HARVEST INDUSTRIAL PARK
AREA STRUCTURE PLAN

CITY OF LEDUC

Prepared for
IPM Developments

Prepared by
WEDLER ENGINEERING LLP

Revised August 2010

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1. INTRODUCTION AND CURRENT CONDITIONS

1.1 PURPOSE

The Harvest Industrial Park Area Structure Plan (ASP) will serve to guide the development planning including rezoning and subdivision and the concept technical works required for the completion of this proposed industrial development.

This ASP identifies the general land use framework and guidelines relating to the:

- Proposed industrial development areas;
- Transportation network within this ASP;
- Conceptual servicing scheme;
- Environmental features;
- Implementation and staging of development.

The surrounding land uses and the relationship of this proposed development with these existing lands have been considered and addressed as well as the existing infrastructure in the area. Discussions with the City of Leduc have been completed to address the initial requirements and to develop the rationale for proceeding with this ASP.

1.2 LEGAL DESCRIPTION AND LOCATION

The subject site of the Area Structure Plan is in the City of Leduc and can be seen in Figure 1.

The roughly rectangular area comprises approximately 53.8 hectares (133 acres) in Block B and 53.5 hectares (132 acres) in Block A as shown on the legal description plan included as Figure 2 done by Wedler Engineering. The legal description is Plan Number 792 1548, Section 36, Township 49, Range 25, west of 4th Meridian (Block B), east of 4th Meridian (Block A).

The land within this ASP is bounded by 65th Avenue to the north and by Telford Lake to the south. It is south east of Edmonton International Airport.

1.3 LAND OWNERSHIP

The subject property of Block A is held under Certificate of Title Number 962-297-494 in the name of Kevin James Gaetz and Block B is held under Certificate of Title Number 092-379-318 in the name of 1330075 Alberta Ltd.

The land title certificates can be seen in Appendix A.

1.4 EXISTING LAND USE

The existing land of the subject property consists of unused farmland.

An aerial photograph showing the existing land can be seen in Figure 3.

1.5 EXISTING LAND USE OF SURROUNDING AREAS

The land use of the surrounding areas is as follows:

- North side – Farmland.
- West side – Already disturbed land (previously farmland).
- South side – Telford Lake.
- East side – Pasture.

The existing land of the surrounding areas can also be seen in Figure 3.

1.6 SITE CONDITIONS

The ASP area is mainly inactive farmland with some treed areas. The topography is relatively level with some long gentle slopes. The majority of the site slopes towards a low area in the north section which has a natural drainage course that flows east. The natural channel, which is protected by a blanket right-of-way in favour of the City of Leduc, flows to the east towards Saunders Lake. The south-most portion of the site tends to naturally drain into Telford Lake to the south.

There is a high pressure gas pipeline right-of-way running east to west through the central portion of the site. Also, there is a transmission line right-of-way through the southern portion of the site, just to the north of Telford Lake.

1.7 OTHER LANDS

The City of Leduc has directed the inclusion of Block A, which is the 53 hectare parcel immediately to the east within this ASP. While we have addressed the potential layout and servicing of these lands, detailed studies and analysis of this parcel is not included. This ASP has been developed to be compliant with current adjacent development plans and the potential development planning of this Block A.

2. DEVELOPMENT CONCEPT

2.1 OBJECTIVES

The Harvest Industrial Park Area Structure Plan provides an overall framework for the development of the subject site while mitigating any potential development issues and providing additional infrastructure and amenities for use by, and benefit to, the existing community.

The intent of this ASP is to obtain approval for Phase 1 (see Figure 8) with approval for Phase 2 and Phase 3 subject to revisions as required for compliance to the Telford Lake Master Plan. This will provide an opportunity for the development to proceed in the areas which will have no impact on Telford Lake.

2.2 POLICIES AND STANDARDS

2.2.1 City of Leduc Municipal Development Plan

The City of Leduc Municipal Development Plan (MDP) was adopted in 2005 by Bylaw 625.2006. The MDP states that the Plan is the foundation for all other planning policies, including the Land Use Bylaw, Area Structure Plans, and Area Redevelopment Plans.

The subject land of this ASP is designated in Leduc's MDP Future Land Use Plan as "Industrial Reserve". In the MDP the City of Leduc recognizes the expected continual growth in industrial developments while also attempting to promote the goal of a 60:40 ratio of residential: industrial/commercial.

The ASP land can be seen on the City of Leduc's Future Land Use Plan Map in Figure 4.

2.2.2 City of Leduc Land Use Bylaw 516-2002, As Amended

The subject land of this ASP is currently designated as U-R – Agriculture – Urban Reserve in the City of Leduc Land Use Bylaw. The proposed land use districts for this land are a mixture of:

- M-1 – Light Industrial District
- M-2 – Medium Industrial District

The Proposed Site Plan can be seen in Figure 5.

2.2.3 City of Leduc Minimum Engineering Design Standards

The City of Leduc Minimum Engineering Design Standards manual, dated April 2006, outlines requirements and standards for the development of land and services within the City of Leduc. This manual provides information on items including procedures, roadways, lot grading, utility trenches, water distribution systems, sanitary sewage systems, and storm drainage systems.

This ASP acknowledges the requirements and standards of the procedure and design standards for the Design Manual.

2.2.4 Airport Vicinity Protection Area (AVPA) Regulation

The Edmonton International Airport Vicinity Protection Area Regulation is a provincial regulation that was adopted to ensure that land uses near the airport are compatible with both the existing and future airport plans. The AVPA provides measures to mitigate noise impacts and protect airport operations.

The specific restrictions in the AVPA Regulation include but are not limited to the following:

- Anything which will produce emissions, exterior lighting, etc. that may decrease visibility;
- Anything with operations, machinery, etc. that may affect airport radio communications;
- Anything that may be affected by airport noise;
- Anything that may attract birds (including accumulations of water/material edible by birds).

The Noise Exposure Forecast (NEF) system is used to predict the annoyances and effects from airport and aircraft noise in order to forecast appropriate land uses nearby.

The subject land of this ASP falls in the NEF areas of 30 to 35.

The Edmonton International Airport Vicinity Protection Area Regulation, Alberta Regulation 55/2006 can be seen in Appendix B.

2.3 PUBLIC CONSULTATION

The Developer is prepared to hold any public information meetings as deemed necessary by the City of Leduc.

2.4 LAND USE

The policies as outlined in Section 2.2 of this report direct the form and type of development within the land in this ASP. A proposed site plan has been developed in consideration of these policies and anticipated benefiting development demands.

This area is currently identified in Leduc's MDP Future Land Use Plan as "Industrial Reserve". In accordance with this, the proposed land use is mixed M-1 – Light Industrial District and M-2 – Medium Industrial District. The subject site has 23 proposed industrial lots and the development statistics have projected employment of approximately 2,468.

The proposed industrial lots and corresponding land use areas can be seen on the Site Plan in Figure 5.

2.4.1 M-1 – INDUSTRIAL – Light Industrial District

The City of Leduc Land Use Bylaw states that the general purpose of this District is to accommodate light industrial uses with activity mainly indoors.

The City of Leduc Land Use Bylaw for the permitted and allowed discretionary uses and other regulations for the M-1 – Light Industrial District can be seen in Appendix C.

2.4.2 M-2 – INDUSTRIAL – Medium Industrial District

The City of Leduc Land Use Bylaw states that the general purpose of this District is to accommodate indoor and outdoor industrial uses that do not cause any objectionable or dangerous conditions beyond the site boundary. This District will be separated from commercial and residential district by the M-1 – Light Industrial Districts.

The City of Leduc Land Use Bylaw for the permitted and allowed discretionary uses and other regulations for the M-2 – Medium Industrial District can be seen in Appendix C.

2.4.3 Proposed Site Land Use

Figure 5 shows the preliminary areas identified for land use M-1 and M-2. Lot 23 is the only lot to allow for land use M-2 and it is anticipated to contain a concrete batch and precast plant. Lot 23 has been specifically identified within this proposed layout to establish a known lot buffer around the proposed plant site as well as separation to the water course. This configuration has been developed to allow this M-2 area to be accommodating with the surrounding M-1 areas.

Screen fencing as approved by the City will be required for the proposed concrete plant. Figure 6 shows the proposed layout of the concrete plant.

A report prepared by Active Earth Engineering Ltd. addresses the best management practices for the concrete producing plant and can be seen in Appendix H.

A report being undertaken by the City of Leduc on eco-industrial land uses adjacent to Telford Lake and preferred transitional land uses will be completed in 2010. The findings of the report may result in a Land Use Overlay of the ASP area. Due to the sensitivity of Telford Lake, the City may require specific Architectural Controls for the lots in the vicinity of the Lake.

The proposed land uses of Block B can be seen in the following table:

Block B Zoning Legend	
Land Use	**Area (ha)**
Gross Area	53.8
Developable Area	53.03
M-1 Zoning	35.15
M-2 Zoning	2.72
PUL Land	2.78
MR Land	5.303
ER Land	0.77
Road Widening	0.44

The suggested land uses of Block A can be seen in the following table:

Block A Zoning Legend	
Land Use	**Area (ha)**
Gross Area	53.5
Developable Area	52.85
M-1 Zoning	38.98
PUL Land	2.72
MR Land	5.285
ER Land	0.65
Road Widening	1.41

2.4.4 Planned Land Use of Adjacent Areas

The lands surrounding the subject ASP land will be non-residential.

There does not appear to be any land development currently planned to the direct north of the ASP site. Also, the land directly north is not currently within the service area as per the City of Leduc's Future Sewer Servicing Concept.

The lands to the northwest of the ASP site are proposed to be developed for industrial and commercial uses under the ASP in place. The land uses are mixed M-1 and M-2 Industrial Districts.

The site to the immediate west of the ASP land is proposed to be developed for light industrial and business uses under the Outline Plan in place. The lands to the west are currently zoned U-R. It is proposed to be rezoned by the City to M-1 in the future.

This ASP addresses the potential development planning of Block A, detail studies and analysis may be required at the actual time of development. This may be accomplished with an outline plan. Conceptual layout, road network, and servicing are addressed for this land in this ASP.

The development plans of the future surrounding sites to the east, west, and northwest can be seen in Figures 5, 7, and 8 respectively.

2.5 DEVELOPMENT STAGING

The staging of the ASP land development will consist of three phases. The three stages will advance from the north of the site to the south by Telford Lake. The first stage, located adjacent to 65th Avenue, will encompass the lands that are proposed to develop in the immediate future. The second stage will be the transitional zone between the standard industrial development of the first stage and the "lakeside industrial" zone which will be adjacent to Telford Lake. The third stage will encompass the lands adjacent to Telford Lake, which are expected to have different land use regulations in place in early 2010 in order to protect the environmental integrity of Telford Lake. It is understood that the ASP will be required to meet any land use regulations or policies that result from the research work currently being conducted by the City of Leduc. It is also understood that following the release of the new land use regulations an ASP amendment must be completed prior to any new Plans of Subdivision being approved by the City of Leduc, regardless of the Stage of Development that the Plan of Subdivision is in.

A Conceptual Staging Plan can be seen in Figure 8.

3. TRANSPORTATON AND CIRCULATION

3.1 ACCESS AND EXTERNAL ROADWAY SYSTEM

The development ASP provides one roadway site access onto 65th Avenue. This proposed site access and corresponding site layout is in accordance with the Transportation Study Update (2006 to 2016) Final Report by ISL dated June, 2009 and the Functional Plan by McElhanney Consulting Services Ltd. The major affect of these documents on the ASP site area is the realignment of RR250 along with the elimination of direct access south of 65th Avenue within the ASP lands.

We note that the Functional Plan essentially maintains the RR250 alignment as per the Transportation Plan Update. This ASP area is identified for development within this Plan as per Exhibits 2.7 and 2.12. The corresponding congestion level is "good" as per Exhibit 4.7 for 65th Avenue at the maximum analyzed build out of 40,000 Traffic. However, we are actually proposing to construct the additional access road to 65th Avenue as shown in Exhibit 5.1, Long Term Network, between the existing right-of-way to the west and RR 250 to the east. This will only improve the already good rated congestion level and the proposed intersection location is near centered, slightly favoring the east side which is preferable for a little additional space from the major intersection at RR 250.

The site access and site development complies with the Transportation Master Plan 2006-2016 Long Term Network and the Functional Plan. The relevant exhibits and plans are included in Appendix I. The planned cross section for RR 250 can be seen in Figure 16.

Williams Engineering previously completed a Traffic Impact Assessment (TIA) for the site which is included in Appendix J. While this report acknowledges the Transportation Master Plan, it addresses the road network "as is" due to the Transportation Plan updates not being complete at the time of the TIA report completion. As this development is compliant with the Master and Functional Plans, the relevancy of the report is mainly to address intersection improvements for the site access onto 65th Avenue. Accordingly, the report recommends the intersection be a Type IVd to accommodate full build out in 2034. While the upgrades are identified based on the existing road network, the Williams TIA report indicate this intersection level of service is conservative.

We suggest that the Type IVd intersection be utilized as per the Williams report in concept as the benchmark for upgrades, but the level of service required and the corresponding amount of construction and potential timing of this construction be reviewed at detailed design stage. It may be viable to complete interim access improvements which will satisfy the current proposed development in consideration of the existing road network while ensuring that possible future

additional upgrades are secured. These future upgrades can then be done with the confidence of being compatible with the new RR 250 alignment and connection network improvements.

An 11 metre road widening is required along the north ASP boundary. We understand the upgrade of 65th Avenue is to be completed by the City of Leduc and the City will establish the corresponding Offsite Levy Charges payable by this development.

The Outline Plan for the NW ¼ Section 36-49-25 prepared by gpec Consulting Ltd. can be seen in Figure 7.

3.2 INTERNAL ROADWAY SYSTEM

The internal roads will be designated as standard local and collector rural industrial roads with 30.0 metre and 32.0 metre right-of-ways as per the City of Leduc and shown in Figure 16. 57th Avenue and the main entrance road are designated as rural collector roads.

The natural trees and vegetation will be protected by easement or restrictive covenant. These tree protection areas can be seen on Figure 5

The east-west roads have been proposed and will also be designed taking the expected future developments to the direct east and west of the subject site into account. There will be special crossings at existing gas and power right-of-ways. These roadways can be connected through to the future neighbouring sites. The internal roadway system can be seen on Figure 9. While we have shown an optional north-south road adjacent to the Melcor Development property, this roadway may be eliminated if not agreeable to this property's owners.

The internal network of roadways will lead to all of the industrial lot entrances; no individual properties will be accessed off 65th Avenue. All internal roads will be designed and constructed to the City of Leduc Minimum Engineering Standards and the geotechnical recommendations. The cross sections of the internal roads can be seen in Figure 16.

4. SERVICES

4.1 GENERAL

Services to the ASP lands for water, sanitary, and storm, as well as shallow utilities will be by way of connection to existing utilities on the west of the lands. A detailed servicing brief, to be reviewed by the City, shall be undertaken prior to doing any detailed engineering design drawings.

4.2 WATER SUPPLY AND DISTRIBUTION

The water supply for the Harvest Industrial Park will be from the City of Leduc's existing municipal water system. The existing 400mm diameter water pipeline sits near the intersection of 65th Avenue and 43rd Street and will be extended to the project site farther east on 65th Avenue. The extension of the existing water service can be seen in Figure 10.

All watermain piping is to comply with the City's water network modeling. The proposed onsite water network, which can be seen in Figure 11, is appropriately sized to provide fire flow demands and service to each of the individual properties on the industrial park. The preliminary sizes shown are to be confirmed at detail design. The City of Leduc will be performing the overall water network analysis for this area to determine water main sizes and where trunk lines should go. All water works will be completed to the City of Leduc's standards.

4.3 SANITARY SEWER SYSTEM

The City of Leduc has provided the planned service catchment boundary of this sanitary sewer and it is shown on Figure 12.

This catchment boundary has been established based on the capacity of the existing 450mm diameter sanitary sewer main located on 44th Street to the northwest of the ASP lands. The option for the sanitary mainline extension to the site is shown in Figure 10.

The sanitary mainline extension choice has been previously established with the City of Leduc's consultation. We understand from the City that this alignment does not encounter any known pipelines or oil wells. There will likely be a requirement for additional right-of-way or working easements due to the depth of cut and the right-of-way width off of 43rd Street. Preliminary review indicates cuts in the magnitude of 9 metres.

Final sizing of the sanitary sewer extension will also be confirmed at detail design stage. The maximum allowable sewer capacity for the subject property will be set as requested by the City of Leduc Engineering Department.

The onsite sewer will also be appropriately sized and connected to the system on 65th Avenue and can be seen in Figure 13. The preliminary sizes shown are to be confirmed at detail design.

All sanitary sewer works will be completed to the City of Leduc's standards. Review of the gravity service area available should also be completed and the need for pump stations, if any, be identified.

4.4 STORM WATER MANAGEMENT SYSTEM

The majority of the drainage is proposed to flow by pipe and grading from the industrial sites to a storm water management pond located in the northwest quadrant of the ASP land. The Storm Water Management Model (SWMM) will be utilized as it is the preferred computer model of the City of Leduc. The City of Leduc's suggested runoff parameters and storm drainage system guidelines as stated in the Engineering Design Standards are all being considered. Preliminary storm water modeling has given an approximate storm water management pond volume of 30,000 m^3; the sizing will be confirmed at detail design.

