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Alberta Infrastructure and Transportation
Highway 1 and Highway 36 Interchange
Functional Planning Study

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Executive Summary

Alberta Infrastructure and Transportation (INFTRA) retained UMA Engineering Ltd. to conduct a functional planning study to determine the optimum configuration for a future interchange at the intersection of Highway 1 and Highway 36. The primary objectives of the study were to:

1. Review the study area, and identify the future location for the Highway 1 and 36 interchange and develop conceptual configuration plans.

2. Analyze and evaluate the conceptual plans to develop a detailed functional plan of the preferred option that accommodates the intersectional improvements being designed and constructed by the department, thus resulting in minimum throw-away costs.

3. Identify the right-of-way requirements for the interchange and service roads, by preparing basic Right-of-Way request plans.

4. Address access management requirements along the highways within the study area to ensure consistency between function and service classification.

ES.1 Study Area

The study considers the area falling within a 5 km radius of the current intersection of Highway 1 and Highway 36, located approximately 8.5 km northwest of the City of Brooks.

ES.2 Background and Existing Information

Increasing traffic volumes on the Trans-Canada Highway (Highway 1) in conjunction with a steady rise in truck traffic volumes on Highway 36 have resulted in operational issues at the existing at-grade intersection of the two roadways. At the time of this study, INFTRA was introducing improvements to the intersection to address the situation, including widening the median of Highway 1 to facilitate large truck crossings. As Highway 1 is on the National Highway System and will eventually achieve freeway status, the intersection was also identified as a future interchange location; consequently, INFTRA requested that a functional planning study be undertaken to develop conceptual configuration plans to allow for the protection of the right-of-way of the interchange and any associated service roads.

ES.3 Major Considerations of the Functional Planning Study

Several factors have been identified as having a major impact on any proposed interchange development.

- **Utility Conflicts**

Utilities within the study area include ATCO Pipelines, TELUS, Fortis, EnCana, AltaLink, and Monarch. Of particular concern is the 240kVA AltaLink transmission line east of the intersection.

- **Future Design Designation and High Load Corridor**

The future design designation of Highway 1 is a freeway (RFD 616.6-130) and the future design designation of Highway 36 is a major two lane highway (RAU 212-110). The existing High Load Corridor includes Highway 1 west of Highway 36 to Calgary and Highway 36 north of Highway 1 to Highway 28. The future High Load Corridor will also include Highway 36 south of Highway 1 to Highway 3. The High Load Corridor must accommodate nine meter high vehicles.

- **Access Management**

Considering the future freeway status of Highway 1, access to the highway will be limited to the interchange at Highway 36. No at grade intersections along Highway 1 will remain and existing property accesses along Highway 1 and Highway 36 will be rerouted via service roads.

ES.4 Traffic Volumes

The 20-year and 40-year horizon traffic volumes (approximately years 2026 and 2046, respectively) for Highway 1 and Highway 36 were determined by projecting the existing traffic volumes to the selected horizon years. As outlined in the McElhanney Corridor Study[1], the Lakeside Packers Feedlot access to Highway 1 located east of the study area is proposed to be a flyover in the future. The closure of turning movements at this location will influence the Highway 1 and Highway 36 interchange by increasing traffic volumes primarily destined to and from the west. In order to accommodate this, the turning movements destined to and from the west were superimposed onto the existing Highway 1 and Highway 36 turning volumes.

The historical traffic volume growth for Highway 1 and Highway 36 are 3.4% and 4.4% respectively. This growth is larger than the provincial average of 2.5%. After conversations with stakeholders, a decision was made to use the historical 3.4% growth for Highway 1 for all traffic forecasts in the study area. As Highway 36 would be the primary north-south route west of Brooks accessing Highway 1, planned land uses are expected to generate exponentially increasing traffic volumes up to the 20 year design horizon. The development of lands accessed via Highway 36 depends largely on assumptions of growth that are difficult to quantify at the time of this study. To account for the predicted exponential growth, the 2005 traffic volumes were compounded year over year utilizing the historical non-compounded average of 3.4%. The total projected AADT, AM and PM peak hour 2026 design traffic volumes for Highway 1 and Highway 36 are shown in **Figure ES.1**.

