. Field-measured parameters (including temperature, pH, and electrical conductivity) were collected during sampling.

Groundwater samples were collected and submitted to AGAT Laboratories in Calgary, Alberta, for routine chemical parameter analyses. Dissolved petroleum hydrocarbons (benzene, toluene, ethylbenzene, and xylenes and dissolved metals parameters were obtained from MW18-02 (B2)).

The following groundwater monitoring wells were not sampled due to the wells being dry or having limited water: MW12 1, MW12 4, MW12 5, MW12 8, MW18 01 (B1), MW18 03 (B3), and MW18 04 (D3).

# F-1 - Attachment C Page 29 of 113

#### Table 4: Groundwater Quality Results

| Monitoring       | Sample        | MSI Sample     | Lab pH             | Lab EC | Ca   | Mg   | Na       | К    | CI   | SO4  | NO2-N   | NO3-N  | NO <sub>2</sub> -N+NO <sub>3</sub> -N | T-Alkalinity | HCO3 | Hardness | TDS                |
|------------------|---------------|----------------|--------------------|--------|------|------|----------|------|------|------|---------|--------|---------------------------------------|--------------|------|----------|--------------------|
| Well             | Date          | Number         |                    | µS/cm  | mg/L | mg/L | mg/L     | mg/L | mg/L | mg/L | mg/L    | mg/L   | mg/L                                  | mg/L         | mg/L | mg/L     | mg/L               |
| MVV10-1          | 28-Mar-12     | 862756-1       | 8.08               | 679    | 46.8 | 41.1 | 40.9     | 3.9  | 12.8 | 59.5 | < 0.005 | 1.22   | 1.22                                  | 305          | 372  | 286      | 388                |
| MVV10-1          | 07-Nov-18     | 26388181107005 | 8.03               | 752    | 51.8 | 39.8 | 43.7     | 3.5  | 16.7 | 54.8 | <0.01   | 4.79   | 4.79                                  | 314          | 383  | 293      | 420                |
| MVV10-2          | 28-Mar-12     | 862756-5       | 7.96               | 922    | 92.5 | 49.4 | 31.2     | 4.1  | 60.6 | 193  | < 0.005 | 0.01   | 0.01                                  | 230          | 280  | 434      | 568                |
| MVV10-2          | 07-Nov-18     | 26388181107007 | 7.97               | 796    | 75.9 | 40.9 | 23.2     | 3.1  | 40.4 | 119  | <0.01   | < 0.02 | <0.02                                 | 256          | 312  | 358      | 456                |
| MVV10-3          | 07-Nov-18     | 26388181107008 | 8.07               | 545    | 61.9 | 28.4 | 18       | 1.5  | 6.2  | 35.6 | <0.01   | 0.42   | 0.42                                  | 253          | 309  | 272      | 305                |
| MW12-2           | 28-Mar-12     | 862756-3       | 8.08               | 764    | 39.8 | 9    | 126      | 3.2  | 10.4 | 89.4 | 0.045   | 0.33   | 0.375                                 | 322          | 393  | 140      | 471                |
| MVV12-2          | 13-May-13     | 935496-12      | 8.29               | 757    | 28.7 | 11.8 | 138      | 2.9  | 5.6  | 61.6 | 0.005   | 0.02   | 0.025                                 | 386          | 471  | 120      | 480                |
| MVV12-2          | 13-May-13     | 935496-13      | 8.29               | 753    | 27.8 | 11.6 | 134      | 2.8  | 5.3  | 64.3 | < 0.005 | 0.02   | 0.02                                  | 385          | 470  | 117      | 477                |
| MVV12-2          | 13-May-13     | 935496-14      | 8.31               | 756    | 27.6 | 11.4 | 140      | 2.8  | 5.2  | 61.8 | <0.005  | 0.05   | 0.05                                  | 386          | 470  | 116      | 480                |
| MVV12-2          | 07-Nov-18     | 26388181107010 | 8.14               | 783    | 42.7 | 23.9 | 98.3     | 2.8  | 17.7 | 79.6 | 0.23    | 1.03   | 1.25                                  | 313          | 381  | 205      | 458                |
| MVV12-3          | 28-Mar-12     | 862756-4       | 7.95               | 926    | 91.2 | 49.1 | 30.3     | 4    | 59.4 | 196  | < 0.005 | 0.02   | 0.02                                  | 230          | 281  | 430      | 568                |
| MVV12-3          | 07-Nov-18     | 26388181107006 | 8.09               | 877    | 53.5 | 32   | 99.9     | 3    | 14.2 | 135  | <0.01   | 0.03   | 0.03                                  | 325          | 397  | 265      | 533                |
| MW12-6           | 02-Apr-12     | 863229-1       | 7.82               | 714    | 280  | 53   | 31       | 4.4  | 27   | 44   | < 0.005 | 0.66   | 0.66                                  | 336          | 410  | 917      | 641                |
| MVV12-6          | 13-May-13     | 935496-7       | 8.1                | 691    | 60.3 | 41   | 33.3     | 2.6  | 17.5 | 36.8 | < 0.005 | 0.68   | 0.68                                  | 375          | 457  | 319      | 416                |
| MVV12-6          | 13-May-13     | 935496-8       | 8.08               | 703    | 59.7 | 42.3 | 32.9     | 2.5  | 17.7 | 36.8 | < 0.005 | 0.72   | 0.72                                  | 356          | 435  | 323      | 406                |
| MVV12-6          | 07-Nov-18     | 26388181107009 | 7.95               | 688    | 61.2 | 38   | 36.8     | 2.4  | 10.9 | 31.9 | <0.01   | 0.33   | 0.33                                  | 355          | 433  | 309      | 396                |
| MW12-7           | 28-Mar-12     | 862756-2       | 7.88               | 643    | 61.2 | 14.9 | 56.7     | 5    | 23.7 | 85.6 | <0.005  | 0.81   | 0.81                                  | 222          | 271  | 214      | 380                |
| MVV12-7          | 07-Nov-18     | 26388181107002 | 7.96               | 780    | 68.7 | 30.3 | 59.2     | 3.3  | 22.9 | 55.9 | ⊲0.01   | 0.27   | 0.27                                  | 337          | 411  | 296      | 444                |
| MW12-9           | 02-Apr-12     | 836229-2       | 7.97               | 573    | 86   | 20.9 | 25.4     | 3.4  | 8.3  | 57.8 | 0.024   | 0.17   | 0.194                                 | 255          | 310  | 301      | 355                |
| MVV12-9          | 13-May-13     | 935496-10      | 8.16               | 543    | 60.7 | 24   | 25.3     | 3.1  | 6.1  | 39.2 | < 0.005 | 0.02   | 0.02                                  | 277          | 337  | 250      | 324                |
| MW12-9           | 13-May-13     | 935496-11      | 8.18               | 544    | 59.8 | 23.6 | 25.7     | 3.2  | 6.7  | 40.5 | < 0.005 | 0.03   | 0.03                                  | 282          | 344  | 246      | 329                |
| MVV12-9          | 07-Nov-18     | 26388181107003 | 7.98               | 578    | 59.2 | 26.8 | 25.5     | 2.8  | 6.4  | 37.8 | <0.01   | <0.02  | <0.02                                 | 271          | 330  | 258      | 321                |
| MW18-02 (B2)     | 30-Aug-18     | 26388180830001 | 7.88               | 1880   | 161  | 96.6 | 111      | 4.6  | 140  | 326  | <0.01   | 0.3    | 0.3                                   | 523          | 638  | 800      | 1150               |
| MW18-02 (B2)     | 07-Nov-18     | 26388181107011 | 7.71               | 2010   | 140  | 128  | 101      | 3.8  | 195  | 228  | <0.01   | <0.02  | <0.02                                 | 665          | 811  | 877      | 1190               |
| MW18-05 (D2)     | 07-Nov-18     | 26388181107001 | 8.03               | 965    | 49.7 | 17.6 | 149      | 3.2  | 32.9 | 110  | <0.01   | 0.03   | 0.03                                  | 359          | 438  | 197      | 578                |
| MW18-06 (D1)     | 07-Nov-18     | 26388181107012 | 8.01               | 680    | 79.1 | 37   | 12.1     | 6.8  | 11.1 | 56.7 | 0.09    | 3.20   | 3.36                                  | 297          | 362  | 350      | 396                |
| Alberta Tier 1 - | Natural Areas | *              | 65.95 <sup>P</sup> | NIS    | NS   | MS   | 200 9,40 | NS   | ADDA | LLAP | CIA     | Ac     | NS                                    | NS           | NS   | NS       | 500 <sup>P</sup> - |

NS - not specified - indicates guideline for Aquatic Life exposure pathway

~ Indicates guideline for Aquatic Line exposure paurway
As - aesthetic objective from Guidelines for Canadian Drinking Water Quality-Summary Table (Health Canada 2017)
Cl - dependent on chloride value

H - dependent on hardness value  $^{\text{LAP}}$  - lowest of Aquatic Life and Potable Groundwater exposure pathways  $^{\text{P}}$  - indicates guideline for Potable Groundwater exposure pathway

- Alberta Tier 1 Soil and Groundwater Remediation Guidelines (AEP 2016)

Environmental Quality Guidelines for Alberta Surface Waters (AEP 2018)
Indicates values do not meet applicable guidelines

and advanting the function

#### 2.7 **Historical Resources**

Lifeways of Canada Limited (Lifeways) was retained by BURNCO to conduct a historical resources assessment of the proposed development. In addition, a Stage 1 excavation was completed on the lands from the existing gravel pit in NW13 to evaluate the significance of resources previously identified within EhPp-75 and pursue full clearance from Alberta Culture. A complete copy of these reports can be found as part of BURNCO's Land Use Application.

# 2.7.1 Historical Resources – NW 13-26-05 W5M

The existing gravel pit at NW 13-26-05 W5M has been in operation since 2016. As such, these lands had been previously evaluated for historical resources. In 2009, Bison Historical Service Ltd. completed an assessment for these lands. This assessment identified several stone features (EhPp-75) which had the potential for historical significance. Under project file #4650-09-002, Alberta Culture provided clearance to conduct mining activities on those areas of the site not covered by EhPp-75 while requiring further evaluation of the stone features.

Lifeways was retained by BURNCO to conduct a Stage 1 excavation of the EhPp-75 sites located within the development area. An overview of the results is as follows:









Historical Resources Impact Mitigations (HRIMs) required at EhPp-75 were to include the following components:

- 1. Mapping of all 29 stone features; 28 tipi rings/stone circles and one hearth feature,
- 2. 2 m2 of excavation in each ring or arc (for a total of 56 m2),
- 3. 1 m2 and mapping of the single visible hearth,
- 4. a total of 50 m2 excavation spread over site Areas A, B, and C, and;
- 5. radiocarbon dating if suitable samples were recovered.

In three instances during the relocation and mapping of the 28 stone circles (tipi rings) and one other stone feature, we were unable to verify previously reported rings. Lifeways staff then identified three ring locations that do not appear to have been recorded in 2009. In discussion with Dr. Trevor Peck (Plains Archaeologist, Historical Resources Management Branch; HRMB), the newly recorded rings were substituted for those we were unable to relocate. As per the Schedule of Requirements, test excavations of 2 m2 were undertaken in each ring, and 1 m2 at Feature 20 (roasting platform). Following the stone feature test excavations, block excavations were undertaken in Areas A, B, and C as per the requirements (Appendix A). After the first 10 m2 of excavation of the required 20 m2 at Area B, results indicated that further work in this location was not warranted. However, we recommended that additional units be excavated at Feature 20 to capture a larger area, and at Area A to gather a larger sample of materials. After discussing this with Dr. Peck, he agreed that shifting the remaining 10 m2 to more productive areas would be prudent. Ultimately, 2 m2 were excavated in each of 28 tipi rings, 7 m2 at Feature 20, 24 m2 at Area A, 10 m2 at Area B, and 10 m2 at Area C for a total of 107 m2 at EhPp-75.

The stone feature test excavations produced valuable information about EhPp-75, however in all cases neither diagnostic nor dateable materials were recovered, artifact density in almost all cases was low to very low, and only a single ring feature provided evidence of a central hearth.

Block excavations in Area A produced valuable information relative to the site's Precontact occupations. That being said, there is no stratigraphic separation of these near-surface materials, disturbance to site features in the area is clear, and overall artifact densities are considered to be moderate. The excavations to date have recovered an adequate sample of materials from Area A, and we conclude that additional investigations here have only a low probability of further contributing meaningfully to our knowledge of EhPp-75.

Block excavations as required in Areas B and C identified the areas as low to moderate density scatters of materials commonly found across the site. These areas lacked features, diagnostic artifacts, or artifacts in high amounts or of special interest. Further work in these areas has very low potential to contribute to our understanding of EhPp-75.





The Lifeways report concluded with a recommendation for full clearance related to the development phases in NW13. This recommendation was accepted by Alberta Culture and a Historical Resources Act Approval # 4650-18-0056-003 was received. A copy of this approval is provided as part of BURNCO's Land Use Application. This means that the development areas proposed by BURNCO in NW 13 can proceed with no further assessment related to historical resources.



# 2.7.1 Historical Resources – Expansion Areas

In 2018, Lifeways also conducted a Historical Resources Impact Assessment (HRIA) as well as a Historical Resources Impact Assessment for Palaeontology (pHRIA) for all lands beyond NW13.

The HRIA included work in four defined Disturbance Areas. Based on a Historic Resources Application filed on behalf of the proponent on April 30, 2018, the Historic Resources Management Branch (HRMB) issued a Schedule of Requirements for the Project on June 25, 2018. The Schedule specified that the HRIA address all areas of high archaeological potential within the Project area that had not been previously assessed, and that the relationship between the footprint and previously recorded sites EhPp-1, EhPp-3, EhPp-49, EhPp-65, and EhPp-75 be established (portions of EhPp-75 were subject to mitigative excavations in the context of the existing gravel pit operations under Permit 18-059 earlier in the season).

A separate palaeontological HRIA was required for a small subset of these lands. This work was undertaken under RTMP Permit 18-062 in August 2018.



Figure 15: HRIA – Areas for Assessment

Seventeen archaeological sites were recorded during the 2018 HRIA program, sixteen of which are directly associated with the Project area. Most are of at least high local archaeological significance and worthy of some level of mitigation prior to impact from the development of the BURNCO West Cochrane Expansion Project or any other proposed development. The HRIA resulted in the rerecording of previously recorded site EhPp-65, the relocation and reassessment of sites EhPp-1, EhPp-3, EhPp-49, EhPh-59, and EhPh-75, and the recording of 8 previously unrecorded Precontact sites with stone features, one Historic Period homestead site, and one site with both Precontact stone features and a Historic homestead. In addition, the historic Morley Trail crosses the Project area and was recorded.



Heritage Sites recorded within the Borden designations include HS 107372, 107373, 103374, 103375, and 103376.

EhPp-65 was found to be outside of the Project area, and no further work on the site is recommended in the context of BURNCO's West Cochrane Expansion Project. The remainder of the sites will be addressed in the Disturbance Area-specific summaries and recommendations below.

### Disturbance Area 1

Eight archaeological sites were recorded in association with Disturbance Area 1: EhPp-49, EhPp-86, EhPp-87, EhPp-88, EhPp-89, EhPp-90 (HS 107373, 107374, and 107375), EhPp-91, and EhPp-92. We recommend that additional preimpact mitigation be required on all of these sites or any portions thereof to be impacted by the BURNCO West Cochrane Expansion Project. In addition, we recommend that Historical Resources Act clearance be granted to Project impacts associated with all non-site areas within Disturbance Area 1.

Figure 16: HRIA Work Undertaken in Disturbance Area 1



# Disturbance Area 2

One archaeological site was recorded in association with Disturbance Area 2, EhPp-75 (HS 107372). Intensive HRIA work on the proposed Access Road and Water Diversion Point (Disturbance Area 2) found that it will not impact any significant features or activity areas at EhPp-75 and observed no other historical resources associated with the development. Therefore, we recommend that Historical Resources Act clearance be granted to BURNCO for the development of the access road (Disturbance Area 2) as illustrated in Figure 6. However, should development plans be altered to disturb deposits below the depth of 50 cmbs on the river bottom in Disturbance Area 2, we recommend that deep backhoe testing of the proposed access road right-of-way be required. Should proposed development extend outside of Disturbance Area 2, additional HRIA may be required.

Alberta Culture and Tourism, through the Royal Tyrrell Museum of Palaeontology and Royal Alberta Museum, had specified an Area of Concern (AoC) in 13-26-5 W5 on the north side of the Bow River valley, associated with the rim of the +30 m gravel-bearing surface and exposing not only the gravels but also outcrops of the underlying Cretaceous bedrock. A proposed Access Road and Water Diversion Point is to be constructed through a portion of the AoC from the high surface to the Bow River.



A field survey of the AoC was undertaken, supplemented by a detailed examination of exposed gravels at the small existing BURNCO gravel pit to the north of the AoC, just south of Highway 1A, associated with the same terrace-like surface.

Bedrock in the AoC is of Late Cretaceous age and appears to be equivalent to the Maastrichtian Horseshoe Canyon Formation of the Edmonton Group in the Red Deer River valley to the east. Bedrock outcrops roughly on strike with these deposits to the south, across the Bow, and to the north along Grand Valley Creek have yielded fossils of dinosaurs (theropod and hadrosaur) as well as fresh-water molluscs, plant macrofossils, and palynomorphs. No animal remains were found during the survey of the AoC but a prominent indurated sideritic siltstone unit (Bedrock Exposure #1) immediately west of the proposed Access Road coulee was found to be rich in macerated leaf and twig fragments as well as large pieces of coalified wood. This significant occurrence has potential to be sampled in detail for identifiable plant fossils, which may be amenable to detailed study via cellulose acetate peels. This bedrock outcrop must be carefully protected from any impact during construction of the proposed Access Road. If the road impact involves only shallow blading, there would be no palaeontological concerns. However, if deeper cutting into bedrock in the coulee is needed for construction to grade, a palaeontologist should be on hand to monitor Access Road construction in that zone. A second sandstone outcrop (Bedrock Exposure #2) had poorly preserved macerated plant remains and should be protected to avoid impact. A third outcrop reveals bentonitic claystone that may have potential for radiometric dating.



#### **Disturbance Area 3**

A single significant archaeological site, EhPp-75, was found to cover most of Disturbance Area 3. We recommend that any portion of EhPp-75 to be impacted in Disturbance Area 3 be mitigated prior to development associated with the BURNCO West Cochrane Expansion Project.

# F-1 - Attachment C Page 36 of 113

#### West Cochrane Gravel Pit – Master Site Development Plan



#### Figure 17: HRIA Work Undertaken in Disturbance Areas 2 and 3

### Disturbance Area 4

Seven archaeological sites are associated with Disturbance Area 4: EhPp-1, EhPp-3, EhPp-59, EhPp-83, EhPp-84, EhPp-85, and EhPp-93 (HS 107376). No further work is recommended prior to any ground disturbance on archaeological site EhPp-93 (HS 107376). We recommend that additional pre-impact mitigation be required on any portions of EhPp-1, EhPp-3, EhPp-59, EhPp-83, EhPp-84, and EhPp-85 to be impacted by the BURNCO West Cochrane Expansion Project. In addition, we recommend that Historical Resources Act clearance be granted to Project impacts associated with all non-site areas within Disturbance Area 4.



# Figure 18: HRIA Work Undertaken in Disturbance Area 4

### <u>Closure</u>

Within Disturbance Areas 1, 3, and 4 there were 16 archaeological sites that were recorded during the 2018 field program. Historical Resources Act approval was provided on areas not containing these sites under project file #4650-18-0056-001. A copy of this approval is provided as part of BURNCO's Land Use Application. This means that development areas located outside of mapped archaeological sites can proceed with no further assessment related to historical resources. For those development areas located within mapped archaeological sites, additional studies and excavation is required prior to any excavation or disturbance.

The assessment completed in disturbance area 2 determined that the access road route avoids all precontact stone features and the historic sandstone foundation (HS 1073732) at EhPp-75. Development of the access road may proceed as per Historical Resources Act approval #4650-18-0056-001. A copy of this approval is provided as part of BURNCO's Land Use Application. This means that the development of this access road can proceed with no further assessment related to historical resources.

# Policy #4

BURNCO will secure historical resource clearance from Alberta Culture & Tourism before commencing operations in uncleared areas of the project.



# 3.0 Development / Operating Plan

# 3.1 Overview

BURNCO currently operates a gravel pit at NW 13-26-05 W5M. This site is 61 hectares in size. It contains an estimated 2,500,000 tonnes of aggregates and is selling roughly 125,000 tonnes of material annually. This site was permitted in 2012 with a design capacity of 500,000 tonnes per year. It opened in 2016 after the completion of an intersection upgrade at Range Road 51 in support of the project.

BURNCO is proposing to increase the overall size of the pit to 452 hectares of contiguous lands through the inclusion of adjacent land parcels. In total, the Project Area contains an estimated 15,000,000 tonnes of aggregate and is expected to operate for 30 to 35 years. No change in annual design capacity is being proposed. Major activities at the pit will continue to include:

- aggregate crushing
- aggregate washing
- earthworks
- loading and scaling

# **Crushing**

Crushing is completed with a portable crushing plant. This plant is comprised of a number of modular components on wheeled chassis. When assembled, the components work together to crush, screen, and convey aggregate materials in the production of construction materials. The plant is mobilized to the site as required and the length of stay is dependent on the type and amount of materials required for anticipated construction projects. It is expected that the use of a portable crushing plant will continue through all phases of the proposed project. This portable crushing plant will not be set up in a central location, but instead, will be set up in the active mining areas of the pit progresses over time.





# <u>Washing</u>

Washing is completed with a portable washing plant. Like the crusher, this plant is comprised of a number of modular components on wheeled chassis. When assembled, the components work together to wash, screen, and convey aggregate materials in the production of washed construction materials. The plant is mobilized to the site as required and the length of stay is dependent on the type and amount of materials required for anticipated construction projects. It is expected that the use of a portable washing plant will continue through all phases of the proposed project. This portable washing plant is not as easily moved and will be set up in a central location. The initial location will be in NW13. As operations progress west of Range Road 51, the location will be moved to NE 14. This is illustrated in Section 3.3.



#### Earthworks

To extract the gravel (pit-run), topsoil and subsoil must be salvaged, and overburden must be removed to expose the gravel beneath. This work is accomplished with heavy machinery such as scrapers, track hoes, articulating trucks, bulldozers, graders. This process is expected to continue as required through all phases of the proposed project.





# Loading and Scaling

Once aggregate materials have been processed by the portable crusher and portable wash plant, the final step is to load these materials into trucks for transport to construction projects. This work is accomplished with a loader. Trucks are then weighed and ticketed at a portable commercial truck scale and portable scale house. This process is expected to continue as required through all phases of the proposed project.



At present, operations include aggregate crushing, earthmoving necessary to expose aggregate and reclaim disturbed areas, and loading trucks with finished construction aggregates. Washing at the site is expected to commence within the next five years.

Over time, sales are expected to reach 500,000 tonnes per year. This annual volume is the original design capacity of the site and is already approved at the existing gravel pit in NW13. The volume currently being shipped from the site is roughly 125,000 tonnes per year. Thus, the target capacity would represent an increase of roughly four times the volumes currently being shipped from the site as it ramps up to full production. All studies and assessments have been completed based on this 500,000 tonne annual sales volume.

Aggregate from this site will be used to supply local projects in Rocky View County and in the Town of Cochrane. Washing capacity at this site will also allow BURNCO to supply premium aggregates to its network of asphalt and concrete plants in the Greater Calgary Area. BURNCO has a number of sites in Rocky View that currently serve this vital role as a supply of premium materials, however they are nearing depletion and BURNCO views the West Cochrane site as a replacement.

# 3.2 Hours of Operation

BURNCO's existing gravel pit is currently operated Monday through Saturday with no operations on Sundays or Statutory Holidays.

Going forward, BURNCO is not proposing any change to operating hours. The site would remain as a 24-hour operation for crushing, washing, and earthworks (as per the current Development Permit DP # PRDP20175123), while trucking would remain as a daytime operation.

- Hours for Operating:
  - o 24 Hours a Day; Monday through Friday
  - 7am to 5pm on Saturday
  - No activities on Sundays or Statutory Holidays
- Hours for Hauling:
  - o 6:00 am to 7:00 pm Monday through Saturday
  - No activities on Sundays or Statutory Holidays

# Policy #5

BURNCO will follow the hours of operation as determined by Rocky View County as part of the Development Permit process.

# 3.3 Development Phasing

As there is an existing operation in NW 13-26-05 W5M, the infrastructure necessary for the operation of a gravel pit on these lands is already in place. This includes items such as a designated haul route and upgraded intersection, scale, water licenses to source water, and screening berms. Over time, and as the project develops, new infrastructure will be required and changes to existing infrastructure are also anticipated. A detailed phasing plan is provided in Appendix 3. The key development strategies associated with that phasing plan are as follows:

# Policy #6

BURNCO will follow the development phasing plan as illustrated in the MSDP.

Phases A1 to A7:

- Screening berm already in place for this parcel with small extension to be completed as operations move further east,
- Haul route to remain unchanged (Range Road 51 to Highway 1A),
- Crushing, Earthworks, Loading and Scaling to following mine phasing,
- Washing to commence once sufficient space opened up by mining activities. Wash plant to be located in phases A1 and A2,
- Road to Bow River diversion point (in SE13) to be constructed.

"E" phases of site to commence during "B" phases of site. The two sides of the site will utilize independent highway access and due to the presence of the Grande Valley Creek (which BURNCO plans no activities within), the sides will operate largely independently. For the purposes of this report, they are represented below as parallel columns.



# <u> Phases B8 – B11</u>

- "B" portion of screening berm to be constructed upon commencement of activity in phase B8,
- Haul route to remain unchanged (Range Road 51 to Highway 1A),
- Crushing, Earthworks, Loading and Scaling to following mine phasing,
- Washing to commence once sufficient space opened up by mining activities. Wash plant to be located in phase B8.

# <u> Phases C12 – C15</u>

- "C" portion of screening berm to be constructed upon commencement of activity in phase C12,
- Haul route to remain unchanged (Range Road 51 to Highway 1A),
- Crushing, Earthworks, Loading and Scaling to following mine phasing,
- Wash plant to remain in B8.

# <u> Phases D16 – D21</u>

- "D" portion of screening berm to be constructed upon commencement of activity in phase D16,
- Haul route to remain unchanged (Range Road 51 to Highway 1A),
- Crushing, Earthworks, Loading and Scaling to following mine phasing,
- Wash plant to remain in phase B8.

# <u> Phases E22 – E24</u>

- "E" portion of screening berm to be constructed upon commencement of activity in phase E22,
- Traffic Impact Assessment will be undertaken to determine required upgrades for eastern access (Range Road 45 to Highway 1A),
- Crushing, Earthworks, Loading and Scaling to following mine phasing.

# <u> Phases F25 – F27</u>

- "F" portion of screening berm to be constructed upon commencement of activity in phase F25,
- Haul route to remain unchanged (Range Road 45 to Highway 1A),
- Crushing, Earthworks, Loading and Scaling to following mine phasing.

# <u> Phases G28 – G31 + H30</u>

- "G" portion of screening berm to be constructed upon commencement of activity in phase G28,
- "H" potion of screening berm to be constructed upon commencement of activity in phase H30,
- Haul route to remain unchanged (Range Road 45 to Highway 1A),
- Crushing, Earthworks, Loading and Scaling to following mine phasing.

# F-1 - Attachment C Page 43 of 113

#### West Cochrane Gravel Pit – Master Site Development Plan

# Figure 19: Mine Phase Plan



Figure 20: Mine Phasing Illustration







Reclamation of depleted areas is guided by the available reclamation materials from new mining areas (cut) and the amount of material needed to achieve the final grading plan (fill). Figure 20 illustrates the mine phasing planned at the site based on BURNCO's analysis of the cut/fill balances. The maximum planned disturbance area on the west side as illustrated will be 70 acres at any single time. The maximum planned disturbance area on the east side as illustrated will be 51 acres. These areas were the ones used in analysis of project impacts such as air quality.



# 3.4 Site Securement, Signage, Buffers

Project lands will continue to be secured on all property boundaries with farm fencing. All access points to the project lands such as farm approaches will be gated.

Upon issuance of a development permit for these lands, "Danger No Trespassing" signs will be posted every 200 meters along all property boundaries to inform the general public about the presence of open excavations and provide basic site information.





The primary access point to the project will have lockable steel gates comprised of two 16-foot gates hung on large steel corner posts. Signage will also be provided to identify the site and provide key information. Signs will be 4 feet by 8 feet and mounted on one or both sides of the approach.







There will be a minimum three-meter buffer to adjacent property or road allowances. Given the high amount of overburden material available for back-sloping/reclamation purposes no additional extraction setbacks will be required.

Proximity setbacks were also reviewed in relation to utilities. In all cases, BURNCO will secure a proximity agreement with the applicable operators before any activities within 30m of any utility Right-Of-Way. TC Energy operates the east-west pipeline across the project (ROW 467JK), and based on consultation, BURNCO will ensure a 7m development setback from the edge of the Right-Of-Way as well as 3:1 reclamation back sloping for any excavations adjacent to the pipeline.

# Policy #7

BURNCO will install site signage. This will include perimeter signage to discourage trespassing as well as entrance signage as necessary to identify the site and provide key information to the public.

# Policy #8

Site signage shall include a 24-hour phone number for neighbors to call in the event of questions or concerns.

# Policy #9

BURNCO will secure a proximity agreement with the applicable operator before any activities within 30m of any utility Right-Of-Way.

# 3.5 Noise Assessment and Control

BURNCO intends to minimize the noise of the operation through the following measures:

- The loader back-up alarm systems will be maintained at the minimum dBA levels allowable under Alberta Occupational Health and Safety guidelines. When the equipment is operating during darkness, the noise alarm system is turned off and a strobe light warning system is turned on as an alternative to the warning sounds,
- Access roads will be graded and regularly maintained to reduce traffic noise,
- Each separate main component of the crusher (i.e. the cone, jaw and screen deck) will be enclosed by a sound and dust retarder blanket system. Testing has shown that the sound levels drop significantly from 10-15 dBA with the installation of these blankets,
- Any electrical generating sets will have sound absorbing baffles installed,
- Where feasible highline power will be utilized instead of generators for powering the conveyors, crushers and wash-plant,
- Rubber liners will be used at all conveyor transfer points to reduce the impact noise,
- Where feasible, the use of poly screen decks vs. traditional steel screen decks on the wash-plant to reduce the sound level,
- All equipment associated with the crusher will be regularly maintained to ensure that it is working properly and that no noise other than normal operating noise is emanating from the equipment,
- Use of engine retarder brakes will not be allowed when trucks are in the stockpile area,
- Strategically place product piles to shield the neighboring areas from the operating equipment,
- Construction of screening berms in strategic locations as detailed in Section 3.14.



In support of the Project, ACI Acoustical Consultants Inc. (ACI) was retained to complete an Environmental Noise Impact Assessment for the Project. A complete copy of the ACI report is provided as part of BURNCO's Land Use Application. The objectives of this assessment were to evaluate the potential noise impact of the project operations for residential receptors within 2.0km of the project boundaries. As part of the study, noise monitoring was conducted at a receptor location within the study area. In addition, detailed on-site measurements were conducted at an existing BURNCO aggregate site. The information from the noise monitoring, the on-site measurements and detailed operational information provided by BURNCO were used to generate a computer noise model of the study area under existing and future conditions (i.e. with the Project operating). An overview of the results is as follows:

#### **Baseline**

A long-term noise monitoring was conducted at two receptor locations within the study area to determine the existing noise climate. Site work was conducted for ACI on May 9, May 15 & May 24, 2018 by P. Froment, B.Sc., B.Ed., P.L.(Eng.). From this, a 24-hour review period (based on meteorological conditions) indicated that the noise climate of the area was dominated by traffic related noise sources (primarily Highway 1A to the north). Results from the long-term noise monitoring were used as a calibration tool to model the projected existing noise climate of the study area.

Figure 21: Baseline Case Leq24 Sound Levels



#### West Site

The results of the West Site noise modeling scenario indicated Leq24 sound levels ranging from 19.7 dBA to 51.5 dBA for modeled residential receptor locations within 2.0km of the Project boundaries. The impact of the Project relative to the existing noise climate for receptors within 5.0km of the active project operations ranged from -3.1 to 6.1 dBA. The variance in the impact of the Project was contributed to the relative distance of the receptors to the Project and to Highway 1A, respectively. The relative impact of the Project

# F-1 - Attachment C Page 48 of 113

#### West Cochrane Gravel Pit – Master Site Development Plan

for all receptor locations ranged from -3.1 to 6.1 dBA. The variance in the impact can be attributed to the relative distance of the receptors to the Project and to Highway 1A, respectively. Therefore, residents that were further from Highway 1A but within proximity to the West Site operations had the highest impact. Subsequently, the noise climate of receptors further than 600m from the active site and south of the project were determined to be minimally impacted by the contributions of the Project.

Figure 22: West Site Operations Leq24 Sound Levels



# East Site

The results of the East Site noise modeling scenario indicated Leq24 sound levels ranging from 19.1 dBA to 35.9 dBA for modeled residential receptor locations within 2.0km of the Project boundaries. The impact of the Project relative to the existing noise climate for receptors within 5.0km of the active project operations ranged from -13.9 dBA to 6.0 dBA. The variance in the impact of the Project was again contributed to the relative distance of the receptors to the Project and to Highway 1A, respectively. However, it should be noted that the projected noise levels between residential locations within 5.0km of the active project operations had a relatively minimal difference (maximum of 2.8 dBA between the highest and lowest noise levels.



Figure 23: East Site Operations Leq24 Sound Levels

Based on this modeling, it is BURNCO's belief that the Project will not create an adverse effect related to noise. The noise environment for the area is already heavily influenced by road traffic on Highway 1A. The projected noise increases related to the project are modest.

BURNCO is also committed to monitoring the site as necessary to ensure noise does not become an adverse effect for the area. As required, BURNCO will utilize enhanced mitigation measures. Such enhanced mitigations include:

- Additional noise control,
- Reducing site activities during periods of excessive noise.

With these options in place, BURNCO is confident that noise will not become a nuisance as a result of this development.

# Policy #10

BURNCO will follow the noise control measures detailed in the MSDP. In addition, BURNCO will utilize enhanced mitigation measures if necessary, to ensure that noise is reasonably controlled and does not become a nuisance.



# 3.6 Air Quality Assessment and Control

BURNCO has implemented the following measures to reduce dust generated from the operations:

- A 30km/hour speed limit is enforced in the stockpile area,
- A water truck will be available to water the extraction and processing areas as a means of reducing dust,
- During overburden stripping operations, the dust will be controlled by watering the work area as needed,
- All soil stockpiles will be seeded as soon as possible following construction,
- The disturbance associated with the excavation area will be kept to a minimum by progressively reclaiming mined out cuts thereby reducing the amount of wind borne dust generated from exposed areas,
- Each separate major component of the crusher (i.e., the cone, jaw and screen deck) will be enclosed by a sound and dust retarder blanket system.

In support of the Project, Matrix Solutions Inc. (Matrix) was retained to complete an air quality assessment to identify the potential effects and changes to ambient air quality due to the proposed BURNCO expansion Project near Cochrane, Alberta. A complete copy of the report is provided as part of BURNCO's Land Use Application. An overview of the results is as follows:

The objective of this assessment is to assess the potential effects of the proposed Project on the ambient air quality in the region. The Project emissions interact with existing emissions from other sources in the region; therefore, the assessment considers the effect of nitrogen oxides (NOX), fine particulate matter less than 2.5  $\mu$ m in diameter (PM2.5), total suspended particulates (TSP), and carbon monoxide (CO) emissions as a result of the Project, in combination with other regional sources.

The Alberta Ambient Air Quality Objectives (AAAQOs) were developed under the Environmental Protection and Enhancement Act (EPEA, R.S.A. 2000) to protect Alberta's air quality (AEP 2019a). The objectives refer specifically to ambient concentrations expressed in units of micrograms per cubic metre ( $\mu$ g/m3) and parts per billion (ppb). The objectives also represent a range of averaging periods that address potential short-term exposure responses (i.e., 1-hour or 24-hour) and/or long-term chronic exposures (i.e., 30-day or annual). The assessment considers both short- and long-term averaging objectives.

| Substances                                   | Averaging Period | АААQO (а)<br>(µg/m <sup>3</sup> ) |  |  |
|----------------------------------------------|------------------|-----------------------------------|--|--|
| Nitesaar Disuida (NO.)                       | 1-hour           | 300<br>45                         |  |  |
| Nitrogen Dioxide (NO <sub>2</sub> )          | Annual           |                                   |  |  |
| Fine Particulate Matter (PM <sub>2.5</sub> ) | 24-hour          | 29                                |  |  |
| Total Conservated Destinutates (TCD)         | 24-hour          | 100                               |  |  |
| Total Suspended Particulates (TSP)           | Annual           | 60 <sup>(b)</sup>                 |  |  |
| Contract Managerials (CO)                    | 1-hour           | 15,000                            |  |  |
|                                              | 8-hour           | 6,000                             |  |  |

Table 5: Alberta Ambient Air Quality Objectives (AAAQOs)

a. AAAQO (AEP 2019a)

b. Calculated using the geometric mean concentration.



Background concentrations represent contributions from sources not included in the modelling (such as naturally occurring sources, nearby non-industrial sources, and unidentified distant sources). Per the requirements of the AQMG, an ambient monitoring background value was determined based on a reduced dataset of the ambient monitoring data.

The background concentrations were estimated using the methodology outlined in the AQMG, using data from two air quality monitoring stations based on the availability of continuous data. The Caroline Station was considered the most representative station for the Project.

Since only NO2 and PM2.5 are monitored at the Caroline Station, monitored CO data were used from the closest station to the Project, Calgary Northwest Station. A full year of data were not available at the Calgary Northwest Station for 2018, so 2017 data were used.

Recent data were not available in the CRAZ or PAMZ monitoring networks for TSP, so PM2.5 data were assumed to be representative of this particulate size fraction.

Air dispersion models provide a scientific means of relating air emissions to ground level pollutant concentrations at receptors by using complex mathematical equations that simulate transportation, dispersion, chemical transformation, and deposition processes.

The California Puff Dispersion Model (CALPUFF) is a non-steady-state puff dispersion model that simulates the effects of time- and space-varying meteorological conditions on pollution transport, transformation, and removal. The CALPUFF model is approved by the AQMG for refined assessments with potential long range (>200 km) impacts. For this assessment the CALPUFF model (version 7.2.1) was used in accordance with the AQMG to determine air quality changes for the Baseline Case, Project Case, and Application Case.

The assessment considers the contribution of existing and approved industrial sources within the Study Area (50 km × 50 km). These sources include major facilities in the Study Area, as well as smaller facilities and sand/gravel pits.

Emission information for existing and approved sources was obtained from an internal database of known emission sources including AEP and Alberta Energy Regulator licence information, approvals, and permits, and recent air quality assessments undertaken in the region. This database is routinely updated as new applications and licenses become available. Existing and approved sources included in the Study Area were identified by searching this database for facilities within the Study Area. In addition to the Matrix database, the IHS Markit database was also reviewed for additional facilities that are likely to have an impact on cumulative air quality in the Study Area (gas plants and processing facilities, sand/gravel pits, etc.).

The operation of the Project will result in emissions of NOX, PM2.5, TSP, and CO from electrical generators, dirt work, crush plant operations, wash plant operations, gravel mining, and sales activity.



Project Emissions have been modelled to capture the anticipated worst-case subsection of proposed mining areas as well as the worst-case subsection of operation. The worstcase subsection of proposed mining areas placed crushing operations at the eastern and westernmost extents of the project area. These locations were chosen as they placed operations in the closest proximity to existing residents, the Air Assessment Boundary and the Town of Cochrane. The intent of this approach was to estimate the air quality experienced by those receptors during the worst-case of emissions from a location perspective. From an operations perspective, modelling assumes that all activity types from both Assessment Areas 1 and 4 are occurring simultaneously. This is not possible in practice and is, again, meant to model the worst-case emissions from this proposed development.

The facility was divided into the following general activities, with each activity having its own sources emitting the substances of concern:

- Crushing Plant,
- Wash Plant,
- Hauling Operations,
- Earthmoving.

The following standard BURNCO mitigations were then incorporated into the model:

- Crusher enclosures,
- Water spray bars,
- Dust control on haul roads and at Plant,
- Progressive reclamation,
- Berms and separation of operations from receptors.

The modeled concentrations provided in the report were as follows:

# F-1 - Attachment C Page 53 of 113

#### West Cochrane Gravel Pit – Master Site Development Plan



Figure 24: Maximum Predicted 1-hr Average CO<sub>2</sub> Concentration

Figure 25: Maximum Predicted 24-hr PM<sub>2.5</sub> Concentration





Figure 26: Maximum Predicted 24-hr TSP Concentration

Figure 27: Maximum Predicted 8-hr Average CO Concentration





The report concluded as follows:

The air assessment identified that emissions of NO2, PM2.5, TSP, and CO will be emitted from the Project site. Predicted results of the dispersion modelling show that maximum ground level NO2, PM2.5, and CO concentrations due to the Project Case will be below the applicable AAAQOs at the Air Assessment Boundary and beyond. In addition, the results from the Application Case and Baseline Case also show that the maximum ground level concentrations of NO2 and CO will be below the applicable AAAQOs.

While the results predict exceedances of PM2.5 in the Application and Baseline Cases, the maximum values are 8.7 km from the Air Assessment Boundary and are attributed to existing emission sources and not the Project.

Predicted maximum ground level concentrations of TSP from the Project, Baseline, and Application Cases are above the applicable objectives (Figures 11 and 12). The actual impacts are expected to be below these predictions given the highly conservative assumptions used in the modelling, such as using 24 hours per day operations, simultaneously modelling Assessment Areas 1 and 4, and assuming the entire area of each Assessment Area will be excavated at one time. These conservative assumptions are primarily affecting emissions of particulate matter which have impacts to air quality that are local, short-term (will cease when operations are not occurring), and reversible when operations end. Impacts due to operations are considered very intermittent and conservative estimates were applied to operations and emissions which ultimately overpredicted worst-case potential of particulate impacts.

There is higher confidence in emissions estimated from combustion sources, such as the generators and vehicle emissions, as the combustion product emissions associated with fuel are well understood. There are higher uncertainties for emissions associated with dust generation such as earth movement, transport of materials, processing, and stock piling. As such, the probability of predictions at the boundary is higher for short-term durations, not as high for annual averages, and not for the entire duration of operations, whereas during most of the operations, mitigated measures will be monitored and used to reduce the surface dust generated.

Given the results of the modelling, and the conservative assumptions used, the operations for the BURNCO Assessment Area 4 operations and Assessment Area 1 operations are not expected to compromise the far field air quality in the area.

Based on this modeling, it is BURNCO's belief that the Project will not create an adverse effect related to air quality. While the air quality assessment does indicate the possibility of exceeding the Alberta ambient air quality objectives (AAQO's) for TPM, it is also important to note that this exceedance is predicted to extend no more than 100 meters beyond the property line. Additionally, the predicted concentrations are calculated using worst-case and highest intensity site operation conditions and are anticipated to only be encountered under extremely infrequent site operating conditions.

BURNCO is also committed to monitoring the site as necessary to ensure air for the area is not adversely affected. As required to meet Alberta ambient air quality objectives, BURNCO will utilize enhanced mitigation measures.



Such enhanced mitigations include:

- Additional dust control (sprinklers, more frequent water truck use, and dust suppressants),
- Reducing site activities during periods of poor air quality,
- Paving of the access road up to and including the scale facility,
- Additional vegetation planting around receptors.

With these enhanced mitigation options in place and significant time to monitor impacts as the site develops over 30 to 35 years of operation, BURNCO is confident that this development can be successfully operated to ensure compliance with Alberta ambient air quality objectives.

# Policy #11

BURNCO will follow the dust control measures detailed in the MSDP. In addition, BURNCO will utilize enhanced mitigation measure if necessary, to ensure that dust is reasonably controlled and does not become a nuisance.

# Policy #12

Operations at the pit will be compliant with the Alberta Ambient Air Quality Objectives (AAAQO).

# 3.7 Environmental Monitoring & Complaint Resolution

At the present time, the existing gravel pit in NW13 is more than 1,700m from the nearest occupied residence. This will be the case for many years to come. As such, no permanent monitoring stations for either noise, dust, or other emissions are envisioned for the site at this time. Instead, monitoring will be conducted on an as-required basis.

In future, BURNCO will employee full time monitoring for noise when gravel pit operations during periods when both night time operations are occurring, and operations are within 400m of an occupied residence. Full time monitoring for dust will occur when gravel pit operations are within 400m of an occupied residence.

At all times, the following protocol shall be employed in the case of noise or dust complaints received by BURNCO from nearby residents:

- BURNCO will investigate the complaint,
- BURNCO will make reasonable steps to address the complaint if it is determined that the site is the source of the complaint,
- In all instances, BURNCO will respond to the complainant within 24 hrs. This response will include the results of BURNCO's investigation, and any actions taken. This response will be provided in writing.

# Policy #13

BURNCO will provide full time noise monitoring during periods when both night time operations are occurring, and operations are within 400m of an occupied residence. Full time monitoring for dust will occur when gravel pit operations are within 400m of an occupied residence.



### Policy #14

BURNCO will follow the complaint response protocol provided in the MSDP related to noise and dust complaints.

# 3.8 Groundwater Assessment and Security

# 3.8.1 Groundwater Assessment

As discussed in Section 2.6, Matrix Solutions Inc. (Matrix) was retained to complete a Groundwater Impact Assessment. The objectives for this assessment were to describe the hydrogeology and groundwater resources within the Project Area and to evaluate the potential effects on groundwater that may be caused by the proposed gravel pit. A complete copy of the report is provided as part of BURNCO's Land Use Application. An overview of the results is as follows:

To meet the hydrogeological requirements as outlined in the Code of Practice for Pits (AENV 2004). Matrix undertook the following tasks in this assessment:

- reviewing geological and hydrogeological data to identify and characterize local and regional geology and develop a hydrogeological framework for the site
- o reviewing all existing water wells data within a 5 km radius of the site
- reviewing all existing groundwater and surface water allocations within a 5 km radius of the site
- assessing the site hydrogeological conditions including hydraulic conductivity, recharge/discharge conditions, depth to water level, baseline groundwater conditions, and flow direction in the aggregates deposit
- assessing potential impact of the gravel mining operations on groundwater resources
- assess potential effects from dewatering during operations in accordance with the Alberta Environment Guide to Groundwater Authorization (AENV 2011)

A search of well information from AEP water well database (AEP 2018a) was completed on October 18, 2018 and March 21, 2019. The search identified 203 records within a 5 km radius of 18-026-04 W5M and 1.6 km radius of N-15-026-05 W5M (Table 6a, Figure 6). These include 179 water wells, 4 flowing shot holes, and 2 springs. The wells ranged in depth from 6.10 to 260.00 m bgs and the majority of the wells are listed for domestic and stock use. Based on the listed completion information and associated depth to bedrock for the water wells, 166 out of the 179 wells are interpreted to be completed in the bedrock and 3 wells (GIC 2079054, 386523, and 386518; water well numbers 8, 11, and 144; Table 6a) are interpreted to be completed in sand and gravel. The groundwater wells interpreted to be completed in the sand and gravel are located greater than 735 m to the north and west of the west end of the site and are listed as domestic and stock use.

The records for the remaining 13 wells did not include adequate information to determine the depth to bedrock.

A field-verified survey (FVS) was conducted between June 18, 2018, and May 28 to September 16, 2019, to supplement the FVS that was conducted by Levelton in 2014 (Appendix A) and BURNCO in 2016. The FVS aimed to obtain baseline information about local water users and to establish their proximity to the site. A questionnaire modified from



the Alberta Environment Guide to Groundwater Authorization (AENV 2011) was used to conduct an interview with the landowners.

A search of well and landowner information from Alberta Environment and Parks (AEP) and AbaData<sup>TM</sup> (Abacus 2018) within a 1.6 km radius of 18-026-04 W5M and N-15-026-05 W5M was conducted to identify residential wells. A review of the county maps and an open house meeting held by BURNCO was used to identify and contact landowners via telephone. At the discretion of the landowners, the surveys were conducted in person at the property, or over the telephone.

The field verification survey included the following:

- o contacting all well owners to arrange for access the wells
- o collecting GPS coordinates of the wells
- leaving a site visit letter at the property if the landowner was not present at the residence

Figure 28: Area Water Resources



Matrix installed six monitoring wells across the property between July 23 and August 30, 2018, with the existing 12 monitoring wells (Appendix A) west of Grand Valley Creek (Figure 5), resulting in an 18 monitoring well network to characterize site geology and hydrogeology.

Matrix manually measured depths to groundwater on November 7, 2018 and are included in Table A. Water levels recorded in pressure transducers installed in the monitoring wells were reviewed and compensated for atmospheric conditions. A total of 11 hydrographs were created based on available and usable data from August 28, 2015 to November 7, 2018.



A saturated gravel thickness contour map was generated using water elevation data and the base of sand and gravel surface supplied by BURNCO. The gravels were fully saturated in the northeast portion of the study area near MW18-02 (B2) and were less saturated to the west, ranging from 0 to 3 m.



Figure 29: BURNCO Monitoring Well Locations





BURNCO will monitor water levels in the network of 18 monitoring wells spread across the project. Continuous monitoring will occur in no less than 6 wells. Continuous monitoring will be done in wells situated between active operations and adjacent landowners as well as in accordance with direction from Alberta Environment & Parks.

# 3.8.2 Dewatering Activities

This work determined that within the proposed gravel pit, some of the gravel is below the water table. In order to recover these resources, BURNCO will dewater these zones to allow for mining. In support of this requirement Matrix examined the volume of water necessary for dewatering the zones of saturated gravel. This volume was examined in combination with necessary stormwater handling on the site and is provided as part of the Stormwater and Drainage Management Plan found in BURNCO's Land Use Application.

The proposed stormwater drainage management plan for the project accounts for stormwater runoff from the mining areas as well as expected groundwater inflows to mining operations. This report provides sizing and location concepts based on current mine planning.

All stormwater runoff from mining areas will be collected in dewatering excavation pits located within the mining area and will be pumped to dedicated recharge ponds located a sufficient distance away to allow for groundwater infiltration. Groundwater inflows to mining areas will also be collected in the dewatering excavation pits and pumped to the recharge ponds. The recharge ponds will be sized to accommodate stormwater runoff

volumes from a 1:10-year, 24-hour design storm event plus pit water that would be pumped from the dewatering excavation.

The mining scenario west of Grand Valley Creek assumes a contributing runoff area of 25 ha (equivalent to the size of the two largest two adjoining phases on the west side + 10%) and a maximum saturated depth of 2 m (equivalent to the highest saturated depth in any mine phase on the west side of Grand Valley Creek and therefore the highest possible groundwater inflow rate in the western portion of the site). This scenario was analyzed using PCSWMM with one 150-mm (6-inch) pump (maximum rate of 0.032 m3/s, giving a maximum daily diversion rate of 2,765 m3/day).

The mining scenario east of Grand Valley Creek assumes a contributing runoff area of 30 ha (equivalent to the size of the two largest two adjoining phases on the east side + 10%) and a maximum saturated depth of 3 m (equivalent to the highest saturated depth in any mine phase on the east side of Grand Valley Creek and therefore the highest possible groundwater inflow rate in the eastern portion of the site). This scenario was analyzed using PCSWMM with one 6" pump (maximum rate of 0.032 m3/s, giving a maximum daily diversion rate of 2,765 m3/day).

These results provide the expected maximum diversion rates assuming that the initial dewatering as well as six months of ongoing dewatering would occur in the same year, based on the expected maximum groundwater inflow rates.

|                    | Maximum Annual Groundwater Diversion Volume (m <sup>3</sup> ) |                                                               |         |  |  |  |  |  |
|--------------------|---------------------------------------------------------------|---------------------------------------------------------------|---------|--|--|--|--|--|
| Pond               | During Initial<br>Dewatering Phase                            | During Ongoing Mining<br>(Assuming 6 months of<br>dewatering) | Total   |  |  |  |  |  |
| West Recharge Pond | 164,900                                                       | 123,100                                                       | 288,000 |  |  |  |  |  |
| East Recharge Pond | 354,000                                                       | 233,900                                                       | 587,900 |  |  |  |  |  |

# Table 6: Maximum Annual Groundwater Diversion Volume

The model results indicate that the east recharge pond has sufficient capacity at 95 m  $\times$  95 m to handle these initial dewatering flows at a 1.0 m depth; however, the west recharge pond at 90 m  $\times$  90 m would require a design depth of 1.5 m to handle the initial dewatering flows from the pits.

| Table 7: Rech | arge Pond | Design |
|---------------|-----------|--------|
|---------------|-----------|--------|

| Recharge Pond      | Minimum Pond Base Area<br>(m²) | Minimum Base Width<br>(Assuming Square Geometry)<br>(m) | Pond<br>Depth<br>(m) |
|--------------------|--------------------------------|---------------------------------------------------------|----------------------|
| West Recharge Pond | 8,100                          | 90                                                      | 1.5                  |
| East Recharge Pond | 9,025                          | 95                                                      | 1.0                  |




Figure 31: Drainage Management Plan (Recharge Ponds Locations)

### 3.8.3 Groundwater Conclusions

The majority of the site is expected to have little or no groundwater. Many of the drill holes completed by BURNCO were dry. The saturated gravel thickness map shows that areas with groundwater are limited. Further, that these areas are expected to be a significant distance from nearby water users. The evaluations by Matrix concluded as follows:

Due to the generally low saturation and shallow water table (near the base of the gravel), dewatering at site may be limited. Water well records also indicate that the wells in the vicinity of the site are completed in bedrock aquifers at various depths. Dewatering of the saturated gravels at site is not expected to impact users in the area. A bailing strategy for resource removal will likely result in higher total suspended solids compared to dewatering. Potential environmental impacts can be eliminated or minimized with engineering controls implemented at construction and as part of ongoing operations.

Potential impacts of future aggregate operations on nearby groundwater and surface water diversions are expected to be minimal with best management practices.

Finally, hydraulic connectivity of the groundwater table present in the base of the gravel deposit will be maintained by providing layer of aggregate at the base of the excavation and above the bedrock. This layer is illustrated on the cross sections in Appendix 3.

## F-1 - Attachment C Page 63 of 113

### 3.8.4 Groundwater Security

Diverting groundwater may require a Water Act approval from Alberta Environment and Parks. BURNCO will secure any necessary authorizations prior to proceeding with this activity.

Should any nearby water well users indicate to BURNCO that they believe their water supply has been negatively impacted due to the gravel mining operation, BURNCO will do the following:

- Provide a temporary alternate water supply within 24 hours if a resident is without water,
- Hire an outside consultant within 14 days to determine the cause of the problem,
- Provide a permanent alternate water supply if the problem is at least partially due to BURNCO's mining operation.

### Policy #16

BURNCO will secure Water Act approvals as necessary from Alberta Environment & Parks related to dewatering, bailing, or any other activities in the groundwater table before commencing such operations.

### Policy #17

BURNCO will complete a baseline monitoring program for any residential water well located within 400m of the project boundary if requested by the owner.

### Policy #18

BURNCO will follow the complaint protocol provided in the MSDP related to groundwater security.

### 3.8.5 Existing Water Licenses & Approvals

BURNCO currently has two water licenses for the diversion of water from the Bow River. The diversion for these licenses will be located in SE 13-26-5 W5M and will provide a source of water for gravel washing and dust control. BURNCO also holds a Water Act approval which allows for excavation of gravel from within the groundwater table in NW 13. Copies of these licenses are provided as part of BURNCO's Land Use Application.

- License No. 00396954-00-00
- 44 acre-feet (55,507 m<sup>3</sup>)
- License No. 00396952-00-00
- 67 acre-feet (83,260 m<sup>3</sup>) Aggregate Extraction Below Water Table
- Approval No. 00430788-00-00
- Policy #19

BURNCO will secure Water Act approvals as necessary from Alberta Environment & Parks related to gravel washing before commencing such operations.

### 3.9 Traffic Impact Assessment and Control

BURNCO expects to continue utilizing the current haul route out of NW 13-26-05 W5M (Range Road 51 to Highway 1A) for the duration of the site activities. This access will be utilized for all activities west of Grande Valley Creek. This includes phases A1-A7, B8-B11, C12-C15, and D16-D21.



### Policy #20

BURNCO will continue to utilize the upgraded intersection at Range Road 51 and Highway 1A for all activities west of Grade Valley Creek (phases A1-A7, B8-B11, C12-C15, and D16-D21).

BURNCO is not proposing any activities within Grande Valley Creek. As a result, the operations east of Grande Valley Creek will be operated independently of those operations west of the Creek. A new access for these operations will be developed out of SE 18-26-04 W5M (Range Road 45 to Highway 1A). This access will be utilized for all activities east of Grande Valley Creek. This includes phases E22-E24, F25-F27, G28-G31, and H30.

Policy #21

In future, BURNCO will develop an upgraded intersection at Range Road 45 and Highway 1A for all activities east of Grade Valley Creek (phases E22-E24, F25-F27, G28-G31, and H30). This upgrade will be built to the standard required by Rocky View County and Alberta Transportation.

### Policy #22

# No aggregate operations shall occur within the MSDP area without approval of a Roadside Development Permit from Alberta Transportation.

Over time, sales are expected to reach 500,000 tonnes per year. This annual volume is the amount already approved at the existing gravel pit in NW13, but is an increase of roughly four times the volumes currently being shipped from the site as it ramps up to full production. This annual amount will utilize the existing access, or, will be split between the existing access and the future access at Range Road 45.

### 3.9.1 Traffic Impact Assessment

In 2013 a Traffic Impact Assessment (TIA) was submitted by Scheffer Andrew Ltd. on behalf of BURNCO Rock Products Ltd. This TIA was utilized to determine that an upgrade was required at the intersection of Range Road 51 and Highway 1A. The TIA determined that a Type IVb intersection was required to facilitate the development and any additional road usage. After acceptance from Rocky View County and Alberta Transportation (through a Roadside Development Permit), the intersection was received by BURNCO in January 2020. A copy of the TIA, FAC, and Roadside Development Permit and is provided as part of BURNCO's Land Use Application.

In support of this application, Scheffer Andrew Ltd. conducted a 2021 review of the 2013 TIA. This technical memo is provided as part of BURNCO's Land Use Application. It concludes:

We have reviewed our 2013 TIA for the site, and the current traffic volumes on Highway 1A as reported by Alberta Transportation. Our review shows that background traffic growth on Highway 1A has been slower than what was assumed in 2013. In addition, BURNCO has confirmed that the maximum number of trips assumed to be generated by the pit development in 2013 are still valid. For these two reasons, the intersection layout, intersection capacity, and intersection lighting warrant calculations from the 2013 TIA are still valid today.



As the development progresses, it is known that the construction of an intersection will be needed at the east side of the property at Range Road 45 to Highway 1A. It is anticipated that this access will be required in 10-15 years. Therefore, a TIA will be undertaken at that time to determine the appropriate upgrades.

### 3.9.2 Haul Safety

All drivers are required to follow the BURNCO trucking policy to ensure BURNCO safety standards as well as the public's expectations are met. Drivers must always practice responsible driving habits and maintain a good driving record. As with all BURNCO operations, company employees and independent truckers involved in the hauling of aggregate must meet three criteria:

- Safety only the highest standard of safety is appropriate to safeguard the public, the driver's peers and the driver,
- Legality all federal, provincial and municipal laws and regulations must be followed as well as BURNCO's own regulations,
- Efficiency the least time-consuming, safe and legal haul route must be taken.

Each spring, independent truckers wishing to work for BURNCO must register themselves and their vehicles by providing, among other things, proof of proper insurance, registration, vehicle safety inspection, and coverage by the Workers Compensation Board.

### Policy #23

BURNCO will follow the protocol provided in the MSDP related to haul safety.

### 3.9.3 Haul Monitoring

BURNCO participates in the Alberta Sand and Gravel Association (ASGA) truck registry program to help monitor trucks. The registry works in the following manner:

- The truck registry requires all gravel truck operators to display a four-digit number, and the phone number 1-866-901-ASGA (2742),
- If someone feels the truck is not operating in a safe and courteous manner, they can phone the complaint line and register a complaint,
- All complaints received via this number are documented and relayed to the producer (i.e. BURNCO) the truck is registered with.

The producer then follows up on the complaint to ensure it is resolved. With the truck registry, BURNCO is informed of any problems that are occurring on the haul route and can resolve them promptly.

### Policy #24

BURNCO will follow the protocol provided in the MSDP related to haul monitoring.

### 3.10 Storm Water

As discussed in Section 2.5, Matrix Solutions Inc. (Matrix) was retained to complete a Stormwater Management Plan (SMP) for the Project. A complete copy of the Matrix report can be found in BURNCO's Land Use Application. Section 2.5 addressed existing site conditions. The Assessment also included a review of appropriate management measures. The following is the conclusion from the report:



All stormwater runoff from mining areas will be collected in dewatering excavation pits located within the mining area and will be pumped to dedicated recharge ponds located a sufficient distance away to allow for groundwater infiltration.

Overland flows from upstream sources will be directed around active mining operations using interceptor ditches and/or berms. All flows generated in the upstream catchment areas of Grand Valley Creek and/or Beaupre Creek will continue to pass through the project area.

Adequate setback distances will be maintained from Grand Valley and Beaupre Creek as well as the three unnamed watercourses identified in the study area. Culverts of adequate capacity will be provided through the visibility berm in several locations, including at Beaupre Creek, to convey the 1:100-year design flows. These culverts should be designed to meet Alberta Transportation requirements for highway culvert crossings. The conceptual stormwater drainage management plan, including proposed culvert locations, is shown on Figure 5.

#### Policy #25

BURNCO will ensure that regional stormwater flows are not impacted. All flows generated in the upstream catchment areas of Grand Valley Creek and/or Beaupre Creek will continue to pass through the project area.

### Policy #26

BURNCO will ensure that stormwater from the active mining area is collected and not discharged from the site.

In the final reclaimed condition, the drainage patterns are expected to have minimal impact on the surrounding area, provided the following recommendations are implemented:

- Because visibility berms will remain in place, the proposed culverts must be adequately sized and adequately maintained to ensure upstream flows can continue to flow through the project area after mining is completed.
- To ensure that post-development runoff rates are equal to or less than predevelopment runoff rates, bioretention and localized depression storage must be provided as follows:
  - The site will not be uniformly graded; local depressions and undulations will be provided to attenuate post-development flows and provide hydraulic grade control.
  - The local depressions and undulations are critical in areas A2 and A4, where the onsite drainage areas have increased. Specific volume targets have been provided for these areas in Table 20.
  - Bioretention areas will be provided in A6 (6 ha east of Grand Valley Creek and 4 ha west of Grand Valley Creek) to attenuate additional flows both from the project area and the upstream portion of drainage area A7.
  - Because of pipeline conflicts, the post-development drainage area A7 has been reduced significantly. There may be some impacts to the existing wetland in area A7 because of this reduction.



• Adequate erosion and sediment control measures must be implemented to minimize downstream impacts.

### Policy #27 BURNCO will follow the reclamation recommendations in the MSDP related to drainage. This will ensure that the reclaimed site does impact local or regional drainage patterns.

### Policy #28

Stormwater will be managed in accordance with the submitted Conceptual Stormwater Management Plan.

Figure 32: Drainage Management Plan (Culvert Locations)





#### Figure 33: Post Development Drainage

### 3.11 Vegetation and Wildlife Controls

As discussed in Section 2.2, Matrix Solutions Inc. (Matrix) was retained to complete a Biophysical Impact Assessment (BIA) for the Project area, to assess potential impacts to the biophysical resources and recommend mitigation measures to minimize potential impacts. Section 2.2 addressed existing site conditions. The Assessment also included a review of appropriate mitigation measures which shall be observed during site operations.

Setbacks and Restricted Activity Periods apply to environmentally sensitive resources identified during the field surveys. They are based on federal, provincial, and county regulatory requirements as well as professional judgement. Matrix developed the following in relation to this project:

### Policy #29

BURNCO will follow the setback and restricted activity requirements identified in the MSDP in relation to wildlife, wetlands, riparian areas and watercourses.



### Table 8: Table of Setback and Restricted Activity Periods

| Environmental<br>Sensitivity             | Setback and Restricted Activity Periods                                                                                                                                                                                                                                                                                                        | Regulatory Requirement                                                                                                                                                                                                                                         |
|------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Red-tailed Hawk<br>Nest                  | • 100 m setback (year-round)                                                                                                                                                                                                                                                                                                                   | <ul> <li>Alberta Wildlife Act (setback supports<br/>due diligence but is not specifically<br/>stated in the Act)</li> </ul>                                                                                                                                    |
| Bald Eagle Nest                          | <ul> <li>1,000 m setback (year-round)</li> </ul>                                                                                                                                                                                                                                                                                               | <ul> <li>Alberta Wildlife Act (setback supports<br/>due diligence but is not specifically<br/>stated in the Act)</li> </ul>                                                                                                                                    |
| Amphibian<br>Breeding Ponds <sup>1</sup> | <ul> <li>100 m setback from the edge of a breeding pond</li> <li>May require setbacks if activity is in the breeding period (April 1 to July 1)</li> <li>May require setbacks if young are present (setbacks in effect to October 1)</li> </ul>                                                                                                | <ul> <li>Alberta Wildlife Act (setback supports<br/>due diligence but is not specifically<br/>stated in the Act)</li> <li>SARA - depending on species identified<br/>(setback supports due diligence but is<br/>not specifically stated in the Act)</li> </ul> |
| Key Wildlife and<br>Biodiversity<br>Zone | RAP = December 15 to April 30                                                                                                                                                                                                                                                                                                                  | Wildlife Act (RAP supports due diligence<br>but is not specifically stated in the Act)                                                                                                                                                                         |
| Migratory Bird                           | RAP = April 15 to August 31                                                                                                                                                                                                                                                                                                                    | <ul> <li>Migratory Birds Convention Act</li> <li>Wildlife Act (RAP supports due diligence<br/>but is not specifically stated in the Act)</li> </ul>                                                                                                            |
| Wetland<br>Setbacks                      | • бm (year-round)                                                                                                                                                                                                                                                                                                                              | <ul> <li>Alberta Wetland Policy (setback<br/>supports due diligence but is not<br/>specifically stated in the Policy)</li> <li>Alberta Water Act (setback supports<br/>due diligence but is not specifically<br/>stated in the Act)</li> </ul>                 |
| Riparian Areas                           | 30 m setback                                                                                                                                                                                                                                                                                                                                   | Rocky View Land Use Bylaw     Policy 419: Riparian Protection Policy                                                                                                                                                                                           |
| Watercourses                             | <ul> <li>60 m from Bow River and Grand<br/>Valley Creek</li> <li>30 m from all other watercourses</li> </ul>                                                                                                                                                                                                                                   | <ul> <li>Code of Practice for Pits</li> <li>Fisheries Act (setback supports due diligence but is not specifically stated in the Act)</li> </ul>                                                                                                                |
| Fish and Fish<br>Habitat Setbacks        | <ul> <li>RAP = September 16 to April 15 -<br/>within banks (to top of bank) of all<br/>watercourses except U-WC2 and U-<br/>WC3 (as they do not have defined<br/>bed and banks)</li> <li>For U-WC2 and U-WC3 drainage must<br/>be maintained and mitigation<br/>measures utilized to ensure no<br/>sedimentation of the watercourse</li> </ul> | <ul> <li>Fisheries Act (RAP supports due diligence but is not specifically stated in the Act)</li> <li>Water Act- This RAP is specific to the Class C watercourses</li> </ul>                                                                                  |

These setbacks and restricted activity periods were applied to the project mapping and provided the following figures:





Figure 35: Applicable Wildlife Setbacks





With the exception of the necessary crossing of Beaupre Creek, the watercourse, riparian, and wetland setbacks were permanently incorporated into the site planning. Disturbance limits were adjusted to ensure these setbacks were met.

A screening berm is planned to be constructed across Beaupre Creek at the northern property boundary. To maintain the existing drainage pattern a culvert will be constructed through the screening berm to convey 1:100-year flows in Beaupre Creek.

BURNCO will seek appropriate authorizations from Alberta Environment and Parks prior to construction of this screening berm to ensure that all necessary mitigations and controls are in place.

#### Policy #30

BURNCO will secure necessary authorizations from Alberta Environment & Parks related to the berm and vehicle crossing at Beaupre Creek before commencing these developments.

For the wildlife setbacks, the mapping only provides necessary setbacks while the wildlife is present and the noted nesting locations shall be monitored. In particular, the report noted:

The Project is located within the recommended regulatory setbacks for a bald eagle nest (1,000 m), as per the Master Schedule of Standards and Conditions (GoA 2018) and the Recommended Land Use Guidelines for Protection of Selected Wildlife Species and Habitat within Grassland and Parkland Natural Regions of Alberta (ASRD 2011; Figure 11). Bald eagles and their nests are also covered under the Alberta Wildlife Act (Province of Alberta 2018) However, it is noted that due to topography, there is no line of site from the eagle nest to the portion of the Project Area located within 1,000 m of the nest. Additionally, BURNCO does not plan to begin mining on this portion of the site until approximately 2028. Therefore, Matrix recommends that the nest be monitored twice per breeding season to track activity and successful breeding within the nest. If the nest continues to be active and activity is planned to start within the buffer area, additional consultation will be required with AEP.

The Project Area is also located within the recommended setback of 100 m from two active red-tailed hawk nests identified during the 2018 raptor stick nest survey (Figure 11; GoA 2018). Depending on the timing of construction within the nest setbacks, it is recommended that these nests are surveyed for activity prior to construction. If the nests are noted to be active, initial construction of the phases within these setbacks should occur outside of the raptor breeding season (March 15 to August 30) to avoid impacts to breeding wildlife and birds (ESRD 2013).

The report went on to complete an impact assessment and cumulative effect review for the following items:

- Geology,
- Hydrology, Soils and Topography,
- Vegetation and Wetlands,
- Wildlife and Wildlife Habitat,
- Fish and Fish Habitat.



Mitigation measures are the elimination, reduction or control of the adverse environmental effects of the Project and includes restitution for any damage to the environment caused by such effects through replacement, restoration, compensation or any other means (Government of Alberta 2010).

The potential environmental effects of Project construction and operation were predicted, based on experience with previous gravel pits as well as experience gained through assessment of other Projects with similar environmental conditions.

Effects are considered to occur where anticipated future conditions resulting from the Project differ from the conditions otherwise expected from natural change, before mitigations are applied. Residual effects are those effects that remain after mitigation measures have been implemented.