The planned storm water management pond will be a shared pond with the developing site to the direct west. The ASP site will have an appropriate portion of the shared storm water management pond located on the ASP land sized to suit its own required storage volume. The storm pond facility is also able to provide storage for the half of the 65th Avenue right-of-way along the property. The development to the west will also have the remaining part of the pond sized to hold its own required storage volume. The large storm water management pond with controls will achieve the mandatory criteria and will also provide an amenity for the development. The outflow of the storm water management pond located on the ASP site will be sized appropriately to control the necessary flow of the entire shared pond including the storm water from both sites and to maintain the pre-development conditions to the east.

As the possible future development to the direct east of the ASP lands has also been considered throughout this proposed design, it should be noted that it will be able to meet the City of Leduc's preferences for storm water management facilities on its own. The City of Leduc Minimum Engineering Design Standards state that *it is preferred that only one or two storage facilities be used to handle storm runoff from about 65 ha* and that *a storage facility shall handle the runoff from a minimum area of about 30 ha* and the site to the east appears to fit into these guidelines, with a land area of approximately 53 hectares. Detailed analysis will be completed at the design stage to confirm these parameters and the corresponding final pond arrangement.

The proposed onsite storm water network, which can be seen in Figure 14, will be appropriately sized to transport storm water services from the internal roadways and each of the individual properties on the industrial park to the storm water management pond.

The Southern portion of the land naturally drains to Telford Lake and will not flow to the storm water management facility. This land area however, will be included in the storm water calculations of the management facility. While this will

address the overall site storm water management, specific facilities for Stage 3 of Block B will be mandatory to ensure an acceptable level of treatment is achieved before the storm water is discharged into Telford Lake. Options for storm water management for the lots in Stage 3 of Block B will be considered by the City. Options may include one storm water management pond for all Stage 3 or ditch at the rear of lots within Stage 3 which may require cross-easement agreements between the owners of the lots. An Environmental Consultant will be utilized at the design stage to confirm this and any facility will be approved by the City of Leduc to ensure the safety and sensitivity of Telford Lake.

All storm water management systems will be designed and constructed to the City of Leduc's standards. The preliminary sizes shown are to be confirmed at detail design.

Complete details of the storm water management pond, storm piping (if required), and corresponding service areas will all be included at the design stage.

4.5 SHALLOW UTILITIES

Sub-consultant A.D. Williams will be confirming power supply, telephone, and cable with the appropriate utility companies. There are existing gas and transmission utility right-of-ways on the Lands.

4.6 BENEFITING SERVICING WORKS

There are servicing works, namely sanitary sewer and water main that require offsite extension to service the ASP lands (seen in Figure 10). Future planned developments will benefit directly from these offsite works and should contribute to the offsite costs. The City will endeavor to assist the developer within the ASP area in collecting costs associated with over sizing from the owners of benefitting lands as the benefitting lands are developed.

5. OTHER ASSESSMENTS

5.1 ENVIRONMENTAL

5.1.1 Site Assessment

A Phase 1 Environmental Site Assessment has been completed for the ASP lands. The report was done by Hoggan Engineering & Testing (1980) Ltd. and they did not find any further environmental assessments to be necessary as there were not any significant environmental concerns found. A full copy of the Phase 1 Environmental Report can be seen in Appendix D.

5.1.2 Environmentally Sensitive Areas

In accordance with the MGA, a minimum of 6.0m of land is required to be dedicated as Environmental Reserve (ER) land along the shoreline of Telford Lake. A setback of 16m, which far exceeds the required minimum, is being proposed as ER land along Telford Lake for Block B the subject property. This creates an area of 0.77ha of ER land. Following this same setback on Block A, the suggested area of ER land would be 0.65ha.

While this is compliant with the preliminary information provided to area stake holders, it is understood that this area will be revised, if required, in conjunction with the final Telford Lake Master Plan.

5.1.3 Municipal Reserve Lands

Municipal reserve (MR) lands are commonly set at 10%, as is proposed in the ASP subject property. The total area of approximately 53.8ha for Block B less the 0.77ha of ER land (as explained in Section 5.1.2) leaves a net developable area of 53.03ha. Therefore, 5.303ha will be dedicated as MR land for Block B. The total area of approximately 53.5ha for Block A less the suggested 0.65ha of ER land (as suggested in Section 5.1.2) leaves a net developable area of 52.85ha. Therefore, 5.285ha is suggested to be dedicated as MR land for Block A. An overview of the MR and ER land with an aerial underneath can be seen in Figure 15.

The developer will retain a qualified Environmental Consultant to assist in this process, as required, and also to provide recommendations for the storm water discharge to Telford Lake.

5.2 GEOTECHNICAL

A site detailed Geotechnical Report has been completed by Geo Media Engineering Ltd. and it did not yield any concerns. The field investigations, testing results, site conditions, and recommendations are outlined in the report. A full copy of the site detailed GeoMedia Geotechnical Report can be seen in Appendix E.

5.3 WELL SITES AND PIPELINES

It is noted in the Phase 1 Environmental Site Assessment that the Alberta Utilities Board had indications of two test holes on the study area, but no wells were ever installed.

There is a high pressure gas pipeline right-of-way running east to west through the central portion of the site. AltaGas Utilities has advised of the location and

details of the high pressure gas pipeline in their Utilities Record. Detailed site development will respect all the necessary precautions and construction regulations and appropriate permits and approvals will be obtained. A restrictive covenant will have to be registered against the title to any lands that have the right-of-way on it identifying the development restrictions.

The Energy Resources Conservation Board (ERCB) was contacted for information on restrictions for development over the high pressure gas pipeline. An ERCB representative instructed that no permanent structures are to be installed on a pipeline right-of-way. They also advised that the applicable ground disturbance regulations must be considered. Anyone creating a ground disturbance *in the pipeline right-of-way* must get written permission from the pipeline owner prior to conducting the ground disturbance. Additionally, they must notify the pipeline owner if doing ground disturbance within 30 metres of the pipeline, which could easily be outside of the designated right-of-way. Ground disturbance may be conducted up to the right-of-way without written permission as long as the pipeline owner is notified of the work and has the opportunity to first come out and mark the location of their line.

The AltaGas Utilities Record on the high pressure gas pipeline and the email response from the ERCB can be seen in Appendix F.

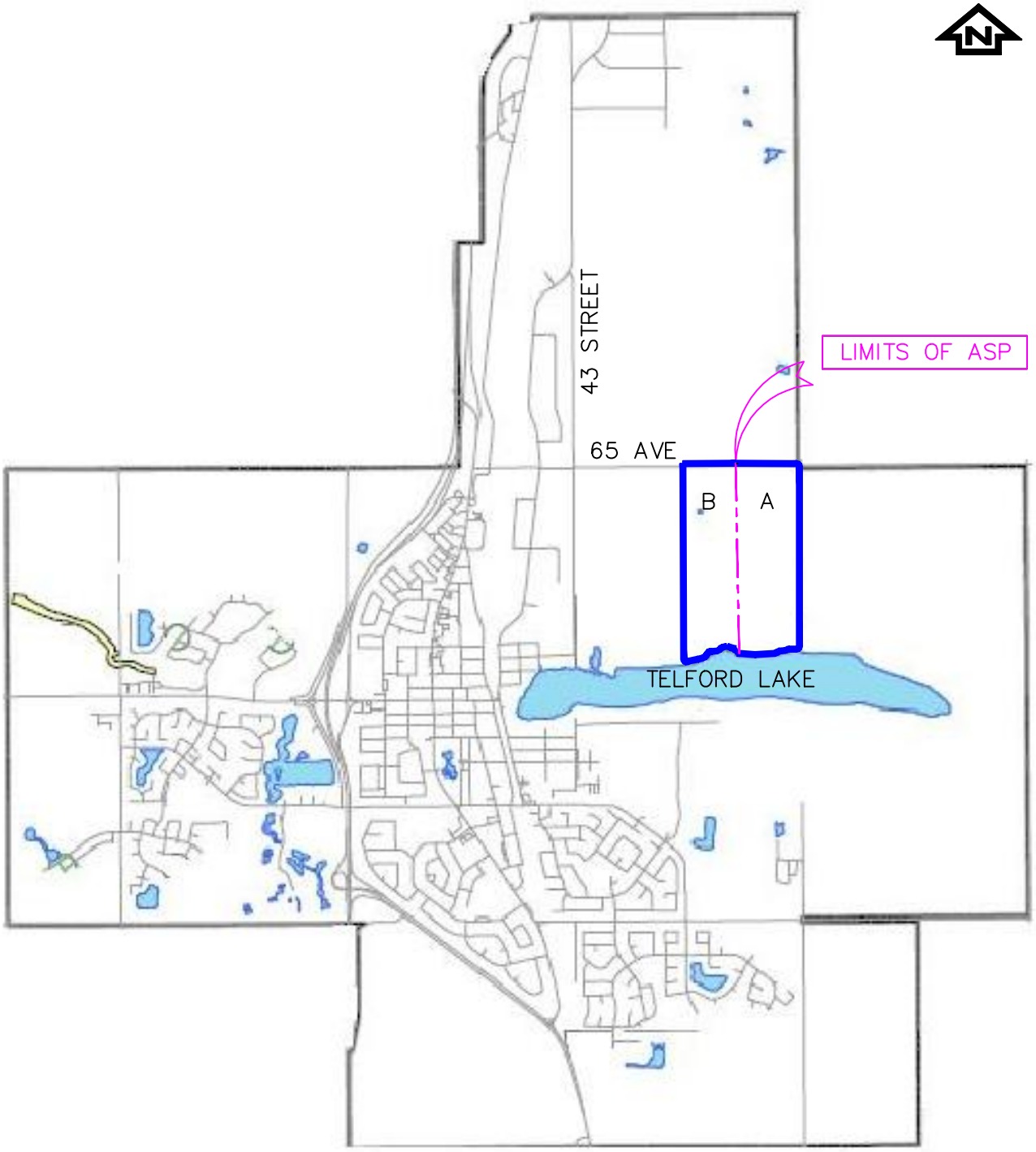
Also, as is noted in the Environmental Phase 1 Report, there is a transmission line right-of-way through the southern portion of the site, just to the north of Telford Lake.

Both of the above-mentioned right-of-ways are identified on the ASP's proposed site plan.

5.4 HISTORICAL/ARCHAEOLOGICAL RESOURCES

The Historical Resources Management Branch of Alberta Culture and Community Spirit (formerly referred to as Alberta Community Development) was contacted requesting any advice on whether there are any significant historical/archaeological concerns with land development in the ASP area. A Land Use Planner from the Historic Resources Management Branch confirmed that there are not any concerns as there are no previously recorded historic resource sites that will be impacted by development in this area. There is also land disturbance in the general area and such sites are not expected to be encountered.

The email response from The Historical Resources Management Branch of Alberta Culture and Community Spirit can be seen in Appendix G. As per their email response, a Historic Resources Impact Assessment is not required.



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IPM DEVELOPMENTS

LEDUC, ALBERTA

FIGURE No. 1
LIMITS OF ASP

DRAWING NO.
C08–4444/A–R1

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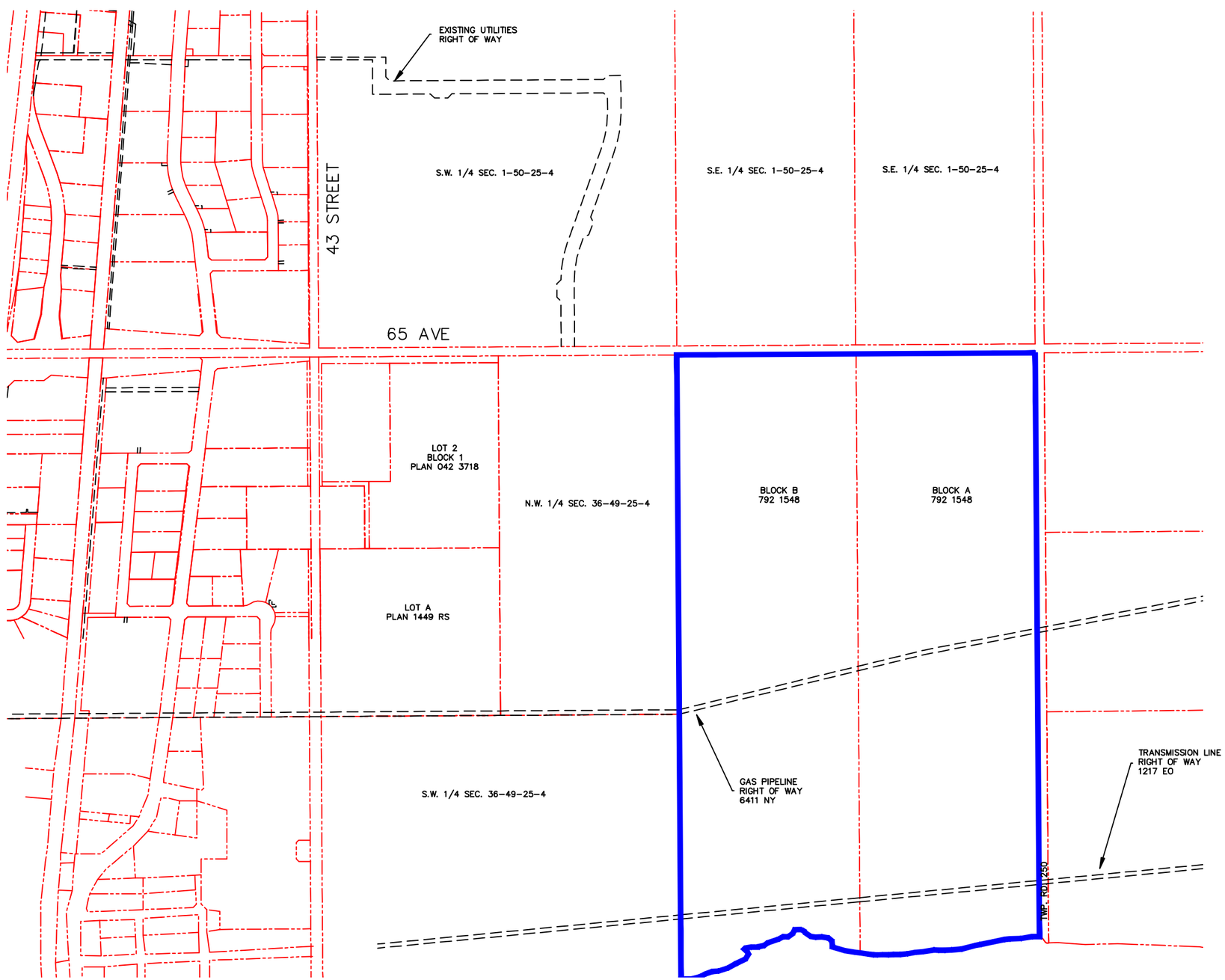

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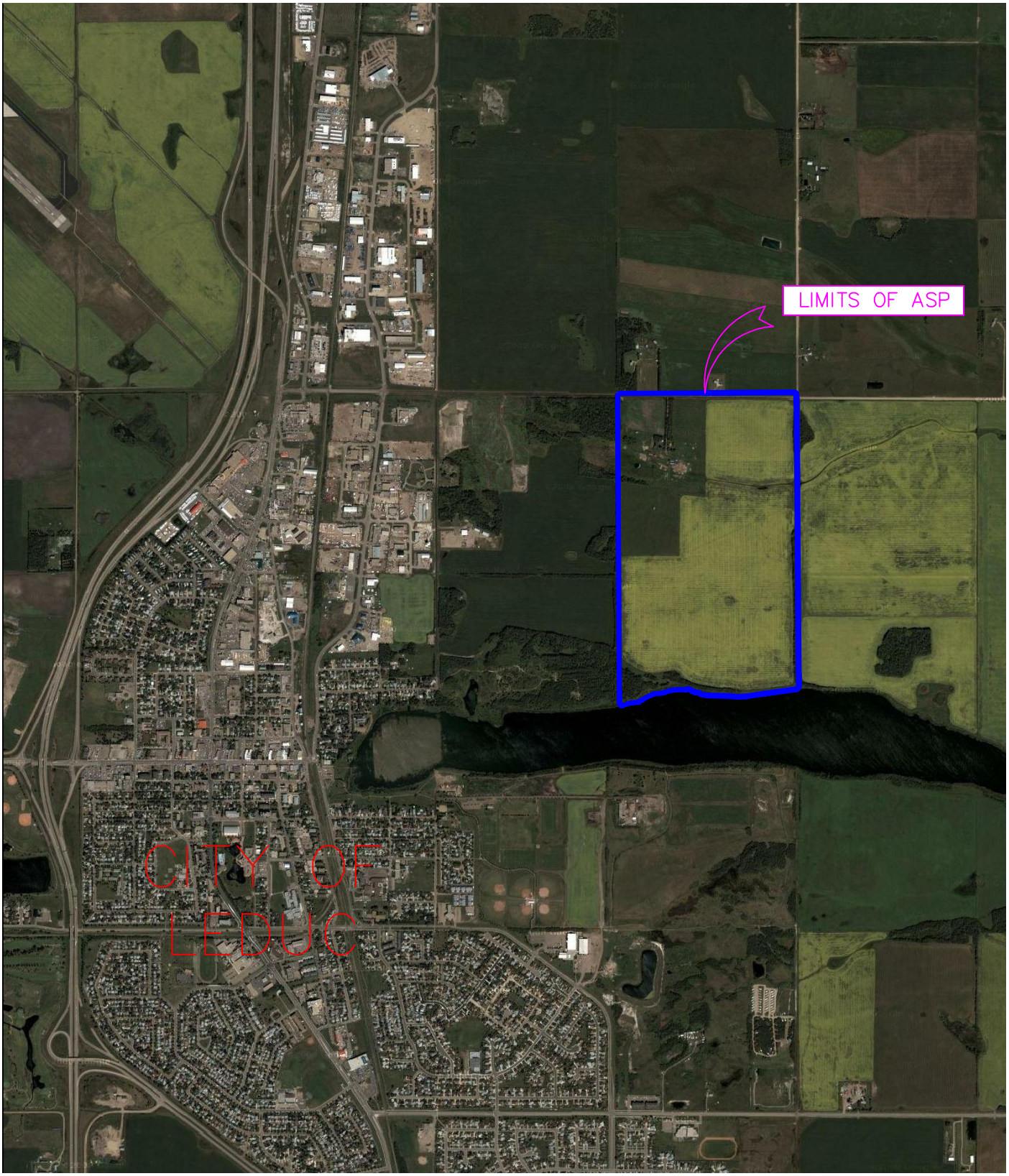

