EXECUTIVE SUMMARY

CastleGlenn Consultants Inc. was retained in December 2008 to undertake a functional planning study that would determine the "ultimate" configuration of the Highway 1/Range Road 33 interchange and confirm the access management strategy for Range Road 33 (between Township Road 250 and Township Road 245). The planning study was initiated in response to a request made by the Rocky View County for Alberta Transportation to specify the property requirements (necessary to permit development to proceed within the vicinity of the Springbank community) by advancing the Functional Planning study for the Highway 1/Range Road 33 interchange.

This study included the development of a three phase interchange staging strategy that accommodates future Highway 1 and Range Road 33 lane requirements by implementing components of the "ultimate" interchange on an "as-required" basis. The staging plans depict specific interchange configurations that accommodate a 2-lane, 4-lane and 6-lane Range Road 33 cross-section as well as a 4-lane to "ultimate" 10-core lane Highway 1 configuration (At the time of detailed design the requirements for accommodating a 10 lane Highway 1 cross-section should be confirmed).

Objectives

The primary objectives of the *Highway 1/Range Road 33 (Springbank) Interchange Functional Planning Study* were to:

- identify access management requirements along Range Road 33 within the vicinity of the interchange;
- develop a recommended plan outlining the interchange infrastructure required to accommodate a 2-lane, 4-lane and 6-lane Range Road 33 cross-section as well as a 4-lane to "ultimate" 10-lane Highway 1;
- provide rationale for selecting the recommended Highway 1/Range Road 33 interchange configuration;
- develop functional plan and profile drawings for each proposed interchange improvement stage; and
- define basic right-of-way requirements for the recommended improvements.

Existing Highway 1/Range Road 33 Interchange

The existing *Highway 1/Range Road 33 interchange* (constructed in 1966) is located approximately 6km west of the Calgary City limits and features a diamond configuration on the south side of Highway 1 and a Parclo "B" configuration on the north side. The four span structure accommodates two Range Road 33 lanes over a 4-lane Highway 1 cross-section. Generally the structure is in fairly good condition for a 43 year old bridge, and with proper maintenance and rehabilitation could have a remaining lifespan of 30 to 35 years. Intersection capacity analysis

(using 2008 traffic volumes) indicates that from a traffic operations perspective the interchange is performing at satisfactory levels-of-service (LOS "C") and demonstrate efficient traffic operational characteristics; however, when compared to current interchange design standards the geometrical features of the interchange (loop/ramp radii, exit/entrance terminal lengths and lane tapers) are considered to be substandard including:

- short separation distances between existing Range Road 33 accesses/intersections and the north/south interchange ramp terminals;
- inconsistent lane geometry at the Range Road 33 northbound bridge requires northbound motorists to make a lane change to maintain their direction of travel over the structure; and
- unconventional yield control at Highway 1 entrance ramps that is required as a result of short acceleration lane terminals.

Traffic Volumes

Existing (2008) traffic information obtained from AT traffic counts would indicate that peak hour traffic volumes at the approach to the Highway 1/Range Road 33 are as follows:

- *Highway 1*: 2,335 vehicles-per-hour [vph] (1,140 eastbound and 1,195 westbound) east of Range Road 33 and 2,075 vph (1,020 eastbound and 1,055 westbound) west of Range Road 33; and
- *Range Road 33*: 480 vehicles-per-hour [vph] (180 northbound and 300 southbound) north of Highway 1 and 750 vph (300 northbound and 450 southbound) south of Highway 1.