The estimated 2026 traffic volumes were utilized to project the 40-year traffic volumes. Since the interchange study design horizon is 20-years, and all of the current development plans and ASP's are also for 20 years, a traditional non-compounded linear growth rate was applied past the year 2026. The 2026 volumes were non-compounded at the rate of 3.4% per year, from 2026 to 2046.

ES.5 Analysis and Development of Alternatives

All of the data concerning land uses, environment, historical resources, and traffic volume projections were analyzed in the development of future interchange alternatives.

The traffic volumes forecasted for the Highway 1 and Highway 36 interchange are relatively low. The largest perceived benefit from the construction of an interchange is the grade separation to allow free flow conditions on Highway 1. Three main alternatives were analyzed including:

- **Alternative 1** – Tight Diamond Configuration
- **Alternative 2** – Spread Diamond Configuration with provision for upgrading to a Partial Cloverleaf
- **Alternative 3** – Parclo A4 Configuration

Due to the location of the transmission towers adjacent to Highway 36, modifications to these three main alternatives were analyzed which pulled the Highway 36 alignment away from the transmission tower alignment.

[1] *"Highway 1 Calgary to Saskatchewan Border Corridor Management Study"*, McElhanney Consulting Services Ltd. November 2005, Exhibit 4.6

ES.6 Evaluation and the Preferred Alternative

To evaluate the interchange alternatives to find the preferred alternative, evaluation criteria were created in order to compare each alternative with a base. The initial comparative analysis of the interchange alternatives was carried out by using five main criteria: safety, cost, operations, constructability, and environmental considerations. These main criteria were made up of multiple sub-criteria. In order to compare the alternatives on a relative scale, Alternative 1 was set as the base and Alternative 2 and 3 were compared to it.

The option to preserve the existing AltaLink transmission towers by realigning the Highway 36 alignment to the west through the interchange area was eliminated based on a potential decrease in safety related to a change in driver expectations. However, a small shift in the alignment of 40m to the west would enable the use of the existing intersection during construction of the bridge over Highway 1. **Table ES.1** shows the total overall comparison of the three alternatives.

Table ES.1: Total Overall Comparison

Main Evaluation Criteria	Alternative 1 (Base)	Alternative 2	Alternative 3
Safety	0	4	6
Cost	0	-3	-5
Operations	0	2	0
Constructability	0	2	1
Environment	0	-1	-1
Total Overall Comparison	**0**	**4**	**1**

ES.7 Recommended Alternative

Alternative 2, a Spread Diamond interchange with future provisions for upgrading to a Parclo A4, was determined to be the preferred alternative for the intersection of Highway 1 and Highway 36.

Alternative 2 was analysed further to determine staging, bridge layout, land requirements, access management, utility impacts, and capital cost.

ES.7.1 Interchange Level of Service

Alternative 2 was selected because of the flexibility it provides for future upgrading if traffic trends are drastically different from what is currently forecasted. The interchange layout, which has the provision to be upgraded with loops in any of the four quadrants, locates the ramp terminal intersections further away from the bridge structure. The overall interchange configuration for Alternative 2 is shown in **Figure ES.2**.

The Level Of Service (LOS) for all movements are acceptable for both intersections with no signalization requirement for the 20-year horizon. However, at the 40-year horizon, the west to south movement and east to north movement experience significant delays. At this point, the interchange may require upgrading to a Parclo A4 configuration or may be signalized based on the level of development at the 40-year horizon.

ES.7.2 Bridge Structure

The ultimate bridge structure is approximately 106m in length and is designed to accommodate a Parclo A4 interchange with loop ramps. It is recommended that the bridge deck be constructed 18m wide to accommodate the initial Spread Diamond interchange configuration, but if or when the loop ramps are

required for the ultimate configuration, the bridge may be widened to the full 37m as shown in **Figure ES.3**.

ES.7.3 Typical Cross Sections

To work towards a future design designation of RFD 616.6-130 for Highway 1, widening the outside of Highway 1 east of Highway 36 and widening the inside of Highway 1 west of Highway 36 is recommended to ensure a constant median width.