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FIGURE No. 3
AERIAL OF ASP AREA

DRAWING NO.
C08-4444/A-R3

OF

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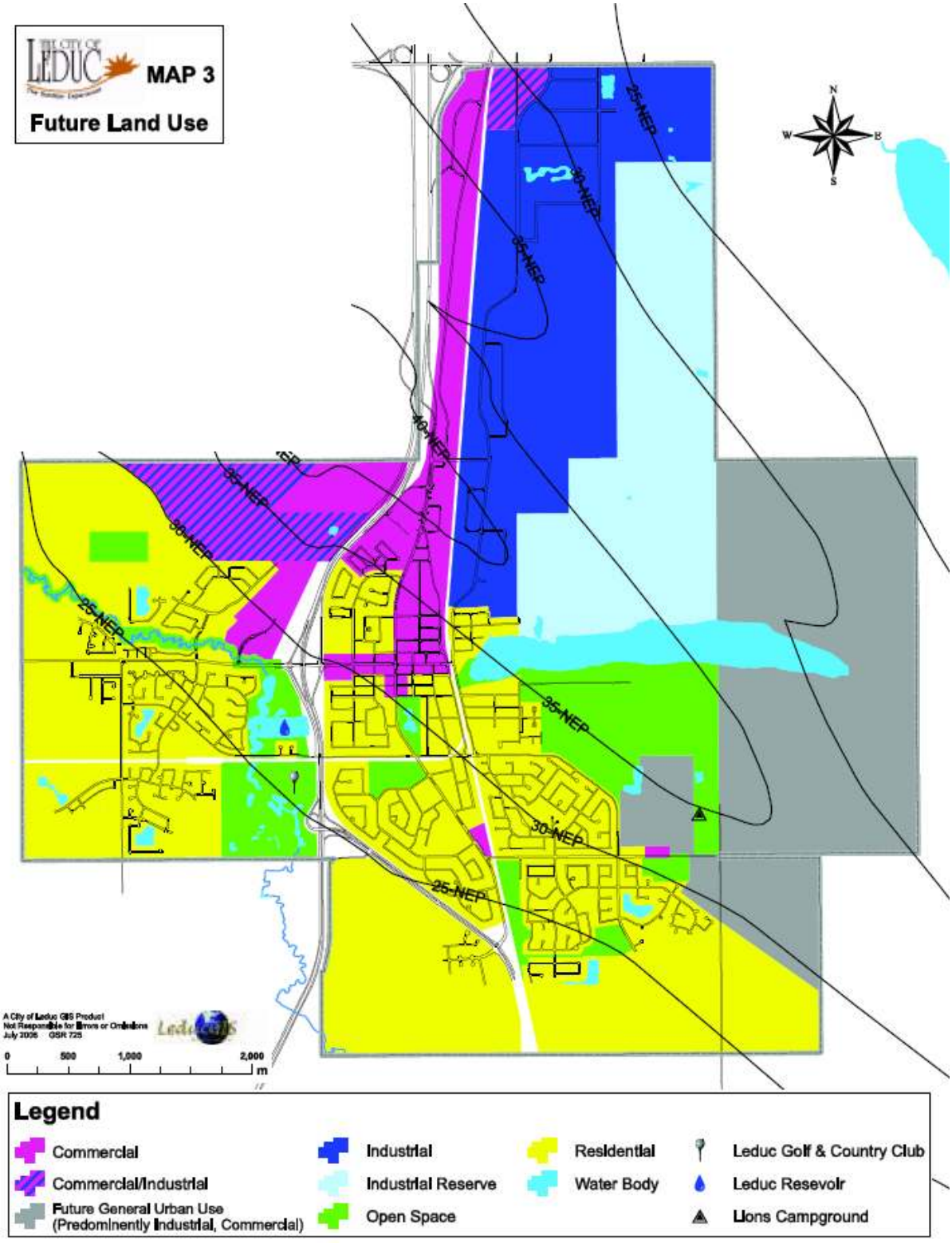

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FIGURE No. 4
LEDUC FUTURE LAND USE PLAN MAP

DRAWING NO.
C08–4444/A–R4

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MELCOR DEVELOPMENT

POTENTIAL FUTURE ROAD

OPTIONAL ROAD SUBJECT TO MELCOR & CITY ACCEPTANCE

TREE PROTECTION AREA (TYPICAL)

EXISTING MELCOR SWMF

16.00m

COLLECTOR ROAD (TYIPCAL)

TELFORD LAKE

65 AVE

FUTURE ROAD (BY OTHERS)

11.00m

BLOCK 'B'

BLOCK 'B' ZONING LEGEND	
M-1 ZONING (35.10ha)	
M-2 ZONING (2.72ha)	
P.U.L. LAND (2.78ha)	
M.R. LAND (5.30ha)	
E.R. LAND (0.77ha)	
ROAD WIDENING (0.44ha)	

BLOCK 'A' ZONING LEGEND (BY OTHERS)	
M-1 ZONING (38.78ha)	
P.U.L. LAND (2.72ha)	
M.R. LAND (5.29ha)	
E.R. LAND (0.65ha)	
ROAD WIDENING (1.41ha)	

NOTE: M.R. LAND IS EQUAL TO 10% OF TOTAL DEVELOPABLE LAND AREA

11	12,989m²	3.21 ac	
12	12,989m²	3.21 ac	
13	11,033m²	2.72 ac	
14	11,033m²	2.72 ac	
10	15,347m²	3.79 ac	
9	15,371m²	3.80 ac	
8	16,703m²	4.13 ac	
7	16,743m²	4.13 ac	
6	13,556m²	3.35 ac	
5	13,530m²	3.34 ac	
4	23,260m²	5.75 ac	
DETENTION POND SWMF			
3	18,596m²	4.59 ac	
2	13,336m²	3.29 ac	
1	13,734m²	3.39 ac	
15	16,409m²	4.05 ac	
16	16,435m²	4.06 ac	
17	21,080m²	5.21 ac	
18	21,743m²	5.37 ac	
19	19,029m²	4.70 ac	
20	20,264m²	5.00 ac	
21	14,336m²	3.54 ac	
22	15,545m²	3.84ac	
23	27,196m²	6.72 ac	
39			
40			
41			
42			
43			
44			
45			
46			
47			
24			
38			
25			
37			
35			
34			
33			
32			
31			
30			
29			
SWMF			
28			
27			
26			
36			

57 AVE

FUTURE BLOCK 'A' ZONING

RANGE ROAD 250

60.00m

POSSIBLE FUTURE MR & ER LANDS FROM UNUSED ROAD R.O.W.

POSSIBLE SURPLUS ROAD R.O.W.

OIL PIPELINE RIGHT OF WAY

OPTION 3 RANGE ROAD 250 (McELHANNEY)

G:\Drawing\4400444\C08-4444\Dwg\115-Preliminary\March 2010 Revised\4444a ASP March 2010.dwg 2010/5/18 11:49:37 AM cwickham

LEGAL:

BENCHMARK:

NO.	ISSUE / REVISION	YYYY/MM/DD	BY

SEAL

PROJ. MGR.	GWD
DESIGN/DRAWN	CTW
DATE	
HORIZ. SCALE	
VERT. SCALE	

WEDLER ENGINEERING

IPM DEVELOPMENTS

LEDUC, ALBERTA

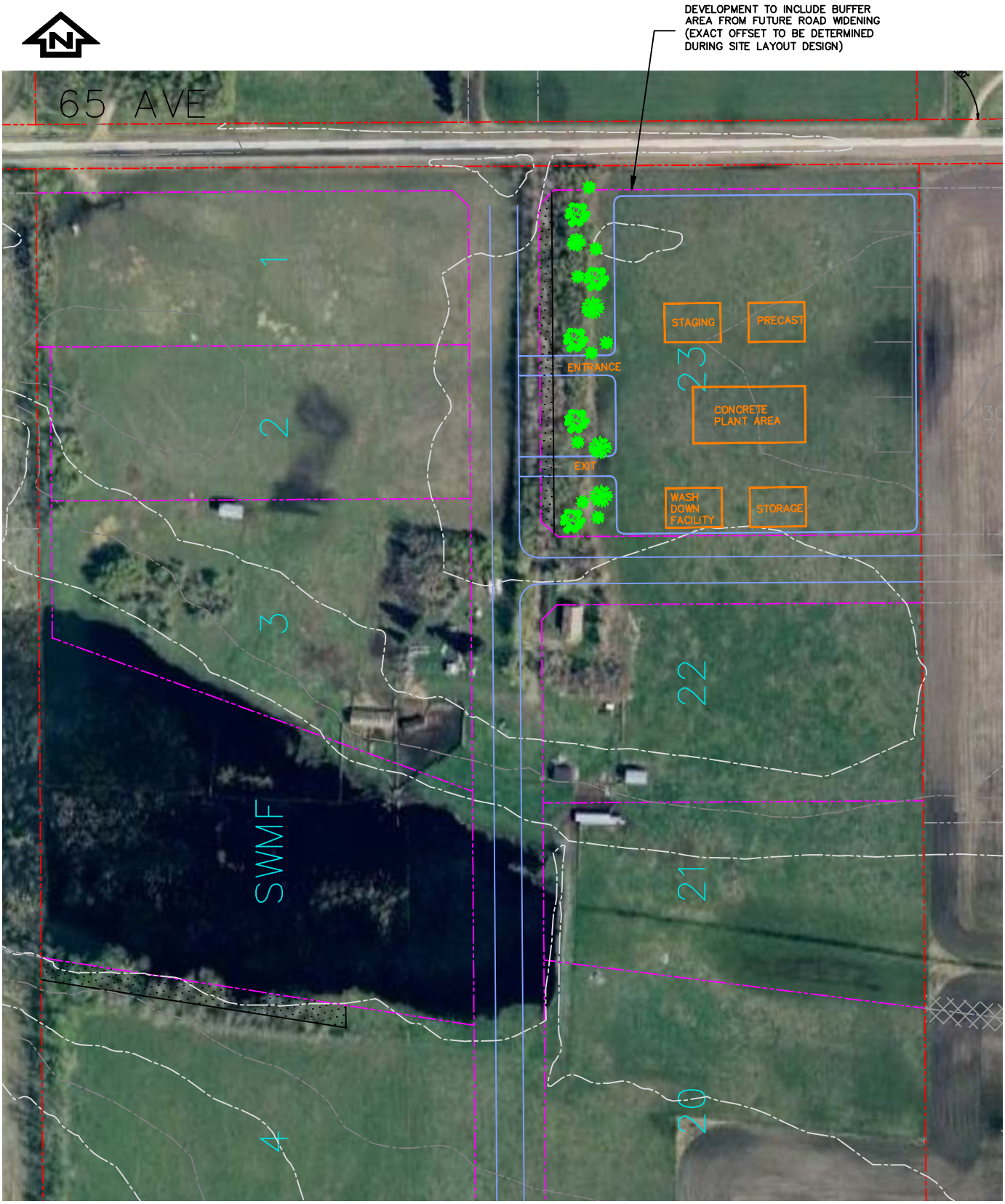
FIGURE No. 5
SITE PLAN

DRAWING NO. C08-4444/R5

SUB. NO.

OF | ISSUE/REV.

FOR PLANNING PURPOSES ONLY. NOT TO BE USED FOR CONSTRUCTION



DESIGN	GWD
DRAWN	CTW
CHECKED	
DATE	
SCALE	N.T.S.

WEDLER ENGINEERING
201-9300 Nowell Street
Chilliwack, B.C.
V2P 4V7
Tel: (604) 792-0651
Fax: (604) 792-0693
Email: info@wedler.com

IPM DEVELOPMENTS

LEDUC, ALBERTA

FIGURE No. 6
PROPOSED CONCRETE PLANT
SITE PLAN

C08-4444/A-R6

OF

ISSUE/REVISION

DESIGN	GWD
DRAWN	CTW
CHECKED	
DATE	
SCALE	N.T.S.

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Fax: (604) 792-0893
Email: info@wedler.com