Traffic Forecasts (20-year and "Ultimate" build-out year horizon periods) were prepared using information obtained from AT, several traffic/transportation studies completed for future Springbank developments (Bingham Crossing, Pradera Springs, Harmony Development, Springbank Airport Master Plan) and the Rocky View County *"2008 Emme/2 Transportation Model Update"*. The presence of a potential *Regional Ring Road* was also addressed in the analysis and assumed a future freeway corridor would be located west of the Highway 1/Range Road 33 interchange serving Calgary and the outlying communities. The results of the traffic forecasts indicated that at the "ultimate" build-out year horizon (50 years plus and assuming implementation of the proposed Regional Ring Road) traffic volumes at the approach to the Highway 1/Range Road 33 could be as follows:

- *Highway 1*: 8,160 vehicles-per-hour [vph] (4,390 eastbound and 3,770 westbound) east of Range Road 33 and 6,480 vph (3,030 eastbound and 3,450 westbound) west of Range Road 33; and
- *Range Road 33*: 8,730 vehicles-per-hour [vph] (4,250 northbound and 4,480 southbound) north of Highway 1 and 5,890 vph (3,350 northbound and 2,540 southbound) south of Highway 1.

The preferred "ultimate" configuration for the Highway 1/Range Road 33 was based on a comparative analysis of five primary interchange alternatives (taking into consideration forecast traffic volumes, intersection capacity, weaving operations and bridge requirements).

The analysis indicated that the "Modified" Parclo "A" (see Exhibit ES-3) was found to be the best overall interchange configuration given the following:

- satisfactory levels-of-service are achieved at each of the ramp terminals;
- reduced number of lanes to be supported by bridge structures [no left turn lanes required along Range Road 33];
- reduced separation between ramp terminals; and
- decreased weaving conflicts.

Staging Strategy

A staging strategy consisting of three phased interchange configurations was developed for the Highway 1/Range Road 33 interchange with the objective of:

- maximizing the use of the remaining life span of the existing Range Road 33 structure;
- staging the widening of the existing 2-lane Range Road 33 cross-section from an "interim" 4-lane configuration to an "ultimate" 6-lane cross-section;
- providing a plan that will accommodate future traffic demands for Highway 1 and Range Road 33 as they are anticipated to occur;
- limiting property impacts in the vicinity of the interchange by using components of the existing interchange (including Range Road 33 alignment, interchange ramps and pavement area) where possible; and
- limiting "throw-away costs" by assuring that to the greatest extent possible infrastructure built in previous stages, could be used in subsequent stages.

Stage I – 2 lane Range Road 33 Spread Diamond Configuration

Implementation of the "Stage I" Highway 1/Range Road 33 interchange (See Exhibit ES-1) was envisioned to occur in the 5-10 year horizon and make use of the existing Range Road 33 alignment/structure by reconfiguring the existing interchange to a spread diamond configuration. The "Stage I" interchange design:

- addresses the safety and operational concerns associated with the existing interchange by replacing all of the existing ramps and the westbound Highway 1 exit loop;
- could be implemented prior to the twinning of Range Road 33 and 6-laning of Highway 1;
- proposes signalization of the interchange ramp terminals along Range Road 33 with dedicated left turn-lanes;
- includes widening of Range Road 33 in the vicinity of the north and south ramp terminals to accommodate a raised median; and
- proposes closure of all existing accesses/roads along Range Road 33 between Township Road 245 and Township Road 250.

Stage II – 4 lane RR 33 Spread Diamond Configuration

The necessity for the "Stage II" Highway 1/Range Road 33 interchange was envisioned to occur in the 20 year horizon once the capacity of the existing 2-lane Range Road 33 is exceeded and/or continuous 6-laning of Highway 1 is required. The "Stage II" interchange design:

- assumes a 4-lane Range Road 33 cross-section with two through lanes in each direction on two separate Highway 1 overpass structures. Depending on the timeframe for "Stage II" construction it may be beneficial to temporarily use the existing structure for the southbound Range Road 33 lanes and construct a new overpass for the northbound lanes only;
- maintains the "Stage I" spread diamond configuration with generally minor reconstruction of the interchange ramps constructed in "Stage I" (some vertical ramp profiles adjustments are required in the vicinity of the ramp terminals);
- maintains signalized ramp terminals (from "Stage I") with proposed double S-E left-turn lanes at the south ramp terminal;
- includes provisions for all new Highway 1 overpass structures to accommodate a 10-core lane Highway 1 cross-section; and
- assumes signalized Township Road 245 and Township Road 250 intersections;