The typical cross section for Highway 36 based on a design designation of RAU 212-110 is a rural-type cross section both north and south of the interchange and an urban-type cross section within the interchange location. The urban cross section has a 6.0m wide raised median, which accommodates left turn lanes through the interchange.

Service roads were based on a design designation of RLU 210G-90 with a 40m Right-of-Way.

ES.7.4 Land Acquisition

The amount of land acquisition required is highlighted in **Figure ES.4**. The total approximate land required for the interchange construction is shown in **Table ES.2**.

Table ES.2: Land Acquisition

Land Use	Acres
Interchange Footprint	78 acres
Service Roads	144 acres
SWMF (NE Quadrant)	19 acres
Orphaned Land (SW Quadrant)	8 acres
Total land required	**249 acres**

ES.7.5 Access Management

Several access management considerations should be incorporated in conjunction with the construction of the proposed interchange. Ultimately Highway 1 will be designated as a freeway throughout the study area and Highway 36 will remain as a Major Two Lane Highway. All existing direct access to Highway 1 must be closed and access be provided through the service roads and interchange access.

While the majority of the existing accesses may remain along Highway 36, due to minimum spacing requirements, the EnCana field access on Highway 36:08 will have to be accessed via the north service road to Highway 36. EnCana field accesses on Highway 36:06 should be consolidated to maximize the distance from the service road intersection with Highway 36.

The design designation of the service roads throughout the study area is RLU 210G-90. The 10m wide gravel service road and design speed of 90 km/hr will serve to handle the traffic from the surrounding area.

ES.7.6 Utilities

There are 6 utility companies who have facilities that either cross or travel parallel to Highway 1 and Highway 36 within the study area. These utilities belong to ATCO Pipelines, TELUS, Fortis, EnCana, AltaLink, and Monarch.

The following utilities are impacted by the construction of the future interchange and should be realigned outside the highway right-of-way and cross the interchange as close to 90^{o} as possible.

- Two TELUS facilities
- One Fortis overhead powerline
- One Monarch fibre optic cable
- One AltaLink transmission line. The AltaLink transmission towers should be raised along their current alignment to provide adequate vertical clearance. This work is the responsibility of AltaLink.