IPM DEVELOPMENTS

LEDUC, ALBERTA

FIGURE No. 7
OUTLINE PLAN
FOR THE NW $\frac{1}{4}$ SECTION 36-49-25

C08-4444/A-R7

OF

ISSUE/REVISION

DESIGN	GWD
DRAWN	CTW
CHECKED	
DATE	
SCALE	1: 7500

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IPM DEVELOPMENTS

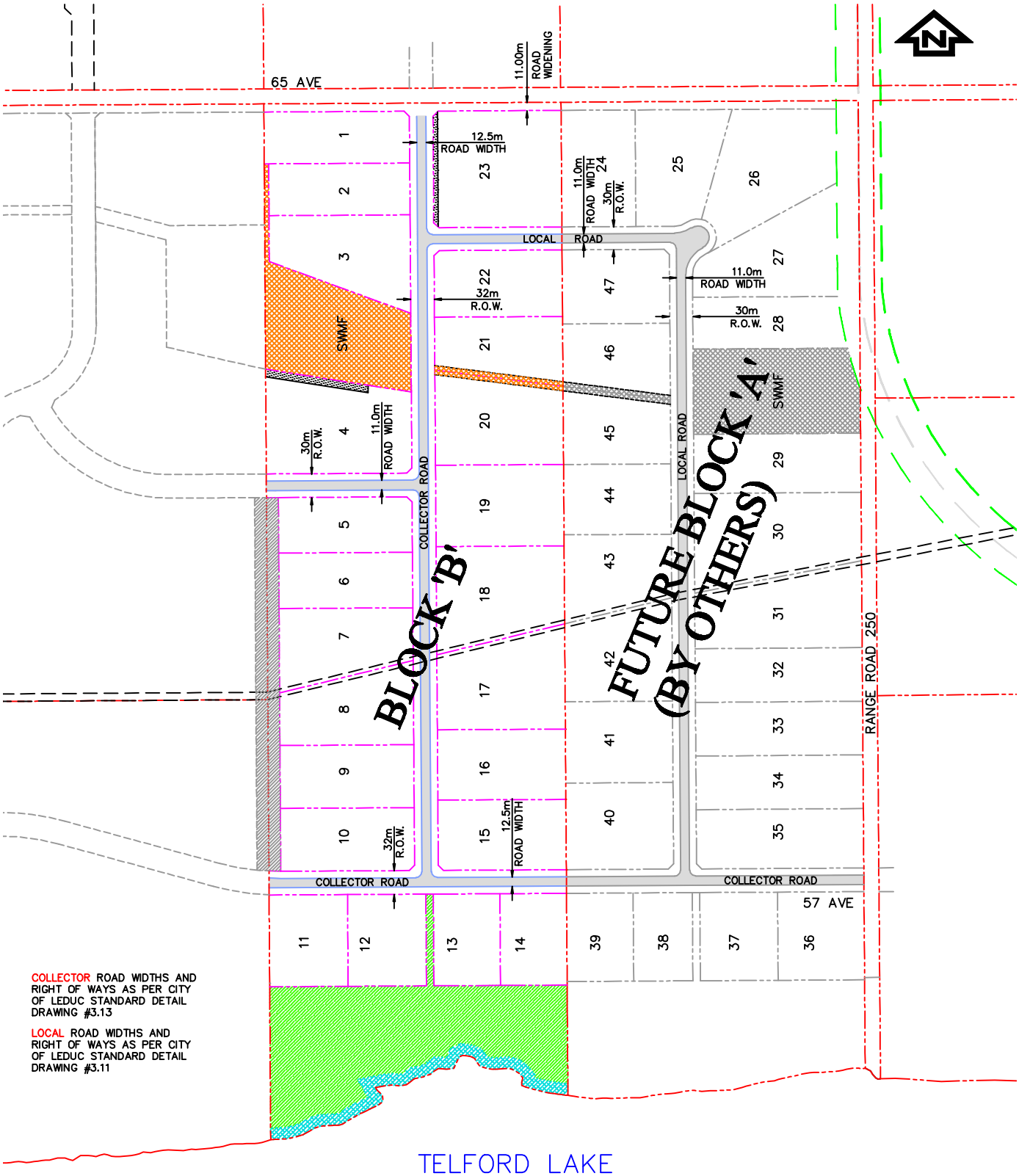
LEDUC, ALBERTA

FIGURE No. 8
CONCEPTUAL STAGING PLAN

DRAWING NO.
C08-4444/A-R8

OF

ISSUE/REVISION



DESIGN	GWD
DRAWN	CTW
CHECKED	
DATE	
SCALE	1: 7500

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IPM DEVELOPMENTS

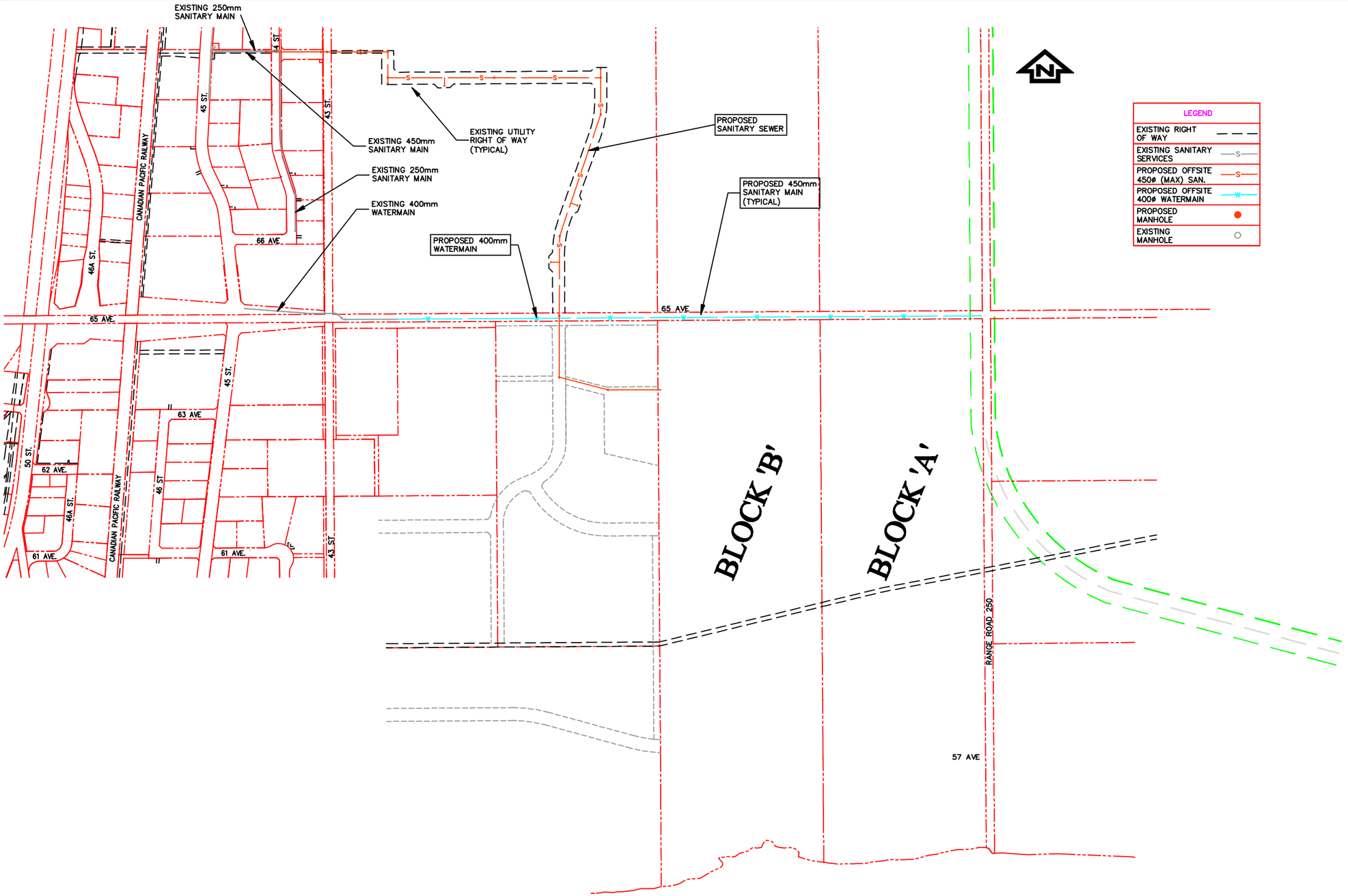
LEDUC, ALBERTA

FIGURE No. 9
INTERNAL ROAD SYSTEM

DRAWING NO.
C08-4444/A-R9

OF

ISSUE/REVISION



DESIGN	GWD	WEDLER ENGINEERING	IPM DEVELOPMENTS
DRAWN	CTW		LEDUC, ALBERTA
HORIZ. SCALE	1:10000		FIGURE No. 10 OFFSITE SERVICE EXTENSION PLAN
VERT. SCALE			

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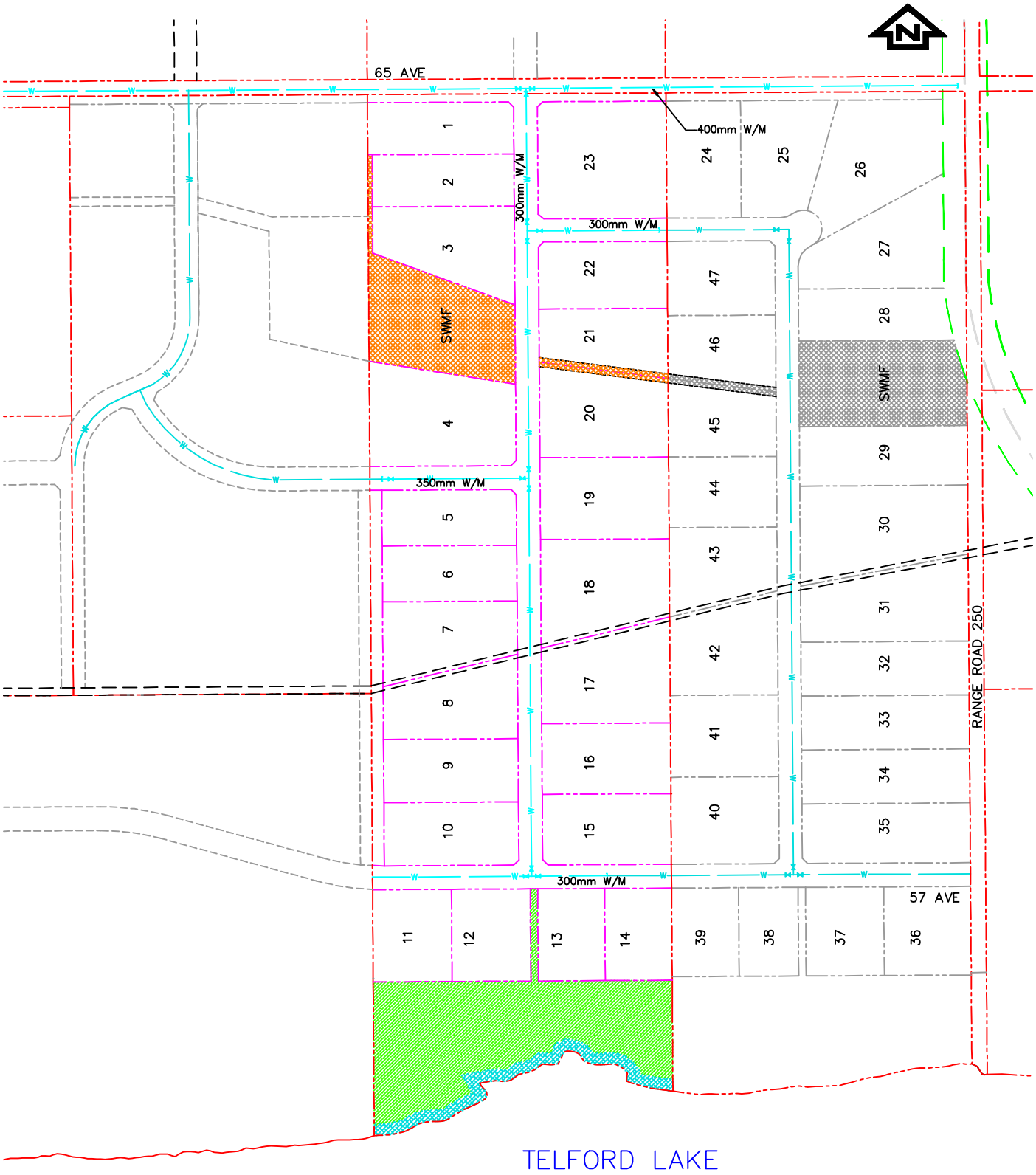
DRAWING NO.
C08-4444/A-R10



DESIGN	GWD
DRAWN	CTW
CHECKED	
DATE	
SCALE	1: 7500

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IPM DEVELOPMENTS

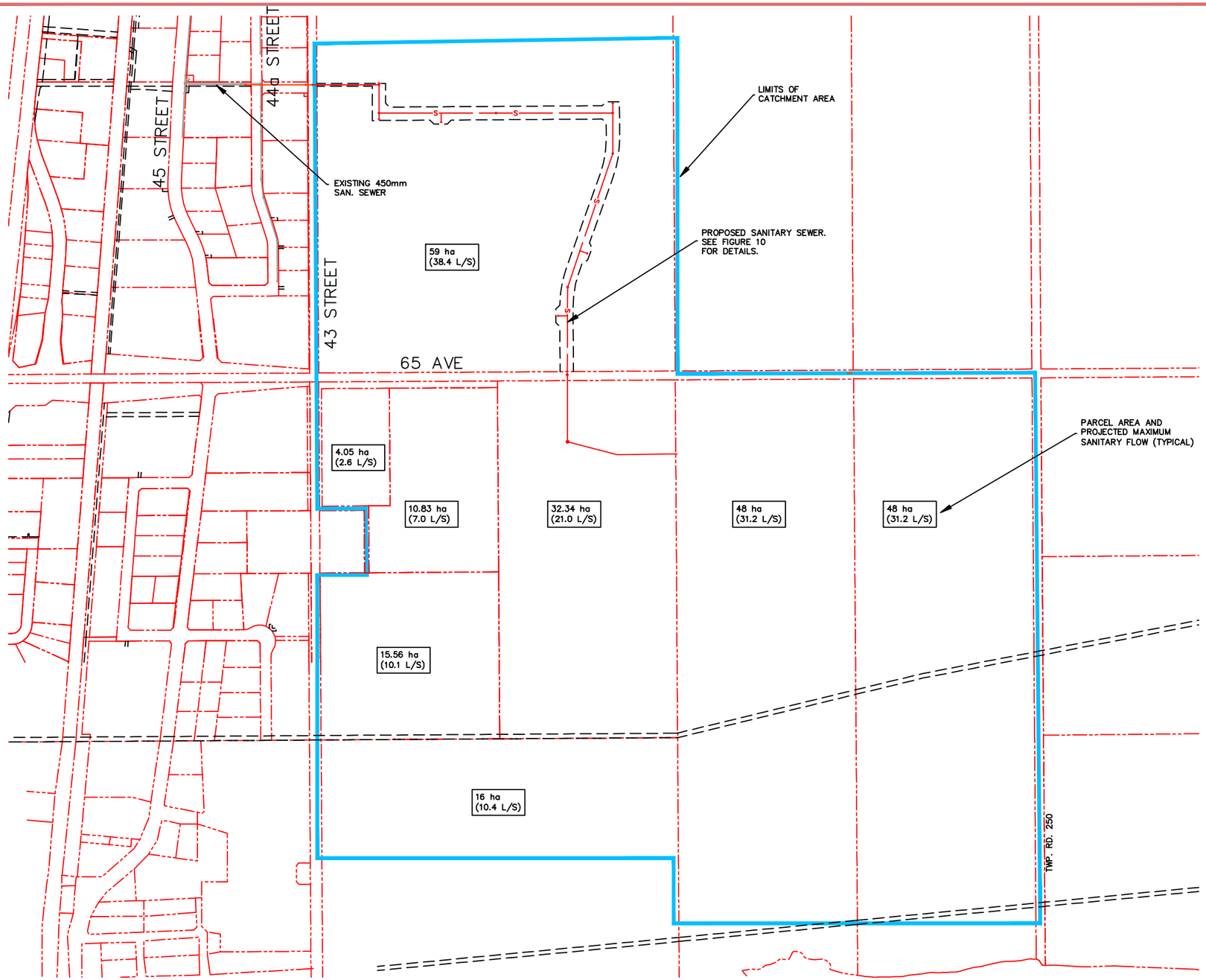
LEDUC, ALBERTA

FIGURE No. 11
WATER NETWORK

DRAWING NO.
C08–4444/A–R11

OF

ISSUE/REVISION



DESIGN	GWD
DRAWN	CTW
HORIZ. SCALE	1:10000
VERT. SCALE	

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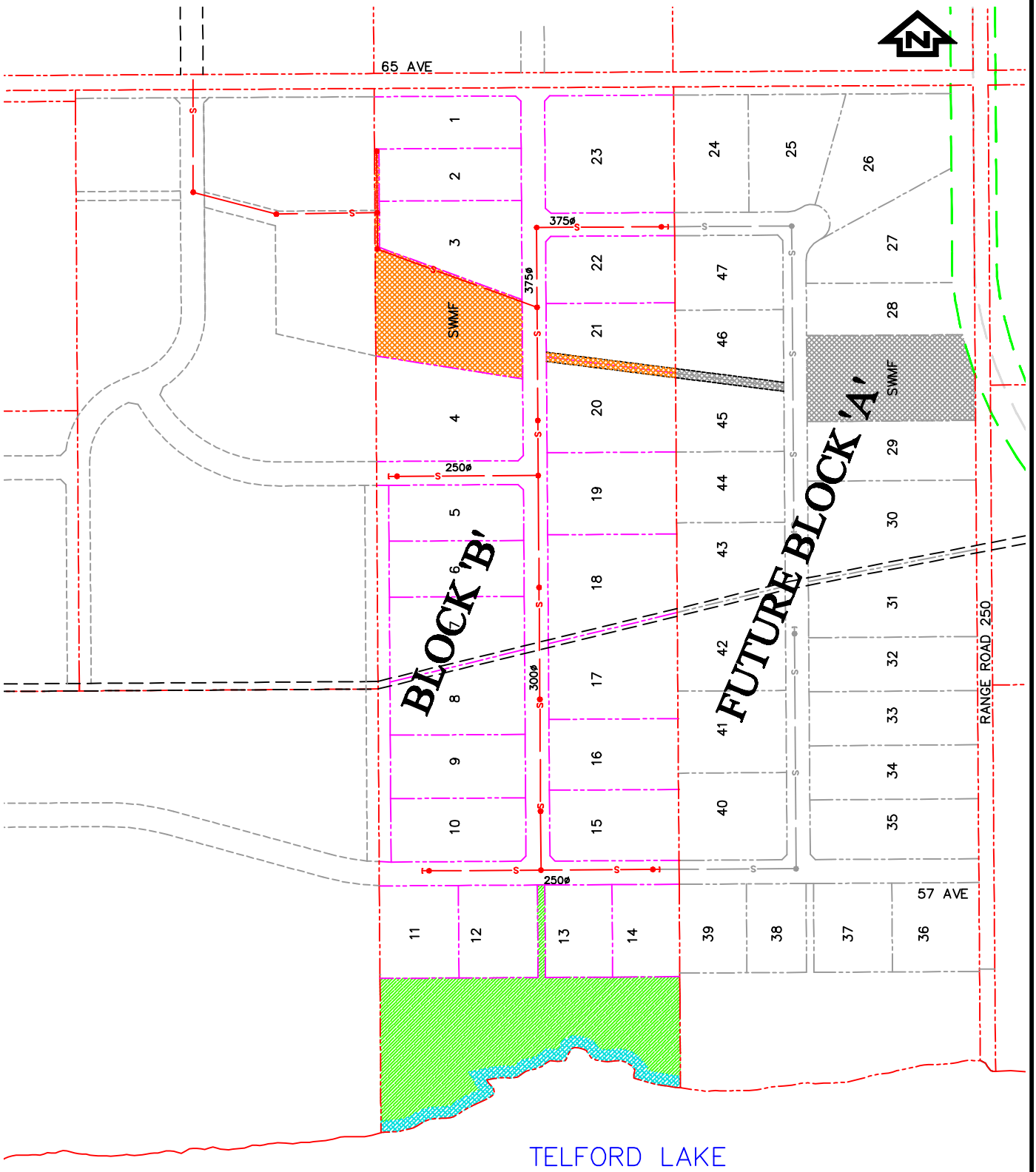
IPM DEVELOPMENTS

LEDUC, ALBERTA

FIGURE No. 12
LEDUC SANITARY SEWER CATCHMENT BOUNDARY

DRAWING NO.
C08-4444/A-R12



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DRAWN	CTW
CHECKED	
DATE	
SCALE	1:10000

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V2P 4V7
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IPM DEVELOPMENTS