Stage III – 6 lane Range Road 33 Parclo "A" Configuration

The "Stage III" Highway 1/Range Road 33 interchange was envisioned to occur in the 50 year plus time horizon and culminate in a modified Parclo "A" configuration. The "Stage III" interchange design:

- augments the "Stage II" interchange configuration with the addition of two loops (in the NE and SW interchange quadrants);
- proposes a 6 lane divided Range Road 33 cross-section with lane widening occurring on the outside of the "Stage II" 4-lane configuration;
- accommodates an "ultimate" 10-core lane Highway 1 cross-section;
- includes a double S-E loop located on a separate approach and structure that bypasses the north ramp terminal;
- includes 2-lane collector-distributor (CD) road that begins just south of the Township Road 250 intersection providing access to the double S-E loop and single lane S-W ramp; and
- requires a single N-W loop in the northeast quadrant of the interchange given that the northbound left-turn movement at the north ramp terminal is restricted by the median separated CD road.

Cost Estimates

- The cost of constructing each Highway 1/Range Road 33 interchange stage independently (with no sequential progression from one construction stage to the other) has been estimated at:
    - "Stage I" - $6.9M (existing structure in place)
    - "Stage II" - $33.7M (new NB and SB Range Road 33 structures)
    - "Stage III" - $63.5M (new NB and SB Range Road 33 structures and S-E Loop Structure)
- Incremental costs incurred when constructing the interchange sequentially from "Stage I" to "Stage II" and ultimately to "Stage III" were estimated as follows:
    - "Stage I" to "Stage II" - $28M; and
    - "Stage II" to "Stage III" - $37M

It was determined that using the existing structure in the "Stage II" configuration for the southbound Range Road 33 lanes followed by future replacement results in an estimated $0.9M premium as compared to constructing a new southbound structure at the onset of "Stage II" (the premium is incurred as a result of additional traffic control and throw-way costs).

Access Management

Application of Alberta Transportation access management guidelines to the proposed interchange configurations (all three interchange stages) requires closure of all existing access located along Range Road 33 between Township Road 250 and Township Road 245. A proposed right-in/right-out intersection providing access to the future *Bingham Development* (NE quadrant of the Highway 1/Range Road 33 Interchange) could potentially be located along Range Road 33 (approximately 160m south of Township Road 250); however, the access location should be reviewed to ensure that Rocky View County access management, operations and safety standards are met;