A summary of the mitigation measures that will be implemented to minimize Project related impacts is provided below.

| Component                           | Potential<br>Impact                    | Mitigation Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Residual Effects                                                                                                                                                                                                                                      |
|-------------------------------------|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Vegetation<br>and<br>Wetlands       | Rare Plants and<br>Rare<br>Communities | <ul> <li>Based on the timing of future construction, additional rare plant<br/>surveys may be required.</li> <li>In the event that rare plants or rare ecological communities are<br/>discovered during construction, work will be stopped, and the<br/>Construction Supervisor Environmental Advisor will be<br/>contacted. Mitigation measures will be implemented as<br/>required, and may include avoidance or transplanting.</li> </ul>                                                                                                                                                                                                                                                                                                          | Direction: Negative<br>Magnitude: High<br>Duration: Long-term<br>Frequency: Isolated<br>Extent: Project Area<br>Reversibility: Irreversible<br>Probability: Low<br>Confidence: High<br>Residual Effect: Not significant                               |
| Vegetation<br>and<br>Wetlands       | Weeds                                  | <ul> <li>Access work areas from approved areas.</li> <li>Ensure vehicles and equipment are cleaned before being<br/>allowed onsite.</li> <li>Restrict vehicle access over newly seeded areas.</li> <li>Monitor the disturbed areas for weeds and work with<br/>landowners to apply control measures if required.</li> <li>Weed control and management will be performed during<br/>construction activities to prevent prohibited or noxious weeds<br/>from being introduced or spread.</li> </ul>                                                                                                                                                                                                                                                     | Direction: Negative<br>Magnitude: Low<br>Duration: Long-term<br>Frequency: Isolated<br>Extent: Project Area<br>Reversibility: Reversible in the <u>short term</u><br>Probability: High<br>Confidence: High<br>Residual Effect: Not significant        |
| Wildlife and<br>Wildlife<br>Habitat | Wildlife habitat<br>loss/alteration    | <ul> <li>Construction of new phases will commence outside of the migratory bird RAP, between April 15 and August 31 (ECCC. 2018) where possible.</li> <li>If construction must take place within the migratory bird RAP, a nest sweep will be completed prior to vegetation clearing to limit the risk of impacting nesting wildlife.</li> <li>In the event an active nest is found, site-specific mitigation measures should be developed (e.g., clearly marked species specific buffer around the nest or non-intrusive monitoring). Relocate nests following consultations with applicable regulators.</li> <li>In the event that wildlife and/or specific wildlife habitat features are identified during construction/operations, the</li> </ul> | Direction: Negative<br>Magnitude: Low<br>Duration: Long-term<br>Frequency: Continuous<br>Extent: Project Area<br>Reversibility: Reversible in the medium to<br>long-term<br>Probability: High<br>Confidence: High<br>Residual Effect: Not significant |

Table 9: Potential Vegetation and Wildlife Impacts, Mitigation Measures, and Residual Effects

### F-1 - Attachment C Page 73 of 113 BURNCO

### West Cochrane Gravel Pit – Master Site Development Plan

| Valued<br>Ecosystem<br>Component | Potential<br>Impact | Mittigation Mieasures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Residual Effects                                                                                                                                                                                                                                       |
|----------------------------------|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| -                                |                     | <ul> <li>Implement immediate action to control, contain, recover and<br/>clean up any release.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                        |
| Vegetation<br>and<br>Wetlands    | Vegetation          | <ul> <li>Follow existing roads and overlap cultivated land, minimizing the Project footprint where possible.</li> <li>Maintain compatible vegetation or vegetated ground mat, to the extent practical.</li> <li>Maintain native ground cover where possible.</li> <li>Implement progressive reclamation.</li> <li>During weed control, reduce uncontrolled overspray and unnecessary damage to native vegetation and/or cultivated land.</li> </ul>                                                                                                                                                                                                      | Direction: Negative<br>Magnitude: High<br>Duration: Long-term<br>Frequency: Continuous<br>Extent: Project Area<br>Reversibility: Reversible in the medium to<br>long-term<br>Probability: High<br>Confidence: High<br>Residual Effect: Not significant |
| Vegetation<br>and<br>Wetlands    | Riparian Areas      | <ul> <li>No aggregate development shall be located within the County's Riparian Protection Areas (Rocky View County 2019).</li> <li>Riparian areas will include a 30 m buffer from the center of the watercourse (60 m from bank for Bow River).</li> <li>Demarcate the riparian area using flagging tape or other visual marker as a means to alert construction traffic to the presence of the riparian and identify an odriving zone.</li> </ul>                                                                                                                                                                                                      | If setbacks are adhered to, there will be no<br>residual effects.                                                                                                                                                                                      |
| Vegetation<br>and<br>Wetlands    | Wetlands            | <ul> <li>Wetlands will be avoided.</li> <li>Maintain compatible vegetation or vegetated ground mat, to the extent practical, particularly within the wetland buffer.</li> <li>Install erosion control measures upslope of wetlands.</li> <li>Demarcate the wetland using flagging tape or other visual marker as a means to alert construction traffic to the presence of the wetland. and identify a no driving zone.</li> <li>The recommended 6 m buffer around the wetlands will not be encroached upon.</li> <li>In the event that wetlands will be impacted, a WaterAct application and associated wetland assessment will be completed.</li> </ul> | If setbacks are adhered to, there will be no residual effects.                                                                                                                                                                                         |

| Valued<br>Ecosystem<br>Component | Potentia<br>Impact     | Mittigation Weasures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Residual Effects                                                                                                                                                                                                                                              |
|----------------------------------|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                  |                        | <ul> <li>features should be <u>flagged</u> and the appropriate mitigation developed, which may require consultation with AEP.</li> <li>Progressive reclamation will occur once phases are depleted and mining operations within that phase is no longer feasible.</li> <li>Footprint avoids of riparian areas.</li> <li>Mining activities will not take place along the areas immediately adjacent to the Bow River (Figure 1).</li> <li>Install erosion/sedimentation control along fences adjacent to riparian areas and wetlands.</li> <li>Based on the timing of future construction, follow-up surveys may be required.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                               |
| Wildlife<br>Wildlife<br>Habitat  | Sensory<br>Disturbance | <ul> <li>Construction of new phases will commence outside of the migratory bird RAP, between April 15 and August 31 (ECCC 2018) where possible.</li> <li>If construction must take place within the migratory bird RAP, a nest sweep will be completed prior to vegetation clearing to limit the risk of impacting nesting wildlife.</li> <li>In the event an active nest is found, site-specific mitigation measures should be developed (e.g., clearly marked species specific buffer around the nest or non-intrusive monitoring). Relocate nests following consultations with applicable regulators.</li> <li>In the event that wildlife and/or specific wildlife habitat features are identified during construction/operations, the features are identified during construction with Rocky View County and AEP.</li> <li>Maintain a 1,000 m buffer from the bald eagle nest when active.</li> <li>Monitor the bald eagle nest twich proceeding season, until activity is scheduled to start within the 1,000 m buffer, to track activity of the nest, and note successful breeding within the nest.</li> </ul> | Direction: Negative<br>Magnitude: Low<br>Duration: Long-term<br>Frequency: Continuous<br>Extent: Outside Project Area<br>Reversibility: Reversible in the medium to<br>long-term<br>Probability: High<br>Confidence: High<br>Residual Effect: Not significant |



| Valued<br>Ecosystem<br>Component    | Potential<br>Impact               | Mitugation Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Kesimual Effects                                                                                                                                                                                                                         |
|-------------------------------------|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                     |                                   | <ul> <li>Once activities commence within the 1,000 m buffer, monitor the nest for activity during construction and operations.</li> <li>If the nest continues to be active and activity is planned to start within the buffer area, additional consultation may be required with AEP.</li> <li>If construction occurs within the amphibian breeding season and within the 100 m of any riparian areas or wetlands amphibian surveys will be completed. If amphibians are identified, a setback from the breeding pond will be determined in discussion with BURNCO and AEP.</li> <li>Make efforts to conduct construction during daylight hours to minimize noise disturbance to wildlife during dawn and dusk.</li> <li>Reduce noise levels of activities, whenever possible, and ensure that noise abatement equipment is in good working order.</li> <li>Based on the timing of future construction, follow-up surveys may be required.</li> </ul> |                                                                                                                                                                                                                                          |
| Wildlife and<br>Wildlife<br>Habitat | Barriers to<br>movement           | <ul> <li>For work that is required in the KWBZ, construction of new phases will not occur between December 15 to April 30.</li> <li>Footprint avoids of riparian areas.</li> <li>Mining activities will not take place along the areasimmediately adjacent to the Bow River within the KWBZ (Figure 11).</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Direction: Negative<br>Magnitude: Low<br>Duration: Long-term<br>Frequency: Continuous<br>Extent: Project Area<br>Reversibility: Reversible in the long-term<br>Probability: High<br>Confidence: High<br>Residual Effect: Not significant |
| Wildlife and<br>Wildlife<br>Habitat | Potential for<br>direct mortality | <ul> <li>If a SAR is encountered in the Project Area and there is potential<br/>for direct mortality, cease construction activities until<br/>consultation has occurred with AEP, and appropriate mitigation<br/>measures have been implemented (e.g., setbacks, timing<br/>restrictions).</li> <li>Construction of new phases will commence outside of the<br/>migratory bird RAP, between April 15 and August 31 (ECCC<br/>2018), where possible.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Direction: Negative<br>Magnitude: Low<br>Duration: Long-term<br>Frequency: Continuous<br>Extent: Outside Project Area<br>Reversibility: Reversible in the medium to<br>long-term<br>Probability: Low                                     |

| Valued<br>Ecosystem<br>Component | Potential<br>Impact | Mitigation Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Residual Effects                                     |
|----------------------------------|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|
|                                  |                     | <ul> <li>If construction must take place within the migratory bird RAP, a nest sweep will be completed prior to vegetation clearing to limit the risk of impacting nesting wildlife.</li> <li>In the event an active nest is found, site-specific mitigation measures should be developed (e.g., clearly marked species specific buffer around the nest or non-intrusive monitoring). Relocate nests following consultations with applicable regulators.</li> <li>In the event that wildlife and/or specific wildlife habitat features are identified during construction/operations, the features should be flagged and the appropriate mitigation developed, which may require consultation with AEP.</li> <li>If sensitive amphibians are identified within the construction area and work will occur when young are present, install slit fence around the wetland and salvage and move the amphibians that are in the construction are to a suitable habitat.</li> <li>Investigate the possibility of installing wildlife crossing signs at points along the highway where the east and west boundaries of the site are located.</li> <li>Advise personnel to follow speed limits to improve road safety and reduce risks of wildlife mortality.</li> <li>Lower speeds during periods of reduced visibility.</li> <li>Attempt to limit traffic during periods where wildlife tend to be most active (i.e., dawn and dusk) to reduce the risk of wildlife mortality.</li> <li>Do not harass, feed, or interact with wildlife.</li> <li>Ensure proper containers are provided for garbage and ensure regular facility maintenance to prevent accurnulation of garbage on the ground.</li> <li>Carry a spill kit and report any vehicle or equipment leaks to the appropriate authority.</li> </ul> | Confidence: High<br>Residual Effect: Not significant |



| Valued<br>Scosystem<br>Component | Potential<br>Impact                                                                                                                              | Mitugation Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Residual Effects                                                                                                                                                                                                                      |
|----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                  |                                                                                                                                                  | <ul> <li>Do not refuel vehicles or equipment within 100 m of a wetland<br/>or riparian area.</li> <li>If immobile machinery is required to be within 100 m of the<br/>riparian area (e.g., pumps), then they should be placed in an<br/>isolated area within secondary containment capable of<br/>containing all fluids in said machinery.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                       |
| Fish and Fish<br>Həbitat         | Use of<br>industrial<br>equipment<br>near<br>watercourse<br>that could<br>result in<br>deleterious<br>substances<br>entering the<br>watercourses | <ul> <li>All machinery working near water will be cleaned and free of debris and organic matter before entering the construction site.</li> <li>All machinery and vehicles will be refuelled a minimum of 100 m away from the watercourse.</li> <li>If immobile machinery is required to be within 100 m of the watercourse (e.g., pumps), then they should be placed in an isolated area within secondary containment capable of containing all fluids in said machinery.</li> <li>Any equipment (personal protective equipment, fisheries equipment) used within Beaupre Creek, Grand Valley Creek or the three Unnamed Watercourses must be cleaned and disinfected according to the standards provided in the Interim Guidelines for the Disinfection of Fisheries Equipment to Reduce the Spread of Whirling Disease in Southern Alberta (AEP 2016).</li> <li>A site-specific spill response plan will be developed before construction occurs.</li> </ul> | Direction: Neutral<br>Magnitude: Negligible<br>Duration: Immediate<br>Frequency: Incidental<br>Extent: Outside Project Area<br>Reversibility: Reversible immediately<br>Probability: Low<br>Confidence: High<br>Residual Effect: None |
| Fish and Fish<br>Habitat         | Change in<br>sediment<br>concentrations<br>resulting in<br>poor visibility<br>and altered<br>food sources                                        | <ul> <li>Implement setbacks as specified in Table 12.</li> <li>Develop and implement an ESC Plan addressing each watercourse if activities occur within the setbacks.</li> <li>Maintain and inspect ESC measures frequently to ensure effectiveness.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Direction: Neutral<br>Magnitude: Negligible<br>Duration: Immediate<br>Frequency: Incidental<br>Extent: Outside Project Area<br>Reversibility: Reversible immediately<br>Probability: Low<br>Confidence: High<br>Residual Effect: None |
| Valued<br>Ecosystem<br>Component | Potential<br>Impact                                                                                                                              | Mitigation Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Residual Effects                                                                                                                                                                                                                      |
| Fish and Fish<br>Habitat         | Potential<br>mortality of fish<br>and eggs<br>resulting from<br>deposition of<br>sediment                                                        | <ul> <li>Implement setbacks as specified in Table 12.</li> <li>Develop and implement an ESC Plan addressing each<br/>watercourse if activities occur within the setbacks.</li> <li>Maintain and inspect ESC measures frequently to ensure<br/>effectiveness.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Direction: Neutral<br>Magnitude: Negligible<br>Duration: Immediate<br>Frequency: Incidental<br>Extent: Outside Project Area<br>Reversibility: Reversible immediately<br>Probability: Low<br>Confidence: High<br>Residual Effect: None |

The Report concluded as follows:

Valued Ecosystem Components (VECs) within the Project Area were identified during desktop and field assessments. Activities related to the Project were determined and potential impacts of those activities on VECs were identified.

Mitigation measured identified in this report are based on information collected during field surveys, best management practices, regulatory requirements for setbacks and RAPs and professional judgement.

The Project will have no residual impacts on geology, wetlands, riparian areas or fish and fish habitat if mitigations measures are implemented. The Project will have residual impacts to hydrology, soils, vegetation, rare plants, weeds, and wildlife. These impacts are considered not significant if mitigation measures are implemented. No cumulative impacts are expected for any of the VECs within the Project Area or within the VEC spatial boundary.



BURNCO will be implementing progressive reclamation during the course of the Project, which will reduce the duration of an impact, as well as the amount of area being impacted. Progressive reclamation also contributes to reducing cumulative effects of the Project.

### Policy #31

BURNCO will follow the recommendations in the MSDP related to impact assessment and managing cumulative effects for Vegetation and Wildlife. These measures will ensure limited impact on geology, hydrology, soils and topography, vegetation and wetlands, wildlife and wildlife habitat, fish and fish habitat.

### Policy #32

BURNCO will control weeds during operations and reclamation. These efforts will be compliant with the Weed Control Act and the Rocky View County Land Use Bylaw.

### 3.12 Hazardous Waste Plan

All fuel storage sites will be constructed in a manner that follows the *Guidelines for Secondary Containment for Above Ground Storage Tanks*, Alberta Environmental Protection, May 1997, and comply with Part 4 of the *Alberta Fire Code 2006* for tank registrations. A bermed imperviously lined area, or other form of secondary containment, will surround fuel tanks with a minimum 110% holding capacity of the largest tank's capacity. Any spills within or beyond the bermed area of the above ground storage tanks will be controlled immediately using various techniques including diking and containing. Any spills will be collected using sorbent pads and vacuum trucks.

Materials such as oil, lubricants, glycols, etc. that are stored on-site will be labeled according to the Workplace Hazardous Materials Information System (WHIMIS) regulations and will be suitably contained. No waste material will be imported into the pit. All waste material generated from pit operations will be collected and stored in approved containers. This waste material will then be hauled on a regular basis to an approved landfill for proper disposal. Burial of waste will be prohibited during all phases of the operation. Portable sanitary facilities will be located on site. All sanitary waste will be hauled to an approved waste management treatment facility.

### Policy #33

### BURNCO will follow the hazardous waste plan in the MSDP.

### 3.13 Erosion and Sediment Control

In support of the Project, Matrix Solutions Inc. (Matrix) was retained to complete an Erosion and Sediment Control Plan for the Project area. This assessment was completed in 2020 and is provided as part of BURNCO's Land Use Application. It includes the following components:

- A site description and identification of erosion and sediment control areas of concern,
- A description of erosion and sediment control measures to be implemented, and appropriate maintenance and repair requirements,
- Inspection, maintenance and record keeping procedures,
- Post-construction monitoring,
- A sample erosion and sediment control inspection form.



A summary of the mitigation measures that will be implemented to minimize Project related impacts is provided below.

### Policy #34

BURNCO will follow the erosion and sediment control measures in the MSDP.

Figure 36: ESC Plan – West





### F-1 - Attachment C Page 78 of 113 BURNCO

#### Figure 37: ESC Plan - East



This provides high level control measures for proposed project activities during active gravel pit operation (interim condition) and during site reclamation (final condition).

Drainage patterns must be reasonably returned to pre-development conditions to prevent problematic drainage issues when landscape alterations occur. Preferable drainage patterns include effective infiltration and temporary storage in small depressions, which is supported by proper ESC measures. The purpose of this ESC plan is to support proposed restored drainage patterns to ensure there is no risk of sediment laden drainage entering adjacent sensitive/protected watercourses.

### 3.14 Landscaping and Site Screening

As there is an existing operation in the NW 13-26-05 W5M, the infrastructure necessary for the operation of a gravel pit is already in place. This includes items such as a designated haul route, scale, screening berms. Over time, and as the project develops, new infrastructure will be required and changes to existing infrastructure are also anticipated. A detailed phasing plan is provided as part of BURNCO's Land Use Application. One of the key development strategies associated with that phasing plan is the development of a suitable screening berm along west, north, and east portions of the Project.



In support of the Project, Matrix Solutions Inc. (Matrix) was retained to complete a Visual Impact Assessment. The assessment was conducted to Identify the potential impact of the project development to the visual resources in the area.

Visual resources are defined as the landforms, vegetation, water surfaces, and cultural modifications (physical changes caused by human activities) that give the landscape its visual qualities. A visual resources assessment is the study of the perception of the landscape (both aesthetic and scenic qualities) by the users of the landscape and how this perception may change with new cultural modifications (USDI 1986 a,b).

In order to enhance the appearance of the facility and reduce the impact on neighboring tenants, Matrix created a planting and maintenance plan for a visual screen adjacent to the proposed gravel pit. Rocky View County advises that screening be considered for certain development activities to manage the aesthetics of the landscape.

This assessment was completed in 2019 and is provided as part of BURNCO's Land Use Application and includes the following components:

- Line-of-sight from the viewpoint location to the Project area,
- Documented and potential use of the viewpoint by stakeholders,
- Accessibility of the viewpoint locations to the public,
- Proximity to roads, trails, rivers, settlements locations,
- Locations accessed by recreational users,
- Potential for views over larger portions of the landscape.

Based on this analysis, a berm design and planting plan was developed to mitigate impacts on the visual resources of the area as much as feasible. The resulting designs are shown below.

### Policy #35

# BURNCO will follow the development and planting plan for the screening berm as provided in the MSDP.





Figure 39: Visual Impact Assessment – Planting Plan



A total of 57 receptors were identified in the Study Area (Figure 4). These receptors have been grouped in five peripheral clusters (Clusters A to E) and a central "cluster" ("Cluster" X). There are apparent residences generally clustered in the western area (Clusters A and B). Cluster C represents a combination of individual acreages and points representing a grouping of acreages north of Cochrane.

Areas of Cochrane sit within the Study Area, so a number of point locations representing various neighborhoods and potential development areas were selected, split into two clusters: Cluster D, representing areas north of the Bow River, and Cluster E, representing areas south of the Bow River.

For all 57 point receptors, the visible area was quantified for both the existing conditions and full site mined models, calculating the total VIA Footprint and percentage of the VIA Footprint that is visible from that each receptor. Additionally, the total Study Area visible before and after mitigation and a percentage loss in total Study Area viewshed was calculated (Table 1).

Out of 57 total receptors, a total of 26 receptors did not have a view into the VIA Footprint in the Existing Conditions model case. One of these receptors (X01) sits within 1.6 km of the VIA Footprint.

Of the remaining 31 receptors:

- 10 receptors currently have less than 10% of the VIA Footprint in view. Of these, only 1 receptor (X02) sits within 1.6 km of the VIA Footprint.
- 11 receptors had greater than 10% of the VIA Footprint in view in Existing Conditions model, but proposed berms have reduced this to less than 10% of the VIA Footprint in view. Of these, 4 receptors (X03 to X06) sit within 1.6 km of the VIA Footprint.
- 10 receptors had greater than 10% of the VIA Footprint in view and proposed berms have not reduced this to less than 10% of the VIA Footprint in view. Of these, only 1 receptor (X07) sits within 1.6 km of the VIA Footprint.

For all receptors, an evaluation of the amount of reduction of Study Area viewable from the receptor was undertaken. In almost all cases, the total loss in viewshed is under 10%; the exceptions being the three nearest receptors (X04, X05, and X06) to the VIA Footprint.

The line of sight analysis helps to illustrate the mitigative value provide by the berm design and planting plan. These features should provide significant screening capability for public traveling at road level and to nearby residents. Due to topography, it is not possible to fully screen operations from some residential receptors located around the development due to their significantly higher elevation, but the berm and planting will still provide some level of visual mitigation to these locations.

Figure 40: View of Berm and Planting Plan (Location #2)



Figure 41: View of Berm and Planting Plan (Location #3)



Figure 42: View of Berm and Planting Plan (Location #4)





As described in the Section 3.3, the site will be developed based on milestones related to the progress of the mining areas. Likewise, construction of the screening berm will also be built in phases and will be done so in accordance with the following:

### Phase A:

- Screening berm already in place for this parcel with small extension to be completed as operations move further east.
- Vegetation planting on this section of berm will be completed upon receipt of municipal and provincial permits associated with this application.

### <u>Phase B:</u>

- "B" portion of screening berm to be constructed upon commencement of activity in phase B8.
- Vegetation planting on this section of berm will be completed at the time of construction.

### <u>Phase C:</u>

• "C" portion of screening berm to be constructed upon commencement of activity in phase C12.

### <u>Phase D:</u>

- "D" portion of screening berm to be constructed upon commencement of activity in phase D16.
- Vegetation planting on this section of berm will be completed at the time of construction.

### <u>Phase E:</u>

- "E" portion of screening berm to be constructed upon commencement of activity in phase E22.
- Vegetation planting on this section of berm will be completed at the time of construction.

### Phase F:

 "F" portion of screening berm to be constructed upon commencement of activity in phase F25.

### <u>Phase G:</u>

 "G" portion of screening berm to be constructed upon commencement of activity in phase G28.

### <u>Phase H:</u>

• "H" potion of screening berm to be constructed upon commencement of activity in phase H30.

In all cases, these screening berms will be constructed with an overburden core as insufficient volumes of topsoil and subsoil would be available to construct such significant berms. It is also intended that these berms will remain as a permanent reclamation feature. As such, proper handling of topsoil and subsoil to avoid admixing will be followed:

- Prior to placement of overburden, topsoil and subsoil will be removed from the berm development area and temporarily stockpiled,
- Overburden will then be used to shape the berm,
- Subsoil and topsoil will then be replaced, and the screening berm will be seeded.

### 4.0 Cumulative Effects

The development planning process for the West Cochrane Gravel Pit included an assessment of the cumulative aspects of extraction activities in the area. A review of nearby gravel pits indicated that the closest gravel operations were a significant distance away:

- Big Hill Springs Pit (Registration #15240-00-00) 8.5kms away,
- BURNCO Cochrane Pit (Registration #15944-00-00) 6.0kms away,
- Robinson Pit (Registration #244731-00-00) 8.0kms away,
- Cochrane Pit (Registration #15685-00-00) 6.0kms away,
- Griffin Pit (Registration #15328-00-00) 4.8kms away.

Due to these distances, and after reviewing their locations and likely scale of operations, no cumulative impact was predicted.

As described earlier, BURNCO has completed various impact assessments related to the West Cochrane Gravel Pit. These assessments included review of predevelopment conditions, operating conditions and post development conditions. Potential impacts have been identified and appropriate mitigations developed. It should also be noted that assessments were completed with both areas of the West Cochrane Gravel Pit assumed to be in operation (east side plus west side). With these mitigations in place, BURNCO is confident that impacts related to this development have been mitigated as much as reasonably possible, that the site will not have an undue impact, and that the West Cochrane Gravel Pit will be operated in a socially and environmentally responsible manner.

### Policy #36

### BURNCO will provide Annual Reporting to Rocky View County and in accordance with Development Permit requirements.

### 5.0 Reclamation Plan

BURNCO always strives to promptly reclaim their operations back to an equivalent land capability and to re-establish a similar grade and drainage patterns that existed prior to disturbance. The site will be predominantly reclaimed back to agricultural use as shown in the reclamation drawings provided in Appendix 3.

### Policy #37

BURNCO will reclaim areas promptly wherever possible and in accordance with the reclamation contours and cross-sections in the MSDP. In addition, BURNCO will limit maximum disturbed area on the west side to 70 acres at any single time. The maximum planned disturbance area on the east side will be 51 acres. The total maximum disturbed area at any single time will be 121 acres.

### 5.1 Landscaping and Closure

As described in Section 3.14, the screening berms built adjacent to Highway 1A will be left as a permanent reclamation feature. These screening berms will have been constructed with an overburden core and should have mature landscaping at the time of final reclamation.



The contouring associated with this permanent feature is shown on the reclamation plan in DWG. NO. 6 in Appendix 3.

### 5.2 Soil Salvage

All topsoil and subsoil on site will be salvaged and used in the final reclamation. Topsoil and subsoil salvage will not occur under wet, frozen, adverse field conditions or high wind velocities that will result in mixing, loss, compaction or degradation of soil. Topsoil and subsoil will be salvaged a minimum of three meters ahead of pit faces.

In some instances, topsoil and subsoil will be placed along the west development boundary for use in creating screening berms. These stockpiles will be separated from each other with topsoil used to develop the south portion of the berm and browns used to develop the north portion of the berm. These screening berms will be vegetated as soon as possible and will be sloped 3:1 with a three-meter top. Stockpile site locations will be prepared so that:

- Stockpiles are placed on stable ground,
- Stockpiles are placed in locations unaffected by pit activities,
- Stockpiles are stabilized to minimize erosion.

As much as possible, topsoil and subsoil will be directly placed into areas of reclamation.

### Policy #38

BURNCO will ensure proper soil salvage and will follow the protocols provided in the MSDP related to soil salvage.

### 5.3 Subgrade

Placement of fill and rough grading will follow the contour plan shown in Appendix 3 Drawing No. 5: Site Reclaimed Map. Once subgrades are established, areas will be ripped and cross ripped to a depth of 0.3 meters to ensure decompaction of the subgrade. Ripping can help improve soil conditions by breaking up the surface of the overburden, increasing infiltration of surface water, and creating a better root zone.

### 5.4 Soils Placement

Once subgrades are established and decompacted, subsoil and topsoil will be spread evenly. Target replacement depths will be based on parcel and will be 85% of the pre-disturbance soils depths as detailed in Section 2.4 of this report.

### 5.5 Vegetation

Once topsoil has been evenly placed, the reclaimed areas will be re-vegetated to hayland using drill seeding at a rate no less than 22 kg/acre. Grass seed mixture will be 30% wheatgrass, 40% smooth brome, 30% Kentucky bluegrass. Once seeding is complete, a program of cutting and fertilizing will take place as necessary to ensure the hayland becomes established.

### 5.6 Inactive Pit Conservation & Reclamation

At all time, the pit will be clearly identified by signs that indicate danger and discourage trespassing. Slopes around structures and equipment will be stabilized and sloped no steeper than 3:1. During periods of inactivity of over six months, pit faces will be sloped no steeper than



2:1. Stockpiles will be vegetated, and the weeds will be sprayed and mowed. The site will be monitored to ensure soil reclamation material is stable, weeds are controlled, and the site is secure.

Once the above items have been completed, the site will be monitored on a monthly basis to ensure soil reclamation material is stable, weeds are controlled, and the site is secure.

#### Policy #39

# BURNCO will follow the protocols provided in the MSDP related to inactive pit conservation and reclamation.

### 6.0 Conclusion

The BURNCO West Cochrane Pit has been in successful operation since 2016. BURNCO would like to continue operating at this location and is seeking to increase the permitted area of the pit and secure the long-term future of the project. This report outlined how BURNCO would address the concerns that were expressed about the development of the project. It also presents the various studies that have been undertaken by independent professionals to look at the scientific data and determine the project impacts and prescribe mitigation measures.

This project presents a great opportunity for Rocky View County and the people of Alberta in continuing to meet the growing demand for aggregates. These aggregates are critical in building our communities and maintaining our quality of life.

BURNCO is committed to the highest level of care and compliance in all our developments. It is BURNCO's belief that by following the Project Activities Plan for the lands associated with the proposed development, that BURNCO's West Cochrane Pit can continue to operate in a socially and environmentally responsible manner for many years to come.

# Appendix 1: Supporting Documents Submitted with Land Use Application

- 1: Drawings
- 2: Application for Amendment to Land Use Bylaw
- 3: Land Titles and Landowner Consents
- 4: Biophysical Impact Assessment
- 5: Stormwater Management Plan
- 6: Erosion and Sediment Control (ESC) Plan
- 7: Environmental Noise Impact Assessment
- 8: Air Quality Assessment
- 9: Groundwater Impact Assessment
- 10: Visual Resources Assessment
- 11: Traffic Impact Assessment
- 12: Historic Resources Impact Assessment
- 13: Open House #1 Summary
- 14: Open House #2 Summary
- 15: Existing Permits and Authorizations

### Appendix 2: MSDP Policy Summary

### Policy #1

BURNCO will secure appropriate approvals to excavate aggregate and develop within all onsite Road Allowances and will follow applicable terms and conditions as negotiated with the County and Alberta Transportation.

### Policy #2

BURNCO will secure an approved Registration from Alberta Environment & Parks under the Code of Practice for Pits before commencing operations.

### Policy #3

Aggregate development within the MSDP area shall comply with all relevant municipal, provincial and federal legislation, regulations and policies.

### Policy #4

BURNCO will secure historical resource clearance from Alberta Culture & Tourism before commencing operations in uncleared areas of the project.

### Policy #5

BURNCO will follow the hours of operation as determined by Rocky View County as part of the Development Permit process.

### Policy #6

BURNCO will follow the development phasing plan as illustrated in the MSDP.

### Policy #7

BURNCO will install site signage. This will include perimeter signage to discourage trespassing as well as entrance signage as necessary to identify the site and provide key information to the public.

### Policy #8

Site signage shall include a 24-hour phone number for neighbors to call in the event of questions or concerns.

### Policy #9

BURNCO will secure a proximity agreement with the applicable operator before any activities within 30m of any utility Right-Of-Way.



### Policy #10

BURNCO will follow the noise control measures detailed in the MSDP. In addition, BURNCO will utilize enhanced mitigation measures if necessary, to ensure that noise is reasonably controlled and does not become a nuisance.

### Policy #11

BURNCO will follow the dust control measures detailed in the MSDP. In addition, BURNCO will utilize enhanced mitigation measure if necessary, to ensure that dust is reasonably controlled and does not become a nuisance.

### Policy #12

Operations at the pit will be compliant with the Alberta Ambient Air Quality Objectives (AAAQO).

### Policy #13

BURNCO will provide full time noise monitoring during periods when both night time operations are occurring, and operations are within 400m of an occupied residence. Full time monitoring for dust will occur when gravel pit operations are within 400m of an occupied residence.

### Policy #14

BURNCO will follow the complaint response protocol provided in the MSDP related to noise and dust complaints.

### Policy #15

BURNCO will monitor water levels in the network of 18 monitoring wells spread across the project. Continuous monitoring will occur in no less than 6 wells. Continuous monitoring will be done in wells situated between active operations and adjacent landowners as well as in accordance with direction from Alberta Environment & Parks.

### Policy #16

BURNCO will secure Water Act approvals as necessary from Alberta Environment & Parks related to dewatering, bailing, or any other activities in the groundwater table before commencing such operations.

### Policy #17

BURNCO will complete a baseline monitoring program for any residential water well located within 400m of the project boundary if requested by the owner.

### Policy #18

BURNCO will follow the complaint protocol provided in the MSDP related to groundwater security.

F-1 - Attachment C Page 92 of 113

West Cochrane Gravel Pit – Master Site Development Plan

### Policy #19

BURNCO will secure Water Act approvals as necessary from Alberta Environment & Parks related to gravel washing before commencing such operations.

### Policy #20

BURNCO will continue to utilize the upgraded intersection at Range Road 51 and Highway 1A for all activities west of Grade Valley Creek (phases A1-A7, B8-B11, C12-C15, and D16-D21).

### Policy #21

In future, BURNCO will develop an upgraded intersection at Range Road 45 and Highway 1A for all activities east of Grade Valley Creek (phases E22-E24, F25-F27, G28-G31, and H30). This upgrade will be built to the standard required by Rocky View County and Alberta Transportation.

### Policy #22

No aggregate operations shall occur within the MSDP area without approval of a Roadside Development Permit from Alberta Transportation.

### Policy #23

BURNCO will follow the protocol provided in the MSDP related to haul safety.

### Policy #24

BURNCO will follow the protocol provided in the MSDP related to haul monitoring.

### Policy #25

BURNCO will ensure that regional stormwater flows are not impacted. All flows generated in the upstream catchment areas of Grand Valley Creek and/or Beaupre Creek will continue to pass through the project area.

### Policy #26

BURNCO will ensure that stormwater from the active mining area is collected and not discharged from the site.

### Policy #27

BURNCO will follow the reclamation recommendations in the MSDP related to drainage. This will ensure that the reclaimed site does impact local or regional drainage patterns.

### Policy #28

Stormwater will be managed in accordance with the submitted Conceptual Stormwater Management Plan.



### Policy #29

BURNCO will follow the setback and restricted activity requirements identified in the MSDP in relation to wildlife, wetlands, riparian areas and watercourses.

### Policy #30

BURNCO will secure necessary authorizations from Alberta Environment & Parks related to the berm and vehicle crossing at Beaupre Creek before commencing these developments.

### Policy #31

BURNCO will follow the recommendations in the MSDP related to impact assessment and managing cumulative effects for Vegetation and Wildlife. These measures will ensure limited impact on geology, hydrology, soils and topography, vegetation and wetlands, wildlife and wildlife habitat, fish and fish habitat.

#### Policy #32

BURNCO will control weeds during operations and reclamation. These efforts will be compliant with the Weed Control Act and the Rocky View County Land Use Bylaw.

### Policy #33

BURNCO will follow the hazardous waste plan in the MSDP.

### Policy #34

BURNCO will follow the erosion and sediment control measures in the MSDP.

### Policy #35

BURNCO will follow the development and planting plan for the screening berm as provided in the MSDP.

#### Policy #36

BURNCO will provide Annual Reporting to Rocky View County and in accordance with Development Permit requirements.

### Policy #37

BURNCO will reclaim areas promptly wherever possible and in accordance with the reclamation contours and cross-sections in the MSDP. In addition, BURNCO will limit maximum disturbed area on the west to 70 acres at any single time. The maximum planned disturbance area on the east side will be 51 acres. The total maximum disturbed area at any single time will be 121 acres.

### Policy #38

BURNCO will ensure proper soil salvage and will follow the protocols provided in the MSDP related to soil salvage.



### Policy #39

BURNCO will follow the protocols provided in the MSDP related to inactive pit conservation and reclamation.

F-1 - Attachment C Page 95 of 113 BURNCO

West Cochrane Gravel Pit – Master Site Development Plan

# Appendix 3: Drawings




























F-1 - Attachment C Page 109 of 113











## F 1 - Attachment D Page 1 of 5 ROCKY VIEW COUNTY

# Location & Context

### **Redesignation Proposal**

Development Proposal: To redesignate portions of 3 parcels, and 5 whole parcels totaling ± 391.10 hectares (± 966.43 acres) from Agricultural - General District to Special - Natural Resources for aggregate extraction (File: PL20200066)

A Master Site Development Plan has been submitted in support of this development proposal (File: PL20200067), to include the existing S-NAT parcel.

Division: 09 Roll: 06915001/06914002/069140 01/06913001 /06913002/06913003/06818 002/06818003/06818004 File: PL20200067 Printed: Mar 1, 2021 Legal: NE-15-26-05-W05M, NPAGYE 1449.051/05/9 SE/NW/NE-13-26-05-W05M, SW/NW/E-18-26-04-W05M

#### ATTACHMENT 'D': MAP SET



F 1 - Attachment D Page 2 of 5 ROCKY VIEW COUNTY

# Development Proposal

### **Redesignation Proposal**

Development Proposal: To redesignate portions of 3 parcels, and 5 whole parcels totaling ± 391.10 hectares (± 966.43 acres) from Agricultural - General District to Special - Natural Resources for aggregate extraction (File: PL20200066)

A Master Site Development Plan has been submitted in support of this development proposal (File: PL20200067), to include the existing S-NAT parcel.

Division: 09 Roll: 06915001/06914002/069140 01/06913001 /06913002/06913003/06818 002/06818003/06818004 File: PL20200067 Printed: Mar 1, 2021 Legal: NE-15-26-05-W05M, NPAGYE 14-50-05-W05M, SE/NW/NE-13-26-05-W05M, SW/NW/E-18-26-04-W05M

#### ATTACHMENT 'D': MAP SET



F 1 - Attachment D Page 3 of 5 ROCKY VIEW COUNTY

# Environmental

## **Redesignation Proposal**

Development Proposal: To redesignate portions of 3 parcels, and 5 whole parcels totaling ± 391.10 hectares (± 966.43 acres) from Agricultural - General District to Special - Natural Resources for aggregate extraction (File: PL20200066)

A Master Site Development Plan has been submitted in support of this development Subject Lands Contour - 2 meters Riparian Setbacks Alberta Wetland Inventory Surface Water

Division: 09 Roll: 06915001/06914002/069140 01/06913001 /06913002/06913003/06818 002/06818003/06818004 File: PL20200067 Printed: Mar 1, 2021 Legal: NE-15-26-05-W05M, NPAct 4-56-05-W05M, SE/NW/NE-13-26-05-W05M, SW/NW/E-18-26-04-W05M

#### ATTACHMENT 'D': MAP SET



E-1 - Attachment D Page 4 of 5 ROCKY VIEW COUNTY

# Soil Classifications

### **Redesignation Proposal**

Development Proposal: To redesignate portions of 3 parcels, and 5 whole parcels totaling ± 391.10 hectares (± 966.43 acres) from Agricultural - General District to Special - Natural Resources for aggregate extraction (File: PL20200066)

A Master Site **Development Plan has** been submitted in support of this development proposal (File: PL20200067), to include the existing S-NAT parcel.

Division: 09 Roll: 06915001/06914002/069140 01/06913001 /06913002/06913003/06818 002/06818003/06818004 File: PL20200067 Printed: Mar 1, 2021 Legal: NE-15-26-05-W05M, NP/andre 14-32-05fW705/9 SE/NW/NE-13-26-05-W05M, SW/NW/E-18-26-04-W05M



SE/NW/NE-13-26-05-W05M, SW/NW/E-18-26-04-W05M

| From:    |                                                        |
|----------|--------------------------------------------------------|
| To:      | Oksana Newmen; Dominic Kazmierczak                     |
| Cc:      |                                                        |
| Subject: | [EXTERNAL] - Re: Update on Burnco Aggregate Submission |
| Date:    | March 9, 2021 11:14:31 AM                              |

Do not open links or attachments unless sender and content are known.

Hi Oksana,

After discussing with several parties, Rocky View and the latest hearings have set precedences on several areas that we believe Administration is responsible to include:

- water security: Lehigh and Mtn Ash agreed on water monitoring of neighbour wells, the latest up to 1.5 miles.

Darryl's well is only 40 feet deep and in the gravels.

Our dry holes immediately across from the pit showed water formation in the gravels. Without water security, we have nothing.

Hydrogeological studies are complex for all the areas. The applicant reports are not validated by third party experts.

The opposition hydrogeological experts showed significant evidence.

Alberta Environment process doesn't involve or circulate to adjacent landowners who water security is critical!

- performance measures and standards: Lehigh discussed. Mtn Ash agreed to monitoring and reporting

- size of pit: the approved Mtn Ash pit was a portion of 320 acres or about 150-160 acres in size. McKyler said she might have approved a smaller Lehigh pit?

As our largest neighbour and experienced business said phases of 10 years for the Burnco pit. Current pit was approved 2011 for 10 year pit of six phases.

Market conditions and transportation and other factors show the pit is still processing the first phase and has large piles of gravel stored waiting.

Councillor 9 has changed 3 times in 10 years. Only one councillor was on RV Council 2011 when the pit of 10 years was approved.

- since covid the tourists, traffic and area have seen significant increases. The Bow River Valley is a significant corridor and provides water security to millions downstream!

There are more points that we and our neighbours will be submitting once we know the applicant timelines and get the revised reports.

The applicant has over 4.5 months to review and revise. We expect to be given reasonable time frames of 60-90 days too.

Appreciate this topic is extremely important to our family for now and future generations!

Ann McKendrick McNabb

On Mar 8, 2021, at 11:52 AM, ONewmen@rockyview.ca wrote:

Hi Ann,

Sorry, I've not forgotten you! And Happy International Women's Day to you as well 😊

I'll send an update by the end of today.

Warm regards, ~Oksana

 From: Ann McNabb

 Sent: March 8, 2021 11:35 AM

 To: Oksana Newmen <<u>ONewmen@rockyview.ca</u>>

 Cc: Will McNabb P.E.

Subject: [EXTERNAL] - Re: Update on Burnco Aggregate Submission

Do not open links or attachments unless sender and content are known.

Hello Oksana,

Happy International Women's day! Hope you have a special day.

Just wondering if you have any answers?

Please confirm that you have received my requests? I do not know if you are working or if I should send my requests to Dominique?

Appreciate,

Ann

On Mar 1, 2021, at 13:40 PM, Ann McNabb wrote:

Hello Oksana,

Hope all is going well.

I submitted a video to the Feb 16, 2021 MDP hearing and

recommended some motions.

I am wondering if you have received an update for the Cochrane West pit from Burnco?

Will the parties who submitted and adjacent landowners be circulated and given adequate time of 8-12 weeks to comment?

Is there an anticipated time that there will be a public hearing? or any date established?

Are you involved with the Mt Ash March 2, 2021 hearing?

I have yet to hear from Alberta Environment appeal. There is growing evidence from all the Lehigh Hanson and Mtn Ash hearings technical experts that there is significant potential for impact on the water aquifer.

That is what we stated in 2009-2011 hearing for the West Cochrane now Burnco pit.

Appreciate your feedback.

Ann

Ann McKendrick McNabb President McKendrick Ranches Ltd.

| From:    | PAA Development                                                   |
|----------|-------------------------------------------------------------------|
| To:      | Oksana Newmen                                                     |
| Subject: | FW: [EXTERNAL] - Public comment, Burnco West Cochrane gravel pit. |
| Date:    | June 14, 2021 9:12:28 AM                                          |

Hi Oksana,

Some feedback regarding your upcomoing burnco gravel pit file west of Cochrane.

Best regards,

EVAN NEILSEN Development Assistant | Planning Services

ROCKY VIEW COUNTY 262075 Rocky View Point | Rocky View County | AB | T4A 0X2 Phone: 403-520-7285 ENeilsen@rockyview.ca | www.rockyview.ca

This e-mail, including any attachments, may contain information that is privileged and confidential. If you are not the intended recipient, any dissemination, distribution or copying of this information is prohibited and unlawful. If you received this communication in error, please reply immediately to let me know and then delete this e-mail. Thank you.

-----Original Message-----From: Christine Harrison <CHarrison@rockyview.ca> Sent: June 14, 2021 9:02 AM To: PAA\_Development <Development@rockyview.ca> Cc: Brenda Shute <BShute@rockyview.ca> Subject: FW: [EXTERNAL] - Public comment, Burnco West Cochrane gravel pit.

Hello,

We have received this email in our general mailbox for your department, please respond to this inquiry.

We respectfully request you confirm contact when this inquiry is completed.

Thank you.

CHRISTINE HARRISON Call Centre Representative || Customer Care and Support

ROCKY VIEW COUNTY 262075 Rocky View Point | AB | T4A 0X2 Phone: 403-230-1401 charrison@rockyview.ca | www.rockyview.ca

This e-mail, including any attachments, may contain information that is privileged and confidential. If you are not the intended recipient, any dissemination, distribution or copying of this information is prohibited and unlawful. If you received this communication in error, please reply immediately to let me know and then delete this e-mail. Thank you.

-----Original Message-----From: Andrew Woolley Sent: June 13, 2021 10:27 PM To: Questions <questions@rockyview.ca> Subject: [EXTERNAL] - Public comment, Burnco West Cochrane gravel pit.

Do not open links or attachments unless sender and content are known.

(Can you please pass this on ready for the hearing?)

"Yes, but not until after the Highway 1A and 22x new junction has been completed. It is already horribly difficult to manage to cross at various times of the day and the truck traffic will make it much, much worse."

Thank you.

Andrew Woolley Ghost Lake June 2, 2021

Via Email

Rocky View County 262075 Rocky View Point Rocky View County, Alberta T4A0X2

Attention: Oksana Newman, Planner

Re: Burnco West Cochrane Proposed Bylaw C-8073-2020 Application PL20200066 to amend Rocky View Land Use Bylaw (the "Proposed Bylaw Amendment")

McKendrick Ranches Ltd. (MRL), McNabb Developments Limited (MDL), and Ann McKendrick McNabb, are opposed to the Proposed Bylaw Amendment, which was presented to Rocky View (RV) Council and received first reading September 1, 2020.

**Our first and primary concern is the size of the proposed pit**. If approved, this Land Use and subsequent mine expansion would create 452 hectares (1,117 acres) of contiguous lands zoned as NRI for a gravel mining and aggregate processing expansion. The proposed land use would rezone approximately 6.5 km of lands south of the highway 1A along the Bow River.

Rezoning an area this large for resource extraction without a Rocky View gravel strategy is risky and unwise. Rocky View has not developed a gravel strategy and policies to allow a mix of land uses in a developing a community for the next 120 years. Policies need to be established to allow growth, planning, operating, reclamation, and environmental standards to protect surrounding residents from the harmful health, water, and numerous concerns. Currently the County approves land use assuming the extensive regulatory approvals which don't engage the community. Approving decades (or potentially a century +) of gravel with current policies and practices is not be in the best interests of future Councils and future generations of Rocky View residents. At a recent Council meeting, it was stated Rocky View has 50 or more years of gravel supply, so taking the time now to get this right is imperative.

Burnco has advised their current operations are 125,000 tonnes per year. At this rate, the current zoned 151 ac pit allows for 20 years of supply. At this time we feel there is no need to expand. The proposed total expanded pit is estimated to be 15 million tonnes would take 120 years of gravel extraction at the current yearly sales. Burnco's proposed MSDP states that they plan to increase the production to 500,000 tonnes per year over the next few years but these numbers are purely speculative. If these rates were ever to be achieved, Burnco proposes the pit will result in 30-35 years of aggregate extraction, which based on past performance we feel are not achievable.

Our concern is that if Rocky View approves between 30-120 years of gravel production, spanning 6.5 km along a critical county and tourist highway corridor, the County and the Community will lose the ability to apply good planning principals, will sterilize the entire area, and impact the highest and best use of this area along the beautiful Bow River west of Cochrane. This is directly contrary to Rocky View new Municipal Development Plan (MDP).

**Recommend that Council grant Aggregate Land Use for an area that can be mined and reclaimed in a ten-year period or for an additional 160acres.** This would allow Burnco to continue development and minimize impact to adjacent property owners, allow review of the environmental impact and critical Bow River water aquifer, and understand the performance monitoring Burnco has identified in the MSDP and proposed Direct Control monitoring measures. The Land Use timeframe should be defined for a specific period so that the County, adjacent properties, and the community can plan for future land use and development growth with the County's and Bow River Community's best interest in mind.

Recommend Rocky View table the bylaw until third party reviews of water quality are conducted and presented to Rocky View given concerns of water aquifer needs to adjacent owners, First Nations, and downstream water intakes by Cochrane and Calgary. A scientific study done by Jon Fennel (attached) shows the current 151 ac Burnco pit, has water samples with concentrations of these constituents: aluminum, chromium, arsenic, lead, cadmium, cobalt, copper, iron, and zinc were found to be in excess of guidelines for the protection and freshwater aquatic life in Alberta's surface waters (Alberta Environment 2018). Some were also in excess of Health Canada's 2020 Guidelines for Canadian Drinking Water Quality, those being: aluminum, arsenic, lead, iron, mercury and manganese. Further reviews should ensure biophysical impact and environmental sensitive setbacks of Grand Valley Creek are adequate before consideration of rezoning.

**Recommend Rocky View table the bylaw until the MSDP is updated to not impact neighbouring properties.** We ask that Burnco revise their MSDP to not impact neighbouring properties when it comes to impacts such as dust. Currently Burnco shows dust impacts extending onto neighbouring properties, we feel that is unfair and unnecessary and needs to be remedied before rezoning is considered as the MSDP forms part of the bylaw being contemplated by Council.

In summary, we are opposed to a gravel development of 1117 ac and 6.5 km along the Bow River 1A corridor which contain some of the most picturesque views in all of Rocky View County. We urge Rocky View Council to limit Burnco to the amount of land that can be developed and reclaimed in a ten-year time frame.

We also urge Council to table this bylaw until third party reviews are completed to validate the potential impact of the current and any future expansion of the Burnco pit on the drinking water quality for adjacent properties, Cochrane, Calgary, downstream users, and the aquatic life of this ecosystem.

Sincerely,

Ann McKendrick McNabb, President McKendrick Ranches Ltd. William McNabb, President McNabb Developments Kari-Ann McNabb, Vice President McNabb Developments

# Summary of a scientific experiment by Dr. Fennell, M.Sc., Ph.D., P.Geol. Hydrogeologist & Geochemist, see attached report and data for the complete results.

An experiment was conducted on a sample of sand and gravel obtained from Burnco's current West Cochrane Pit. This pit is part of a large development currently under review by Rocky View County. The area extends for 6 or more kilometers along the Bow River approximately 7km west on Highway 1A from the Highway 1A/22 intersection. The purpose of this experiment was to assess what type of changes to water quality might occur after flowing deionized water these sediments. The purpose was to mimic the infiltration of snowmelt and/or rainfall through a thin (1.25m) column of soil (see Figure 1).



Figure 1. Experimental setup, execution, and sample turbidity noted.

Test results showed a significant increase in turbidity (0 to >4000 NTU), pH (5 to 9.1), and the chemical quality of the effluent water. The most notable changes were related to metals and trace elements, many exceeding published guidelines to protect humans and aquatic receptors (see the following table).

| Parameter            | Soil flush<br>#1 | Soil flush<br>#2 | AB Tier<br>1       | AB<br>FWAL         | CDWQ        |
|----------------------|------------------|------------------|--------------------|--------------------|-------------|
| Turbidity (NTU)      | >4000            | 1600             |                    | 2                  | 1           |
| Aluminum (mg/L       | 6.1              | 4.0              | 0.05               |                    | <0.1 og     |
| Arsenic (mg/L        | 0.019            | 0.009            | 0.005              | 0.005              | 0.010 alara |
| Cadmium (µg/L)       | 0.53             | 0.44             | 0.34*              |                    |             |
| Chromium (mg/L)      | 0.013            | 0.020            | 0.001+<br>0.0049++ | 0.001+<br>0.0089++ | 0.05 мас    |
| Cobalt (mg/L)        | 0.0095           | 0.0071           | 0.0015*            |                    |             |
| Copper (mg/L)        | 0.0150           | 0.0097           | 0.0070             | 0.0390             | 2 ao        |
| Iron (mg/L)          | 17               | 12               | 0.3                |                    | ≤0.3 ao     |
| Lead (mg/L)          | 0.010            | 0.0073           | 0.007*             |                    | 0.005 alara |
| Manganese (mg/L)     | 0.81             | 0.74             | 0.05               |                    | 0.12 мас    |
| Mercury-total (mg/L) | Not              | 0.030            | 0.000005           |                    | 0.001 MAC   |
| Zinc (mg/l)          | 0.120            | 0.073            | 0.030              |                    | 5.0 AO      |

Notes:

1. Values indicated for protection of freshwater aquatic life relate to long-term exposure.

2. \* Assumes a groundwater hardness of 250 mg/L (as CaCO<sub>3</sub>).

3. + = hexavalent; ++ = trivalent.

3. MAC = maximum acceptable value; ALARA = as low as reasonably achievable; AO = aesthetic value; OG = operational guidance value.

The proposed development of the West Cochrane Pit by Burnco will significantly, and permanently, alter the natural landscape of this picturesque area and forever change the conditions by eliminating the filtering capacity of the soils to contaminants mobilized or introduced during pit operation and following site reclamation. And given the estimate groundwater flow rates, based on available site information ( from around 150 to more than 500 m/yr) the threat of impact to nearby receptors is notable.



Exposing sand, gravel, and bedrock to weathering and flushing has the potential to increase risk to the local environment from mobilized or introduced contaminants. Not only will fish-bearing streams like the Bow be put at risk, but also the drinking water supplied of downstream communities. If this is not properly assessed we are placing these receptors at risk. Unfortunately, we are left with more questions than answers. And for such a highly intrusive, visually unappealing, and extremely disruptive project wouldn't you want to know?

The concern with the current application before Rocky View County is that it does nothing to assess the impacts that may occur around a VERY LARGE gravel pit development, despite the opportunity to clarify these outstanding questions and concerns.

# Why is it always have to be left up to the public to seek the truth about such gravel developments?

# Why can't proponents do a more thorough job of assessing the risks?

June 5, 2021

Attention: To whom it may concern

# Re: West Cochrane Pit soil column flushing experiment

The following is a summary of the experiment conducted on a sample of sand and gravel obtained from Burnco's currently operating West Cochrane Pit, located approximately 7 km west on Highway 1A from the Highway 1A/22 intersection. The purpose of this test was to assess the possible physical and chemical changes that may occur to water (i.e. precipitation) flowing through these sediments and entering the local groundwater.

# <u>Methodology</u>

A sample of sand and gravel was procured from the Burnco West Cochrane Pit for testing. Once delivered, a subset of that sand and gravel was placed in a newly purchased, and cleaned, plastic 20L pail for delivery to the point of testing. On 08 May 2021 a representative aliquot of the sand and gravel, comprising a mixture of clay, silt, sand and cobbles, was loaded into a pre-cleaned 1.5 m x 51 mm ID PVC pipe to mimic a vertical soil column beneath the Burnco pit area. A pre-cleaned plastic container was used to load the sample into the PVC pipe to avoid the use of any metallic equipment. Prior to loading the sample, the base of the PVC pipe was covered with clean fibreglass mesh to retain the soil sample the pipe. Once in place, settling of the sediment was achieved by tapping the outside of the pipe with a small hammer to compact the material towards natural in-situ conditions.

Laboratory-grade deionized water was obtained from the contacted laboratory (Bureau Veritas, BV) to react with the soil column. Prior to adding the deionized water to the soil, the length of the sediment column was measured indicating a 1.25 m vertical thickness. When ready the soil column was slowly hydrated with the deionized water to mimic infiltration of precipitation. Once the water began draining from the base of the PVC pipe, unfiltered samples were collected into sample bottles provided by BV (i.e. HDPE and glass, where required).

An initial set of samples (Soil flush #1) was collected on 08 May 2021 at 11:30AM. Once obtained and properly labelled the samples were placed in a refrigerator. The soil column was then allowed to drain over-night and a second set of samples (Soil flush #2) was collected the following day, 09 May 2021 at 10:45AM, using the same deionized water flow-through procedure.



Figure 1. Experimental setup, execution, and sample turbidity noted.

Upon completion of testing, both sample sets were placed in an ice-filled cooler to maintain their integrity while in transit to BV in northeast Calgary AB. Stand chainof-custody (CoC) protocols were followed to track the shipping and handling process. Delivery was made within 48 hours for the first set of samples, and 24 hrs for the second set. A copy of the completed CoC is provided in Appendix 1. During the testing procedure, photographs were taken to document the process. Visual turbidity of the samples was noted at the time, as indicated in the photographs provided in Figure 1.

# Analytical program

A relatively comprehensive analytical program was executed to assess changes to the deionized water quality following its transit through the soil column. Analysis was completed for the following:

- pH, alkalinity, and hardness,
- major ions (calcium, magnesium. sodium, potassium, bicarbonate + carbonate, sulphate, and chloride),
- nitrate and nitrite,
- metals and trace elements (including mercury), and
- turbidity.

All samples were received in good order, as documented by BV on the CoC. Sample temperatures were logged in at less than the require 10°C threshold and were received within the required time limit for sensitive parameters including turbidity and nitrate+ nitrite. The high quality of the deionized water was confirmed by BV (Appendix 1). A Certificate of Analysis for the two tests was provided (Appendix 2).

# **Results**

As noted in Appendix 1, the deionized water used for the testing was devoid of any particulate or dissolved constituents, much like natural precipitation. Measurement with a hand-held TDS meter confirmed a "zero" mineralization. The pH and temperature were also measured at the time of testing with a combination

3 | Page

hand-held meter and returned values of 5 to 6 and 13°C to 14°C, respectively, on both days.

After confirming the starting conditions of the deionized water, the water was slowly flowed through the sediment column. Samples collected from the base were very different in appearance compared to the water that was added at the top. Of particular note was the colour and turbidity as noted in the lower right image of Figure 1. The occurrence of such turbidity is surprising considering the assumption often made that fine particles will be strained or filtered out as the water flows through the subsurface. However, this was obviously not the case. Measured values for Soil flush #1 and Soil flush #2 were >4000 NTU and 1600 NTU, respectively (Appendix 2).

In addition to turbidity, the chemical quality of the deionized water was also notably changed after reacting with the soil mixture. For example, the total dissolved solids (TDS) content increased from a pre-test value of 0 mg/L to 47 mg/L for Soil flush #1 and to a value of 39 mg/L for Soil flush #2. The laboratory pH also increased significantly to 9.1 for both tests. This represents a change from mildly acidic to alkaline conditions following a rather short reaction time and is indicative rapid reactions occurring as the water flowed through the soil mixture (e.g. ion exchange).

Prior to conducting further data evaluation a check on the correctness of analysis was performed. This included a review of the anion-cation charge balance to confirmed acceptability. The values obtained for both samples (-1.1% and 1.9%, respectively) were within the recommended standard of  $\pm 2\%^1$ . An additional test was performed where the ratio of reported TDS versus calculated TDS was compared. The range of acceptability is between 1.0 to 1.2<sup>1</sup>, and the values obtained for the two soil flush tests were 1.01 and 1.00, respectively. Based on these confirmations the results from both tests were considered acceptable for further evaluation.

Other changes that occurred to the deionized water were less visual and more chemical in nature, with some of the constituents returning values in excess of

<sup>&</sup>lt;sup>1</sup> Standard Methods for the Examination of Water and Wastewater

published water quality criteria. The criteria used for comparison is this study included:

- Alberta Tier 1 Soil and Groundwater Remediation Guidelines for agricultural land (Alberta Government 2019)
- Environmental Quality Guidelines for Alberta Surface Waters for the protection of freshwater aquatic life - FWAL (Alberta Government 2018)
- Guidelines for Canadian Drinking Water Quality CDWQ (Health Canada 2020)

The following table summarizes a number of parameters in the soil flush effluent that exhibited values in excess of the above-noted criteria:

| Parameter            | Soil flush<br>#1 | Soil flush<br>#2 | AB Tier<br>1       | AB<br>FWAL         | CDWQ               |
|----------------------|------------------|------------------|--------------------|--------------------|--------------------|
| Turbidity (NTU)      | >4000            | 1600             |                    | 2                  | 1                  |
| Aluminum (mg/L       | 6.1              | 4.0              | 0.05               |                    | <0.1 <sub>OG</sub> |
| Arsenic (mg/L        | 0.019            | 0.009            | 0.005              | 0.005              | 0.010 alara        |
| Cadmium (µg/L)       | 0.53             | 0.44             | 0.34*              |                    |                    |
| Chromium (mg/L)      | 0.013            | 0.020            | 0.001+<br>0.0049++ | 0.001+<br>0.0089++ | 0.05 mac           |
| Cobalt (mg/L)        | 0.0095           | 0.0071           | 0.0015*            |                    |                    |
| Copper (mg/L)        | 0.0150           | 0.0097           | 0.0070             | 0.0390             | 2 <sub>AO</sub>    |
| Iron (mg/L)          | 17               | 12               | 0.3                |                    | ≤ <b>0.3</b> ao    |
| Lead (mg/L)          | 0.010            | 0.0073           | 0.007*             |                    | 0.005 alara        |
| Manganese (mg/L)     | 0.81             | 0.74             | 0.05               |                    | 0.12 мас           |
| Mercury-total (mg/L) | Not .            | 0.030            | 0.000005           |                    | 0.001 mac          |
| Zinc (mg/l)          | 0.120            | 0.073            | 0.030              |                    | 5.0 ao             |

Notes:

1. Values indicated for protection of freshwater aquatic life relate to long-term exposure.

2. \* Assumes a groundwater hardness of 250 mg/L (as CaCO<sub>3</sub>).

3. + = hexavalent; ++ = trivalent.

3. MAC = maximum acceptable value; ALARA = as low as reasonably achievable; AO = aesthetic value; OG = operational guidance value.
Measured values for the other constituents analyzed are provided in Appendix 2. However, those listed in the preceding table represent the most notable in terms of risk to human and ecological receptors.

### **Discussion**

The proposed development of the West Cochrane Pit by Burnco will significantly, and permanently, alter the natural landscape of this picturesque area. Although Burnco indicates that the anticipated change to the local groundwater and surface water will be negligible, that claim has not actually been substantiated. Baseline groundwater quality was established by Burnco back in 2018, but no follow-up water quality monitoring has been conducted since. This includes in and around the currently operating pit area, which was commissioned following the 2018 program.

In light of the results generated by this experiment, concern exists that particulate matter and dissolved constituents will be mobilized from disturbed areas into the local groundwater and any receiving water bodies. Given the range of hydraulic conductivity values measured for the sand and gravel at the site (pdf page 773-75 of the Burnco's MSDP: 4.8 to 25.6 m/d), a calculated lateral hydraulic gradient of 0.028 from the Matrix's supporting report, and an assumed effective porosity of 30%, the flow of groundwater beneath the site could range anywhere from around 150 m/yr to more than 600 m/yr (depending on local conditions). Therefore the transit time for a substance release to a receptors would be relatively short at less than a year to perhaps a year or so.

Stripping of the overlying topsoil and removal of a substantial amount (if not all) of the sand and gravel beneath will inevitably reduce the filtering capacity of the subsurface and allow contaminants that occur during the mining process (natural or other) to move more quickly down to the water table. This is shown in conceptual manner in Figure 2 on the following page, and is reinforced by a statements made by Matrix Solutions in an excerpt from Burnco's 2020 Master Site Development Plan (MSDP pdf page 682 of 1882):

The removal of the silty clay (where present) at site, will remove a natural barrier to potential contamination of the groundwater from surface spills. Any contaminant spilled at surface during or after operations would preferentially flow either vertically through the porous gravel and bedrock to the water table or along preferentially pathways (secondary permeability/fractures) in the bedrock. From below the water table it would follow groundwater flow direction (south to southeast), likely ending up in the Grande Valley Creek, Beaupré Creek, and the Bow River. Any contamination could potentially flow into the underlying bedrock, posing a risk to any residential well users in the area.





Recharging precipitation (snow melt or rai) entering the subsurface will enhance the ability to move particulate and dissolved matter into the groundwater. By removing the filtering capacity of sediment this will only exacerbate the condition. It is clear from this experiment that turbidity can be produced from flushing water thought a 1.25 m soil column, not to mention notable changes to the chemical quality of the effluent.

The findings of this study suggest that the action of mining gravel from a very large development area will ultimately expose the remaining sand and gravel, as

7 | Page

well as the underlying bedrock aquifers, to weathering reactions and enhanced flushing by annual snow melt and rainfall events.

As such, any contaminants (solid or dissolved) mobilized and flushed from these exposed sediments will increase the risk of impact to the local environment. Proximity to receptors will be a major factor, not to mention how the mobilized contaminants move through the subsurface. However, this aspect has not been assessed by Burnco, and the fact that the groundwater flow velocity has not been assessed makes any statements about risk very difficult, if not impossible. The receptors at greatest risk include:

- local springs and water wells,
- Grand Valley Creek,
- Beaupre Creek, and
- the Bow River.

With the exception of the Bow River, most of the local surface water features in the study area are not believed to be fish-bearing. However, they do likely have environments that will sustain aquatic habitat that supports downstream aquatic systems. From a federal *Fisheries Act* perspective this is pertinent. The potential introduction of harmful constituents into aquatic systems is an obvious threat, and the waters from the site eventually drain into the fish-bearing Bow River. The Bow River is also used as a source of drinking water by the Town of Cochrane, as well as Calgary, so some assessment of the potential discharge of harmful substances into the river should have been conducted. However, it was not.

The turbidity guideline for protection of aquatic life in Alberta requires that the maximum long-term average for "clear" water systems, like the West Cochrane Pit area, be kept within 8 NTU above background values for any short-term exposure (e.g. up to 24 hours). Over the longer-term the increase should be no more than 2 NTU above background levels (Alberta Government 2018).

The way in which Burnco mines the sand and gravel deposit will dictate the end result regarding risk to the local groundwater and connected systems. It is unclear whether the plan is to mine down to the bedrock surface or whether a thin veneer of sand and gravel deposit will be left in place. All of this granular material rests in contact with fractured bedrock as noted in Burnco's MSDP, submitted in June 2020. Based on the findings of this study, mobilization of turbidity from any residual sand and gravel left above the bedrock is a risk. Once in bedrock it will have a reduced chance of being attenuated, as fracture flow is very different than flow though the porous media. Again, this aspect was not assessed.

If Burnco decides to operate a wet pit instead, and mine below the water table without dewatering, this will likely occur via bailing operations. The effect of this extraction method will be to create very turbid water due to the churning action of the equipment. Again, the migration of mobilized particulate matter through the sediments is likely. Mobilization of turbidity in local groundwater has been documented before, with measurable effects being noted as far as 1.8 km downgradient. The following quote is taken from a report authored by Mead (1995):

"This DEQ [Department of Environmental Quality] study found a turbidity plume that extended more than a mile to the north (downgradient) of the gravel operation. The average turbidity of the water being discharged from the washing operation into the pond at the site was 2,737 nephelometric turbidity units (NTUs). Nearly all wells sampled within the first 6,000 feet of the turbidity plume were measured at 5 NTU or more. Many wells within the first 3,000 feet of the plume had turbidity levels of 10 NTU or more. Nearly all wells outside the plume had turbidities of 2 NTU or less."

Additionally, the release of harmful metals and trace elements is of concern. This is not only associated with the type of metal or trace element mobilized, but also the form it is in when present in the water. Given the anticipated groundwater conditions beneath the Burnco development area (i.e. well oxygenated and at a pH of 7 to 8, as noted on pdf page 699 in Burnco's MSDP) the speciation of chromium, for example, would favour the more mobile chromate ion (i.e.  $CrO_4^2$ -).

When present as chromate, and at the groundwater conditions described previously, it will be present in the hexavalent form. This is shown in the Eh-pH diagram provided in Figure 3. Hexavalent chromium is a highly toxic species, and can influence aquatic life at values as low as 0.001 mg/L. The other metals and trace elements noted in the summary table on page 5 will have their own unique toxicity and mobility characteristics.



**Figure 3.** Eh-pH diagrams for chromium (left) and selenium (right)<sup>2</sup>. Note: red shaded area represents conditions expected in well-oxygenated groundwater system.

Unfortunately, none of the required information to assess this aspect has been provided. In fact, there is no monitoring data available for any of the wells around the working gravel pit to determine what constituents may have been mobilized so far. The only location assessed for metals and trace elements back in 2018 was a monitoring well located upgradient of the operating pit and adjacent to Highway 1A, that being MW18-02(B2).

The concern with the Burnco's current application to Rocky View County is that it does nothing to assess the impacts to groundwater and connected surface water environments that could occur around a working gravel pit. Although there are monitoring wells established around the current open pit, no up-to-date information is available to assess what has occurred since commissioning of that pit. Of equal

<sup>&</sup>lt;sup>2</sup> Geological Survey of Japan

importance is the lack of assessment done to determine what the full impact of the West Cochrane Pit will look like once development is complete and reclamation has occurred.

Given the results of this soil column test there should be cause for concern. The pit mining activities will be located very close to aquatic receptors and therefore pose a threat to their existence and future viability. At the very least Burnco should be required to conduct a proper risk assessment and account for the potential mobilization, transport, and fate of contaminants like the ones documented in this experiment. It would also be informative for Burnco to assess conditions around their existing West Cochrane Pit via the series of dedicated monitoring wells installed there. This should include a proper assessment of water quality and geochemical conditions to better understand the risks involved if mining is to be extended across the larger proposed development area. Unfortunately, none of this work has been completed or provided for decision makers to rely on. This begs the questions:

"To what degree will Burnco's proposed development impact the groundwater quality across the larger area?"

and

"How will this impact downgradient receptors like Grand Valley Creek, Beaupre Creek, and ultimately the Bow River?"

## <u>Closure</u>

This report has been prepared to summarize results of a soil column flushing experiment designed to mimic infiltration of snowmelt and rainwater through sand and gravel deposits beneath the West Cochrane Pit area. The content is meant to inform decision makers so that unintended consequences to the environment and downstream communities can be avoided. If there are any questions regarding the methodology or interpretation of findings provided herein, the reader should contact the undersigned for clarification.

Respectfully submitted by:

Jon Fennell, M.Sc., Ph.D., P.Geol. Hydrogeologist & Geochemist

## **References**

Alberta Government (2018). Environmental Quality Guidelines for Alberta Surface Waters. Water Policy Branch, Alberta Environment and Parks, March 28, 2018, ISBN (PDF) 978-1-4601-3873-1, 58 pp. <u>https://open.alberta.ca/publications/9781460138731</u>

Alberta Government (2019). Alberta Tier 1 Soil and Groundwater Remediation Guidelines. AEP, Land Policy, 2019, No. 1, ISBN 978-1-4601-2695-0, <u>https://open.alberta.ca/dataset/842becf6-dc0c-4cc7-8b29-</u> <u>e3f383133ddc/resource/a5cd84a6-5675-4e5b-94b8-</u> 0a36887c588b/download/albertatier1guidelines-jan10-2019.pdf

Burnco Rock Products Ltd. (2020). Land Use Redesignation Application: Project Activities Plan - Master Site Development Plan, West Cochrane Gravel Pit. Prepared for submission to the Rocky View County for consideration and approval, 1882 pp.

Geological Survey of Japan (2005). Atlas of Eh-pH diagrams: Intercomparison of thermodynamic databases, Open File Report No.419, National Institute od Advanced Industrial Science and Technology – Research Center for Deep Geological Environments, 287 pp, https://www.nrc.gov/docs/ML1808/ML18089A638.pdf.