LEDUC, ALBERTA

FIGURE No. 13
SANITARY SERVICES

DRAWING NO.
C08–4444/A–R13

OF

ISSUE/REVISION

DESIGN	GWD
DRAWN	CTW
CHECKED	
DATE	
SCALE	1: 7500

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IPM DEVELOPMENTS

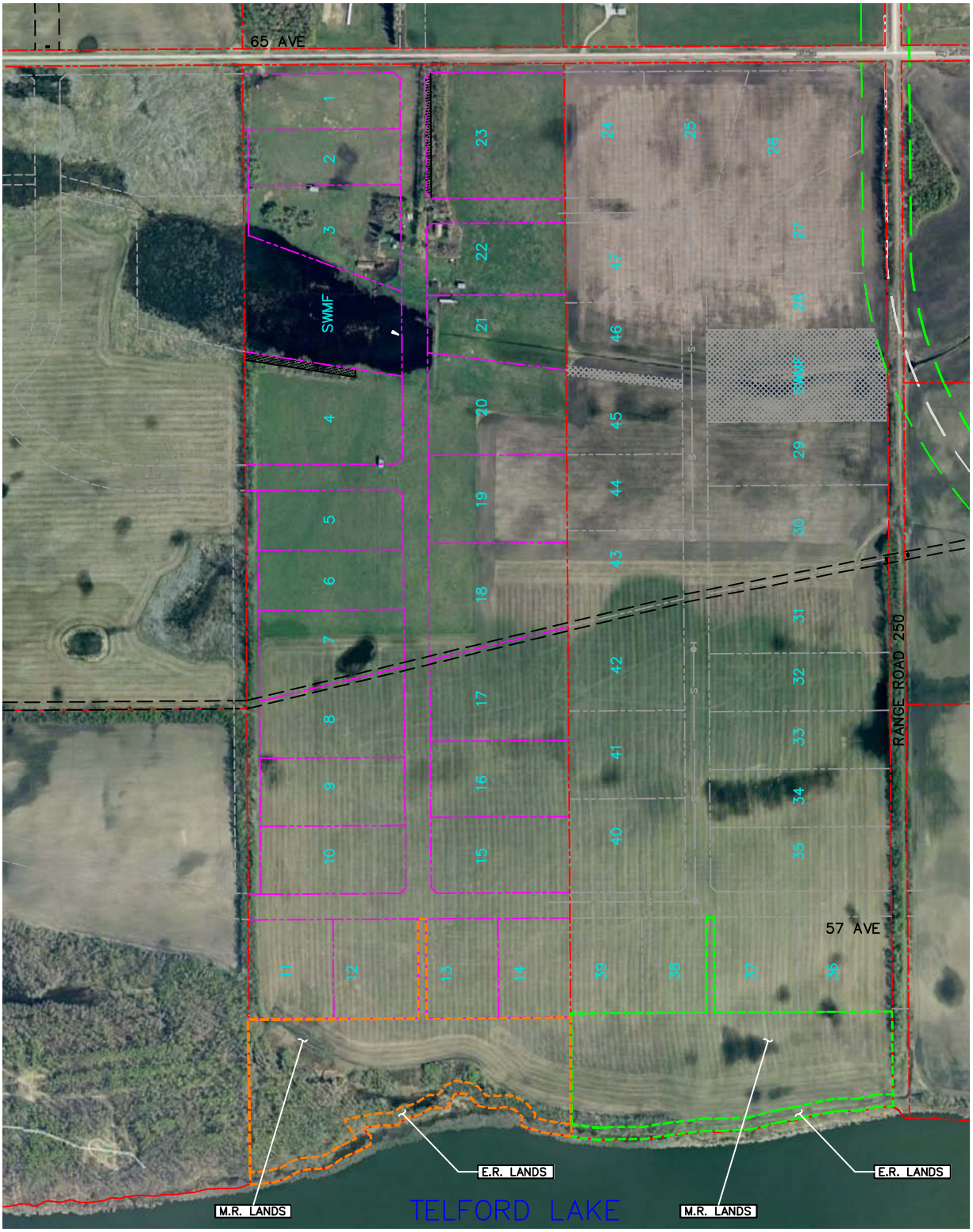
LEDUC, ALBERTA

FIGURE No. 14
STORMWATER SERVICES

DRAWING NO.
C08-4444/A-R14

OF

ISSUE/REVISION



DESIGN	GWD
DRAWN	CTW
CHECKED	
DATE	
SCALE	1: 7500

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IPM DEVELOPMENTS

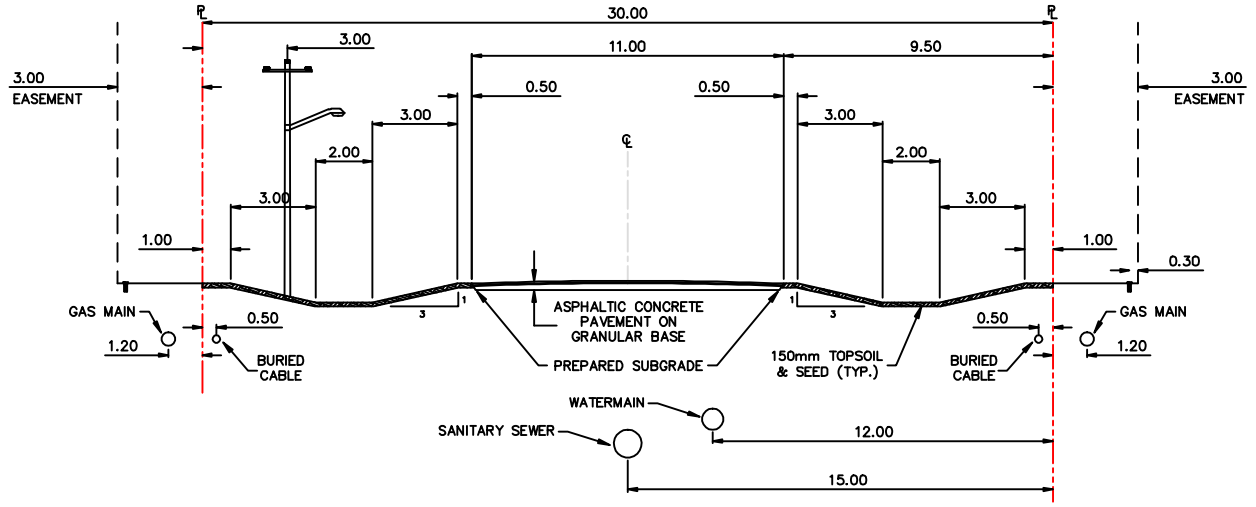
LEDUC, ALBERTA

FIGURE No. 15
M.R. & E.R. LANDS PLAN

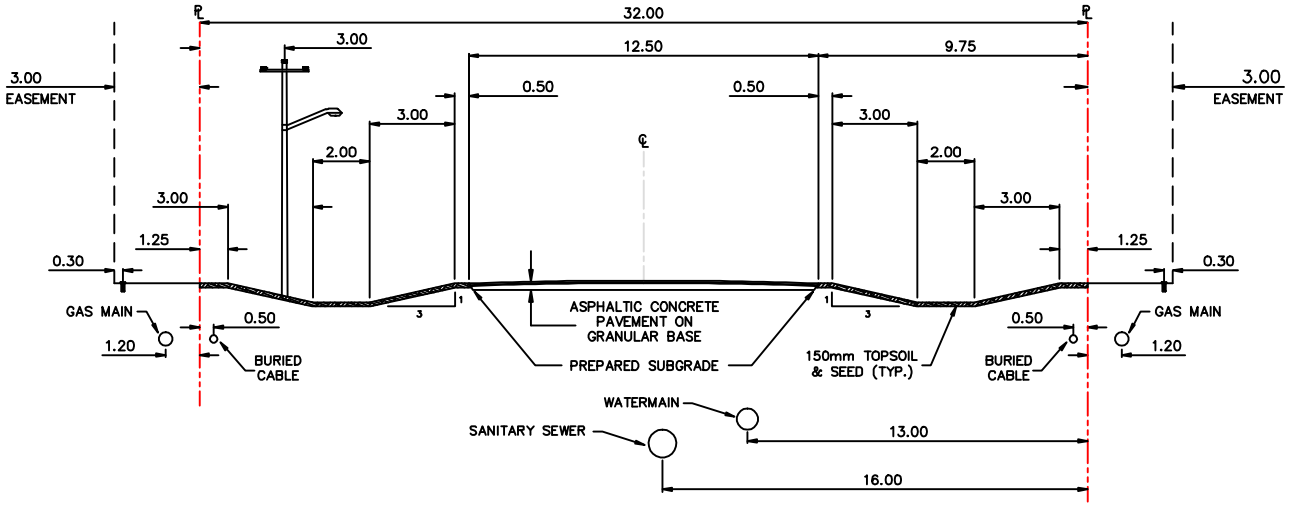
DRAWING NO.
C08-4444/A-R15

OF

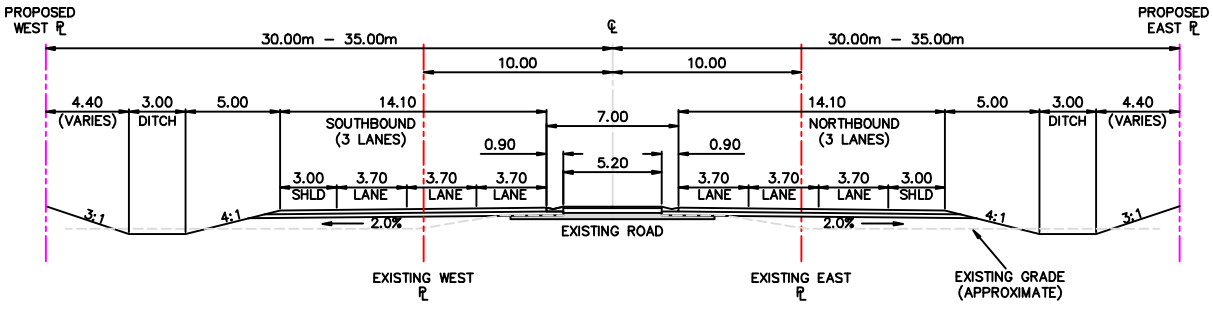
ISSUE/REVISION



2 LANE INDUSTRIAL/COMMERCIAL
LOCAL – RURAL



2 LANE INDUSTRIAL/COMMERCIAL
COLLECTOR – RURAL



PLANNED RANGE ROAD 250
TYPICAL SECTION

DESIGN	GWD
DRAWN	CTW
CHECKED	
DATE	
SCALE	NTS

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201–9300 Nowell Street
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V2P 4V7
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Fax: (604) 792–0693
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IPM DEVELOPMENTS

LEDUC, ALBERTA

FIGURE No. 16
PROPOSED ROAD SECTIONS

DRAWING NO.
C08-4444/A-R16

OF

ISSUE/REVISION

APPENDIX A

LAND TITLE CERTIFICATE

S

LINC	SHORT LEGAL	TITLE NUMBER
0012 722 055	7921548;A	962 297 494

LEGAL DESCRIPTION
PLAN 7921548
BLOCK A
EXCEPTING THEREOUT ALL MINES AND MINERALS
AREA: 53.2 HECTARES (131.46 ACRES) MORE OR LESS

ESTATE: FEE SIMPLE
ATS REFERENCE: 4;25;49;36;E

MUNICIPALITY: CITY OF LEDUC

REFERENCE NUMBER: 792 141 503

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
962 297 494	29/10/1996	TRANSFER OF LAND	$106,000	1.00

OWNERS

KEVIN JAMES GAETZ
OF 4512 - 52 AVENUE
LEDUC
ALBERTA T9E 5W8
(DATA UPDATED BY: CHANGE OF ADDRESS 002355059)

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
5675PH	01/12/1967	UTILITY RIGHT OF WAY GRANTEE - PLAINS WESTERN GAS & ELECTRIC CO LTD. AS TO PORTION OR PLAN:6411NY

(CONTINUED)

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
5029RB	13/11/1968	CAVEAT RE : EASEMENT CAVEATOR - PLAINS WESTERN GAS & ELECTRIC CO LTD.
792 141 504	20/06/1979	CAVEAT RE : DEFERRED RESERVE CAVEATOR - EDMONTON REGIONAL PLANNING COMMISSION.
832 254 117	19/10/1983	UTILITY RIGHT OF WAY GRANTEE - ICG UTILITIES (PLAINS-WESTERN) LTD. AS TO PORTION OR PLAN:6411NY
872 008 104	14/01/1987	ZONING REGULATIONS BY - HER MAJESTY THE QUEEN IN RIGHT OF CANADA AS REPRESENTED BY DEPARTMENT OF TRANSPORT EDMONTON INTERNATIONAL AIRPORT
872 152 705	03/07/1987	CAVEAT RE : EASEMENT CAVEATOR - DUCKS UNLIMITED CANADA. 302, 10335 - 172 ST., EDMONTON ALBERTA AGENT - NANCY MONEY
082 428 203	29/09/2008	CAVEAT RE : UTILITY RIGHT OF WAY CAVEATOR - THE CITY OF LEDUC. C/O THE CITY CLERK'S OFFICE 1 ALEXANDRA PARK CITY OF LEDUC ALBERTA T9E4C4

TOTAL INSTRUMENTS: 007

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 30 DAY OF SEPTEMBER, 2009 AT 09:58 A.M.

ORDER NUMBER:14949393

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

(CONTINUED)

THIS ELECTRONICALLY TRANSMITTED LAND TITLES PRODUCT IS INTENDED FOR THE SOLE USE OF THE ORIGINAL PURCHASER, AND NONE OTHER, SUBJECT TO WHAT IS SET OUT IN THE PARAGRAPH BELOW.

THE ABOVE PROVISIONS DO NOT PROHIBIT THE ORIGINAL PURCHASER FROM INCLUDING THIS UNMODIFIED PRODUCT IN ANY REPORT, OPINION, APPRAISAL OR OTHER ADVICE PREPARED BY THE ORIGINAL PURCHASER AS PART OF THE ORIGINAL PURCHASER APPLYING PROFESSIONAL, CONSULTING OR TECHNICAL EXPERTISE FOR THE BENEFIT OF CLIENT(S).

CERTIFIED COPY OF

CERTIFICATE OF TITLE

S

LINC	SHORT LEGAL
0012 722 070	7921548;B

TITLE NUMBER: 092 379 318
TRANSFER OF LAND
DATE: 21/10/2009

AT THE TIME OF THIS CERTIFICATION

1330075 ALBERTA LTD..
OF 4, 4002-9 AVE NORTH
LETHBRIDGE
ALBERTA T1H 6T8

IS THE OWNER OF AN ESTATE IN FEE SIMPLE
OF AND IN

PLAN 7921548
BLOCK B
EXCEPTING THEREOUT ALL MINES AND MINERALS

SUBJECT TO THE ENCUMBRANCES,LIENS AND INTERESTS NOTIFIED BY MEMORANDUM UNDER-WRITTEN OR ENDORSED HEREON,OR WHICH MAY HEREAFTER BE MADE IN THE REGISTER.

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
5675PH	01/12/1967	UTILITY RIGHT OF WAY GRANTEE - PLAINS WESTERN GAS & ELECTRIC CO LTD. AS TO PORTION OR PLAN:6411NY
5029RB	13/11/1968	CAVEAT RE : EASEMENT CAVEATOR - PLAINS WESTERN GAS & ELECTRIC CO LTD.
792 141 505	20/06/1979	CAVEAT RE : DEFERRED RESERVE CAVEATOR - EDMONTON REGIONAL PLANNING COMMISSION.
832 254 118	19/10/1983	UTILITY RIGHT OF WAY GRANTEE - ICG UTILITIES (PLAINS-WESTERN) LTD. AS TO PORTION OR PLAN:6411NY
872 008 104	14/01/1987	ZONING REGULATIONS BY - HER MAJESTY THE QUEEN IN RIGHT OF CANADA AS REPRESENTED BY DEPARTMENT OF TRANSPORT EDMONTON INTERNATIONAL AIRPORT
882 107 024	18/05/1988	CAVEAT RE : EASEMENT CAVEATOR - DUCKS UNLIMITED CANADA. 302, 10335 - 172 ST., EDMONTON ALBERTA AGENT - MARG JOHNSTON

(CONTINUED)

CERTIFIED COPY OF

CERTIFICATE OF TITLE

SHORT LEGAL 7921548;B
NAME 1330075 ALBERTA LTD.
NUMBER 092 379 318

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
082 428 659	30/09/2008	CAVEAT RE : UTILITY RIGHT OF WAY CAVEATOR - THE CITY OF LEDUC. #1 ALEXANDRA PARK LEDUC ALBERTA T9E4C4 AGENT - SEAL.
092 246 596	21/07/2009	CAVEAT RE : AGREEMENT CHARGING LAND CAVEATOR - BATTLE RIVER RURAL ELECTRIFICATION ASSOCIATION LIMITED. BOX 1420 CAMROSE ALBERTA T4V1X3 AGENT - SHERRY FOLKMANN
092 379 319	21/10/2009	MORTGAGE MORTGAGEE - ZIAD PROPERTIES LTD.. #29 LEDUC CITY CENTRE MALL 5201-50 ST LEDUC ALBERTA T9E6T4 ORIGINAL PRINCIPAL AMOUNT: $1,800,000
092 379 320	21/10/2009	MORTGAGE MORTGAGEE - ZIAD PROPERTIES LTD.. #29 LEDUC CITY CENTRE MALL 5201-50 ST LEDUC ALBERTA T9E6T4 ORIGINAL PRINCIPAL AMOUNT: $6,543,334

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 21 DAY OF OCTOBER ,2009

REGISTRAR OF LAND TITLES

SUPPLEMENTARY INFORMATION

VALUE: $9,977,775
CONSIDERATION: $9,977,775
MUNICIPALITY: LEDUC COUNTY
REFERENCE NUMBER:
952 296 226
AREA:

(CONTINUED)

CERTIFICATE OF TITLE

TITLE NUMBER: 092 379 318

53.5 HECTARES (132.2 ACRES) MORE OR LESS
ATS REFERENCE:
4;25;49;36;E
TOTAL INSTRUMENTS: 010

APPENDIX B

Edmonton International Airport Vicinity Protection Area Regulation, Alta. Reg. 55/2006

This regulation replaces Alta. Reg. 63/1981.