Public Consultation Process

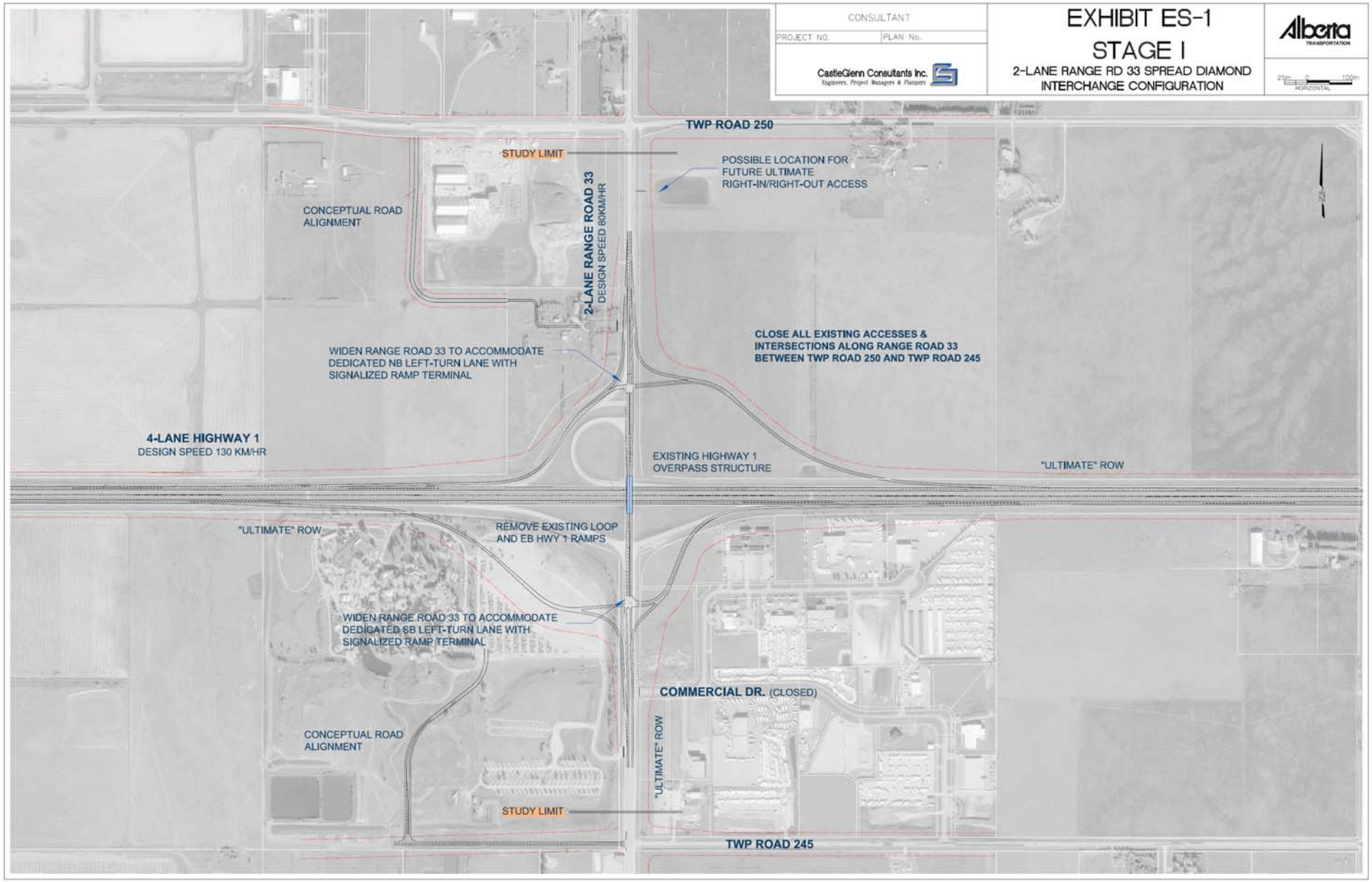
The public involvement strategy for the study included:

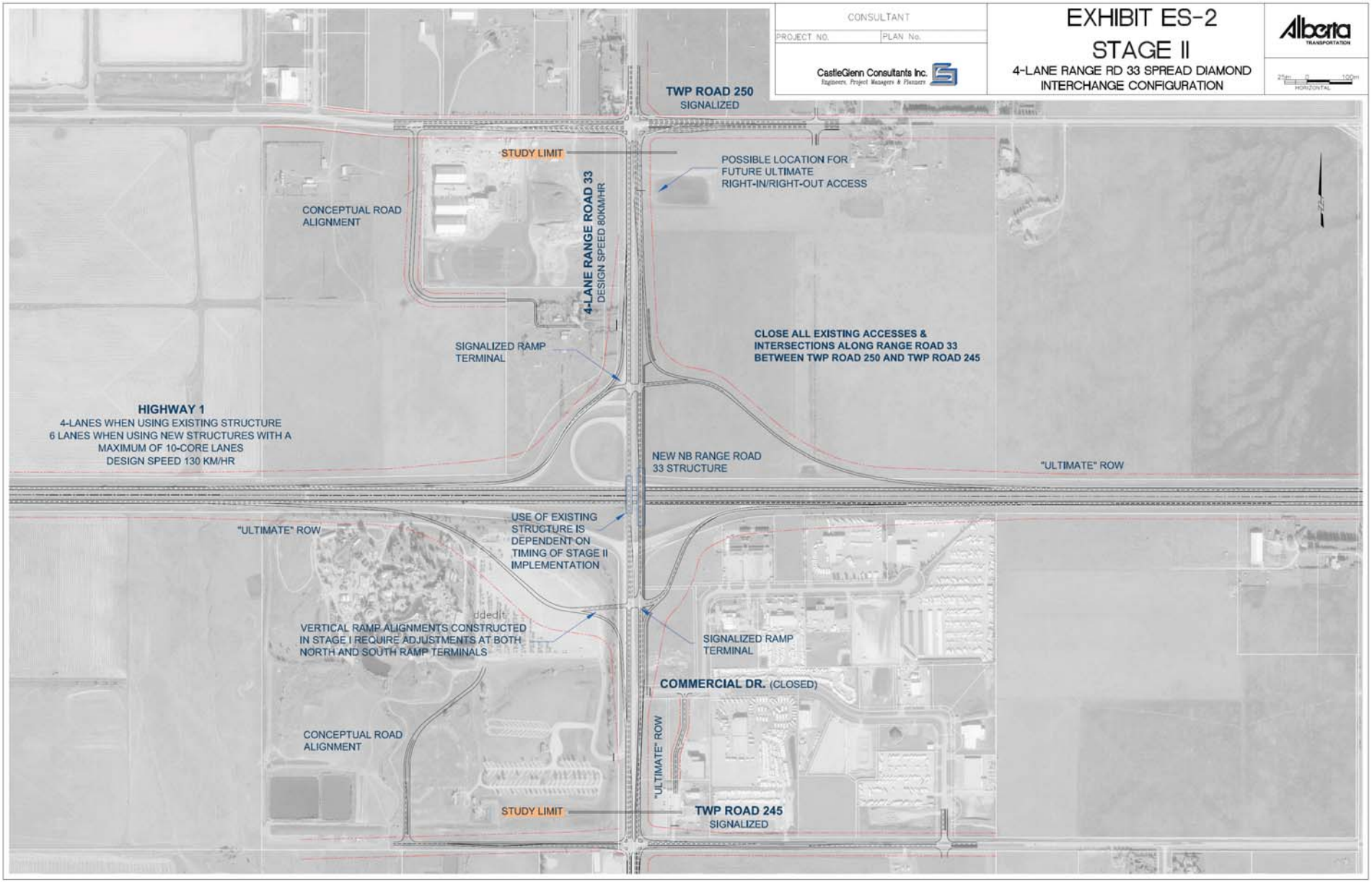
- *a total of 5 meetings* with landowners and developers located within the study area. The meetings included discussions pertaining to study objectives, existing conditions, proposed development initiatives, traffic operations and staged designs for the Highway 1/Range Road 33 interchange (attendance at the meeting varied from 5 to 14 people); and
- *two Public Open Houses* with presentations given to the general public located within the greater study area. *Public Open House No. 1* was held at the onset of the study with the purpose of presenting the study objectives,, existing conditions and conceptual Highway 1/Range Road 33 interchange options. *Public Open House No. 2* focused on outlining the proposed staged interchange functional designs and study findings (attendance at the open houses varied from 20 to 34 people).