Health Canada (2020). Guidelines for Canadian Drinking Water Quality – Summary Table. Prepared in collaboration with the Federal-Provincial-Territorial Committee on Drinking Water of the Federal-Provincial-Territorial Committee on Health of the Environment, September 2020, 28 pp. <u>https://www.canada.ca/en/health-</u>

<u>canada/services/environmental-workplace-health/reports-publications/water-</u> <u>quality/guidelines-canadian-drinking-water-quality-summary-table.html</u>

Mead R.D. (1995). The Direct and Cumulative Effects of Gravel Mining on Groundwater within Thurston County, Washington. Ground Water Management Program, Environmental Health Division, Thurston County Public Health and Social Services Department, Appendix A of Technical Memorandum #33 (August 2018), 65 pp. <u>https://www.thurstoncountywa.gov/planning/planningdocuments/3%20-</u> %20Tech%20Memo%2033%20-

%20Hydrogeologic%20review%20of%20Mineral%20Extraction%20Code%2008152018.p

# <u>Websites</u>

Standard Methods for the Examination of Water and Wastewater, accessed May 24, 2021, pdf page 39 of 541, https://beta-static.fishersci.com/content/dam/fishersci/ en\_US/documents/programs/scientific/ technical-documents/white-papers/aphawater-testing-standard-methods-introduction-white-paper.pdf

**14 |** Page

# **APPENDIX 1**

Deionized water quality (from Bureau Veritas):

| QA/QC Batch | QC Type      | Parameter                | Date Analyzed | Value    | UNITS     |
|-------------|--------------|--------------------------|---------------|----------|-----------|
| 1221005     |              | Turkidit                 | 2024/05/12    | -0.10    | NTU       |
| A221986     | Method Blank |                          | 2021/05/12    | <0.10    | NIU<br>// |
|             |              | Total Mercury (Hg)       | 2021/05/12    | <0.0019  | ug/L      |
|             |              | Total Barium (Ba)        | 2021/05/16    | <0.010   | mg/L      |
|             |              | Total Boron (B)          | 2021/05/16    | <0.020   | mg/L      |
|             |              | Total Calcium (Ca)       | 2021/05/16    | <0.30    | mg/L      |
|             |              | Total Iron (Fe)          | 2021/05/16    | <0.060   | mg/L      |
|             |              | Total Lithium (Li)       | 2021/05/16    | <0.020   | mg/L      |
|             |              | Total Magnesium (Mg)     | 2021/05/16    | <0.20    | mg/L      |
|             |              | Total Manganese (Mn)     | 2021/05/16    | <0.0040  | mg/L      |
|             |              | Total Phosphorus (P)     | 2021/05/16    | <0.10    | mg/L      |
|             |              | Total Potassium (K)      | 2021/05/16    | <0.30    | mg/L      |
|             |              | Total Silicon (Si)       | 2021/05/16    | <0.10    | mg/L      |
|             |              | Total Sodium (Na)        | 2021/05/16    | <0.50    | mg/L      |
|             |              | Total Strontium (Sr)     | 2021/05/16    | <0.020   | mg/L      |
|             |              | Total Sulphur (S)        | 2021/05/16    | <0.20    | mg/L      |
|             |              | Total Aluminum (Al)      | 2021/05/14    | <0.0030  | mg/L      |
|             |              | Total Antimony (Sb)      | 2021/05/14    | <0.00060 | mg/L      |
|             |              | Total Arsenic (As)       | 2021/05/14    | <0.00020 | mg/L      |
|             |              | Total Beryllium (Be)     | 2021/05/14    | <0.0010  | mg/L      |
|             |              | Total Chromium (Cr)      | 2021/05/14    | <0.0010  | mg/L      |
|             |              | Total Cobalt (Co)        | 2021/05/14    | <0.00030 | mg/L      |
|             |              | Total Copper (Cu)        | 2021/05/14    | <0.00020 | mg/L      |
|             |              | Total Lead (Pb)          | 2021/05/14    | <0.00020 | mg/L      |
|             |              | Total Molybdenum (Mo)    | 2021/05/14    | <0.00020 | mg/L      |
|             |              | Total Nickel (Ni)        | 2021/05/14    | <0.00050 | mg/L      |
|             |              | Total Selenium (Se)      | 2021/05/14    | <0.00020 | mg/L      |
|             |              | Total Silver (Ag)        | 2021/05/14    | <0.00010 | mg/L      |
|             |              | Total Thallium (Tl)      | 2021/05/14    | <0.00020 | mg/L      |
|             |              | Total Tin (Sn)           | 2021/05/14    | <0.0010  | mg/L      |
|             |              | Total Titanium (Ti)      | 2021/05/14    | <0.0010  | mg/L      |
|             |              | Total Uranium (U)        | 2021/05/14    | <0.00010 | mg/L      |
|             |              | Total Vanadium (V)       | 2021/05/14    | <0.0010  | mg/L      |
|             |              | Total Zinc (Zn)          | 2021/05/14    | <0.0030  | mg/L      |
|             |              | Dissolved Sodium (Na)    | 2021/05/13    |          | %         |
|             |              | Dissolved Calcium (Ca)   | 2021/05/13    | <0.30    | mg/L      |
|             |              | Dissolved Iron (Fe)      | 2021/05/13    | <0.060   | mg/L      |
|             |              | Dissolved Magnesium (Mg) | 2021/05/13    | <0.20    | mg/L      |
|             |              | Dissolved Manganese (Mn) | 2021/05/13    | <0.0040  | mg/L      |
|             |              | Dissolved Potassium (K)  | 2021/05/13    | <0.30    | mg/L      |
|             |              | Dissolved Sodium (Na)    | 2021/05/13    | <0.50    | mg/I      |
|             |              | Dissolved Calcium (Ca)   | 2021/05/13    | <0.30    | mg/l      |
|             |              | Dissolved Iron (Fe)      | 2021/05/13    | <0.060   | mg/l      |
|             |              | Dissolved Magnesium (Mg) | 2021/05/13    | <0.000   | mg/l      |
|             |              | Discolved Manganese (Ma) | 2021/05/12    | <0.0040  | mg/l      |
|             |              | Dissolved Potacsium (K)  | 2021/05/12    | <0.0040  | mg/l      |
|             |              | Dissolved Sodium (Na)    | 2021/05/12    | <0.50    | mg/L      |
|             |              |                          | 2021/05/15    | <0.010   | mg/L      |
|             |              | Alkalinity (BB as (2002) | 2021/05/12    | <0.010   | mg/L      |
|             |              | Conductivity             | 2021/05/14    | <1.0     | IIIg/L    |
|             |              |                          | 2021/05/14    | <2.0     | us/cm     |
|             |              | Dissolved Chloride (Cl)  | 2021/05/14    | <1.0     | mg/L      |

# **APPENDIX 2**

(see attached PDF)

17 | Page

Page 480 of 719



Your C.O.C. #: 635648-01-01

#### **Attention: John Fennell**

COMMERCIAL ACCOUNTS - CALGARY BUREAU VERITAS CANADA (2019) INC. 4000 19th Street NE Calgary, AB CANADA T2E 6P8

> Report Date: 2021/05/31 Report #: R3026392 Version: 3 - Revision

#### **CERTIFICATE OF ANALYSIS – REVISED REPORT**

#### BV LABS JOB #: C130760

Received: 2021/05/10, 08:10

Sample Matrix: Water # Samples Received: 2

|                                            |          | Date       | Date       |                                 |                      |
|--------------------------------------------|----------|------------|------------|---------------------------------|----------------------|
| Analyses                                   | Quantity | Extracted  | Analyzed   | Laboratory Method               | Analytical Method    |
| Alkalinity @25C (pp, total), CO3,HCO3,OH   | 2        | N/A        | 2021/05/14 | AB SOP-00005                    | SM 23 2320 B m       |
| Cadmium - low level CCME (Total)           | 2        | N/A        | 2021/05/14 |                                 | Auto Calc            |
| Chloride/Sulphate by Auto Colourimetry     | 2        | N/A        | 2021/05/15 | AB SOP-00020                    | SM23-4500-Cl/SO4-E m |
| Conductivity @25C                          | 2        | N/A        | 2021/05/14 | AB SOP-00005                    | SM 23 2510 B m       |
| Hardness                                   | 1        | N/A        | 2021/05/14 |                                 | Auto Calc            |
| Hardness                                   | 1        | N/A        | 2021/05/16 |                                 | Auto Calc            |
| Mercury (Total) by CV                      | 1        | 2021/05/12 | 2021/05/12 | AB SOP-00084                    | BCMOE BCLM Oct2013 m |
| Elements by ICP-Dissolved-Lab Filtered (1) | 2        | N/A        | 2021/05/13 | AB SOP-00042                    | EPA 6010d R5 m       |
| Elements by ICP - Total                    | 2        | 2021/05/12 | 2021/05/16 | AB SOP-00014 / AB SOP-<br>00042 | EPA 6010d R5 m       |
| Elements by ICPMS - Total                  | 2        | 2021/05/12 | 2021/05/13 | AB SOP-00014 / AB SOP-<br>00043 | EPA 6020b R2 m       |
| Ion Balance                                | 1        | N/A        | 2021/05/15 |                                 | Auto Calc            |
| Ion Balance                                | 1        | N/A        | 2021/05/16 |                                 | Auto Calc            |
| Sum of cations, anions                     | 1        | N/A        | 2021/05/14 |                                 | Auto Calc            |
| Sum of cations, anions                     | 1        | N/A        | 2021/05/16 |                                 | Auto Calc            |
| Nitrate and Nitrite                        | 2        | N/A        | 2021/05/14 |                                 | Auto Calc            |
| NO2 - NO2 + NO3 (N) in Water               | 2        | N/A        | 2021/05/12 | AB SOP-00091                    | SM 23 4500 NO3m      |
| Nitrate (as N)                             | 2        | 2021/05/11 | 2021/05/14 |                                 | Auto Calc            |
| pH @25°C (2)                               | 2        | N/A        | 2021/05/14 | AB SOP-00005                    | SM 23 4500-H+B m     |
| Total Dissolved Solids (Calculated)        | 1        | N/A        | 2021/05/15 |                                 | Auto Calc            |
| Total Dissolved Solids (Calculated)        | 1        | N/A        | 2021/05/16 |                                 | Auto Calc            |
| Turbidity                                  | 2        | N/A        | 2021/05/12 | CAL SOP-00081                   | SM 23 2130 B m       |

#### Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement



Your C.O.C. #: 635648-01-01

#### Attention: John Fennell COMMERCIAL ACCOUNTS - CALGARY BUREAU VERITAS CANADA (2019) INC. 4000 19th Street NE Calgary, AB

Report Date: 2021/05/31 Report #: R3026392 Version: 3 - Revision

#### **CERTIFICATE OF ANALYSIS – REVISED REPORT**

#### BV LABS JOB #: C130760

#### Received: 2021/05/10, 08:10

CANADA

T2E 6P8

Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

\* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Dissolved > Total Imbalance: When applicable, Dissolved and Total results were reviewed and data quality meets acceptable levels unless otherwise noted.
The CCME method requires pH to be analysed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the CCME holding time. Bureau Veritas Laboratories endeavours to analyze samples as soon as possible after receipt.

**Encryption Key** 



Bureau Veritas 31 May 2021 15:09:14

Please direct all questions regarding this Certificate of Analysis to your Project Manager. Customer Solutions, Western Canada Customer Experience Team Email: customersolutionswest@bureauveritas.com Phone# (403) 291-3077

------

BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



COMMERCIAL ACCOUNTS - CALGARY BUREAU VERITAS CANADA (2019) INC.

#### **ROUTINE WATER -LAB FILTERED (WATER)**

|                                    | -     |                  |                  |        |
|------------------------------------|-------|------------------|------------------|--------|
| BV Labs ID                         |       | ZT5148           | ZT5149           |        |
| Sampling Date                      |       | 2021/05/08       | 2021/05/09       |        |
|                                    |       | 11:30            | 10:45            |        |
|                                    |       | 635648-01-01     | 635648-01-01     |        |
|                                    | UNITS | SOIL FLUSH<br>#1 | SOIL FLUSH<br>#2 | RDL    |
| Calculated Parameters              |       |                  |                  |        |
| Anion Sum                          | meq/L | 0.93             | 0.81             | N/A    |
| Cation Sum                         | meq/L | 0.91             | 0.78             | N/A    |
| Hardness (CaCO3)                   | mg/L  | 39               | 35               | 0.50   |
| Ion Balance (% Difference)         | %     | NC               | NC               | N/A    |
| Dissolved Nitrate (N)              | mg/L  | 0.10             | 0.058            | 0.010  |
| Dissolved Nitrate (NO3)            | mg/L  | 0.45             | 0.26             | 0.044  |
| Dissolved Nitrite (NO2)            | mg/L  | <0.033           | <0.033           | 0.033  |
| Calculated Total Dissolved Solids  | mg/L  | 47               | 39               | 10     |
| Misc. Inorganics                   |       |                  |                  |        |
| Conductivity                       | uS/cm | 89               | 76               | 2.0    |
| рН                                 | рН    | 9.15             | 9.11             | N/A    |
| Anions                             |       |                  |                  |        |
| Alkalinity (PP as CaCO3)           | mg/L  | 3.5              | 3.8              | 1.0    |
| Alkalinity (Total as CaCO3)        | mg/L  | 34               | 33               | 1.0    |
| Bicarbonate (HCO3)                 | mg/L  | 32               | 31               | 1.0    |
| Carbonate (CO3)                    | mg/L  | 4.2              | 4.6              | 1.0    |
| Hydroxide (OH)                     | mg/L  | <1.0             | <1.0             | 1.0    |
| Dissolved Chloride (Cl)            | mg/L  | 2.8              | 1.7              | 1.0    |
| Dissolved Sulphate (SO4)           | mg/L  | 8.4              | 4.7              | 1.0    |
| Nutrients                          |       |                  |                  |        |
| Dissolved Nitrite (N)              | mg/L  | <0.010           | <0.010           | 0.010  |
| Dissolved Nitrate plus Nitrite (N) | mg/L  | 0.10             | 0.058            | 0.010  |
| Lab Filtered Elements              |       |                  |                  |        |
| Dissolved Calcium (Ca)             | mg/L  | 4.8              | 4.5              | 0.30   |
| Dissolved Iron (Fe)                | mg/L  | <0.060           | <0.060           | 0.060  |
| Dissolved Magnesium (Mg)           | mg/L  | 6.6              | 5.6              | 0.20   |
| Dissolved Manganese (Mn)           | mg/L  | <0.0040          | <0.0040          | 0.0040 |
| Dissolved Potassium (K)            | mg/L  | 1.4              | 1.2              | 0.30   |
| Dissolved Sodium (Na)              | mg/L  | 2.1              | 1.4              | 0.50   |
| RDL = Reportable Detection Limit   |       |                  |                  |        |
| N/A = Not Applicable               |       |                  |                  |        |



COMMERCIAL ACCOUNTS - CALGARY BUREAU VERITAS CANADA (2019) INC.

#### **REGULATED METALS (CCME/AT1) - TOTAL**

| BV Labs ID                   |       | ZT5148       | ZT5149       |         |
|------------------------------|-------|--------------|--------------|---------|
| Sampling Date                |       | 2021/05/08   | 2021/05/09   |         |
| Sumpling Bate                |       | 11:30        | 10:45        |         |
| COC Number                   |       | 635648-01-01 | 635648-01-01 |         |
|                              | UNITS | SOIL FLUSH   | SOIL FLUSH   | RDL     |
|                              |       | #1           | #2           |         |
| Elements                     | 1     |              | Γ            | 1       |
| Total Cadmium (Cd)           | ug/L  | 0.53         | 0.44         | 0.020   |
| Total Aluminum (Al)          | mg/L  | 6.1          | 4.0          | 0.0030  |
| Total Antimony (Sb)          | mg/L  | 0.00076      | <0.00060     | 0.00060 |
| Total Arsenic (As)           | mg/L  | 0.019        | 0.0094       | 0.00020 |
| Total Barium (Ba)            | mg/L  | 0.35         | 0.24         | 0.010   |
| Total Beryllium (Be)         | mg/L  | <0.0010      | <0.0010      | 0.0010  |
| Total Boron (B)              | mg/L  | <0.020       | <0.020       | 0.020   |
| Total Calcium (Ca)           | mg/L  | 180          | 210          | 0.30    |
| Total Chromium (Cr)          | mg/L  | 0.013        | 0.020        | 0.0010  |
| Total Cobalt (Co)            | mg/L  | 0.0095       | 0.0071       | 0.00030 |
| Total Copper (Cu)            | mg/L  | 0.015        | 0.0097       | 0.00020 |
| Total Iron (Fe)              | mg/L  | 17           | 12           | 0.060   |
| Total Lead (Pb)              | mg/L  | 0.010        | 0.0073       | 0.00020 |
| Total Lithium (Li)           | mg/L  | 0.021        | <0.020       | 0.020   |
| Total Magnesium (Mg)         | mg/L  | 39           | 45           | 0.20    |
| Total Manganese (Mn)         | mg/L  | 0.81         | 0.74         | 0.0040  |
| Total Molybdenum (Mo)        | mg/L  | 0.0020       | 0.0025       | 0.00020 |
| Total Nickel (Ni)            | mg/L  | 0.024        | 0.016        | 0.00050 |
| Total Phosphorus (P)         | mg/L  | 0.73         | 0.63         | 0.10    |
| Total Potassium (K)          | mg/L  | 3.5          | 2.5          | 0.30    |
| Total Selenium (Se)          | mg/L  | 0.00037      | 0.00022      | 0.00020 |
| Total Silicon (Si)           | mg/L  | 12           | 8.1          | 0.10    |
| Total Silver (Ag)            | mg/L  | <0.00010     | <0.00010     | 0.00010 |
| Total Sodium (Na)            | mg/L  | 2.2          | 1.4          | 0.50    |
| Total Strontium (Sr)         | mg/L  | 0.21         | 0.21         | 0.020   |
| Total Sulphur (S)            | mg/L  | 2.0          | 1.4          | 0.20    |
| Total Thallium (Tl)          | mg/L  | <0.00020     | <0.00020     | 0.00020 |
| Total Tin (Sn)               | mg/L  | <0.0010      | <0.0010      | 0.0010  |
| Total Titanium (Ti)          | mg/L  | 0.045        | 0.032        | 0.0010  |
| Total Uranium (U)            | mg/L  | 0.0014       | 0.0012       | 0.00010 |
| Total Vanadium (V)           | mg/L  | 0.021        | 0.015        | 0.0010  |
| Total Zinc (Zn)              | mg/L  | 0.12         | 0.073        | 0.0030  |
| RDL = Reportable Detection I | imit  |              |              | -       |



F-1 - Attachment E Page 32 of 252

COMMERCIAL ACCOUNTS - CALGARY BUREAU VERITAS CANADA (2019) INC.

#### **RESULTS OF CHEMICAL ANALYSES OF WATER**

| BV Labs ID                                                       |     | ZT5148                 | ZT5149            |      |
|------------------------------------------------------------------|-----|------------------------|-------------------|------|
| Sempling Date                                                    |     | 2021/05/08             | 2021/05/09        |      |
| Sampling Date                                                    |     | 11:30                  | 10:45             |      |
| COC Number                                                       |     | 635648-01-01           | 635648-01-01      |      |
|                                                                  |     | SOIL FLUSH             | SOIL FLUSH        |      |
|                                                                  |     |                        |                   | IKUL |
|                                                                  |     | #1                     | #2                |      |
| Physical Properties                                              |     | #1                     | #2                |      |
| Physical Properties<br>Turbidity                                 | NTU | <b>#1</b><br>>4000 (1) | <b>#2</b><br>1600 | 0.10 |
| Physical Properties<br>Turbidity<br>RDL = Reportable Detection L | NTU | <b>#1</b> >4000 (1)    | <b>#2</b>         | 0.10 |



F-1 - Attachment E Page 33 of 252

COMMERCIAL ACCOUNTS - CALGARY BUREAU VERITAS CANADA (2019) INC.

#### **MERCURY BY COLD VAPOR (WATER)**

| BV Labs ID                     |       | ZT5149               |        |
|--------------------------------|-------|----------------------|--------|
| Sampling Date                  |       | 2021/05/09<br>10:45  |        |
| COC Number                     |       | 635648-01-01         |        |
|                                |       | SOIL FLUSH           | рпі    |
|                                |       | #2                   | KDL    |
| Elements                       | UNITS | #2                   |        |
| Elements<br>Total Mercury (Hg) | ug/L  | # <b>2</b><br>0.0030 | 0.0019 |



F-1 - Attachment E Page 34 of 252

COMMERCIAL ACCOUNTS - CALGARY BUREAU VERITAS CANADA (2019) INC.

#### **GENERAL COMMENTS**

Each temperature is the average of up to three cooler temperatures taken at receipt

| Package 1 | 5.7°C |
|-----------|-------|
| Package 2 | 7.3°C |

Version #3: Report reissued only with sample Soil Flush #1 & #2 as per client request. 20210531

Version #2: Report reissued due to typo error with email address. 20210519

Sample ZT5148 [SOIL FLUSH #1] : Turbidity completed within 48h after laboratory receipt to a maximum of five days from sampling. Data are satisfactory for compliance purposes. NO2 - NO2 + NO3 (N) in Water completed within 48h after laboratory receipt to a maximum of five days from sampling. Data are satisfactory for compliance purposes.

#### Results relate only to the items tested.



QUALITY ASSURANCE REPORT

COMMERCIAL ACCOUNTS - CALGARY BUREAU VERITAS CANADA (2019) INC.

|          |                       |            | Matrix     | Spike     | Spiked     | Blank     | Method E | Blank | RPI       | )         |
|----------|-----------------------|------------|------------|-----------|------------|-----------|----------|-------|-----------|-----------|
| QC Batch | Parameter             | Date       | % Recovery | QC Limits | % Recovery | QC Limits | Value    | UNITS | Value (%) | QC Limits |
| A221986  | Turbidity             | 2021/05/12 |            |           | 102        | 80 - 120  | <0.10    | NTU   | 0.83      | 20        |
| A223437  | Total Mercury (Hg)    | 2021/05/12 | 93         | 80 - 120  | 97         | 80 - 120  | <0.0019  | ug/L  | NC        | 20        |
| A223560  | Total Barium (Ba)     | 2021/05/16 | 96         | 80 - 120  | 106        | 80 - 120  | <0.010   | mg/L  | 5.4       | 20        |
| A223560  | Total Boron (B)       | 2021/05/16 | 103        | 80 - 120  | 107        | 80 - 120  | <0.020   | mg/L  | 2.2       | 20        |
| A223560  | Total Calcium (Ca)    | 2021/05/16 | NC         | 80 - 120  | 108        | 80 - 120  | <0.30    | mg/L  | 3.3       | 20        |
| A223560  | Total Iron (Fe)       | 2021/05/16 | 118        | 80 - 120  | 107        | 80 - 120  | <0.060   | mg/L  | 3.4       | 20        |
| A223560  | Total Lithium (Li)    | 2021/05/16 | 108        | 80 - 120  | 112        | 80 - 120  | <0.020   | mg/L  | 4.7       | 20        |
| A223560  | Total Magnesium (Mg)  | 2021/05/16 | NC         | 80 - 120  | 113        | 80 - 120  | <0.20    | mg/L  | 0.90      | 20        |
| A223560  | Total Manganese (Mn)  | 2021/05/16 | 109        | 80 - 120  | 105        | 80 - 120  | <0.0040  | mg/L  | 2.5       | 20        |
| A223560  | Total Phosphorus (P)  | 2021/05/16 | 104        | 80 - 120  | 104        | 80 - 120  | <0.10    | mg/L  | NC        | 20        |
| A223560  | Total Potassium (K)   | 2021/05/16 | NC         | 80 - 120  | 110        | 80 - 120  | <0.30    | mg/L  | 2.4       | 20        |
| A223560  | Total Silicon (Si)    | 2021/05/16 | 113        | 80 - 120  | 113        | 80 - 120  | <0.10    | mg/L  | 5.4       | 20        |
| A223560  | Total Sodium (Na)     | 2021/05/16 | NC         | 80 - 120  | 107        | 80 - 120  | <0.50    | mg/L  | 1.4       | 20        |
| A223560  | Total Strontium (Sr)  | 2021/05/16 | 94         | 80 - 120  | 106        | 80 - 120  | <0.020   | mg/L  | 3.1       | 20        |
| A223560  | Total Sulphur (S)     | 2021/05/16 | NC         | 80 - 120  | 109        | 80 - 120  | <0.20    | mg/L  | 0.77      | 20        |
| A223574  | Total Aluminum (Al)   | 2021/05/13 | 112        | 80 - 120  | 116        | 80 - 120  | <0.0030  | mg/L  | 6.4       | 20        |
| A223574  | Total Antimony (Sb)   | 2021/05/13 | 113        | 80 - 120  | 116        | 80 - 120  | <0.00060 | mg/L  | 1.3       | 20        |
| A223574  | Total Arsenic (As)    | 2021/05/13 | 103        | 80 - 120  | 102        | 80 - 120  | <0.00020 | mg/L  | 0.17      | 20        |
| A223574  | Total Beryllium (Be)  | 2021/05/13 | 114        | 80 - 120  | 108        | 80 - 120  | <0.0010  | mg/L  | NC        | 20        |
| A223574  | Total Chromium (Cr)   | 2021/05/13 | 104        | 80 - 120  | 105        | 80 - 120  | <0.0010  | mg/L  | NC        | 20        |
| A223574  | Total Cobalt (Co)     | 2021/05/13 | 101        | 80 - 120  | 104        | 80 - 120  | <0.00030 | mg/L  | 3.2       | 20        |
| A223574  | Total Copper (Cu)     | 2021/05/13 | 97         | 80 - 120  | 104        | 80 - 120  | <0.00020 | mg/L  | 14        | 20        |
| A223574  | Total Lead (Pb)       | 2021/05/13 | 100        | 80 - 120  | 106        | 80 - 120  | <0.00020 | mg/L  | NC        | 20        |
| A223574  | Total Molybdenum (Mo) | 2021/05/13 | 117        | 80 - 120  | 110        | 80 - 120  | <0.00020 | mg/L  | 5.2       | 20        |
| A223574  | Total Nickel (Ni)     | 2021/05/13 | 98         | 80 - 120  | 105        | 80 - 120  | <0.00050 | mg/L  | 11        | 20        |
| A223574  | Total Selenium (Se)   | 2021/05/13 | 113        | 80 - 120  | 115        | 80 - 120  | <0.00020 | mg/L  | 0.93      | 20        |
| A223574  | Total Silver (Ag)     | 2021/05/13 | 102        | 80 - 120  | 105        | 80 - 120  | <0.00010 | mg/L  | NC        | 20        |
| A223574  | Total Thallium (Tl)   | 2021/05/13 | 108        | 80 - 120  | 113        | 80 - 120  | <0.00020 | mg/L  | NC        | 20        |
| A223574  | Total Tin (Sn)        | 2021/05/13 | 109        | 80 - 120  | 103        | 80 - 120  | <0.0010  | mg/L  | NC        | 20        |
| A223574  | Total Titanium (Ti)   | 2021/05/13 | 110        | 80 - 120  | 103        | 80 - 120  | <0.0010  | mg/L  | NC        | 20        |
| A223574  | Total Uranium (U)     | 2021/05/13 | 103        | 80 - 120  | 105        | 80 - 120  | <0.00010 | mg/L  | 2.6       | 20        |
| A223574  | Total Vanadium (V)    | 2021/05/13 | 107        | 80 - 120  | 105        | 80 - 120  | <0.0010  | mg/L  | 5.9       | 20        |
| A223574  | Total Zinc (Zn)       | 2021/05/13 | 100        | 80 - 120  | 106        | 80 - 120  | <0.0030  | mg/L  | NC        | 20        |

Page 8 of 11

Bureau Veritas Laboratories Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468



QUALITY ASSURANCE REPORT(CONT'D)

COMMERCIAL ACCOUNTS - CALGARY BUREAU VERITAS CANADA (2019) INC.

|          |                                    |            | Matrix     | Spike     | Spiked     | Blank     | Method E | lank  | RPI       | כ         |
|----------|------------------------------------|------------|------------|-----------|------------|-----------|----------|-------|-----------|-----------|
| QC Batch | Parameter                          | Date       | % Recovery | QC Limits | % Recovery | QC Limits | Value    | UNITS | Value (%) | QC Limits |
| A223796  | Dissolved Calcium (Ca)             | 2021/05/16 | NC         | 80 - 120  | 99         | 80 - 120  | <0.30    | mg/L  | 1.1       | 20        |
| A223796  | Dissolved Iron (Fe)                | 2021/05/16 | 111        | 80 - 120  | 104        | 80 - 120  | <0.060   | mg/L  | NC        | 20        |
| A223796  | Dissolved Magnesium (Mg)           | 2021/05/16 | NC         | 80 - 120  | 102        | 80 - 120  | <0.20    | mg/L  | 1.9       | 20        |
| A223796  | Dissolved Manganese (Mn)           | 2021/05/16 | 108        | 80 - 120  | 102        | 80 - 120  | <0.0040  | mg/L  | 3.3       | 20        |
| A223796  | Dissolved Potassium (K)            | 2021/05/16 | 104        | 80 - 120  | 104        | 80 - 120  | <0.30    | mg/L  | 1.3       | 20        |
| A223796  | Dissolved Sodium (Na)              | 2021/05/16 | NC         | 80 - 120  | 96         | 80 - 120  | <0.50    | mg/L  | 1.4       | 20        |
| A223798  | Dissolved Calcium (Ca)             | 2021/05/14 | NC         | 80 - 120  | 101        | 80 - 120  | <0.30    | mg/L  | 1.8       | 20        |
| A223798  | Dissolved Iron (Fe)                | 2021/05/14 | 110        | 80 - 120  | 105        | 80 - 120  | <0.060   | mg/L  | NC        | 20        |
| A223798  | Dissolved Magnesium (Mg)           | 2021/05/14 | NC         | 80 - 120  | 103        | 80 - 120  | <0.20    | mg/L  | 2.8       | 20        |
| A223798  | Dissolved Manganese (Mn)           | 2021/05/14 | 109        | 80 - 120  | 103        | 80 - 120  | <0.0040  | mg/L  | 1.1       | 20        |
| A223798  | Dissolved Potassium (K)            | 2021/05/14 | 104        | 80 - 120  | 105        | 80 - 120  | <0.30    | mg/L  | 2.7       | 20        |
| A223798  | Dissolved Sodium (Na)              | 2021/05/14 | NC         | 80 - 120  | 99         | 80 - 120  | <0.50    | mg/L  | 2.3       | 20        |
| A223899  | Dissolved Nitrate plus Nitrite (N) | 2021/05/12 | 122 (1)    | 80 - 120  | 99         | 80 - 120  | <0.010   | mg/L  | 1.1       | 20        |
| A223899  | Dissolved Nitrite (N)              | 2021/05/12 | 100        | 80 - 120  | 104        | 80 - 120  | <0.010   | mg/L  | NC        | 20        |
| A225434  | Alkalinity (PP as CaCO3)           | 2021/05/14 |            |           |            |           | <1.0     | mg/L  | NC        | 20        |
| A225434  | Alkalinity (Total as CaCO3)        | 2021/05/14 |            |           | 98         | 80 - 120  | <1.0     | mg/L  | 1.5       | 20        |
| A225434  | Bicarbonate (HCO3)                 | 2021/05/14 |            |           |            |           | <1.0     | mg/L  | 2.0       | 20        |
| A225434  | Carbonate (CO3)                    | 2021/05/14 |            |           |            |           | <1.0     | mg/L  | NC        | 20        |
| A225434  | Hydroxide (OH)                     | 2021/05/14 |            |           |            |           | <1.0     | mg/L  | NC        | 20        |
| A225437  | рН                                 | 2021/05/14 |            |           | 100        | 97 - 103  |          |       | 0.16      | N/A       |
| A225438  | Conductivity                       | 2021/05/14 |            |           | 101        | 90 - 110  | <2.0     | uS/cm | 0.65      | 10        |
| A226330  | Dissolved Chloride (Cl)            | 2021/05/15 | 99         | 80 - 120  | 105        | 80 - 120  | <1.0     | mg/L  | NC        | 20        |
| A226330  | Dissolved Sulphate (SO4)           | 2021/05/15 | 105        | 80 - 120  | 106        | 80 - 120  | <1.0     | mg/L  | NC        | 20        |

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

Page 9 of 11

Bureau Veritas Laboratories Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

ATTACHMENT 'E': PUBLIC SUBMISSIONS



F-1 - Attachment E Page 37 of 252

COMMERCIAL ACCOUNTS - CALGARY BUREAU VERITAS CANADA (2019) INC.

#### VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Sandy Yuan, M.Sc., QP, Scientific Specialist

BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



Page 11 of 11

Carrenou Varitan Connude (2019) imi.

Johnson Kwan 32 Horseshoe Crescent Cochrane, AB June 13, 2021

#### Rocky View County Council Letter of Concern – Burnco West Cochrane Gravel Pit Expansion (Bylaw 8073-2020)

Dear Rocky View County Council :

Thank you for your time in reviewing our letter submission. Our family is located  $\pm$  1.6 km from the proposed gravel pit development, at the eastern border of Rocky View County.

We have three major concerns about this application and included our recommendations for each of the concern for Council's consideration.

 Scale and Direction of Expansion: The proposed gravel pit is over 1,116 acres in size, which is far greater than all of the gravel pits in the area combined (Hillstone: 163 acres; Lafarge Hughes: 160 acres; Summit: 323 acres). We question the necessity and the scale of such excessive expansion given that there are multiple gravel pit operations already approved in this area.

In addition to the scale of the proposed development, we are also concerned about the direction of the proposed gravel pit expansion. Heavy industrial development of this scale is incompatible with residential development and should be locate away from existing residences to minimize their adverse impact.

Instead of encroaching the existing residences to the east, the proposed expansion would be more appropriate towards the west where the existing Wildcat Hills gas plant is located.

**Recommendation:** We respectfully recommend Council to amend the MSDP and the associated land use redesignation application to reduce the scope of the expansion by excluding the proposed gravel pit operation east of Grande Valley Creek towards the existing residential areas (See Figure 1 – Phasing Plan from the proposed MSDP – Areas E22-24, F25-27, G28-31, and H30).

The remaining expansion areas toward the west is still significant in size ( $\pm$  600 acres including Areas A1-6, B8-11, C12-15, and D16-21), and would allow the operation to continue for years to come.

Figure 1 - Phasing Plan from proposed MSDP



 Traffic Impact: According to the MSDP, the proposed expansion represents an increase of four times the volumes currently being shipped from the site as it ramps up to full production. The haul route will remain unchanged from Range Road 51 to Highway 1A.

Given that Highway 1A is the only haul route towards the targeted market (Calgary and Cochrane area), it is surprising that the Traffic Impact Assessment (TIA) submitted for this application did not investigate any offsite impacts along Highway 1A and the associated intersections (e.g., Horse Creek Road, Heritage Gate, and Highway 22 intersections).

Based on our firsthand experience, traffic often back up from the Highway 1A & 22 intersection to Heritage Gate during rush hours ( $\pm$  1.3 km) and sometimes all the way to Horse Creek Road during the weekends ( $\pm$  2 km).

**Recommendation:** We respectfully recommend Council to amend the MSDP (Section 3.9) to include a policy that requires an updated Traffic Impact Assessment at future development permit stage. The updated TIA shall be prepared to the County and Alberta Transportation's satisfaction and should examine the offsite impact along Highway 1A and the associated intersections for each phase of the expansion. The applicant/developer shall be responsible for any necessary upgrades, intersection improvements, and/or cost contribution for the improvements as identified by the TIA.



Figure 2 - Context Map (Highway 1A and associated intersections)

3) Inadequate Landscaping and Screening: As noted in the first section, heavy industrial development of this scale is incompatible with residential development. For this reason, we recommend Council to exclude the proposed expansion east of Grande Valley Creek, towards the existing residential areas.

If the application is able to proceed to its full extent, we recommend Council to require additional landscaping and site screening along the eastern portion of the site to mitigate the proposed gravel pit operation's adverse impacts (i.e., dust, noise, and visual impacts).

Given the magnitude of the proposed expansion, the limited landscaping proposed by the applicant is inadequate to serve as a shelter belt to protect the existing residences (See Figure 3 – Proposed Landscaping & Site Screening).

**Recommendation:** We respectfully recommend Council to amend the MSDP (Section 3.14 and Figure 39) to include the requirement for a treed shelter belt with additional landscaping and site screening along the eastern portion of the site.

Sample policy wording as follows: 'the applicant/developer shall provide a treed shelter belt with additional landscaping and site screening along the eastern portion of the site and submit an updated Landscaping and Site Screening Plan at the development permit stage to the County's satisfaction.'



Figure 3 - Proposed Landscaping & Site Screening

Lastly, we would like to express our disappointment in the level of engagement conducted by the applicant given the magnitude of this application. There were only two open houses held for this proposal in the last three years – one in April 2018 before the majority of the residents moved into the area, and another in March 2020 when the COVID-19 pandemic first started. We did not receive any notification from the applicant in the last three years.

To conclude, we respectfully request Council to consider the three amendments suggested in this letter submission. The proposed amendments would enable a more responsible approach to resource development in proximity to the existing residential areas.

We sincerely thank you for taking the time to review our letter submission and taking our recommendations into consideration.

Sincerely,

Johnson Kwan

| From:    | Joan Owen                                                       |
|----------|-----------------------------------------------------------------|
| To:      | Oksana Newmen                                                   |
| Subject: | [EXTERNAL] - Application #PL20200066 - Burnco Rock Products Ltd |
| Date:    | September 22, 2020 6:23:40 PM                                   |

Do not open links or attachments unless sender and content are known.

Greetings,

Thank you for your Notice of Application referenced in application #PL202000066 and dated September 10, 2020.

Big Hill Creek Ranches Ltd. is an adjacent land owner, owning the property described as 25 acres +/- SW17-26-4-W5 in Rockyview County. As Highway 1A divides Section 17, we are in the position of having a small portion of land adjacent to the proposed S-NAT development by Burnco Rock Products Ltd.

It is our understanding that Burnco Rock Products Ltd. intends to build a 7 metre high berm that will run along the east boundary of the project and that this berm would be along/adjacent to the west boundary of our property described as 25 acres +/- SW17-26-4-W5. To the best of our understanding, we believe that this structure is required by various regulatory bodies for the development of an aggregate extraction site.

One question we have is: What would be the implications and subsequent results of having the berm begin south of our property at Section 7/8, thus excluding our property from the discussion? Is this a viable consideration? See page 6 of the Land Use Redesignation Application Master Site Development Plan.

It is our belief that good fences make good neighbours. To this end, we would ask that both the County of Rockyview, in its consideration of the application, and that Burnco Rock Products Ltd., in their development of berm, consider the impact of this structure on our property. We would request that Burnco Rock Products Ltd. be asked, by Rockyview County, to give due consideration to the effects of this berm on the use and enjoyment of our property, now and with any implications for future resale value. We would also ask that Burnco Rock Products Ltd. be held to account by Rockyview County to ensure that this berm, should it be built, is constructed in a thoughtful, intentional, purposeful, and neighbourly manner to maintain neighbourly relations between Big Hill Creek Ranches Ltd. and Burnco Rock Products Ltd., The David H. McDougall Ranch Ltd. and Tricycle Lane Ranches Ltd.

Thank you for the opportunity to provide input on this proposal by Burnco Rock Products Ltd. I can be contacted by return email or at 403.877.6441 should you have any questions or require further clarification of anything contained herein.

We look forward to hearing from you regarding the answer to our question.

Warm regards, --Joan Owen Big Hill Creek Ranches Ltd.



# APPLICATION PL20200066

Burnco Land Use Redesignation Application West Cochrane Gravel Pit

# ADJACENT LANDOWNER COMMENTS

Bertrand Levesque and Julie Simard This letter states Bertrand Levesque and Julie Simard's opposition to Application PL20200066

# This letter states Bertrand Levesque and Julie Simard's <u>opposition</u> to the Application PL20200066. Regardless of all mitigations plans proposed by Burnco, the financial impact to property value remains unaddressed.

We, as adjacent landowners, have great concerns regarding the Land Use Redesignation application to expand the extraction area of the West Cochrane gravel pit at NW 13-26-05 W5M.

Our property is a small 17 acres parcel immediately adjacent to the NW corner of the proposed expanded project; we are located on the north side of Highway 1A, uphill from the project area. The area around our property is farm land, acreages, all in a beautiful landscape, with the Rockies as a back drop. The land surrounding the project - including the land under the project scope – is used for grazing cows and horses, as cultivated land or for country residences.

We are aware of the mitigation plans presented by Burnco regarding the following issues:

- Visual Impact
- Noise
- Air Quality
- Traffic increase
- Ground Water impact
- Wildlife corridor

The Burnco Plan is incomplete and offer poor re-assurances in the event of negative impacts to our water well, our health or the enjoyment of our property. There are no mechanism in place to ensure accountability, responsibility or enforcement.

For example, if our water well was impacted, we would have to bear the cost and weight of proving beyond a reasonable doubt that the impact is resulting from the gravel operation. This can be difficult. The same could be said if we developed lungs issues from the dust.

Ultimately, the Burnco proposed mitigations will do nothing to change the fact that no one wishes to live next to an active gravel pit.

But our main area of concern is that Burnco does not address the impact of their operation on the market value of neighboring properties. The issue is not even acknowledged.

Why should we, as adjacent landowners, have to suffer significant financial losses in order for Burnco to expand and prosper? We firmly believe that Burnco should be made fully responsible and have full mitigation/resolution plans for each impact, including and most importantly, the financial impact to neighboring property values.

This financial impact is real and has been reported by numerous studies, both in Canada and USA. This is a topic that is continuously raised when applications are made to introduce or expand gravel operations close to residential areas.<sup>1 2 3 4</sup>

When a new industrial operation is established, its immediate neighbors will see their property values drop. There is a strong relationship between the distance to the operation and the loss in value of a

1

https://www.lanecounty.org/UserFiles/Servers/Server 3585797/File/Government/BCC/2016/2016 AGENDAS/101 116agenda/PublicHearing/testimony%20BCC%20hearing Part7.pdf

<sup>&</sup>lt;sup>2</sup> <u>http://www.killthealbionguarry.org/HOME-VALUES-PLUMMET-FROM-QUARRIES.html</u>

<sup>&</sup>lt;sup>3</sup> https://www.rockyviewgravelwatch.com/

<sup>&</sup>lt;sup>4</sup> <u>http://www.countynewsonline.ca/wp-content/uploads/2017/02/Bearspaw-Gravel-Quarries-Letter-to-MD.pdf</u>

property: the smaller the distance, the greater the loss. The closest properties stand to lose as much as 25 to 39% of their value once a gravel project starts. <sup>5 6</sup>



This impact can be observed as soon as the project is known publicly, and will be more severe as the project becomes tangible and expand. This impact might be reverted if the land is properly reclaimed, but this is beyond our lifespan and cannot be used to justify approval to this project.

Who would want to spend top dollars to buy a nice house located 100 yards away from a noisy, ugly, busy 7/24 industrial gravel pit? Would you?

This project would undeniably make our property extremely hard to sell and leave us with a huge financial loss in the event of a sale.

#### We are therefore in opposition to application PL20200066.

Sincerely, Bertrand Levesque & Julie Simard

<sup>7</sup> Hite, D. 2006.Summary Analysis: Impact of operation gravel pit on house values, Delaware County, Ohio. Dept. Agricultural Economics and Rural Sociology, Auburn University, May. Graph borrowed from <u>http://www.countynewsonline.ca/wp-content/uploads/2017/02/Bearspaw-Gravel-Quarries-Letter-to-MD.pdf</u>

<sup>&</sup>lt;sup>5</sup> Hite, D. 2006.Summary Analysis: Impact of operation gravel pit on house values, Delaware County, Ohio. Dept. Agricultural Economics and Rural Sociology, Auburn University, May.

<sup>&</sup>lt;sup>6</sup> <u>http://www.lansink.ca/downloads/Lansink's%20Case%20Study%20Pit%20or%20Quarry%20Jan%202014.pdf</u>

# Response to Application Number PL20200066 Burnco Land Use Redesignation Application West Cochrane Gravel Pit

McKendrick Ranches Ltd. (MRL) and McNabb Lands

Abstract

The report states MRL and McNabb's opposition to Application Number PL20200066.

September 30, 2020

Application Number: PL20200066 MRL and McNabb Comments

# Table of Contents

| 1   | Exec  | cutive Summary2                                                                          |
|-----|-------|------------------------------------------------------------------------------------------|
| 2   | Res   | oonsible Planning3                                                                       |
|     | 2.1   | Win-Win-Win3                                                                             |
|     | 2.2   | Planning Required Prior to Approval of Application;3                                     |
|     | 2.3   | Contradiction of RVC Land Use Framework4                                                 |
|     | 2.4   | Proposed MDP Amendment - Aggregate Extraction Section 2.6.1                              |
| 3   | Stag  | ing of Aggregate Mine and Processing Facilities6                                         |
|     | 3.1   | Approval Based on Ten Year Timeframes6                                                   |
|     | 3.2   | Commitment to Standards7                                                                 |
|     | 3.3   | Original Pit to New Proposal Comparison7                                                 |
|     | 3.4   | Water Issues and Environment9                                                            |
|     | 3.5   | Transportation9                                                                          |
|     | 3.6   | Larger Permanent Berm Buffer10                                                           |
|     | 3.6.  | 1 Existing Berm11                                                                        |
|     | 3.6.2 | 2 Gravel Piled Higher than Berms and Views Blocked11                                     |
| 4   | Scal  | e of Mine12                                                                              |
| 5   | Con   | clusion12                                                                                |
| Арр | endi  | c A – Land Ownership Map14                                                               |
| Арр | endi  | k B – County Development Pressure Map15                                                  |
| Арр | endi  | c C – Original McDougall Land Use Application16                                          |
| Арр | endi  | c D – Pictures of Existing Burnco Operations20                                           |
| Арр | endi  | x E - Cochrane Times July 1, 2020 Public Notice Burnco Rock Products Water Act Notice of |
| Dec | ision |                                                                                          |

Page **1** of **23** 

Application Number: PL20200066 MRL and McNabb Comments

## **1** Executive Summary

BURNCO Rock Products Ltd. (BURNCO) currently operates a gravel pit at NW 13-26-05 W5M located northwest of the Town of Cochrane, Alberta. BURNCO has applied for a Land Use amendment Application Number PL20200066 (the Burnco Application) the purpose of which is to increase the permitted area of aggregate resource extraction to further the expansion of the gravel mining and processing and to secure the long-term future of the existing mine. McKendrick Ranches Ltd. ("MRL") provides the following positions regarding the BURNCO application as currently proposed.

If approved, this Land Use and subsequent mine expansion would create 452 hectares (1,117 acres) of contiguous lands zoned as NRI for a gravel mining and aggregate processing expansion. BURNCO's intention is to secure long-term investment in the mine and then amend the existing Development Permit (DP # PRDP20175123) and Provincial Code of Practice Registration (Registration # 254757-00-00) for NW 13-26-05 W5M to include all the lands subject to this Land Use Amendment. This would create a gravel pit development which BURNCO plans to operate for the long term and will have lasting impacts upon neighbors, the Town of Cochrane, Rocky View County and MRL. **Appendix A** illustrates the MRL and McNabb lands impacted.

**Responsible Planning** of a mine facility and employment base of such a scale should predicate the development of an Area Structure Plan firstly to fully consider the long-term nature of planning and development opportunities and constraints of the mine on its neighbour's future planning. It is important that the County undertake a comprehensive planning exercise for Highway 1A prior to approving a Land Use that has such a major impact on neighbouring lands. Moreover, any adverse impacts that may be experienced on neighbouring properties due to the nature and scale of the mine should be mitigated within the boundaries of the applicant's lands and not impose those restrictions on its neighbours. This could include moving the berm and active face of the mine further away from the neighbouring properties and moving the crushing and washing operations to a location which would not impact the neighbouring properties.

**Staging of Aggregate Mining and Processing Facilities** is a common best practice in AB. Land Use for the application area as proposed is premature without operational performance assessment targets being set by Rocky View County and Alberta Environment from which assurances to Rocky View, Cochrane and neighbors will be met prior to subsequent Land Use approvals and further operational permit expansions. Without those guarantees to the community the Land Use application as proposed is premature.

**Scale of Mine** is largely unprecedented in Rocky View County. Burnco's Indus pit is approximately the same size; however, there is no record of an MSDP for this pit on Rocky View County's website. This should constitute requirements for higher levels of Land Use approval assessment, community consultation, neighboring owners Land Use policy and planning considerations to mitigate impacts.

Page **2** of **23** 

Application Number: PL20200066 MRL and McNabb Comments

A comprehensively prepared and approved gravel strategy adopted by Rocky View County is also a must and, like other Counties in Alberta, is a best practice to avoid ad hoc mining approvals and subsequent appeals.

McKendrick Ranches respects the right of an owner such as the Applicant to pursue highest and best uses for their property; however, given the scale and long term nature of the Application, it must be conducted with forethought and on good Land Use planning practices with a responsibility not to negatively impact neighbors and the community from pursuing the enjoyment and economic advancement of their interests as well.

## 2 Responsible Planning

#### 2.1 Win-Win-Win

BURNCO's sustained mining and processing ability is a win for Burnco. Rocky View County wins by additional revenues generated form the mine to further advance towards Rocky View County's goal of 35% nonresidential taxes base. Making an effort to properly plan the Hwy 1A Corridor area and engaging residents in that planning exercise allows both Rocky View County and the residents to not lose on additional opportunities available within this corridor and also to thoroughly evaluate the benefits of development planning on their lands as well as to mitigate mining impacts. An Area Structure Plan developed along the Highway 1A corridor will allow for Rocky View County, the applicant and the residents to understand the full potential of this area and to determine strategies that will allow for the development of resource extraction in concert with the development potential of this locale.

In February 2019, McNabb presented a strategy for the development of Section 8 which is located between the Town of Cochrane and the proposed gravel pit to the Rocky View County Governance and Priorities Committee (GPC). GPC supported recognition of commercial and residential growth pressure in this area for consideration of upcoming updates to the County Plan as shown in **Appendix B**.

McNabb has also discussed this plan with the Town of Cochrane.

#### 2.2 Planning Required Prior to Approval of Application

- **Prepare Hwy 1A ASP:** Planning of corridor can take place in a fully considered format versus spot zoning of 1,200 acres of mining and processing operations.
- Regional Significance: Plan should be circulated to CMRB.
- **Restrictions on Adjacent Landowner Uses**: Rezoning the entire area as NRI restricts neighbouring development for decades and potentially for the next century or longer due to setback requirements from extraction mines. Any restrictions on development within the MRL lands such as additional setbacks due to adverse effects from the extraction operation should be accommodated within the property of the applicant and not within the MRL property.

Page 3 of 23

In particular, the Burnco Report indicates that exceedances of Alberta Ambient Air Quality Objectives will occur for fine particulate matter and for total suspended particles for a distance of 100 metres outside the boundaries of the site. It is requested that Land Use not be granted on those lands that will affect the adjacent landowners until such time as Burnco can demonstrate that its operations will not have any adverse effect on neighbouring lands and that no additional setbacks will be required on the MRL property as a result of the Burnco operations.

#### 2.3 Contradiction of RVC Land Use Framework

The Application contradicts RVC's Land Use Framework:

**1.** Land Use Framework Strategy, which encourages conservation, land stewardship, healthy ecosystems, and the efficient use of land.

Zoning for long term use of 1,200 acres of gravel mining operations plus requiring setbacks from future uses is not efficient use of land and contributes to sprawling development patterns.

2. Provide for a safe, secure, and reliable drinking water supply.

Protection of neighbouring groundwater sources is important. Operational practices for de-watering is known to affect adjacent landowner wells.

- Retain rural landscapes, dark skies, open vistas, and agriculture lands. The 1,200 acres of gravel mine operations does not support any of these policies.
- 4. Development shall be planned, designed, and constructed to protect alluvial aquifers. Dewatering operations required to support the mine do not protect Alluvial Aquifers. MRL has many springs and wells that are difficult to monitor and protect.

#### 5. Avoid Development of Wetlands and Riparian Areas

Protection of Bow River watershed and aquifer, for which the Land Use is adjacent, may place downstream communities' water at risk. The Land Use change and economic viability is dependent on dewatering a complex aquifer. The complexity of the local hydrology and the impact of aggregate mining, contamination and use of water for washing gravel over the lifespan of the mine requires performance measures be met prior to future Land Use expansion.

Page **4** of **23**
## 2.4 Proposed MDP Amendment - Aggregate Extraction Section 2.6.1

The proposed MDP wording is:

### 2.6.1 Aggregate Extraction

a) Minimize the adverse impact of aggregate resource extraction on existing residents, adjacent Land Uses, and the environment.

The impact of the Burnco application should be minimized by requiring that all adverse impacts from the Burnco operation, including dust and noise should be retained within the boundaries of the Burnco lands.

b) Encourage collaboration between the County, the aggregate extraction industry, and impacted residents and landowners to develop mutually agreeable solutions that mitigate impacts of extraction activities.

At present, the collaboration between Burnco and MRL has not yet been apparent. Impacts of the extraction activities clearly impact MRL from a noise, dust and visual perspective. MRL should be allowed to pursue its objectives without undue interference from a neighbor. MRL concerns about de-watering and mining in the aquifer for the benefit of Burnco have been ignored.

c) Discourage residential development that may be impacted by future aggregate extraction when proposed outside of an adopted area structure plan. The adoption of an Area Structure Plan in this area would serve to maximize the

development potential in this corridor and determine the Land Uses that would be complementary to each other. Moreover, the adoption of an Area Structure Plan would provide some certainty as to the phasing of both the aggregate extraction and the adjacent development. This is one of the purposes of an ASP.

- d) Where aggregate activities are located in proximity to an adjacent municipality, the County should co-operate with that jurisdiction to ensure co-ordination of major haul routes and mitigation of impacts on adjacent Land Uses
   Major haul routes may become problematic without the construction of upgrades on Highway 1A and the intersection of Highway 22 and Highway 1A.
- *e)* Consider co-locating other complimentary industrial uses adjacent to aggregate extraction sites

An Area Structure Plan would provide some direction as to which complementary uses could be located in proximity to the aggregate extraction site and determine the phasing of same.

Page 5 of 23

### **Request:**

- That Rocky View County prepare an Area Structure Plan along the Highway 1A Corridor prior to considering the Burnco Application.
- That the Burnco Application be circulated to CMRB.
- That all additional setback requirements due to noise, dust or other nuisances be accommodated within the Burnco property.
- Burnco be required to engage adjacent landowners directly impacted by dewatering.

# **3** Staging of Aggregate Mine and Processing Facilities

## 3.1 Approval Based on Ten Year Timeframes

The current NRI Land Use for 151.21 acres was started in 2009 and **Appendix C** shows the original McDougall application. In 2012 a Development Permit was granted for phased development. See **Appendix D** for pictures of Burnco's existing sites in the area. Burnco continues to work on the first 20-30 acres phase with no mining below the aquifer water level. However, with dewatering practices there will be more aggregate available within the water aquifer which would slow the horizontal expansion need of the mine

Given this timing 20 acres has been in mining operations over about a 10-year period. This questions the need to obtain zoning of a mine requiring 1,200 acres at this time. It is premature to zone that much land for a future mine. Alternatively, a Land Use strategy to conduct mining in stages ensures that performance criteria is met and does not preclude other growth along the 1A corridor or Cochrane.

The initial Land Use should be considered on the east side of the Burnco property. This is the land that is closest to Section 8 near Cochrane. By approving a smaller Land Use footprint, the Applicant will be incentivized to work only the gravel deposits in that location, thereby removing the resource prior to the time when MRL is ready to develop, thus eliminating conflict,

The decisions made today for such a scale of mining operations maybe detrimental for the 1A Corridor area and the Bow River Watershed.

### **Request:**

 That Council grant Land Use for ten-year time frames for mining needs. The initial Land Use should be granted for the lands that are in closest proximity to Section 8 near Cochrane. Future mining needs would be accommodated through subsequent Land Use applications once the applicant demonstrates adherence to appropriate performance standards and reclamation requirements.

Page 6 of 23

### 3.2 Commitment to Standards

Rocky View County needs to have assurance that the Land Use approval of aggregate extraction will be followed up with performance measures once mining is taking place. This could be conducted by Council providing direction to administration to enable periodic review of the measures and required amendments to align with cumulative impact assessments evaluated at the time of Land Use approval. The performance measurements should be brought before Council on a regular basis, available to the public upon request and circulated to adjacent land owners. Should the applicant not meet the performance criteria, then the permit should be cancelled

Precedence and examples have been developed. Refer to Ponoka County Development Permit D-19-53 revised November 26, 2019.

### 3.3 Original Pit to New Proposal Comparison

Table 1 compares the 2009 proposed McDougall pit and the 2020 Burnco Cochrane West pit. The comparison shows a significant change in scope, practice, and impact. This illustrates how cumulative impacts must be assessed and monitored as operations change?

- **1. Water:** Protect the aquifers and Bow River watershed for neighbors use and downstream communities. Water licensing requirements of Burnco.
- 2. Environment and Tourism: Bow River Valley natural scenery.
- **3. Gravel Extraction Volume:** Council should consider business need case study by the applicant to support need for current and future proposed Land Use and mine extraction growth. The applicant (operating since 2016) and previous operator (since the original application in 2009) have been working on the 160-acre pit for the past 11+ years and is only partly completed, which at this pace would give the lifespan of this additional rezoning a project life of potentially 100 years.

Page **7** of **23** 

|  | Table 1: Burnco | West Cochrane | <b>Gravel Pit since</b> | 2009 Proposal |
|--|-----------------|---------------|-------------------------|---------------|
|--|-----------------|---------------|-------------------------|---------------|

|                | McDougall Pit Proposal             | 2020 Burnco Pit MSDP               |
|----------------|------------------------------------|------------------------------------|
| Land Use       | Dutchik 2009-01 first draft        | Burnco MSDP 2020-06-01             |
|                | approve 2011 17ac first phase      |                                    |
|                | Dutchik to operate pit             |                                    |
| Land Use       | 10 years                           | 30-35 years                        |
|                | volume sold to-date?               | 400% increase 500,000 T/yr         |
|                |                                    | 28 tandem trucks per hour          |
| Approved       | 2011 Public Hearing                | 2020 fall Public Hearing?          |
|                | Reeve and Council approve except   |                                    |
|                | Area Councilor Paul McLean opposed |                                    |
| Size           | 151.21 ac                          | New 994.4 ac plus 151.21           |
|                |                                    | Total 1,145.61 ac                  |
|                |                                    | plus, SE13 Bow R water site        |
|                |                                    | Maybe 1200 acres?                  |
| Mine           | stay 1m above water                | dewater McDougall pit              |
|                |                                    | dewater east and west pits         |
| Phase          | 2011: one phase 17ac mine          | Phase 1 and 2 are permanent        |
|                | reclaim to start next phase        | Several phases open                |
|                |                                    | East and West sites in parallel?   |
| Develop Permit | July 12. 2012 Fig 1                |                                    |
| Appeal Board   | Max Area 12 ha.                    |                                    |
|                | Phase 1: 7ha Phase 2: 4.9ha        |                                    |
|                | SDAB change from Council approval  |                                    |
| Develop Permit | 2012-DP-15078                      |                                    |
|                | Burnco now operator                |                                    |
| Process        | crush, market gravel               | crush, wash, market gravel         |
|                |                                    | Water pipeline from Bow River      |
|                |                                    | Access road to Bow River           |
|                |                                    | Potential for cement? Cochrane pit |
|                |                                    | Potential for aspnait?             |
| Dama           | form 100m others                   | Potential for other commercial?    |
| Berm           | Net normanant                      | 7-8 miles?                         |
| CADR           |                                    | Permanent                          |
| SAUD           | PRDBP20175125                      |                                    |
| Appeal Board   | Burnco appeal levy, hours          |                                    |
| After Mine     | 2009 proposed Agriculture          | Historically Burnco redevelops     |
|                | Potential development?             | Greystone, others                  |
|                |                                    | Not returned to agriculture        |
|                |                                    | Best invest value                  |
| Zoning Changes |                                    | potentially change zoning anytime  |
|                |                                    | based on economics with approval   |

Page **8** of **23** 

### **Request:**

• That the applicant be requested to prepare a business case to support the aggregate extraction application which provides support for the 1200-acre extraction operation and the projected operating timeline of 30 – 35 years.

## 3.4 Water Issues and Environment

The Land Use change proposed by Burnco takes the existing pit that was proposed to last 10 years (see **Appendix C**) and expands the area to include another 994.4 acres. This is the prime watershed area for all downstream communities' water supply: Cochrane, Calgary, Carseland and more. The new proposal 2020-06 shows a Master Site Development Plan that mines below the ground water. Currently the development permit is for mining a metre above the ground water. This requires Alberta Environment and Parks (AEP) approval and needs extensive consultation with adjacent landowners, downstream users and the Calgary Region. In particular MRL is concerned with the following:

- Water issue dispute resolution needs to be established to ensure the process does not drag out for quite some time
- Third Party water monitoring of adjacent MRL and McNabb wells and springs paid for by Burnco including a predefined frequency.

MRL was just notified Burnco applied to AEP to mine in the water aquifer for the current pit (McDougall 2011) during COVID-19. Burnco advised they put a public notice advertisement in Cochrane Times July 1, 2020 with a seven-day appeal period see **Appendix E.** Cochrane Times is circulated to Cochrane residences and no longer to MRL's rural Rocky View County mailbox.

### **Request:**

- That this application be held in abeyance by Council until such time as AEP has completed its review of the project.
- That the County determine a dispute resolution mechanism.
- That third-party water monitoring be established and paid for by the Applicant.

## 3.5 Transportation

Transportation in the area is very challenging especially during peak times. Burnco proposes 400% increase to 500,000 T/yr and 28 tandem trucks per hour. At present, Alberta Transportation and the Town of Cochrane have indicated that development potential within the Town is limited due to capacity constraints imposed by the intersection of Highway 22 and Highway 1A. As this is likely a major haul route for Burnco, the capacity of this intersection should be examined to determine whether there is enough capacity to support the Burnco application. The timeline for the upgrade of this intersection should also be determined so that it aligns with the Applicant's proposal.

Page **9** of **23** 

An upgrade of Highway 1A should also be requested to allow for the extra capacity required on the section of roadway adjacent to the applicant's proposal.

### **Request:**

• That Alberta Transportation be consulted regarding expansion of 1A highway and the upgrade of the intersection of Highway 22 and Highway 1A.

### 3.6 Larger Permanent Berm Buffer

A larger buffer between the gravel pit and Section 8 allows both parties to achieve their objectives with no conflicts. The current proposed berms require additional setback on MRL's Section 8 lands to provide a buffer for future development and from Highway 1A for future expansion. Increasing the buffer between the applicant's operation and the MRL property allows the Applicant to retain all potential harmful effects within its property. Additionally, it is anticipated that Highway 1A will likely need to be widened. The location of the berm on Burnco's property should be located to accommodate any potential widening required on the south side of the highway. In the long term it is anticipated that a berm will also be required on the north side, similar to Highway 8. The figures and pictures attached indicate the location and visual effect of the installation of berms along Highway 1A and adjacent to Section 8

### **Request:**

• Increase the setback to Permanent Berms from Section 8 and from Highway 1A.



Figure 1: West Cochrane Mine Phase Plan from Burnco's Application Number PL20200066

Page **10** of **23** 

## 3.6.1 Existing Berm



### 3.6.2 Gravel Piled Higher than Berms and Views Blocked

The following image illustrates that the gravel is piled higher than the berms and blocks views unless a multi-story building is built.



Page **11** of **23** 

# 4 Scale of Mine

Gravel pits are being approved on an ad-hoc basis at various scales of operations in Rocky View County. A comprehensive gravel strategy with periodic reviews within Rocky View would provide clarity regarding the responsible planning of a larger areas of gravel aggregates and certainty for both the mining operators and the community impacted by the cumulative effects.

Below is a link to an example that could be referenced for another municipality that have done studies in order to provide information on where gravel developments are best suited as opposed to ad hoc development:

### https://mdpeace.com/wp-content/uploads/2014/04/Gravel-Pit-Study.pdf

### Request:

• Complete a Comprehensive Gravel Strategy prior to Land Use approval.

# 5 Conclusion

The application is in contradiction to RVC's planning documents and approving the Land Use change is a conflict with RVC's own planning documents.

Decisions today made by Rocky View Council today will impact trends, growth, environment, wildlife, water, resources, health, and economic factors for the foreseeable future.

What are the needs twenty years from now? Does Rocky View need more gravel pits now, ten years or twenty years? What infrastructure is needed for health and technology and are those compatible with gravel pits?

MRL recognizes the importance of business assessment for Rocky View taxes and the County success. MRL understands Burnco desire to profit, provide jobs and be a good corporate citizen by claims to monitor and perform; however, this should not be at the expense of MRL.

In summary MRL and McNabb have made the following requests:

- That Rocky View County prepare an Area Structure Plan along the Highway 1A Corridor prior to considering the Burnco Application.
- That the Burnco Application be circulated to CMRB.
- That all additional setback requirements due to noise, dust or other nuisances within the Burnco property.
- Burnco be required to engage adjacent landowners directly impacted by dewatering.

Page **12** of **23** 

- That Council grant Land Use for ten-year time frames for mining needs. The initial Land Use should be granted for the lands that are in closest proximity to Section 8 near Cochrane. Future mining needs would be accommodated through subsequent Land Use applications once the applicant demonstrates adherence to appropriate performance standards and reclamation requirements.
- That the applicant be requested to prepare a business case to support the aggregate extraction application which provides support for the 1200-acre extraction operation and the projected operating timeline of 30 35 years.
- That this application be held in abeyance by Council until such time as AEP has completed its review of the project.
- That the County determine a dispute resolution mechanism.
- That third-party water monitoring be established and paid for by the Applicant.
- That Alberta Transportation be consulted regarding expansion of 1A highway and the upgrade of the intersection of Highway 22 and Highway 1A.
- Increase the setback to Permanent Berms from Section 8 near Cochrane and from Highway 1A.
- Complete a Comprehensive Gravel Strategy prior to Land Use approval.

# Appendix A – Land Ownership Map



Page **14** of **23** 

# **Appendix B – County Development Pressure Map**



County Plan Growth & Servicing Strategy

Page 18 of 27

Page 15 of 23

# **Appendix C – Original McDougall Land Use Application**

Land Use Redesignation Application Report David H. McDougall Ranches Ltd.

EXECUTIVE SUMMARY

Dennis Twerdoff, P.Geol. P.Ag., 715964 Alberta Ltd., was retained by David H. McDougall Ranches Ltd. (McDougall) to prepare a Land Use Redesignation Application Report for a proposed sand and gravel operation.

The proposed development is located on NW 13-26-5-W5M within the Municipal District of Rockyview. McDougall wishes to apply for Land Use Redesignation from Ranch and Farm District (RF) to Natural Resource Industrial District (NRI) to allow for sand and gravel operations. The land is currently hayland/pasture.

McDougall is proposing to undertake dry excavations, crushing and screening.

Although the life span of the sand and gravel pit is estimated to be approximately ten years, the timeframe is highly dependent upon gravel demand in the area. Excavations will occur in several phases with topsoil stockpiled along the edge of each phase. The site will be progressively reclaimed to pasture/hayland as each phase is depleted.

McDougall is committed to running a quality operation and minimizing potential impacts to local residence and the environment.

ALLAN DE CONSTRUCTION DE LA CONS

Page 16 of 23

## F-1 - Attachment E Page 64 of 252

Application Number: PL20200066 MRL and McNabb Comments



Page 17 of 23

## F-1 - Attachment E Page 65 of 252

Application Number: PL20200066 MRL and McNabb Comments



## F-1 - Attachment E Page 66 of 252

### Application Number: PL20200066 MRL and McNabb Comments



# Appendix D – Pictures of Existing Burnco Operations Gravel View



Night Operation is 24 hours/day Impacting Dark Skies, Neighbours, and Wildlife



Page **20** of **23** 

# **Restored Greystone Site**



Additional View of Restored Greystone Site



Page **21** of **23** 

Application Number: PL20200066 MRL and McNabb Comments

## Additional Gravel View



Page **22** of **23** 

# Appendix E - Cochrane Times July 1, 2020 Public Notice Burnco Rock Products Water Act Notice of Decision

Part 9 of the Water Act provides the right to appeal this decision. Any person who is directly affected by this decision may submit a notice of appeal, within seven (7) days of the providing of this notice, to: Chair Environmental Appeals Board

| Public Notices                                                                                                                                                                                                                                                                                     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PUBLIC NOTICE                                                                                                                                                                                                                                                                                      |
| BURNCO Rock Products Ltd.                                                                                                                                                                                                                                                                          |
| WATER ACT                                                                                                                                                                                                                                                                                          |
| NOTICE OF DECISION                                                                                                                                                                                                                                                                                 |
| NOTICE OF BEOISION                                                                                                                                                                                                                                                                                 |
| Notice is given that <b>BURNCO</b> Rock<br><b>Products</b> Ltd. has been issued an<br>approval under the provisions of the <i>Water</i><br><i>Act</i> , on June 8, 2020, to extract aggregate<br>from below the water table of an existing<br>sand and gravel site located at NW<br>13-026-05-W5M. |
| Further information may be obtained from:                                                                                                                                                                                                                                                          |
| Regulatory Assurance Division<br>Southern Region<br>2nd Floor, 2938 11 Street NE<br>Calgary, Alberta T2E 7L7<br>Telephone: 403-297-7605<br>Fax: 403-297-2749                                                                                                                                       |
| Please quote file number: 00430788                                                                                                                                                                                                                                                                 |
| Part 9 of the Water Act provides the right<br>to appeal this decision. Any person who is<br>directly affected by this decision may<br>submit a notice of appeal, within seven (7)<br>days of the providing of this notice, to:                                                                     |
| Chair                                                                                                                                                                                                                                                                                              |
| Environmental Appeals Board                                                                                                                                                                                                                                                                        |
| 10011 109 Street                                                                                                                                                                                                                                                                                   |
| Edmonton, Alberta T5J 3S8                                                                                                                                                                                                                                                                          |
| Telephone: 780-427-6207                                                                                                                                                                                                                                                                            |
| www.eab.gov.ab.ca/index.htm                                                                                                                                                                                                                                                                        |
| For contact purposes, please include your<br>name, phone number, address, land<br>location, and a statement respecting how<br>this decision will directly affect you or your                                                                                                                       |

water supply.

Page 23 of 23

# 8. Opposition - Storms Cornish September 2020 Burnco Land Use Redesignation Application West Cochrane Gravel Pit

# Reginald Storms and Kathleen Cornish

The report states Storms and Cornish's opposition to Application Number PL20200066.

September 30, 2020

BURNCO Rock Products Ltd. (BURNCO) currently operates a gravel pit at NW 13-26-05 W5M located northwest of the Town of Cochrane, Alberta. BURNCO has applied for a Land Use amendment Application Number PL20200066 (the Burnco Application) the purpose of which is to increase the permitted area of aggregate resource extraction to further the expansion of the gravel mining and processing and to secure the long-term future of the existing mine. Reginald Storms and Kathleen Cornish (Storms/Cornish), owners of neighbouring property located at NW 15 26 R5 W5M, Municipal address 262144 Range Rd 53, provide the following positions regarding the BURNCO application as currently proposed.

If approved, this Land Use and subsequent mine expansion would create 452 hectares (1,117 acres) of contiguous lands zoned as NRI for a gravel mining and aggregate processing expansion. BURNCO's intention is to secure long-term investment in the mine and then amend the existing Development Permit (DP # PRDP20175123) and Provincial Code of Practice Registration (Registration # 254757-00-00) for NW 13-26-05 W5M to include all the lands subject to this Land Use Amendment. This would create a gravel pit development which BURNCO plans to operate for the long term and will have lasting impacts upon neighbors, the Town of Cochrane, Rocky View County and Storms/Cornish.