Current version: as posted between Apr 12, 2006 and Dec 11, 2008

URL: http://www.canlii.org/en/ab/laws/regu/alta-reg-55-2006/latest/
Currency:

(no amdt)

ALBERTA REGULATION 55/2006

Municipal Government Act

EDMONTON INTERNATIONAL AIRPORT VICINITY PROTECTION AREA REGULATION

Table of Contents

Definitions

1 In this Regulation,

(a) "Airport Operator" means the Edmonton Regional Airports Authority established as a corporation under the *Regional Airports Authorities Act*, or a successor to that corporation;

(b) "commercial development" means a development that is used or suitable for the provision of goods or services, or both, but does not include a development that is used or suitable for the processing of raw materials or for the manufacturing, processing, assembling or fabricating of finished products;

(c) "development permit" means an authority to develop land under one of the following:

(i) where the land is in the City of Edmonton, the Edmonton Zoning Bylaw No. 12800, as amended from time to time;

(ii) where the land is in Leduc County, the Leduc County Land Use Bylaw No. 1665-83, as amended from time to time;

(iii) where the land is in the City of Leduc, the City of Leduc Land Use Bylaw No. 516-2002, as amended from time to time;

(iv) where the land is in Parkland County, the Parkland County Land Use Bylaw No. 15-00, as amended from time to time, or a building permit for a single detached dwelling or a mobile home;

(d) "municipality" means any of the following:

(i) the City of Edmonton;

(ii) Leduc County;

(iii) the City of Leduc;

(iv) Parkland County;

(e) "NEF Area" means an area of land that

(i) is enclosed by noise exposure forecast contour line 40 as shown on the map in Schedule 2,

(ii) lies between any 2 noise exposure forecast contour lines shown on the map in Schedule 2, or

(iii) lies between the boundary of the Protection Area and noise exposure forecast contour line 25 as shown on the map in Schedule 2;

(f) "noise exposure forecast" means the system used by Transport Canada that provides for the summation of noise from aircraft operating at an airport based on actual or forecast aircraft movement by runways and the time of day or night the movement occurs;

(g) "prohibited use" means a use that

(i) is prohibited pursuant to Schedule 3 when it occurs on land to which that Schedule relates, or

(ii) is substantially similar, in the opinion of the subdivision authority or development authority, as the case may be, of the relevant municipality, to a use referred to in subclause (i);

(h) "Protection Area" means the Edmonton International Airport Vicinity Protection Area established under section 2.

Protection Area established

2(1) The lands described in Schedule 1 and shown on the map in Schedule 2 are hereby established as the Edmonton International Airport Vicinity Protection Area.

(2) If any discrepancy exists between the description of the lands in Schedule 1 and the location of the lands on the map in Schedule 2, the description in Schedule 1 prevails.

Subdivision approval and development permits relating to land in Protection Area

3(1) No subdivision or development of any kind may be undertaken on land in the Protection Area unless subdivision approval is given or a development permit is issued, as the case may be, by the municipality in which the land is located.

(2) A municipality that receives

(a) an application for the subdivision of land in the Protection Area, or

(b) an application for a development permit relating to land in the Protection Area

must, in addition to complying with Part 17 of the *Municipal Government Act*, comply with this Regulation.

(3) No subdivision approval may be given and no development permit may be issued by a municipality relating to land in the Protection Area if the proposed use of that land is a prohibited use.

(4) This section does not apply to a minor development of land in the Protection Area

(a) that will not result in a change in the use of the land, or

(b) that is exempt under any one of the authorities listed in section 1(c) from the requirement to obtain a development permit.

Continuation of validity of pre-existing approvals

4(1) If, before the coming into force of this Regulation, a municipality approved a subdivision or issued a development permit relating to land in the Protection Area and the use being made of the land or an improvement to the land immediately before the coming into force of this Regulation was a permitted or prohibited use, the approval of the subdivision or the development permit, as the case may be, continues to be valid after the coming into force of this Regulation.

(2) No extension, addition or enlargement may be made to an improvement that is prohibited under this Regulation except in accordance with subsection (3).

(3) The following improvements may be extended, added to or enlarged if the portion so extended, added to or enlarged complies with the acoustical requirements set out in the Alberta Building Code and is entirely located on a parcel of land that existed immediately before the coming into force of this Regulation:

(a) an improvement used as an office and retail facility as defined in Schedule 3 regardless of where it is located in the Protection Area;

(b) an improvement used for a residence or school that is located in a NEF Area of 35 or less.

(4) Where the use of an improvement continues to be valid after the coming into force of this Regulation under subsection (1) and the improvement is destroyed or demolished, the improvement may be replaced and may continue to be used for the prohibited use if the portion so replaced complies with the acoustical requirements set out in the Alberta Building Code.

(5) In this section and in section 5, "NEF Area of 35 or less" means an area of land located between noise exposure forecast contour lines 25 and 35 as shown on the map in Schedule 2.

Construction of prohibited residence

5(1) If, before the coming into force of this Regulation, a municipality approved a subdivision relating to land in the Protection Area in a NEF Area of 35 or less and the use being made of the land immediately before the coming into force of this Regulation was a residential or agricultural use, a residence may be constructed on each lot in that subdivision after the coming into force of this Regulation notwithstanding that the construction of the residence is a prohibited use.

(2) If, before the coming into force of this Regulation, an agreement for the provision of services has been entered into by a municipality and an applicant for subdivision approval of land for residential purposes in the Protection Area in a NEF Area of 35 or less and the applicant has paid or agreed to pay for the provision of services, a residence may be constructed on each lot in that subdivision after the coming into force of this Regulation notwithstanding that the construction of the residence is a prohibited use.

(3) In this section, "services" means roads, pedestrian walkways and public utilities.

Acoustical requirements

6(1) All buildings constructed on land in the Protection area after this Regulation comes into force must comply with the acoustical requirements set out in the Alberta Building Code that are in force at the time the development permit relating to the building is issued.

(2) For the purpose of establishing the acoustic insulation factor under the Alberta Building Code, the NEF contour for a building shall be

(a) the highest numbered contour for the NEF Area in which the building is located, or

(b) if the building is located in 2 NEF areas, the highest numbered contour for the higher of the 2 numbered NEF Areas.

Commercial development requirements

7 All new commercial developments in the Protection Area after this Regulation comes into force must meet the requirements contained in Schedule 4.

Developments within Leduc County and Parkland County

8(1) Except for lands within the NEF 40+ Area, Leduc County may approve subdivisions and allow development for residential use in the Protection Area in accordance with its statutory plans and land use bylaws to a limit of not more that 4 dwellings per quarter section of land.

(2) For those lands within the NEF 30-35 Area outlined in Schedule 7 that are currently designated for country residential use and agricultural/nature conservation use under its land use bylaw, Parkland County may approve subdivisions and allow development in accordance with its statutory plans.

Duty of municipality

9(1) A municipality must notify the Airport Operator where a subdivision of land has been approved or a development permit has been issued relating to land in the Protection Area in a NEF Area of 30 or more and the use of the land will change as a result.

(2) Before adopting a statutory plan or land use bylaw, or an amendment of either, that relates to land in the Protection Area, a

municipality must refer the statutory plan or land use bylaw, or the amendment, to the Airport Operator.

Amendment to Regulation

10(1) Only a municipality may apply to the Minister for an amendment to this Regulation.

(2) An application under subsection (1) must not be considered by the Minister unless the Minister is satisfied that reasonable consultation in respect of the proposed amendment has taken place with any affected municipality and landowners, the Airport Operator and the general public.

Repeal

11 The *Edmonton International Airport Vicinity Protection Area Regulation* (AR 63/81) is repealed.

Expiry

12 For the purpose of ensuring that this Regulation is reviewed for ongoing relevancy and necessity, with the option that it may be repassed in its present or an amended form following a review, this Regulation expires on June 30, 2016.

Schedule 1

Legal Description of Lands in the Edmonton International Airport Vicinity Protection Area

In Township 49, Range 24, West of the 4th Meridian:

West half of section 2;
Northwest quarter and east half of section 3;
Northeast quarter of section 4;
Northeast quarter of section 8;
Section 9;
Southeast quarter and west half of section 10;
West half of section 15;
Sections 16 and 17;
Northwest quarter and east half of section 18;
Sections 19, 20 and 21;
Southwest quarter of section 28;
Sections 29, 30 and 31;
West half of section 32.

In Township 50, Range 24, West of the 4th Meridian:

Section 6;
Southwest quarter of section 7;
West half of section 31.

In Township 51, Range 24, West of the 4th Meridian:

Sections 5 and 6;
Northeast quarter and south half of section 7;
Section 8;
West half of section 9;
Southwest quarter of section 16;
South half of section 17.

In Township 49, Range 25, West of the 4th Meridian:

Northwest quarter of section 19;
North half of section 23;
Southeast quarter and north half of section 24;
Sections 25 and 26;
Southeast quarter and north half of section 27;
Southwest quarter and north half of section 30;
Section 31;
Southwest quarter and north half of section 32;
East half of section 33;
Sections 34, 35 and 36.

In Township 50, Range 25, West of the 4th Meridian:

Sections 1, 2, 3, 4 and 5;
East half of section 6;
Sections 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22 and 23;
Southwest quarter and north half of section 24;
Sections 25, 26, 27, 28, 29, 30, 31, 32 and 33;
Northeast quarter and south half of section 34;
Sections 35 and 36.

In Township 51, Range 25, West of the 4th Meridian:

Northeast quarter and south half of section 1;
Southwest quarter of section 3;
Northwest quarter and south half of section 7;
Southwest quarter of section 8;
Sections 4, 5 and 6;

In Township 49, Range 26, West of the 4th Meridian:

North half of section 24;
East half of section 25.

In Township 50, Range 26, West of the 4th Meridian:

Southeast quarter and north half of section 24;
Section 25;
East half of section 35;
Section 36.

In Township 51, Range 26, West of the 4th Meridian:

Southeast quarter and north half of section 1;
Southeast quarter and north half of section 11;
Section 12;
Northwest quarter and south half of section 13;
Section 14;
Northeast quarter of section 15;
Section 22;
Southwest quarter of section 23.

Schedule 2

Map showing lands in the Edmonton International Airport Vicinity Protection Area

Schedule 3

Land Uses

Definitions

1 In this Schedule,

(a) "clinic" means a facility

(i) for the provision of physical services or mental services, or both, to individuals on an outpatient basis, or

(ii) for the treatment of animals;

(b) "land" means land located in the Protection Area;

(c) "office and retail facility" means an office and retail facility where more than 10 people may assemble at one time;

(d) "outdoor recreation facility" means a development providing a facility for sports and active recreation conducted outdoors where public viewing is incidental and includes a golf course, a driving range, skiing, a sports field, a swimming pool, a tennis court or a park;

(e) "PR", where it appears in the table opposite a particular land use, means that the land use is prohibited in that NEF Area;

(f) "spectator entertainment facility" means a development specifically intended for public viewing such as an arts

event, an exhibition, animals, vegetation or museum exhibit and includes, but is not limited to, a theatrical, musical or dance performance, the showing of motion pictures, the presentation of exhibits, animal acts or museums;

(g) "spectator sport facility" means a development providing a facility intended for sports and athletic events primarily held for public viewing and includes, but is not limited to, a stadium, an arena, a swimming pool and an animal racing track but does not include an auto racing track.

Table of prohibited uses according to NEF Area

2(1) A land use shown in Column 1 of the following table is prohibited on land that is located in a NEF Area shown in Column 2, 3, 4 or 5 of the table if the expression "PR" appears in that column opposite that land use.

TABLE

Column 1 Land Uses	Col. 2 NEF 40+ Area	Col. 3 NEF 35-40 Area	Col. 4 NEF 30-35 Area	Col. 5 NEF 25-30 Area
Commercial Uses				
Billiards, Bowling and Arcades	PR	-	-	-
Cinemas	PR	-	-	-
Eating and Drinking Establishments	PR	-	-	-
Funeral Homes	PR	-	-	-
Gambling Facilities	PR	-	-	-
Hotels/Motels	PR	-	-	-
Office and Retail Facilities	PR	-	-	-
Private Clubs and Lodges	PR	-	-	-
Public and Semi-public Uses				
Churches	PR	PR	-	-
Day Care	PR	PR	-	-
Emergency Response Services	PR	-	-	-
Exhibition and Fairgrounds	PR	PR	-	-
Halls/Auditoriums	PR	PR	-	-
Hospitals	PR	PR	PR	-
Clinics	PR	-	-	-
Libraries	PR	PR	-	-
Nursing Homes	PR	PR	PR	-
Outdoor Recreation Facilities	PR	-	-	-
Schools	PR	PR	PR	-
Spectator Entertainment Facilities				
Outdoor	PR	PR	PR	-
Indoor	PR	PR	-	-
Spectator Sports Facilities				
Outdoor	PR	PR	PR	-
Indoor	PR	PR	-	-
Residential Uses				
Campgrounds	PR	PR	PR	PR
Residences	PR	PR	PR	-

(2) In the table,

(a) "NEF 40+ Area" means an area of land located between noise exposure forecast contour line 40 as shown on the map in Schedule 2 and the runway;

(b) "NEF 35-40 Area" means an area of land located between noise exposure forecast contour lines 35 and 40 as shown on the map in Schedule 2;

(c) "NEF 30-35 Area" means an area of land located between noise exposure forecast contour lines 30 and 35 as shown on the map in Schedule 2;

(d) "NEF 25-30 Area" means an area of land located between noise exposure forecast contour lines 25 and 30 as shown on the map in Schedule 2.

Adjustment of noise exposure forecast contour line

3(1) Where a parcel of land that is equal to or less than 0.2 hectares is located in more than one NEF Area, the noise exposure forecast contour line that runs through the parcel must be adjusted to follow the next appropriate natural or man-made boundary that is further away from the runway.

(2) Where

(a) a noise exposure forecast contour line divides a parcel of land that is greater than 0.2 hectares into 2 areas, and

(b) in one area a proposed use is a prohibited use and in the other area the proposed use is not a prohibited use,

the proposed use of the parcel may be carried out only in the area in which the proposed use is not a prohibited use.

Uses of land in City of Leduc

4(1) Despite anything to the contrary in this Regulation, in that part of the City of Leduc outlined in Schedule 5 as lying within the NEF 40+ Area, commercial developments are permitted only for the uses shown on that Schedule.

(2) Despite anything to the contrary in this Regulation, in that part of the City of Leduc outlined in Schedule 6, development for residential uses is permitted subject to the City of Leduc's statutory plans and land use bylaw to a limit of 650 residential units.

(3) Despite anything to the contrary in this Regulation, in that part of the City of Leduc described as the most easterly 201 metres in perpendicular width throughout the southeast quarter of section 25, township 49, range 25, west of the 4th meridian, containing approximately 16.2 hectares, development for campground uses is permitted subject to the City of Leduc's statutory plans and land use bylaw.

Schedule 4

Performance Based Approach
Commercial Development

1 Despite anything to the contrary in this Regulation, a new commercial development in the Protection Area after this Regulation comes into force must,

(a) in the case of a building, comply with the provisions of the Alberta Building Code, including, without limitation, incorporation of noise mitigation into construction, and

(b) meet the additional requirements set out in Column 2 of the following table that is opposite the NEF Area in Column 1:

Table

Column 1	Column 2
NEF 40+ Area	Except for the area outlined in Schedule 5, a new commercial development that is not prohibited under Schedule 3 is permitted if the use entails a limited gathering of persons or a limited engagement of persons in work or activities located outdoors.
NEF 40+ Area outlined in Schedule 5	A new commercial development is permitted if (a) the use entails a limited gathering of persons or a limited engagement of persons in work or activities located outdoors, and (b) in the case of a building, (i) an acoustic report prepared by a professional engineer specializing in acoustics containing a summary of analysis and recommendations related to building location, outdoor and indoor amenity location and post-construction monitoring and compliance testing is implemented, and (ii) the development incorporates mechanical ventilation and central air conditioning.
NEF 35-40 Area	A new commercial development is permitted if (a) the use entails a limited gathering of persons or a limited engagement of persons in work or activities located outdoors, and (b) in the case of a building, (i) an acoustic report prepared by a professional engineer specializing in acoustics containing a summary of analysis and recommendations related to building location, outdoor and indoor amenity location and post-construction monitoring and compliance testing is implemented, and (ii) the development incorporates mechanical ventilation and central air conditioning.
NEF 30-35 Area	A new commercial development that is a building is permitted if the development incorporates mechanical ventilation and central air conditioning.

NEF 25-30 Area A new commercial development that is a building is permitted if the development incorporates mechanical ventilation.

Schedule 5

City of Leduc 50th Street North Commercial Area

The commercial uses permitted on commercial lands outlined above as lying within the NEF 40+ Area are as follows:

(a) auction rooms;
(b) auto, truck and farm equipment sales and service establishments;
(c) barber and ladies' hairdressing shops;
(d) billiard halls or pool rooms;
(e) bowling alleys;
(f) car washing establishments;
(g) dry cleaning and laundry establishments;
(h) financial institutions;
(i) moving and cartage firms;
(j) office buildings;
(k) parking areas;
(l) restaurants with no outdoor eating or drinking areas;
(m) retail commercial shops;
(n) service stations and gas bars;
(o) tradesmen's work shops, service and repair stations;
(p) wholesale equipment and supplies.

Schedule 6

Schedule 7

Parkland County NEF 30-35 Area

Subject ASP Land Use AVPA Regulation Summary Tables:

Table 1: Airport Industrial District (A-M)

Land Uses	Noise Exposure Forecast Areas		
	NEF 25- Area	NEF 25-30 Area	NEF 30-35 Area
Building Materials, Mills and Storage	P	P	C2
Cartage, Freighting, Trucking Yards &Terminals	P	P	C2
Equipment Sales, Storage and Repair	P	P	C2
Grain Elevator	P	P	P
Manufacturing & Fabrication Activities	P	P	C2
Municipal and Utility Building (excluding water treatment & sewage treatment plants)	P	P	C2
Oil and Gas Storage	P	P	P
Open Storage	P	P	P
Warehouses	P	P	C2
Residential Accommodation for Custodian or Watchman	P	C1	NA

NOTE: Appropriate commercial uses in the Airport Industrial District (A-M) may be permitted in accordance with the provisions of item 3 respecting "Commercial uses" in the portion of this Table relating to the Airport Urban District (A-U).