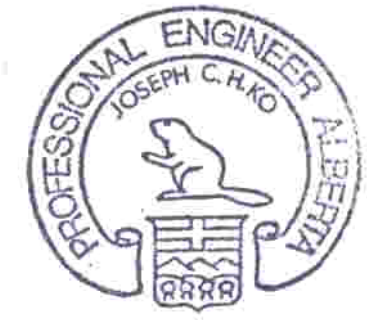
ES.7.7 Capital Cost Estimate

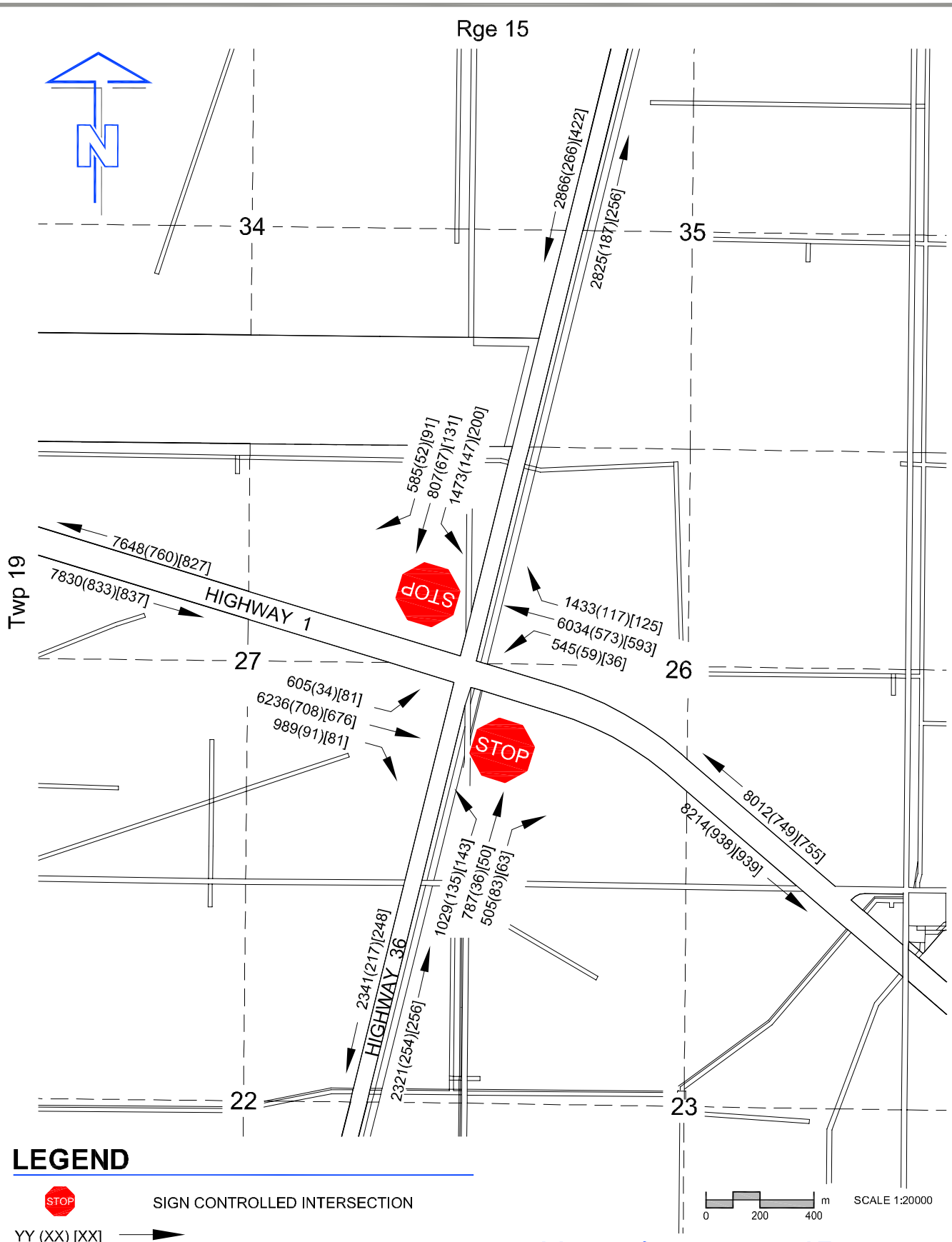
The proposed interchange at Highway 1 and 36 has been divided into three main stages of construction, initial stage 1 construction, potential future interchange loop ramp upgrades, and service road construction.

Initial stage 1 construction includes all aspects of the interchange except the possible future loop ramps and service roads. The service road cost estimate is for accessing all the property parcels. Currently, only small portions of these service roads are required due to the existing land use and density. However, they may be required as development occurs in the area. The total overall interchange cost estimate is outlined in **Table ES.3**.

Table ES.3: Total Capital Cost Estimate (CAD 2007)

Description	Estimated Total Costs
Initial Interchange Construction	$34.5M
Future Loop Ramp Construction	$11.2M
Service Road Construction	$6.2M
Total Interchange Cost	**$51.9M**





LEGEND

STOP SIGN CONTROLLED INTERSECTION

YY (XX) [XX]

- 2026 PM 100th HIGHEST HOUR ESTIMATES
- 2026 AM 100th HIGHEST HOUR ESTIMATES
- 2026 AADT ESTIMATES

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2026 Traffic Volumes (20-Year)
Figure - ES. 1