**Responsible Planning** of a mine facility and employment base of such a scale should predicate the development of an Area Structure Plan firstly to fully consider the long-term nature of planning and development opportunities and constraints of the mine on its neighbour's future planning. It is important that the County undertake a comprehensive planning exercise for Highway 1A prior to approving a Land Use that has such a major impact on neighbouring lands. Moreover, any adverse impacts that may be experienced on neighbouring properties due to the nature and scale of the mine should be mitigated within the boundaries of the applicant's lands and not impose those restrictions on its neighbours. This could include moving the berm and active face of the mine further away from the neighbouring properties and moving the crushing and washing operations to a location which would not impact the neighbouring properties.

**Staging of Aggregate Mining and Processing Facilities** is a common best practice in AB. Land Use for the application area as proposed is premature without operational performance assessment targets being set by Rocky View County and Alberta Environment from which assurances to Rocky View, Cochrane and neighbors will be met prior to subsequent Land Use approvals and further operational permit expansions. Without those guarantees to the community the Land Use application as proposed is premature.

**Scale of Mine** is largely unprecedented in Rocky View County. Burnco's Indus pit is approximately the same size; however, there is no record of an MSDP for this pit on Rocky View County's website. This should constitute requirements for higher levels of Land Use approval assessment, community consultation, neighboring owners Land Use policy and planning considerations to mitigate impacts.

Page **1** of **20** 

A comprehensively prepared and approved gravel strategy adopted by Rocky View County is also a must and, like other Counties in Alberta, is a best practice to avoid ad hoc mining approvals and subsequent appeals.

Storms/Cornish respect the right of an owner such as the Applicant to pursue highest and best uses for their property; however, given the scale and long term nature of the Application, it must be conducted with forethought and on good Land Use planning practices with a responsibility not to negatively impact neighbors and the community from pursuing the enjoyment and economic advancement of their interests as well.

BURNCO's sustained mining and processing ability is a win for Burnco. We assume that Rocky View County benefits financially from the project, and it would be useful to see what the financial benefits are compared with the costs that will be incurred by having such a large development with its environmental issues. Making an effort to properly plan the Hwy 1A Corridor area and engaging residents in that planning exercise allows both Rocky View County and the residents to not lose on additional opportunities available within this corridor and also to thoroughly evaluate the benefits of development planning on their lands as well as to mitigate mining impacts. An Area Structure Plan developed along the Highway 1A corridor will allow for Rocky View County, the applicant and the residents to understand the full potential of this area and to determine strategies that will allow for the development of resource extraction in concert with the development potential of this locale.

## Planning Required Prior to Approval of Application

- **Prepare Hwy 1A ASP:** Planning of corridor can take place in a fully considered format versus spot zoning of 1,200 acres of mining and processing operations.
- **Regional Significance**: Plan should be circulated to CMRB.
- **Restrictions on Adjacent Landowner Uses**: Rezoning the entire area as NRI restricts potential use and enjoyment of neighbouring properties as well as affecting property values for agriculturally zoned properties for decades and potentially for the next century or longer.

In particular, the Burnco Report indicates that exceedances of Alberta Ambient Air Quality Objectives will occur for fine particulate matter and for total suspended particles for a distance of 100 metres outside the boundaries of the site. It is requested that Land Use not be granted on those lands that will affect the adjacent landowners until such time as Burnco can demonstrate that its operations will not have any adverse effect on neighbouring lands and that no additional setbacks will be required on the Storms/Cornish property as a result of the Burnco operations.

## **Contradiction of RVC Land Use Framework**

The Application contradicts RVC's Land Use Framework:

- Land Use Framework Strategy, which encourages conservation, land stewardship, healthy ecosystems, and the efficient use of land.
   Zoning for long term use of 1,200 acres of gravel mining operations plus requiring setbacks from future uses is not efficient use of land and contributes to sprawling development patterns.
- Provide for a safe, secure, and reliable drinking water supply.
  Protection of neighbouring groundwater sources is important. Operational practices for de-watering is known to affect adjacent landowner wells.
- Retain rural landscapes, dark skies, open vistas, and agriculture lands. The 1,200 acres of gravel mine operations does not support any of these policies.
- 4. Development shall be planned, designed, and constructed to protect alluvial aquifers. Dewatering operations required to support the mine do not protect Alluvial Aquifers.
- 5. Avoid Development of Wetlands and Riparian Areas

Protection of Bow River watershed and aquifer, for which the Land Use is adjacent, may place downstream communities' water at risk. The Land Use change and economic viability is dependent on dewatering a complex aquifer. The complexity of the local hydrology and the impact of aggregate mining, contamination and use of water for washing gravel over the lifespan of the mine requires performance measures be met prior to future Land Use expansion.

## Proposed MDP Amendment - Aggregate Extraction Section 2.6.1

The proposed MDP wording is:

### 2.6.1 Aggregate Extraction

a) Minimize the adverse impact of aggregate resource extraction on existing residents, adjacent Land Uses, and the environment.

The impact of the Burnco application should be minimized by requiring that all adverse impacts from the Burnco operation, including dust and noise should be retained within the boundaries of the Burnco lands.

b) Encourage collaboration between the County, the aggregate extraction industry, and impacted residents and landowners to develop mutually agreeable solutions that mitigate impacts of extraction activities.

At present, the collaboration between Burnco and at least one neighbouring landowner has not yet been apparent. Impacts of the extraction activities clearly impact this neighbouring landowner from a noise, dust and visual perspective. All neighbouring landowners should be allowed to pursue their objectives without undue interference from a neighbor. Concerns of neighbouring landowners about de-watering and mining in the aquifer for the benefit of Burnco have been ignored.

c) Discourage residential development that may be impacted by future aggregate extraction when proposed outside of an adopted area structure plan.

The adoption of an Area Structure Plan in this area would serve to maximize the development potential in this corridor and determine the Land Uses that would be complementary to each other. Moreover, the adoption of an Area Structure Plan would provide some certainty as to the phasing of both the aggregate extraction and the adjacent development. This is one of the purposes of an ASP.

- d) Where aggregate activities are located in proximity to an adjacent municipality, the County should co-operate with that jurisdiction to ensure co-ordination of major haul routes and mitigation of impacts on adjacent Land Uses Major haul routes may become problematic without the construction of upgrades on Highway 1A and the intersection of Highway 22 and Highway 1A.
- *e)* Consider co-locating other complementary industrial uses adjacent to aggregate extraction sites

An Area Structure Plan would provide some direction as to which complementary uses could be located in proximity to the aggregate extraction site and determine the phasing of same.

Page **4** of **20** 

**Request:** 

- That Rocky View County prepare an Area Structure Plan along the Highway 1A Corridor prior to considering the Burnco Application.
- That the Burnco Application be circulated to CMRB.
- That all additional setback requirements due to noise, dust or other nuisances be accommodated within the Burnco property.
- Burnco be required to engage adjacent landowners directly impacted by dewatering.

# **Staging of Aggregate Mine and Processing Facilities**

### **Approval Based on Ten Year Timeframes**

The current NRI Land Use for 151.21 acres was started in 2009. In 2012 a Development Permit was granted for phased development. Burnco continues to work on the first 20-30 acres phase with no mining below the aquifer water level. However, with dewatering practices there will be more aggregate available within the water aquifer which would slow the horizontal expansion need of the mine

Given this timing 20 acres has been in mining operations over about a 10-year period. This questions the need to obtain zoning of a mine requiring 1,200 acres at this time. It is premature to zone that much land for a future mine. Alternatively, a Land Use strategy to conduct mining in stages ensures that performance criteria is met and does not preclude other growth along the 1A corridor or Cochrane.

The initial Land Use should be considered on the east side of the Burnco property. By approving a smaller Land Use footprint, the Applicant will be incentivized to work only the gravel deposits in that location.

The decisions made today for such a scale of mining operations may be detrimental for the 1A Corridor area and the Bow River Watershed.

### **Request:**

 That Council grant Land Use for ten-year time frames for mining needs. The initial Land Use should be granted for the lands that are in closest proximity to Section 8 near Cochrane. Future mining needs would be accommodated through subsequent Land Use applications once the applicant demonstrates adherence to appropriate performance standards and reclamation requirements.

Page **5** of **20** 

### **Commitment to Standards**

Rocky View County needs to have assurance that the Land Use approval of aggregate extraction will be followed up with performance measures once mining is taking place. This could be conducted by Council providing direction to administration to enable periodic review of the measures and required amendments to align with cumulative impact assessments evaluated at the time of Land Use approval. The performance measurements should be brought before Council on a regular basis, available to the public upon request and circulated to adjacent land owners. Should the applicant not meet the performance criteria, then the permit should be cancelled

Precedence and examples have been developed. Refer to Ponoka County Development Permit D-19-53 revised November 26, 2019.

### **Original Pit to New Proposal Comparison**

Table 1 compares the 2009 proposed McDougall pit and the 2020 Burnco Cochrane West pit. The comparison shows a significant change in scope, practice, and impact. This illustrates how cumulative impacts must be assessed and monitored as operations change?

- **1. Water:** Protect the aquifers and Bow River watershed for neighbors use and downstream communities. Water licensing requirements of Burnco.
- 2. Environment and Tourism: Bow River Valley natural scenery.
- **3. Gravel Extraction Volume:** Council should consider business need case study by the applicant to support need for current and future proposed Land Use and mine extraction growth. The applicant (operating since 2016) and previous operator (since the original application in 2009) have been working on the 160-acre pit for the past 11+ years and is only partly completed, which at this pace would give the lifespan of this additional rezoning a project life of potentially 100 years.

Page 6 of 20

| Table 1: Burnco | West Cochra | ne Gravel Pit | since 2009 | Proposal |
|-----------------|-------------|---------------|------------|----------|
| Table 1. Durneo |             |               |            |          |

|                | McDougall Pit Proposal              | 2020 Burnco Pit MSDP               |
|----------------|-------------------------------------|------------------------------------|
| Land Use       | Dutchik 2009-01 first draft         | Burnco MSDP 2020-06-01             |
|                | approve 2011 17ac first phase       |                                    |
|                | Dutchik to operate pit              |                                    |
|                |                                     |                                    |
| Land Use       | 10 years                            | 30-35 years                        |
|                | volume sold to-date?                | 400% increase 500,000 T/yr         |
|                |                                     | 28 tandem trucks per hour          |
| Approved       | 2011 Public Hearing                 | 2020 fall Public Hearing?          |
|                | Reeve and Council approve except    |                                    |
|                | Area Councilor Paul MicLean opposed |                                    |
| Size           | 151.21 ac                           | New 994.4 ac plus 151.21           |
|                |                                     | Total 1,145.61 ac                  |
|                |                                     | plus, SE13 Bow R water site        |
|                |                                     | Maybe 1200 acres?                  |
|                |                                     |                                    |
| Mine           | stay 1m above water                 | dewater McDougail pit              |
| Dhasa          | 2011, and phase 17ac mine           | Desce 1 and 2 are permanent        |
| Phase          | zoll. One phase 17ac mine           | Soveral phases open                |
|                | reclaim to start next phase         | Fast and West sites in parallel?   |
|                |                                     |                                    |
| Develop Permit | July 12. 2012 Fig 1                 |                                    |
| Appeal Board   | Max Area 12 ha.                     |                                    |
|                | Phase 1: 7ha Phase 2: 4.9ha         |                                    |
|                | SDAB change from Council approval   |                                    |
| Douolon Dormit | 2012 DD 15079                       |                                    |
| Develop Permit | Burnco now operator                 |                                    |
| Process        | crush market gravel                 | crush wash market gravel           |
| 11000035       |                                     | Water pipeline from Bow River      |
|                |                                     | Access road to Bow River           |
|                |                                     | Potential for cement? Cochrane pit |
|                |                                     | Potential for asphalt?             |
|                |                                     | Potential for other commercial?    |
|                |                                     |                                    |
| Berm           | few 100metres                       | 7-8 miles?                         |
|                | Not permanent                       | Permanent                          |
| SADB           | PRDBP20175123                       |                                    |
| Appeal Board   | Burnco appeal levy, hours           |                                    |
| After Mine     | 2009 proposed Agriculture           | Historically Burnco redevelops     |
|                | Potential development?              | Greystone, others                  |
|                |                                     | Not returned to agriculture        |
|                |                                     | Best invest value                  |

Page **7** of **20** 

| Zoning Changes | potentially change zoning anytime based on economics with approval |
|----------------|--------------------------------------------------------------------|
|                |                                                                    |

### **Request:**

• That the applicant be requested to prepare a business case to support the aggregate extraction application which provides support for the 1200-acre extraction operation and the projected operating timeline of 30 – 35 years.

### Water Issues and Environment

The Land Use change proposed by Burnco takes the existing pit that was proposed to last 10 years and expands the area to include another 994.4 acres. This is the prime watershed area for all downstream communities' water supply: Cochrane, Calgary, Carseland and more. The new proposal 2020-06 shows a Master Site Development Plan that mines below the ground water. Currently the development permit is for mining a metre above the ground water. This requires Alberta Environment and Parks (AEP) approval and needs extensive consultation with adjacent landowners, downstream users and the Calgary Region. In particular MRL is concerned with the following:

- Water issue dispute resolution needs to be established to ensure the process does not drag out for quite some time
- Third Party water monitoring of adjacent Storms/Cornish wells paid for by Burnco including a predefined frequency.

Storms/Cornish were just notified Burnco applied to AEP to mine in the water aquifer for the current pit (McDougall 2011) during COVID-19. Burnco advised they put a public notice advertisement in Cochrane Times July 1, 2020 with a seven-day appeal period see **Appendix E.** Cochrane Times is circulated to Cochrane residences and not to Storms/Cornish's rural Rocky View County mailbox.

### **Request:**

- That this application be held in abeyance by Council until such time as AEP has completed its review of the project.
- That the County determine a dispute resolution mechanism.
- That third-party water monitoring be established and paid for by the Applicant.

Page 8 of 20

## Transportation

Transportation in the area is very challenging especially during peak times. Burnco proposes 400% increase to 500,000 T/yr and 28 tandem trucks per hour. At present, Alberta Transportation and the Town of Cochrane have indicated that development potential within the Town is limited due to capacity constraints imposed by the intersection of Highway 22 and Highway 1A. As this is likely a major haul route for Burnco, the capacity of this intersection should be examined to determine whether there is enough capacity to support the Burnco application. The timeline for the upgrade of this intersection should also be determined so that it aligns with the Applicant's proposal.

An upgrade of Highway 1A should also be requested to allow for the extra capacity required on the section of roadway adjacent to the applicant's proposal.

### **Request:**

• That Alberta Transportation be consulted regarding expansion of 1A highway and the upgrade of the intersection of Highway 22 and Highway 1A.



Figure 1: West Cochrane Mine Phase Plan from Burnco's Application Number PL20200066

# Scale of Mine

Gravel pits are being approved on an ad-hoc basis at various scales of operations in Rocky View County. A comprehensive gravel strategy with periodic reviews within Rocky View would provide clarity regarding the responsible planning of a larger areas of gravel aggregates and certainty for both the mining operators and the community impacted by the cumulative effects.

Below is a link to an example that could be referenced for another municipality that have done studies in order to provide information on where gravel developments are best suited as opposed to ad hoc development:

## https://mdpeace.com/wp-content/uploads/2014/04/Gravel-Pit-Study.pdf

### **Request:**

• Complete a Comprehensive Gravel Strategy prior to Land Use approval.

# Conclusion

The application is in contradiction to RVC's planning documents and approving the Land Use change is a conflict with RVC's own planning documents.

Decisions today made by Rocky View Council today will impact trends, growth, environment, wildlife, water, resources, health, and economic factors for the foreseeable future.

What are the needs twenty years from now? Does Rocky View need more gravel pits now, ten years or twenty years? What infrastructure is needed for health and technology and are those compatible with gravel pits?

Storms/Cornish recognize the importance of business assessment for Rocky View taxes and the County success. Storms/Cornish understand Burnco desire to profit, provide jobs and be a good corporate citizen by claims to monitor and perform; however, this should not be at the expense of Storms/Cornish.

In summary Storms/Cornish have made the following requests:

- That Rocky View County prepare an Area Structure Plan along the Highway 1A Corridor prior to considering the Burnco Application.
- That the Burnco Application be circulated to CMRB.
- That all additional setback requirements due to noise, dust or other nuisances within the Burnco property.
- Burnco be required to engage adjacent landowners impacted by dewatering.

Page **10** of **20** 

- That Council grant Land Use for ten-year time frames for mining needs. The initial Land Use should be granted for the lands that are in closest proximity to Section 8 near Cochrane. Future mining needs would be accommodated through subsequent Land Use applications once the applicant demonstrates adherence to appropriate performance standards and reclamation requirements.
- That the applicant be requested to prepare a business case to support the aggregate extraction application which provides support for the 1200-acre extraction operation and the projected operating timeline of 30 35 years.
- That this application be held in abeyance by Council until such time as AEP has completed its review of the project.
- That the County determine a dispute resolution mechanism.
- That third-party water monitoring be established and paid for by the Applicant.
- That Alberta Transportation be consulted regarding expansion of 1A highway and the upgrade of the intersection of Highway 22 and Highway 1A.
- Complete a Comprehensive Gravel Strategy prior to Land Use approval.

Page 11 of 20

# **Appendix A – County Development Pressure Map**



County Plan Growth & Servicing Strategy

Page 18 of 27

Page 12 of 20

# **Appendix B – Original McDougall Land Use Application**

Land Use Redesignation Application Report David H. McDougall Ranches Ltd.

EXECUTIVE SUMMARY

Dennis Twerdoff, P.Geol. P.Ag., 715964 Alberta Ltd., was retained by David H. McDougall Ranches Ltd. (McDougall) to prepare a Land Use Redesignation Application Report for a proposed sand and gravel operation.

The proposed development is located on NW 13-26-5-W5M within the Municipal District of Rockyview. McDougall wishes to apply for Land Use Redesignation from Ranch and Farm District (RF) to Natural Resource Industrial District (NRI) to allow for sand and gravel operations. The land is currently hayland/pasture.

McDougall is proposing to undertake dry excavations, crushing and screening.

Although the life span of the sand and gravel pit is estimated to be approximately ten years, the timeframe is highly dependent upon gravel demand in the area. Excavations will occur in several phases with topsoil stockpiled along the edge of each phase. The site will be progressively reclaimed to pasture/hayland as each phase is depleted.

McDougall is committed to running a quality operation and minimizing potential impacts to local residence and the environment.

ALLER AND ALTION
 Sold Conservation and Director Control

Page 13 of 20

## F-1 - Attachment E Page 85 of 252

Application Number: PL20200066 Storms/Cornish Comments



## F-1 - Attachment E Page 86 of 252

### Application Number: PL20200066 Storms/Cornish Comments



## F-1 - Attachment E Page 87 of 252

### Application Number: PL20200066 Storms/Cornish Comments


Application Number: PL20200066 Storms/Cornish Comments

# Appendix C – Pictures of Existing Burnco Operations Gravel View



Night Operation is 24 hours/day Impacting Dark Skies, Neighbours, and Wildlife



Page **17** of **20** 

Application Number: PL20200066 Storms/Cornish Comments

# **Restored Greystone Site**



Additional View of Restored Greystone Site



Page **18** of **20** 

#### ATTACHMENT 'E': PUBLIC SUBMISSIONS

Application Number: PL20200066 Storms/Cornish Comments

# Additional Gravel View



Page **19** of **20** 

# Appendix D - Cochrane Times July 1, 2020 Public Notice Burnco Rock Products Water Act Notice of Decision

Part 9 of the Water Act provides the right to appeal this decision. Any person who is directly affected by this decision may submit a notice of appeal, within seven (7) days of the providing of this notice, to: Chair Environmental Appeals Board

| Public Notices                                                                                                                                                                                                                 |   |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| PUBLIC NOTICE                                                                                                                                                                                                                  | 1 |
| BURNCO Rock Products Ltd.                                                                                                                                                                                                      | I |
| WATER ACT                                                                                                                                                                                                                      | I |
| NOTICE OF DECISION                                                                                                                                                                                                             |   |
|                                                                                                                                                                                                                                |   |
| Products Ltd. has been issued an approval under the provisions of the Water Act, on June 8, 2020, to extract aggregate from below the water table of an existing sand and gravel site located at NW 13-026-05-W5M.             |   |
| Further information may be obtained from:                                                                                                                                                                                      |   |
| Regulatory Assurance Division                                                                                                                                                                                                  |   |
| Southern Region                                                                                                                                                                                                                |   |
| 2nd Floor, 2938 11 Street NE                                                                                                                                                                                                   |   |
| Telephone: 403-297-7605                                                                                                                                                                                                        |   |
| Fax: 403-297-2749                                                                                                                                                                                                              |   |
| Please quote file number: 00430788                                                                                                                                                                                             |   |
| Part 9 of the Water Act provides the right<br>to appeal this decision. Any person who is<br>directly affected by this decision may<br>submit a notice of appeal, within seven (7)<br>days of the providing of this notice, to: |   |
| Chair                                                                                                                                                                                                                          |   |
| Environmental Appeals Board                                                                                                                                                                                                    |   |
| 3rd Floor, Peace Trust Tower                                                                                                                                                                                                   |   |
| 10011 109 Street                                                                                                                                                                                                               |   |
| Telephone: 780-427-6207                                                                                                                                                                                                        |   |
| Fax: 780-427-4693                                                                                                                                                                                                              |   |
| www.eab.gov.ab.ca/index.htm                                                                                                                                                                                                    |   |
| For contact purposes, please include your<br>name, phone number, address, land<br>location, and a statement respecting how<br>this decision will directly affect you as some                                                   |   |

water supply.

Page 20 of 20

| From:    | Natalie Robertson                                    |
|----------|------------------------------------------------------|
| То:      | Oksana Newmen                                        |
| Cc:      | Christine Harrison                                   |
| Subject: | FW: [EXTERNAL] - Burnco Development West of Cochrane |
| Date:    | October 1, 2020 2:22:36 PM                           |

Hi Oksana,

I believe this is your file... they made the deadline!

Regards,

#### NATALIE ROBERTSON, MEDES

Development Assistant | | Planning and Development

#### **ROCKY VIEW COUNTY**

262075 Rocky View Point | AB | T4A 0X2 Phone: 403-520-6333 nrobertson@rockyview.ca | www.rockyview.ca

This e-mail, including any attachments, may contain information that is privileged and confidential. If you are not the intended recipient, any dissemination, distribution or copying of this information is prohibited and unlawful. If you received this communication in error, please reply immediately to let me know and then delete this e-mail.

From: Diane Young
Sent: September 30, 2020 8:26 PM
To: Questions <<u>questions@rockyview.ca</u>>
Subject: [EXTERNAL] - Burnco Development West of Cochrane

#### Do not open links or attachments unless sender and content are known.

We would like to have some points looked at in regards to the Burnco Development West of Cochrane and understand the deadline is October 1<sup>st</sup>.

Wendell and Diane Young Division 9 NE Section 16 26 west of 5<sup>th</sup>

We live in the same area where all the proposed development will occur. Our biggest concern is the water issue; Burnco should look after all the neighbors by measuring the water pre start of any work, during the work and continue to work with the neighborhood once they start the production of the pits. Water is life here in the county and we want to make sure that our livelihoods in our homes, farms and ranches continue to be of the same quality pre- development.

Water that flows from the Bow /Grand Valley Creek should not be touched. The Ghost Dam with all of its changing levels is not something that should be relied on for water.

The second thing we would like addressed is the berms. Currently the first pad that has been built has the berm too close to the highway. If there is any need to widen the highways, it would automatically go to the farm/ranch lands. When I see where highway 22X has placed their berms far from the main highway, why cannot this be done on Highway 40?

Sincerely,

Wendell and Diane Young

Sent from Mail for Windows 10

| From:        | Glenn Makwich                                                            |
|--------------|--------------------------------------------------------------------------|
| To:          | Oksana Newmen                                                            |
| Cc:          | Shawn Belecki; John Simpson; Luke Simpson; Christie Simpson; Jeff Beaton |
| Subject:     | Re: [EXTERNAL] - Burnco West Cochrane Development                        |
| Date:        | September 30, 2020 1:12:15 PM                                            |
| Attachments: | 2020 09 30 LTR RVC Objection - Burnco West Cochrane Pit 02 SIGNED.pdf    |
|              | FW Burnco West Cochrane Development Comment Sheet Letter.msg             |
|              | Letter to Burnco - West Cochrane Pit Rev. 1 pdf                          |

Oksana, on behalf of Simpson Ranching Ltd. please see attached their letter of objection to proposed bylaw C-8073-2020 to amend Rocky View County Land Use Bylaw.

Also find attached our letter dated April 30, 2020 addressed to Burnco with our concerns following their open house of March 9, 2020 and their emailed response from May 8, 2020 to our concerns. Please review the attached and keep us apprised of any further developments, especially scheduled public hearing.

Glenn Makwich Senior Project Manager

<u>Please note that I am away/unavailable on Fridays and may not return emails until the</u> <u>following week.</u>

#### **IDEA Group Inc.**

4034-4th Street SE Calgary, AB T2G 2W3 ph. 403.274.4556 cell. 403-835-2133 fax. 403.206.7295 email. g.makwich@ideagroupinc.ca web.www.ideagroupinc.com

From: Oksana Newmen <ONewmen@rockyview.ca>
Date: Thursday, September 17, 2020 at 11:26 AM
To: Glenn Makwich <g.makwich@ideagroupinc.ca>
Subject: RE: [EXTERNAL] - Burnco West Cochrane Development

#### Hi Glenn,

No discussion of potential public hearing dates. And I believe the request for comments is October

1<sup>st</sup>, but if you need more time, just let me know. We appreciate having feedback within a reasonable amount of time so things aren't trickling in over a long period of time, but we are of course sensitive to people's need for time to review.

Warm regards, ~Oksana

From: Glenn Makwich <g.makwich@ideagroupinc.ca>
Sent: September 17, 2020 10:55 AM
To: Oksana Newmen <ONewmen@rockyview.ca>
Cc: Shawn Belecki <Shawn.Belecki@cana.ca>; Jeff Beaton <j.beaton@ideagroupinc.ca>

**Subject:** Re: [EXTERNAL] - Burnco West Cochrane Development

Oksana, we see a unanimous decision on the September 1 council meeting first reading. A couple of quick questions if I may. Any idea yet of when public hearing will be held? Secondly, is there a deadline to submit a letter of objection?

Glenn Makwich Senior Project Manager

<u>Please note that I am away/unavailable on Fridays and may not return emails until the</u> <u>following week.</u>

IDEA Group Inc. 4034-4th Street SE Calgary, AB T2G 2W3 ph. 403.274.4556 cell. 403-835-2133 fax. 403.206.7295 email. g.makwich@ideagroupinc.ca web.www.ideagroupinc.com

From: Oksana Newmen <<u>ONewmen@rockyview.ca</u>>
Date: Friday, July 24, 2020 at 8:25 AM
To: Glenn Makwich <<u>g.makwich@ideagroupinc.ca</u>>
Subject: RE: [EXTERNAL] - Burnco West Cochrane Development

Glenn,

That's correct. I'm guessing you/your client spotted the McNair pit first reading item on July 28<sup>th</sup> – different site, different project entirely. Also much smaller at 26 acres.

Warm regards, ~Oksana

From: Glenn Makwich <g.makwich@ideagroupinc.ca>
Sent: Thursday, July 23, 2020 5:23 PM
To: Oksana Newmen <<u>ONewmen@rockyview.ca</u>>
Subject: [EXTERNAL] - Burnco West Cochrane Development

Do not open links or attachments unless sender and content are known.

Oksana, our client wanted us to confirm that the land use redesignation for the above subject site is not on the July 28<sup>th</sup> council agenda.

I couldn't find it on the agenda but he also wanted me to confirm with you. Can you help?

Glenn Makwich Senior Project Manager <u>Please note that I am away/unavailable on Fridays and may not return emails until the</u> <u>following week.</u>

IDEA Group Inc. 4034-4th Street SE Calgary, AB T2G 2W3 ph. 403.274.4556 cell. 403-835-2133 fax. 403.206.7295 email. g.makwich@ideagroupinc.ca web.www.ideagroupinc.com

#### ATTACHMENT 'E': PUBLIC SUBMISSIONS



#### SIMPSON RANCHING LIMITED

#100, 5720 4th Street S.E., Calgary, Alberta T2H 1K7

# F-1 - Attachment E Page 97 of 252 PHONES

RANCH (403) 932-2897 OFFICE (403) 255-5521 FAX (403) 255-0944 www.simpsonranching.ca

September 30, 2020

**VIA EMAIL** 

Rocky View County 262075 Rocky View Point Rocky View County, Alberta T4A 0X2

Attention: Oksana Newmen (Planner)

# Re: Burnco West Cochrane Development Proposed Bylaw C-8073-2020 to amend Rocky View County Land Use Bylaw (the "Proposed Bylaw Amendment")

Simpson Ranching Limited ("SRL"), is hereby writing to object to the Proposed Bylaw Amendment which was presented to Rocky View Council and received first reading on September 1, 2020.

SRL's concerns respecting the Proposed Bylaw Amendment, as set forth more fully below, were formulated after reviewing the detailed response we received from Burnco respecting questions submitted by SRL after attending Burnco's open house on March 9, 2020 (the "Burnco Response"), and our review of Burnco's presentation boards from that open house. Copies of SRL's initial inquiries of Burnco and the Burnco Response have been enclosed with this letter of objection.

SRL's first and primary concern with the Proposed Bylaw Amendment relates to the amount of land impacted by this proposed change. In the Burnco Response, Burnco informed SRL that current yearly sales from the current operations of this West Cochrane site range from 100,000 to 150,000 tonnes and that if the Proposed Bylaw Amendment is passed, the total estimated reserves available would amount to 15 million tonnes. These numbers suggest that the Proposed Bylaw Amendment would allow for 120 to 150 years of gravel extraction at the current yearly sales volume. The Burnco Response also indicates that Burnco hopes to increase extraction over a 10-year period to 500,000 tonnes per year. If achieved, this would result in a site capacity range of between 30 to 35 years.

As stated, SRL is concerned that greenlighting between 30-150 years of gravel production today, will result in a scenario where the County loses all ability to apply prudent planning principals that address future county needs in a critical county highway corridor, and we would urge the County to avoid.

# F-1 - Attachment E Page 98 of 252

Oksana Newmen I Rocky View County September 30, 2020 Page 2 of 3

This and, there is no guarantee that any current development or production will result from an approved amendment.

After the Burnco open house, SRL inquired about the reclamation timeline for current and future pits, what commitments were in place respecting reclamation, and what certainty County landowners would have respecting open land based on the next stages of operation and development of Burnco's operation. With a timeframe for completion between 30 and 150 years, SRL remains unclear how these requirements will be managed and staged, or how there would be any prudent municipal control or approvals over future activities if the application is approved.

A secondary concern related to magnitude of the proposed amendment is that because several decades of gravel reserves will be preserved and protected by the Proposed Bylaw Amendment, the amendment will likely result in grandfathering and potentially avoidance of future requirements respecting environmental protections, surface reclamation, and resource development requirement and regulations respecting operations. Accordingly, SRL objects to a re-designation of this magnitude. Burnco's primary response to this concern is that they desire long term supply security for their concrete and asphalt plants for long term business certainty. As stated previously, long term remains undefined and a reasonable time frame should be provided based on current performance, taking into account this site together with the complete complement of Burnco gravel reserves in the County.

Burnco should provide a plan to phase development and ensure minimal impact to the surrounding landowners, the environment, and define extraction completion in a manner suitable for future land use and development growth within Rocky View County. On page 5 of the presentation boards it appears that the mining, and more importantly the borrow areas, indicated on the site map are tight to the top of the Grande Valley Creek escarpment. It is important to define and protect these boundaries at land use stage and adhere to them during the mining and borrow operations of the pit. A setback from the top of escarpment is required to minimize the erosion impact to Grande Valley Creek.

On page 17 of the presentation boards, the Biophysical Impact, it states that a 30m buffer from a water course is recommended for a Riparian Zone. When the map and legend are referenced, it appears as though the Riparian Zone is defined incorrectly, in fact Grande Valley Creek seems to be protected on one side at the North end of the map, but not the other.

The reclamation timeline of the current and future pits and how that relates to the amount of open land based on the next stages of operation and completion is critical to understand – with a timeframe for completion between 30 and 150 years, we do not understand how this will be managed, or how there would be any prudent municipal control or approvals over future activities if. the application is approved.

# F-1 - Attachment E Page 99 of 252

Oksana Newmen I Rocky View County September 30, 2020 Page 3 of 3

We do not feel that a gravel development application of this size is the best use of this land along a highway corridor, along the Bow River, with mountain views, and access to major urban centers, at this time or in the future. We urge Rocky View County to limit Burnco and their application to the amount of land feasibly developed and reclaimed in a ten-year period prior to approval by council.

Sincerely, Simpson Ranching Limited

J. Luke Simpson

So

Enclosures (2): SRL's Initial Inquiries of Burnco The Burnco Response



F-1 - Attachment E Page 100 of 252

> 4034 4 Street SE Calgary, AB T2G2W3 (t)403.274.4556 (f)403.206.7295 www.ideagroupinc.com

30 April 2020

IDEA File: 20000

**IDEA GROUP INC.** 4034-4<sup>th</sup> Street SE Calgary AB T2G 2W3

Attention: Travis Coates - via email

### RE: BURNCO West Cochrane Development

On behalf of Simpson Ranching Limited we are writing to comment on your project as requested at your open house of March 9, 2020.

Our concerns and comments listed below were formulated by responses to our questions at the open house as well as review of your presentation boards that were forwarded to us.

We would appreciate a response to our questions and concerns.

Our first concern would be the amount of land that BURNCO is trying to get Land Use on. For us to clearly understand this we need to know the production of each of your operating pits and the timeline of estimated pit depletion. You say that this proposed West Cochrane development should ramp up to 500,000 tonnes per year within the next 10 years. That compares with Indus from 2016. What is the West Cochrane current pit production and what is the estimated gravel reserve in this first phase? As well, we would like to know the forecast on your depletion of these anticipated reserves for the entire application area.

It appears as though this application is protecting Burnco against future changes in zoning regulations, environmental protections or surface resource development. Why is it necessary to rezone so much land now?

How does Burnco plan to phase development to least impact surrounding landowners, the environment and to complete extraction in a pattern that is suitable to a future land use and development growth.

Another concern would be the reclamation timeline of this current pit and how that relates to the amount of open land based on the next stages of operation. We are sure that there has been a considerable amount of research and input into the proper way to stage this project.

How does a gravel development application of this size provide for the highest and best use of this land (along a highway corridor, along the Bow river, with mountain views and access to major urban centers) now and in the future?

On page 5 it appears that the mining and more importantly the borrow areas indicated on your site map are quite tight to the top of the escarpment of the Grande Valley Creek. We believe that it is quite important to define and protect these boundaries at land use stage and stick to them during your mining and borrow operations. There must be a setback from the top of escarpment to minimize the erosion impact to this creek valley.

On page 17, the Biophysical Impact, it states that a 30-meter buffer from a water course is the recommendation for a Riparian Zone. When we look at the map and if we are interpreting the





BURNCO West Cochrane Development Rocky View County AB

30 April 2020 Page 2 of 2

legend properly it doesn't appear to be drawn correctly. The creek itself seems to be protected on one side and not the other.

Further to the above, we did not see any reference to a wildlife corridor study, yet we did see some significant sized culverts in the area, can you please clarify?

We would urge Burnco to limit their application to the amount of land feasibly developed in a tenyear period prior to submission to the county.

Sincerely,

IDEA Group Inc.

Glenn Makwich Tel. 403.274.4556 Fax 403.206.7295

CTJ/ctj

CC: Jeff Beaton, IDEA Shawn Belecki, CANA Group of Companies John Simpson, Simpson Ranching Luke Simpson, Simpson Ranching Christie Simpson, Simpson Ranching

| From:        | Travis Coates                                                                                              |
|--------------|------------------------------------------------------------------------------------------------------------|
| To:          | Glenn Makwich                                                                                              |
| Cc:          | John Simpson; Shawn Belecki; Luke Simpson; Christie Simpson; Jeff Beaton; Thomas Tyler; Ulrich Scheidegger |
| Subject:     | FW: Burnco West Cochrane Development Comment Sheet & Letter                                                |
| Date:        | May 8, 2020 10:50:19 AM                                                                                    |
| Attachments: | Comment Sheet.pdf                                                                                          |
|              | Letter to Burnco - West Cochrane Pit Rev. 1.pdf                                                            |

CAUTION: This email originated from outside your organization. Exercise caution when opening attachments or clicking links, especially from unknown senders.

Glen,

Thanks again for the correspondence. I have included this letter in our open house feedback and it will help assist us as we put the final touches on our Land Use Submission. As mentioned in my previous email, I would be more than happy to have a call with your group to provide further opportunity for discussion.

Please see below. I have provided responses to your questions in red.

We would appreciate a response to our questions and concerns.

Our first concern would be the amount of land that BURNCO is trying to get Land Use on. For us to clearly understand this we need to know the production of each of your operating pits and the timeline of estimated pit depletion. You say that this proposed West Cochrane development should ramp up to 500,000 tonnes per year within the next 10 years. That compares with Indus from 2016. What is the West Cochrane current pit production and what is the estimated gravel reserve in this first phase? As well, we would like to know the forecast on your depletion of these anticipated reserves for the entire application area. Current sales from our existing West Cochrane site are in the range of 100,000 to 150,000 tonnes per year. As stated on the slides, the total estimated reserve of this project is 15 million tonnes. Based on the anticipated extraction rate of 500,000 tonnes plus ramp up time, the project would have a life span of around 30-35 years. BURNCO has a number for gravel production sites around Calgary and supply from this site would form part of that network.

It appears as though this application is protecting Burnco against future changes in zoning regulations, environmental protections or surface resource development. Why is it necessary to rezone so much land now? BURNCO operates a number of asphalt and concrete plants. Having secure supply of aggregate for those plants is critical. The reason to rezone all portions of the project at current time is to provide some assurance that this site can be relied upon in future to supply aggregate to those facilities. Gravel pits are subject to continuous permit renewals at the municipal and provincial levels so the inclusion of areas is not an attempt to avoid future regulation changes, but rather, driven by a need for long term business certainty.

How does Burnco plan to phase development to least impact surrounding landowners, the environment and to complete extraction in a pattern that is suitable to a future land use and development growth. The open house included phasing details of the project. I would draw your attention to the plan for phased construction of the screening berm. This will allow the screening berm to mitigate visual impacts of the project as it proceeds. Feedback form the first open house has also led us to plan phasing on the eastern portion of the project (those lands east of Grande Valley Creek) so that operations progress from east to west. This will mean that operations at the site are moving away from the town of

#### Cochrane over time.

Another concern would be the reclamation timeline of this current pit and how that relates to the amount of open land based on the next stages of operation. We are sure that there has been a considerable amount of research and input into the proper way to stage this project. Not all lands will be open and disturbed at one time. The Permitted land base is there to ensure access to gravel, it is not needed as operational space at one time. Reclamation will be progressive.

How does a gravel development application of this size provide for the highest and best use of this land (along a highway corridor, along the Bow river, with mountain views and access to major urban centers) now and in the future? Gravel pits are an interim land use. As stated above, the life of this project is expected to be in the range of 30-35 years. After that, the lands will be ready for the future. Some areas before that time as operations progress. We think this fits well for the area given its close proximity to urban centers as you noted (but which are still no less than 1 mile away from the east extent of our project boundary). Though we remain unsure what exactly the future will bring as definition of highest and best use often depends who you are talking to.

On page 5 it appears that the mining and more importantly the borrow areas indicated on your site map are quite tight to the top of the escarpment of the Grande Valley Creek. We believe that it is quite important to define and protect these boundaries at land use stage and stick to them during your mining and borrow operations. There must be a setback from the top of escarpment to minimize the erosion impact to this creek valley. Planning has been very careful in relation to this point. Natural drainage flows down the escarpment at present. Mining activities must restore this drainage and ensure ponding is not being created. A couple of key sections of the escarpment must be excavated to facilitate this. The concern about sediment is appreciated and BURNCO has very detailed and thorough planning related to erosion and sediment control for these areas.

On page 17, the Biophysical Impact, it states that a 30-meter buffer from a water course is the recommendation for a Riparian Zone. When we look at the map and if we are interpreting the legend properly it doesn't appear to be drawn correctly. The creek itself seems to be protected on one side and not the other. A 30m buffer is being maintained form all riparian areas. Further a 60m setback is being maintained from the Bow River and Grande Valley Creek. These setbacks were mapped, and sometimes overlap. The most stringent setback was utilized in all cases. Please note that many riparian areas do not have bed or banks (ie active river channel to map) they just hold water periodically at some point throughout the year. As a result, setbacks are generally based of centerline. Other streams have bed and banks to go off, and setbacks in those cases are based of those.

Happy to follow up on this if I am misunderstanding the question.

Further to the above, we did not see any reference to a wildlife corridor study, yet we did see some significant sized culverts in the area, can you please clarify? Impacts to wildlife was reviewed as part of our Biophysical Impact Assessment. As stated above, not all areas of the site will be active at one time. That will greatly assist in maintaining wildlife mobility across the lands. Setbacks form riparian areas will also help to achieve this goal. I am a little unsure with regard to the culvert reference. BURNCO has proposed a number of culverts within its screening berm. These will be located and sized in a similar fashion to those under highway 1A and are there to ensure stormwater flows can continue as most storm water in the area is moving from north to south and toward the Bow River. They are not there to serve a wildlife function specifically. Our screening berms have 3:1 sloping and would be easily navigated by all wildlife.

We would urge Burnco to limit their application to the amount of land feasibly developed in a ten- year period prior to submission to the county. Thank you for this comment however that approach just would not provide BRUNCO with meaningful business certainty.

Working remotely in adherence with COVID-19 social distancing measures. Contact me via email or phone @ (403) 640-9217.

Thank you and take care,

| ? |  |
|---|--|
|   |  |

Travis Coates, P. Eng Land and Resource Manager Alberta and Saskatchewan Phone: (403) 640-9217 Email: <u>travis.coates@burnco.com</u> *Excellence · Integrity · Passion* 

From: Glenn Makwich <g.makwich@ideagroupinc.ca>

Sent: Wednesday, May 6, 2020 11:02 AM

To: Travis Coates < Travis.Coates@burnco.com>

Cc: John Simpson <simpsonj@cana.ca>; Shawn Belecki <Shawn.Belecki@cana.ca>; Luke Simpson

<Luke.Simpson@cana.ca>; Christie Simpson <Christie.Simpson@atco.com>; Jeff Beaton

<j.beaton@ideagroupinc.ca>

Subject: Burnco West Cochrane Development Comment Sheet & Letter

[External Email]

Travis, please see attached.

Glenn Makwich Senior Project Manager

#### <u>Please note that I am away/unavailable on Fridays and may not return emails until the</u> <u>following week.</u>

#### **IDEA Group Inc.**

4034-4th Street SE Calgary, AB T2G 2W3 ph. 403.274.4556 cell. 403-835-2133 fax. 403.206.7295 email. g.makwich@ideagroupinc.ca web.www.ideagroupinc.com

# **Caitlyn T. Anderson**

| From:    | Alex Reed                                                                        |
|----------|----------------------------------------------------------------------------------|
| Sent:    | June 18, 2021 4:13 PM                                                            |
| То:      | Legislative Services Shared                                                      |
| Subject: | [EXTERNAL] - Opposition to the Burnco West Cochrane Gravel Pit Bylaw C-8073-2020 |

Do not open links or attachments unless sender and content are known.

I wish to voice, and have recorded as a matter of record, my opposition to the Burnco West Cochrane Gravel Pit Bylaw C-8073-2020.

Aside from the fact that I don't believe that this gravel is needed, my concerns are about the traffic and air quality, but my major concern is about what will become of the water quality for the Town of Cochrane. 30,000+ residents of the Town of Cochrane depend of that water and the Town's intake value is just downstream from this monster gravel pit.

I plead with the Rockyview County Council to not approve this Bylaw.

Respectfully,

Alex Reed

Town of Cochrane Resident

137 Gleneagles View

June 23, 2021

Via Email

Rocky View County 262075 Rocky View Point Rocky View County, Alberta T4A0X2

Attention: Oksana Newman, Planner

Re: Oppose Burnco West Cochrane Proposed Bylaw C-8073-2020 Application PL20200066 to amend Rocky View Land Use Bylaw (the "Proposed Bylaw Amendment")

# Burnco Land Use and proposed MSDP Policies Lack specific visible performance measures for adjacent landowners and the Community

McKendrick Ranches Ltd and Ann McKendrick McNabb, are opposed to the Proposed Bylaw Amendment, which was presented to Rocky View (RV) Council and received first reading September 1, 2020.

# Land use for additional Aggregate use should be conditional on proving that the Bow River water quality will not be impacted by the current or future pits.

**Our first and primary concern is the size of the proposed pit**. If approved, this Land Use and subsequent mine expansion would create 452 hectares (1,117 acres) of contiguous lands zoned as NRI for a gravel mining and aggregate processing expansion. The proposed land use would rezone approximately 6.5 km of lands south of the highway 1A along the Bow River.

Rocky View has not developed a gravel strategy, performance measures and policies to allow a mix of land uses in a developing community for the next 120 years. Given current markets, the proposed pit could last **120 years with no visible measures to ensure the community is not impacted**.

Are aggregate company consultant reports reviewed by unbiased experts? Is the air quality and dusts measured to ensure no impact on neighbours and animals health regardless of residences or distances? Are visible tests required yearly or frequently to ensure the drinking water of a few million people are reviewed by qualified experts and the data available to the public? The answers to many of these questions: NO, there is no proactive performance measures available to the public to ensure practices are safe and the pits are timely reclaimed to environmental or current standards.

Rocky View County (RVC) and Council have jurisdiction over the public decision and the land use planning. RVC Bylaws State: "practice sound land use planning in order to protect agriculture operations, native habitat, environmentally sensitive areas and retain rural landscapes, dark skies, open vistas and agriculture lands." In the Natural resource policy **basically RVC give all the authority to Alberta Environment and Parks (AEP) or other regulatory groups.** AEP will only consider the application if the County is willing to allow the land use in the environmentally sensitive Bow River Valley corridor. The **AEP process does not** require adjacent property owner notification, engagement and provide for performance monitoring visible to the adjacent property owners. AEP are not elected.

Once Land Use is approved by RVC, Alberta Environment and Parks cannot change the zoning even if that means the Bow River Valley water is destroyed. (Discussed in AE Appeal of a Burnco northern gravel operation). AEP has not required third party testing to ensure aggregate mining doesn't impact the water aquifer and drinking water standards. Any monitoring or measurements are not provided to the adjacent property owners impacted by the decisions and are not public. We have to go through a lengthy and challenging Appeal process and perhaps Public Hearing. All after the fact. After the problems are experienced and real. Impacted Bow River water aquifers are not easily reclaimed. The selenium problems caused by Coal Mining have created huge issues not easily or maybe never resolved. "For years the BC failed to address selenium pollution in the Elk Valley. Now no one knows how to stop it." By Carol Linnitt Dec 4, 2018.

The process needs changing. Rocky View is recommending Land Use change with a Direct Control District. Then the Direct Control needs to allow for performance measures reported regularly to the community impacted. See the attached example Ponoka Aggregate Appendix A. This was provided by a Red Deer lawyer who worked with our hydrogeologist Water Line Resources and other consultants on developing performance measures to support the Community and responsible Aggregate development.

To ensure the Policies stated by Burnco, summarized in Burnco's Appendix 2: MSDP Policy Summary are effective then the Direct Control Bylaws or other practices need to be specific and allow for mutual discussion and collaboration. Land Use changes need to set the process to ensure the Direct Control is written to provide visible and measurable guidance.

### Policy not discussed

RV Direct Control **Recommend that Council grant Aggregate Land Use for an area that can be mined and reclaimed in a ten-year period only after proof the Bow River drinking water will not be impacted.** see the Ponoka Appendix A established 10-year time frames to address the concerns of the Community.

**RV Direct Control should establish setbacks** on the Burnco proposed lands, so the Aggregate resource does not impact the Land Use and residential developments on neighbours' property or the community. RV Municipal Develop Plan does not address planning for the 15 km west of Cochrane. Approving decades (or potentially a century +) of gravel with current policies and practices is not in the best interests of future Councils and future generations of Rocky View residents.

RV Direct Control need Policies to allow growth, planning, operating, reclamation, and environmental standards to protect surrounding residents from the harmful health, water, and numerous concerns.

Policy 1: Burnco will secure from AEP ...

RV Direct Control (DC) Bylaws will engage the community directly impacted in the Registration from AEP under the code of Practice for Pits. DC will ensure water, air, noise and other quality measures are agreed and mitigation agreed in advance versus the current Appeal and complaint process after the negative impact to the health and quality of life occur.

Policy 3, 8, 9: Burnco operating Hours allow for 24-hour crushing.

The Direct Control will propose better positioning of crushing operations and reduce the negative impact on residences and animals. Note 2012-12 Development Appeal Board changed the RV Administration recommended and property owners preferred crush hours to suite the Applicant (24 hours/day).

### Policy 6,9: Noise measures

DC will require peaks and not averages and be visible and reported regularly to the community impacted. Rural standards will be applied.

Policy 7: Dust control measures need to be reported to the community.

Rocky View Land Use and Direct Control (DC) policies should require setbacks to prevent dust impacting the neighbours and health. Burnco reports show our property is impacted 100m. and maybe more given different wind conditions, see Appendix B. Regardless of residence, we and our animals use the space and do not want cancer or other health risks that normally are not present. Only when Aggregate Land Use is approved do the health risks occur. We are not compensated for this contamination and our property reclaimed. Rocky View Land approval should not allow this practice to occur.

**Policy 10, 11,12,13:** Burnco will monitor water levels in the network of 18 monitoring wells...follow direction from AEP. Water act approvals for dewatering, bailing, or other activities in the ground water.

RV Direct Control District should require neighbour water monitoring see Appendix C as proposed by other Aggregate operators and agreed by Burnco provided we agreed to Land Use for 1117 ac. We have expressed concerns about the water aquifer in the first RV hearing 2009-2011, to Burnco and have an Appeal to AEP concerning the probable impact on the water aquifer. 2011 RV approved the current McDougall now Burnco 151 ac pit with mining to one metre above the water aquifer. Burnco got approval from AEP June 2020 to mine in the water aquifer without our involvement or any monitoring of our wells or prevention. Our Appeal has not been addressed after six months. No-one restores the potential water we lost.

Rocky View Direct Control should require quarterly third-party reviews of water quality of the existing pit and all areas disturbed for concerns of drinking water standards for impact to the Bow River and a few million residences. Land use for additional Aggregate use should be conditional on proving that the Bow River water quality will not be impacted.

# Policy 14, 15,16,17: Transportation and safety

RV Direct Control should provide for community and adjacent property owner input plus proper setbacks. Alberta Transportation advised that there should be no permanent berms within 30 m of the property lines. The current pit has 3m high berms to the property line. During the construction our access to SW24-26-5W5 was being removed and later replaced by Burnco as we were not consulted.

**Policy 18,19,20:** Storm water, drainage, reclamation, water quality issues RV Direct Control needs to establish policies to ensure water quality and neighbours are protected.

### Policy 21,23: Setbacks

RV Direct Control should ensure the 3-metre-high berms do not adversely impact wildlife, future road widening and community planning. The Trans Canada trail system is planning a trail along the 1A similar to the one from Canmore to Banff. The views will be significantly altered by 3 m high berms for 6.5 km along the proposed Burnco pit.

# Policy 24, 25, 26, 27, 28, 29, 30: Reclamation...

Direct Control will establish guidelines to allow land use and reclamation occurs in ten-year time frames to ensure that the surrounding community is not directly impacted with a lack of Municipal Plan for the area. A large aggregate area of 6.5 km long and 1117ac establishes a direction of commercial – industrial and spot zoning without planning for the highest and best use.

### Appendix A: see attached policies from Ponoka County

Development Permit D-19-53 – Revised November 26, 2019

Attached as separate document

## Appendix B: from Burnco MSDP



Figure 25: Maximum Predicted 24-hr PM<sub>2.5</sub> Concentration

Figure 26: Maximum Predicted 24-hr TSP Concentration



## Appendix C: Draft of Water Monitoring

Baseline Water Monitoring.

BURNCO will retain a third-party consultant to complete the following activities to establish baseline groundwater information. Such baseline water monitoring shall be completed for a period of two (2) years which will include the following:

(i) Testing will be completed on each of the following wells as shown in Figure 2 below Well in SE22 (1), SE22 (2), SE23, SE22 (3), SW23, Spring (1) in NE22.

(iv) A drive-point piezometer will be installed at Spring (1) in NE22.

(v) A two-hour pumping test will be completed at all water wells and a slug test will be completed at the spring to characterize groundwater flow rates in relation to aquifer drawdown. These pumping tests will be completed once at the start of the baseline testing program.

(vi) Automatic water level recorders will be installed at each water well and the spring to determine the baseline water levels and seasonal fluctuations.
Water levels will be collected for a period of two years and downloaded biannually.
(vii) Groundwater samples will be collected to characterize the water quality, including hydrocarbons, dissolved metals, general chemistry parameters and turbidity. Samples will be collected bi-annually for a period of two years (4 samples per location).

(viii) During operation of the West Cochrane Gravel Pit, BURNCO will complete baseline water monitoring at an additional 4 locations if requested by McKendrick Ranches. Such baseline monitoring shall be completed on wells installed by McKendrick Ranches or at spring locations as desired by McKendrick Ranches and done in accordance with the above protocol.
(c) Ongoing Water Monitoring

During operation of the West Cochrane Gravel Pit, BURNCO will retain a thirdparty consultant to collect ongoing groundwater information in addition the data collected as part of the baseline water monitoring:

(i) Automatic water level recorders will be maintained at four (4) water well and/or spring locations to monitor water levels and seasonal fluctuations. Data will be collected annually.

(ii) Groundwater samples will be collected at four (4) water well and/or spring locations to characterize the water quality, including hydrocarbons,

(iii) Ongoing water monitoring will be completed in locations as requested by McKendrick Ranches as part of the annual data collection.

dissolved metals, general chemistry parameters and turbidity. Such sampling will be completed once every three (3) years;



# Appendix C: Draft of Water Monitoring cont'd Figure 2 Water testing map

## Appendix C: Draft of Water Monitoring cont'd

#### 3. Complaint Protocol

For as long as the West Cochrane Gravel Pit is in operation, and in the event McKendrick Ranches believes that there has been surface water or groundwater interference as a result of the gravel pit, McKendrick Ranches may submit a written complaint to BURNCO setting out in sufficient detail the suspected surface water or groundwater interference and, if known, the suspected cause. In the event BURNCO receives a complaint BURNCO agrees as follows: (a) To investigate, as soon as practicable, the written complaint alleging the Gravel Pit operation has caused the reported surface water or groundwater interference. (d) If the Complaint is related to disruption of water to a residence such that the residence is without potable water, then BURNCO will provide an alternative source of water for use in residential needs within 48 hours of receiving the Complaint. BURNCO shall continue to supply this alternative water until resolution of the compliant has been completed.

(e) Within a commercially reasonable timeframe of receiving the Complaint, to provide McKendrick Ranches with a written report containing the following:

(i) description of the complaint;

(ii) detailed complaint investigation notes;

(iii) conclusion as to whether surface water or groundwater interference has occurred, and whether such interference has occurred as a result of the Gravel Pit operation; and

(iv) if interference has occurred as a result of the Gravel Pit operation, recommendations for remediation and/or mitigation of the impact(s), which

may include among other recommendations:

a. lowering the intake of the pump to compensate for a drop-in water level;

b. re-drilling the water well to an increased depth so as to allow the pump to be installed at a lower depth;

c. drilling a new well; or

d. providing an alternate water supply.

(f) In the event a complaint report concludes that surface water or groundwater interference has occurred as a result of the Gravel Pit operation, BURNCO shall be responsible to remediate and/or mitigate such interference at BURNCO's sole cost and expense. Such recommendations for remediation and/or mitigation shall be discussed and agreed between the Parties acting reasonably.

4

(g) It is mutually acknowledged that at any time during this process, McKendrick Ranches shall be at liberty to file a complaint with Alberta Environment and BURNCO agrees to abide by any corrective actions ordered resulting therefrom.





A Permit has been approved and is hereby issued to:

VCD AGGREGATES LTD. (the "Applicant") #2 – 53050 RR 220 ARDROSSAN, AB T8E 2C7

FOR Development & Operation of a SAND & GRAVEL PIT (Liddle-McKelvie Pit)

As Described on Application No. D-19-53

LEGAL: NW 36-43-25-W4 NW 1-44-25-W4 SW 1-44-25-W4 SE 11-44-25-W4

### CONDITIONS OF APPROVAL:

| CONDITION #1 | The Applicant must remit to Ponoka County a Community Aggregate Levy in the amount                                      |
|--------------|-------------------------------------------------------------------------------------------------------------------------|
|              | By-Law 24-06-CAPL (according to the terms, and in the amount as amended or repealed<br>and replaced from time to time). |

CONDITION #2 The Applicant shall comply with the approved application, reports, (including the Golder Air Quality Report, the Golder Noise Impact Report and the Golder Operations Plan) and plans submitted to Ponoka County and the Ponoka County SDAB (unless altered by these conditions); non-compliance with the reports, plans, and conditions shall be considered a contravention of the development permit. If there is a breach of any requirement of the development permit the County may barricade <u>all</u> or any access between the Site and County controlled roads or pursue any other available enforcement options.

| CONDITION #3 | Hours of operation shall be:                                                                                                                                                   |  |  |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
|              | Earthworks: 7:00 a.m. to 7:00 p.m.; Monday-Friday;                                                                                                                             |  |  |
|              | <ul> <li>Processing/Crushing: 7:00 a.m. to 7:00 p.m.; Monday-Friday;</li> </ul>                                                                                                |  |  |
|              | <ul> <li>Sales/Hauling: 7:00 am to 5:00 p.m.; Monday-Saturday</li> </ul>                                                                                                       |  |  |
|              | except as altered pursuant to Road Use Agreement (see below)                                                                                                                   |  |  |
|              | No operations (earthworks, processing/crushing, sales, hauling) shall be undertaken on<br>Sundays or Statutory Holidays (including but not limited to, New Year's Day, Alberta |  |  |
|              | Family Day, Good Friday, Easter Monday, Victoria Day, Canada Day, Heritage Day, Labour                                                                                         |  |  |
|              | Day, Thanksgiving Day, Remembrance Day, Christmas Day and Boxing Day), unless prior approval has been obtained from Ponoka County.                                             |  |  |





| <b>CONDITION #4</b> | The extraction of sand and gravel that is the subject of this development permit is to be                                                                                                                                                   |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                     | commenced within thirty-six (36) months of the effective date of all regulatory approvals. Prior to this thirty-six (36) months, the Applicant is entitled to commence preparatory work such as the construction of the berms and/or walls. |

| CONDITION #5 | The Applicant shall inform the Ponoka County Development Officer of the date when<br>sand and gravel extraction from the Site commences. This permit shall expire 7 years<br>from the date that sand and gravel extraction from the Site commences. At the<br>expiration of the 7-year period the development permit shall be subject to an extension<br>of a period of 3 years, subject to the Development Authority determining that there has<br>been reasonable compliance with the requirements (including conditions of this<br>development permit). If the permit is not renewed following the authorized extraction<br>of sand and gravel (either within the 7-year period or the extension of a maximum of 3<br>years), the Applicant is granted no more than 3 years to complete reclamation of all<br>disturbed areas (not only within the pit, but on all areas within the Site). |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|              | All extraction activity, excluding reclamation work, must cease upon the expiration of the development permit, unless a new development permit has been applied for and approved by Ponoka County. Final reclamation work of grading and seeding must be completed to the point of a reclamation certificate within the greater of 3 years of all authorized extraction activities ceasing on the Site, or 3 years from the expiry of this or the extended development permit.                                                                                                                                                                                                                                                                                                                                                                                                                |
|              | No extraction or development shall commence within Phase Two of the Site, as described in Section 2.1 Active Mining of the Golder Operations Plan submitted to the Ponoka County SDAB as Exhibit 21, until the Development Authority is satisfied that it has been provided with modelling information indicating that the Applicant can meet, for Phase Two:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

a) The Air Quality Standard; and

b) The Noise Standard.

**CONDITION #6** Any application to extend extraction of sand and gravel beyond the approved 7-year period (whether for the 3-year extension of the development permit, or any renewal of the development permit beyond the term of the development permit) is subject to review by the Development Authority, who shall be notified in writing of any request for an extension. Such requests shall be accompanied by the appropriate development permit application fee, if required. It is expected that any request for an extension or renewal shall be made no less than six (6) months prior to the expiry date of this development permit or any renewed development permit. At the option of Ponoka County, the Applicant (at the Applicant's expense) will also be required to provide an audit by a third party expert providing a review as set out in Ponoka County's direction; it

Phone: (403) 783-3333





| would be anticipated that the audit would review compliance with the requirements of this permit, and impact on neighboring roads, lands and occupants. Beyond the first 3- |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <br>year development permit extension period, any renewal may be on different terms/conditions than referenced in this permit.                                              |

| <b>CONDITION #7</b> | At the option of Ponoka County, the Applicant shall provide (prior to commencing           |
|---------------------|--------------------------------------------------------------------------------------------|
|                     | excavation at the Site) a letter of credit or other acceptable security to Ponoka County's |
|                     | Development Officer to ensure compliance with any Road Use Agreement or                    |
|                     | Development Agreement required by Ponoka County. The security taken under the              |
|                     | Development Agreement shall be returned to the Applicant once the terms of the             |
|                     | Development Agreement have been fulfilled.                                                 |

| CONDITION #8                          | The following shall be provided prior to any construction at the Site (unless Ponoka                                                                                                         |
|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                       | County agrees to defer the timing to a later date).                                                                                                                                          |
|                                       | a) Development permit fees;                                                                                                                                                                  |
|                                       | <ul> <li>b) Entry into a Development Agreement (and any additional work/requirements as set<br/>out in the Development Agreement, including the provision of financial security);</li> </ul> |
|                                       | c) Entry into a Road Use Agreement (and any additional work/requirements as set out in the Road Use Agreement, including the provision of financial security);                               |
|                                       | d) Installation of perimeter fencing and all site security to prohibit all unauthorized access to the site;                                                                                  |
|                                       | e) Placement of signage;                                                                                                                                                                     |
|                                       | f) Emergency Response Plan;                                                                                                                                                                  |
|                                       | g) Fire Prevention and Protection Plan; and                                                                                                                                                  |
| · · · · · · · · · · · · · · · · · · · | h) Baseline Groundwater Study.                                                                                                                                                               |

| CONDITION #9 | <ul> <li>The Applicant shall during the currency of this development permit:</li> <li>a) Ensure compliance with all current and updated conditions/requirements of federal, provincial and municipal legislation (including regulations of Alberta Environmental Protection, Land Reclamation Division and the guidelines set under the Environmental Protection and Enhancement Act), including a provincial Roadside Development Permit;</li> <li>b) Ensure compliance with all current and updated conditions/requirements of any easement, covenant, building scheme, or development agreement affecting the Site;</li> <li>c) Obtain and comply with all necessary approvals from Alberta Transportation and Canadian Pacific Railway; and</li> <li>d) Authorize other regulatory authorities to share information with Ponoka County.</li> </ul> |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|





| CONDITION #10 | The Applicant must provide all required federal and provincial approvals to Ponoka<br>County within sixty (60) days of approval. The Applicant shall notify Ponoka County<br>within sixty (60) days if the Applicant applies for a change and/or if any change to<br>any provincial approval related to the operations is approved by the Province. |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

#### Mine Site and Related Operations:

| CONDITION #11 | Mining shall commence in the areas closest to the residences within the SW 12-<br>44-25-W4. The area of active mining shall not exceed 20 acres at any given time<br>with progressive reclamation as the project moves from one area to another.<br>The area of active mining excludes the stockpile and truck loading area, and the<br>processing and conveyor area. The maximum area where initial reclamation<br>respecting mining is being performed shall not exceed 20 acres at any given<br>time (where overburden is being placed from a new area of active mining). The<br>area where medium or long term reclamation is being performed shall not<br>exceed 60 acres at any given time (where overburden was placed in a prior<br>calendar year). The Applicant shall provide related information (including a<br>survey report by a licensed surveyor or other qualified professional acceptable |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|               | to Ponoka County) in regards to areas of active mining and all reclamation to<br>Ponoka County at the request of Ponoka Country.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

| CONDITION #12 | This development permit includes the following maximum for accessory buildings, namely scales, a scale house, two (2) trailers, and two small buildings for lubricant and fuel storage. Any additional accessory buildings required for the Site shall |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|               | require a separate development permit from Ponoka County.                                                                                                                                                                                              |

| <b>CONDITION #13</b> | Operations on Site shall not rely on generators, unless in an emergency situation |
|----------------------|-----------------------------------------------------------------------------------|
|                      | where there is a failure of the connection from a utility service provider.       |

| CONDITION #14 | o a  | sphalt | plants   | shall  | be  | permitted  | on | the | Site | without | first | obtaining | а |
|---------------|------|--------|----------|--------|-----|------------|----|-----|------|---------|-------|-----------|---|
| C             | evel | opmen  | t permit | t from | Pon | oka County |    |     | -    |         |       |           |   |

| CONDITION #15 | No portable structures, scales, equipment or parked vehicles etc. shall be located within the greater of the following setbacks (unless authorized by the Development Authority): |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|               | a) 40 meters of the right of way of the nearest constructed road/highway/railway line or within 10 meters of the quarter lines unless otherwise relaxed; and                      |





| b) The setbacks shown on Figures 2 and 3 and described in Section 2.2 Structures<br>and Setbacks of the Golder Operations Plan submitted to the Ponoka County |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SDAB as Exhibit 21.<br>Any noise attenuation berm and/or wall may be located within the noted setbacks if                                                     |
| <br>authorized by the Development Authority.                                                                                                                  |

| CONDITION #16 | The Site must be secured by perimeter fencing (6 foot chain link or temporary steel construction fence) along the following 3 areas: |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------|
|               | a) The active mining area;                                                                                                           |
|               | <li>b) The processing area on the west side of the Site; and</li>                                                                    |
|               | c) The stockpile/sale area on the northwest of the Site.                                                                             |
|               | The Applicant shall ensure that the lands are securely gated and locked when not in use by the Applicant.                            |

| <b>CONDITION #17</b> | The Applicant shall provide (and obtain approval of) a copy of the Emergency                                                                                    |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                      | Response Plan for the Site prior to commencing extraction activity. The Emergency<br>Response Plan shall be subject to the approval of the Regional Fire Chief. |

| <b>CONDITION #18</b> | The Applicant shall provide (and obtain approval of) a Fire Prevention and       |
|----------------------|----------------------------------------------------------------------------------|
|                      | Protection Plan prior to commencing any extraction activity. The Fire Prevention |
|                      | and Protection Plan shall be subject to the approval of the Regional Fire Chief. |

| CONDITION #19 | The Applicant shall ensure that there is appropriate lighting to the satisfaction of<br>Ponoka County's Development Officer so as to provide security/safety. Lighting<br>standards and fixtures shall be located and arranged so that no light is directed at<br>residences on adjacent lands and so that it does not interfere with the effectiveness<br>of any traffic control device |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|               | of any traine control device.                                                                                                                                                                                                                                                                                                                                                            |

**CONDITION #20** The Applicant shall keep the area subject to the development permit in a clean and tidy condition, free from rubbish and non-aggregate debris. The Applicant shall remove all garbage, waste and recyclables from the lands and dispose of such materials in an approved disposal facility. The Applicant shall keep the lands in a clean and orderly manner, at the Applicant's own expense, including but not limited to, ensuring appropriate waste receptacles are located on the lands, that no garbage or waste is imported onto the lands, and that any trees that may be required to be removed from the excavation site are properly piled.

| CONDITION #21 | The Applicant shall supply, at the Applicant's own expense, portable commercially |
|---------------|-----------------------------------------------------------------------------------|
|               | serviced toilets to be used on the lands during the entire term of the permit.    |





| CONDITION #22 | Aggregate shall be moved across the Battle River by a covered conveyor bridge with no footprint within the river channel.                |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------|
| CONDITION #23 | Aggregate shall be transported under Highway 2A through a tunnel by a covered conveyor to a loading site on the west side of Highway 2A. |
| CONDITION #24 | A conveyor system shall be used to move aggregate within the pit. The system will                                                        |

# Storage/Hydrocarbons:

have covered dropping points, with spray bars at those dropping points.

| CONDITION #25 | 1. No highly explosive materials used for blasting will be used or stored on the Site.                                                                                                                                                      |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|               | 2. No activity shall be allowed that would interfere or compromise the quality of any broadcast or communication system including, but not limited to, radio, television, internet, phone, and any wireless local area network in the area. |
|               | <ol> <li>There shall be no offensive odour, heat, or glare noticeable at or beyond the<br/>boundary for the Site.</li> </ol>                                                                                                                |

| CONDITION #26 | Only CSA-approved double walled fuel containment vaults shall be allowed on-site |
|---------------|----------------------------------------------------------------------------------|
|               | at any time.                                                                     |

| CONDITION #27 | Secondary containment, not less than 100% of the largest container, shall be provided to all areas where lubricating oil is stored on-site.                                                                                                                                   |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CONDITION #28 | Vehicles will be properly maintained to reduce the potential for hydraulic fluids/fuel leaks or spills. Only biodegradable hydraulic fluids shall be used for vehicles or infrastructure within the pit, unless such fluids are not supported by manufacturer specifications. |

| CONDITION #29 | The Applicant shall ensure that there is suitable disposal methods for liquid wastes generated on the site and that there shall be no hazardous liquids stored on the site (i.e. waste oils, glycol containers etc.). Waste oil shall be removed from the site as it is extracted and taken to an appropriate disposal facility. |
|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CONDITION #30 | Any permanent refueling area shall ensure that the fuel is stored in a container that<br>is surrounded by an impermeable secondary containment that is capable of<br>containing the full volume of fuel that is stored in the tank (e.g.: a dyke lined with an                                                                   |





|               | impermeable geomembrane or plastic containment tray). There shall be no servicing of vehicles in the pit, unless absolutely necessary.                                                                                        |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CONDITION #31 | Refuelling shall occur only in the following areas, namely a permanent refuelling area in:<br>a) The active mining area (Phase I or Phase II as the case may be);<br>b) The processing area on the wort side of the Site; and |

c) The stockpile/sale site on the northwest of the Site.