APPENDIX C

97) M-1—INDUSTRIAL - Light Industrial District

a) The general purpose of this District is to accommodate light industrial uses with activity mainly indoors.

b) Subject to the Edmonton International Airport Vicinity Protection Area (Provincial) Regulations, the permitted and discretionary uses allowed in this District include the following:

i) Permitted uses include:

(1) General Industrial Uses as defined in Section 8
  (a) Type 1 Indoor:

    (i) where all activities are confined primarily within an enclosed building; and

    (ii) where no significant adverse effect or nuisance is created or apparent outside the principal building.

(2) Accessory Buildings (Section 42)
(3) Bakeries
(4) Contractor Services
(5) Equipment Rental
(6) Farm Vehicle and Equipment Sales and Service
(7) Industrial Vehicle and Equipment Sales and Service
(8) Major Service Stations
(9) Rapid Drive Through Vehicle Services
(10) Service Stations – Minor
(11) Utility Buildings (Section 33)

ii) Discretionary uses include:

(1) Air Supported and Fabric-Covered Structures subject to Clause m) below
(2) Adult Entertainment Facility
(3) Auctioneering Establishments
(4) Business Support Services
(5) Community Facilities
(6) General Industrial Uses
  (a) Type II Indoor and Outdoor:

    (i) where the industrial activity occurs both inside and out side the principal building;

    (ii) all outdoor industrial activity is screened from adjacent properties; and

    (iii) the activities do not create significant adverse effect or nuisance such as noise, effluent, odour or emissions beyond the site.

(3) Greenhouses and Plant Nurseries
(4) Meat Packers
(5) Minor Eating and Drinking Establishments
(6) Minor Professional, Financial and Office Services
(7) Minor Retail Stores
(8) Moving Establishments
(9) Parking Facilities
(10) Places Of Worship but not including a residence (Section 40)

(11) Recycling Depots (Section 47)
(12) Recycling Drop Off Centres (Section 47)
(13) Retail and Wholesale Stores Specializing in the Sale of Construction Materials
(14) Radio Communication Facilities
(15) Radio Communication Satellite Reception Dish over 1.2 m in Diameter
(16) Surveillance Suites
(17) Storage Space in association with and subordinate to the principal use
(18) Truck and Recreation Vehicle Sales/Rentals
(19) Utility Buildings (Section 33)
(20) Uses classified as spray painting operations.
(21) Uses included in group F, Division 1 of the Alberta Building Code G
(22) Veterinary Hospitals
(23) Warehouse Sales
(24) Uses similar to the permitted and discretionary uses listed above

c) The Applicant is required to ensure that:

i) that the proposal meets the provincial and /or federal government environmental legislation and standards as set out in section 4 of this Bylaw;

ii) the reliability and record of the methods, equipment and techniques in controlling or mitigating the adverse effect or nuisance.

d) In determining the significance of adverse effects or nuisances of a proposed development on adjacent or nearby sites the Development Officer can consider the following aspects:

i) the magnitude of the adverse effect or nuisance;

ii) the extend, frequency and duration of exposure to the adverse effect or nuisance; and

iii) the use and sensitivity of adjacent or nearby sites relative to the adverse effect or nuisance.

e) The maximum site coverage shall be 60%.

f) The site area shall be landscaped in accordance with:

i) Section 30 of this Bylaw

ii) landscaped areas shall be planted with a tree for every 45 m^2 (483.9 sq. ft.) based on 9% 0f the total site area; and

iii) shall include the following spaces:

(1) 1.8 m (5.9 ft.) along every road; and

(2) in accordance with Section 52 of this Bylaw.

g) The dimensions of the site shall be:

i) minimum area 0.2 ha (0.5 acres); and

ii) minimum frontage 40 m (131.2 ft.).

h) The minimum front yard setback for buildings shall be:

i) 6 m (19.7 ft.);

ii) unless a greater distance is deemed necessary by the Development Officer; and

iii) this front yard setback may be varied where a berm with intensive landscaping is proposed.

i) The front yard shall not be used for the storage of unfinished goods or supplies.

j) The side yard setback shall be:

i) 6 m (19.7 ft.) on one side of the building;

ii) 1.5 m (4.9 ft.) on the other side of the building;

iii) for a building over 4.5 m (14.8 ft.) in height there shall be an additional 0.3 m (1.0 ft.) of setback for every additional meter of height up to a maximum setback of 6.0 m (19.7 ft.):

iv) the setback requirement for one boundary may be relaxed subject to:

(1) the fire regulations;

(2) the Building Code; and

(3) development permitted or existing on adjacent lots.

k) The minimum rear yard setback shall be:

i) 5 m (16.4 ft) where abutting a railway line; and

ii) elsewhere at the discretion of the Development Officer.

l) The maximum height of buildings shall be 14 m (45.9 ft.).

m) Air Supported and Fabric-Covered Structures will only be permitted on property located to the East of the CP Railroad and providing it is an:

i) accessory building; or

ii) a building used for recreational purposes.

n) Sea and Shipping Containers will only be permitted as an accessory building to the principal building for storage only. The containers shall not be stacked one upon the other. The exterior finish shall match or compliment the exterior finish of the principal building.

o) Parking and loading shall:

i) meet the requirements of Part VIII of this Bylaw;

ii) be designed so that trucks have ample room to turn around within the site;

iii) be hard-surfaced in accordance with section 50 of this Bylaw; and

iv) sight triangles shall be maintained on corner lots as specified in Section 38 of this Bylaw.

p) Driveway accesses shall:

i) be limited to one access to a major collector roadways or joint access points with adjacent properties;

ii) a maximum of two access points to any other street or roadway;

iii) be laid out having regard to continuity of traffic flow, the safety of vehicles; and

iv) avoid dangerous intersections to the satisfaction of the Development Officer.

q) Easements and Rights-of-Way shall be protected no building or structure shall be located closer than:

i) 15.0 m (49.3 ft.) to the centre line of a pipeline (as defined in the Pipeline Act, 1975) or the centre line of the pipeline right-of-way, whichever is the lesser;

ii) 5.0 m (16.4 ft.) to a railway right-of-way; and

iii) 7.5 m (24.6 ft.) to the centre line of a utility within an easement or closer than 3 m (9.8 ft.) to the boundary, of any easement or right-of-way containing the utility, whichever is the lesser.

r) Burning will be permitted within this District providing:

i) the burning facilities have been approved by the Department of the Environment and the Local Fire Department.

s) The entire site and all buildings shall be developed and maintained in a neat, tidy manner including the trimming and upkeep of landscaped areas and the removal of debris and unsightly objects and in particular:

i) the architectural appearance shall meet the standards set out in Section 36 of this Bylaw;

ii) the landscaping will meet the standard as required by Section 30 of this Bylaw;

iii) signs provided shall be in accordance with Part IX of this Bylaw; and

iv) lighting shall be in accordance with Section 39 of this Bylaw.

t) An approved storage area for garbage disposal shall be screened to the height considered necessary by the Development Officer.

98) M-2- INDUSTRIAL - Medium Industrial District

a) The general purpose of this District is to accommodate indoor and outdoor industrial uses that do not cause any objectionable or dangerous conditions beyond the site boundary. This District will be separated from commercial and residential district by the M1 – Light Industrial Districts.

b) Subject to the Edmonton International Airport Vicinity Protection Area (Provincial) Regulations, the permitted and discretionary uses allowed in this District include the following:

i) Permitted uses include:

(1) General Industrial as defined in Section 8
(a) Type I Indoor:

(i) where all activities are confined primarily within an enclosed building; and

(ii) where no significant adverse effect or nuisance is created or apparent outside the principal building.

(b) Type II Indoor and Outdoor:

(i) where the industrial activity occurs both inside and outside the principal building;

(ii) where all outdoor industrial activity is screened from adjacent properties; and

(iii) where the activities do not create significant adverse effect or nuisance such as noise, effluent, odour or emissions beyond the M-2 Land Use District.

(2) Accessory Buildings (Section 42)
(3) Contractor Services
(4) Equipment Rentals
(5) Greenhouses and Plant Nurseries
(6) Industrial Vehicle and Equipment Sales and Service
(7) Meat Packers
(8) Rapid Drive Through Vehicle Services
(9) Recycling Depots
(10) Recycling Drop Off Centre
(11) Service Stations – Minor
(12) Service Stations – Major
(13) Utility Buildings (Section 33)

ii) Discretionary uses include:

(2) Air Supported and Fabric-Covered Structures subject to clause n) below
(3) Adult Entertainment Facility
(4) Business Support Services
(5) General Industrial as defined in Section 8
(a) Type III where:

(i) The industrial activity is conducted indoor or out door; and

(ii) there may be an adverse effect or nuisance on the safety, use, amenity, property value or enjoyment of adjacent or nearby sites due to appearance, noise, odour, and emission of contaminants, fire explosive hazard and/or dangerous goods.

(3) Minor Eating and Drinking Establishments
(4) Surveillance Suites
(5) Uses Classified as Spray Painting Operation
(6) Uses included in Group F, Division 1 of the Alberta Building Code
(7) Radio Communication Facilities
(8) Radio Communication Satellite Reception Dish over 1.2 m in diameter
(9) Uses similar to the permitted and discretionary uses listed above

c) The Applicant is required to ensure that:

i) that the proposal meets the provincial and /or federal government legislation and standards as set out in Section 4 of this Bylaw;

ii) the reliability and record of the methods, equipment and techniques in controlling or mitigating the adverse effect or nuisance.

d) In determining the significance of adverse effects or nuisances of a proposed development on adjacent or nearby sites the Development Officer can consider the following aspects:

i) the magnitude of the adverse effect or nuisance;

ii) the extend, frequency and duration of exposure to the adverse effect or nuisance; and

iii) the use and sensitivity of adjacent or nearby sites relative to the adverse effect or nuisance.

e) The maximum site cover shall be 60%.

f) The minimum site area shall be 0.5 ha (1.2 acre).

g) The site area shall be landscaped in accordance with:

i) Section 30 of this Bylaw;

ii) landscaped areas shall be planted with a tree for every 45 m^2 (484 sq. ft.) based on 9% of the total site area; and

iii) shall include the following spaces:

(1) 1.8 m (5.9 ft) along every road; and

(2) in accordance with Section 52 of this Bylaw.

h) The minimum front yard setback for buildings shall be:

i) 6 m (19.7 ft.); and

ii) this front yard setback may be varied where a berm with intensive landscaping is proposed.

i) The front yard shall not be used for the storage of unfinished goods or supplies.

j) The side yard setback shall be:

i) 6 m (19.7 ft.) on one side of the building;

ii) 1.5 m (4.9 ft.) on the other side of the building;

iii) an additional side yard setback 0.3 m (1.0 ft.) setback for every meter of height between 4.5 m (14.8 ft.) and 6 m (19.7 ft.); and

iv) the setback requirement for one boundary may be relaxed subject to:

(1) the fire regulations;

(2) the Building Code; and

(3) development permitted or existing on adjacent lots.

k) The minimum rear yard setback shall be:

i) 5 m (16.4 ft) where abutting a railway line; and

ii) elsewhere at the discretion of the Development Officer.

l) Sight triangles shall be maintained on corner lots as specified in Section 38 of this Bylaw.

m) The maximum height of buildings shall not exceed 14 m (46 ft.).

n) Air Supported and Fabric-Covered Structures will only be permitted as an accessory building unless it is used for recreational purposes.

o) Sea and Shipping Containers will only be permitted as an accessory building to the principal building for storage only. The containers shall not be stacked one upon the other. The exterior finish shall match or compliment the exterior finish of the principal building.

p) Parking and loading shall:

i) meet the requirements of Part VIII of this Bylaw;

ii) be designed so that trucks have ample room to turn around within the site;

iii) be hard-surfaced in accordance with section 50 of this Bylaw; and

iv) sight triangles shall be maintained on corner lots as specified in Section 38 of this Bylaw.

q) Driveway accesses shall:

i) be limited to one access to a major collector roadways or joint access points with adjacent properties;

ii) a maximum of two access points to any other street or roadway;

iii) be laid out having regard to continuity of traffic flow, the safety of vehicles; and

iv) avoid dangerous intersections to the satisfaction of the Development Officer.

r) Easements and Rights-of-Way shall be protected and no building or structure shall be located closer than:

i) 15 m (49.3 ft.) to the centre line of a pipeline (as defined in the Pipeline Act, 1975) or the centre line of the pipeline right-of-way, whichever is the lesser;

ii) 5 m (16.4 ft.) to a railway right-of-way; and

iii) 7.5 m (24.6 ft.) to the centre line of a utility within an easement or closer than 3 m (9.8 ft.) to the boundary, of any easement or right-of-way containing the utility, whichever is the lesser.

s) Burning will be permitted within this district providing the burning facilities have been approved by the Department of the Environment and the Local Fire Department.

t) Outdoor storage shall be:

i) permitted only when accessory to a permitted principal use; and

ii) an approved storage area shall be screened to the height considered necessary by the Development Officer to screen the storage of materials and in accordance with Section 31.

u) The entire site and all buildings shall be developed and maintained in a neat, tidy manner including the trimming and upkeep of landscaped areas and the removal of debris and unsightly objects and in particular:

i) the architectural appearance shall meet the standards set out in Section 36 of this Bylaw;

ii) the landscaping will meet the standard as required by Section 30 of this Bylaw;

iii) signs provided shall be in accordance with Part IX of this Bylaw; and

iv) lighting shall be in accordance with Section 39 of this Bylaw.

v) An approved storage area for waste disposal shall be screened to the height considered necessary by the Development Officer.

w) Buildings that have been brought to the site prebuilt shall be visually compatible with the site in the opinion of the Development Officer and may require a Development Permit.

APPENDIX D

FILE NO: 6052-2

ENVIRONMENTAL SITE ASSESSMENT PHASE I
NORTH TELFORD LAKE AREA
SECTION 36-49-25-4 & WEST ½ OF SECTION 31-49-24-4
LEDUC, ALBERTA

February/March, 2002

HOGGAN ENGINEERING & TESTING (1980) LTD.
17505 - 106 Avenue
Edmonton, Alberta
T5S 1E7

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UPDATE - ENVIRONMENTAL SITE ASSESSMENT PHASE I
NORTH TELFORD LAKE AREA
SECTION 36-49-25-4 & WEST ½ OF SECTION 31-49-24-4
LEDUC, ALBERTA

TABLE OF CONTENTS

1.0 EXECUTIVE SUMMARY

HOGGAN ENGINEERING AND TESTING LTD. has performed an Environmental Site Assessment - Phase I on the subject property. Authorization to proceed was provided by Mr. Eugene Lee of E/A Lee Consulting Ltd., in consultation with Mr. Reg Dacyk of GPEC Consulting Ltd. The subject area is Section 36-49-25-4, and the western half of Section 31-49-24-4, east of Leduc, Alberta. Some subdivision of the property has occurred, and some of the legal addresses within the study area are Lots A & B of Plan 1449RS, and Blocks A & B of Plan 792 1548.

The ESA-Phase I research into available information revealed no significant environmental concerns with respect to the subject property. No further environmental assessment work is considered necessary for the subject property at the time of this report.

2.0 INTRODUCTION

HOGGAN ENGINEERING AND TESTING (1980) LTD. has undertaken a Phase I, Environmental Site Assessment for the subject property. The work was undertaken in February and March, 2002 for E/A Lee Consulting Ltd. and GPEC Consulting Ltd. The purpose of the ESA was to determine the potential for contamination of this site from surficial and/or underground sources. The Phase I ESA involves a review of the records and data pertaining to the site and adjacent properties in order to expose any environmental concerns related to contamination of the site. A Phase I assessment is a preliminary study which would indicate the potential for contamination. This assessment does not include any investigation procedures of sampling, monitoring, analyzing, and measuring as related to environmental testing at this site. If, through the findings of this assessment, concerns or suspicion for environmental contamination arise, additional Phase II or Phase III studies could become necessary. Phase II and III studies are beyond the scope of this report.

3.0 METHODOLOGY

The general approach utilized for this assessment was adopted from the CSA standard Z768-94 publication, "Phase I, Environmental Site Assessment". The topics covered within this report are summarized as follows:

a) Historical investigation
b) Site reconnaissance
c) Review of known subsoil conditions
d) Overview of neighbouring operations
e) Search of municipal and other regulatory records

The findings of our research, as presented herein, were sufficient for our firm to draw reasonable conclusions on the probable environmental conditions of the subject land.

4.0 HISTORICAL SEARCH

4.1 Property Description

The area under investigation is located in or near Leduc, Alberta, in the area north of Telford Lake. The proposed development area includes 6 quarter sections, with the exception of the

portions covered by the lake and an existing cemetery. The area was bordered on the north side by Township Road 500 (65 Avenue), beyond which more farmland was noted, and on the south side by Telford Lake. Bordering the site on the western edge was Range Road 251 (44 Street). On the other side of this road, various commercial developments were noted. The eastern edge of the site was marked by a fence separating the subject property from more farmland to the east.

At the time of the investigation, the subject area was mostly farmland, with several bush areas. A farmhouse and farmyard were noted in a portion of NE 36-49-25-4, accessed from Township Road 500, and a trucking business was noted in the southwest portion of NW 36-49-25-4, accessed from Range Road 251. Although no permanent road has been constructed, the right-of-way for Range Road 250 was noted bisecting the site between Sections 36 and 31. The right-of-way contained a tree-lined, temporary road accessed by a locked gate. At the time of the investigation, the study area was snow covered. The terrain was slightly rolling, with the drainage pattern mostly toward the lake at the south edge of the site. A minor drainage swale was noted running east-west in the northern portion of the study area.