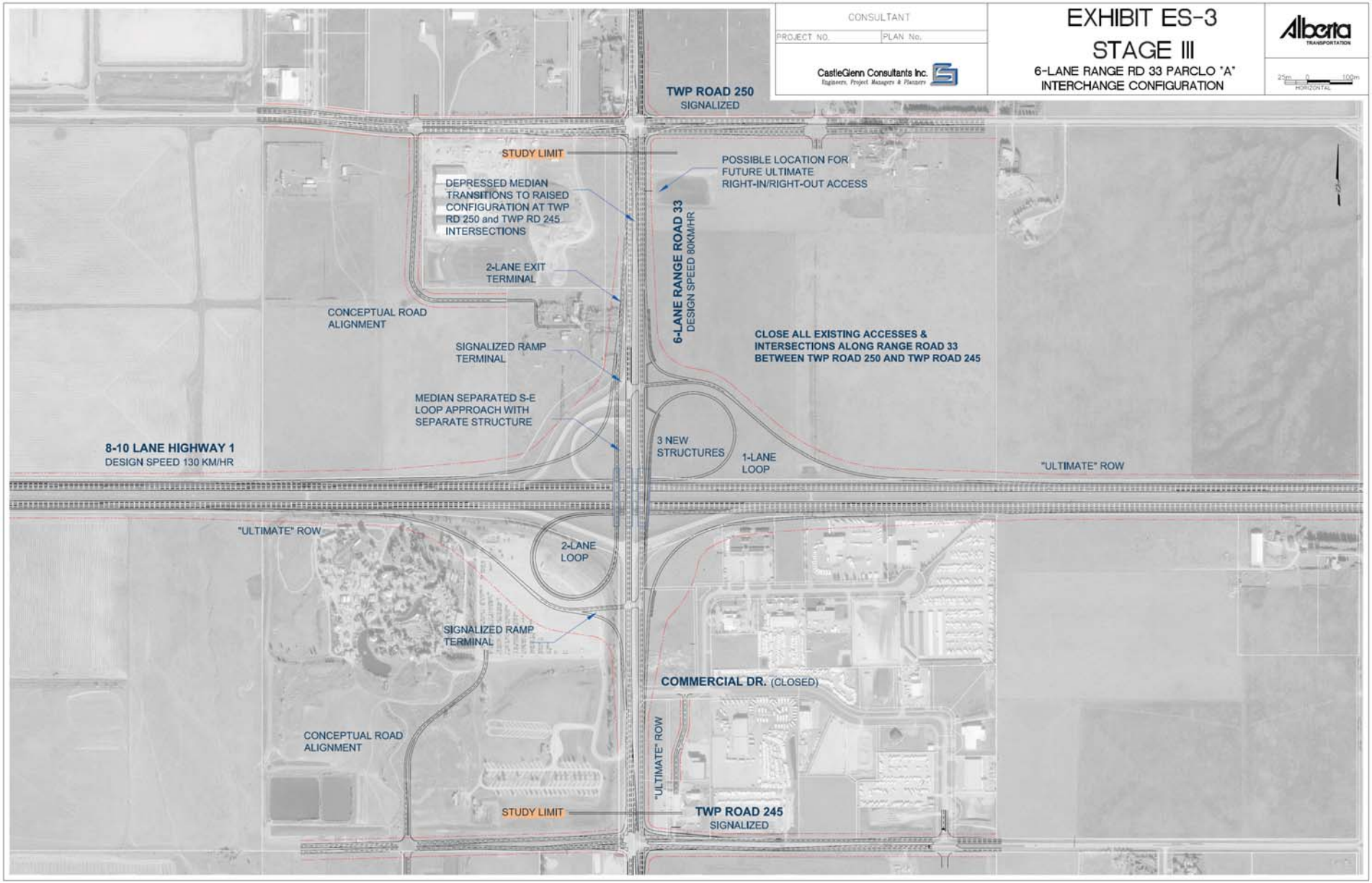
Recommendations

It is recommended that……

1. The infrastructure improvements consistent with the *Highway 1 & Range Road 33 (Springbank) Interchange Functional Planning Study* be received by Alberta Transportation;
2. Rocky View County be informed that the *Highway 1 & Range Road 33 (Springbank) Interchange Functional Planning Study* represents a planning document and as such interchange improvements are currently not scheduled;
3. Rocky View County Councils be requested to incorporate the *Highway 1 & Range Road 33 (Springbank) Interchange Functional Planning Study* within their area structure plan and municipal development plans (see Appendix G for Rocky View County Council Resolution);
4. Subsequent to Alberta Transportations endorsement of the staged Highway 1/Range Road 33 functional designs as recommended in the *Highway 1 & Range Road 33 (Springbank) Interchange Functional Planning Study;* Alberta Transportation is encouraged to pursue those initiatives necessary to confirm the detailed engineering feasibility of the proposed interchange configurations. These activities would likely include, but are not limited to:
    a) Presenting to Rocky View County with the goal of seeking endorsement of those components of the functional plan that would proceed to detailed design;
    b) Responding to development driven initiatives [i.e. northeast quadrant of the Highway 1/Range Road 33 interchange] to assure that access provisions accordance with the access management strategy;
    c) Monitoring vehicular traffic at critical intersections along the Range Road 33 corridor to enable AT to assess warrants for signalization and/or infrastructure improvements; and
    d) Developing individual detailed interchange construction staging plans that would offer the flexibility to modify the Highway 1/Range Road 33 interchange configuration at the appropriate time frames.