# **Reclamation:**

| CONDITION #32 | Unless these standards are modified by a provincial regulatory authority, the Applicant shall ensure that reclamation of the Site occurs as follows:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|               | <ul> <li>All aspects of the extraction and reclamation operation take place in full<br/>compliance with any requirements or recommendations contained within any<br/>professional's report submitted as part of this development permit or provincial<br/>approvals.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                        |
|               | b) If operations under the development permit are abandoned prior to the expiration of the development permit, the Applicant shall complete the reclamation of the Site within three (3) years of the abandonment of the operations on the Site. For the purposes of this condition, the operation of the use shall be deemed to be abandoned if the Applicant fails to haul aggregate from the Site for a period of more than one (1) year.                                                                                                                                                                                                                           |
|               | <ul> <li>c) Progressive reclamation techniques will be implemented as the mine sequence progresses. <ol> <li>The Applicant will salvage all topsoil and replace evenly with an average depth of 0.15m.</li> <li>If subsoil is encountered, it will be salvaged and replaced evenly throughout the Site.</li> <li>Once reclamation is complete, there will be four water body areas;</li> <li>These water bodies will have side slopes of 5:1 both 1m above and 1m below the full water supply. The water bodies will collect the majority of the surface runoff within the pit boundaries</li> <li>Phase 1 will drain into Water Body #1 and #2</li> </ol> </li> </ul> |





#### **Development Agreement:**

| CONDITION #33 | The Applicant shall enter into (prior to performing any site excavation) and comply<br>with a development agreement pursuant to Section 650 of the <i>Municipal</i><br><i>Government Act</i> with Ponoka County, if such agreement is deemed necessary by<br>Ponoka County the agreement shall contain terms satisfactory to Ponoka County.<br>Without limiting the generality of the foregoing, the development agreement may<br>include: |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|               | <ul> <li>a) requirements relating to accesses to and from the Site; and</li> <li>b) paving or other upgrading to municipal roads (including Range Road 251 from the Junction of Highway #2A to the Menaik Road (Township Road 442)).</li> </ul>                                                                                                                                                                                            |

#### **Road Use Agreement:**

| CONDITION #34 | <ul> <li>The Applicant shall enter into and comply with a Road Use Agreement with Ponoka County on terms satisfactory to Ponoka County if such agreement is deemed necessary by Ponoka County during the currency of the development permit. Note that Ponoka County may require the terms of the agreement to be amended from time to time. If Ponoka County does not require a Road Use Agreement initially it may require one at a later point during the currency of the development permit. These terms may include (without limiting the generality of the foregoing) the following requirements at the option of Ponoka County: <ul> <li>a) All loads leaving the pit loading area must be tarped;</li> <li>b) All gravel trucks used in the operation of the pit are registered with the Alberta Sand &amp; Gravel Association;</li> <li>c) Dust control measures and road maintenance;</li> <li>d) Financial security requirements;</li> <li>e) Hours of operation for hauling;</li> <li>f) Haul routes;</li> <li>g) Maximum truck numbers and volume;</li> <li>h) The haul route may be amended from time to time, when in the opinion of Ponoka County circumstances warrant the haul route to be amended;</li> <li>i) Restrictions on hauling in relation to school buses (for example, No gravel trucks shall enter or exit the Site when a school bus is within 300.0 m (984.25 ft.) of the access to the Site);</li> <li>j) The Applicant shall, prior to undertaking any work on County roads, obtain the consent of Ponoka County to do such work. This shall include but shall not be limited to the installation of signage on County road right-of-way's;</li> </ul></li></ul> |
|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|               | <ul> <li>consent of Ponoka County to do such work. This shall include but shall not be limited to the installation of signage on County road right-of-way's;</li> <li>k) The Applicant shall provide regular gravel truck counts to Ponoka County for every vehicle once every quarter, in a manner suitable to Ponoka County,</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |





during the operation of the pit;

- The Applicant shall ensure that all trucks used in connection with the development are clearly marked as per the applicable federal, provincial, or municipal requirements;
- m) Noise mitigation measures;
- n) Prohibitions or restrictions respecting accessing the Site;
- Prohibitions respecting parking on any municipal road. In this regard, an on-site parking area shall be provided to accommodate all vehicles waiting to load materials (for example prohibitions respecting no trucks allowed to stage on RR 251 or any municipal road. Including that there must be no access into the loading area until 6:30 a.m. and no trucks shall leave the Site prior to 7:00 a.m.);
- p) The placement and location of any required signage. This may include emergency contact numbers to warn of possible Site or operational hazards and dangers such as but not limited to: prohibiting the use of engine retarder brakes; advising of the gravel haul in progress; advising of trucks turning; warning of open pit excavation).

### Visual Mitigation:

| <b>CONDITION #35</b> | The Applicant shall provide 4 berms and/or walls to address visual and noise |
|----------------------|------------------------------------------------------------------------------|
|                      | mitigation as further described in these conditions.                         |

### **Noise Mitigation:**

| CONDITION #36 | The Applicant shall ensure that all operations at the Site, from the date that excavation of sand and gravel commences until completion of reclamation, meet or exceed the requirements of the following (the "Noise Standard") namely compliance with AER Directive 38, with measurements being at the Site boundary, subject to the following interpretations and modifications: |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|               | receptors that are beyond the Site. For clarity, the residence represented by<br>Receptor R05 as referred to throughout the Noise Report need not meet the<br>requirements of the Noise Standard;                                                                                                                                                                                  |
|               | <ul> <li>b) the Noise Standard applies to the operations within the Site and does not apply<br/>to noise emanating from the haul route;</li> </ul>                                                                                                                                                                                                                                 |
|               | <ul> <li>c) baseline testing may include mitigative measures such as berms and/or walls;</li> <li>d) the modelling for the Noise Standard may include the noise emanating from the existing feedlot within the site.</li> </ul>                                                                                                                                                    |





| The Applicant shall install noise mitigative measures similar to the four (4) noise                                                                              |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| attenuation berms referenced in the Noise Report on p. 10 and in Figure 1. That                                                                                  |
| said, the final design of these features shall be designed in accordance with the                                                                                |
| Noise Standard, and the final design is subject to the approval of the Development                                                                               |
| Authority. They may be designed to be a berm and/or wall. Each of these features                                                                                 |
| (i.e. the berm and/or wall) shall be constructed prior to extraction of sand and gravel in the vicinity of the area where they are serving as noise attenuation. |
| The Applicant shall be subject to submitting periodic reports to Ponoka County detailing compliance with the Noise Standard, as provided for in Condition 46.    |
|                                                                                                                                                                  |

| CONDITION #27 | The Applicant shall undertake additional poise mitigation measures satisfactory to                                                                                       |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CONDITION #37 | the Development Officer, in order to ensure that noise does not unduly impact<br>occupants of residences in the vicinity of the Site, including:                         |
|               | a) avoiding unnecessary revving of engines and switch off equipment when not required;                                                                                   |
|               | <ul> <li>b) ensuring plant and vehicles are properly maintained, and regularly checking<br/>silencers and bearings to ensure noise is minimized;</li> </ul>              |
|               | <ul> <li>c) using rubber linings where possible in chutes and dumpers to reduce impact of<br/>noise;</li> </ul>                                                          |
|               | d) prohibiting the use of engine retarder brakes (both on the Site and when hauling off-site);                                                                           |
|               | e) enclosing pumps and crushers with sound absorbing blanket systems;                                                                                                    |
|               | <ul> <li>f) positioning crushers behind stockpiles or in low lying areas (e.g. pit bottom) to<br/>provide acoustic screening;</li> </ul>                                 |
|               | g) installing and maintaining muffler systems on engine-driven equipment (e.g., trucks, dozers, shovels);                                                                |
|               | h) restricting pit operations to the daytime period (e.g., between 7:00 a.m. and 7:00 p.m.);                                                                             |
|               | i) processing/crushing infrastructure shall only be located in the processing/crushing area along the western boundary of the Site, and out of view from the public; and |
|               | <ul> <li>j) other measures as required to ensure compliance with AER Directive 038 at the<br/>perimeter of the Site.</li> </ul>                                          |

### Air Quality:

| <b>CONDITION #38</b> | The Applicant shall ensure that all operations at the Site, meet or exceed the    |
|----------------------|-----------------------------------------------------------------------------------|
|                      | requirements of the following (the "Air Quality Standard") at the boundary of the |
|                      | Site, namely compliance with the Alberta Ambient Air Quality Objectives ("AAAQO") |

**F-1 - Attachment E**




| Compound                                                                                                                                                                                                                                                                                                                                  | Averaging Period                                                                                                                                                                                                                                                                                                                 | Accepted AAAQO<br>Concentration<br>[μg/m³]                                                                                                                                                                                                                                                                           |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TSP                                                                                                                                                                                                                                                                                                                                       | 24-hour                                                                                                                                                                                                                                                                                                                          | 100                                                                                                                                                                                                                                                                                                                  |
|                                                                                                                                                                                                                                                                                                                                           | Annual                                                                                                                                                                                                                                                                                                                           | 60                                                                                                                                                                                                                                                                                                                   |
| PM <sub>2.5</sub>                                                                                                                                                                                                                                                                                                                         | 24-hour                                                                                                                                                                                                                                                                                                                          | 29                                                                                                                                                                                                                                                                                                                   |
| NO <sub>2</sub>                                                                                                                                                                                                                                                                                                                           | 1-hour                                                                                                                                                                                                                                                                                                                           | 300                                                                                                                                                                                                                                                                                                                  |
|                                                                                                                                                                                                                                                                                                                                           | Annual                                                                                                                                                                                                                                                                                                                           | 45                                                                                                                                                                                                                                                                                                                   |
| d) Location - The modell                                                                                                                                                                                                                                                                                                                  | ing and measurement shall b                                                                                                                                                                                                                                                                                                      | be measured at the boundar                                                                                                                                                                                                                                                                                           |
| d) Location - The modell<br>of the Site, not at the<br>For clarity, any reside<br>requirements of the A                                                                                                                                                                                                                                   | ing and measurement shall be<br>location of individual reside<br>ence within the boundary of<br>ir Quality Standard.                                                                                                                                                                                                             | be measured at the boundary<br>ences that are the receptors<br>the Site need not meet the                                                                                                                                                                                                                            |
| <ul> <li>d) Location - The modell<br/>of the Site, not at the<br/>For clarity, any reside<br/>requirements of the A</li> <li>The Applicant shall ensure<br/>place at the perimeter of<br/>AAAQO threshold. Passive<br/>period) is also required at<br/>are at or below the AAAQ<br/>discretion of the Developure<br/>required.</li> </ul> | ing and measurement shall be<br>e location of individual reside<br>ence within the boundary of<br>ir Quality Standard.<br>The that continuous ground leve<br>the Site to ensure concentrat<br>by but ongoing ground level Ne<br>the perimeter of the Site to e<br>O thresholds. Should a compl<br>ment Officer, a monitoring sys | the above table;<br>be measured at the boundar<br>ences that are the receptors<br>the Site need not meet the<br>el monitoring of PM <sub>2.5</sub> take<br>ion levels are at or below the<br>O <sub>2</sub> monitoring (for a 30 day<br>ensure concentration levels<br>aint be tabled, at the<br>stem for TSP may be |





| <ul> <li>c) installation of spray bars at crushers and conveyor transfer points where dust<br/>generation is anticipated (season appropriate);</li> </ul> |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| d) shrouding where spray bars are insufficient; and                                                                                                       |
| the truck exit to Range Road 251.                                                                                                                         |
| Results from the air quality monitoring program will be submitted to Ponoka County to make available for public access as indicated below.                |

#### **Complaints:**

| CONDITION #39 | If Ponoka County receives complaints relating to air quality or noise, Ponoka County<br>through its Development Officer may request the Applicant to provide a third party<br>study of Ponoka County's choice (at the Applicant's expense) on operations and<br>additional mitigative measures that could be taken to improve air quality or reduce<br>noise levels; Ponoka County may during the currency of the development permit<br>impose additional recommended requirements for these mitigative measures which<br>shall be complied with by the Applicant within the timeframe imposed by the<br>County |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|               | county.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

| CONDITION #40 | If an affected party has a complaint relating to the Applicant's operations under this Development Permit, the affected party shall submit a written (or email) complaint concurrently to: |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|               | The Applicant: VCD Aggregates                                                                                                                                                              |
|               | and                                                                                                                                                                                        |
|               | The County's Development Officer                                                                                                                                                           |
|               | At the following addresses:                                                                                                                                                                |
|               | VCD Aggregates Ltd.                                                                                                                                                                        |
|               | #2 – 53050 RR 220                                                                                                                                                                          |
|               | ARDROSSAN, Alberta                                                                                                                                                                         |
|               | T8E 2C7                                                                                                                                                                                    |
|               | Ponoka County Development Officer                                                                                                                                                          |
|               | 4205 Hwy #2A                                                                                                                                                                               |
|               | PONOKA, Alberta                                                                                                                                                                            |
|               | T4J 1V9                                                                                                                                                                                    |





Surface Water:

| The Applicant shall ensure that the development does not cause any adverse draining impact on adjacent property or flooding of nearby ditches in excess of their capabilities.                                                                                                                                                                           |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Any required <i>Water Act</i> approvals must be obtained prior to any excavation or soil disturbance on the site.                                                                                                                                                                                                                                        |
| Alberta's <i>Water Act</i> requires that an approval and/or license be obtained before<br>undertaking a construction activity in a waterbody or before diverting and using<br>water (surface water and groundwater). It is the Applicant's responsibility to contact<br>Alberta Environment to ensure that the development complies. Call (403)340-7052. |
|                                                                                                                                                                                                                                                                                                                                                          |

| All portions of the Site that will not be excavated shall be landscaped in a manner                                      |
|--------------------------------------------------------------------------------------------------------------------------|
| granted stating otherwise. Portions of the site that will be excavated shall be                                          |
| landscaped in accordance with a reclamation plan. The reclamation plan shall detail how surface run-off will be managed. |
|                                                                                                                          |

#### Ground Water:

| CONDITION #45 | The Applicant shall be required to take reasonable steps, as determined by Ponoka<br>County to ensure that the development does not cause any adverse groundwater<br>impacts on adjacent existing water users, aquifers, or the natural environment.<br>The Applicant shall provide a baseline study (to the satisfaction of Ponoka County's<br>Development Officer) of all wells within 1,600m of the perimeter of the Site<br>including water quantity and quality.                                                                                                                                                                                                                               |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|               | a second s |

#### Access and Information:

| CONDITION #46 | The Applicant shall according to the frequency set out as follows supply a report to Ponoka County for review indicating: |
|---------------|---------------------------------------------------------------------------------------------------------------------------|
|               | a) Compliance with the Noise Standard;                                                                                    |
|               | b) Compliance with the Air Quality Standard; and                                                                          |

{B3387597.DOCX;1}Page 13 of 15





 c) Compliance with the other requirements of this development permit including the progress of pit operations and a drawing showing current pit boundaries, stockpile locations, reclaimed areas and overall Site development status.

During the first two years following the extraction of sand and gravel, the Applicant shall provide the Report on a quarterly basis (or more frequently on the County's request). After the first two years following the extraction of sand and gravel, the Applicant shall provide the Report on an annual basis (or more frequently on the County's request).

**CONDITION #47** The Site including processing, reclamation or other areas involving related activities may be subject to inspection at any time deemed necessary by Ponoka County.

| <b>CONDITION #48</b> The Applicant shall provide Ponoka County (and its agents) with access to the la<br>and all records necessary and beneficial to satisfy Ponoka County that the Applic                                                                                                                                                                                                                                                                           |                                                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|
| <ul> <li>has complied with this development permit, the terms and requirements of Road Use Agreement, and the requirements of the Development Agreemincluding without limiting the generality of the foregoing: <ul> <li>a) All information that verifies the details in the aggregate shipped tonnage roll the lands; and</li> <li>b) Tonnage of aggregate stockpiled on the lands or elsewhere; and tonnage aggregate removed from the lands.</li> </ul></li></ul> | lands<br>licant<br>of the<br>ment,<br>oll for<br>ge of |

#### Other:

| CONDITION #49 | The Applicant shall ensure that weed and invasive species control measures are in place for the life of the pit, which shall be at the Applicant's sole expense. The Applicant shall work with Ponoka County's Manager of Agricultural Services and the land owners of the Site to develop and implement an active weed control program for the development. |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**CONDITION #50** The Applicant shall ensure that the lands are seeded, and vegetation maintained, where possible, or planted, at the Applicant's sole expense, as required by Ponoka County. The Applicant may work with Ponoka County's Manager of Agricultural Services and the land owners of the Site to develop and implement a seeding and vegetation program for the development.

| <b>CONDITION #51</b> | It is the Applicant's responsibility to locate all underground utilities and rights-of- |
|----------------------|-----------------------------------------------------------------------------------------|
|                      | way prior to construction or excavation. Contact ALBERTA ONE-CALL at 1-800-242-         |
| the deal should be   | 3447 or online at http://www.alberta1call.com.                                          |

-1 - Attachment E





This Permit is issued in compliance with the requirements of Ponoka County Land Use By-Law 07-08-LU. It is the permittees' responsibility to examine the Title in order to ascertain if a RESTRICTIVE COVENANT exists that would further restrict the type of construction or land use.

The Permittee is hereby authorized to proceed with the specified development providing that there is complete adherence to all of the above noted conditions. Should an appeal be made against this decision to the Court of Appeal, this Permit shall be rendered NULL and VOID. **REMOVED** 

Date of Issuance of Permit: November 18, 2019

Signature of Chairman, Subdivision & Development Appeal Board:

Paul McLauchlin

NOTES:

- 1. The issuance of a Permit in accordance with the Notice of Decision is subject to the condition that it does not become effective until 14 days after the date the order, decision or permit is issued.
- 2. This Permit is issued in accordance with the Notice of Decision and is valid for a period as set out in the conditions. If at the expiry of this period, the development has not been commenced or carried out with reasonable diligence, this Permit shall be NULL and VOID.
- 3. Any affected person may appeal this decision within 30 days of the issuance of the Permit, to the Court of Appeal on a question of law or jurisdiction, in accordance with Section 688 of *the Municipal Government Act*.

Phone: (403) 783-3333

#### Caitlyn T. Anderson

| From:    |
|----------|
| Sent:    |
| To:      |
| Cc:      |
| Subject: |

June 23, 2021 11:50 AM Legislative Services Shared

[EXTERNAL] - BYLAW C-8073-2020: Letter of OPPOSITION (application PL20200066)

Do not open links or attachments unless sender and content are known.

To Legislative Services,

# We, Bertrand Levesque and Julie Simard, owners of 17 acres property located at NW 15 TWP26 RGE 5 W of 5, OPPOSE the proposed BYLAW C-8073-2020 (application PL20200066) to facilitate aggregate extraction.

We are located on the north side of Highway 1A, uphill from the project area. We are X06 in the Burnco Proposed BYLAW documents.

The area around our property is farm land, acreages, all in a beautiful landscape, with the Rockies as a back drop. We have worked very hard to be in a position to purchase our property and it represents our largest asset. We enjoy our acreage surrounded by horses and country life.

We have reviewed the documents provided by Burnco and are left with deep concerns. Our reasons to **OPPOSE BYLAW C-8073-2020** (application PL20200066) are numerous:

1- Very negative visual Impact: as we are overlooking the existing pit on Highway 1A, we already have first row seats to watch it progress towards the west until it ultimately reaches us (60m between the edge of our property and the edge of the Project). Our house and acreage being at higher elevation than the proposed project already allows us to see the present exploitation work with existing berms already in place (tops of piles are visible). We can be guaranteed of an even better view as it continues it's expansion through the years even with the 7m berm in place. Berms and trees are suppose to help but they would need to be in place to have a chance to work. The berms around the existing exploitation still have no trees and trees need time to gain significant height and width necessary to create a barrier for dust, noise and limit the visual impact.

2- Increase noise with trucking, crushing, machinery etc. Burnco has a crushing plant planned 350m from our property. According to the proposed plan, no full time monitoring until work is within 200m of an occupied residence... So pretty much no full time monitoring at all since we are the closest residence. Trucking is meant to increase to 28 tandem trucks per hour 6 days/week representing a much increased traffic for our road.

3- Deteriorating Air quality as we are immediately north west of the present and future exploitation areas along the Hwy 1A. We were shocked to see that the Air Quality model produced for the Burnco proposal shows PM2.5 levels above 25 for our location and 552 just across the road. These particles directly impact health of humans and animals. Of course the model is run with all berms in place. This will only be true at the final stage of the operations since Burnco plans to build the berms as they move west. This leaves us completely open to the operations as soon as they start Phase B. To add to this, Burnco presented no plans for full time air quality monitoring as long as the exploitation work is not within 200m of an occupied residence. This implies that as long as they are not actively working within D19 (across from us) there will be no monitoring although we will have been living in increased dust from the gravel pit for over 10-15 years! This is unacceptable!

4- Impacts on water all around us: impacts on our water well, the potential risk of increased flooding of the Beaupre Creek which passes through our property upstream from the proposed Burnco crossing and we can not forget the

#### ATTACHMENT 'E': PUBLIC SUBMISSIONS

#### F-1 - Attachment E Page 130 of 252

impacts on the water of the Bow River with increased concentrations of constituents already seen from the present 151 ac West Burnco Pit. The proposed exploitation expansion of another 966.4 acres can only lead to much more pronounced increase of these constituents in the Bow River which will affect all downstream residents and municipalities of Cochrane and Calgary and beyond.

5- Impacts on wildlife... we are blessed with a varied and healthy wildlife around us particularly along the Beaupre Creek. Gravel exploitation from both the east and west bank will be very detrimental to all. Just last week I witnessed a Great Blue Heron by the creek just east of our house! Over the past 7 years we have lived here, we observed coyotes, bears, cougars, elks, deers, fox, owls, herons, eagles, osprey and so many other varieties of birds. The required setback from the creek will not change the fact that the Beaupre Creek will be a small island of vegetation surrounded by a large gravel operation running 24/7. It will not protect any current and future wildlife which inhabits this area.

6- **Negative Impact on adjacent/nearby Property Value**. This is of extreme concern to us since Burnco does not address the impact of their operation on the market value of neighboring properties. The issue is not even acknowledged.

Obviously, we are not the first property owners having to deal with such situation and many studies were done on this topic here in Canada and in the USA. Whenever a gravel pit, a mine or other industrial operation moves into a neighborhood, neighboring properties suffer a loss in resale value. This can be observed many kms away from the operation. The loss of value is noticeable as soon as the project is publicly known, well ahead of the arrival of the machinery and is measurable only if the properties are sold. In extreme situations, the impact on the property can be so severe that the property becomes un-sellable but unrecorded loss (no sell price data).

Furthermore, there is a direct relationship between the Property Value Decrease and its distance to the operation. In other words, the closer the property is to the pit, the greater the negative impact to its value. Our Property is located **60m** from the North West corner of the planned project area. Reported Property Value Decrease in such close proximity to operations range from **30 to 40%**. How are we supposed to absorb a \$300,000-\$400,000 loss?

Why should we, as adjacent landowners, have to suffer significant financial losses in order for Burnco to expand and prosper? We firmly believe that Burnco should be made fully responsible and have full mitigation/resolution plans for each impact, including and most importantly, the financial impact to neighboring property values

At the West Cochrane location, Burnco has the "benefit" of having very few neighbors to deal with, essentially only a handful of people opposing their plan and who can easily be dismissed. We may represent a smaller deterrent for Burnco but we stand to be 100% affected by them, financially as well as having to live with the direct impacts on our environment for the rest of our lives (we are already too old to see the end of the operations). Yet, we find ourselves having very little recourse to protect us.

If you took a few minutes to truly put yourself in our shoes (or in our house), you would be filled with disbelief, helplessness, anger and panic as this Burnco train coming full speed ahead with apparently no one to slow them down. The life long savings you put into your property are now being seriously threatened and you are easily dismissed by the company responsible. You are being told not to worry, trees will be planted... and you will see no change in your property value!

These are lies! Any realtor looking after their buyers interest will recommend to avoid buying a property next to a gravel pit whether existant or proposed. This is a no brainer and no one will argue on that.

We are facing our biggest single financial loss, having to reconsider retirement plans because of Burnco's imposition around us. It is time for companies to be held fully accountable for the impacts of their business.

#### ATTACHMENT 'E': PUBLIC SUBMISSIONS

#### F-1 - Attachment E Page 131 of 252

In summary, we find the proposed mitigation plans to be insufficient and also late in their execution to truly mitigate the impacts on water, noise, air, wildlife and view. We also fail to see why such a large area should be considered for land use redesignation at once. Small

And above all, that no efforts are made to alleviate the imposed financial burden this will cause us.

We fully OPPOSE BYLAW C-8073-2020

Regards,

Bertrand Levesque and Julie Simard

# Fish & Habitat Concerns from Burnco's Proposed West Cochrane Gravel Mine

David W. Mayhood



### FWR Freshwater Research Limited

Technical Note No. 2021/06-1

June 2021 Page 585 of 719 **Cover photo**: Grand Valley Creek as seen from the top of the culvert at Highway 1A, looking downstream, 18 June 2021, showing the fractured bedrock beneath overburden to be mined at the subject pit.

# Fish & Habitat Concerns from Burnco's Proposed West Cochrane Gravel Mine

David W. Mayhood

Prepared on behalf of

Ann McNabb Cochrane, AB

for

Rocky View County Council Rocky View, Alberta

FWR Technical Note No. 2021/06-1 June 2021

### FWR Freshwater Research Limited

1213 Twentieth Street NW, Calgary, Alberta T2N 2K5 Canada FWResearch.ca

403.283.8865 mtk@fwresearch.ca

Aquatic Research Conservation Biology

Fisheries Investigations Impact Assessment Biological Monitoring Baseline Studies Identification Services

Page 587 of 719

## Summary

Burnco Rock Products Ltd. proposes to mine for aggregate across 4.52 km<sup>2</sup> of land extending in two blocks for a total distance of approximately 6-7 km along, and south of, Highway 1A to the Bow River west of Cochrane, Alberta. The principal watercourses to be affected are the Bow River mainstem; its tributaries Beaupre Creek and Grand Valley Creek; and local springs. There are several springs draining groundwater from the proposed mine site to the tributary watercourses and the Bow River. Data on the aquatic habitats and fish populations in the affected watercourses are sparse to non-existent, but it is known that the Bow River above Calgary holds 19 species of fish, of which 9 are sportfish. Many species of fish favour habitats influenced by groundwater discharges into streams for temperature regulation, spawning, egg incubation, juvenile rearing, overwintering, and refuge from other adverse conditions.

Here I comment on the implications for fish and their habitats of a soil flushing experiment conducted by professional hydrogeologist and geochemist Dr. Jon Fennell on a representative sample of the soil to be disturbed by the mining operation. I make additional comments on some other aspects of the proposed mine as they occurred to me in reviewing the available documentation.

Dr. Fennell's experiment is a reasonable attempt to evaluate, at a preliminary level, the likely consequences to groundwater quality of natural precipitation draining through the disturbed above-bedrock deposits in the area to be mined. Dr. Fennell reported one physical characteristic and several chemical constituents in the soil flush effluent that exceeded, and sometimes far exceeded, various regulatory criteria, and so are of concern if they were to reach open-water aquatic habitats and springs via the groundwater system.

It is important to understand that these concerns are not significantly reduced by the dilution power of the receiving watercourses if fish or other organisms are using those sites preferentially, as several species are likely to do. Dilution is not even a viable solution to contaminant releases under prevailing regulations.

Some of the potential problems posed by the elevated parameters are as follows. Several contaminants can bioaccumulate, so may amplify through food webs throughout the aquatic domain and even into terrestrial systems.

**Turbidity** from the experiment effluent water exceeded maximum criteria for the protection of fish and wildlife by 800 to more than 2000 times. Turbidity in this case would have been due to **total suspended solids** almost entirely, and the turbidity levels measured were likely comparable to 1100 to 2800 mg/L of total suspended solids, as a rough estimate. In the field, we should expect these high levels to be persistent over weeks and months, possibly longer. Suspended solids that high and persistent are capable of causing up to 100% mortality of trout eggs and larvae. Adult and juvenile trout would be expected to avoid locations so affected, which leads to the question whether there is suitable alternative habitat for them nearby. Burnco's document provides no data to address this issue, a serious deficiency.

Total Arsenic in effluent water exceeded guidelines for aquatic life by 1.8 to 3.8 times.

Total Cadmium in effluent water exceeded guidelines for aquatic life by 1.3 to 1.6 times.

**Total Chromium** in effluent water exceeded guidelines for aquatic life by 13 to 20 times, if all in the hexavalent form, or 1.5 to 2.2 times, if all in the trivalent form.

Total Cobalt in effluent water exceeded guidelines for aquatic life by 4.7 to 6.3 times.

Total Lead in effluent water equaled or slightly exceeded guidelines for aquatic life.

Total Zinc in effluent water exceeded guidelines for aquatic life by 2.4 to 4 times.

Synergistic effects, in which the toxicity of these and other individual constituents affect the toxicity of each other, are possible, even likely, and need to be assessed to fully understand the risk posed by this proposed development.

Fish move around among the habitats critical for completing their life history. They use different kinds of habitat at different times and life stages. To understand how any disturbance, such as this gravel mine, might affect fish populations, it is essential to understand if, how and when local populations use the emergent groundwater habitat that might be affected by the gravel pit disturbance. Burnco has made no attempt to do this.

Gravel extraction sites are surface mines. Large mines disturb large areas, so roughly speaking, they inevitably impact the local environment more or less in proportion to their size. This proposed aggregate mine is quite large and close to sensitive aquatic receptors, so it needs to be evaluated accordingly.

Burnco's two-paragraph fish and aquatic habitat survey was performed with minimal effort and attention to the risks in question and was not designed for, or capable of, identifying the aquatic biological communities at groundwater discharge sites, or their uses by fishes. Dr. Fennell's simple experiment shows that serious contamination problems from Burnco's gravel mine are possible and could affect any Bow River fish populations that rely upon groundwater discharge habitats in the vicinity of the proposed development. These issues need to be properly evaluated in a thorough environmental assessment of Burnco's desired gravel extraction activities.

# **Contents**

| Introduction                                  | 4  |
|-----------------------------------------------|----|
| Study Area                                    | 4  |
| Contaminants in Disturbed Soil Water Effluent | 6  |
| Fishes and Habitat Use                        | 7  |
| Conclusion                                    | 7  |
| Acknowledgements                              | 8  |
| References Cited                              | 8  |
| Appendix: DW Mayhood Curriculum Vitae         | 10 |

## Introduction

Burnco Rock Products Ltd. proposes to mine for aggregate across 4.52 km<sup>2</sup> of land extending in two blocks for a total distance of approximately 6-7 km along, and south of, Highway 1A to the Bow River west of Cochrane, Alberta (Burnco 2020). Hydrogeologist and geochemist Dr. Jon Fennell conducted an experimental test to assess the possible physical and chemical changes that may occur to precipitation flowing through these sediments after being disturbed, and entering the local groundwater, as will occur as a result of mining (Fennell (2021). In a 15 June email I was asked by Ann McNabb of Cochrane to comment on the findings and their implications for fishes and their habitats, if any, and more generally on any other possible effects of the proposed gravel mine that I noticed in Burnco's documentation. I agreed to do so in a very limited way due to the short notice, on 16 June.

Here I comment on the potential effects on local fishes and their habitats of Dr. Fennell's findings, based on a reading of his report (Fennell 2021), Burnco's master site development plan (Burnco 2020, as revised May 2021), my understanding of the effects of groundwater contamination, the biology of Alberta's fishes, and my reading of relevant scientific literature. I understand that Burnco has produced a voluminous supporting document of some 1800 pages in hard copy, which I could not find on the Rocky View County website, and which was not available to me on short notice.

I am an aquatic ecologist with an M.Sc. and 54 years of experience working on the ecology of the inland waters of western Canada, with emphasis on the fishes, other aquatic organisms, and their habitats of the Eastern Slopes of the Rocky Mountains in Alberta. My curriculum vitae is attached hereto.

## Study Area

The site in question lies within the land description described in Burnco (2020:1), and is mapped in various ways throughout that document. The Bow River mainstem borders the site on the south, and two named tributaries, Beaupre and Grand Valley creeks (cover photo), are incised into the site in the west and centre-east, respectively. Several smaller unnamed watercourses cross or drain the property along its length, emptying primarily into the Bow River, with some emptying into Beaupre and Grand Valley creeks.

I searched Alberta Environment and Parks' online database (Alberta FWMIS, FWIMT) for recent fish inventories, but found none in either named creek within the study area as of 17 June 2021. I could find no recent site-specific fish occurrences within the study area reach of the Bow River in the same database on the same date. Burnco (2020:12) did not report finding any fish in the named creeks or three other unnamed watercourses from a survey they conducted 8 November 2018. They noted that there were no impediments or barriers to fish migration to their confluences with the Bow River. The two most easterly watercourses they visited did not provide fish habitat. Burnco (2020) did not provide any information as to fish or fish habitat in the Bow River.

The most current summarized information available on the fishes occupying the Bow River above Calgary was extracted from Henderson and Peter (1969) by Culp et al. (1992). I believe it reasonably represents the Bow River fauna in the vicinity of the Burnco proposed gravel mine site (Table 1). Of the 19 species listed, nine are considered sportfish species. Several of the remainder are often abundant and therefore must play a large role in the ecology of the river. One, bull trout, is threatened under Canada's *Species at Risk Act*, but is believed to be functionally extirpated in the river below this point (Bighill Springs reach), and at very high risk of extirpation-likely unrecoverable above it in the Ghost Reservoir reach (DFO 2020).

| Species name             | Common name        |
|--------------------------|--------------------|
| Oncorhynchus clarkii     | cutthroat trout    |
| Oncorhynchus mykiss      | rainbow trout      |
| Salvelinus fontinalis    | brook trout        |
| Salvelinus confluentus   | bull trout         |
| Salvelinus namaycush     | lake trout         |
| Salmo trutta             | brown trout        |
| Prosopium williamsoni    | mountain whitefish |
| Esox lucius              | northern pike      |
| Lota lota                | burbot             |
| Catostomus catostomus    | longnose sucker    |
| Catostomus platyrhynchus | mountain sucker    |
| Catostomus commersonii   | white sucker       |
| Culaea inconstans        | brook stickleback  |
| Couesius plumbeus        | lake chub          |
| Rhinichthys cataractae   | longnose dace      |
| Cottus ricei             | spoonhead sculpin  |
| Percopsis omiscomaycus   | trout-perch        |
| Semotilus margarita      | pearl dace         |
| Pimephales promelas      | fathead minnow     |

**Table 1.** Species of fish known to occur in the Bow River above Calgary. Extracted from Henderson and Peter (1969) by Culp *et al.* (1992).

## **Contaminants in Disturbed Soil Water Effluent**

In a laboratory experiment, Fennell (2021) assessed the possible physical and chemical changes that may occur to water (i.e. precipitation) flowing through the sediments in Burnco's proposed mining area and entering the local groundwater. In measurements of numerous parameters, he found one physical characteristic and several chemical constituents in the soil flush effluent that exceeded, and sometimes far exceeded, various regulatory criteria, and so are of concern if they were to reach open-water aquatic habitats and springs via the groundwater system.

**Turbidity** from the experimental effluent water exceeded maximum criteria for the protection of fish and wildlife (Government of Alberta 2018) by 800 to more than 2000 times. Turbidity in this case would have been due to total suspended solids almost entirely, and the turbidity levels measured were likely comparable to 1100 to 2800 mg/L of total suspended solids, as a rough estimate (D. Mayhood, unpublished data). In the field, we should expect these high levels to persist over weeks and months, possibly longer. Suspended solids that high and persistent are capable of causing up to 100% mortality of trout eggs and larvae (Newcombe and Jensen 1996). Adult and juvenile trout would be expected to avoid locations so affected, which leads to the question whether there is suitable alternative habitat for them nearby. Burnco's document provides no data to address this issue.

Several metals and a metalloid exceeded guidelines for protection of aquatic life (Government of Alberta 2018). Here are a few examples.

Total Arsenic in effluent water exceeded guidelines for aquatic life by 1.8 to 3.8 times.

Total Cadmium in effluent water exceeded guidelines for aquatic life by 1.3 to 1.6 times.

**Total Chromium** in effluent water exceeded guidelines for aquatic life by 13 to 20 times, if all in the hexavalent form, or 1.5 to 2.2 times, if all in the trivalent form.

Total Cobalt in effluent water exceeded guidelines for aquatic life by 4.7 to 6.3 times.

Total Lead in effluent water equaled or slightly exceeded guidelines for aquatic life.

Total Zinc in effluent water exceeded guidelines for aquatic life by 2.4 to 4 times.

All of these elements are toxic to fish, and all bioaccumulate (Chu and Chow 2002, Sevcikova *et al* 2011). For those that survive, the fish may be turned into toxic time bombs that, if consumed by predators, will spread the toxin further into aquatic and terrestrial food webs at even higher concentrations. Synergistic effects, in which the toxicity of these and other individual constituents affect the toxicity of each other, are possible, even likely (Bae *et al*. 2001), and need to be assessed to fully understand the risk posed by this proposed development.

## Fishes and Habitat Use

Many species of fish favour habitats influenced by springs and groundwater discharges into streams for temperature regulation, spawning, egg incubation, juvenile rearing, overwintering, and refuge from other adverse conditions (Cunjak and Power 1986, Power *et al.* 1999, Hitt *et al.* 2017). They will often migrate long distances to take advantage of groundwater. Springs can even be important in establishing genetic differentiation within populations, as shown by rainbow trout in Fall River, California, where certain groups favour specific springs and are evolving different genetic characteristics (Ali *et al.* 2016).

Some of the species of fish occupying the Bow River in the reach affected by Burnco's proposed mine (Table 1) are likely to be essentially sedentary, travelling very little throughout their lifetime. Examples of this group likely include stickleback (Jiang *et al.* 2015) and sculpins (Veillard 2016), that probably remain within a few tens of metres or less of one location. Other small fishes, such as lake chub, are known to move up to 3 km to spawn (Brown *et al.* 1970). Some of the larger species, however, are well-known to travel long distances throughout their lifetimes in riverine habitats, such as white and longnose suckers, and mountain whitefish.

These differences in mobility mean that impacts to use of instream groundwater discharge and springs will affect species differently. Migratory fishes that use such sites near the proposed Burnco mine site, if they become contaminated with elements from the pit, could carry them upstream as far as the Ghost Dam or as far downstream as Bearspaw Dam, spreading the contamination over a large area as they die or enter the food web of predators. On the other hand, they may be less likely to become contaminated if they use the Burnco groundwater discharge sites for only relatively brief periods. In contrast, the less mobile species are at particular risk of contamination if they occupy groundwater discharge sites carrying pollutants from Burnco's pit, and could build up higher concentrations as a result. Finally, all fishes might be displaced from these discharge sites.

Given the great importance of springs and instream groundwater discharge sites to fish, Burnco (2020) should have surveyed springs and groundwater sites, and should have considered the effects from any disruptions to them caused by the proposed aggregate mining operation. At present, it is just not possible to make even an informed guess as to the effects of the proposed mine site on fishes in the Bow River and its tributaries. We simply don't know what fish species use the groundwater discharge sites, if they use them at all, or anything at all about the importance of these sites for fish and how and when they use them.

## Conclusion

Fish move around among the habitats critical for completing their life history (Schlosser 1991). They use different kinds of habitat at different times and life stages. To understand how any disturbance, such as this gravel mine, might affect fish populations, it is essential to understand if, how and when local populations use the emergent groundwater and spring

habitat that might be affected by the gravel pit disturbance. Burnco has made no attempt to do this.

Gravel extraction sites are surface mines. Surface mines disturb large areas, so roughly speaking, they inevitably impact the local environment more or less in proportion to their size. This proposed aggregate mine is quite large and close to sensitive aquatic receptors, so it needs to be evaluated accordingly.

Burnco's two-paragraph fish and aquatic habitat survey was performed with minimal effort and attention to the risks in question and was not designed for, or capable of, identifying the aquatic biological communities at groundwater discharge sites, or their uses by fishes. Dr. Fennell's simple experiment shows that serious contamination problems from Burnco's gravel mine are possible and could affect any Bow River fish populations that rely upon instream groundwater discharge habitats or springs in the vicinity of the proposed development. These issues need to be properly evaluated in a thorough environmental assessment of Burnco's desired gravel extraction activities.

## Acknowledgements

Jon Fennell provided helpful comments and corrections on an earlier summary of this technical note.

## **References Cited**

- Ali, O. A., S. M. O'Rourke, S. J. Amish, M. H. Meek, G. Luikart, C. Jeffres, and M. R. Miller. 2016. RAD capture (Rapture): Flexible and efficient sequence-based genotyping. Genetics 202:389-400. doi:10.1534/genetics. 115.183665
- Bae, D.-S., C. Gennings, W. H. Carter Jr, R. S. H. Yang, and J. A. Campain. 2001. Toxicological interactions among arsenic, cadmium, chromium, and lead in human keratinocytes. Toxicological Sciences 63:132-142.
- Brown, J. H., U. T. Hammer, and G. D. Koshinsky. 1970. Breeding biology of the lake chub, *Couesius plumbeus*, at Lac La Ronge, Saskatchewan. Journal of the Fisheries Research Board of Canada 27:1005-1015.
- Burnco. 2020. Master Site Development Plan, West Cochrane Gravel Pit. Burnco Rock Products Ltd. June 2020 v.3, revised May 2021. 112 p.
- Chu, K. W., and K. L. Chow. 2002. Synergistic toxicity of multiple heavy metals is revealed by a biological assay using a nematode and its transgenic derivative. Aquatic Toxicology 61:53-64.
- Culp, J. M., H. R. Hamilton, A. J. Sosiak, and R. W. Davies. 1992. Longitudinal zonation of the biota and water quality of the Bow River system in Alberta, Canada. pp. 30-49. *in* C. D. Becker, and D. A. Neitzel, editors. Water quality in North American river systems. Battelle Press, Columbus, OH. 304 p.
- Cunjak, R. A., and G. Power. 1986. Winter habitat utilization by stream resident brook trout (*Salvelinus fontinalis*) and brown trout (*Salmo trutta*). Canadian Journal of Fisheries and Aquatic Sciences 43:1970-1981.
- DFO. 2020. Recovery strategy for the bull trout (*Salvelinus confluentus*), Saskatchewan- Nelson rivers populations, in Canada [final]. Species at Risk Act Recovery Strategy Series. Fisheries and Oceans Canada, Ottawa, ON. viii+130 p. <u>https://wildlife-species.canada.ca/species-risk-registry/virtual\_sara/files/plans/Rs-BullTroutOmblesTetePlateSaskNelson-v00-2020Sept-Eng.pdf</u>

- Fennell, J. 2021. West Cochrane Pit soil column flushing experiment. Report submitted to Rocky View County Council, Rocky View County, AB. 13 p.+appendices.
- Government of Alberta. 2018. Environmental quality guidelines for Alberta surface waters. Water Policy Branch, Alberta Environment and Parks, Edmonton, AB. v+53 p. <u>https://bit.ly/3qhMIR6</u>
- Henderson, N. E., and R. E. Peter. 1969. Distribution of fishes of southern Alberta. Journal of the Fisheries Research Board of Canada 26:325-338.
- Hitt, N. P., E. L. Snook, and D. L. Massie. 2017. Brook trout use of thermal refugia and foraging habitat influenced by brown trout. Canadian Journal of Fisheries and Aquatic Sciences 74:406-418. doi:10.1139/ cjfas-2016-0255
- Jiang, Y., L. Torrance, C. L. Peichel, and D. I. Bolnick. 2015. Differences in rheotactic responses contribute to divergent habitat use between parapatric lake and stream threespine stickleback. Evolution 69:2517-2524. doi:10.1111/evo.12740
- Newcombe, C. P., and J. O. T. Jensen. 1996. Channel suspended sediment and fisheries: a synthesis for quantitative assessment of risk and impact. North American Journal of Fisheries Management 16:693-727.
- Power, G., R. S. Brown, and J. G. Imhof. 1999. Groundwater and fish—insights from northern North America. Hydrological Processes 13:401-422.
- Schlosser, I. J. 1991. Stream fish ecology: a landscape perspective. BioScience 41:704-712. doi:10.2307/1311765
- Sevcikova, M., H. Modra, A. Slaninova, and Z. Svobodova. 2011. Metals as a cause of oxidative stress in fish: a review. Veterinarni Medicina 56:537-546.
- Veillard, M. F. 2016. Investigating fine-scale movement patterns and comparative swimming performance of the newly identified and threatened Rocky Mountain sculpin (*Cottus* sp.) across its Canadian distribution.
   MSc thesis, Department of Renewable Resources, University of Alberta, Edmonton, AB. xv+81 p. <u>https://bit.ly/3ivU5Te</u>

#### Online

Alberta Fish and Wildlife Management Information System (FWMIS). <u>https://www.alberta.ca/access-fwmis-data.aspx</u> Access 17 June 2021.

# Appendix: DW Mayhood Curriculum Vitae

1213 · 20th Street NW, Calgary, Alberta, Canada T2N 2K5 +1.403.283.8865

## David W. Mayhood

Aquatic Ecologist

dmayhood@fwresearch.ca https://www.fwresearch.ca

### Education

M.Sc. Limnology 1978, University of Calgary

B.Sc. Honours Zoology 1969, University of Calgary

Graduate research projects: Production of trout and their food supplies in Alberta mountain lakes (thesis research); population dynamics of the zooplankton organism *Leptodiaptomus sicilis* in four mountain lakes

### Continuing Professional Development, Specialized Courses

Wildland Hydrology Silva Forest Foundation, Slocan Park, British Columbia 1994

### **Professional Experience**

| since 1981: | Principal & President, FWR Freshwater Research Limited, Calgary                                                                                                |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1979-1981:  | Senior Biologist, Aquatic Environments Limited, Calgary                                                                                                        |
| 1974-1978:  | Contract Biologist, Canadian Wildlife Service/Parks Canada (Banff Na-<br>tional Park), Calgary, and graduate work, University of Calgary                       |
| 1970-1973:  | Fisheries Technician & Project Biologist, Canadian Wildlife Service/Parks<br>Canada, Calgary                                                                   |
| 1967-1969:  | Summer Research Assistant, Fisheries Research Board of Canada (Experi-<br>mental Lakes Area, NW Ontario); Canadian Wildlife Service/Parks Cana-<br>da, Calgary |

### **Professional Memberships & Affiliations**

American Association for the Advancement of Science, American Fisheries Society, Ecological Society of America, International Society of Limnology, Society for Freshwater Science, Society for Conservation Biology, Society of Canadian Limnologists, Canadian Society of Zoologists

Fisheries Investigations

Impact Assessment

Biological Monitoring Baseline **Studies** 

Identification Services

### Honours

Wilderness Defender Award, Alberta Wilderness Association, 23 November 2018. https://albertawilderness.ca/about-us/alberta-wilderness-defenders-awards/ https://albertawilderness.ca/wp-content/uploads/2018/10/20180900\_archive\_awa\_wla-1.pdf

### Areas of Special Interest

- Ecology and conservation biology of western Canadian fishes, with emphasis on mountain trout
- Ecology and natural history of mountain lakes, streams and their watersheds
- Zoogeography and ecology of fishes, zooplankton and benthic invertebrates in lakes and streams of western Canada
- Aquatic biomonitoring and impacts of pipelines, oil & gas wells, roads, railways, strip mines, extraction plants, dams and agriculture on freshwater ecosystems

### **Representative Projects**

### Current Project: Alberta Wilderness Association, funded by Bow River Basin Council

Independent researcher: Sediment loading to selected streams in the McLean Creek ATV area. With University of Calgary Environmental Science student Logan Boyer, identifying the principal sources of total suspended sediment (TSS) to Elbow River tributaries Silvester, McLean, Quirk, and Connop creeks; assessing the relative importance of each to sediment loading and fish habitat in those creeks; quantifying the TSS loading to the Elbow River from the creeks, and to the total TSS load in the Elbow River.

### Alberta Sustainable Resource Development, Fisheries & Oceans Canada

Consulting Biologist: contributed 2 reviews as background references to the provincial recovery plan for threatened westslope cutthroat trout; coauthored background paper and recovery potential assessment for federal recovery program; developed reference parameters for headwater stream stocks of native cutthroat trout; contributed a conceptual framework and guidelines for westslope cutthroat trout recovery in Alberta

### Watershed analysis 1996-present – various clients

Consulting Biologist: Analyzed ecosystem risks in 105 small watersheds in southwestern Alberta; recommended changes in land use and management to correct identified problems.

#### Yellowstone to Yukon Conservation Initiative

Consulting Biologist: Compiled information and prepared a technical report on the distribution and conservation status of the fishes of the Y2Y biogeographic region.

#### Canadian Parks Service, Banff & Jasper National Parks

Consulting Biologist: in-depth review and analysis of the regulatory and conceptual background for fish conservation and management in Canadian national parks; survey of fish conservation and management in North American parks and reserves; analysis of the origin, history and status of native fish stocks of JNP and BNP; draft of a fish management plan for JNP based on these studies.

#### Canadian Wildlife Service/Parks Canada

Project Biologist: eight years of research and management work on aquatic ecology and fisheries in the national parks of western Canada

- 3-year biophysical survey of lakes, streams and fish populations in the Lake Louise area of Banff National Park, Alberta, including habitat morphometry and hydrology, water chemistry, planktonic primary productivity (radiocarbon studies), zooplankton, benthic invertebrates, macrophytes, fish, estimates of fish food organism production, estimates of potential trout production based on the food supply; developed a fisheries management plan based on the estimates.
- 2-year biophysical survey of lakes and streams in southern Prince Albert National Park, Saskatchewan
- fishery management activities in the prairie national parks over a five-year period as a fisheries technician and biologist, including trapping, spawn-taking, marking, field hatchery operations, fry planting, population monitoring and analysis, creel census operation and analysis, and program evaluation

#### Clients: Denison Mines Ltd., Petro-Canada

Biologist & Project Biologist: baseline studies of Rocky Mountain streams in British Columbia's North-East Coal Block as a basis for assessing the potential impact of coal strip mining on fish and their habitats

#### Client: Canadian Hunter Exploration Limited

Project Biologist: baseline study of stream habitats and fish populations; assessment of potential impacts of gas pipeline construction on fish populations and fish habitat in the foothills region near Grande Prairie, Alberta; monitoring of stream crossings during installation.

Clients: Alberta Wilderness Association, Diamond Hitch Outfitters, Beaver Mines Area Landowners Group, Rocky Mountain Ecosystem Coalition, other NGOs

Expert witness: testimony on fishes and their habitats in the Rocky Mountain and Plains ecoregions at 10 public hearings on feedlot, pipeline, well licence, coal mine and dam applications before federal and provincial regulatory boards.

### **Ongoing Self-directed Studies**

Studies of sediment delivery from roads and off-highway vehicle trails, chemistry of mountain waters, mountain stream temperatures, trout growth in mountain lakes, native cutthroat trout, mountain spring fauna

### Specialized Analytical Services

- expert identification and sample analysis services on fish, benthic invertebrates and zooplankton organisms from throughout northwestern North America numerous contracts with Environment Canada, Alberta Environment, Alberta Forestry, Lands and Wildlife, and several environmental consulting companies.
- computerized statistical analysis of salary data, analysis of student distribution data for the University of Calgary Faculty Association

### Teaching

#### University of Calgary

**Environmental Sciences Program** 

Supervised Students

- Logan Boyer: Environmental Science 505; Road and off-highway vehicle trail total surface erosion and sediment delivery into McLean Creek assessed using the WEPP:Road model. Research Project in Environmental Science, Environmental Sciences Program, University of Calgary, Calgary, AB. 2017 Fall Term
- Caitlin Gifford: Environmental Science 504; Natural individual markings for studying fall movements, habitat use and population size in threatened westslope cutthroat trout, Oncorhynchus clarkii lewisi. ENSC 504 Research Project in Environmental Science (unpublished), Environmental Sciences Program, University of Calgary, Calgary, AB. iii+20 p. 2010/2011 Fall/Winter Term. Parts of this work were published by Gifford & Mayhood (2014).
- Heidi Erdle: Environmental Science 504; Effects of ATV use, cattle grazing, logging and petroleum development on westslope cutthroat trout (*Oncorhynchus clarkii lewisi*) habitat in an Alberta foothills stream. ENSC 504 Research Project

in Environmental Science (unpublished), Environmental Sciences Program, University of Calgary, Calgary, AB. iii+35 p. 2010/2011 Fall/Winter Term

Environmental Science 401 - Environmental Science Field Course

• August & September 2018: assisted students on stream ecology field course

Environmental Science 401 - Environmental Science Field Course

• September 2017: advised students on stream ecology and trout habitat

Environmental Science 401 - Environmental Science Field Course

• September 2015: advised students on stream ecology and trout habitat

Environmental Science 502 - Special Problems in Environmental Management, Guest lectures

- November 2011: *Green Science in a brown world: Interpretation hazard in value-based science*
- February 2011: *Bullshit in environmental science* An application of Harry Frankfurt's 2005 philosophical analysis to the field (Frankfurt, H. 2005. On bullshit. Princeton University Press, Princeton, NJ. 67 p.)
- January 2010: Atmospheric, aquatic and terrestrial waste disposal: Issues for inland fish populations
- November 2007: Fish population loss, habitat damage and watershed degradation in southwestern Alberta, 1885 2007
- December 2006: Degradation of fish populations and their habitats in southwestern Alberta, 1885 2006

Department of Biology

Biology 200 - Introductory Biology

1969: Teaching Assistant

#### Mount Royal College, Calgary

Department of Chemical, Biological and Environmental Sciences

Biology 1219 - Limnology

*September to December 1989*: As a sabbatical replacement instructor, developed, prepared and taught a credit lecture and field/laboratory course (6 hours weekly) required for the college's 2-year diploma in Environmental Technology/Water Pollution Studies.

various dates, 1988-96: guest lectures, lab and field instruction in aquatic ecology

### Southern Alberta Institute of Technology, Calgary

Guest lectures on watershed ecology to Environmental Technology students

• December 2008, November 2009: *Some effects of human development on watersheds: Problems and solutions* 

### **Related Volunteer Activities**

- Timberwolf Wilderness Society founding director, 2012 present; President 2018-2019; Director 2019-2021
- Rocky Mountain Ecosystem Coalition founding director and treasurer, 1993 1999
- Alberta Wilderness Association Director 1991-92, 1978-79
- Organizer, Wild Rivers Forum, Alberta Wilderness Association Provincial Conference 1978
- Alternate Member, Public Advisory Committee of the Environment Council of Alberta 1978-79
- donated professional services (e.g., technical studies and advice, written and oral technical submissions to regulatory bodies, popular-style articles on fish conservation, computer consulting), various public interest groups including Timberwolf Wilderness Society, Friends of Mount Backus, Yellowstone to Yukon Conservation Initiative, Bragg Creek Environmental Coalition, Canadian Parks and Wilderness Society, Rocky Mountain Ecosystem Coalition, Alberta Wilderness Association, Speak Up for Wildlife Foundation, Trout Unlimited Canada and American Wildlands

### **Publications and Reports**

### Technical Publications (Peer-reviewed)

Fluker, S. C., and D. W. Mayhood. 2020. Environmental stewardship of public lands? The decline of westslope cutthroat trout along the eastern slopes of the Rocky Mountains in Alberta. Public Land & Resources Law Review 42:39-79. <u>https://scholarship.law.umt.edu/plrlr/</u> Temprarily also available online at: <u>https://www.researchgate.net/publication/342978970\_Environmental\_Stewardship\_of\_Public\_Lands\_The\_Decline\_of\_Westslope\_Cutthroat\_Trout\_along\_the\_Eastern\_Slopes\_of\_the\_Rocky\_Mountains\_in\_Alberta</u>

Mayhood, D.W., M. D. Sawyer and W. Haskins. 2004. Historical risk analysis of watershed disturbance in the southern east slopes region of Alberta, Canada, 1910-1996. Pages 23-29 *in* G.J. Scrimgeour, G. Eisler, B. McCulloch, U. Silins and M. Monita, editors. Forest-Land Fish Conference – Ecosystem Stewardship through Collaboration. Proceedings of the Forest-Land-Fish Conference II, 26-28 April 2004, Edmonton, Alberta. x+212 p. <u>http://www.fwresearch.ca/Library.html</u>

Sawyer, M. D. and D. W. Mayhood. 1998. Cumulative effects analysis of land-use in the Carbondale River catchment: implications for fish management. pp. 429-444 *in* M. K. Brewin and D. M. A. Monita, technical coordinators. Proceed-ings of the Forest-Fish Conference: land management practices affecting aquatic ecosystems, Calgary, AB, May 1-4, 1996. Canadian Forest Service, Northern Forest Centre Information Report NOR-X-356, xiii+533 p. <u>http://www.fwresearch.ca/Library.html</u>

Mayhood, D. W. 1998. Is the greater ecosystem concept relevant for conserving the integrity of aquatic ecosystems in the Canadian Rocky Mountains? pp. 772-780. *in* Munro, N. W. P., and J. H. M. Willison, editors. Linking protected areas with working landscapes — conserving biodiversity. Science and Management of Protected Areas Association, Wolfville, NS. xvii + 1018 p. <u>http://www.fwresearch.ca/Library.html</u>

Mayhood, D. W., M. D. Sawyer and W. Haskins. 1998. British Columbia's level 1 watershed assessment procedure as a tool for monitoring potential impacts of development on aquatic ecosystems in Canada's Rocky Mountains. pp. 677-686. *in* Munro, N. W. P., and J. H. M. Willison, editors. Linking protected areas with working landscapes — conserving biodiversity. Science and Management of Protected Areas Association, Wolfville, NS. xvii + 1018 p. <u>http://</u>

#### www.fwresearch.ca/Library.html

Donald, D. B., R. S. Anderson and D. W. Mayhood. 1994. Coexistence of fish and large *Hesperodiaptomus* species (Crustacea: Calanoida) in subalpine and alpine lakes. Canadian Journal of Zoology 72:259-261. doi: 10.1139/z94-035

Donald, D. B., R. S. Anderson and D. W. Mayhood. 1980. Correlations between brook trout growth and environmental variables for mountain lakes in Alberta. Transactions of the American Fisheries Society 109:603-610. doi: 10.1577/1548-8659(1980)109<603:CBBTGA>2.0.CO;2

Herzig, A., R. S. Anderson and D. W. Mayhood. 1980. Production and population dynamics of *Leptodiaptomus sicilis* in a mountain lake in Alberta, Canada. Holarctic Ecology (now Ecography) 3:50-63. doi: 10.1111/j. 1600-0587.1980.tb00708.x

#### Technical Publications (not peer-reviewed)

Mayhood, D. W. 2020. The proposed Grassy Mountain Coal Mine: Effects on trout populations & their critical habitats. Report prepared on behalf of Timberwolf Wilderness Society for submission to Joint Impact Assessment Panel for the Grassy Mountain Mine. Canadian Impact Assessment Agency & Alberta Energy Regulator, FWR Technical Report No. 2020/09-1, Ottawa, ON & Calgary, AB. iv+31 p. <u>https://ln2.sync.com/dl/9359ad130/svnyzuir-shumidvf-rcbr2dgf-9jerxvne</u>

Mayhood, D. W. 2014. Guerrilla ecology: Toward an effective strategy for monitoring Alberta's trout streams in a hostile climate. pp. 316-322. in R. F. Carline, and C. LoSapio, editors. Wild Trout IX: Sustaining wild trout in a changing world. Wild Trout Symposium, Bozeman, MT. 392 p. <u>http://www.wildtroutsymposium.com/proceedings-11.pdf</u>

Gifford, C. M., and D. W. Mayhood. 2014. Natural marks for identifying individual fish in small populations of at-risk westslope cutthroat trout. pp. 275-281. *in* R. F. Carline, and C. LoSapio, editors. Wild Trout IX: Sustaining wild trout in a changing world. Wild Trout Symposium, Bozeman, MT. 392 p. <u>http://www.wildtroutsymposium.com/proceed-ings-11.pdf</u>

Cleator, H., J. Earle, L. Fitch, S. Humphries, M. Koops, K. Martin, D. Mayhood, S. Petry, C. Pacas, J. Stelfox, and D. Wig. 2009. Information relevant to a recovery potential assessment of pure native westslope cutthroat trout, Alberta population. Canadian Science Advisory Secretariat Research Document 2009/036. iv+24 p. Available from: <u>http://www.dfo-mpo.gc.ca/csas/</u>

Mayhood, D. W. 2007. Fishes of the Yellowstone to Yukon region. Technical Report No. 3, Yellowstone to Yukon Conservation Initiative, Canmore, AB. vi+39 p. Available from: <u>http://www.y2y.net</u>

Mayhood, D. W. 2001. Conceptual framework and an action plan for conserving westslope cutthroat trout in Canada (Abstract). p. 265. *in* M. K. Brewin, A. J. Paul, and M. Monita, editors. Bull Trout II Proceedings: Ecology and Management of Northwest Salmonids. c/o Trout Unlimited Canada, PO Box 6270, Stn. D, Calgary, AB T2P 2C3. <u>http://www.fwresearch.ca/Library.html</u>

Mayhood, D. W. 2000. Provisional evaluation of the status of westslope cutthroat trout in Canada. pp 579-585. *in* L. M. Darling, editor. Proceedings of the Biology and Management of Species and Habitats At Risk, Kamloops, B.C., 15 - 19 Feb. 1999. Ministry of Environment, Lands and Parks, Victoria, BC, and University College of the Cariboo, Kamloops, BC. 974 p. Submitted version: <u>http://www.fwresearch.ca/Library.html</u>

Sawyer, M., and D. Mayhood. 1998. Cumulative effects of human activity in the Yellowstone to Yukon. pp. 61-63. *in* L.Willcox, B. Robinson and A. Harvey, editors. A sense of place: issues, attitudes and resources in the Yellowstone to Yukon Ecoregion. Yellowstone to Yukon Conservation Initiative, 710 Ninth Street, Studio B, Canmore, AB T1W 2V7. 138 p. <u>http://www.y2y.net</u>

Mayhood, D. W., R. Ament, R. Walker and W. Haskins. 1998. Selected fishes of Yellowstone to Yukon: distribution and status. pp. 77-91. *in* L.Willcox, B. Robinson and A. Harvey, editors. A sense of place: issues, attitudes and resources in the Yellowstone to Yukon Ecoregion. Yellowstone to Yukon Conservation Initiative, 710 Ninth Street, Studio B, Canmore, AB T1W 2V7. 138 p. <u>http://www.y2y.net</u>

Haskins, W., and D. W. Mayhood. 1997. Stream crossing density as a predictor of watershed impacts. Paper 457, Proceedings of the Seventeenth Annual ESRI User Conference, San Diego, CA, July 1997. <u>http://fwresearch.ca/Library.html</u>

#### **Peer-reviewed Technical Reports**

Boyer, L., and D. W. Mayhood. 2018. Erosion & suspended sediment delivery from off-highway vehicle trails & roads in the McLean Creek watershed, Alberta. Report prepared for Alberta Wilderness Association, Calgary, AB. Freshwater Research Limited Technical Report No. 2018/06-01. 92 p. Copy for public review available at <u>https://ln.sync.-com/dl/c2311d1d0/744jprjc-dynznjaw-g4vdkc5s-67g29dsi</u>

Mayhood, D. W., W. Haskins and M. D. Sawyer. 1997. Watershed assessment. pp. 43-74. *in* M. D. Sawyer, D. W. Mayhood, P. Paquet, R. Thomas, C. Wallis and W. Haskins. Southern East Slopes cumulative effects assessment. A report by Hayduke and Associates Ltd., Calgary AB, funded by Morrison Petroleum Ltd. Calgary AB. 207p. + appendices. http://www.fwresearch.ca/Library.html

Mayhood, D. W. W. Haskins and M. D. Sawyer. 1997. Cumulative effects on fish. pp. 173-187. *in* M. D. Sawyer, D. W. Mayhood, P. Paquet, R. Thomas, C. Wallis and W. Haskins. Southern East Slopes cumulative effects assessment. A report by Hayduke and Associates Ltd., Calgary AB, funded by Morrison Petroleum Ltd. Calgary AB. 207p. + appendices. <u>http://www.fwresearch.ca/Library.html</u>

Mayhood, D. W. 1995. Some effects of natural gas operations on fishes & their habitats on Canada's Rocky Mountain East Slopes. Rocky Mountain Ecosystem Coalition Technical Report 95/1:1-35. Reprinted with minor changes 1998. http://www.fwresearch.ca/Library.html

Mayhood, D. W. 1992. To keep every cog and wheel: regulatory and conceptual background for managing the fishes of Jasper National Park. Part 1 of a fish management plan for Jasper National Park. Prepared for Canadian Parks Service, Jasper National Park, Jasper, Alberta, by Freshwater Research Limited, Calgary, Alberta. 80 p. <u>http://www.fwresearch.ca/Library.html</u>

Mayhood, D. W. 1992. Approaches to managing freshwater fishes in North American parks and reserves. Part 2 of a fish management plan for Jasper National Park. Prepared for Canadian Parks Service, Jasper National Park, Jasper, Alberta, by Freshwater Research Limited, Calgary, Alberta. 118 p. <u>http://www.fwresearch.ca/Library.html</u>

Mayhood, D. W. 1992. A preliminary assessment of the native fish stocks of Jasper National Park. Part 3 of a fish management plan for Jasper National Park. Report prepared for the Canadian Parks Service, Jasper National Park, by Freshwater Research Limited. 296 p. + maps. doi: 10.13140/2.1.4015.9044 http://www.fwresearch.ca/Library.html

Walder, G. L., and D. W. Mayhood. 1985. An analysis of benthic invertebrate and water quality monitoring data from the Athabasca River. Alberta Environment Research Management Division Report L-91. 254 p. <u>http://hdl.han-dle.net/10402/era.23615</u>

McCart, P. J., and D. W. Mayhood. 1980. A review of aquatic biomonitoring with particular reference to its possible use in the AOSERP study area. Alberta Oil Sands Environmental Research Program (AOSERP) Project WS 3.5. 117 p. https://era.library.ualberta.ca/downloads/7d278v16p

Mayhood, D. W. 1980. Zooplankton, pp. 141-162. *in* P. J. McCart, (ed.) Effects of siltation on the ecology of Ya-Ya Lake, N. W. T. Environmental Studies No. 13, Northern Affairs Program, Indian and Northern Affairs Canada, Ottawa. Catalogue No. R71-19/13-1979. 286 p.

#### Thesis

Mayhood, D. W. 1978. Production of crustacean plankton, benthic macroinvertebrates and fish in six mountain lakes in Alberta. M.Sc. thesis, Department of Biology, University of Calgary, Calgary, Alberta. 219 p. <u>http://www.fwre-search.ca/Library.html</u>

#### Conference Papers & Selected Presentations (presenter in bold)

**Mayhood**, **D. W. 2019.** Recovering native cutthroats: What they need & what they're getting. FWR Freshwater Research Limited and Timberwolf Wilderness Society presentation to the Fish & Forests Roundtable Workshop, Alberta Wilderness Association, Calgary, AB, 14 June 2019.

Boyer, L., and **D. W. Mayhood**, 2018. Sediment loading from off-highway vehicle trails and roads to McLean Creek and its tributaries. FWR Freshwater Research Limited presentation to Bow River Basin Council Stewardship Forum, High River, AB, 12 December 2018.

Mayhood, D. W., 2018. Clearcuts, linear disturbance, & trout habitat: New ways of thinking about forest-fish issues on Alberta's East Slopes. FWR Freshwater Research Limited presentation to Fish-Forest Roundtable Workshop, Alberta Wilderness Association, Calgary, Alberta, 6 December 2018.

**Boyer, L.**, and D. W. Mayhood. 2018. Sediment loading from off-highway vehicle trails and roads to McLean Creek and its tributaries. FWR Freshwater Research Limited presentation to Bow River Basin Council Science Forum, University of Calgary, 2 May 2018.

**Mayhood**, **D. W.**, and L. Boyer. 2018. Effects of roads & trails on critical habitat of threatened cutthroat trout, Silvester Creek, Alberta. FWR Freshwater Research Limited presentation to Bow River Basin Council Science Forum, University of Calgary, 2 May 2018.

Mayhood, D. W. 2018. Recovering Alberta's westslope cutthroat trout to secure status. FWR Freshwater Research Limited presentation to Canadian Council on Freshwater Fisheries Research, Edmonton, Alberta 6 January 2018.

Mayhood, D. W. 2017. Recovering Alberta's native trout. FWR Freshwater Research Limited presentation to Fish-Forest Roundtable Workshop 11, Alberta Wilderness Association, Calgary, Alberta, 9 November 2017.

**Mayhood**, **D. W. 2017**. Roads & OHV trails are destroying east slopes watersheds & streams. FWR Freshwater Research Limited presentation, News conference, Alberta Wilderness Association, Calgary, Alberta, 4 March 2017.

**Mayhood**, **D. W.** 2015. How much road can we fit on Alberta's eastern slopes? FWR Freshwater Research Limited and Timberwolf Wilderness Society presentation to Eastern Slopes Today & Tomorrow Workshop, Alberta Wilderness Association, Calgary, AB, 4 December 2015.

**Mayhood, D. W.** 2014. Guerrilla ecology: toward an effective strategy for monitoring Alberta's trout streams in a hostile climate. FWR Freshwater Research Limited presentation to Wild Trout XI, September 22-25, 2014. West Yellowstone, MT.

Gifford, C. M., and **D. W. Mayhood**. 2014. Natural marks for identifying individual fish in small populations of atrisk westslope cutthroat trout. University of Calgary B.Sc. Program in Environmental Science, and FWR Freshwater Research Limited presentation to Wild Trout XI Proceedings, September 22-25, 2014. West Yellowstone, MT.

Mayhood, D. W. 2014. Not just plumbing: A rationale for rewilding Alberta's rivers. FWR Freshwater Research Limited presentation to Forests, Fish and Floods Forum, Alberta Wilderness Association, Calgary, Alberta, 26 June 2014.

**Mayhood**, **D. W.** 2014. Watersheds as trout habitat: Sediment loading in Silvester Creek. FWR Freshwater Research Limited and Timberwolf Wilderness Society presentation to Westslope Cutthroat Trout Stakeholders Workshop, Municipal District of Ranchlands Administration Building, 26 February, 2014.

**Mayhood, D. W. 2008.** Cumulative impacts on native trout in Petro-Canada's Sullivan Project area. FWR Freshwater Research Limited presentation on behalf of Alberta Wilderness Association to Alberta Energy Resources Conservation Board hearing in the matter of Petro-Canada's Sullivan Pipeline Application, High River, Alberta, 9 December 2008.

**Mayhood**, **D.W.**, M. D. Sawyer and W.Haskins. 2004. Historical risk analysis of watershed disturbance in the southern east slopes region of Alberta, Canada, 1910-1996. Forest-Land Fish Conference – Ecosystem Stewardship through Collaboration. April 26-28, 2004, Edmonton, Alberta.

Mayhood, D. W. 2002. Ecological thresholds in inland fish populations and catchment ecosystems. Devon Canada Biological Thresholds Workshop, Blairmore, AB, 1 May 2002.

**Mayhood**, D. W. 2000. Westslope cutthroat trout in Canada: apparent status and a conceptual framework for conservation. British Columbia Cutthroat Trout Workshop, Harrison Hotsprings, BC, 3-4 February 2000.

Mayhood, D. W. 1999. Provisional evaluation of the status of westslope cutthroat trout in Canada. Paper presented at the Biology and Management of Species and Habitats at Risk Conference, Kamloops, BC, 15-19 February 1999.

**Mayhood**, **D. W.** 1998. A watershed perspective of environmental risk at pipeline water crossings: incorporating concepts of cumulative ecological damage. Presentation to the Meeting of the Canadian Pipeline Water Crossing Committee, Banff, AB 25-27 November 1998.

**Mayhood**, **D. W.** 1997. Is the greater ecosystem concept relevant for conserving the integrity of aquatic ecosystems in the Canadian Rocky Mountains? Paper presented at the Science and Management of Protected Areas Association (SAMPA III) Conference, Calgary, AB, May 1997.

**Mayhood, D. W.**, M. D. Sawyer and W. Haskins. 1997. British Columbia's level 1 watershed assessment procedure as a tool for monitoring potential impacts of development on aquatic ecosystems in Canada's Rocky Mountains. Paper presented at the Science and Management of Protected Areas Association (SAMPA III) Conference, Calgary, AB, May 1997.