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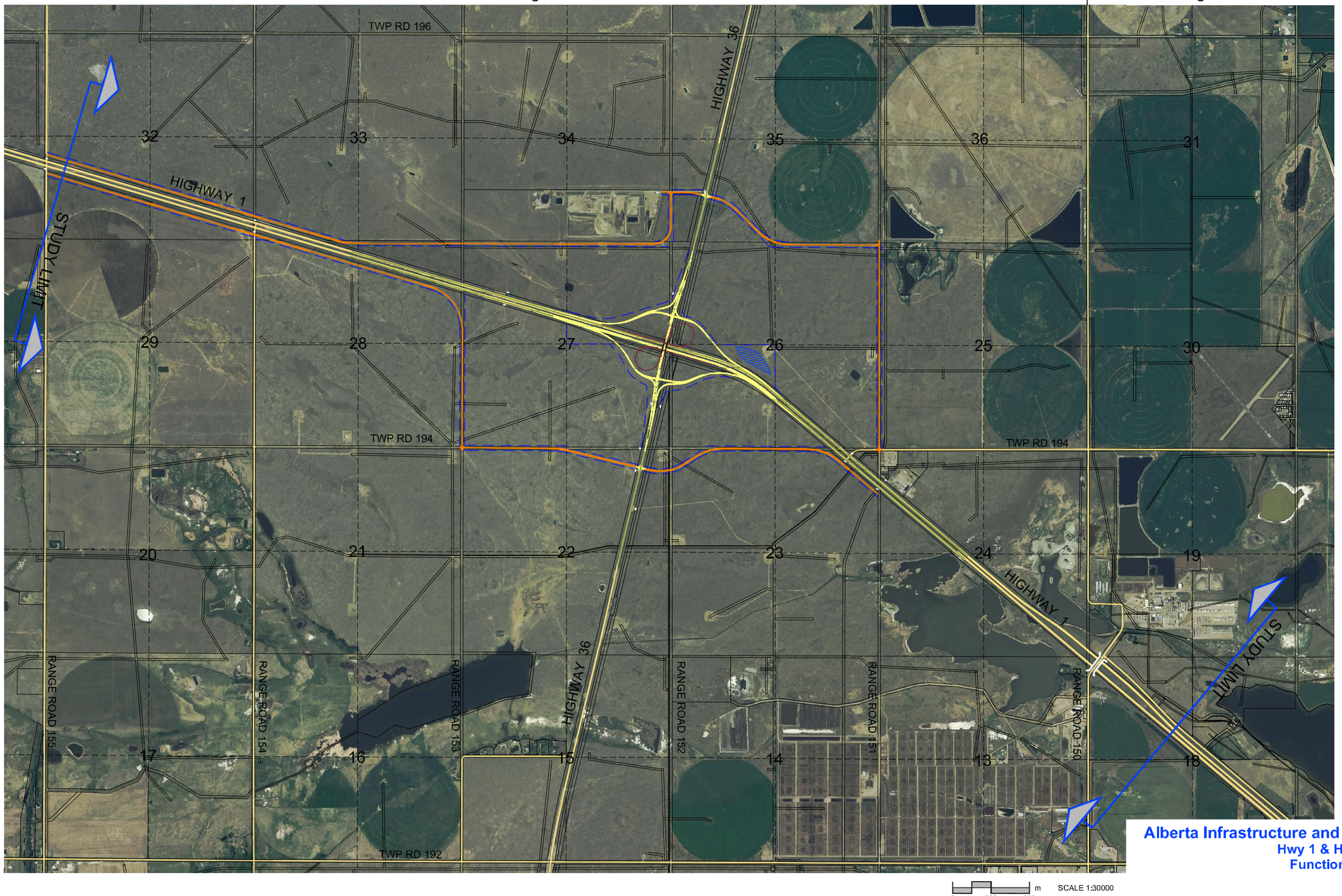
Rge 15

Rge 14

Twp 19



0 300 600 m SCALE 1:30000

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Recommened Interchange Plan
Figure - ES. 2
P-3309-28