CONSULTANT
PROJECT NO.
PLAN No.
CastleGlenn Consultants Inc.
Engineers, Project Managers & Planners
EXHIBIT ES-2
STAGE II
4-LANE RANGE RD 33 SPREAD DIAMOND
INTERCHANGE CONFIGURATION
Alberta
TRANSPORTATION
HORIZONTAL
TWP ROAD 250
SIGNALIZED
STUDY LIMIT
POSSIBLE LOCATION FOR
FUTURE ULTIMATE
RIGHT-IN/RIGHT-OUT ACCESS
CONCEPTUAL ROAD
ALIGNMENT
4-LANE RANGE ROAD 33
DESIGN SPEED 80KM/HR
SIGNALIZED RAMP
TERMINAL
CLOSE ALL EXISTING ACCESSES &
INTERSECTIONS ALONG RANGE ROAD 33
BETWEEN TWP ROAD 250 AND TWP ROAD 245
HIGHWAY 1
4-LANES WHEN USING EXISTING STRUCTURE
6 LANES WHEN USING NEW STRUCTURES WITH A
MAXIMUM OF 10-CORE LANES
DESIGN SPEED 130 KM/HR
NEW NB RANGE ROAD
33 STRUCTURE
"ULTIMATE" ROW
"ULTIMATE" ROW
USE OF EXISTING
STRUCTURE IS
DEPENDENT ON
TIMING OF STAGE II
IMPLEMENTATION
VERTICAL RAMP ALIGNMENTS CONSTRUCTED
IN STAGE I REQUIRE ADJUSTMENTS AT BOTH
NORTH AND SOUTH RAMP TERMINALS
SIGNALIZED RAMP
TERMINAL
COMMERCIAL DR. (CLOSED)
CONCEPTUAL ROAD
ALIGNMENT
"ULTIMATE" ROW
STUDY LIMIT
TWP ROAD 245
SIGNALIZED


CONSULTANT
PROJECT NO.
PLAN No.
CastleGlenn Consultants Inc.
Engineers, Project Managers & Planners
EXHIBIT ES-3
STAGE III
6-LANE RANGE RD 33 PARCLO "A"
INTERCHANGE CONFIGURATION
Alberta
TRANSPORTATION
HORIZONTAL
TWP ROAD 250
SIGNALIZED
STUDY LIMIT
DEPRESSED MEDIAN TRANSITIONS TO RAISED CONFIGURATION AT TWP RD 250 and TWP RD 245 INTERSECTIONS
POSSIBLE LOCATION FOR FUTURE ULTIMATE RIGHT-IN/RIGHT-OUT ACCESS
6-LANE RANGE ROAD 33
DESIGN SPEED 80KM/HR
2-LANE EXIT TERMINAL
CONCEPTUAL ROAD ALIGNMENT
SIGNALIZED RAMP TERMINAL
CLOSE ALL EXISTING ACCESSES & INTERSECTIONS ALONG RANGE ROAD 33 BETWEEN TWP ROAD 250 AND TWP ROAD 245
MEDIAN SEPARATED S-E LOOP APPROACH WITH SEPARATE STRUCTURE
8-10 LANE HIGHWAY 1
DESIGN SPEED 130 KM/HR
3 NEW STRUCTURES
1-LANE LOOP
"ULTIMATE" ROW
"ULTIMATE" ROW
2-LANE LOOP
SIGNALIZED RAMP TERMINAL
COMMERCIAL DR. (CLOSED)
CONCEPTUAL ROAD ALIGNMENT
"ULTIMATE" ROW
STUDY LIMIT
TWP ROAD 245
SIGNALIZED