Haskins, W., and D. W. Mayhood. 1997. Stream crossing density as a predictor of watershed impacts. Paper presented at the Seventeenth Annual ESRI User Conference, San Diego, CA, July 1997.

**Sawyer, M. D.** and D. W. Mayhood. 1996. Cumulative effects analysis of land-use in the Carbondale River catchment: implications for fish management. Paper presented at the Forest-Fish Conference, Calgary, AB, May 1-4, 1996.

#### **Published Popular Articles**

Mayhood, D. W. 2018. The global extinction crisis, Alberta's native cutthroat trout, and wilderness. Wild Lands Advocate 26(4):10-12. <u>https://albertawilderness.ca/wp-content/uploads/2018/12/December-2018-Advocate-Web.pdf</u>

Mayhood, D. W. 2015. Thinking about rivers. Wild Lands Advocate 23:4-7. <u>http://albertawilderness.ca/archive/wla-archive/2015-10-00-vol-23-no-5-wild-lands-advocate</u>.

Mayhood, D. W. 2014. Floods are not a water management problem. Wild Lands Advocate. 22(3):11-12. <u>http://fwresearch.ca/Library\_files/Mayhood%202014c.pdf</u>

Mayhood, D. W. 2014. Silvester Creek: Watershed condition, foothills roads, and native trout. Preserving Our Lifeline [Newsletter of the Bow River Basin Council] 14(6):6-7. <u>http://bit.ly/SYdmxG</u>

Mayhood, D. W. 2008. Exotic fishes in Alberta: paying the price. Wild Lands Advocate 16(4):9-11. Available from <a href="http://www.albertawilderness.ca/AWRC/WLA.htm">http://www.albertawilderness.ca/AWRC/WLA.htm</a>

Mayhood, D., and C. Olson. 2008. Westslope cutthroat trout assessed as "threatened." Wild Lands Advocate 16(2):28. Available from <u>http://www.albertawilderness.ca/AWRC/WLA.htm</u>

Mayhood, D. W. 2005. Ottawa's paperless map plot: bad for libraries, bad for people. CASLIS Special Issues [news-letter of the Canadian Association of Special Libraries and Information Services]16(4):2-3. <u>http://www.fwresearch.-</u> ca/Library.html

Mayhood, D. W. 1998. Following Silver City: westslope cutthroat trout in Canada. On the Wild Side: The Journal of American Wildlands 9(1):7-8. <u>http://www.fwresearch.ca/Library.html</u>

Mayhood, D. W., and M. D. Sawyer. 1997. Yellowstone to Yukon: real or imagined? pp.5-8. *in* B. Robinson and M. Sawyer, editors. A sense of place: issues, attitudes and resources in the Yellowstone to Yukon bioregion. Yellowstone to Yukon Conservation Initiative, Canmore, AB. 31 p. Available from: <u>http://www.y2y.net</u>

Mayhood, D. W., R. Ament and R. Walker. 1997. Fishes of the Yellowstone to Yukon. pp. 21-23. *in* B. Robinson and M. Sawyer, editors. A sense of place: issues, attitudes and resources in the Yellowstone to Yukon bioregion. Yellowstone to Yukon Conservation Initiative, Canmore, AB. 31 p. Available from: <u>http://www.y2y.net</u>

Mayhood, D. W. 1997. Do protected areas work? Research Links 5(1):15. <u>http://publications.gc.ca/site/eng/42057/</u> issues.html

Mayhood, D. W. 1997. How roads kill streams. Rocky Mountain Ecosystem Coalition Home Page.

Mayhood, D. W. 1996. Historical transformation of the fish fauna of the central Canadian Rockies. Research Links 4(2):21,6. <u>http://parkscanadahistory.com/series/rl/R61-16-4-2E.pdf</u>

Mayhood, D. W. 1995. What good is the Earth? Review of Odum, E. P. 1993. Ecology and our endangered life-support systems. Sinauer Associates, Inc., Sunderland, MA. 301p. Wild Lands Advocate 3(1):18,25.

Mayhood, D. W. 1994. Protected areas and conservation. Rocky Mountain News 1(1):3.

Mayhood, D. W. 1992. It was my future: a conversation with Milton Born With A Tooth. Wilderness Alberta 22(1):7-9.

Mayhood, D. W. 1992. A home without walls: ecological principles and proposals for the Canadian constitution. Wilderness Alberta 22(1):15.

Mayhood, D. W. 1991. Keeping our eyes on the prize. Environment Network News 18:17.

Mayhood, D. W. 1989. IJC flattens Flathead mine proposal. Wilderness Alberta 19(2):6.

Mayhood, D. W. 1989. The case against Cabin Creek coal. Wilderness Alberta 19(2):7-8.

Mayhood, D. W. 1989. Nudity on the North Fork. Wilderness Alberta 19(2):8.

Mayhood, D. W. 1989. Restoring the crown. Wilderness Alberta 19(2):9.

Mayhood, D. W. 1989. Going native: a search for roots among the lower vertebrates. pp. 41-52. Book chapter *in*: Norman, J. G., editor. Fish and tell and go to hell: Alberta flyfishing wisdom. Dirtwater Publications, Calgary. 172 p.

Mayhood, D. W. 1987. Epitaph for an unknown fish. Wilderness Alberta 17(3):4-5.

Mayhood, D. W. 1986. Southern Alberta's native trout — are they in trouble? The Riseform 2(2):23-25.

Mayhood, D. W. 1986. Book review: J. R. Butler and R. R. Maw. 1985. Fishing Canada's mountain parks. Lone Pine Publishing, Edmonton. 125 p. The Riseform 2(1):24-25.

#### Microcomputer Applications

Mayhood, D. W., and H. B. N. Hynes. 1987-93. Hynes' Bibliography on the Ecology of Running Waters for MS-DOS. Microcomputer database translated from Macintosh, maintained, enhanced and marketed by FWR Freshwater Research Limited for the software package Q&A 3.0 running on MS-DOS computers. Over 15,000 references and 170+ subject keycodes in 4.3 mb, with 98-page operations manual.

#### Technical Reports (unpublished)

Mayhood, D. W. 2019. Comments on the 2019 proposed recovery strategy & action plan for the Alberta population of westslope cutthroat trout. Freshwater Research Limited report prepared on behalf of Timberwolf Wilderness Society, Pincher Creek, Alberta, for Species At Risk Directorate, Department of Fisheries, Oceans and the Coast Guard, Ot-tawa, Ontario. FWR Technical Note No. 2019/07-1, iv+29 p. <u>https://ln2.sync.com/dl/69c601e10/uis7dkrz-bycyx9pe-axuzmnv4-enzd8jgw</u>

Mayhood, D. W. 2019. Brief submitted to the Senate Standing Committee on Energy, the Environment and Natural Resources, regarding Bill C-69, specifically the *Impact Assessment Act* provisions. <u>https://sencanada.ca/content/sen/committee/421/ENEV/Briefs/DaveMayhood\_e.pdf</u>

Mayhood, D. W. 2017. Emergency report: Alberta native cutthroat trout populations & critical habitat at risk. Report prepared for Timberwolf Wilderness Society, Pincher Creek, AB, and Alberta Wilderness Association, Calgary, AB. Freshwater Research Limited Technical Note 2017/08-1. iii+32 p. http://fwresearch.ca/Library.html

Mayhood, D. W. 2017. Comments on the Castle Management Plan Revised Draft: Effects on trout & their critical habitats. Report Prepared for Alberta Environment and Parks Edmonton, Alberta on behalf of Timberwolf Wilderness Society Calgary, Alberta. Freshwater Research Limited Technical Note 2017/04-1. 43 p. <u>http://fwresearch.ca/Library.html</u>

Mayhood, D. W. 2016. Overview of alluvial river, riparian, & watershed ecological function, with comments on the effects of gravel mining. Report prepared for Lars Larsen, Fort Assiniboine, Alberta, by FWR Freshwater Research Limited. FWR Technical Note 2016/12-1. 12 p. <u>https://fwresearch.ca/Library.html</u>

Mayhood, D. W. 2015. Upper Silvester Creek sediment source survey 5 August 2013. Freshwater Research Limited Technical Note 2015/10-2. i+40 p. <u>http://fwresearch.ca/Library.html</u>

Mayhood, D. W. 2015. Notes on a proposal to permit off-highway vehicle use in the Castle wilderness parks. Interim report. FWR Freshwater Research Limited Technical Note 2015/10-1. 12 p.

Erdle, H. and Mayhood, D. W. 2014. Anthropogenic effects on the habitat of a critical population of at-risk westslope cutthroat trout assessed using simple monitoring methods. FWR Freshwater Research Limited Technical Report 2014/06-1. v+17 p. http://www.fwresearch.ca/Library.html

Mayhood, D. W. 2014. Conceptual framework and recovery guidelines for restoring westslope cutthroat trout populations in Alberta. Report prepared on behalf of Timberwolf Wilderness Society for Alberta Fish & Wildlife Division and Fisheries & Oceans Canada. Freshwater Research Limited Technical Report 2014/03-1. xii+90 p. doi: 10.13140/2.1.1931.6809 http://www.fwresearch.ca/Library.html

Mayhood, D. W. 2013. Suspended sediment in Silvester Creek and its potential effects on the westslope cutthroat trout population. Report prepared for Timberwolf Wilderness Society. Freshwater Research Limited Technical Report 2013/07-1. iii+50 p. http://www.fwresearch.ca/Library.html

Mayhood, D. W. 2013. Suspended sediment in Silvester Creek and its potential effects on the westslope cutthroat trout population: Photo appendix. Report prepared for Timberwolf Wilderness Society. Freshwater Research Limited Technical Report 2013/07-1 Appendix. 12 p. <u>http://www.fwresearch.ca/Library.html</u>

Mayhood, D. W. 2012. Reference parameters for headwater stream populations of westslope cutthroat trout in Alberta. Report prepared for Fisheries & Oceans Canada, and Alberta Fish & Wildlife Division. Freshwater Research Limited Technical Report 2012/12-1. Calgary, AB. iii+34 p. <u>http://www.fwresearch.ca/Library.html</u>

Mayhood, D. W. 2012. Cutthroat trout length conversion regressions. Report prepared for Fisheries & Oceans Canada, and Alberta Fish & Wildlife Division. Freshwater Research Limited Technical Note 2012/06-1. Calgary, AB. ii+32 p. http://www.fwresearch.ca/Library.html

Mayhood, D. W. and E. B. Taylor. 2011. Contributions to a recovery plan for westslope cutthroat trout (*Oncorhynchus clarkii lewisi*) in Alberta: distribution, population size and trends. Report prepared for Alberta Fish & Wildlife Division. Freshwater Research Limited Technical Report No. 2011/06-1, Calgary, AB. vi+45 p.+appendix. <u>http://www.fwresearch.ca/Library.html</u>

Mayhood, D. W. 2010. An overview of river ecology and its implications for simplified hydropower approvals in Alberta. Report prepared by Freshwater Research Limited for the Alberta Wilderness Association. 38 p.

Mayhood, D. W. 2010. Testing the H<sub>60</sub> calculations in the 1998 Carbondale basin Interior Watershed Assessment Procedure. Freshwater Research Limited Technical Note 2010/01-1. 12 p. <u>http://www.fwresearch.ca/Library.html</u>

Mayhood, D. W. 2009. Contributions to a recovery plan for westslope cutthroat trout (*Oncorhynchus clarkii lewisi*) in Alberta: Threats and limiting factors. Report prepared for Alberta Fish & Wildlife Division. Freshwater Research Limited Technical Report No. 2009/05-1, Calgary, AB. ix+68 p. <u>http://www.fwresearch.ca/Library.html</u>

Mayhood, D. W. 2008. Watershed assessments for the southern portion of Petro-Canada's Sullivan Field project. Prepared for Big Loop Landowners Group, Longview, AB, by FWR Freshwater Research Limited, Calgary, AB. 10p.

Mayhood, D. W. 2008. Cumulative human impacts on native trout stocks in relation to Petro-Canada's Sullivan Field development project. Report prepared for Alberta Wilderness Association and Big Loop Landowners Group, by FWR Freshwater Research Limited, Calgary, AB. 19p. including responses to Petro-Canada's information requests. 5 p. + 3 maps.

Mayhood, D. W. 2004. Fishes of Yellowstone to Yukon: overview. FWR Freshwater Research Limited report to the Yellowstone to Yukon Conservation Initiative, Canmore, AB. 44 p.

Mayhood, D. W. 2001. Potential effects of a proposed feedlot on fish and their habitats in Onetree Creek and the Red Deer River, Alberta. Report prepared for the Newell Clean County Coalition, Brooks, AB, by FWR Freshwater Research Limited. 18 p. including addendum. <u>http://www.fwresearch.ca/Library.html</u>

Mayhood, D. W., R. Ament and R. Walker. 1997. The fishes of Yellowstone to Yukon: distribution and status. Interim report submitted to the First Conference of the Yellowstone to Yukon Conservation Initiative, Waterton Lakes National Park, AB, 2-5 October 1997. 21 p.

Mayhood, D. W. 1997. Notes on the proposed Cheviot Mine: effects on biota and their habitats. Submitted to the Cheviot Mine Review Panel on behalf of the Rocky Mountain Ecosystem Coalition. 7 p.

Mayhood, D. W. 1996. Impact of the proposed Express pipeline on fish populations. Report prepared for the Rocky Mountain Ecosystem Coalition by FWR Freshwater Research Limited, Calgary, AB. 33 p. + map.

Mayhood, D. W. 1995. The fishes of the Central Canadian Rockies Ecosystem. FWR Freshwater Research Limited Report No. 950408 prepared for Parks Canada, Banff National Park, P.O. Box 900, Banff, AB T0L 0C0. 59 p. <u>http://www.fwresearch.ca/Library.html</u>

Mayhood, D. W., and J. Paczkowski. 1993. Preliminary fall survey of the fishes of the upper Bow River, Banff National Park. Prepared for Banff National Park, Banff, Alberta, by Freshwater Research Limited, Calgary, Alberta. 39 p.

Mayhood, D. W. 1991. Fishes threatened, vulnerable or of special concern in relation to the Oldman River dam. Oldman River Dam Environmental Assessment Review Panel submission FWR 1-NC-30/11/91, Federal Environmental Assessment Review Office, Panel Secretariat, Suite 1150, 555 West Hastings Street, P.O. Box 12071, Harbour Centre, Vancouver, B.C., by Freshwater Research Limited, Calgary. 50 p.

Mayhood, D. W. 1991. Managing the fishes of Jasper National Park 1991-2000. Report prepared for the Canadian Parks Service, Jasper National Park, by Freshwater Research Limited. 52 p. + appendix. (draft)

Mayhood, D. W. 1988. Fisheries and water quality aspects. pp. 19-26. *in* Submission on behalf of the Beaver Mines Area Land Owners Group, intervenors in respect of Energy Resources Conservation Board Application No. 880983, surface location 11-8-6-2-W5M. Submission prepared by Atkinson McMahon Barristers and Solicitors, Calgary. 48 p. + appendix.

Mayhood, D. W. 1988. Fisheries. Section V.B.2, Concerns of the Alberta Wilderness Association respecting ... ERCB Application - Shell Waterton 6-30-4-1 (Whitney Creek). Intervenor's submission to the Alberta Energy Resources Conservation Board, Calgary, AB. 7 p.

Mayhood, D. W. 1988. Trout populations and streambed condition in Whitney and Mill creeks, Alberta, July 1988. Report prepared for Alberta Wilderness Association, Calgary, by FWR Freshwater Research Limited. 34 p.

Mayhood, D. W. 1987. Preliminary investigation of a fish kill at the Bearspaw Country Club trout pond. Report prepared for Bearspaw Country Club, Calgary, Alberta by FWR Freshwater Research Limited. 10 p.

Mayhood, D. W. 1986. Fisheries. pp. 28-37. *in* Intervenor's submission. Submission of the Alberta Wilderness Association to the Energy Resources Conservation Board in the matter of Shell Canada Ltd. Jutland well application No. 851037. 75 p.

Mayhood, D. W. 1985. Potential impact of a proposed new highway crossing on fish in Altrude Creek, Banff National Park, and possible mitigation measures. Report prepared for Underwood McLellan Limited, Calgary, by FWR Freshwater Research Limited. 25 p.

Mayhood, D. W. 1983. Preliminary report on the invertebrates and cutthroat trout of twelve mountain lakes sampled by the Alberta Fish and Wildlife Division, summer 1981 and 1982. Report prepared for Fish and Wildlife Division, Alberta Energy and Natural Resources, Rocky Mountain House, by FWR Freshwater Research Limited, Calgary. 14 p.

Mayhood, D. W. 1982. Observations on selected stream crossings during installation of the South Wapiti gas gathering system. Report prepared for Western Wildlife Environments Consulting Ltd., Calgary, by FWR Freshwater Research Limited, Calgary. 38 p. + appendix.

Mayhood, D. W. 1981. Late autumn stream habitats and fish populations in the vicinity of the proposed South Wapiti gas gathering system. Report prepared for Canadian Hunter Exploration Limited, Calgary, by Western Wildlife Environments Consulting Ltd., Calgary. 112 p.

Horejsi, B. L., D. Mayhood and P. McNichol. 1981. Environmental report, pipeline development and reclamation application for the South Wapiti gas gathering system. Canadian Hunter Exploration Limited report. 83 p + appendix.

Mayhood, D. W. 1981. An ecological baseline study of Lake Bonavista, Calgary. Report prepared for the Lake Bonavista Homeowners' Association by Aquatic Environments Limited, Calgary. 67 p.

Mayhood, D. W., R. D. Saunders and P. J. McCart. 1981. Aquatic habitats and fish populations in the vicinity of Petro-Canada's Monkman coal project. Report prepared for Petro-Canada, Calgary, by P. McCart Biological Consultants Limited, Nanaimo, B. C. 163 p.

Mayhood, D. W., and L. D. Corkum. 1981. Chemical and biological monitoring of muskeg drainage at the Alsands project site. Volume 1: Review of available data on the Muskeg River. Alberta Environment Research Management Division Report OF-37. 76 p. + appendix. <u>http://hdl.handle.net/10402/era.25523</u>

Mayhood, D. W., G. L. Walder, T. Dickson, R. B. Green, D. E. Reid and R. Stushnoff. 1981. Chemical and biological monitoring of muskeg drainage at the Alsands project site. Volume 2: Monitoring and fish studies. Alberta Environment Research Management Division Report OF-38. 247 p. + appendices. <u>http://hdl.handle.net/10402/era.25542</u>

Mayhood, D. W. 1981. Chemical and biological monitoring of muskeg drainage at the Alsands project site. Volume 3: Program evaluation and suggestions for continued monitoring. Alberta Environment Research Management Division Report OF-39. 25 p. + appendix. <u>http://hdl.handle.net/10402/era.25532</u>

Mayhood, D. W. 1980. Aquatic analysis, pp. 79-97. *in* Hardy Associates (1978) Ltd. An evaluation of the twinning of the CNR line in Mount Robson Provincial Park. Report prepared for Canadian National Railways, Edmonton. 107 p + appendices.

Mayhood, D. W. 1980. Aquatic analysis, pp. 134-168. *in* Hardy Associates (1978) Ltd. An environmental evaluation of the twinning of the CNR line in Jasper National Park. Report prepared for Canadian National Railways, Edmonton. 172 p. + appendices.

Saunders, R. D., and D. W. Mayhood. 1980. Biological survey of a pond affected by an oil spill near Hussar, Alberta. Report prepared for Sundance Oil (Canada) Limited, Calgary, by Aquatic Environments Limited, Calgary. 21 p.

Mayhood, D. W., and P. J. McCart. 1980. A design for biological monitoring of aquatic habitats in the Cold Lake area. Report prepared for Esso Resources Canada Limited, Calgary, by Aquatic Environments Limited, Calgary. 62 p.

McCart, P. J., D. W. Mayhood, M. L. Jones and G. J. Glova. 1980. Stikine - Iskut fisheries studies. Report prepared for British Columbia Hydro and Power Authority, Vancouver, by P. McCart Biological Consultants Limited, Nanaimo, B. C. 136 p.

Cross, P. M., R. D. Saunders, R. B. Green, D. W. Mayhood and P. J. McCart. 1979. Aquatic habitats and acidification of waters in the vicinity of the Kaybob gas plant. Aquatic Environments Limited report to Hudson's Bay Oil and Gas Limited, Calgary. 163 p.

Mayhood, D. W. 1979. Zooplankton, pp. 136-161, and benthic invertebrates, pp. 162-195. *in* P. J. McCart (ed.) Limnological and fisheries surveys of the aquatic ecosystems at Esso Resources' Cold Lake lease. Report prepared for Esso Resources Canada Limited, Calgary, by Aquatic Environments Limited, Calgary. 267 p.

McCart, P. J., and D. W. Mayhood. 1979. Summary of biological data for the Beaver River in the vicinity of Cold Lake. Report prepared for Esso Resources Canada Limited, Calgary, by Aquatic Environments Limited, Calgary. 41 p.

Den Beste, J., D. Mayhood and S. Olson. 1979. Preliminary fisheries and wildlife investigations of Denison Mines Limited's Belcourt lease. Report prepared for Denison Mines Limited, Vancouver, by Aquatic Environments Limited, Calgary. n. p.

Mayhood, D. W., and R. S. Anderson. 1977. An introductory bibliography of whole-lake, secondary and fish productivity studies. Canadian Wildlife Service Report, Edmonton. 28 p.

Mayhood, D. W., and R. S. Anderson. 1976. Limnological survey of the Lake Louise area, Banff National Park. Part 1: General section. Canadian Wildlife Service Report to Parks Canada, Calgary. 81 p.

Mayhood, D. W., and R. S. Anderson. 1976. Limnological survey of the Lake Louise area, Banff National Park. Part 2: The lakes. Canadian Wildlife Service Report to Parks Canada, Calgary. 273 p. doi:10.13140/2.1.3848.4802

Mayhood, D. W., R. S. Anderson, D. B. Donald and R. B. Green. 1976. Limnological survey of the Lake Louise area, Banff National Park. Part 3: The streams. Canadian Wildlife Service Report to Parks Canada, Calgary. 90 p.

Mayhood, D. W., and R. S. Anderson. 1976. Limnological survey of the Lake Louise area, Banff National Park. Part 4: Production estimates and recommendations. Canadian Wildlife Service Report to Parks Canada, Calgary. 76 p.

Mayhood, D. W. 1974. The limnology and fisheries of Prince Albert National Park, Saskatchewan. 80 p. *in* R. E. Scace (ed.) Prince Albert National Park: a literature review. Report prepared for Parks Canada, Calgary, by R. E. Scace and Associates, Calgary. <u>http://fwresearch.ca/Library\_files/Mayhood%201974.pdf</u>

Mayhood, D. W., A. H. Kooyman, R. L. Hare and R. D. Saunders. 1973. A limnological survey of some waters in southern Prince Albert National Park, Saskatchewan. Canadian Wildlife Service Report. 101 p. + appendices.

Mayhood, D. W., and R. E. Smith. 1972. Biological sampling on the Bow and Pipestone rivers near Lake Louise, Banff National Park, Alberta. Canadian Wildlife Service Report. 43 p.

Kooyman, A. H., and D. W. Mayhood. 1971. A limnological survey of Chiniki Lake, Alberta. Canadian Wildlife Service Report. 17 p.

#### **Derivative Publications**

Technical publications by corporate authors and others substantially based on my published and unpublished work.

DFO. 2014. Recovery strategy for the Alberta populations of westslope cutthroat trout (*Oncorhynchus clarkii lewisi*) in Canada [Final]. Species at Risk Act Recovery Strategy Series. Fisheries and Oceans Canada, Ottawa, ON. 28 p. <u>http://publications.gc.ca/collection\_2014/mpo-dfo/En3-4-182-2014-eng.pdf</u>

Cove, T., J. E. Earle, L. Fitch, M. Holder, S. Humphries, E. Kulcsar, B. E. Meagher, C. Pacas, M. Percy, S. Petry, S. Rogers, R. Staniland, D. Wig, and L. Winkel. 2013. Alberta westslope cutthroat trout recovery plan 2012 – 2017. Publication No: I/604, Alberta Environment and Sustainable Resource Development, Alberta Species at Risk Recovery Plan No. 28, Edmonton, AB. ix+77 p. <u>http://srd.alberta.ca/FishWildlife/SpeciesAtRisk/SpeciesAtRiskPublications-WebResources/Fish/documents/SAR-WestslopeCutthroatTrout-RecoveryPlan-A-Mar2013.pdf</u>

DFO. 2009. Recovery potential assessment of pure native westslope cutthroat trout, Alberta population. Department of Fisheries and Oceans Canadian Science Advisory Secretariat, Science Advisory Report 2009/050. Available from: <a href="http://www.dfo-mpo.gc.ca/csas">www.dfo-mpo.gc.ca/csas</a>

Anonymous. 2005. The waters of Y2Y. Yellowstone to Yukon Conservation Initiative, Canmore, AB. Map. 1 p. Available from: <u>http://www.y2y.net</u>

Mahr, M. 1999. Y2Y aquatics strategy workshop. Flathead Lake Biological Station, MT USA. 20-22 August, 1999. Yellowstone to Yukon Conservation Initiative, 710 Ninth Street, Studio B, Canmore, AB T1W 2V7. 37 p. Available from: http://www.y2y.net

Anonymous. 1995. Fish. pp. 23-26. *in* White, C., D. Gilbride, M. Scott-Brown. and C. Stewart. Atlas of the Central Rockies Ecosystem: towards an ecologically-sustainable landscape. Status report to the Central Rockies Ecosystem Interagency Liaison Group (CREILG) prepared by Komex International Ltd., Calgary, AB. ii+49 p.

Pharis, V. 1994. A glacial relict with a preglacial fish assemblage: Tutizzi Lake. Global Biodiversity 3(4):26–27.
# Caitlyn T. Anderson

From: Sent: To: Subject: Attachments:

June 22, 2021 7:23 AM Legislative Services Shared [EXTERNAL] - Bylaw C-8073-2020: Burnco West Cochrane Pit application Soil column experiment\_JFennell\_June 18\_2021 Rev 1.pdf; Appendix 2\_C130760V3R-R2021-05-31\_15-07-08\_R006-redacted.pdf; 2021-06-05 Exec Summary of scientific experiment by Dr. Jon Fennell.pdf

## Do not open links or attachments unless sender and content are known.

Respected Council Members;

My name is Dr. Jon Fennell. I am a professional hydrogeologist and geochemist registered with APEGA, and have been practicing for over 30 years (both locally and internationally). I was recently asked by a group of local landowners located near the proposed West Cochrane Pit to review Burnco's application. Specifically, I was asked to review the groundwater aspects of this proposed development and the risks to local water resources. Based on work done by Matrix in support of Burnco's application it is clear that Grand Valley Creek, Beaupre Creek, and the Bow River will be receiving entities to any contaminants released during and after this massive development. Although baseline work has been done to understand the groundwater quality pre-development, <u>nothing</u> has been done to assess the risk that stripping of the topsoil and removal of a large amount of gravel will pose to local water bodies and/or water wells.

The assumption that has consistently been made by many is that gravel extraction will not affect local groundwater quality to any degree. To test the validity of that assumption I was asked to perform an scientific experiment to mimic what might occur after a large thickness of the gravel deposit is removed from the area and a thin veneer is left above the fractured bedrock. I have attached a report I prepared for the group summarizing the results of that experiment, as well as the Certificate of Analysis from the contracted lab (Bureau Veritas), and an Executive Summary. I request that your read these documents – at least the short 1-page Executive Summary prepared by the group.

To summarize through, after flowing laboratory-grade, filtered and purified deionized water through a 1.2m soil column (to mimic snowmelt and rainfall infiltrating through a thin veneer of remaining gravel) the results were not consistent with assumption that minimal change will occur. In fact the water contained:

- high levels of turbidity (over 500 times higher than expected background) and
- concentrations of harmful trace elements like arsenic, chromium, and lead (among other things) well in excess of Alberta's guidelines to protect freshwater aquatic life as well as drinking water.

This compromised water would be flowing into fractured bedrock with limited ability to filter out these contaminant before they reached a receptor like Grand Valley Creek, or the Bow River. The concern here, as it is with all gravel pits, is that this aspect has never really been studied before, yet the results are striking and should give cause for concern.

Considering the scale of this development and the proximity to local creeks and the Bow River (that support critical habitat for fish species and provide drinking water for downstream communities) a proper risk assessment should have been conducted by the applicant. Unfortunately, this was <u>not</u> done. And this now places the RVC council members in a disadvantaged position. Having to make a land use decision like this, that will permanently alter the landscape along a picturesque highway and place the environment at risk with less than all the facts is, frankly, unacceptable. And given the results of the soil column experiment, which is **direct evidence** that mobilization of harmful contaminants **is possible**, a more in-depth and proper risk review should be required before any further development is considered.

### ATTACHMENT 'E': PUBLIC SUBMISSIONS

# F-1 - Attachment E Page 161 of 252

Although all of this may run counter to what Burnco or others who support then feel is necessary (or may be required to do under the currently "limited" guidelines or directives for this activity), what they are asking of the council members is to approve something with less than all the facts. As a resident and tax payer in Rocky View County my request to you is that you consider the possible consequences of this proposed development before you make a final decision. More work is needed to cover off the potential risk associated with this massive land disturbance and ensure that an everyone, and everything, that will be impacted are properly protected. This might mean a different type of development – maybe smaller, maybe phased with performance criteria before further development is approved. It might mean no development if the risk is too high. Whatever the course, what is certainly required is a due diligence to ensure that long-lasting, unintended consequences do not occur as a result of this and other similar developments.

If you have any questions you may contact me at your convenience.

Respectfully,

June 18, 2021

Attention: To whom it may concern

# Re: West Cochrane Pit soil column flushing experiment

The following is a summary of the experiment conducted on a sample of sand and gravel obtained from Burnco's currently operating West Cochrane Pit, located approximately 7 km west on Highway 1A from the Highway 1A/22 intersection. The purpose of this test was to assess the possible physical and chemical changes that may occur to water (i.e. precipitation) flowing through these sediments, both during and after development, and entering the local groundwater.

# **Methodology**

A sample of sand and gravel was procured from the Burnco West Cochrane Pit for testing. Once delivered, a subset of that sand and gravel was placed in a newly purchased, and cleaned, plastic 20L pail for delivery to the point of testing. On 08 May 2021 a representative aliquot of the sand and gravel, comprising a mixture of clay, silt, sand and cobbles, was loaded into a pre-cleaned 1.5 m x 51 mm ID PVC pipe to mimic a vertical soil column beneath the Burnco pit area. A pre-cleaned plastic container was used to load the sample into the PVC pipe to avoid the use of any metallic equipment. Prior to loading the sample, the base of the PVC pipe was covered with clean fibreglass mesh to retain the soil sample the pipe. Once in place, settling of the sediment was achieved by tapping the outside of the pipe with a small hammer to compact the material towards natural in-situ conditions.

Laboratory-grade deionized water was obtained from the contacted laboratory (Bureau Veritas, BV) to react with the soil mixture in the column. Prior to adding the deionized water, the length of the sediment column was measured

# F-1 - Attachment E Page 163 of 252

indicating a 1.25 m vertical thickness. When ready the soil column was slowly hydrated with the deionized water to mimic infiltration of precipitation. Once the water began draining from the base of the PVC pipe, unfiltered samples were collected into bottles provided by BV (i.e. HDPE and glass, where required).

An initial set of samples (Soil flush #1) was collected on 08 May 2021 at 11:30AM. Once obtained and properly labelled the samples were placed in a refrigerator. The soil column was then allowed to drain over-night and a second set of samples (Soil flush #2) was collected the following day, 09 May 2021 at 10:45AM, using the same deionized water flow-through procedure.



Figure 1. Experimental setup, execution, and sample turbidity noted.

Upon completion of testing, both sample sets were placed in an ice-filled cooler to maintain their integrity while in transit to BV in northeast Calgary AB. Stand chainof-custody (CoC) protocols were followed to track the shipping and handling process. Delivery was made within 48 hours for the first set of samples, and 24 hrs for the second set. A copy of the completed CoC is provided in Appendix 1. During the testing procedure, photographs were taken to document the process. Visual turbidity of the samples was noted at the time, as indicated in the photographs provided in Figure 1.

# **Analytical program**

A relatively comprehensive analytical program was executed to assess changes to the deionized water quality following its transit through the soil column. Analysis was completed for the following:

- pH, alkalinity, and hardness,
- major ions (calcium, magnesium. sodium, potassium, bicarbonate + carbonate, sulphate, and chloride),
- nitrate and nitrite,
- metals and trace elements (including mercury), and
- turbidity.

All samples were received in good order, as documented by BV on the CoC. Sample temperatures were logged in at less than the require 10°C threshold and were received within the required time limit for sensitive parameters including turbidity and nitrate+ nitrite. The high quality of the deionized water was confirmed by BV (Appendix 1). A Certificate of Analysis for the two tests was also provided (Appendix 2).

# **Results**

As noted in Appendix 1, the deionized water used for the testing was devoid of any particulate or dissolved constituents, much like natural precipitation. Measurement with a hand-held TDS meter confirmed a "zero" mineralization. The pH and temperature were also measured at the time of testing with a combination

hand-held meter and returned values of 5 to 6 and 13°C to 14°C, respectively, on both days.

After confirming the starting conditions of the deionized water, the water was slowly flowed through the sediment column. Samples collected from the base were very different in appearance compared to the water that was added at the top. Of particular note was the colour and turbidity as indicated in the lower right image of Figure 1. The occurrence of such turbidity is surprising considering the assumption often made that fine particles will be strained or filtered out as the water flows through the subsurface. However, this was obviously not the case. Measured values for Soil flush #1 and Soil flush #2 were >4000 NTU and 1600 NTU, respectively (Appendix 2).

In addition to turbidity, the chemical quality of the deionized water was also notably changed after reacting with the soil mixture. For example, the total dissolved solids (TDS) content increased from a pre-test value of 0 mg/L to 47 mg/L for Soil flush #1 and to a value of 39 mg/L for Soil flush #2. The laboratory pH also increased significantly to 9.1 for both tests. This represents a change from mildly acidic to alkaline conditions following a rather short reaction time, and is indicative rapid reactions occurring as the water flowed through the soil mixture (e.g. ion exchange).

Prior to conducting further data evaluation a check on the correctness of analysis was performed. This included a review of the anion-cation charge balance to confirmed acceptability. The values obtained for both samples (-1.1% and 1.9%, respectively) were within the recommended standard of  $\pm 2\%^1$ . An additional test was performed where the ratio of reported TDS versus calculated TDS was assessed. The range of acceptability is between 1.0 to 1.2<sup>1</sup>, and the values obtained for the two soil flush tests were 1.01 and 1.00, respectively. Based on these confirmations the results from both tests were considered acceptable for further evaluation.

Other changes that occurred to the deionized water were less visual and more chemical in nature, with some of the constituents returning values in excess of

<sup>&</sup>lt;sup>1</sup> Standard Methods for the Examination of Water and Wastewater

published water quality criteria. The criteria used for comparison in this study included:

- Alberta Tier 1 Soil and Groundwater Remediation Guidelines for agricultural land (Alberta Government 2019)
- Environmental Quality Guidelines for Alberta Surface Waters for the protection of freshwater aquatic life - FWAL (Alberta Government 2018)
- Guidelines for Canadian Drinking Water Quality CDWQ (Health Canada 2020)

The following table summarizes a number of parameters in the soil flush effluent that exhibited values in excess of the above-noted criteria:

| Parameter        | Soil flush<br>#1 | Soil flush<br>#2 | AB Tier<br>1       | AB<br>FWAL         | CDWQ            |
|------------------|------------------|------------------|--------------------|--------------------|-----------------|
| Turbidity (NTU)  | >4000            | 1600             |                    | 2                  | 1               |
| Aluminum (mg/L)  | 6.1              | 4.0              | 0.0                | 05                 | <0.1 og         |
| Arsenic (mg/L)   | 0.019            | 0.009            | 0.005              | 0.005              | 0.010 alara     |
| Cadmium (µg/L)   | 0.53             | 0.44             | 0.3                | 34*                |                 |
| Chromium (mg/L)  | 0.013            | 0.020            | 0.001+<br>0.0049++ | 0.001+<br>0.0089++ | 0.05 мас        |
| Cobalt (mg/L)    | 0.0095           | 0.0071           | 0.00               | )15*               |                 |
| Copper (mg/L)    | 0.0150           | 0.0097           | 0.0070             | 0.0390             | 2 ao            |
| lron (mg/L)      | 17               | 12               | 0                  | .3                 | ≤ <b>0.3</b> ao |
| Lead (mg/L)      | 0.010            | 0.0073           | 0.0                | 07*                | 0.005 alara     |
| Manganese (mg/L) | 0.81             | 0.74             | 0.05               |                    | 0.12 мас        |
| Zinc (mg/l)      | 0.120            | 0.073            | 0.0                | )30                | 5.0 AO          |

Notes:

1. Values indicated for protection of freshwater aquatic life relate to long-term exposure.

- 2. Metals and trace elements are reported as "Total". Guidelines for aluminum and iron relate to the "Dissolved" forms.
- 2. \* Assumes a groundwater hardness of 250 mg/L (as CaCO<sub>3</sub>).
- 3. + = hexavalent; ++ = trivalent.
- 4. MAC = maximum acceptable value; ALARA = as low as reasonably achievable; AO = aesthetic value; OG = operational guidance value.

Measured values for the other constituents analyzed are provided in Appendix 2. However, those listed in the preceding table represent the most notable in terms of risk to human and ecological receptors.

# **Discussion**

The proposed development of the West Cochrane Pit by Burnco will significantly, and permanently, alter the natural landscape of this picturesque area. Although Burnco indicates that the anticipated change to the local groundwater and surface water will be negligible, that claim has not actually been substantiated. Baseline groundwater quality was established by Burnco back in 2018, but no follow-up water quality monitoring has been communicated since. This includes in and around the currently operating pit area, which was commissioned following the 2018 program.

In light of the results generated by this experiment, concern exists that particulate matter and dissolved constituents will be mobilized from disturbed areas into the local groundwater and any receiving water bodies. Given the range of hydraulic conductivity values measured for the sand and gravel at the site (pdf page 773-75 of the Burnco's MSDP: 4.8 to 25.6 m/d), a calculated lateral hydraulic gradient of 0.028 from the Matrix's supporting report, and an assumed effective porosity of 30%, the flow of groundwater beneath the site could range anywhere from around 150 m/yr to more than 600 m/yr (depending on local conditions). Therefore the transit time for a substance released to reach a receptors would be relatively short at less than a year to perhaps a year or so.

Stripping of the overlying topsoil and removal of a substantial amount of the sand and gravel beneath will inevitably reduce the filtering capacity of the subsurface and allow contaminants that occur during the mining process (natural or other) to move more quickly down to the water table. This is shown in conceptual manner in Figure 2 on the following page, and is reinforced by a statement made by Matrix Solutions in an excerpt from Burnco's 2020 Master Site Development Plan (MSDP pdf page 682 of 1882):

The removal of the silty clay (where present) at site, will remove a natural barrier to potential contamination of the groundwater from surface spills. Any contaminant spilled at surface during or after operations would preferentially flow either vertically through the porous gravel and bedrock to the water table or along preferentially pathways (secondary permeability/fractures) in the bedrock. From below the water table it would follow groundwater flow direction (south to southeast), likely ending up in the Grande Valley Creek, Beaupré Creek, and the Bow River. Any contamination could potentially flow into the underlying bedrock, posing a risk to any residential well users in the area.





Recharging precipitation (snow melt or rain) entering the subsurface will enhance the ability to move particulate and dissolved matter into the groundwater. By removing the filtering capacity of sediment this will only exacerbate the situation. It is clear from this experiment that turbidity can be mobilized by flushing water thought a 1.25 m soil column, not to mention notable changes to the chemical quality of the effluent.

The findings of this study suggest that the action of mining gravel from a very large development area will ultimately expose the remaining sand and gravel, as

well as the underlying bedrock aquifers, to weathering reactions and enhanced flushing by annual snow melt and rainfall events.

As such, any contaminants (solid or dissolved) mobilized and flushed from these exposed sediments will increase the risk of impact to the local environment. Proximity to receptors will be a major factor, not to mention how the mobilized contaminants move through the subsurface. However, this aspect has not been assessed by Burnco, making any statements about risk very difficult, if not impossible. The receptors at greatest risk include:

- local springs and water wells,
- Grand Valley Creek,
- Beaupre Creek, and
- the Bow River.

With the exception of the Bow River, most of the local surface water features in the study area are not believed to be fish-bearing. However, they do likely have environments that will sustain aquatic habitat that supports downstream aquatic systems. From a federal *Fisheries Act* perspective this is pertinent. The potential introduction of harmful constituents into aquatic systems is an obvious threat, and the waters from the site eventually drain into the fish-bearing Bow River. The Bow River is also used as a source of drinking water by the Town of Cochrane, as well as Calgary, so some assessment of the potential discharge of harmful substances into the river should have been conducted. However, it was not.

The turbidity guideline for protection of aquatic life in Alberta requires that the maximum long-term average for "clear" water systems, like the West Cochrane Pit area, be kept within 8 NTU above background values for any short-term exposure (e.g. up to 24 hours). Over the longer-term the increase should be no more than 2 NTU above background levels (Alberta Government 2018).

The way in which Burnco mines the sand and gravel deposit will also dictate the end result regarding risk to the local groundwater and connected systems. It is understood that a thin veneer of sand and gravel deposit will be left in place. All of this granular material rests in contact with fractured bedrock as noted in Burnco's MSDP, submitted in June 2020. Based on the findings of this study, mobilization of turbidity from any residual sand and gravel left above the bedrock is a risk. Once in the fractured bedrock it will have a reduced chance of being attenuated, as fracture flow is very different than flow though porous media. Again, this aspect was not assessed.

If Burnco decides to operate a wet pit instead, and mine below the water table without dewatering, this will likely occur via bailing operations. The effect of this extraction method will be to create very turbid water due to the churning action of the excavation equipment. Again, the migration of mobilized particulate matter through the sediments is likely. Mobilization of turbidity in local groundwater has been documented before, with measurable effects being noted as far as 1.8 km downgradient. The following quote is taken from a report authored by Mead (1995):

"This DEQ [Department of Environmental Quality] study found a turbidity plume that extended more than a mile to the north (downgradient) of the gravel operation. The average turbidity of the water being discharged from the washing operation into the pond at the site was 2,737 nephelometric turbidity units (NTUs). Nearly all wells sampled within the first 6,000 feet of the turbidity plume were measured at 5 NTU or more. Many wells within the first 3,000 feet of the plume had turbidity levels of 10 NTU or more. Nearly all wells outside the plume had turbidities of 2 NTU or less."

Additionally, the release of harmful metals and trace elements is a concern. This is not only associated with the type of metal or trace element mobilized, like arsenic or lead, but also the form it takes when present in the water. Given the anticipated groundwater conditions beneath the Burnco development area (i.e. well oxygenated and at a pH of 7 to 8, as noted on pdf page 699 in Burnco's MSDP) the speciation of chromium, for example, would favour the more mobile chromate ion (i.e.  $CrO_{4^2}$ ).

When present as chromate, and at the groundwater conditions described previously, it will be present in the hexavalent form (the more toxic form). This is shown in the Eh-pH diagram provided in Figure 3. Hexavalent chromium is a highly toxic species, and can influence aquatic life at values as low as 0.001 mg/L. The

other metals and trace elements noted in the summary table on page 5 will have their own unique toxicity and mobility characteristics.



**Figure 3.** Eh-pH diagrams for chromium<sup>2</sup>. Note: red shaded area represents conditions expected in well-oxygenated groundwater system.

Unfortunately, none of the required information to assess this aspect has been provided. In fact, there is no monitoring data available for any of the wells around the working gravel pit to determine what constituents may have been mobilized so far. The only location assessed for metals and trace elements back in 2018 was a monitoring well located upgradient of the operating pit and adjacent to Highway 1A, that being MW18-02(B2).

The concern with the Burnco's current application to Rocky View County is that it does nothing to assess the impacts to groundwater and connected surface water environments that could occur around a working gravel pit. Although there are monitoring wells established around the current open pit, no up-to-date information is available to assess what has occurred since commissioning of that pit. Of equal importance is the lack of assessment done to determine what the full impact of the

<sup>&</sup>lt;sup>2</sup> Geological Survey of Japan

West Cochrane Pit will look like once development is complete and reclamation has occurred.

Given the results of this soil column test there should be cause for concern. The pit mining activities will be located very close to aquatic receptors and therefore pose a threat to their existence and future viability. At the very least Burnco should be required to conduct a proper risk assessment and account for the potential mobilization, transport, and fate of contaminants like the ones documented in this experiment. It would also be informative for Burnco to assess conditions around their existing West Cochrane Pit via the series of dedicated monitoring wells installed there. This should include a proper assessment of water quality and geochemical conditions to better understand the risks involved if mining is to be extended across the larger proposed development area. Unfortunately, none of this work has been completed or provided for decision makers to rely on. This begs the questions:

"To what degree will Burnco's proposed development impact the groundwater quality across the larger area?"

and

"How will this impact downgradient receptors like Grand Valley Creek, Beaupre Creek, and ultimately the Bow River?"

# <u>Closure</u>

This report has been prepared to summarize results of a soil column flushing experiment designed to mimic infiltration of snowmelt and rainwater through sand and gravel deposits beneath the West Cochrane Pit area. The content is meant to inform decision makers so that unintended consequences to the environment and downstream communities can be avoided. If there are any questions regarding the methodology or interpretation of findings provided herein, the reader should contact the undersigned for clarification.

Respectfully submitted by:



# **References**

Alberta Government (2018). Environmental Quality Guidelines for Alberta Surface Waters. Water Policy Branch, Alberta Environment and Parks, March 28, 2018, ISBN (PDF) 978-1-4601-3873-1, 58 pp. <u>https://open.alberta.ca/publications/9781460138731</u>

Alberta Government (2019). Alberta Tier 1 Soil and Groundwater Remediation Guidelines. AEP, Land Policy, 2019, No. 1, ISBN 978-1-4601-2695-0, <u>https://open.alberta.ca/dataset/842becf6-dc0c-4cc7-8b29-</u> <u>e3f383133ddc/resource/a5cd84a6-5675-4e5b-94b8-</u> 0a36887c588b/download/albertatier1guidelines-jan10-2019.pdf

Burnco Rock Products Ltd. (2020). Land Use Redesignation Application: Project Activities Plan - Master Site Development Plan, West Cochrane Gravel Pit. Prepared for submission to the Rocky View County for consideration and approval, 1882 pp.

Geological Survey of Japan (2005). Atlas of Eh-pH diagrams: Intercomparison of thermodynamic databases, Open File Report No.419, National Institute od Advanced Industrial Science and Technology – Research Center for Deep Geological Environments, 287 pp,

https://www.nrc.gov/docs/ML1808/ML18089A638.pdf.

Health Canada (2020). Guidelines for Canadian Drinking Water Quality – Summary Table. Prepared in collaboration with the Federal-Provincial-Territorial Committee on Drinking Water of the Federal-Provincial-Territorial Committee on Health of the Environment, September 2020, 28 pp. <u>https://www.canada.ca/en/healthcanada/services/environmental-workplace-health/reports-publications/waterquality/guidelines-canadian-drinking-water-quality-summary-table.html</u>

Mead R.D. (1995). The Direct and Cumulative Effects of Gravel Mining on Groundwater within Thurston County, Washington. Ground Water Management Program, Environmental Health Division, Thurston County Public Health and Social Services Department, Appendix A of Technical Memorandum #33 (August 2018), 65 pp. <u>https://www.thurstoncountywa.gov/planning/planningdocuments/3%20-</u> <u>%20Tech%20Memo%2033%20-</u>

%20Hydrogeologic%20review%20of%20Mineral%20Extraction%20Code%2008152018.p

# <u>Websites</u>

Standard Methods for the Examination of Water and Wastewater, accessed May 24, 2021, pdf page 39 of 541, https://beta-static.fishersci.com/content/dam/fishersci/en\_US/documents/programs/scientific/technical-documents/white-papers/apha-water-testing-standard-methods-introduction-white-paper.pdf

# **APPENDIX 1**

Deionized water quality (from Bureau Veritas):

# ATTACHMENT 'E': PUBLIC SUBMISSIONS

| QA/QC Batch | QC Type      | Parameter                | Date Analyzed | Value    | UNITS         |
|-------------|--------------|--------------------------|---------------|----------|---------------|
| A221986     | Method Blank | Turbidity                | 2021/05/12    | <0.10    | NTU           |
| 112213000   | Method Brunk | Total Mercury (Hg)       | 2021/05/12    | <0.10    | 1170<br>119/1 |
|             |              | Total Barium (Ba)        | 2021/05/16    | <0.0015  | mg/l          |
|             |              | Total Boron (B)          | 2021/05/16    | <0.010   | mg/L          |
|             |              | Total Calcium (Ca)       | 2021/05/16    | <0.020   | mg/L          |
|             |              | Total Iron (Eq)          | 2021/05/16    |          | mg/L          |
|             |              | Total Lithium (Li)       | 2021/05/16    | <0.000   | mg/L          |
|             |              | Total Magnasium (Mg)     | 2021/05/16    | <0.020   | mg/L          |
|             |              |                          | 2021/05/16    | <0.20    | mg/L          |
|             |              | Total Pheenhamic (D)     | 2021/05/16    | <0.0040  | mg/L          |
|             |              | Total Potacsium (K)      | 2021/05/16    | <0.10    | mg/L          |
|             |              | Total Silicon (Si)       | 2021/05/16    | <0.50    | mg/L          |
|             |              | Total Silicon (SI)       | 2021/05/16    | <0.10    | mg/L          |
|             |              |                          | 2021/05/16    | <0.50    | mg/L          |
|             |              | Total Strontium (Sr)     | 2021/05/16    | <0.020   | mg/L          |
|             |              | Total Sulphur (S)        | 2021/05/16    | <0.20    | mg/L          |
|             |              | Total Aluminum (Al)      | 2021/05/14    | <0.0030  | mg/L          |
|             |              | Total Antimony (Sb)      | 2021/05/14    | <0.00060 | mg/L          |
|             |              | Total Arsenic (As)       | 2021/05/14    | <0.00020 | mg/L          |
|             |              | Total Beryllium (Be)     | 2021/05/14    | <0.0010  | mg/L          |
|             |              | Total Chromium (Cr)      | 2021/05/14    | <0.0010  | mg/L          |
|             |              | Total Cobalt (Co)        | 2021/05/14    | <0.00030 | mg/L          |
|             |              | Total Copper (Cu)        | 2021/05/14    | <0.00020 | mg/L          |
|             |              | Total Lead (Pb)          | 2021/05/14    | <0.00020 | mg/L          |
|             |              | Total Molybdenum (Mo)    | 2021/05/14    | <0.00020 | mg/L          |
|             |              | Total Nickel (Ni)        | 2021/05/14    | <0.00050 | mg/L          |
|             |              | Total Selenium (Se)      | 2021/05/14    | <0.00020 | mg/L          |
|             |              | Total Silver (Ag)        | 2021/05/14    | <0.00010 | mg/L          |
|             |              | Total Thallium (Tl)      | 2021/05/14    | <0.00020 | mg/L          |
|             |              | Total Tin (Sn)           | 2021/05/14    | <0.0010  | mg/L          |
|             |              | Total Titanium (Ti)      | 2021/05/14    | <0.0010  | mg/L          |
|             |              | Total Uranium (U)        | 2021/05/14    | <0.00010 | mg/L          |
|             |              | Total Vanadium (V)       | 2021/05/14    | <0.0010  | mg/L          |
|             |              | Total Zinc (Zn)          | 2021/05/14    | <0.0030  | mg/L          |
|             |              | Dissolved Sodium (Na)    | 2021/05/13    |          | %             |
|             |              | Dissolved Calcium (Ca)   | 2021/05/13    | <0.30    | mg/L          |
|             |              | Dissolved Iron (Fe)      | 2021/05/13    | <0.060   | mg/L          |
|             |              | Dissolved Magnesium (Mg) | 2021/05/13    | <0.20    | mg/L          |
|             |              | Dissolved Manganese (Mn) | 2021/05/13    | <0.0040  | mg/L          |
|             |              | Dissolved Potassium (K)  | 2021/05/13    | <0.30    | mg/L          |
|             |              | Dissolved Sodium (Na)    | 2021/05/13    | <0.50    | mg/L          |
|             |              | Dissolved Calcium (Ca)   | 2021/05/13    | <0.30    | mg/L          |
|             |              | Dissolved Iron (Fe)      | 2021/05/13    | <0.060   | mg/L          |
|             |              | Dissolved Magnesium (Mg) | 2021/05/13    | <0.20    | mg/L          |
|             |              | Dissolved Manganese (Mn) | 2021/05/13    | <0.0040  | mg/L          |
|             |              | Dissolved Potassium (K)  | 2021/05/13    | <0.30    | mg/L          |
|             |              | Dissolved Sodium (Na)    | 2021/05/13    | <0.50    | mg/L          |
|             |              | Dissolved Nitrite (N)    | 2021/05/12    | <0.010   | mg/L          |
|             |              | Alkalinity (PP as CaCO3) | 2021/05/14    | <1.0     | mg/L          |
|             |              | Conductivity             | 2021/05/14    | <2.0     | uS/cm         |
|             |              | Dissolved Chloride (Cl)  | 2021/05/14    | <1.0     | mg/L          |

# **APPENDIX 2**

(see attached PDF)

17 | Page

Page 631 of 719



Your C.O.C. #: 635648-01-01

# Attention: John Fennell

COMMERCIAL ACCOUNTS - CALGARY BUREAU VERITAS CANADA (2019) INC. 4000 19th Street NE Calgary, AB CANADA T2E 6P8

> Report Date: 2021/05/31 Report #: R3026392 Version: 3 - Revision

# **CERTIFICATE OF ANALYSIS – REVISED REPORT**

### BV LABS JOB #: C130760

Received: 2021/05/10, 08:10

Sample Matrix: Water # Samples Received: 2

|                                            |          | Date       | Date       |                                 |                      |
|--------------------------------------------|----------|------------|------------|---------------------------------|----------------------|
| Analyses                                   | Quantity | Extracted  | Analyzed   | Laboratory Method               | Analytical Method    |
| Alkalinity @25C (pp, total), CO3,HCO3,OH   | 2        | N/A        | 2021/05/14 | AB SOP-00005                    | SM 23 2320 B m       |
| Cadmium - low level CCME (Total)           | 2        | N/A        | 2021/05/14 |                                 | Auto Calc            |
| Chloride/Sulphate by Auto Colourimetry     | 2        | N/A        | 2021/05/15 | AB SOP-00020                    | SM23-4500-Cl/SO4-E m |
| Conductivity @25C                          | 2        | N/A        | 2021/05/14 | AB SOP-00005                    | SM 23 2510 B m       |
| Hardness                                   | 1        | N/A        | 2021/05/14 |                                 | Auto Calc            |
| Hardness                                   | 1        | N/A        | 2021/05/16 |                                 | Auto Calc            |
| Mercury (Total) by CV                      | 1        | 2021/05/12 | 2021/05/12 | AB SOP-00084                    | BCMOE BCLM Oct2013 m |
| Elements by ICP-Dissolved-Lab Filtered (1) | 2        | N/A        | 2021/05/13 | AB SOP-00042                    | EPA 6010d R5 m       |
| Elements by ICP - Total                    | 2        | 2021/05/12 | 2021/05/16 | AB SOP-00014 / AB SOP-<br>00042 | EPA 6010d R5 m       |
| Elements by ICPMS - Total                  | 2        | 2021/05/12 | 2021/05/13 | AB SOP-00014 / AB SOP-<br>00043 | EPA 6020b R2 m       |
| Ion Balance                                | 1        | N/A        | 2021/05/15 |                                 | Auto Calc            |
| Ion Balance                                | 1        | N/A        | 2021/05/16 |                                 | Auto Calc            |
| Sum of cations, anions                     | 1        | N/A        | 2021/05/14 |                                 | Auto Calc            |
| Sum of cations, anions                     | 1        | N/A        | 2021/05/16 |                                 | Auto Calc            |
| Nitrate and Nitrite                        | 2        | N/A        | 2021/05/14 |                                 | Auto Calc            |
| NO2 - NO2 + NO3 (N) in Water               | 2        | N/A        | 2021/05/12 | AB SOP-00091                    | SM 23 4500 NO3m      |
| Nitrate (as N)                             | 2        | 2021/05/11 | 2021/05/14 |                                 | Auto Calc            |
| pH @25°C (2)                               | 2        | N/A        | 2021/05/14 | AB SOP-00005                    | SM 23 4500-H+B m     |
| Total Dissolved Solids (Calculated)        | 1        | N/A        | 2021/05/15 |                                 | Auto Calc            |
| Total Dissolved Solids (Calculated)        | 1        | N/A        | 2021/05/16 |                                 | Auto Calc            |
| Turbidity                                  | 2        | N/A        | 2021/05/12 | CAL SOP-00081                   | SM 23 2130 B m       |

### Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement



Your C.O.C. #: 635648-01-01

Attention: John Fennell COMMERCIAL ACCOUNTS - CALGARY BUREAU VERITAS CANADA (2019) INC. 4000 19th Street NE Calgary, AB CANADA T2E 6P8

> Report Date: 2021/05/31 Report #: R3026392 Version: 3 - Revision

## **CERTIFICATE OF ANALYSIS – REVISED REPORT**

### BV LABS JOB #: C130760

# Received: 2021/05/10, 08:10

Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

\* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Dissolved > Total Imbalance: When applicable, Dissolved and Total results were reviewed and data quality meets acceptable levels unless otherwise noted. (2) The CCME method requires pH to be analysed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are

reported past the CCME holding time. Bureau Veritas Laboratories endeavours to analyze samples as soon as possible after receipt.





Please direct all questions regarding this Certificate of Analysis to your Project Manager. Customer Solutions, Western Canada Customer Experience Team Email: customersolutionswest@bureauveritas.com Phone# (403) 291-3077

-----

BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



COMMERCIAL ACCOUNTS - CALGARY BUREAU VERITAS CANADA (2019) INC.

# **ROUTINE WATER -LAB FILTERED (WATER)**

| BV Labs ID                                               |       | ZT5148              | ZT5149              |        |
|----------------------------------------------------------|-------|---------------------|---------------------|--------|
| Sampling Date                                            |       | 2021/05/08<br>11:30 | 2021/05/09<br>10:45 |        |
| COC Number                                               |       | 635648-01-01        | 635648-01-01        |        |
|                                                          | UNITS | SOIL FLUSH<br>#1    | SOIL FLUSH<br>#2    | RDL    |
| Calculated Parameters                                    |       |                     |                     |        |
| Anion Sum                                                | meq/L | 0.93                | 0.81                | N/A    |
| Cation Sum                                               | meq/L | 0.91                | 0.78                | N/A    |
| Hardness (CaCO3)                                         | mg/L  | 39                  | 35                  | 0.50   |
| Ion Balance (% Difference)                               | %     | NC                  | NC                  | N/A    |
| Dissolved Nitrate (N)                                    | mg/L  | 0.10                | 0.058               | 0.010  |
| Dissolved Nitrate (NO3)                                  | mg/L  | 0.45                | 0.26                | 0.044  |
| Dissolved Nitrite (NO2)                                  | mg/L  | <0.033              | <0.033              | 0.033  |
| Calculated Total Dissolved Solids                        | mg/L  | 47                  | 39                  | 10     |
| Misc. Inorganics                                         |       |                     |                     |        |
| Conductivity                                             | uS/cm | 89                  | 76                  | 2.0    |
| рН                                                       | рН    | 9.15                | 9.11                | N/A    |
| Anions                                                   |       |                     |                     |        |
| Alkalinity (PP as CaCO3)                                 | mg/L  | 3.5                 | 3.8                 | 1.0    |
| Alkalinity (Total as CaCO3)                              | mg/L  | 34                  | 33                  | 1.0    |
| Bicarbonate (HCO3)                                       | mg/L  | 32                  | 31                  | 1.0    |
| Carbonate (CO3)                                          | mg/L  | 4.2                 | 4.6                 | 1.0    |
| Hydroxide (OH)                                           | mg/L  | <1.0                | <1.0                | 1.0    |
| Dissolved Chloride (Cl)                                  | mg/L  | 2.8                 | 1.7                 | 1.0    |
| Dissolved Sulphate (SO4)                                 | mg/L  | 8.4                 | 4.7                 | 1.0    |
| Nutrients                                                |       |                     |                     |        |
| Dissolved Nitrite (N)                                    | mg/L  | <0.010              | <0.010              | 0.010  |
| Dissolved Nitrate plus Nitrite (N)                       | mg/L  | 0.10                | 0.058               | 0.010  |
| Lab Filtered Elements                                    |       |                     |                     |        |
| Dissolved Calcium (Ca)                                   | mg/L  | 4.8                 | 4.5                 | 0.30   |
| Dissolved Iron (Fe)                                      | mg/L  | <0.060              | <0.060              | 0.060  |
| Dissolved Magnesium (Mg)                                 | mg/L  | 6.6                 | 5.6                 | 0.20   |
| Dissolved Manganese (Mn)                                 | mg/L  | <0.0040             | <0.0040             | 0.0040 |
| Dissolved Potassium (K)                                  | mg/L  | 1.4                 | 1.2                 | 0.30   |
| Dissolved Sodium (Na)                                    | mg/L  | 2.1                 | 1.4                 | 0.50   |
| RDL = Reportable Detection Limit<br>N/A = Not Applicable |       |                     |                     |        |



COMMERCIAL ACCOUNTS - CALGARY BUREAU VERITAS CANADA (2019) INC.

# **REGULATED METALS (CCME/AT1) - TOTAL**

| BV Labs ID                   |       | 7T5148       | ZT5149       |         |
|------------------------------|-------|--------------|--------------|---------|
|                              |       | 2021/05/08   | 2021/05/09   |         |
| Sampling Date                |       | 11:30        | 10:45        |         |
| COC Number                   |       | 635648-01-01 | 635648-01-01 |         |
|                              | UNUTC | SOIL FLUSH   | SOIL FLUSH   | 201     |
|                              | UNITS | #1           | #2           | KDL     |
| Elements                     |       |              |              |         |
| Total Cadmium (Cd)           | ug/L  | 0.53         | 0.44         | 0.020   |
| Total Aluminum (Al)          | mg/L  | 6.1          | 4.0          | 0.0030  |
| Total Antimony (Sb)          | mg/L  | 0.00076      | <0.00060     | 0.00060 |
| Total Arsenic (As)           | mg/L  | 0.019        | 0.0094       | 0.00020 |
| Total Barium (Ba)            | mg/L  | 0.35         | 0.24         | 0.010   |
| Total Beryllium (Be)         | mg/L  | <0.0010      | <0.0010      | 0.0010  |
| Total Boron (B)              | mg/L  | <0.020       | <0.020       | 0.020   |
| Total Calcium (Ca)           | mg/L  | 180          | 210          | 0.30    |
| Total Chromium (Cr)          | mg/L  | 0.013        | 0.020        | 0.0010  |
| Total Cobalt (Co)            | mg/L  | 0.0095       | 0.0071       | 0.00030 |
| Total Copper (Cu)            | mg/L  | 0.015        | 0.0097       | 0.00020 |
| Total Iron (Fe)              | mg/L  | 17           | 12           | 0.060   |
| Total Lead (Pb)              | mg/L  | 0.010        | 0.0073       | 0.00020 |
| Total Lithium (Li)           | mg/L  | 0.021        | <0.020       | 0.020   |
| Total Magnesium (Mg)         | mg/L  | 39           | 45           | 0.20    |
| Total Manganese (Mn)         | mg/L  | 0.81         | 0.74         | 0.0040  |
| Total Molybdenum (Mo)        | mg/L  | 0.0020       | 0.0025       | 0.00020 |
| Total Nickel (Ni)            | mg/L  | 0.024        | 0.016        | 0.00050 |
| Total Phosphorus (P)         | mg/L  | 0.73         | 0.63         | 0.10    |
| Total Potassium (K)          | mg/L  | 3.5          | 2.5          | 0.30    |
| Total Selenium (Se)          | mg/L  | 0.00037      | 0.00022      | 0.00020 |
| Total Silicon (Si)           | mg/L  | 12           | 8.1          | 0.10    |
| Total Silver (Ag)            | mg/L  | <0.00010     | <0.00010     | 0.00010 |
| Total Sodium (Na)            | mg/L  | 2.2          | 1.4          | 0.50    |
| Total Strontium (Sr)         | mg/L  | 0.21         | 0.21         | 0.020   |
| Total Sulphur (S)            | mg/L  | 2.0          | 1.4          | 0.20    |
| Total Thallium (Tl)          | mg/L  | <0.00020     | <0.00020     | 0.00020 |
| Total Tin (Sn)               | mg/L  | <0.0010      | <0.0010      | 0.0010  |
| Total Titanium (Ti)          | mg/L  | 0.045        | 0.032        | 0.0010  |
| Total Uranium (U)            | mg/L  | 0.0014       | 0.0012       | 0.00010 |
| Total Vanadium (V)           | mg/L  | 0.021        | 0.015        | 0.0010  |
| Total Zinc (Zn)              | mg/L  | 0.12         | 0.073        | 0.0030  |
| RDL = Reportable Detection L | .imit |              |              | ·       |



F-1 - Attachment E Page 183 of 252

COMMERCIAL ACCOUNTS - CALGARY BUREAU VERITAS CANADA (2019) INC.

### **RESULTS OF CHEMICAL ANALYSES OF WATER**

| BV Labs ID                                                       |     | ZT5148          | ZT5149            |      |
|------------------------------------------------------------------|-----|-----------------|-------------------|------|
| Complian Data                                                    |     | 2021/05/08      | 2021/05/09        |      |
| Sampling Date                                                    |     | 11:30           | 10:45             |      |
| COC Number                                                       |     | 635648-01-01    | 635648-01-01      |      |
|                                                                  |     | SOIL FLUSH      | SOIL FLUSH        |      |
|                                                                  |     |                 |                   | KUL  |
|                                                                  |     | #1              | #2                |      |
| Physical Properties                                              |     | #1              | #2                |      |
| Physical Properties<br>Turbidity                                 | NTU | #1<br>>4000 (1) | <b>#2</b><br>1600 | 0.10 |
| Physical Properties<br>Turbidity<br>RDL = Reportable Detection L | NTU | #1<br>>4000 (1) | #2<br>1600        | 0.10 |



F-1 - Attachment E Page 184 of 252

COMMERCIAL ACCOUNTS - CALGARY BUREAU VERITAS CANADA (2019) INC.

# **MERCURY BY COLD VAPOR (WATER)**

| BV Labs ID                     |       | ZT5149              |        |
|--------------------------------|-------|---------------------|--------|
| Sampling Date                  |       | 2021/05/09<br>10:45 |        |
| COC Number                     |       | 635648-01-01        |        |
|                                | UNITS | SOIL FLUSH          | RDL    |
|                                |       | #2                  |        |
| Elements                       |       | #2                  |        |
| Elements<br>Total Mercury (Hg) | ug/L  | #2<br>0.0030        | 0.0019 |



F-1 - Attachment E Page 185 of 252

COMMERCIAL ACCOUNTS - CALGARY BUREAU VERITAS CANADA (2019) INC.

### **GENERAL COMMENTS**

Each temperature is the average of up to three cooler temperatures taken at receipt

| Package 1 | 5.7°C |
|-----------|-------|
| Package 2 | 7.3°C |

Version #3: Report reissued only with sample Soil Flush #1 & #2 as per client request. 20210531

Version #2: Report reissued due to typo error with email address. 20210519

Sample ZT5148 [SOIL FLUSH #1] : Turbidity completed within 48h after laboratory receipt to a maximum of five days from sampling. Data are satisfactory for compliance purposes. NO2 - NO2 + NO3 (N) in Water completed within 48h after laboratory receipt to a maximum of five days from sampling. Data are satisfactory for compliance purposes.