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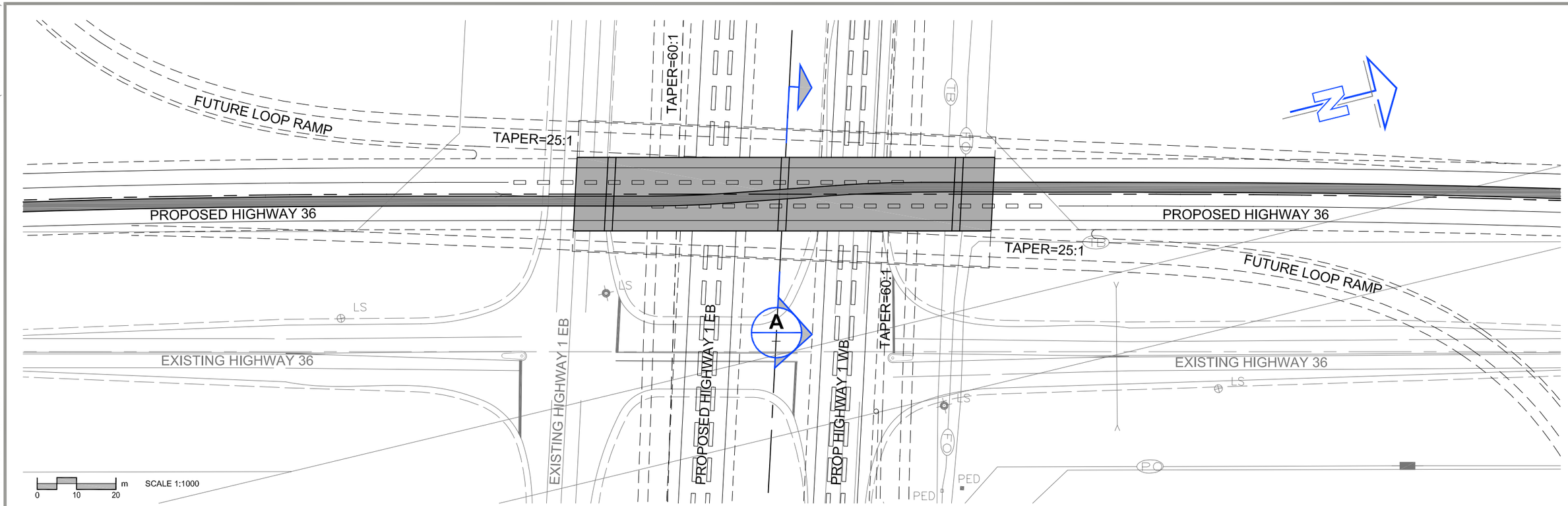
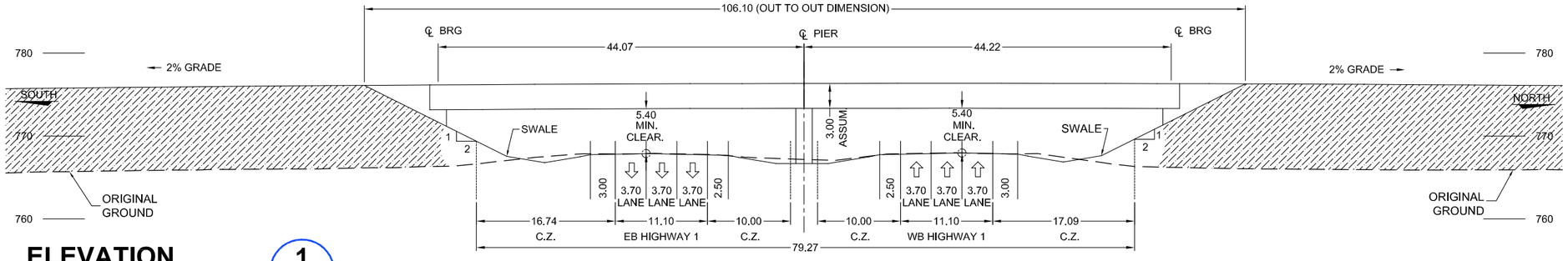
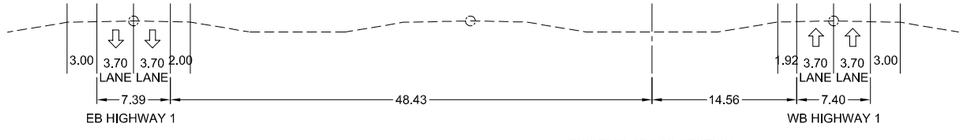




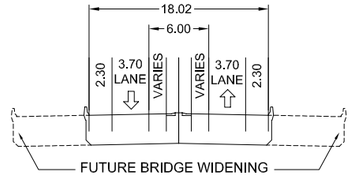
ELEVATION 1

0 6 12 m SCALE 1:600

PROPOSED BRIDGE



EXISTING CROSS SECTION



SECTION A

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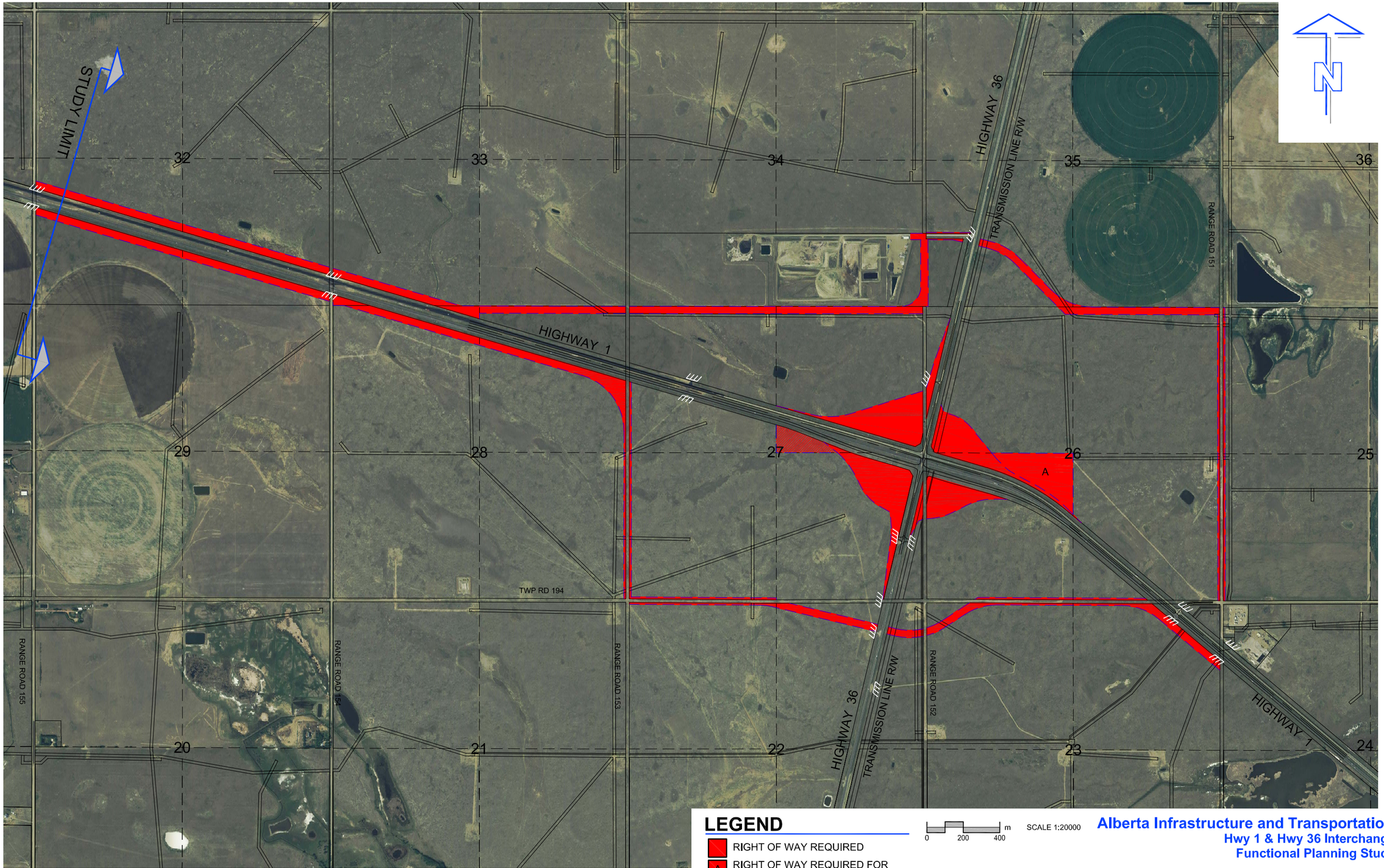
Proposed Functional Bridge Plan

Figure - ES. 3
P-3309-29



Twp 19

Rge 15

LEGEND

- RIGHT OF WAY REQUIRED
- A — RIGHT OF WAY REQUIRED FOR STORM WATER POND
- ORPHANED LAND
- ACCESS CLOSURE

0 200 400 m

SCALE 1:20000

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Land Acquisition Plan
Figure - ES. 4
P-3309-30

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