### Results relate only to the items tested.



QUALITY ASSURANCE REPORT

COMMERCIAL ACCOUNTS - CALGARY BUREAU VERITAS CANADA (2019) INC.

|            |            | Matrix     | Spike     | Spiked     | Blank     | Method I | 3lank | RPI       |                  |
|------------|------------|------------|-----------|------------|-----------|----------|-------|-----------|------------------|
|            | Date       | % Recovery | QC Limits | % Recovery | QC Limits | Value    | UNITS | Value (%) | QC Limits        |
|            | 2021/05/12 |            |           | 102        | 80 - 120  | <0.10    | NTU   | 0.83      | 20               |
|            | 2021/05/12 | 93         | 80 - 120  | 67         | 80 - 120  | <0.0019  | ng/L  | NC        | 20               |
|            | 2021/05/16 | 96         | 80 - 120  | 106        | 80 - 120  | <0.010   | mg/L  | 5.4       | 20               |
|            | 2021/05/16 | 103        | 80 - 120  | 107        | 80 - 120  | <0.020   | mg/L  | 2.2       | 20               |
|            | 2021/05/16 | NC         | 80 - 120  | 108        | 80 - 120  | <0.30    | mg/L  | 3.3       | 20               |
|            | 2021/05/16 | 118        | 80 - 120  | 107        | 80 - 120  | <0.060   | mg/L  | 3.4       | 20               |
|            | 2021/05/16 | 108        | 80 - 120  | 112        | 80 - 120  | <0.020   | mg/L  | 4.7       | 20               |
| n (Mg)     | 2021/05/16 | NC         | 80 - 120  | 113        | 80 - 120  | <0.20    | mg/L  | 0.00      | 20               |
| e (Mn)     | 2021/05/16 | 109        | 80 - 120  | 105        | 80 - 120  | <0.0040  | mg/L  | 2.5       | 20               |
| (P) st     | 2021/05/16 | 104        | 80 - 120  | 104        | 80 - 120  | <0.10    | mg/L  | NC        | 20               |
| - (K)      | 2021/05/16 | NC         | 80 - 120  | 110        | 80 - 120  | <0.30    | mg/L  | 2.4       | 20               |
| (          | 2021/05/16 | 113        | 80 - 120  | 113        | 80 - 120  | <0.10    | mg/L  | 5.4       | 20               |
| Na)        | 2021/05/16 | NC         | 80 - 120  | 107        | 80 - 120  | <0.50    | mg/L  | 1.4       | 20               |
| n (Sr)     | 2021/05/16 | 94         | 80 - 120  | 106        | 80 - 120  | <0.020   | mg/L  | 3.1       | 20               |
| (S)        | 2021/05/16 | NC         | 80 - 120  | 109        | 80 - 120  | <0.20    | mg/L  | 0.77      | 20               |
| m (AI)     | 2021/05/13 | 112        | 80 - 120  | 116        | 80 - 120  | <0:0030  | mg/L  | 6.4       | 20               |
| ıγ (Sb)    | 2021/05/13 | 113        | 80 - 120  | 116        | 80 - 120  | <0.00060 | mg/L  | 1.3       | 20               |
| (As)       | 2021/05/13 | 103        | 80 - 120  | 102        | 80 - 120  | <0.00020 | mg/L  | 0.17      | 20               |
| ım (Be)    | 2021/05/13 | 114        | 80 - 120  | 108        | 80 - 120  | <0.0010  | mg/L  | NC        | 20               |
| ium (Cr)   | 2021/05/13 | 104        | 80 - 120  | 105        | 80 - 120  | <0.0010  | mg/L  | NC        | 20               |
| (Co)       | 2021/05/13 | 101        | 80 - 120  | 104        | 80 - 120  | <0.00030 | mg/L  | 3.2       | 20               |
| (Cu)       | 2021/05/13 | 97         | 80 - 120  | 104        | 80 - 120  | <0.00020 | mg/L  | 14        | 20               |
| (q,        | 2021/05/13 | 100        | 80 - 120  | 106        | 80 - 120  | <0.00020 | mg/L  | NC        | 20               |
| lenum (Mo) | 2021/05/13 | 117        | 80 - 120  | 110        | 80 - 120  | <0.00020 | mg/L  | 5.2       | 20               |
| Ni)        | 2021/05/13 | 98         | 80 - 120  | 105        | 80 - 120  | <0.00050 | mg/L  | 11        | 20               |
| m (Se)     | 2021/05/13 | 113        | 80 - 120  | 115        | 80 - 120  | <0.00020 | mg/L  | 0.93      | 20               |
| Ag)        | 2021/05/13 | 102        | 80 - 120  | 105        | 80 - 120  | <0.00010 | mg/L  | NC        | 20               |
| n (TI)     | 2021/05/13 | 108        | 80 - 120  | 113        | 80 - 120  | <0.00020 | mg/L  | NC        | <b>Pa</b><br>07  |
|            | 2021/05/13 | 109        | 80 - 120  | 103        | 80 - 120  | <0.0010  | mg/L  | NC        | 20 <b>g</b>      |
| n (Ti)     | 2021/05/13 | 110        | 80 - 120  | 103        | 80 - 120  | <0.0010  | mg/L  | NC        | 20 <b>9</b>      |
| n (U)      | 2021/05/13 | 103        | 80 - 120  | 105        | 80 - 120  | <0.00010 | mg/L  | 2.6       | <sup>20</sup> 81 |
| 1m (V)     | 2021/05/13 | 107        | 80 - 120  | 105        | 80 - 120  | <0.0010  | mg/L  | 5.9       | 20 <b>9</b>      |
|            | 2021/05/13 | 100        | 80 - 120  | 106        | 80 - 120  | <0.0030  | mg/L  | NC        | <b>of</b> 20     |
|            |            | Page 8     | of 11     |            |           |          |       |           | 2                |

Bureau Veritas Laboratories Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

t E 252 Δ++ \ k



# QUALITY ASSURANCE REPORT(CONT'D)

COMMERCIAL ACCOUNTS - CALGARY BUREAU VERITAS CANADA (2019) INC.

|          | s          |                        |                     |                          |                          |                         |                       | ΔТ.                    | TA                  | СН                       | ME                       | NT                      | <u>'</u> E            | <u>':</u>                          | PUI                   | BLI                      | C                           | SU                 | вм              | ISS            | 510        | NS           |                         |                          |                |                                         | F                                   | - <u>1</u><br>P                       | - A                                    | <u>tt</u>                                                    | ac<br>18                              | hn<br>7 4                             | ne<br>of                              | nt<br>25 |
|----------|------------|------------------------|---------------------|--------------------------|--------------------------|-------------------------|-----------------------|------------------------|---------------------|--------------------------|--------------------------|-------------------------|-----------------------|------------------------------------|-----------------------|--------------------------|-----------------------------|--------------------|-----------------|----------------|------------|--------------|-------------------------|--------------------------|----------------|-----------------------------------------|-------------------------------------|---------------------------------------|----------------------------------------|--------------------------------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|----------|
| 0        | QC Limit   | 20                     | 20                  | 20                       | 20                       | 20                      | 20                    | 20                     | 20                  | 20                       | 20                       | 20                      | 20                    | 20                                 | 20                    | 20                       | 20                          | 20                 | 20              | 20             | N/A        | 10           | 20                      | 20                       |                |                                         |                                     | •                                     | ay                                     | a reliable                                                   |                                       |                                       |                                       |          |
| RPI      | Value (%)  | 1.1                    | NC                  | 1.9                      | 3.3                      | 1.3                     | 1.4                   | 1.8                    | NC                  | 2.8                      | 1.1                      | 2.7                     | 2.3                   | 1.1                                | NC                    | NC                       | 1.5                         | 2.0                | NC              | NC             | 0.16       | 0.65         | NC                      | NC                       |                |                                         |                                     |                                       |                                        | small to permit                                              |                                       | ence <= 2x RDL).                      |                                       |          |
| llank    | UNITS      | mg/L                   | mg/L                | mg/L                     | mg/L                     | mg/L                    | mg/L                  | mg/L                   | mg/L                | mg/L                     | mg/L                     | mg/L                    | mg/L                  | mg/L                               | mg/L                  | mg/L                     | mg/L                        | mg/L               | mg/L            | mg/L           |            | uS/cm        | mg/L                    | mg/L                     |                |                                         |                                     |                                       |                                        | unt was too                                                  |                                       | olute differe                         |                                       |          |
| Method B | Value      | <0.30                  | <0.060              | <0.20                    | <0.0040                  | <0.30                   | <0.50                 | <0.30                  | <0.060              | <0.20                    | <0.0040                  | <0.30                   | <0.50                 | <0.010                             | <0.010                | <1.0                     | <1.0                        | <1.0               | <1.0            | <1.0           |            | <2.0         | <1.0                    | <1.0                     |                |                                         |                                     | hod accuracy.                         |                                        | the spike amo                                                |                                       | alculation (abs                       |                                       |          |
| 3lank    | QC Limits  | 80 - 120               | 80 - 120            | 80 - 120                 | 80 - 120                 | 80 - 120                | 80 - 120              | 80 - 120               | 80 - 120            | 80 - 120                 | 80 - 120                 | 80 - 120                | 80 - 120              | 80 - 120                           | 80 - 120              |                          | 80 - 120                    |                    |                 |                | 97 - 103   | 90 - 110     | 80 - 120                | 80 - 120                 |                |                                         | ence.                               | o evaluate met                        |                                        | int sample and                                               |                                       | ı reliable RPD c                      | a.                                    |          |
| Spiked E | % Recovery | 66                     | 104                 | 102                      | 102                      | 104                     | 96                    | 101                    | 105                 | 103                      | 103                      | 105                     | 66                    | 66                                 | 104                   |                          | 98                          |                    |                 |                | 100        | 101          | 105                     | 106                      |                | nt.                                     | matrix interfe                      | added. Used to                        | ntamination.                           | tion in the pare                                             |                                       | low to permit a                       | ptability criteri                     |          |
| Spike    | QC Limits  | 80 - 120               | 80 - 120            | 80 - 120                 | 80 - 120                 | 80 - 120                | 80 - 120              | 80 - 120               | 80 - 120            | 80 - 120                 | 80 - 120                 | 80 - 120                | 80 - 120              | 80 - 120                           | 80 - 120              |                          |                             |                    |                 |                |            |              | 80 - 120                | 80 - 120                 |                | ne measuremei                           | /aluate sample                      | urce, has been                        | laboratory cor                         | the concentrat                                               |                                       | licate was too l                      | sis meets acce                        | f 11     |
| Matrix : | % Recovery | NC                     | 111                 | NC                       | 108                      | 104                     | NC                    | NC                     | 110                 | NC                       | 109                      | 104                     | NC                    | 122 (1)                            | 100                   |                          |                             |                    |                 |                |            |              | 66                      | 105                      |                | e variance in th                        | ded. Used to ev                     | m a second soi                        | lsed to identify                       | ence between                                                 | ration)                               | ole and/or dup                        | ol for this analy                     | Page 9 o |
|          | Date       | 2021/05/16             | 2021/05/16          | 2021/05/16               | 2021/05/16               | 2021/05/16              | 2021/05/16            | 2021/05/14             | 2021/05/14          | 2021/05/14               | 2021/05/14               | 2021/05/14              | 2021/05/14            | 2021/05/12                         | 2021/05/12            | 2021/05/14               | 2021/05/14                  | 2021/05/14         | 2021/05/14      | 2021/05/14     | 2021/05/14 | 2021/05/14   | 2021/05/15              | 2021/05/15               |                | Jsed to evaluate th                     | erest has been add                  | analyte, usually fro                  | ytical procedure. U                    | The relative differ                                          | ve sample concent                     | itration in the sam                   | erall quality contro                  |          |
|          |            |                        |                     |                          |                          |                         |                       |                        |                     |                          |                          |                         |                       |                                    |                       |                          |                             |                    |                 |                |            |              |                         |                          |                | e same sample. U                        | the analyte of int                  | n amount of the a                     | s used in the anal                     | as not calculated.                                           | less than the nati                    | ated. The concen                      | trol limits. The ov                   |          |
|          | Parameter  | Dissolved Calcium (Ca) | Dissolved Iron (Fe) | Dissolved Magnesium (Mg) | Dissolved Manganese (Mn) | Dissolved Potassium (K) | Dissolved Sodium (Na) | Dissolved Calcium (Ca) | Dissolved Iron (Fe) | Dissolved Magnesium (Mg) | Dissolved Manganese (Mn) | Dissolved Potassium (K) | Dissolved Sodium (Na) | Dissolved Nitrate plus Nitrite (N) | Dissolved Nitrite (N) | Alkalinity (PP as CaCO3) | Alkalinity (Total as CaCO3) | Bicarbonate (HCO3) | Carbonate (CO3) | Hydroxide (OH) | Hd         | Conductivity | Dissolved Chloride (Cl) | Dissolved Sulphate (SO4) | licable        | ed analysis of a separate portion of th | A sample to which a known amount of | v blank matrix sample to which a know | A blank matrix containing all reagents | <ul><li>(e): The recovery in the matrix spike ware</li></ul> | ation (matrix spike concentration was | RD): The duplicate RPD was not calcul | RPD for this parameter is outside con |          |
|          | QC Batch   | A223796                | A223796             | A223796                  | A223796                  | A223796                 | A223796               | A223798                | A223798             | A223798                  | A223798                  | A223798                 | A223798               | A223899                            | A223899               | A225434                  | A225434                     | A225434            | A225434         | A225434        | A225437    | A225438      | A226330                 | A226330                  | N/A = Not Appl | Duplicate: Pair                         | Matrix Spike: 🖌                     | Spiked Blank: A                       | Method Blank:                          | ONC (Matrix Spik                                             | Recovery calcul                       | OVC (Duplicate F                      | 1) Recovery or                        | 19       |

ATTACHMENT 'E': PUBLIC SUBMISSIONS



F-1 - Attachment E Page 188 of 252

COMMERCIAL ACCOUNTS - CALGARY BUREAU VERITAS CANADA (2019) INC.

### VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Sandy Yuan, M.Sc., QP, Scientific Specialist

BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

| 2                    | INVOICE TO:                                   |              |                      |          |                           |                       |                           | 00,0010 |            |              | 1.10          |                |       | er and e                                                                               | OUSTODI RECORD                                                                                                                                                                                    |                             |
|----------------------|-----------------------------------------------|--------------|----------------------|----------|---------------------------|-----------------------|---------------------------|---------|------------|--------------|---------------|----------------|-------|----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| #10311 0             | OMMERCIAL ADDOLINES                           |              |                      | REF      | PORT TO                   | ):                    |                           |         |            | 11           | PROJE         | ECT INFORMATIC | DN-   |                                                                                        |                                                                                                                                                                                                   |                             |
| Bention              | SIMULACOUNTS - CALGA                          | ARYBUR       | Company Name         | ON FE    | Enlado                    | SIL                   |                           |         |            | Driefation # |               |                |       |                                                                                        | Laboratory Use                                                                                                                                                                                    | Only:                       |
| ideese 4000 19th :   | street NE                                     |              | Atlention            |          |                           |                       |                           |         | F          | 2.0. #       | _             |                |       |                                                                                        | DV LIDS JUL #:                                                                                                                                                                                    | Bottle Order #:             |
| Calgary AB           | T2E 6P8                                       |              | Addines -            |          |                           |                       |                           |         | F          | roject       |               |                |       | H                                                                                      |                                                                                                                                                                                                   |                             |
| (403) 201 2          | Fax:                                          |              | Tal                  |          |                           |                       | 6.00                      | _       | F          | roject Name: |               |                |       |                                                                                        | COC#:                                                                                                                                                                                             | Project Manager:            |
| iait:                |                                               |              | Emailt               |          |                           |                       |                           |         | s          | iite #:      | -             |                |       |                                                                                        |                                                                                                                                                                                                   | Customer Solutions          |
| Regulatory Criteria  |                                               |              | Special Instructions |          | _                         |                       |                           | AN      | ALYSIS RE  | OUESTED (F   | PLEASE BE SPE | ECIFIC)        |       |                                                                                        | C#635648-01-01                                                                                                                                                                                    |                             |
| M ATI                |                                               |              |                      |          |                           |                       | 9                         |         | 9          | 1.1          |               |                |       | 1000                                                                                   | Please provide advance police for early                                                                                                                                                           | uired:                      |
| Other                | KEPT COOL ( < 10°C) FROM TIME OF SAM          | IPLING UNTIL | DELIVERY TO BV LABS  | CRITE    | Is Field Filtered 7 ( Y / | ine Water -Lab Filter | ulated Metals (CCME<br>al | idity   | FRURY (TTO |              |               |                |       | (will be a)<br>Standard<br>Piease no<br>details<br>Job Spoc<br>Date Req<br>Rush Confil | ppled if Rush TAT is not specified);<br>TAT = 5-7 Working days for most tests.<br>te: Standard TAT for certain fests are > 5 days - or<br>liftc Rush TAT (if applies to entire submission<br>unod | onlact your Project Manager |
| Sample Barcode Label | Sample (Location) Identification              | Date S       | Sampled Time Sampled | Matrix   | Vieta                     | Sout                  | Tot                       | urbi    | 5          |              |               |                |       | # of Bottles                                                                           | (C8                                                                                                                                                                                               | (lab for #)                 |
|                      | SOIL FLUSH #1                                 | 10020        | 0/21 11:20           | in an is | -                         |                       |                           |         | 1          |              |               |                |       |                                                                                        | Comments                                                                                                                                                                                          |                             |
|                      | Su Tweette                                    | PARY         | 814 11.70            | w        | N                         | V                     | V                         | 1       |            | -            |               |                |       | 3                                                                                      |                                                                                                                                                                                                   |                             |
|                      | SOIC FLOSH #2                                 | MAY          | 9/21 10:45           | w        | N                         | 1                     | 1                         | V       | 2          |              |               |                |       | 4                                                                                      |                                                                                                                                                                                                   |                             |
|                      |                                               |              |                      | W        | N                         | 1                     | V                         | V       |            |              |               |                |       | 2                                                                                      | 1                                                                                                                                                                                                 | - 10                        |
|                      | Need certificate                              | they         | nistry of A          | Tim      | .F.                       | _                     |                           | -       | 1          |              |               |                |       | 2                                                                                      |                                                                                                                                                                                                   |                             |
|                      |                                               | 1000         | 19010                | - wa     | TE                        | <u> </u>              | -                         | -       |            | -            | -             |                | -     | -                                                                                      |                                                                                                                                                                                                   |                             |
|                      |                                               |              |                      | -        |                           | -                     |                           | -       | -          |              | -             |                |       | 1                                                                                      | 10 Mar. 21 00                                                                                                                                                                                     | 10                          |
|                      |                                               | 1            |                      | -        | 1                         | -                     | -                         |         |            |              |               |                | 1     |                                                                                        | Customer S-bet                                                                                                                                                                                    | 10 -                        |
|                      |                                               | -            |                      |          |                           |                       |                           |         |            |              |               |                |       | 1                                                                                      |                                                                                                                                                                                                   | -                           |
|                      |                                               | -            |                      |          |                           |                       | 1                         |         |            |              |               |                |       |                                                                                        | C130760                                                                                                                                                                                           | -                           |
|                      |                                               | -            |                      |          | $\square$                 |                       |                           |         |            |              |               | 1.01           |       |                                                                                        | JK4 INS-0088                                                                                                                                                                                      | 1                           |
|                      |                                               |              |                      |          |                           | -                     |                           |         |            |              |               |                |       |                                                                                        |                                                                                                                                                                                                   |                             |
| * RELINQUISHED BY:   | (Signature/Print)                             | 1            |                      |          |                           | _                     |                           |         |            |              |               |                |       |                                                                                        |                                                                                                                                                                                                   |                             |
| · RELINQUISHED BY:   | (Signature/Print) Date: (M<br>ON FENNELL 21/A | Y/MM/DD)     | Time                 |          |                           |                       |                           |         | Dat        | e (YY/MM/D   | D) Time       | # jars use     | d and | _                                                                                      | Laboratory Lies Onto                                                                                                                                                                              |                             |

# **Curriculum Vitae**

# Jon Fennell. M.Sc., Ph.D., P.Geol.

# PROFESSIONAL PROFILE

Dr. Jon Fennell has been a practicing consultant in the natural resource sector for over 30 years offering support in the environmental sciences and resource management. His experience includes contaminated sites assessment, development of local and regional-scale groundwater systems, mine dewatering strategies, water supply and disposal, groundwater-surface water interaction assessment, implementation of monitoring and management systems, climate analysis and adaptation strategies, and environmental forensics including applications of:

- i) remote sensing
- ii) downhole, earth-based and airborne geophysical methods
- iii) geochemical assessment & modelling
- iv) stable and radiogenic isotopes to support source water tracing, chemical fingerprinting, and age-dating

The bulk of Jon's experience is associated with various oil & gas and mineral resource development projects in Canada and abroad. Over the last 13 years Jon has worked closely the Alberta Government through various initiatives to support the Water for Life Strategy, Land Use Framework, and Cumulative Effects Management System in the province. A primary area of focus is on developing strategies to ensure water security and communicating the importance of water knowledge as it applies to sustainable development activities.

# **PROJECT EXPERIENCE**

# International support

## United Nations – Joint Caribbean Climate Change Partnership

Technical lead for the development of UNFCCC-sanctioned National Adaptation Plans for the countries of Belize and Guyana, with the goal of addressing multi-sector impacts from future climate change. Responsibilities included review of existing policies and studies supporting climate change adaptation, assessment of current adaptation plans for major economic, social, and environmental sectors, Incorporation of IPCC model results under various RCP scenarios, delivery of facilitated in-country workshops for various ministries, provision of recommendations to address gaps identified in current plans, liaison with government officials and UNDP organizers, completion of risk assessment and options analysis to identify high-value actions, preparation of capacity-building plan and 10-yr strategic plan, and risk and vulnerability assessment (including spatial aspects under various climate change scenarios – SRES and RCP).

# Mexican Soda and Water Company – Monterrey Mexico

Lead for a groundwater evaluation project to supplement beverage making operations a large manufacturing plant in the city of Monterrey. Responsibilities included review of background geological, hydrogeological and geochemical information across a large study area centered on the Monterrey Metropolitan Area; assessment of structural fabric of study area including presence of major folds, faults, and other features (e.g. karst), amalgamation of background data with result from Quantum

Geoelectrophysics reconnaissance program to identify prospective drilling targets, completion of a 4C report (compare, contrast, correlate, confirm) and selection of prime drilling target for testing and evaluation.

# Dept. of Environment & Resource Management – Coal Seam Gas Development, Queensland Australia

Lead for a hydrogeochemical assessment and water fingerprinting exercise in Great Artesian Basin aquifers of the Surat and Bowen basins to support Coal Seam Gas development and cumulative effects analysis. Responsibilities included a comprehensive data and information inventory to facilitate source water fingerprinting and collation of large public-domain data sets to provide a first-of-its-kind database of water quality information, review of major ions, metals and trace elements, stable and radiogenic isotopes and dissolved gases to identify recharge phenomenon, cross-formational flow characteristics and distinct water types, and statistical analysis to assess data groupings and spatial trends.

Additionally, lead for an aquifer vulnerability assessment to assess groundwater and groundwaterdependent ecosystem risks from Coal Seam Gas development in southeast Queensland. Responsibilities included development of a multi-criteria weighting and ranking system linked with GIS to display areas of highest risk to drawdown including areas users and groundwater dependent ecosystems, and facilitation of industry and government workshops to present and vet results.

# Origin Energy - Coal Seam Gas Development, Queensland Australia

Groundwater lead for a large-scale coal seam gas project (up to 10,000 wells) located in the headwaters of the Murray-Darling Basin and recharge area for the Great Artesian Basin. Responsibilities included, development of a regional-scale groundwater monitoring system using vulnerability and risk mapping, design of a hydrogeological model covering a 173 000 km<sup>2</sup> area (using FEFLOW) to assess cumulative effects from coal seam gas development, completion of supporting Technical Report (including risk mapping, injection feasibility, model development) and Environmental Impact Statement chapter, and liaison with the Queensland Department of Environment and Natural Resources to address needs for the required Environmental Impact Assessment.

## Texas Petroleum Company – Hydrocarbon Development, Columbia South America

Completion of an onsite environmental assessment of oilfield operations in support of the transfer of the Teca Nare, Cocorná, Velásques Oil Fields and the Velásquez-Galan Pipeline. Responsibilities included phase 1 site assessment of field operations, verification of site conditions at all well sites including soil and vegetation conditions prior to property transfer, assessment of baseline surface water and groundwater chemical conditions, as wells as environmental quality assessment to determine contamination from oilfield operations, and provision of summary report including recommendations.

# Texas Petroleum Company – Hydrocarbon Development, Ecuador South America

Completion of a baseline groundwater and surface water study in a remote and environmentally sensitive area of the Amazon basin (headwaters area) to support a helicopter-assisted drilling program for oil and gas exploration. Responsibilities included field reconnaissance to establish the suitability of proposed drilling targets, assessment of the suitability of local surface water and groundwater sources for drilling fluid provision (quality and quantity), review of baseline soil quality, site hydrogeology, and geochemical conditions, and development of recommendations for pit construction and site preparation.

### Canadian International Development Agency – Municipal works, Ecuador South America

Completion of a baseline soil and groundwater study (physical and chemical) around the City of Catamayo to determine the feasibility of siting an engineered wastewater impoundment for the treatment of municipal sewage treatment (project funded by CIDA). Responsibilities included general site reconnaissance, collection of soil and groundwater samples for baseline geochemical quality assessment, review of hydrogeological conditions and processes relating to baseline conditions, and submission of recommendations on the suitability of the proposed location and possible approaches to rectify existing limitations.

### Government of Yemen – National water supply, Yemen

Hydrogeological and geochemical support for a regional-scale study of water supply potential in the country. Responsibilities included hydrogeological and hydrogeochemical facies mapping, geochemical assessment and flow path evolution modelling, groundwater flow field assessment and modelling, sustainable yield evaluation, and groundwater age dating.

### Blackbird Mine – Acid Rock Drainage assessment, Idaho USA

Completion of a hydrogeological baseline study and associated stable isotope investigation ( $\delta^{34}$ S,  $\delta^{18}$ O, and  $\delta^{2}$ H) to determine the source of acid mine drainage near active underground workings. Responsibilities included review of existing geochemical data and related mineral equilibria conditions (i.e. baseline and impacted), and assessment of geochemical reactions leading to ARD conditions, including biogeochemical aspects.

# Government support

### Alberta Environment, Oil Sands Science and Monitoring Division

Preparation of oil sands tailings pond seepage review report. Responsibilities included review of background information pertaining to oil sands produced water (OSPW) seepage research and natural bedrock groundwater discharge studies, review of industry-submitted EPEA compliance reports to assess current "state of affairs" regarding monitoring and OSPW detections, assessment of seepage management systems, review of geological pathways for OSPW migration, and development of seepage risk profiles for all active tailings ponds.

# Alberta Environment and Parks (AEP)

Provision of external expert review for the Implementation Directive for the Surface Water Body Aggregate Policy (SWBAP). Responsibilities included review of relevant Government of Alberta documents relating to aggregate mining in or near surface water bodies and/or floodplain environments, use of information from relevant policies in other jurisdictions as well as studies and research (aquatic, terrestrial, river morphology, climate risk) regarding impacts of aggregate mining in floodplain areas, identification of gaps regarding goals and objectives of the approval and management process, ,review of

risk assessment approach to approving aggregate mines near surface water bodies, and provision of recommendations for monitoring, evaluating and reporting, and interaction with AEP project team members and presentation of results.

Also, participation on expert hydrogeology panel to development a template for groundwater management frameworks (GMFs) in Alberta. Responsibilities included assessment of background on Alberta groundwater resources and documents highlighting existing GMFs inside and outside of Canada, review of sustainability goals and challenges with groundwater management (quantity and quality), review of prevailing concepts to groundwater management (i.e. surface water capture, risk and vulnerability assessment), identification of data needs and required infrastructure to support cumulative effects management, identification of proposed indicators using DPSIR approach, and participation in external panel and internal AEP team of hydrogeological experts to define aspects of a standardized GMF template.

# Alberta Environmental Monitoring Evaluation and Reporting Agency (AEMERA)

Assessment of Alberta's groundwater observation well network, including redundancy and gap analysis. Responsibilities included groundwater risk mapping, development of a numerical scoring scheme to prioritize monitoring wells, statistical and spatial analysis of provincial water chemistries using information from the Alberta water well information database, and development of monitoring strategy including analytes and frequency to address key development activities (e.g. hydraulic fracturing, waste disposal, large-scale groundwater extractions).

### Alberta Environment (AENV)

Various projects include:

- Assistance with scoping, conceptual design and development of approach to Groundwater Management framework template
- Expert review for Implementation Directive for the Surface Water Body Aggregate Policy
- Review and comment on Groundwater Monitoring Directive (2012 draft)
- Technical assistance with development of a guidance framework to respond to the implications of thermal mobilization of constituents at in-situ bitumen recovery projects including facilitation of team workshops to communicate the physical and chemical aspects of thermal mobilization and the risks posed by in-situ operations, development of a risk-based, phased, approach to assessing thermal mobilization to address source-pathway-receptor aspects, development of a draft guidance document and interaction with the AEP communications team, and support for industry and CAPP consultation meetings to review the draft guidance document.
- Completion of vulnerability and risk mapping for the Lower Athabasca Regional Planning area and development of groundwater management framework for the mineable and thermal in situ areas.
- Completion of an inventory of existing quality and quantity issues, water supply conditions and related environmental policy.
- Participation in technical and policy-related work sessions involving various stakeholder representatives.
- Assessment of potential cumulative effects from thermal in-situ bitumen recovery operations and related activities (i.e. water withdrawal for steam generation; fluid waste injection)
- Facilitation of technical and policy-related work sessions to engage stakeholders (operators, AENV and ERCB) directly affected by changes to provincial water management.

# F-1 - Attachment E Page 194 of 252

# Alberta Environment and Sustainable Resource Development (ESRD)

Various projects include:

- Development of a multi-attribute point-scoring system and ArcGIS tool to assist with optimal siting
  of provincial monitoring wells to address concerns regarding hydraulic fracturing (HF).
  Responsibilities included identification of key risks to groundwater resource from HF activities,
  conceptualization and construction of a subsurface risk assessment, and identification of surface
  access opportunities in an ArcGIS platform to identify prime locations for monitoring in active and
  future development areas.
- Northern Athabasca Oil Sands Region groundwater monitoring program. Responsibilities included development of sampling methodology, data evaluation process and program logistics, communication to technical team comprising oil sands operators, ERCB and AEP representatives, development of an on-line visualization tool, and client liaison.
- Review of LARP management plan, supporting Groundwater Management Frameworks and supporting guidance documents re: Thermal Mobilization of Trace Elements during In Situ Developments and Groundwater Monitoring Directive.
- Preparation of summary document for Scientific Advisory Committee of the Oil sands GW working group, and Alberta Environment.

# Alberta Land Use Secretariat (LUS)

Assistance with development of land planning scenarios in NE Alberta to guide future development in the Lower Athabasca Regional Plan area pursuant to the goals of the Alberta Land-use Framework. Responsibilities included presentations to the Land Use Secretariat, Regional Planning Team and Regional Advisory Council, development and assessment of modelled results from a cumulative effects simulator, completion of groundwater modelling over a 93 000 km<sup>2</sup> area (using MODFLOW), and development of an approach to deal with groundwater resources in the LARP area.

# Alberta Utilities Commission (AUC)

Provision of expert review support for a wind power application in the Provost AB area. Responsibilities included review of project concept and environmental implications, assessment of completeness regarding baseline hydrogeological assessment, assessment of impact analysis and proposed mitigation, identification of gaps and provision supplemental information requests.

## BC Ministry of Energy, Mines and Petroleum Resources

Provision of expert review support for hydraulic fracturing review process. Responsibilities included preparation of background information pertaining to water quality risks and source-pathway-receptor aspects of hydraulic fracturing operations, provision of recommendation regarding geochemical fingerprinting (ion ratios, isotopes, NORMs), risk assessment and mapping techniques, and monitoring, and appearance at in-camera session to discuss water quality aspects with academic panel members including recommendations.

# Agency support

# Alberta Innovates (AI)

Provision of hydrogeological support services for the following University of Alberta research studies:

- Resolving human versus Industrial Influences on the water quality of the Lower Athabasca River (data synthesis; geophysical and geochemical assessment; isotope geochemistry source water fingerprinting, GW-SW interaction – identification and flux)
- Review of Arsenic in Alberta's groundwater (collation of multiple open source and private data bases, GIS platform design; correlation/cluster/factor analysis to determine source/cause/reasons(s), both physical and geochemical, for elevated concentrations, development of a risk mapping tool to identify existing and potential future high-risk areas and aquifer intervals)
- Predicting Alberta's Water Future (complete estimates of groundwater recharge to Alberta's 2200 sub-basins; determining groundwater use projection by major sector to 2050; assessing baseflow contributions and groundwater stress area based analytic model outputs; project changes to provincial water supplies based on population growth, energy extraction, food production, land use, and climate variability/change; coordinate results with climate change model outputs and SWAT model outputs to generate preliminary Water Risk map for the province.

# Alberta Water Research Institute (AWRI)

Preparation of a report assessing Alberta's inventory of water and its associated dynamics (natural and human-induced). Responsibilities included the development of a partnership model including participants from Universities and Institutes in Beijing, Switzerland, Edmonton, Calgary and Lethbridge, completion of a complete inventory of surface water, groundwater and fossil water (glaciers and deep groundwater) to identify current and future risks to water supplies in the province, and assessment of climate variability and change implications to provincial groundwater water resources

# Canada's Oil Sands Innovation Alliance (COSIA)

Completion of a tailing pond seepage risk assessment and preparation of a peer-review journal manuscript to place suspected oil sands impacts into perspective. Responsibilities included review of individual tailings ponds established at the various operating oil sands mines in the Athabasca Oil Sands region, application of source-pathway-receptor model in relation to calculated groundwater flow velocities, stand-off distances from receptors, and natural attenuation properties to assess risk associated with each structure, and preparation of manuscript to place into context natural discharge of low-quality groundwater from bedrock formation versus oil sands seepage.

Other projects include:

- Completion of regional geochemical assessments in NE Alberta (35,000 km<sup>2</sup> area) supporting the Regional Water Management Initiative. Responsibilities included, collation of regional geological, hydrogeological, and geochemical data using public domain and industry information, assessment and interpretation of hydrogeological setting and of conceptual models, assessment of traditional and isotope geochemistry to determine source water chemistry to define flow path phenomena areas of aquifer interactions, statistical analysis of data to determine groupings and associations (PCA analysis), and documentation and presentation of results at various public venues.
- Completion of a water disposal assessment in NE Alberta (153,000 km<sup>2</sup> area) supporting the Regional Water Management Initiative. Responsibilities included collation of regional geological, hydrogeological, and water production data using public domain and industry information, development of a multi-criteria analysis approach to assessing Injection Potential and Theoretical Injection Rates based on a system of weighted and ranked physical and chemical attributes, and development of an ArcGIS platform to identify high-value disposal formations in relation to existing and planned in situ developments and pipelines
Completion of oil sands industry study assessing the risks and benefits of landfills, salt caverns and disposal wells in liquid waste management. Responsibilities included participation in industry workshops. assessment of liquid waste management options, documentation and presentation of the results to industry members.

## Cumulative Environmental Management Association (CEMA)

Assessment of baseline hydrological and hydrogeological conditions and development of a regional-scale groundwater quality monitoring network (18 000 km<sup>2</sup> study area) located in the Athabasca Oil Sands Region of northeast Alberta. Responsibilities included refinement of conceptual hydrogeological model, groundwater-surface water interaction assessment, assessment of quality conditions and trends (including statistical analysis), knowledge and data gap analysis, pathway identification and vulnerability assessment for sensitive receptors, field reconnaissance and well selection, isotope interpretation ( $\delta^{18}$ O,  $\delta^{2}$ H,  $\delta^{13}$ C, Carbon-14), groundwater hydrograph analysis, report preparation and presentation, and liaison with government and industry representatives.

Other projects include:

- Preparation of a groundwater monitoring and management plan in support of the State of the Muskeg River Watershed report. Responsibilities included assessment of baseline groundwater quantity and quality conditions in the study area, identification of development stresses and potential short and long-term impacts, identification of proposed physical, chemical and state indicators for monitoring, and interaction in multidisciplinary team.
- Overview of historical, current, and planned groundwater initiatives in the Regional Municipality of Wood Buffalo. Responsibilities included interviews with relevant industry, government, academia, aboriginal, and non-governmental organization groups, identifying and accessing relevant studies, reports, and investigations relating to groundwater and groundwater-surface water interaction, and development of a useable database with relevant descriptors of content and results.

### Lakeland Industry and Community Association (LICA)

Assessment of the current health of two large watersheds (covering over 8500 km<sup>2</sup>) in response to changing climatic conditions, changing land use practices, and increased pressure on water resources (surface water and groundwater) by agricultural and industrial users. Responsibilities included the assessment of historical Landsat imagery, review of stream and groundwater hydrograph data, assessment of effects of climate phenomena on basin hydrology, development of a hydrogeological framework from over 11,500 water well records, and review of temporal quality data from lakes and water wells.

### Petroleum Technology Alliance of Canada (PTAC)

Completion of studies and industry workshops assessing environmental net benefit of saline water use versus non-saline water use in unconventional oil and gas development and the role of collaboration in unconventional oil and gas development.

# Municipal and Watershed Stewardship Groups

### **Butte Action Committee**

Preparation for, and participation in, AEP-led Surface Water Body Aggregate Policy 2017 stakeholder review workshops. Responsibilities included consultation with stakeholder group, provision of support for Leduc workshop, review of AEP materials in advance of Airdrie workshop (AEP policies, guides, codes, risk assessment framework), review of other Canadian and International policies and guides to

aggregate mining near water bodies, review of impact studies related to aggregate mine development near surface water bodies (erosion, pit capture, infrastructure risk, fisheries and riparian area impacts), assessment of climate change implications for streamflow timing and magnitude, as well as intensity, duration, and frequency of storms and related runoff, on 1:100 levels, and documentation of questions to AEP for clarification and response to AEP questions re: climate change implications.

#### Red Deer River Watershed Alliance (RDRWA)

Assistance with development of an Integrated Watershed Management Plan to address future development in the basin. Responsibilities included assessment of aquifer types and groundwater inventory, water use patterns, effects of land use and climate variability/change on basin storage, assessment of water quality conditions, risk and vulnerability analysis, development of beneficial management practices, and development of a conceptual monitoring system to achieve plan goals and objectives.

#### South McDougall Flats Protection Society, Sundre AB

Review of proposed re-zoning for aggregate mine development in historic floodplain of Little Red Deer River in Sundre, AB. Responsibilities included review of proposed gravel pit re-zoning area, air photo assessment and delineation of paleo-floodplain. preparation and presentation of workshop materials at public forums re: pros and cons of gravel mining (including policy framework review), and support for Town Council hearing.

#### Town of Okotoks, AB

Assistance with review of development applications and support for ensuring water security through conjunctive use strategies. Responsibilities included expert review of development applications assessing cumulative drawdown effects and provision of recommendations to manage effects, engagement with Town official on development of a sustainable water management strategy, and provision of support for AENV and Environmental Appeal Board process.

Also, completion of a pre-feasibility study to assess aquifer storage and recovery (ASR) and managed aquifer recharge (MAR) as a solution to water supply challenges. Responsibilities included review of regulatory setting and constraints for ASR and MAR (Canada and international jurisdictions), review of ASR and MAR projects world-wide, assessment of local geological and hydrogeological conditions and identification of potential areas to facilitate ASR and MAR success, modelling to determine optimal placement of MAR system to enhance baseflow conditions, groundwater-surface water interaction assessment, and preparation and presentation of pre-feasibility summary to Town Council and Mayor.

### Town of High River, AB

Lead for the development of a Water Sustainability Plan predicated on risk identification and alternative storage and management options for a large alluvial aquifer system. Responsibilities included concept and program design, execution of vulnerability mapping approach to assess risk to High River from groundwater impacts (e.g. underground storage tanks), development of conceptual hydrogeological framework, review of groundwater–surface water interaction and climate variability effects, assistance with groundwater model development, and liaison with town officials, MD Foothills official and other project stakeholders.

#### **Tsuut'ina First Nation**

Completion of flood analysis for the Redwood Meadow development on the Elbow River floodplain. Responsibilities included review of river hydrology, flood frequency, and related changes in river

morphology, assistance with hydrological modelling to address groundwater flooding potential to existing and panned development areas, calculation of damage estimates associated with 5-, 20-,100-, 200- and 500-year return periods, and liaison with First Nations representatives, Government of AB, and Canadian Environmental Assessment Agency.

# Industry support

## Alberta Energy Company (AEC)

Preparation of an Environmental Operations Manual for all aspects of petroleum exploration and development in Alberta. Contents of the manual included environmental procedures for seismic cutline provision and reclamation, siting and construction of drilling leases and processing facilities, siting and construction of pipeline right of ways, spill response and cleanup, and site reclamation.

### Amoco Canada

Various projects include:

- Numerous gas plant and batter investigations, including the completion of geophysical surveys (EM38, EM31, and EM61), and the design, installation, testing and sampling of groundwater monitoring networks.
- Completion of environmental site assessments and landfill delineation programs for gas plant divestitures. Responsibilities included installation, testing and sampling of groundwater monitoring wells, completion of soil sampling programs, and assessment of the results to determine the liability cost associated with property transfer.
- Completion of a stable isotope study using δ<sup>34</sup>S, δ<sup>18</sup>O, δ<sup>2</sup>H, δ<sup>13</sup>C to determine the source of anomalous groundwater sulphate concentrations (natural vs. anthropogenic), and review of fresh groundwater usage for steam injection. Responsibilities included assessment of historical monitoring well and lake level readings to evaluate local effects resulting from groundwater withdrawal.
- Sounding Lake area monitoring program to determine effects from nearby drilling activity. Responsibilities included interviews with well-owners, assessment of the water delivery system, short-term aquifer testing, sample collection using ultra-clean sampling methods, evaluation of the data, and communication of results to client and owner.

## Apache Canada

Completion of watershed analysis and intake siting in support of a Water Act Application on Smoky Lake. Responsibilities included assessment of Smoke Lake watershed and water supply potential, water supply modelling to determine availability and reliability of lake water, review of historical flow data and determination of suitable IFN at outlet (i.e. Q80), review of terrestrial, fisheries and water quality data to support water diversion strategy, development of proposed monitoring and response plan, and liaison with AEP and AER representatives.

### **Bellatrix Exploration Ltd.**

Completion of a Water Sourcing study for Rocky Mountain asset. Responsibilities included review of existing and potential water sourcing options, development MCA and of GIS tool to assess and map high-value water opportunities, and completion of a corporate water security plan.

## **BP** Canada

Resident well sampling program to determine effects from nearby drilling programs and existing gas wells. Responsibilities included well-owner interviews, assessment of the well conditions and water delivery system, sample collection using ultra-clean sampling methods, and communication of results.

### **Canadian Occidental**

Completion of a stable isotope studies to determine the source of sulphate impact from two large sour gas processing facilities (Balzac and Okotoks). Responsibilities included drilling, installation, and testing of monitoring wells, development of a conceptual site model , review of site-wide geochemistry (soil and groundwater), and application of  $\delta^{34}$ S,  $\delta^{18}$ O,  $\delta^{2}$ H, and  $\delta^{13}$ C isotopes to resolve natural versus anthropogenic influences.

### **Devon Canada**

Various projects include:

- Development of a thermal mobilization risk model to support development efforts in the Jackfish and Pike oil sands developments. Responsibilities included review and evaluation of existing geochemical data including metals and trace elements, development of conceptual site model using existing geological picks for various identified formations, design of Spatial MCA approach to map risk of thermal mobilization from artificial ground heating, and preparation of summary document and presentation at various public venues.
- Completion of detailed studies to define baseline hydrogeological and hydrological conditions in support of a CBM project in the Crowsnest Region of the eastern Rocky Mountains. Responsibilities included, completion of detailed field reconnaissance program, establishment of a spring and water well monitoring network, investigation of surface water/groundwater interactions, development of a conceptual hydrogeological framework in a mountainous area using geological and geochemical data, groundwater age dating of regional confined aquifers using radioactive isotopes (i.e. Tritium and Chlorine-36), and public and regulatory liaison.
- Hydrogeological support for D51 disposal application. Responsibilities included refinement of conceptual model and identification of hydrodynamic conditions supporting disposal water entrapment by stagnation zone using geochemical and isotope evidence.

#### **Enerplus**

Completion of a Water Security Plan for the Western Canadian assets. Responsibilities included review of asset operations and water management process, assessment of basin water risk conditions and current mitigations in place, source water and disposal opportunity assessment, and development of multi-criteria assessment (MCA) process to rank water risk profile of each asset and provide recommendations for mitigation.

### Graymont Western US Inc.

Preliminary development of a mine dewatering and water management strategy for a large limestone quarry located in the eastern from ranges of the Rocky Mountains. Responsibilities included assessment of baseline hydrogeological and hydrogeochemical conditions in a mountain environment, source water fingerprinting and groundwater age-dating, fracture and lineament analysis using structural geology and geophysical analysis (GPR, borehole tele-viewer), groundwater-surface water interaction assessment (i.e., Bow River), conceptualization of dewatering strategy utilizing oriented and horizontal well technology, and issues identification and risk analysis.

# F-1 - Attachment E Page 200 of 252

### Hammerhead Resources

Completion of watershed analysis, flood assessment and intake siting in support of a Water Act Application on the Smoky River. Responsibilities included assessment of Smoky River watershed and water supply potential, review of historical flow data and assessment of Q80 and Q95, flood assessment to determine 1:10 and 1:25 year event levels, review of fisheries and bank stability assessment in support of intake siting, development of proposed monitoring and response plan, and liaison with AEP and AER representatives.

### Husky Oil Operations Ltd.

Completion of a water security plan for the Ansell asset, west-central Alberta. Responsibilities included review of project water profile and future requirements for hydraulic fracturing, facilitation of risk review workshop, and review of water source opportunities and development of MCA opportunity ranking process.

Also, completion of a Water Security Plan for a 200,000 barrel per day thermal in situ oil sands operation. Responsibilities included, review of water supply and disposal needs for the duration of the planned project, risk and opportunity analysis using multi-criteria analysis to ensure viability of supply and disposal strategies, and identification of strategies to ensure project viability and project sustainability.

### **Imperial Oil**

Various projects include:

- Completion of field and bench-scale tests to determine facilitated mobility of metals, trace elements, and dissolved organics resulting from artificial ground heating around thermal in situ wells. Responsibilities included drilling, installation, testing, and sampling (soil and water) from 22 deep (up to 90 m) monitoring wells at a newly established thermal in situ pad to determine baseline geochemistry and groundwater flow directions, tracer experiment to determine groundwater flow velocities in a deep (>80 m) confined aquifer, collection of sediment samples (under anoxic conditions) for bench-scale heating experiments to determine metals mobility and related kinetics, review of stable isotopes in groundwater and dissolved gases to determine effects of heating from insitu thermal wells on local geochemical conditions (inorganic and organic constituents), reaction path modelling to determine processes influencing changes metals concentrations and biological activity resulting from subsurface heating, determination of activation energies for metals release, and the role of biogeochemical reactions in facilitating metals release, transport and fate modelling to determine the long-term risk of thermal mobilization of metals (and other related constituents) to the surrounding environment, and documentation of result and liaison with client and regulatory agencies.
- Design and implementation of dewatering program for large process water ponds. Responsibilities
  included review of site geological conditions, installation of dewatering wells, acquisition and
  interpretation of aquifer test data, design of dewatering system using appropriate theoretical
  calculations and analytical modelling solution, and development of dewatering plan and associated
  performance monitoring
- Completion of a regional groundwater investigation and development of a regional-scale ground water monitoring network (per EPO 95-07 requirements) in a multi-layer inter-till aquifer system in east-central Alberta. Responsibilities included assessment and interpretation of Quaternary stratigraphy, interpretation of seismic line data and geophysical borehole log analysis, regional groundwater flow mapping, geochemical facies mapping, assessment of regional arsenic concentrations, trends, and potential connection to thermal in situ development activities,

groundwater age-dating and stable isotope analysis ( $\delta^{18}$ O,  $\delta^{2}$ H,  $\delta^{34}$ S,  $\delta^{11}$ B and  $\delta^{13}$ C: dissolved constituents and gases), preparation of investigation report to address EPO questions (i.e. source and cause of groundwater quality issues), and liaison with regulators during investigation and EPO closure process.

- Completion of an environmental liability assessment to determine the cost of decommissioning, abandoning and restoring the area currently occupied by the Norman Wells field. Responsibilities included completion of a Phase 1 audit of production facilities and supporting infrastructure (i.e. wellheads, pipelines, satellites, batteries and former refinery), design and implementation of a late Fall field program to sample a statistically sufficient number of locations to generate realistic liability costing for field shutdown and closure, generation of a summary report, and assistance with design of liability costing model and summary reporting.
- Completion of numerous isotope studies using to determine groundwater flow rates in regional confined aquifers and the source of anomalous groundwater quality conditions and dissolved gas concentrations near a large heavy oil recovery operation using assessment of δ<sup>18</sup>O, δ<sup>2</sup>H, δ<sup>34</sup>S, δ<sup>11</sup>B and δ<sup>13</sup>C and Tritium and Carbon-14 for groundwater age-dating.
- Tritium age dating of groundwater in Norman Wells, NWT to determine vertical groundwater flow characteristics in discontinuous permafrost environment
- Development and implementation of a site characterization program at a former refinery and battery (circa 1930s) located approximately 160 km south of the Arctic Circle. Responsibilities included the design and installation of a monitoring network in discontinuous permafrost, and assistance in development of assessment programs to generate Tier II criteria in support of a human health and ecological risk assessment.
- Support for re-licensing of supply wells for oilfield injection using Alberta Environment "Water Conservation and Allocation Guideline for Oilfield Injection" and "Groundwater Evaluation Guideline." Responsibilities included, completion of field-verified surveys, review of site geological conditions, acquisition and interpretation of aquifer test data, assessment of groundwater/surface water interaction, and determination of long-term sustainable yield using analytical solutions
- Hydrogeological lead for a large oil sands mine EIA (Kearl Oil Sands Mine Project). Responsibilities
  include evaluation and interpretation of water well information and chemical data, defining
  Quaternary stratigraphy, temporal water level assessment to determine potential impact to regional
  groundwater quality and quantity arising from mine development and dewatering, and support at
  Joint Panel hearing.
- Cold Lake area monitoring program (Arsenic Investigation 30 private residents). Responsibilities
  included interviews with well-owners, assessment of the water delivery system, sample collection
  using ultra-clean sampling methods, review of the data, and communication of results to client, well
  owner and Alberta Environment
- Completion of an environmental liability assessment and costing exercise in support of the sale of the Judy Creek field to PenGrowth Corp. to statistically sample a sufficient number of facilities to generate realistic liability cost for property transfer. Responsibilities included completion of Phase 1 audits of production facilities and supporting infrastructure (i.e. wellheads, pipelines, satellites, and batteries), design and implementation of winter field program to sample facilities to generate realistic liability cost for property transfer
- Conceptual model design for dewatering scheme in support of mine development. Responsibilities
  included assessment of geological conditions, boundary assessment, parameter selection and
  optimization, and assessment of model results

- Completion of a groundwater modelling study to determine the sustainable yield of a major deep freshwater aquifer in the Cold Lake area. Responsibilities included the provision of hydrogeological support for model conceptualization and design, input parameter selection, and evaluation and communication of results
- Development and implementation of a regional groundwater quality monitoring network covering an area of 1,200 km<sup>2</sup>. Responsibilities included, regular interaction with environmental regulatory agencies and the local landowners, installation, testing and sampling of deep (up to 230 m) monitoring wells to assess potential impact to confined aquifers due to production well casing failures, design, implementation and interpretation of aquifer tests in support of groundwater remediation programs, and development of cost effective approaches towards restoring water quality conditions in deep aquifers influenced by heavy hydrocarbons and associated production fluids.
- Preparation of an AB environment approved Incident Response Plan to deal with groundwater quality issues identified during routine monitoring activities at a large heavy oil recovery scheme. Responsibilities included design of a cost-effective sampling schedule including rationalization of a 200 well monitoring network to provide a meaningful network of approx. 100 wells, and development of statistical limits for response and mitigation actions.

### Japan Canada Oil Sands (JACOS)

Execution of hydrogeological section of an expansion EIA for the Hangingstone Thermal In Situ Oil Sands project. Responsibilities included development of baseline hydrogeology, EIA sections, and SIR responses, liaison with project team and governing agencies, and stakeholder consultation with First Nations and 3PC.

Also, completion of a water supply project in support of a heavy oil recovery scheme using Alberta Environment "Water Conservation and Allocation Guideline for Oilfield Injection" and "Groundwater Evaluation Guideline." Responsibilities included assessment of geophysical logs and EM survey results, design and implementation of field programs, step rate test and constant rate test data acquisition and analysis, well screen selection and well design, well efficiency assessment, and use of pertinent analytical equations to predict effect of long-term pumping.

#### Mobil Oil Canada

Completion of a stable isotope study to determine the source of sulphate impact from a large sour gas processing facility. Responsibilities included, drilling and installation of monitoring wells, development of a conceptual site model, review of site-wide geochemistry (soil and groundwater), and application of  $\delta^{34}$ S,  $\delta^{18}$ O,  $\delta^{2}$ H, and  $\delta^{13}$ C isotopes to resolve natural versus anthropogenic influences.

### **Nexen ULC**

Development of a water strategy to service the Aurora LNG project/Dilly Creek asset. Responsibilities included assessment of development trajectory with respect to water use, identification of feasible water supply source to accommodate up to 6.5 million m<sup>3</sup> per year of water, conceptualization of water storage strategy to reduce pressure on local water sources and minimize physical footprint of development, development of a water conveyance strategy utilizing existing rights of way, including Class 5 cost estimation, and liaison with Fort Nelson first Nations to facilitate development of baseline hydrology monitoring program and facilitation of a Section 10 water licence (following successful EAB appeal of previous licence).

Also, the design and completion of bench-scale testing to determine the mobilization of metals and trace elements under applied heating. Responsibilities included conceptual design of experimental process in

collaboration with AGAT lab representatives, assessment of frozen core samples and selection of appropriate intervals for physical (grain size, mineralogy via XRD) and chemical testing (total metals, leachable metals), assessment of results from sequential batch heating experiments extending from 5-100°C for metals species released to solution, geochemical modelling of kinetic experiment results to determine activation energies of metals release, completion of attenuation experiments to determine potential for mobilized metals to re-associated with sediments under cooled conditions, and preparation of suitable documentation to present to the client and AER.

#### **Pembina Pipeline Corporation**

Provision of expert legal support to review source and cause of industrial chemical contamination at an operating gas plant. Responsibilities included review of existing site investigations, procedures, and documentation, assessment of efficacy of investigations and protocols (field and laboratory), development of conceptual model to explain presence and movement of sulfolane in bedrock deposits, and review of risk assessment findings and provision of recommendations to close data and information gaps.

#### Petro-Canada

Various projects include:

- Completion of detailed regional and local baseline studies, and cumulative impact assessment, to establish regional and local hydrogeological and geochemical characteristics in support of a 30,000 bbl/d heavy oil recovery expansion (MacKay River Project). Responsibilities included defining Quaternary stratigraphy, temporal water level assessment to determine potential impact to regional groundwater quality and quantity arising from bitumen recovery operations, development of a numerical groundwater model to assess long-term effects of water withdrawal and waste disposal to support project activities, and completion of climate change assessment formed part of the assessment for project design.
- Conceptualization and design of field program to assess water supply and water disposal for two
  major heavy oil projects (>30,000 bbl/d). Responsibilities included selection of drilling locations
  based on geophysical reconnaissance, implementation of field programs, step rate test and constant
  rate test data acquisition and analysis, well efficiency assessment, well screen selection and well
  design, and use of pertinent analytical equations.
- Review of fresh groundwater use for a water flood project. Responsibilities included interpretation of historical monitoring well data to determine the effects of the groundwater withdrawal from the local aquifer.
- Assessment of long-term effects of industrial water supply wells used for a water flood scheme. Responsibilities included a review groundwater chemistry and well hydraulic data to determination sustainable production rates.
- Completion of an environmental operations audit and subsequent industrial landfill delineation to determine the source area of possible groundwater contamination. Responsibilities included completion of a comprehensive intrusive landfill delineation and soil sampling program to determine the extent and volume of landfill contamination.
- Completion of an industrial landfill delineation project to determine possible sources of groundwater contamination. Responsibilities included completion of a magnetometer survey, follow-up excavation and soil sampling near a decommissioned landfill to determine the presence, extent and volume of residual landfill material.

## Procor

Review of operational history of a salt cavern storage facility including an assessment of groundwater quality near the large brine storage ponds and the potential for impact to the Regina Aquifer.

## **Shell Canada**

Various projects include:

- Completion of watershed analysis and intake siting in support of a Water Act Application on Iosegun Lake. Responsibilities included assessment of Iosegun Lake watershed and water supply potential, water supply modelling to determine availability and reliability of supply, review of historical flow data and determination of suitable IFN at outlet (i.e. Q80), review of terrestrial, fisheries and water quality data to support water diversion strategy, development of proposed monitoring and response plan, and liaison with AEP and AER representatives.
- Hydrogeological support for Jackpine Mine Expansion EIA
- Development of Groundwater Management Plan and annual monitoring support at Shell's Muskeg River Mine. Responsibilities included review of site-wide groundwater monitoring network for applicability to EPEA Approval requirements (including gap analysis, routine monitoring and reporting per EPEA requirements, selection of indicator suites to facilitate routine monitoring, evaluation, and reporting, identification of locations with water quality concerns, development of approach to statically assessing and responding to data excursions and trends, and preparation of the GMP for consideration and acceptance by AEP.
- Support for Carmon Creek EIA and assessment of brackish water supply potential in support of heavy oil operations in the Peace River area. Responsibilities included assessment of baseline hydrogeological conditions and potential impacts from project development, preparation of climate change assessment for project development, support for SIR submissions and EIA team interactions, feasibility assessment of potential for deep formations to produce sustained supplies and conceptual well-field development, and liaison with regulatory agencies
- Development of a regional-scale ground water monitoring network in a multi-layer aquifer system in the Peace River region of Alberta. Responsibilities included assessment of Quaternary stratigraphy, interpretation of seismic line data, geophysical borehole log analysis, and geochemical facies mapping and solution chemistry analysis.
- Assistance with the development and construction of an induced infiltration groundwater supply system for the Shell Caroline Gas Plant industrial water supply project. Responsibilities included drilling and installation of large diameter water production wells, borehole geophysical logging and interpretation. sand quantification testing and analyses to determine sediment production volumes prior to pipeline construction, and liaison with client and local landowners.

### **Suncor Energy**

Various projects include:

Lead subsurface specialist for a multi-criteria decision analysis and life-cycle value analysis in support of a regional brine management strategy in the Athabasca Oil Sands area. Responsibilities included development of a holistic weighting and ranking approach to address triple-bottom-line assessment of treatment and disposal options for liquid and solid waste streams originating from oil sands mining and in situ assets located across a 30 000 km<sup>2</sup> area, facilitation of, and participation in, workshops to assess viable options for treatment and disposal including Class 4 costing, and

development of a constraints mapping approach (vulnerability, risks and opportunities) using ArcGIS to assist in management and disposal options for liquid and solids waste streams.

- Development of an Athabasca River reconnaissance program to identify and sample natural groundwater-surface water interaction zones discharging waters from the Cretaceous and Devonian formations. Responsibilities included planning/execution and interpretation of a marine-based geophysical program using EM31 imaging and bathymetric readings, development of pore water sampling program including geochemical assessment of waters and source fingerprinting (major ion, trace element, dissolved organics, and stable and radiogenic isotopes), interpretation of results and presentation at various venues (government, industry.
- D51 disposal monitoring at the Firebag Thermal In Situ Project
- Thermal mobilization assessments (Firebag, Lewis, Meadow Creek)
- Development of brine water management strategy including options analysis and Class 4 costing
- Preparation of an oil sands mining closure strategy outlining goals, objectives, tasks, timelines, and consulting and research agencies to execute in support of Life of Mine Closure and Reclamation process
- Assistance with Fort Hills Operational Plan regarding preservation of McClelland Lake and wetland complex; review of physical hydrogeology and geochemical setting; assessment of numerical model design and output; review of cut-of wall design and mitigation system; review of adaptive management processes
- Review of Devonian McMurray interactions at the North Steepbank mine expansion and assistance with investigation program design (including geochemical assessment)
- Completion of geophysical and porewater surveys on the Athabasca and Steepbank Rivers to determine contributions of natural discharge versus industry inputs
- Review of existing water supply for Steepbank and Millennium mine operations and development of contingency supply options. Responsibilities included review of past water resource evaluations, development of geophysical investigation program and interpretation of results, assessment of contingency water supply (groundwater and operations water), client consultation and liaison with Alberta Environment, and implementation of horizontal well technology to provide a secure supply of water for continued operations
- Groundwater age-dating and source area identification in support of active tailings pond seepage investigations. Responsibilities included conceptual site model design, review of traditional geochemistry to determine end-point water types, and application of Tritium, δ<sup>18</sup>O, δ<sup>2</sup>H, δ<sup>34</sup>S, δ<sup>11</sup>B to resolve geochemical setting and potential areas of seepage
- Preparation of an AB Environment approved Groundwater Management Plan at a large oil sands mining operation. Activities included, the design of a cost-effective sampling schedule including rationalization of over 300 wells to establish a meaningful monitoring network of 150 wells, development of statistically established trigger values for response and mitigation, and lliaison with Government of Alberta during review and approval.

### Syncrude Canada

Participation on expert hydrogeology panel to review Devonian investigation program for Aurora mine and assess mitigation strategies to control high risk areas (Les Gray - UBC, Carl Mendoza, - UofA, Ken Baxter - Golder, Jon Fennell - WP). Responsibilities included review of existing baseline data for active mining site, identification of high-risk areas to consider for future investigation and monitoring, participation in group workshop settings to communicate findings and accumulate input for

recommendations refinement, and participation in internal panel meetings to discuss concepts and develop final recommendations.

## **Teck Resources Limited**

Evaluation of stream response to groundwater interception in support of fisheries habitat offsetting at Line Creek Mine, BC. Responsibilities included baseline reconnaissance of Line Creek alluvial system and GW-SW water interactions with Line Creek, assessment of area springs, shallow groundwater, and creeks to determine geochemical quality and flow conditions (using drive point well technology and data logger systems), completion of ground penetrating radar survey to map thickness and morphology of alluvial deposits, water quality fingerprinting using major ion, trace elements (in particular selenium) and stable isotopes to determine interaction of groundwater environment with Line Creek, and assessment of selenium mobilization conditions related to active mine workings and development of a conceptual (passive) mitigation strategy to offset impacts to fisheries habitat.

### Total E&P

Support for Joslyn North Mine EIA submission and development of a mine dewatering strategy for. Responsibilities included development of baseline hydrogeology, EIA sections and SIR responses, liaison with project team and governing agencies, joint Panel hearing support.

Also, selection and phasing of depressurization wells and associated monitoring wells, review of deep well injection potential, including geochemical compatibilities of waters, development of a performance monitoring system, selection of pipeline route, and preparation of a design-based memorandum with related costs (Class 3) of implementation and long-term operation.

#### Various Gas Plants, Batteries and Refineries (Alberta, British Columbia, Saskatchewan)

Completion of piezometer network design at numerous operating facilities to assess the potential impact to local groundwater quality resulting from industrial activities and extent of contaminant migration from known source areas (Imperial Oil, Shell, Mobil, Canadian Occidental); and, provision of hydrogeological services in support of a gas plant decommissioning (ongoing). Responsibilities include, well installation, testing and sampling, involvement in a site-specific risk assessment (ecological and human health), development of sampling protocols, and assessment of cost-effective remediation techniques to address various contaminant situations in both soil and groundwater.

### Various Oil and Gas Facilities (Alberta, Saskatchewan)

Completion of environmental operations audits and development of waste management plans for numerous operating oil and gas facilities (Amoco, Petro-Canada, Shell). Responsibilities included review of historical operations files (spill reports, waste handling procedures, EUB and AENV records), completion of site inspections and interviews, and historical air photo analysis and interpretation.

# **EDUCATION**

Ph.D. (Geochemistry) - University of Calgary, 2008

M.Sc. (Physical Hydrogeology and Isotope Geochemistry) - University of Calgary, 1994

B.Sc. (Geology: hard rock, sedimentology, mineralogy, structural, geochemical) – University of Saskatchewan, Saskatoon, 1985

# **REGISTRATIONS & AFFILIATIONS**

APEGA (P.Geol. - Alberta)

EGBC (P.Geo. - British Columbia)

APEGS (P.Geo. P.Eng. - Saskatchewan)

NAPEG (P.Geol. – Northwest Territories and Nunavut)

National Ground Water Association (NGWA)

International Association of Hydrogeologists

Canadian Water Resources Association (CWRA)

Sustainable Energy Development Program (Univ. of Calgary) – External Advisory Board – 2017 to present

Bow River Basin Council (Calgary), Board of Directors (2008-2013), Chair of Monitoring and Modelling committee (2008 to 2012), Member of Legislation and Policy Committee (2006-2011), Member of Integrated Watershed Management Group (2007 to 2010)

# SPECIFIC TECHNICAL EXPERTISE

- ICP-MS, GC-MS, Ion chromatography (LC-MS, HPLC, IC)
- SEM, XRD (bulk and clays), XRF, EDS and Synchrotron Light (XANES, and EXAFS)
- Isotope ratio mass spectrometry (IRMS)
- Solid-phase extraction, Alumina fraction, and sequential soil extraction
- Toxicity identification evaluation for metals and organics
- Selection of appropriate inorganic or organic analytical techniques based on Standard Methods for Water and Wastewater
- Statistical analysis (e.g. population testing, trend analysis, control charting, PCA, HCA, spatial analysis)
- Multi-criteria decision analysis (MCDA)
- Vulnerability and risk mapping
- Risk assessment (human and ecological)
- Climate tele-connections assessment, climate model analysis and impact identification, development of adaptation strategies

# PUBLICATIONS

**Fennell J.** and Aciszewski T (2019). Current knowledge of seepage from oil sands tailings ponds and its environmental influence in northeastern Alberta. Science of the Total Environment, 686, p. 968-985.

Birks S.J., **Fennell J.W.**, Gibson J.J., Yi. Y., Moncur M.C., and Brewster M. 2019. Using regional datasets of isotope geochemistry to resolve complex groundwater flow and formation connectivity in northeastern Alberta, Canada. Applied Geochemistry, 101 (2019), p. 140-159.

Hatala R., **Fennell J.**, and Gurba G. 2018. Advances in the realm of Hydrogeophysics: The emerging role of Quantum Geoelectrophysics in Aquifer Exploration. Can. Soc. of Expl. Geoph., RECORDER October Focus - Hydrogeophysics: the Past, Present, and Future. Vo. 43, No. 6, p. 32-36.

# F-1 - Attachment E Page 208 of 252

Birks S.J., Moncur M.C., Gibson J.J., Yi Y., **Fennell J.**, and Taylor E.B. 2018. Origin and hydrogeological setting of saline groundwater discharges to the Athabasca River: Characterization of the hyporheic zone. Applied Geochem., 98, p. 172-190.

**Fennell J.**, 2018. Predictions, perceptions and the precautionary principle: responding to climate change in a realm of uncertainty. Canadian Water Resources Association, Water News, Fall/Winter 2018. Vo. 37, No. 2, p. 6-9.

**Fennell J.,** 2018. Water, Peace, and Global Security: Canada's Place in the World We Want (Sandford and Smakhtin, eds.), Groundwater and Canada's Future – Moving data and information to knowledge and security. Prepared for the United Nations University, Institute for Environment, Water and Health, 17 pp.

**Fennell J.** 2018. Poison Well: Chasing arsenic in Alberta's groundwater. Water Canada, January/February 2018, p. 20-21.

**Fennell J.** 2017. Let's make a deal: Canada's vital role in the Columbia River Treaty. Water Canada, September/October 2017. p. 42-43.

Faramarzi M., K. Abbaspour, V. Adamowicz, W. Lu, **J. Fennell**, A. Zehnder and G. Goss 2017. Uncertainty based assessment of dynamic freshwater scarcity in semi-arid watershed of Alberta, Canada. *Journal of Hydrology: Regional Studies*, 9, p. 48-68.

**Fennell J.** 2015. Disposal in the unconventional oil and gas sector: Challenges and solutions. American Assoc. of Petroleum Geologists, *Environmental Geosciences*, Vol. 22, No. 04, December 2015, p. 127-138.

**Fennell J.** and O. Keilbasinki 2014. Water, food, and our climate: Is California a harbinger of things to come? *WaterCanada*, July/August 2015, p. 24-25.

**Fennell J.** and O. Keilbasinki 2014. Water without Borders: What is Canada's role in water security? *WaterCanada*, November/December 2014, p. 50-51.

Gibson J.J., **J. Fennell**, S.J. Birks, Y. Yi, M. Moncur, B. Hansen and S. Jasechko 2013. Evidence of discharging saline formation water to the Athabasca River in the northern Athabasca oil sands region. *Canadian Journal of Earth Sciences*, 50, p. 1244 - 1257.

M.S. Ross, A.S. Santos Pereira, **J. Fennell**, M. Davies, J. Johnson, L. Sliva, and J.W. Martin 2012. Quantitative and Qualitative Analysis of Naphthenic Acids in Natural Waters Surrounding the Canadian Oil Sands Industry. *Environmental Science and Technology*, 46, p. 12796 – 12805.

**Fennell J.** 2011. Total Water Management – a new and necessary paradigm. Environmental Science and Engineering Magazine, May/June edition.

**Fennell J.**, Klebek M. and Forrest F. 2011. An approach to managing cumulative effects to groundwater resources in the Alberta Oil Sands. World Heavy Oil Congress proceedings, March 2011.

**Fennell J.** 2010. Protecting water supplies in CSG development. *Water Engineering Australia*, Vo. 4, No. 6, September 2010.

**Fennell J.** 2008. Effects of Aquifer Heating on Groundwater Chemistry with a Review of Arsenic and its Mobility. Ph.D. thesis, Department of Geoscience, University of Calgary.

**Fennell J.** Zawadzki A. and Cadman C. 2006. Influence of natural vs. anthropogenic stresses on water resource sustainability: a case study. *Water Science and Technology*. Volume 53, No. 10, p 21-27.

William L.B., M.E. Wieser, **J. Fennell**, I. Hutcheon, and R.L. Hervig 2001. Application of boron isotopes to the understanding of fluid-rock interactions in a hydrothermally stimulated oil reservoir in the Alberta Basin, Canada. *Geofluids*, Vol. 1, p. 229-240.

Kellett R., J. Fennell, A. Glatiotis, W. MacLeod, and C. Watson 1999. An Integrated Approach to Site Investigations in Permafrost Regions: Geophysics, Soils, Groundwater, and Geographical Information Systems. ARCSACC Conference, Edmonton '99.

Gilson E.W., R. Kellett, **J. Fennell**, P. Bauman, and C. Sikstrom 1998. High Resolution Reflection Seismic and Resistivity Imaging of Deep Regional Aquifers for Stratigraphic Mapping. CSEG Conference.

**Fennell J.** and Bentley L. 1997. Distribution of Sulphate and Organic Carbon in a Prairie Till Setting: Natural versus Industrial Sources. *Water Resources Research*, Vol. 34, No. 7, p. 1781-1794.

**Fennell J.** and Sevigny J. 1997. Effects of Acid Conditions on Element Distribution Beneath a Sulphur Base Pad (Acid Mobilization Study). Publication submitted to the Canadian Association of Petroleum Producers (CAPP).

**Fennell J.** 1994. Source and Distribution of Sulphate and Associated Organics at a Sour Gas Plant in Southern Alberta. M.Sc. thesis, Department of Geology and Geophysics, University of Calgary. Hayes B., J. Christopher, L. Rosenthal, G. Los, B. McKercher, D. Minken, Y. Tremblay, and

**J. Fennell** 1994. Atlas of the Western Canadian Sedimentary Basin – Chapter 19: Cretaceous Manville Group. Canadian Society of Petroleum Geologists and Alberta Research Council, ISBN 0-920230-53-9.

# **PRESENTATIONS & LECTURES**

Bow River Basin Council – Technical Series, May 2021, online: Flooding, climate change and the need for a precautionary approach.

Bow River Basin Council – Legislation and Policy Group seminar, April 2021, online: Gravel mining – the physics, chemistry, and risks you need to know.

COSIA Oil Sands Innovation Summit, June 2019 Calgary AB: Fact or fiction – the truth regarding tailings pond seepage in Canada's oil sands (response to a Free Trade Agreement challenge),

CWRA Alberta Branch conference, April 2019 Red Deer: Flooding, climate change, and the need for a precautionary approach.

University of Calgary, Sustainable Energy Development Program. February 2019, Decision support processes and tools in sustainable energy development projects.

Mine Water Solutions, June 2018. Total Water Management: Canada's contribution to sustainable mine development.

Canadian Water Resources Association, April 2018, Red Deer, AB. Arsenic and Alberta's Groundwater: the where and why.

Southern Alberta Institute of Technology (water Initiative), February 2018, Calgary AB. Risky business: understanding Alberta water security

Canadian Society of Unconventional Resources (CSUR), January 2018, Calgary AB. Managing through nature's extremes: ensuring water security for successful UCOG operations.

SEAWA, Nov 2017, Medicine Hat AB. Hydrology of riparian areas: the need for protection and preservation.

CWRA National Conference, June 2017, Lethbridge AB. Climate change, the Columbia River Treaty, and considerations for a successful re-negotiation.

Thermal mobilizations and the regulatory response, May 2017, Calgary AB. CHOA forum.

National Ground Water Association, March 2017, Denver CO. Advances in the realm of hydrogeophysics: the role of Quantum Geoelectrophysics in groundwater exploration

Haskayne School of Business IRIS series, Feb 2017. Following the molecules: the importance of water to Canada's future.

BRBC-CEAC, Feb 2017, Cochrane AB, GW-SW interaction and the implication for development in riparian lands.

Watertech, April 2017, Banff AB. Arsenic in Alberta's Groundwater: the where and why; Isotopes and Geochemistry:

National Ground Water Association, Hydrogeophysics for deep groundwater exploration, March 2017, Denver CO. Advances in the realm of Hydrogeophysics: the role of Quantum Geoelectrophysics in Groundwater Exploration

Haskayne School of Business CPC IRIS seminar series, February 2017, Calgary AB. Following the molecules: the importance of water in Canada's future.

Bow River Basin Council/Cochrane Environmental Action Committee Collaborating for Healthy Riparian Lands Engagement Workshop, February 2017, Cochrane AB. Groundwater-Surface water interaction and the implications of human development in riparian lands.

Watertech, April 2016, Banff AB. Predicting Alberta's Groundwater Future & An Integrated Approach to Resolving Complex Hydrogeological Settings.

Canadian Water Resources Association (CWRA), April 2016, Edmonton AB. Natural discharge and its role in Athabasca River water quality.

Canada's Oil Sands Innovation Alliance (COSIA) Water Forum, March 2016, Calgary AB. Natural discharge and its role in Athabasca River water quality.

Canadian Association of Petroleum Geologists (CSPG), March 2016, Calgary AB. Climate, water availability, and the success of Western Canada's Energy Development & Natural discharge and its role in Athabasca River water quality.

Underground Injection Control (GWPC), February 2016, Denver CO. Disposal in the unconventional oil and gas sector: challenges and solutions.

AGAT Environmental Series, Jan/Feb 2016. Calgary and Edmonton, AB. Climate, water availability and the success of Western Canada's energy industry.

International Water Conference, November 2015, Orlando FL. Disposal in the unconventional oil and gas sector: challenges and solutions.

Chemistry Industry Association of Canada, October 2015, Edmonton AB. Water Sustainability: and its importance to successful industry.

EnviroAnalysis, July 2015, Banff AB. Thermal mobilization and Arsenic: implication for the oil sands.

WaterTech, April 2015, Kananaskis AB. Smart Monitoring to address challenges of Unconventional Gas development and an approach to mapping risk related to thermal mobilization of constituents.

Canadian Water Resources Association, April 2015, Red Deer AB. Water, Energy and Canada's Future (keynote address)

Underground Injection Council, February 2015, Austin TX. Monitoring to address challenges of Unconventional Gas development (invited speaker)

National Ground Water Association, Groundwater monitoring for Shale Gas developments workshop, November 2014, Pittsburgh PA. Smart monitoring to address the challenges of Unconventional Gas Development (invited speaker)

Canadian Water Resources Association, June 2014, Hamilton ON. Water disposal in the Oil Sands: challenges and solutions and What is Water Security and Why is it Important.

Water Management in Mining, May 2014, Vancouver BC. Total Water Management: a necessary paradigm for sustainable mining.

CSPG GeoConvention May 2014, Calgary AB. Water disposal in the Oil Sands: challenges and solutions; Placing the risk of thermal mobilization into perspective; What is Water Security and Why is it Important?

WaterTech, April 2014, Banff AB. Water disposal in the Oil Sands: challenges and solutions and Placing the risk of thermal mobilization into perspective.

Canada's Oil Sand Innovation Alliance (COSIA), March 2014, Edmonton AB. Water disposal in the Oil Sands: challenges and solutions and Placing the risk of thermal mobilization into perspective.

International Assoc. of Hydrogeologists, GeoMontreal 2013, October 2013, Montreal QC. The role of subsurface heating in trace element mobility.

Oil Sands Heavy Oil Technology 2013, July 2013, Calgary AB. The role of subsurface heating in trace element mobility.

Watertech, April 2013, Banff AB. The role of subsurface heating in trace element mobility.

International Assoc. of Hydrogeologists World Congress 2012, September 2012, Niagara ON. Session Chair for Hydrogeological Issues in the Oil Sands and presenter: i) Oil Sands overview – economic and environmental setting; ii) Framing groundwater vulnerability in the oil sands: an approach to identify and discern; and iii) Climate: a driving force affecting water security in the oil sands

Water in Mining 2012, June 2012, Santiago Chile. Total Water Management: a necessary paradigm for sustainability.

BCWWA 2012 Annual Conference, April 2012, Penticton BC. The role of inventory, dynamics, and risk analysis in water management: a case study.

WaterTech, April 2012, Banff AB. Plenary Session. Bringing context to the oil sands debate: understanding the role of nature and its environmental effects.

BCWWA Hydraulic Fracturing Workshop, Fort St. John BC, March 2012. Keynote address: Striking a Balance – water resource management versus economic development (keynote address).

CONRAD 2012, March 2011, Edmonton AB. Bringing context to the oil sands debate: understanding the role of nature and its environmental effects.

Alberta Irrigation Projects Assoc., November 2011, Lethbridge AB. Managing what we have: a review of Alberta's water sources, volumes and trends (invited speaker).

Alberta Innovates Technology Talks, November 2011, Calgary AB. Dynamics of Alberta's Water Supply: a review of supplies, trends and risks.

Red Deer River Watershed Alliance Annual General Meeting, October 2011, Red Deer AB. Water in the Red Deer: volumes, patterns, trends and threats.

Land and Water Summit, October 2011, Calgary AB. Total Water Management: a necessary paradigm for water security.

CEMA Groundwater Working Group, June 2011, Fort McMurray AB. Groundwater in the oil sands: facts, concepts and management processes.

CWRA Alberta / Alberta Low Impact Development Annual Conference, April 2011, Red Deer AB. A Review of Alberta's Water Supply and trends.

WaterTech, April 2011, Banff AB. Managing what we have: a review of Alberta's water supply.

World Heavy Oil Congress 2011, March 2011, Edmonton, AB. An approach to managing cumulative effects to groundwater resources in the Alberta Oil Sands.

Engineers Australia, August 2010, Brisbane Qld. CSG development in Australia: an approach to assessing cumulative effects on groundwater (invited speaker).

Joint IAH/AIG meeting, July 2010, Melbourne Vic. Assessing the effects of coal seam gas development on water resources of the Great Artesian Basin (invited speaker).

18<sup>th</sup> Queensland Water Symposium, June 2010, Brisbane Qld. A cumulative effects approach to assessing effects from coal seam gas development on groundwater resources (invited speaker).

WaterTech, April 2010, Lake Louise AB. Regional Groundwater Monitoring Network Implementation: Northern Athabasca Oil Sands Region.

University of Calgary, December 2009, Calgary AB. What's happening to our water? A review of issues and dynamics.

CSPG Gussow Conference, October 2009, Canmore AB. Water sustainability in the Alberta Oil Sands: managing what we have (invited speaker).

Bow River Basin Council, Legislation and Policy Committee Groundwater Licensing Workshop, March 2009, Calgary AB. Groundwater: the hidden resource

BlueWater Sustainability Initiative, January 2009, Sarnia ON. Planning approaches and forensic tools for large-scale regional monitoring initiatives.

CWRA Technical luncheon session, October 2008, Calgary, AB. Water sustainability in a growing Alberta.

Bow River Basin Council, September 2008, Calgary AB. Basin Monitoring and Management Approaches.

IAH/CGS GeoEdmonton08, Edmonton AB. Coordinator and Chair of Groundwater Development Session.

North American Lake Management Society (NALMS) 2008, Lake Louise AB, Coordinator and Chair of Climate Change Effects to Lakes, Reservoirs and Watersheds section.

EcoNomics<sup>™</sup> Luncheon, May 2008, Calgary AB. Water Sustainability in the Hydrocarbon Industry.

WaterTech, April 2008, Lake Louise AB. Effects of climate and land cover changes on basin water balances.

CWRA Annual Conference, April 2008, Calgary AB. Role of climate change and land cover on water supply sustainability.

Bow River Basin Council, March 2007, Calgary AB. Forest Hydrology and the effects of Climate Change.

ALMS/CWRA, October 2006, Lethbridge AB. Reservoir Maintenance Workshop. Climate teleconnections and their effects on basin water supplies

Bow River Basin Council, June 2006, Calgary AB. Groundwater sustainability: the invisible resource (Climate change and basin sustainability)

Engineering Institute of Canada, May 2006, Ottawa ON. CCC2006 Land use and climate change effects at the basin scale.

International Water Association, Watershed and River Basin Management Specialists Group Conference, Calgary, AB, 2005. Basin Water Management Strategies.

Burgess Shale Geoscience Foundation, August 2004 and 2005, Field BC. Water in a Changing Climate: understanding and adapting.

C-CAIRNS, October 2005, Victoria BC, Climate and Fisheries Impacts, Uncertainty and Responses of Ecosystems and Communities, Effects of Climate and the PDO on Hydrology of a Major Alberta Watershed.

North American Lake Management Society, November 2004, Victoria BC. Climate Change and Effects on Water Resources.

Canadian Institute Conference, June 2004, Calgary AB. Water Management Strategies for the Oil and Gas Industry: The challenge and approach

Canadian Society of Petroleum Geologists, Gussow Conference, March 2004, Canmore AB. Understanding the Effects of Natural and Anthropogenic Forcings on Basin Water Resources.

Alberta Environment and EUB, April 2003, Elk Point AB. Climate and Land Use Change Effects on Basin Water Resources in the Lakeland Region - East-central Alberta.

Joint CGS/IAH Conference, June 2001, Calgary AB. A Multidisciplinary Approach to Resolving Complex Hydrogeologic Systems.

Aquatic Toxicity Workshop, October 1996, Calgary AB. Use of site characterization and contaminant situation ranking to focus a risk assessment evaluation at a decommissioned sour gas plant and associated landfill.

Joint GAC/MAC Conference, April 1995, Waterloo ON. Use of geochemical modelling and stable isotopes to determine the source of groundwater quality impacts near a sour gas processing facility.

Joint GAC/MAC Conference, Edmonton AB, 1994. Assessment of depression-focused recharge as a mechanism for variable groundwater and soil chemistry.

GasRep Conference, Calgary AB, 1994. Use of stable isotopes to determine the source of water quality impacts near a sour gas processing facility.

## **Caitlyn T. Anderson**

From: Sent: To: Subject: L. McCullough June 23, 2021 2:53 PM Legislative Services Shared [EXTERNAL] - RE: Burnco West Cochrane Gravel Pit Bylaw C-8073-2020

Do not open links or attachments unless sender and content are known.

## I'M STRONGLY OPPOSED TO POLLUTING BOW RIVER AND OUR DRINKING WATER.

As a new resident of Cochrane, I am learning more about how developing nearby gravel pits are being priortorized before people's health.

**WE CANNOT LIVE WITHOUT CLEAN WATER.** There is a real move now to protect Alberta's water ie. the halt of Grassi Mountain to foreign fuel interests and more to come. The writing is on the wall. It is time Rocky View County get in touch with what is paramount to human and animal health and a *fundamental human right: access to clean water*.

**CONCERN FOR CLEAN WATER SHOULD BE THE GUIDING PRINCIPLE for any and all economic activity anywhere**. Expansion of gravel pits in the area is NOT IN THE PUBLIC'S BEST INTEREST. It may benefit a few (jobs) but it will harm many (water-drinkers, animals, the environment.)

ALSO, I AM CONCERNED ABOUT PROTECTING BIG HILL SPRINGS PARK. If there must be expansion of a nearby gravel pit, it should be given a 5 km berth as recommended by environmental experts. Long-term impacts must be considered and decisions not be made piece-meal. It is not easy but it is necessary.

Thank you for taking this matter under serious consideration.

Signed,

A concerned citizen in Cochrane, AB.

F-1 - Attachment E Page 216 of 252

## **Michelle Mitton**

From: Sent: To: Subject: Aaron Hamilton June 14, 2021 10:04 AM Public Hearings Shared [EXTERNAL] - Bylaw C-8073-2020

Follow Up Flag: Flag Status:

Follow up Flagged

Do not open links or attachments unless sender and content are known.

Name: Mrs Aaron Hamilton Address: 175 Jumping Pound Terrace, Cochrane, AB T4C 0K5

Dear Council Members:

I am writing to oppose Bill C-8073-2020

Please do NOT proceed with another gravel pit!

Highway 1A is a beautiful highway used by families on their way to the mountains and Ghost Lake with recreation vehicles, boats, Trailers etc. Adding heavy equipment, extra traffic, dust, stone chips just makes for dangerous driving conditions for families.

The very close proximity of the gravel pit to the town of Cochrane is ridiculous! Strong westerly winds blow over Cochrane daily. The toxins and heavy medals stirred up by in the air and water by yet another gravel pit in the area is so unnecessary, not to mention the additional noise.

Please, please do NOT move this redundant gravel pit forward!

Aaron Hamilton

# **Caitlyn T. Anderson**

| From:    |
|----------|
| Sent:    |
| To:      |
| Subject: |

Rick Hayton June 22, 2021 3:26 PM Legislative Services Shared [EXTERNAL] - Comments to Burnco West Cochrane Gravel Pit Bylaw C-8073-2020

Do not open links or attachments unless sender and content are known.

Please find my comments below on the proposed Burnco West Cochrane Gravel Pit Bylaw C-8073-2020.

As a Cochrane resident, I am strongly opposed to the development of the Burnco West Cochrane Gravel Pit.

The potential for toxic ground water runoff into the Bow River from this site is not acceptable. Burnco's proposed setbacks from the Bow River will not prevent eventual leaching from the site into the river. Since Cochrane's water supply is obtained immediately downstream of this site, I do not believe development of this site as a large gravel operation is in the best interests of the Cochrane community.

The increase in activity (noise and dust) and truck traffic from this proposed gravel operation should not be allowed to develop on the edges of a growing metropolitan community. It is not in the best interests of Cochrane. It is bad enough that gravel operations are within the Town of Cochrane on the south side of the river. The dust and noise from this existing gravel operation are excessive and dangerous to health on windy days with dust blowing long distances from the actual operation of screening and stockpiling. Putting a large gravel operation up wind of Cochrane is just plain stupid and extremely bad regional planning.

Sincerely, Rick Hayton, Cochrane, Alberta

## **Michelle Mitton**

From: Sent: To: Subject: Robert Hamilton June 14, 2021 8:35 AM Public Hearings Shared [EXTERNAL] - Re: Bylaw C-8073-2020

Do not open links or attachments unless sender and content are known.

Name: Robert Hamilton Address: 175 Jumping Pound Terrace, Cochrane, AB T4C 0K5

Dear Council Members:

#### I am writing in opposition to the proposed rezoning.

I was shocked when you approved a gravel pit on the edge of Big Hills Springs provincial park. How could you even consider something like that? Now you are considering a much larger gravel pit on the edge of our town on the way to the Ghost Lake reservoir? How many of these gravel pits do we need in our one small county?

The dust and noise associated with a large gravel mining operation on the edge of our town will impact the quality of life for all residents of Cochrane but especially those with chronic breathing conditions. Coming so soon on the heels of a respiratory pandemic it's astonishing you would want to diminish air quality in any way.

In addition, any run-off from the gravel mining activity will impact water quality in the adjacent waterways. When combined with run-off from proposed coal mines the environmental impact will be significant for all Albertans.

The people of Rockey View County treasure fresh air, clean water and natural beauty. You were elected to protect our way of life and our environment. A gravel pit promotes none of those values. If you continue to approve gravel pits you will be failing in your duty.

For these reasons I strongly oppose the proposed rezoning and I urge you to do the same.

Robert Hamilton 175 Jumping Pound TC Cochrane AB T4C 0K5

# Burnco West Cochrane Gravel Pit Redesignation & Master Site Development Plan RVC Bylaw C-8073-2020 Submission prepared by: Rocky View Gravel Watch June 18, 2021

Rocky View Gravel Watch is opposed to Burnco's application to expand its existing gravel operations west of Cochrane south of Highway 1A from 151 acres to a total of 1,117 acres.

The primary reasons for our opposition to this application are:

- Serious concerns regarding the pit's impact on water quality in the local aquifers, the Bow River, and creeks that flow through the property. Recently performed tests have provided disturbing results that must be addressed.
- No justification has been provided to support the need to add such massive acreage to their existing gravel pit.
- No explanation has been provided to support their assertion that production from the site will increase four-fold once the pit is expanded.
- Serious impacts on significant wildlife corridors.
- Permanent disfiguring of a major tourism attraction in Rocky View the scenic views along Highway 1A between Cochrane and the Rockies.
- Inadequate reclamation plans.

Unlike earlier gravel pit applications that have been considered by Rocky View Council this term, the Burnco application has not provided any of its technical studies for review by the public. This makes an assessment of its application significantly more difficult, especially given that its MSDP is also much more vague on many critical issues relative to MSDPs provided with other gravel pit redesignation applications.

In itself, this shortcoming should be sufficient to require the tabling of this application until Burnco releases its technical studies and the public have had a meaningful opportunity to review them. Of all the gravel applications considered by this Council, Burnco is requesting that significantly more land to be redesignated than any of its competitors have done. As a result, it is only fair and appropriate to hold Burnco to at least the same standard of information sharing as has been provided in other gravel applications.

## Water Quality Concerns

Burnco is proposing to excavate gravel both above and below the water table. Its MSDP is extremely vague about specifics. This in itself should be completely unacceptable. It is not clear how Council can approve an application when such substantive information is not clearly evident in the applicant's submission.

In a separate submission, Dr. Jon Fennell is presenting the results of a soil column flushing experiment conducted with gravel from the existing Burnco West Cochrane gravel pit. The results from that experiment are disturbing in that they found levels of metals and trace elements above levels that are safe for freshwater aquatic life and for human drinking water. Many of these are toxins that accumulate in the body, rather than being flushed out over time.

The test Dr. Fennell performed mimics the effect of precipitation flowing through what is left after most of the gravel has been extracted from a site. This is the situation that will be present during excavation and quite possibly after reclamation.

Burnco has acknowledged that the bedrock in that area is fractured. As a result, whatever leaches through during and after gravel extraction will end up in the aquifer. This means that any contaminants will end up affecting drinking water for everyone who relies on groundwater wells and on water from the Bow River.

Burnco's technical studies supporting its application do not consider this issue. They have reported on pre-excavation groundwater quality. However, they have done no work to determine the impact their gravel extraction activities might have on that water quality. This is an unacceptable shortcoming.

Simply assuming there will not be a problem is not adequate. Burnco must be required to demonstrate that its proposed gravel extraction activities will not damage water quality before they can proceed.

## No Demonstrated Need for Pit Expansion

Burnco currently operates a 151-acre pit at its West Cochrane location. Since it opened in 2016, it has produced 125,000 tonnes of gravel per year. This leaves their existing pit with 14 – 15 years remaining reserves, at their current production rate.

Burnco also has over 3,200 acres of operating gravel pits elsewhere in Rocky View. Although they assert that some of these pits are "nearing depletion", they have provided no information on expected remaining reserves at any of their other four pits in Rocky View. Nor have they provided any information on possibilities for expanding any of those pits as an alternative to expanding its West Cochrane operations.

At Burnco's current production rate, the additional reserves at the West Cochrane location would increase the pit's lifespan to well over 100+ years. It is completely irresponsible to consider redesignating land to gravel production that may not be used for such purposes within the next century. This is particularly true given the current lack of any comprehensive policy approach to managing gravel resources within the County. Once such policy is in place, this may be an appropriate location to identify for future gravel extraction. However, until such a policy is in place, permanently redesignating almost 1,000 acres lacks any justification.

Given the water quality concerns raised above, Burnco's explanation for the need for this expansion is particularly worrisome. Burnco indicates that they are looking to this site to replace gravel washing operations they have undertaken at other locations to continue to provide itself with a vertically integrated source of supply for its asphalt and concrete operations in Calgary.

For starters, it is not Rocky View's responsibility to assist Burnco in maintaining its vertical integration. From Rocky View's perspective, the question is whether this is the highest and best use for this land, not whether Burnco can maintain its profitability more easily if this land is redesignated as it desires.

Even more importantly, gravel washing activities this close to the Bow River and on top of fractured bedrock will significantly increase the risks of contamination for critical water sources. Burnco does not appear to have provided any technical studies documenting the potential impacts from gravel washing at this location. Until they have demonstrated that this activity will not increase risks of water quality degradation, their application must not be approved.

# No Explanation for Assumed Four-fold Increase in Production Volumes

Burnco's MSDP assumes that once the additional 966 acres are redesignated, their production rate at the West Cochrane site will suddenly increase from 125,000 tonnes/year to 500,000 tonnes/year. There is no justification provided for this assertion. As a result, it appears to be, at best, an extremely optimistic hope.

The gravel market is highly competitive. According to Burnco's MSDP, its existing West Cochrane pit could be producing 500,000 tonnes/year but has not been doing so. It is difficult to imagine that if they could have sold an additional 375,000 tonnes/year, they would not have been doing so already.

Without any explanation for why they will be able to quadruple their production rate, there is no demonstrated need for such a massive expansion.

Even if there were an explanation, the proposed expansion would extend the pit's expected life to at least 30 years. It would be far more responsible to redesignate the land as it is needed within a 5 – 10-year timeframe, not a 30 - 100-year timeframe. How can any current council determine the highest and best use for land so far into the future?

## Significant Impacts on Wildlife Habitat and Corridors

Burnco's own MSDP identifies many species at risk that traditionally live in or near its proposed gravel pit expansion. This is not surprising given that the site stretches 6.5 kilometres along the Bow River.

The proposed mitigation measures are totally inadequate to protect the affected wildlife. The wording of Burnco's mitigation measures is full of "should" statements rather than concrete obligations. This makes them meaningless and unenforceable.

As an example, the location includes nesting sites for a number of migratory bird species. Burnco's mitigation measures state that if they find active nesting sites, "site-specific measures **should be** developed" (emphasis added) – that commits them to nothing.

It is also highly disturbing that Burnco's own description of its mitigation measures for riparian areas and wetlands states "if setbacks are adhered to" the mitigation measures should result in no residual impacts on the affected riparian areas and wetlands. This suggests that there is a real possibility that the setbacks will not be adhered to and that, if they are not, there will be permanent damage to these environmentally sensitive areas. Disturbingly, other mitigation measures include commitments to develop plans for activities that occur within setback areas. No explanation is provided for these apparently contradictory mitigation measures.

### Permanently disfiguring scenic tourist route

The drive through Rocky View County along Highway 1A to the Rockies is an extremely popular tourist route. Many people intentionally choose the slower, more scenic route along Highway 1A rather than the Trans-Canada Highway west from Calgary.

The proposed gravel expansion will permanently disfigure this major tourist attraction. Constructing 6.5 kilometres of berms along the south side of Highway 1A to obscure the presence of heavy industrial open pit mining will

transform a drive with breath-taking scenery to a drive during which one endures a heavy industrial corridor. Few tourists seek out heavy industrial "sites" as part of their vacation plans.

This disfigurement of the scenic corridor would be bad enough if Burnco was removing the berms once the gravel pit is finally reclaimed. However, they are proposing to leave the berms in place forever. As well as the serious negative impact this will have on one of the province's premier tourist routes, it also raises questions about the adequacy of their reclamation plans.

### Inadequate and/or ineffective reclamation plans

Gravel pit operations typically use berms as a convenient location to store topsoil, subsoil, and overburden so that it will be readily available for use during reclamation at the end of the pit's life. However, Burnco is proposing the retain the screening berms adjacent to Highway 1A permanently. Given this, how is Burnco going to fulfill its reclamation obligations?

Burnco's MSDP asserts that the screening berms will be "constructed with an overburden core". However, for these berms to be landscaped as described, they will need to have topsoil and subsoil as well – without those components, vegetation will not grow or survive.

Despite this basic plant science reality, the MSDP asserts that all topsoil and subsoil will be salvaged and used in reclamation. These statements in its MSDP simply do not fit together. They cannot both have used overburden and soil from the site to construct permanent berms and also use all soil in their reclamation activities.

Burnco is also proposing to maintain far greater disturbed areas as active gravel pit operations than has been proposed by other gravel applications in the County. They are proposing to have 70 acres on the west side of the pit and 51 acres on the east side of the pit as disturbed areas at any one time for a total of 121 acres. In contrast, other gravel operations have proposed active disturbed areas of only 40 acres at any one time. What justification is there for Burnco to be held to a lower standard for its reclamation obligations than its competitors? This is particularly critical given the environmentally sensitive nature of its location and the serious water quality concerns that have been raised.

### Conclusion

There is no justification for approving this application as submitted. Burnco's existing pit has 15 years remaining reserves at its current production rate. Until Burnco returns with a credible explanation for how it will maintain a quadrupling of its rate of production over the next thirty years, there is no need to redesignate any additional land to meet its production needs in the immediate future. Even if Burnco can realize these optimistic production levels, there is no need to redesignate enough land to provide 30 years of production. It would be far more responsible to redesignate land on an as-needed basis.

Before any further redesignation of land is appropriate at this location, Burnco also must demonstrate that the water quality concerns raised by Dr. Jon Fennell's study are false. Until they can do that, it is irresponsible to approve additional gravel pit operations in this location.

Burnco also needs to address the serious shortcomings in its mitigation measures that should be protecting the highly sensitive environment in which they propose to operate. The inconsistencies in their reclamation plans also must be resolved before any application is approved.

# **Caitlyn T. Anderson**

From: Sent: To: Subject: William McNabb June 23, 2021 1:30 PM Legislative Services Shared [EXTERNAL] - Bylaw C-8073-2020

Do not open links or attachments unless sender and content are known.

Name: William McNabb Address:31 Silver Ridge Rise Nw, Calgary AB T3B 4P6 - Have an option to develop W5M-4-26-8 Bylaw: C-8073-2020

To Rocky View Counsel

Concerning Bylaw C-8073-2020

A lot of things about this application scares me. The first is that this pit could be in the community for 120 years or more if approved as is. The approval needs to be for what can be used in ten years at current rates or max 160 additional acres connected to the current location.

The second is the dewatering of the pit. The pit was not supposed to be dewatered. But over ten years there has been efforts to change this scope through the operating agreement every 5 years that has no elected official on the board. This allows the operator to increase the scope of the operations without the public input that is required. This is ridiculous for planning and holding the surrounding land owner's captive to a temporary land usage that will outlast all living today.

The third is the environmental aspect of the pit. Burnco has chosen to put the plants for their operations on the east and west fence line of the pit. This will spread the contaminants onto the surrounding land owners. They have the land to put the operations where the dust and noise will mostly be on Burnco's land. Yet they have chosen to hurt the surrounding land owners by letting them be the buffers for Burnco's light, noise and dust contamination. This is unacceptable, especially when they have the land to do otherwise.

The fourth is the Health of the surrounding community. Burnco can limit exposure by putting the operations as far away from the city of Cochrane and neighbors as possible. They have chosen to put it as close as possible to the east and west boundaries. Exposure to dust is the cause of ailments that have long term effects. Reducing the exposure is a critical part of having the highest tax benefit with the lowest associated health costs that will occur with the pit. To do otherwise is fiscally and morally wrong.

It comes down to the "why" of this pit. Clearly more gravel is not needed at present, as the current pit still has 20 years of life. I would request that this not be approved until the current pit is used and then max 160 arces. A gravel policy needs to be in place to provide guidance for the residents of Rocky View. Why would people want to live out in Rocky View country when they are under constant threat of a gravel development next to them for 100+ years. With no way to protect their investment, their surrounding environment and their health.

#### ATTACHMENT 'E': PUBLIC SUBMISSIONS

# F-1 - Attachment E Page 226 of 252

Environment is critical. The current protocols allow for data gaps that are crucial for determining the real effect. If the current pit is approved, we want to see real time data from around the property monitored by a third party and complaints filed when they are putting contaminants on the surrounding properties.

Water is critical. If dewatering is taking place a monitor needs to be put in place on the wells within 1 mile of the Burnco pit. This is to allow us data to fight if we lose our water due to the pit and thus lose the agricultural base that has been the lifeblood for 150 years.

Thanks you, William GM McNabb PE P.Eng June , 2021

Legislative Services Rocky View County 262075 Rocky View Point Rocky View County, AB, T4A 0X2

#### Attention: Rocky View County Legislative Services

#### Subject: Letter of Support – Bylaw C-8073-2020

I am writing this letter in support of BURNCO Rock Product's Land Use Amendment Application – Bylaw C-8073-2020.

I currently work as a truck driver in the aggregate industry and I transport aggregate to and from BURNCO's numerous sites in Rocky View County. These aggregate sites allow for me to make a living in the community and are an essential part of continued sustainable development. BURNCO has shown through their current and past projects, that when projects are developed responsibly, they can create a beneficial relationship with the community and the residents that reside there.

It's due to BURNCO's track record in Rocky View County that I can support BURNCO and its application for expansion of the West Cochrane Gravel Pit.

Sincerely,

[Individual's Name] APVINDER GILL [Individual's Address] 164 WILLOWMERE WAY CHESTERMERE AB T1X0E2 June 22, 2021

Legislative Services Rocky View County 262075 Rocky View Point Rocky View County, AB, T4A 0X2

### Attention: Rocky View County Legislative Services

#### Subject: Letter of Support – Bylaw C-8073-2020

I am writing this letter in support of BURNCO Rock Product's Land Use Amendment Application – Bylaw C-8073-2020.

I currently work as a truck driver in the aggregate industry and I transport aggregate to and from BURNCO's numerous sites in Rocky View County. These aggregate sites allow for me to make a living in the community and are an essential part of continued sustainable development. BURNCO has shown through their current and past projects, that when projects are developed responsibly, they can create a beneficial relationship with the community and the residents that reside there.

It's due to BURNCO's track record in Rocky View County that I can support BURNCO and its application for expansion of the West Cochrane Gravel Pit.

Sincerely,

Beinder Brar 152 Willowmere Way Chesteremere, AB, T1X 0E2 June 16, 2021

Rocky View County

262075 Rocky View Point

Rocky View County, AB

T4A 0X2

Attention: Legislative Services (legislativeservices@rockyview.ca)

# Re: Burnco's West Cochrane Pit (By-Law C-8073-2020)

As the owner of NW and SW 31-26-3 W5M, Mountain Ash Limited Partnership supports the Master Site Development Plan and redesignation from Ranch and Farm District to Natural Resource Industrial District of Burnco's West Cochrane Pit.

Responsible aggregate resource extraction should be encouraged in this area to avoid sterilization of a valuable natural resource and ensure competitive aggregate pricing of aggregate requirements for the benefit of Rocky View County and local business.

Sincerely,

Mountain Ash Limited Partnership Bruce Waterman June 23, 2021

Legislative Services Rocky View County 262075 Rocky View Point Rocky View County, AB, T4A 0X2

#### Attention: Rocky View County Legislative Services

#### Subject: Letter of Support – Bylaw C-8073-2020

I am writing this letter in support of BURNCO Rock Product's Land Use Amendment Application – Bylaw C-8073-2020.

I am the current tenant of BURNCO's Carseland property, located in Wheatland County. Prior to BURNCO's development on this property, they leased the adjacent property from my family for a number of years. Throughout my experience with BURNCO, they have been courteous and professional in their dealings with me and have been very willing to remedy concerns that may arise. During the operation of their sites, they develop and follow excellent mitigation factors that significantly reduce the impacts of their operations. BURNCO strives to be a courteous neighbour in the community and I look forward to working with them in the future.

I believe that BURNCO will continue to follow these practices with their West Cochrane Gravel Pit and because of this I can support this application.

Sincerely,

Clarence Byma 225047 Highway 817, Wheatland County, Alberta, T1P 0S4



June 22, 2021

Legislative Services, Rocky View County, 262075 Rocky View Point, Rocky View County, AB, T4A 0X2

Sent via email to legislativeservices@rockyview.ca

Re: Proposed Amendments to Land Use Bylaw C-8000-2020

Volker Stevin Contracting is in support of the Proposed Amendments to Land Use Bylaw C-8000-2020. We work with Burnco on a regular basis and find that they are the standard that all gravel crushing operations should be held to. We have Burnco crush material in our pits yearly and we are also a partner in the Stoney Trail Aggregate Reserve (STAR) with them along with Lafarge.

After reviewing the Master Site Development Plan for the West Cochrane Gravel Pit it is clear that Burnco is committed to continue to be a great community partner to Rocky View County and an example for other gravel producers in Alberta.

Sincerely,

Corey Stasiuk GM Asphalt Plants Volker Stevin Contracting 7175 12 St SE Calgary, AB, T2H 2S6

> Box 5850 Stn A. Calgary, AB T2H 1Y3 7175 - 12<sup>th</sup> Street SE Calgary, AB T2H 2S6 Main Office: 403- 571-5800 Operations: 403-571-5806 Administration Fax: 403- 571-5851 Operations Fax: 403- 571-5850
#### <mark>June 22, 2021</mark>

Legislative Services Rocky View County 262075 Rocky View Point Rocky View County, AB, T4A 0X2

#### Attention: Rocky View County Legislative Services

#### Subject: Letter of Support – Bylaw C-8073-2020

I am writing this letter in support of BURNCO Rock Product's Land Use Amendment Application – Bylaw C-8073-2020.

I am the current tenant of BURNCO's Aldersyde property, located in Foothills County. Throughout my experience with BURNCO they have been courteous and professional in their dealings with me and have been very willing to remedy concerns that may arise. During operation of their sites, they develop and follow excellent mitigation factors that significantly reduce the impacts of their operations. BURNCO strives to be a courteous neighbour in the community and I look forward to working with them in the future.

I believe that BURNCO will continue to follow these practices with their West Cochrane Gravel Pit and because of this I can support this application.

Sincerely,

Darren Hansma



Hello, my name is David Dutchik.

I'm the owner of lands associated with those areas of the project west of Grand Valley Creek. And as the owner of these lands, I would like to express my support for the proposed gravel pit.

I've known BURNCO since 2011 when they started to get involved in the proposed gravel pit I had on NW13. Since then, they completed the permits for that site. They upgraded the intersection on the 1A. They built a large berm to hide the operation. They've done fencing and signs....They brought that concept into reality. They pay attention to things... to noise, dust and truck traffic. Their site is neat and orderly. BURNCO has always been courteous and professional.

In my opinion, they've done a good job with the existing site and I think they will do a good job with what they are proposing. They have expertise and they have been around long enough to give me confidence.

Change is constant and our Cochrane community is a prime example. The community continues to grow with developments and upgrades and this does not happen without the resources.

Finally, I've just finished building my dream house a half mile away from this project and I wouldn't have done that if I didn't think BURNCO would do a good job. Most importantly, my ranch has been in the family over 100 years and my son plans to make it longer. In no way would I jeopardize his future in agriculture.

Please support this project.

Thank you

I avid lutalik

David Dutchik

# **Caitlyn T. Anderson**

| From:    |  |
|----------|--|
| Sent:    |  |
| To:      |  |
| Subject: |  |

Erik Bakke June 15, 2021 5:25 PM Legislative Services Shared [EXTERNAL] - Burnco / Bylaw C-8073-2020

Do not open links or attachments unless sender and content are known.

To whom it may concern regarding Burnco proposed gravel pit west of Cochrane:

First, I've been a neighbour of Burnco for the past 6 years. Arguably, I am Burnco's closest residential neighbour, although 2 others likely tie for this (map and location can be viewed at your option, 15 Artists View Gate, Calgary, AB online).

I've provided commentary below in support of Burnco's development plans, categorized by "neighbour" and "operations".

First, Burnco is a good neighbour. How can an industrial neighbour be a good neighbour? They, and their employees, act like people who care about neighbourly relations and behave and follow through as such. Examples:

in 2017/18, ATCO refurbished their gas lines in our neighbourhood. They used the corner by our house as a "lay down area" for equipment. This turned it into a reasonably large gravel parking lot, which upon completion, and further prodding, they didn't do a great job remediating. The neighbourly concern was partly aesthetic, but also neighbourhood quality - it wasn't long until this gravel pad screamed "late night parking area" to all kids and others who want to park their cars and do... things... in their cars at night, including littering after the refuse of drinking, smoking, sex, etc.. The residential neighbours got together to plan to remediate it ourselves. We thought it was a long shot to reach out to Burnco, but they were helpful right away (they had experienced equipment theft from people using that same corner to access their lands). We had planned to chip in to get an appropriate amount of topsoil, more than the dusting ATCO did, some seed, and plans to take turns watering it until the seed took. Burnco provided both a loader to bring over a bucket of soil right away, plus a truck to deliver some in a few days time. One could easily expect a large industrial neighbour to just ignore inquiry, or say that's not something they can do. But their actions are neighbourly - just as easy as I could go to the garden shed to grab a spade to help a neighbour, their "garden shed" has larger implements that they are willing to dedicate a few minutes time with to help. That was their offer, not even our ask.

Secondly, their land is posted no trespassing. I respect this. At one point in 2019 our neighbour's (now gone, sadly) dog was in the habit of jailbreaking himself from their yard, then luring one of my dogs out for adventures. He was an Australian Shepard mix, and was both clever and felt he had a broader responsibility to patrol the neighbourhood. This caused me to one day walk over to Burnco through the no trespassing signs to find their security staff to ask if they've seen the adventuring dogs. I walked up to the station of a fellow, whom did ask me what I was doing there as his first question. I explained that I was a neighbour looking for two dogs on the lam, gave my address and phone number, etc. I could have just as easily been brushed off with comments like "our policy doesn't make exception for searching for dogs", "not my problem", etc. but even the security guard said "I think I can help", and "We'II keep an eye out". Think! How many times are you frustrated in life interacting with corporations or other bureaucracies where think is no part of the interaction - where it's defined by rules and procedure - when empowering an employee to think solves problems better while leading to better outcomes, even if they are "just" the security guard. This also stuck with me as a good neighbour concept, it's not just when you contact senior management, but their front line people as well. Good management and attitude have a way of trickling down.

#### ATTACHMENT 'E': PUBLIC SUBMISSIONS

# F-1 - Attachment E Page 235 of 252

It is clear these types of things are not their ongoing obligation, however my experience is simply that as a neighbour, one is greeted with dialogue and thoughtfulness rather than the typical corporate procedures and stonewalling, and it has been appreciated.

Secondly, on the subject of Operations, the 6 years I've been next to them, here are some day to day experiences: - I've never experienced dust

- I've not heard cement or gravel trucks coming or going.

- occasionally, and only if I'm outside and the wind is right, I hear what I have dubbed the "Fred Flintstone whistle" which I think is a shift change or such later in the afternoon, although I don't know for sure. It has never dawned on me whatsoever that this is even close to what a person would call a nuisance or be disturbed by.

Literally that's it.

I don't know if the standard of operation is the same or different from the gravel pit I live next to vs the one being proposed, but that can be ascertained by those in charge of the application. If it's the same, I attest as a neighbour that any future residential neighbours are extremely unlikely to be disappointed by having Burnco as a neighbour.

Submission by Erik Bakke 15 Artists View Gate, Calgary AB T3Z 3N4 June 21, 2021

Legislative Services Rocky View County 262075 Rocky View Point Rocky View County, AB, T4A 0X2

#### Attention: Rocky View County Legislative Services

#### Subject: Letter of Support - Bylaw C-8073-2020

I am writing this letter in support of BURNCO Rock Product's Land Use Amendment Application – Bylaw C-8073-2020.

I am the current tenant of BURNCO's Black Diamond property, located in Foothills County and have leased the same lands from them for 8 years. Throughout my experience with BURNCO they have been courteous and professional in their dealings with me and have been very willing to remedy concerns that may arise. During operation of their sites, they develop and follow excellent mitigation factors that significantly reduce the impacts of their operations. BURNCO strives to be a courteous neighbour in the community and I look forward to continue working with them in the future.

I believe that BURNCO will continue to follow these practices with their West Cochrane Gravel Pit and because of this I can support this application.

Sincerely,

Frank Thomson



RVC Public Hearing, BURNCO, July 6/21

Bylaw C - 8073-2020

File PL 20200066, et al

This letter is for All of Council, in support of the BURNCO APPLICATION, W of Cochrane.

I have lived next to BURNCO's Springbank pit for the past 42 years. They are stellar neighbours in that they use full dust control, and sound control. In addition, they clean along the eastern portion of Old Banff Coach Road of dropped gravel, which is their most used truck route.

In this new location, under application, I am impressed that:

they are working with the Stoney Nakoda Nation to identify archaeological sites such as tipi rings,

their disturbance is all outside the wetlands as per their Biophysical Site Assessment report,

they propose to spend \$1.5M to upgrade the current entry site, both for safety and in cooperation with Alberta Transportation,

and in cooperation with the Town of Cochrane they propose one of their first sites to be at the east end to finish that off earliest.

I take all these points from their submission and from exchanges with BURNCO; in order to point out that this level of thoroughness is typical of my experience with how BURNCO operates.

Respectfully, Gloria Wilkinson Springbank

#### OVER A CENTURY OF QUALITY AND SERVICE ATTACHMENT 'E': PUBLIC SUBMISSIONS

F-1 - Attachment E Page 238 of 252

**Legislative Services** 

**Rocky View County** 

262075 Rocky View Point

Rocky View County, AB, T4A 0X2

# Attention: Rocky View County Legislative Services

# Subject: Letter of Support - Bylaw C-8073-2020

I am writing this letter in support of BURNCO Rock Product's Land Use Amendment Application – Bylaw C-8073-2020.

I currently work as a truck driver in the aggregate industry and I transport aggregate to and from BURNCO's numerous sites in Rocky View County. These aggregate sites allow for me to make a living in the community and are an essential part of continued sustainable development. BURNCO has shown through their current and past projects, that when projects are developed responsibly, they can create a beneficial relationship with the community and the residents that reside there.

It's due to BURNCO's track record in Rocky View County that 1 can support BURNCO and its application for expansion of the West Cochrane Gravel Pit.

Sincerely,

1831626 Alberta Ltd

GURPREET SAINI

he i

Legislative Services

Rocky View County

262075 Rocky View Point

Rocky View County, AB T4A 0X2

#### **Attention: Rocky View County Legislative Services**

#### Subject: Letter of Support – Bylaw C – 8073 2020

I am writing this letter in support of BURNCO Rock Product's Land Use Application – Bylaw C - 8073-2020.

I currently work as a truck driver in the aggregate industry, and I transport aggregate to and from BURNCO'S sites in Rocky View County. These aggregate sites allow for me to make a living in the community and are an essential part of continued sustainable development. BURNCO has shown through their current and past projects, that when projects are developed responsibly they can create a beneficial relationship with the community and the residents that reside there.

It's due to BURNCO's track record in Rocky View County that I can support BURNCO and its application for expansion of the West Cochrane Gravel Pit.

Sincerely,

Harinderpal Kang

45 Martha's Haven Green NE Calgary, AB T3J3X6v

# **GRAY'S LIMITED**

62 Slater Road Strathmore, AB T1P 1J3 Telephone: 403-934-3590 Fax: 403-934-3076 Email: info@graysltd.com

June 17, 2021

Rocky View County 262075 Rocky View Point Rocky View County, AB T4A 0X2

#### RE: Burnco West Cochrane Hearing 2021608 Council Meeting Public Hearing July 6, 2021

Rocky View Council:

I understand that Burnco Rock Products is proposing to develop a gravel operation at a West Cochrane site.

Gray's Limited of Strathmore Alberta in the County of Wheatland has been in business for over seventyfour years. During this period, Burnco has processed various gravel materials for us.

I can confirm that Burnco is responsible, and dependable, and provides a quality product in a safe, and environmentally friendly manner. I wholeheartedly endorse this company.

Yours truly, Gray's Limited lay

Harrison Gray

HG/jw

Y:\HGRAY\HG-Rockyview County Letter.docx

# **Caitlyn T. Anderson**

From: Sent: To: Subject: jagdev deol June 19, 2021 1:04 PM Legislative Services Shared [EXTERNAL] - Letter of Support - BYLAW C- 8073-2020

Do not open links or attachments unless sender and content are known. I am writing this letter in support of BURNCO Product's Land USE Amendment Applicaiton - Byl 8073-2020

I am currently employed as a truck driver in the aggregate industry and I transport aggregate to and from BURNCO's sites in the Rockyview County. These aggregates sites are allowing me to make a living in the community and are a very essential part of continued sustainable development.

BURNCO's past and current projects have shown that, when projects are developed responsibly, they do create a beneficial relationship with the community and the residents that reside there.

It is because of BURNCO's responsibly developed projects and record in Rocky View County I support BURNCO and its application for the expansion of the West Cochrane Gravel Pit.

Sincerely

Jagdev Deol O/A Samaira Deol Trucking Ltd 301 Windermere Drive Chestermere AB T1X1S3

#### ATTACHMENT 'E': PUBLIC SUBMISSIONS

LEYINAUVE DEIVILES

Rocky View County

262075 Rocky View Point

Rocky View County, AB, T4A 0X2

Attention: Rocky View County Legislative Services

# Subject: Letter of Support - Bylaw C-8073-2020

I am writing this letter in support of BURNCO Rock Product's Land Use Amendment Application - Bylaw C-8073-2020.

I currently work as a truck driver in the aggregate industry and I transport aggregate to and from BURNCO's numerous sites in Rocky View County. These aggregate sites allow for me to make a living in the community and are an essential part of continued sustainable development. BURNCO has shown through their current and past projects, that when projects are developed responsibly, they can create a beneficial relationship with the community and the residents that reside there.

It's due to BURNCO's track record in Rocky View County that I can support BURNCO and its application for expansion of the West Cochrane Gravel Pit.

Sincerely,

Jasmal Suri (JHK transport) 149 willanne vo- chefenne

21 June /2021



June 21, 2021

Rocky View County Legislative Services 262075 Rocky View Point Rocky View County, AB T4A 0X2

#### Re: Letter of Support – Bylaw C-8073-2020

This letter is being provided in support of Land Use Amendment Application – Bylaw C-8073-2020.

Aggregates are a key resource in sustaining our way of life. They are used to construct our homes, they are needed for roads, schools and in hospitals. Aggregate production also supports a wide variety of local jobs. These jobs include truck drivers, equipment operators, consultants and engineers. These jobs provide value to our communities and helps to sustain our municipalities and our province.

Responsible aggregate development should be encouraged and supported. We believe that BURNCO Rock Products Ltd. has shown a long history of successful projects that have been operated in a thoughtful and responsible manner. We have no doubt that they will bring the same expertise and stewardship shown at these other locations to this project.

Please accept this letter of support for the West Cochrane Gravel Pit.

Sincerely,

Jennifer Weslowski Land Manager, SAB & WCAN Cement

# **Caitlyn T. Anderson**

| From:    |
|----------|
| Sent:    |
| To:      |
| Subject: |

Jim Burns <jim.burns@burnswest.com> June 21, 2021 11:57 AM Legislative Services Shared [EXTERNAL] - Bylaw C-8073-2020

Do not open links or attachments unless sender and content are known.

TO LEGISLATIVE SERVICES RE: BYLAW C-8073-2020

from BURNSWEST Corporation, Suite 106, 155 Glendeer Circle S.E. Calgary, AB T2H 2S8

TO WHOM IT MAY CONCERN -

I have read through BURNCO's submission for their West Cochrane Pit, and was totally overwhelmed at the extensive detail their staff and consultants have provided in answer to all the pertinent questions which have been asked by the County, as well as some which haven't been asked. Believe me when I say that their follow through in meeting their obligations and satisfying the concerns of the County and the Public goes well beyond expectation in my opinion. I may be prejudiced, but BURNCO's track record is the best in the business.

I was an instrumental part in working with Rocky View Councillors on BURNCO's gravel pit application for the Burma Road Pit, and at that time thought we had gone above and beyond in answering any concerns which could arise from opening that or any other pit. The details in this current application go beyond what was supplied at Burma Road. You will find in checking the County's records on that pit since it opened, that they have lived up to all they said they would do in operating that site, and more. That is also true for their other sites located in Rocky View County and elsewhere.

BURNCO is requesting that the site be operated for 30 to 35 years. To some neighbours and maybe some councillors this may appear to be excessive, but it is not when you consider that during this period dust, noise, and visual perceptions will be controlled and minimal. Again, take a look at the Burma Road Pit for their exemplary performance.

Yours truly, James Burns, Past President, BURNCO, and President, BURNSWEST Corporation. June 22, 2021

Legislative Services Rocky View County 262075 Rocky View Point Rocky View County, AB, T4A 0X2

#### Attention: Rocky View County Legislative Services

#### Subject: Letter of Support – Bylaw C-8073-2020

I have been approached by Burnco to submit a letter in support of their Master Site Development Plan (MSDP) for the West Cochrane Gravel Pit. I accept this request with respect and would like to share some of my experiences with living beside an active gravel pit for the consideration of the decision makers prior to their approval of this MSDP.

I have lived on the east side of Burnco's Springbank Operations for sixteen years, in the community of Cougar Ridge in Calgary. Cougar Ridge is immediately adjacent to the West Calgary Ring Road, and Burnco mined the gravel to the future road grade depth within the transportation utility corridor (TUC) beside Cougar Ridge as an extension of their ongoing Springbank operations. My house overlooks the ring road and gravel pit operations. This pit was already in operation prior to the development of Cougar Ridge as a residential development.

I am also the President of the Cougar Ridge Residents Association<sup>1</sup> (CRRA), and that is how I came to interact with Burnco about their gravel pit operations. Our association was approached by a concerned citizen about the ongoing impacts that the gravel pit was having on his residence, and he initiated an extensive plan to increase the mitigation measures that were in place to reduce these negative impacts (primarily of dust and noise). The CRRA eventually agreed to assist with his push for increased mitigation measures. As this land was owned by Alberta Transportation and those lands were reserved for the ring road, this became quite a lengthy process. To summarize the results, without getting into the details of the process, the CRRA was ultimately successful in obtaining permission from Alberta Transportation to plant a 1 km long shelterbelt in the 10m immediately bordering Cougar Ridge. This shelterbelt was and is the responsibility of the CRRA. It was planted by a group of over 100 community volunteers. When we approached Burnco about this, they not only provided a significant portion of the costs toward trees but many of their staff gave up a weekend and brought their families to help us plant. I remain grateful for that. I would like to note that throughout this process we learned that Burnco had previously planted trees along the top of the screening berm prior to the residential development but was asked to remove them by the authorities, as they didn't want any trees to interfere with the future uses within the Transportation and Utility Corridor.

<sup>&</sup>lt;sup>1</sup> The opinions expressed in this letter are the opinions of the author and are not a representation of the opinions of the Cougar Ridge Residents Association.

I have read through the MSDP and it looks to be very thorough with most, if not all, of the concerns that would arise being identified and addressed. The positive measures of the MSDP that stand out to me the most based on my experience as a neighbour to a gravel pit are the commitment to mitigation measures including screening berms and planting and Burnco's commitment to progressive reclamation. There is also a commitment to periodically reassess aspects of the plan as time goes on and conditions may change, and to implement further measures as needed.

Gravel pits mine a non-renewable resource and permanently alter the landscape over a multiyear process with a significant environmental and social impact. They also provide necessary resources for development and ongoing employment. There are both costs and benefits. With proper management, the benefits can outweigh the costs. As I am not an expert in gravel pits or their impact on the environment, I will defer to the scientists and experts any concerns about the natural creeks, mining below the water table, proximity to the Bow River, the impact on vegetation and wildlife, and Burnco's safety record and operational management.

For myself, when I moved into Cougar Ridge at the edge of town, much of the area was still a greenspace. The area that is now the vast site of ring road and utility construction was once a well-managed gravel pit whose operations were performed in a manner that intentionally minimized its impact on its neighbours and was staged to leave the native vegetation in place until it became necessary to remove it. I can say that the current state of the Ring Road construction and its apparent minimal concern and mitigation of nuisances on its neighbours and the environment is a stark contrast to how Burnco runs its operations. Burnco's plan for progressive reclamation of vegetation and original habitat for the wildlife is extremely important. Within the TUC footprint the land use has been forever changed and Burnco was not responsible for performing any of that reclamation as the area is becoming a highway. The loss of that vegetation and witnessing the impact it is having on the displaced local wildlife is having a greater negative impact on the neighbouring residents than ever expected. This is why the need for proper reclamation and ongoing management of the landscape is critically important.

To summarize my letter, I will quote the MSDP under item 4.0 Cumulative effects. "The impacts related to this development have been mitigated as much as reasonably possible, that the site will not have an undue impact, and that the West Cochrane Gravel Pit be operated in a socially and environmentally responsible manner." As long as Burnco operates the West Cochrane Gravel Pit with the same stewardship and respectful approach that I have experienced at their Springbank site, and I believe they will based on the relationship that I have developed with Burnco, please accept this letter in support of this MSDP.

Kelly G. Smith

98 Cougarstone Court SW, Calgary AB T3H 5R4

June 18th, 2021

Legislative Services

Rocky View County

262075 Rocky View Point

Rocky View County, AB, T4A 0X2

#### Attention: Rocky View County Legislative Services

#### Subject: Letter of Support – Bylaw C-8073-2020

I am writing this letter in support of BURNCO Rock Product's Land Use Amendment Application – Bylaw C-8073-2020.

I currently work as a truck driver in the aggregate industry and I transport aggregate to and from BURNCO's numerous sites in Rocky View County. These aggregate sites allow for me to make a living in the community and are an essential part of continued sustainable development. BURNCO has shown through their current and past projects, that when projects are developed responsibly, they can create a beneficial relationship with the community and the residents that reside there.

It's due to BURNCO's track record in Rocky View County that I can support BURNCO and its application for expansion of the West Cochrane Gravel Pit.

Sincerely, ≮JJJJ Kuljit Dhanda 305 Windermere Drive Chestermere AB

# **Caitlyn T. Anderson**

From: Sent: To: Subject: Larry de Castro June 23, 2021 3:00 PM Legislative Services Shared [EXTERNAL] - Burnco Rock Products

Do not open links or attachments unless sender and content are known.

Legislative Services

Rocky View County

262075 Rocky View Point

Rocky View County, AB, T4A 0X2

# Attention: Rocky View County Legislative Services

# Subject: Letter of Support – Bylaw C-8073-2020

I am writing this letter in support of BURNCO Rock Product's Land Use Amendment Application – Bylaw C-8073-2020.

I currently have worked with Burnco since 1998 as a self employed truck driver in the aggregate industry and I transport aggregate to and from BURNCO's numerous sites in Rocky View County. I am also a resident of RVC near Chestermere. These aggregate sites allow for me to make a living in the community and are an essential part of continued sustainable development. BURNCO has shown through their current and past projects, that when projects are developed responsibly, they can create a beneficial relationship with the community and the residents that reside there.

It's due to BURNCO's track record in Rocky View County that I can support BURNCO and its application for expansion of the West Cochrane Gravel Pit.

Sincerely,

Larry de Castro

DeCastro Trucking Ltd

Larry de Castro DeCastro Trucking Ltd



**HEIDELBERG**CEMENT Group

Lehigh Hanson Materials Limited

222, 885 – 42 Ave SE Calgary, AB T2G 1Y8 Phone 403-531-3000 Fax 403-531-3001 www.lehighhansoncanada.com

June 22, 2021

Attention: Rocky View County Legislative Services Rocky View County 262075 Rocky View Point Rocky View County, AB, T4A 0X2

Via email: legislativeservices@rockyview.ca

#### Subject: Letter of Support – Bylaw C-8073-2020

To whom it may concern,

I am writing regarding BURNCO Rock Products Ltd.'s proposed West Cochrane Gravel Pit. As a landowner of Rocky View County, please accept this letter of support for the land use amendment application Bylaw C-8073-2020.

Aggregates are a critical component of supporting long-term growth and development in the region. They are a scarce, non-renewable resource which, if not extracted prior to the development of an alternative use, will be potentially lost forever.

Responsible aggregate development should be encouraged and supported. BURNCO Rock Products Ltd. has a history of responsible operation in the region. We believe they will continue to be good stewards of the industry with this latest project.

Sincerely,

Mike Smith VP & GM, Materials SAB, SK & MB

Lehigh Hanson Materials Limited Phone: 403-214-4141 June 22, 2021

Legislative Services Rocky View County 262075 Rocky View Point Rocky View County, AB, T4A 0X2

#### Attention: Rocky View County Legislative Services

#### Subject: Letter Of Support – Bylaw C-8073-2020

McNair Sand and Gravel's support of Land Use Amendment Application – Bylaw C-8073-2020.

The owners and management of McNair Sand and Gravel believe responsible aggregate development should be encouraged and supported. We believe that BURNCO Rock Products Ltd. has shown a long history of successful projects that have been operated in a thoughtful and responsible manner. We have no doubt that they will bring the same expertise and stewardship shown at these other locations to this project.

Please accept this letter of support for the West Cochrane Gravel Pit.

Miles McNair

# **Caitlyn T. Anderson**

From: Sent: To: Subject: Muray Poffenroth June 19, 2021 9:00 AM Legislative Services Shared [EXTERNAL] - Burnco west Cochrane project

Do not open links or attachments unless sender and content are known.

I would like to provide a letter of support for this project as our property and our sons property are very close to Burnco Irricana gravel pit and have had no issues with noise or dust we have livestock right next to the pit as well we find Burnco to be considerate and very good neighbours sincerely Murray Poffenroth June 23, 2021

Legislative Services

Rocky View County

262075 Rocky View Point

Rocky View County, AB, T4A 0X2

# Attention: Rocky View County Legislative Services

# Subject: Letter of Support – Bylaw C-8073-2020

We are writing this letter in support of BURNCO Rock Product's Land Use Amendment Application – Bylaw C-8073-2020.

We were the previous owners of the subject lands that are located to the east of the Grand Valley Creek. Our experience with the West Cochrane Gravel Pit, has shown us that BURNCO takes their operations and relationship with the community very seriously. They've shown that through careful planning and development, these operations can have little to no impact on the surrounding neighbours and communities that they operate in. BURNCO has significant experience in Rocky View County and have shown that they are a part of the community.

We believe that BURNCO will continue to follow these practices with their West Cochrane Gravel Pit and because of this we can support this application.

Sincerely,

Russell & Patricia Wiechnik



# PLANNING AND DEVELOPMENT SERVICES

TO: Council

**DATE:** July 6, 2021

DIVISION: 9

FILE: 07805013

APPLICATION: PL20210041

**SUBJECT:** First Reading Bylaw – Residential Redesignation

**APPLICATION:** To redesignate the subject lands from Agricultural, Small Parcel District (A-SMLp8.1) to Residential, Rural District (R-RUR) in order to facilitate the creation of two (2)  $\pm$  4.00 acre parcels, with  $\pm$  12.91 acre remainder.

**GENERAL LOCATION:** Located approximately 7 kilometres northwest of the town of Cochrane; located on the east side of Range Road 45, approximately 2.85 kilometres (1 3/4 miles) south of Township Road 272.

LAND USE DESIGNATION: Agricultural, Small Parcel District (A-SMLp8.1)

**EXECUTIVE SUMMARY:** The application will be evaluated against relevant county policies.

## **OPTIONS:**

Option #1: THAT Bylaw C-8189-2021 be given first reading.

Option #2: THAT application PL20210041 be denied.

# AIR PHOTO & DEVELOPMENT CONTEXT:



Administration Resources Oksana Newmen, Planning and Development Services



Respectfully submitted,

"Brock Beach"

Acting Executive Director Community Development Services

ON/IIt

# **ATTACHMENTS:**

ATTACHMENT 'A': Bylaw C-8189-2021 & Schedule A ATTACHMENT 'B': Map Set

Concurrence,

"Kent Robinson"

Acting Chief Administrative Officer



# **BYLAW C-8189-2021**

# A bylaw of Rocky View County, in the Province of Alberta, to amend Rocky View County Bylaw C-8000-2020, being the *Land Use Bylaw*.

The Council of Rocky View County enacts as follows:

## Title

1 This bylaw may be cited as *Bylaw C-8189-2021*.

## Definitions

- 2 Words in this Bylaw have the same meaning as those set out in the *Land Use Bylaw* and *Municipal Government Act* except for the definitions provided below:
  - (1) "Council" means the duly elected Council of Rocky View County;
  - (2) "*Land Use Bylaw*" means Rocky View County Bylaw C-8000-2020, being the *Land Use Bylaw*, as amended or replaced from time to time;
  - (3) "*Municipal Government Act*" means the *Municipal Government Act,* RSA 2000, c M-26, as amended or replaced from time to time; and
  - (4) **"Rocky View County"** means Rocky View County as a municipal corporation and the geographical area within its jurisdictional boundaries, as the context requires.

## Effect

- 3 THAT Schedule B, Land Use Maps, of Bylaw C-8000-2020 be amended by redesignating Lot 2, Block 6, Plan 101101 within SW-05-27-04-W5M from Agricultural, Small Parcel District (A-SMLp8.1) to Residential, Rural District (R-RUR) as shown on the attached Schedule 'A' forming part of this Bylaw.
- 4 THAT Lot 2, Block 6, Plan 101101 within SW-05-27-04-W5M is hereby redesignated to Residential, Rural District (R-RUR) as shown on the attached Schedule "A' forming part of this Bylaw.

## **Effective Date**

5 Bylaw C-8189-2021 is passed and comes into full force and effect when it receives third reading and is signed in accordance with the *Municipal Government Act*.



READ A FIRST TIME this

\_\_\_\_\_ day of \_\_\_\_\_, 2021

PUBLIC HEARING HELD this

READ A SECOND TIME this

\_\_\_\_\_ day of \_\_\_\_\_, 2021

\_\_\_\_\_ day of \_\_\_\_\_, 2021

READ A THIRD AND FINAL TIME this

\_\_\_\_\_ day of \_\_\_\_\_, 2021

Reeve

Chief Administrative Officer or Designate

Date Bylaw Signed





#### **ATTACHMENT 'B': MAP SET**



## G-1 - Attachment B Page 2 of 5 ROCKY VIEW COUNTY

# Development Proposal

## **Redesignation Proposal**

To redesignate the subject lands from Agricultural, Small Parcel District (A-SMLp8.1) to Residential, Rural District (R-RUR) in order to facilitate the creation of a  $\pm$ 1.62 hectare ( $\pm$ 4.00 acre) parcel (Lot 1), a  $\pm$ 1.62 hectare ( $\pm$ 4.00 acre) parcel (Lot 2), with  $\pm$ 5.22 hectare ( $\pm$ 12.91 acre) remainder (Lot 3).

Division: 09 Roll: 07805013 File: PL20210041 Printed: March 10, 2021 Legal: Lot:2 Block:6 FRanct@17012 within 199V-05-27-04-W05M

#### **ATTACHMENT 'B': MAP SET**



G-1 - Attachment B Page 3 of 5 ROCKY VIEW COUNTY

# Environmental

#### **Redesignation Proposal**

To redesignate the subject lands from Agricultural, Small Parcel District (A-SMLp8.1) to Residential, Rural District (R-RUR) in order to facilitate the creation of a  $\pm 1.62$  hectare ( $\pm 4.00$  acre) parcel (Lot 1), a  $\pm 1.62$  hectare ( $\pm 4.00$ acre) parcel (Lot 2), with  $\pm 5.22$  hectare ( $\pm 12.91$ acre) remainder (Lot 3).



Division: 09 Roll: 07805013 File: PL20210041 Printed: March 10, 2021 Legal: Lot:2 Block:6 Franci@17013 wfhin 199/-05-27-04-W05M

#### **ATTACHMENT 'B': MAP SET**



Printed: March 10, 2021 HPangle 17014 within 1991-05-



27-04-W05M



#### 2021 COUNCIL PRIORITIES AND SIGNIFICANT ISSUES

| Division | Status | Торіс                                                                           | Description                                                                                                                                                                                                                                                                                                                                                                                          | Date Raised<br>Scheduled | Target<br>Completion | Responsible Area                        |
|----------|--------|---------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|----------------------|-----------------------------------------|
| All      | Active | Board and<br>Committee<br>Amendments                                            | Administration was directed at the October 27,<br>2020 Council meeting to bring back amendments to<br>standardize the term lengths for all boards and<br>committees by the end of June, 2021.<br>Administration was directed at the May 11, 2021<br>Council meeting to prepare amendments to the<br>County's board and committee terms of references<br>in accordance with the staff recommendation. | 27-Oct-20                | TBD                  | Legislative Services                    |
| All      | Active | Mayor and Deputy<br>Mayor<br>Appointment Term                                   | Administration was directed at the May 11, 2021<br>Council meeting to investigate amendments to the<br><i>Procedure Bylaw</i> to extend the appointment term<br>of the chief elected official, on or before<br>September 7, 2021.                                                                                                                                                                    | 27-Oct-20                | TBD                  | Legislative Services                    |
| All      | Active | Standardized<br>Councillor Expense<br>Reporting                                 | Administration was directed at the June 8, 2021<br>Council meeting to standardize councillor expense<br>reporting, and to include training on expense<br>reporting as part of the orientation program after<br>the October 2021 election.                                                                                                                                                            | 8-Jun-21                 | 31-Oct-21            | Legislative Services                    |
| All      | Active | Voter<br>Identification<br>Bylaw                                                | Administration was directed at the January 12,<br>2021 Council meeting to prepare a voter<br>identification bylaw.                                                                                                                                                                                                                                                                                   | 12-Jan-21                | TBD                  | Legislative Services                    |
| All      | Active | Reinstatement of<br>Dog License Fees                                            | Administration was directed at the February 23,<br>2021 Council meeting to review reinstating the dog<br>license fee in time for the 2022 budget cycle.                                                                                                                                                                                                                                              | 23-Feb-21                | TBD                  | Municipal Enforcement                   |
| 1        | Active | Bragg Creek<br>Hamlet Expansion<br>Strategy                                     | Council adopted a terms of reference for the Bragg<br>Creek Hamlet Expansion Strategy Project at the<br>January 8, 2019 Council meeting.<br>Administration was directed at the May 12, 2020<br>Council meeting to continue with the project and to<br>finalize amendments to the Greater Bragg Creek<br>ASP based on higher residential densities.                                                   | 8-Jan-19                 | TBD                  | Planning Policy                         |
| 4        | Active | Further<br>Consideration of<br>the Shepard<br>Industrial Area<br>Structure Plan | Administration was directed at June 29, 2021<br>Council meeting to engage in further dialogue with<br>the City of Calgary on cost/revenue sharing<br>options, amendments to the intermunipal<br>development plan, and joint planning endeavours.<br>Administration was further directed to bring a<br>report back to Council at the September 14, 2021<br>Council meeting.                           | 9-Jul-19                 | 14-Sep-21            | Planning Policy                         |
| 2 and 4  | Active | Springbank and<br>Langdon<br>Stakeholder<br>Engagement Terms<br>of Reference    | Administration was directed at June 22, 2021<br>Council to return to the July 13, 2021 Council<br>meeting with new terms of reference incorporating<br>councillor feedback.                                                                                                                                                                                                                          | 22-Jun-21                | 13-Jul-21            | Recreation, Parks and Community Support |



#### 2021 COUNCIL PRIORITIES AND SIGNIFICANT ISSUES

| Division | Status  | Tonic                                                           | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Date Raised | Target             | Responsible Area              |
|----------|---------|-----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|--------------------|-------------------------------|
| Division | Status  | ropic                                                           | Compton                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Scheduled   | Completion<br>Date | nesponsible med               |
| 8        | Active  | Blazer Water<br>System Acquisition                              | Administration be directed to begin the process<br>that will faciliate the purchase of Blazer Water<br>System at the March 23, 2021 Council meeting<br>Council provided first reading to Borrowing Bylaw C-<br>8165-2021 at the March 23, 2021 Council meeting.<br>Council approved Borrowing Bylaw C-8165-2021 at<br>the May 11, 2021 Council meeting, and was<br>directed to prepare amendments to the Master<br>Rates Bylaw.                                                                                                                                                                                                                                    | 23-Mar-21   | TBD                | Utility Services              |
| 9        | Active  | Horse Creek Water<br>and Waste Water<br>Services<br>Acquisition | Administration was directed at the December 22,<br>2020 Council meeting to prepare a borrowing<br>bylaw and budget adjustment for the purchase of<br>Horse Creek Water & Waste Water Services Inc.<br>Administration be directed to begin the process<br>that will faciliate the purchase of Horse Creek<br>Water & Waste Water Services Inc. at the March<br>23, 2021 Council meeting<br>Council provided first reading to Borrowing Bylaw C-<br>8166-2021 at the March 23, 2021 Council meeting.<br>Council approved Borrowing Bylaw C-8166-2021 at<br>the May 11, 2021 Council meeting, and was<br>directed to prepare amendments to the Master<br>Rates Bylaw. | 12-Mar-19   | TBD                | Utility Services              |
| All      | Active  | Report on Waste<br>to Energy<br>Solutions                       | Administration was directed at the March 23, 2021<br>Council meeting to bring a report back to Council<br>on waste to energy solutions, including<br>technologies, regional markets and economic<br>costs/benefits to Council by end of July, 2021.                                                                                                                                                                                                                                                                                                                                                                                                                | 9-Jul-19    | 27-Jul-21          | Utility Services              |
| 5        | Ongoing | Garden of Peace<br>Chapel Lease                                 | Administration was directed at the February 25,<br>2020 Council meeting to negotiate a 5-year lease<br>for the Garden of Peace Chapel and related lands.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 25-Feb-20   | Ongoing            | Legal and Land Administration |



#### 2021 COUNCIL PRIORITIES AND SIGNIFICANT ISSUES

 2021 COUNCIL PRIORITIES AND SIGNIFICANT ISSUES

 A list of ongoing and active priorities to assist Council on the status of business items

| Division | Status  | Торіс                                                       | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Date Raised | Target             | Responsible Area              |
|----------|---------|-------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|--------------------|-------------------------------|
|          |         |                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Scheduled   | Completion<br>Date |                               |
| 5        | Ongoing | Sale of the<br>Chestermere<br>Regional<br>Recreation Center | Administration was directed at the September 24,<br>2019 Council meeting to explore the sale of the<br>land and remediation of the facility.<br>Administration was further directed at the January<br>28, 2020 Council meeting to review the letter of<br>intent presented by the City of Chestermere and<br>prepare a report for Council's consideration.<br>At the May 12, 2020 Council meeting, Council<br>declined an offer from the City of Chestermere.<br>Administration was directed at the November 24,<br>2020 Council meeting to enter into negotiations<br>with the City of Chestermere regarding the<br>Chestermere Regional Recreation Centre. | 28-Jan-20   | Ongoing            | Legal and Land Administration |
| 9        | Ongoing | Sale of the<br>Cochrane Gravel<br>Pit Lands                 | Administration was directed at the February 25,<br>2020 Council meeting to negotiate a purchase and<br>sale agreement for the sale of the Cochrane Gravel<br>Pit lands.<br>At the June 9, 2020 Council meeting, Council<br>declined a letter of intent received.                                                                                                                                                                                                                                                                                                                                                                                             | 25-Feb-20   | Ongoing            | Legal and Land Administration |
| All      | Ongoing | Potential Joint<br>Assessment<br>Review Board               | Administration was directed at the February 11,<br>2020 Council meeting to bring back options for a<br>joint Assessment Review Board once<br>Administration has concluded preliminary<br>discussions with potential partner municipalities.<br>Administration was directed at the June 23, 2020<br>Council meeting to continue discussions and return<br>with options for the 2021 assessment year.                                                                                                                                                                                                                                                          | 11-Feb-20   | Ongoing            | Legislative Services          |

| Notice of Motion: | To be read in at the July 6, 2021 Council Meeting                           |  |  |  |
|-------------------|-----------------------------------------------------------------------------|--|--|--|
|                   | To be debated at the July 20, 2021 Council Meeting                          |  |  |  |
| Title:            | Withdrawal of Appeal of Kissel et al v. Rocky View County, 2020 ABQB<br>406 |  |  |  |
| Presented by:     | Councillor Crystal Kissel, Division 9<br>Reeve Dan Henn, Division 7         |  |  |  |

**WHEREAS** Council passed a resolution on July 28, 2020 to direct Administration to proceed with the notice of appeal regarding Kissel et al v. Rocky View County, 2020 ABQB 406;

**AND WHEREAS** due to a backlogged court system, there is no ability to have the appeal heard before the spring of 2022 at the earliest;

**AND WHEREAS** a municipal election is scheduled for October 18, 2021;

**AND WHEREAS** the County is being reduced to seven elected councillors from the current nine councillor model, meaning this Council will not sit as it exists today;

**AND WHEREAS** all sanctions, other than the communication sanction, have already expired;

AND WHEREAS the appeal is not covered by the County's insurance;

**AND WHEREAS** Council's Strategic Plan speaks to accountability and financial resiliency with regards to lessening financial risk to our ratepayers;

**THEREFORE, BE IT RESOLVED** that Administration be directed to withdraw the application to appeal of Kissel et al v. Rocky View County, 2020 ABQB 406.