Two maps showing the site and the surrounding area are attached as Figures 1 and 2 in Appendix A. Some of the local land use and legal boundaries are also detailed on these plans.

4.2 Land Title Review

A search of the historical records for ownership of the subject lots dates back to approximately 1900, when the general area was unsubdivided farmland. The objective of this search was to determine possible land uses associated with the ownership. The property ownership, in sequence, is summarized as follows:

NW36-49-25-4

Lot A, Plan 1449RS

Date	Registered Owner
December, 1989 to present	Ray-Ann Holdings Inc.
November, 1985 to December, 1989	Royal Bank of Canada
September, 1985 to November, 1985	Thorndale Properties Ltd.
April, 1985 to September, 1985	City of Leduc
July, 1980 to April, 1985	Crakim Holdings Ltd.
August, 1976 to July, 1980	Alexander William Currie / Joan Mabel Currie
September, 1970 to August, 1976	Arden Buss and Hazel Buss
September, 1970	Marilyn Lloyd (certified nursing aid) and James V. Kenyon (garage operator)
May, 1969 to September, 1970	John George Mucha

East ½ of NW36-49-25-4

Date	Registered Owner
August, 1983 to present	Melcor Developments Ltd.
March, 1976 to August, 1983	Apex Loan and Investments Ltd.
May, 1969 to March, 1976	John George Mucha

All of NW36-49-25-4 (except cemetery)

Date	Registered Owner
February, 1968 to May, 1969	John George Mucha
May, 1967 to February, 1968	Ernest A. Hauser / Fred Kubbernus
July, 1950 to May, 1967	Ewald Hauser (farmer) / Emma Hauser
August, 1948 to July, 1950	Nick Frick (retired gentleman) / Emilie Frick
August, 1948	Nick Frick (retired gentleman)
April, 1923 to August, 1948	Franklin Hunter (farmer)
August, 1902 to April, 1923	Richard Fethertonbaugh (farmer)

HOGGAN ENGINEERING & TESTING (1980) LTD.

SW36-49-25-4

All of SW36-49-25-4 (except lake)

Date	Registered Owner
September, 1981 to present	Walter P. Twinn
September, 1981	Allalta Credit Union Ltd.
April, 1977 to September, 1981	Core-Mix Concrete Ltd.
September, 1960 to April, 1977	Victor Ivan MacLaren (construction superintendent) / William Henry Ronald MacLaren (solicitor)
April, 1906 to September, 1960	Cynthia Beulah MacLaren
November, 1902 to April, 1906	William R. Burns (clergyman)
August, 1896 to November, 1902	Frederick Searle Gray (farmer)

East ½ of Section 36-49-25-4

Block B, Plan 792 1548

Date	Registered Owner
November, 1995 to present	Ziad Properties Ltd.
July, 1979 to November, 1995	Glasgow Farms Ltd.
June, 1979 to July, 1979	Leduc Acceptance Corporation Ltd.

Block A, Plan 792 1548

Date	Registered Owner
October, 1996 to present	Kevin James Gaetz
June, 1979 to October, 1996	Leduc Acceptance Corporation Ltd.

East ½ of Section 36-49-25-4 (except lake)

Date	Registered Owner
November, 1969 to June, 1979	Leduc Acceptance Corporation Ltd.

May, 1949 to November, 1969	Andrew E. Fjell (farmer)
December, 1939 to May, 1949	Hilda Fjell (housewife)
December, 1935 to December, 1939	The Canada Life assurance Company

All of SE36-49-25-4 (except lake)

Date	**Registered Owner**
January, 1927 to December, 1935	Henry Belter (farmer)
April, 1912 to January, 1927	Herbert S. Slater (meat merchant)
May, 1909 to April, 1912	George A. Liggins (railway employee)
May, 1909	Louise Josephene Webber
July, 1896 to May, 1909	William Luther Webber

All of NE36-49-25-4

Date	**Registered Owner**
December, 1926 to December, 1935	Henry Belter (farmer)
November, 1926 to December, 1926	Herbert A. S. treadgold (medical practicioner)
December, 1918 to November, 1926	The Land Securities Company of Canada
March, 1917 to December, 1918	Edwin Tracey Hacking (gentleman)
July, 1916 to March, 1917	Thomas Hull (livestock dealer)
May, 1907 to July, 1916	William H. Christenson
May, 1907	John Brown / Thomas Bailey
February, 1900 to May, 1907	Robert Kennedy

NW31-49-24-4

North ½ of NW31-49-24-4

Date	Registered Owner
December, 1994 to present	Paul Larsen
October, 1994 to December, 1994	Alberta Treasury Branch
May, 1994 to October, 1994	Glasgow Farms Ltd.

South ½ of NW31-49-24-4

Date	Registered Owner
January, 1995 to present	Paul Larsen
May, 1994 to January, 1995	Glasgow Farms Ltd. / Nora Josephene Gaetz

All of NW31-49-24-4

Date	Registered Owner
November, 1983 to May, 1994	Glasgow Farms Ltd. / Nora Josephene Gaetz
February, 1978 to November, 1983	Marie Elizabeth Russell
August, 1971 to February, 1978	Charles Walter Russell
July, 1971 to August, 1971	John Jules Bussin
April, 1961 to July, 1971	Wilda May Storer / Saloma Christenson
July, 1947 to April, 1961	William Henry Christenson (farmer) / Saloma Christenson (wife) / Wilda May Christenson (businesswoman)
September, 1901 to July, 1947	William Henry Christenson (farmer)

SW31-49-24-4

All of SW31-49-24-4 (except lake)

Date	Registered Owner
October, 1996 to present	Geoffrey Leonard Gaetz
November, 1983 to October, 1996	Leduc Acceptance Corporation Ltd.
January, 1977 to November, 1983	Romulus Holdings Ltd.
August, 1971 to January, 1977	Charles Walter Russell
July, 1971 to August, 1971	John Jules Bussin
April, 1961 to July, 1971	Wilda May Storer and Saloma Christenson
August, 1947 to April, 1961	William Henry Christenson (farmer) / Saloma Christenson (wife) / Wilda May Christenson (businesswoman)
June, 1940 to August, 1947	Wilda May Christenson
August, 1901 to June, 1940	William Christenson (farmer)

The earliest available titles for this area were granted between 1896 and 1902. Based on the nature of the land ownership, the land use of the study area is likely to have been agricultural through to its current ownership, with several exceptions. Several corporations and banks are noted on some of the titles, indicating that the ownership may have been developmental or speculative in nature. In addition, a concrete company owned SW36-49-25-4 from 1977 to 1981, indicating that some industrial activity may have occurred on this property. No other evidence of potential sources of significant environmental concern were noted in the search. Copies of the land titles are not included in the assessment, but can be supplied upon request.

4.3 Air Photo Review

Aerial photography coverage of the subject area was obtained and carefully reviewed for activities, within and surrounding the site, conducive to potential contamination. A total of 4 air photos covering a time span from 1949 to 1998 were obtained from the Alberta Environment air photo archives.

The photo coverage obtained is summarized as follows:

Year	Catalogue No.	Photo No.	Scale
1998	AS4986	128	1:30000
1979	AS1086	145	1:20000
1960	AS39	171	1:12000
1949	AS140	144	1:40000

The 1949 air photo revealed most of the subject site and surrounding area to be primarily undeveloped bush and farmland. Several outbuildings are noted on the northern edge of the photo, which appear to correspond with the location of the current farm yard noted in NE36-49-25-4. Several lighter areas within the treed area in SW36-49-25-4 indicate some possible disturbance to the area. West of the study area, the highway can be seen running north-south, and development within Leduc is well underway.

The 1960 air photo reveals greater detail in the study area. A farmhouse and yard can be seen in NE36-49-25-4, including several small outbuildings. Additionally, the cemetery can be seen adjacent to the treed area NW36-49-25-4. Also in this area, a driveway with several small buildings can be seen. The driveway and buildings appear to be in the area where the trucking yard is currently located. Extensive disturbance can be seen just north of Telford Lake, within the treed area in SW36-49-25-4. The area appears to have been stripped, with some possible excavation of material. Some small buildings or vehicles can also be seen on the western edge of the disturbed area. The photo also revealed further development in the local area. Some residential development can be seen immediately west of the south end of the study area, with roads or trails leading from the residential area into the disturbed area within the trees.

In the 1979 air photo, the study area appears mostly unchanged, although the previously disturbed area appears less disturbed, possibly indicating that re-growth is occurring. One major change is that a small channel of open water can now be seen in the previously disturbed area. This channel appears to be connected to Telford Lake, and was not visible in previous air photos. General development of the light industrial or commercial local area west of the study area has also begun, with roads and at least one building noted.

The 1998 air photo shows the trucking yard is now in operation in the southwest portion of NW36-49-25-4. Several parked trucks and trailers can also be seen. The light industrial and commercial area located west of the study area has also seen continuing development, as the

roads in the immediate area are now paved, and most of the lots are occupied by businesses. Residential development has also continued west and southwest of the study area.

There were no specific areas of significant environmental concern noted in the air photos reviewed, although the stripping and possible excavation which occurred in the treed area in the southwest corner of the study area is of some concern. The general industrial site usage in the area immediately west of the study area is also of minor concern. Copies of the air photos utilized are included in Appendix A.

5.0 SITE RECONNAISSANCE

5.1 Existing Site

The study area comprises approximately six quarter sections, with the exception of the portions covered by Telford Lake and the cemetery. The area is currently mostly farmland and treed areas, with a high pressure gas pipeline noted running east-west through the central portion of the site. A plan showing the study area is attached as Figure 1 in Appendix A. Some of the local land use and legal boundaries are also detailed on these plans. Photographs of the study area, including developed areas, are provided in Appendix B.

Three areas of development were noted on the study area. A combined office and shop, presently occupied by Gagnon Trucking Ltd., was noted in the southwest portion of NW 36-49-25-4, accessed from Range Road 251. One main building and several small outbuilding and sheds were noted on this property. The building appears to be a cinder block building with a slab-on-grade floor and no basement. The main business of Gagnon Trucking Ltd. at this location is general office operation, as well as some equipment maintenance. No fuel tanks are present at this site. The development was constructed between 1979 and 1998, according to the air photos.

A farmhouse and farmyard were also noted in a portion of NE 36-49-25-4, accessed from Township Road 500. The house was a single storey wood framed building with a basement. The farm yard consisted of several small outbuildings and barns, as well as some fenced pasture areas housing cattle. One above ground fuel storage tank was noted on the site. The farm was originally constructed at some time prior to 1949 according to the aerial photographs. Both the trucking yard and the farm yard are on rural cross-sectioned roads with ditches. These developments are not connected to City of Leduc water or sewer services.

7.0 INTERVIEWS

The following parties were interviewed by means of verbal contact or through written correspondence for their knowledge or for records pertaining to activities/usage associated with the potential for site contamination:

Party	Means of Contact	Contact	Date
PTMAA Environmental Coordinator	Written/Fax	Valerie Hague	March 6, 2002
Alberta Environment	Written/Fax	Della Gerbrandt	March 19, 2002
Alberta Energy and Utilities Board	Written/Fax	Sue Scullion	March 6, 2002
City of Leduc, Planning and Engineering Department	Written/Fax	Carol Hammermeister	March 22, 2002
City of Leduc, Fire Department	Written/Fax	Rick Sereda	March 22, 2002
Capital Regional Health Authority	Written/Fax	Elson Zazulak	March 8, 2002
Environment Canada	Written/Fax	Deanna Cymbaluk	March 20, 2002
Environmental Law Centre	Written/Fax	Iris Djurfors	March 6, 2002

The Petroleum Tank Management Association of Alberta (PTMAA) has no record of active or abandoned tanks within the subject area. However, as noted previously, several above ground storage tanks were noted in the vicinity of the area during the site visit.

Alberta Environment has no information relating to the study site, with regard to the environmental condition of the site subsoil or groundwater. No records have been found concerning any environmental contamination or remediation.

A response from the Alberta Energy and Utilities Board indicates no oil or gas wells, past or present, on the study property. In addition, no complaints, spills, or incidents have been reported. Records for two testholes (exploration wells) advanced in July, 1946 and April, 1952 by Imperial

Oil were forwarded. The locations provided indicate that the testholes were advanced in the northeast corner of NE36-49-25-4, and in the northwest corner of NW31-49-24-4. The information provided indicates that no wells were ever in production at these locations.

The City of Leduc was also contacted as part of this investigation. Information from the Subdivision/Development Officer indicate development permits for both the farm and the trucking business, with the rest of the property vacant farmland. They also indicate that SW36-49-25-4 had previously been utilized as a sand pit in the 1960's, and that the owners of the property had been requested to clean up various debris on the land at various times, typically consisting of empty drums, car bodies, and automobile parts. A response from the Fire Chief revealed no records of storage of above ground or underground substances. However, he did report an airplane crash on the property during the early 1970's, which likely allowed the release of some aircraft fuel.

During a conversation with staff of the City of Leduc Engineering Department, an enquiry about the former use of the disturbed area, noted in the southwest portion of SW36-49-25-4 in the air photos and during the site visit, was made. The response was that a cement company had been excavating material (likely sand) for use in making cement, and that any fill placed was likely extra excavated material which needed to be excavated to gain access to the desired material. The air photos indicated that this activity was possibly taking place as early as 1949, and well underway in 1960, and that re-growth was visible in 1979.

Additionally, the staff of the City of Leduc Engineering Department also recalled the airplane crash described by the Fire Chief. The plane was understood to be carrying livestock and several crew members at the time. No further information could be obtained on the crash from other sources.

The Capital Regional Health Authority was contacted as part of this investigation, and a response indicated that there is no information regarding outstanding orders or contamination on or around the study area.

Environment Canada was also contacted as part of this investigation, and the response revealed no records concerning the subject properties.

The Environmental Law Centre have cited no 'Tickets, Prosecutions, Administrative Penalties, Warnings, Enforcement Orders, Enforcement Orders Concerning Waste, Environmental Protection Orders, Emergency Environmental Protection Orders, Emission Control Orders, Chemical Control Orders, Water Quality Control Orders, and Stop Orders issued pursuant to the

Alberta Environmental Protection and Enhancement Act and its predecessor legislation, the Hazardous Chemicals Act, Agricultural Chemicals Act, Clean Water Act and Clean Air Act' since 1971. The search was conducted on the owners of the property from 1971 to the present, a list of approximately 25 owners. Orders or penalties were identified for several of the owners, namely the Royal Bank of Canada, the City of Leduc, and Melcor Developments Ltd., however the orders were not applicable to the subject property.

Copies of written correspondence sent and received are included in Appendix C.

8.0 CONCLUSIONS

A review of the property title ownership of the land now encompassing the study area indicates the land use of the study area is likely to have been agricultural or speculative through to its current ownership, with the exception of SW36-49-25-4, where a construction superintendent owned the property owned the property from 1960 to 1977, and a concrete company owned the property from 1977 to 1981. This indicates that some industrial activity may have occurred on this property.

Results of the air photo search indicated a disturbed area located in the southwest portion of SW36-49-25-4. Traces of disturbance was noted in the 1949 air photo, and major disturbance was noted in the 1960 air photo. The activity is believed to have been related to excavating material for construction purposes. The potential environmental impact on the site from this disturbed area is rated to be low to moderate.

The site visit revealed an above ground storage tank in the farmyard in NE36-49-25-4. No obvious distressed vegetation, soil staining, or any other evidence of environmental contamination was noted, but the area was snow covered at the time of the study. The potential environmental impact on the immediate area of the tank from this source is considered moderate.

The local area reconnaissance indicated several potential environmental concerns in the general area. A pipe storage and equipment storage yard, featuring a small above ground storage tank, and a food processing development centre were located on the west side of Range Road 251 (44 Street), approximately 100 metres from the study site. Several other light industrial businesses were noted in the general area. Two commercial fuel locations were noted approximately 200 metres northwest and 400 metres west of the study area. One other possible concern was the railway line running north-south approximately 400 metres west of the study area. From the

observations made during the site visit regarding the nature of the surrounding businesses, and from the relatively impermeable nature of the subsoils in the general area, the potential for environmental impact on the subject site from adjacent and nearby sites is considered to be low.

There is no documentation from regulatory/authoritative bodies encountered that indicate land use or the storage of substances on site which would be conducive to site contamination. The Alberta Utilities Board had indications of two testholes on the study area, but no wells were ever installed. The City of Leduc has records of several orders to clean up various debris from the site, and also of an airplane crash on the property. No other regulatory agencies revealed any potential sources for environmental contamination of the study lot.

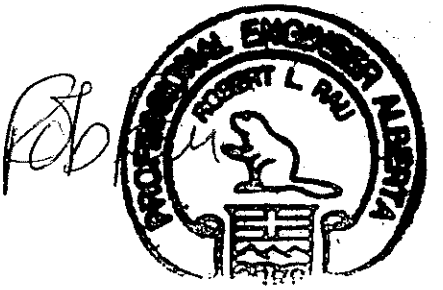
As a result, the overall potential for environmental contamination at this site is considered to be low, and no further investigation is considered to be necessary.

9.0 CLOSURE

It should be noted that no environmental site assessment can completely reveal all the actual contaminants which may be present on a property. The findings and conclusions stated in this report are based upon generally accepted environmental engineering practices. No other warranty expressed or implied is given. Use of this report is for the exclusive use of GEPC Consulting Ltd. and E/A Lee Consulting Ltd., and only applies to the subject property at the time of the assessment.

We trust this information is satisfactory. If you should have any further questions, please contact our office.

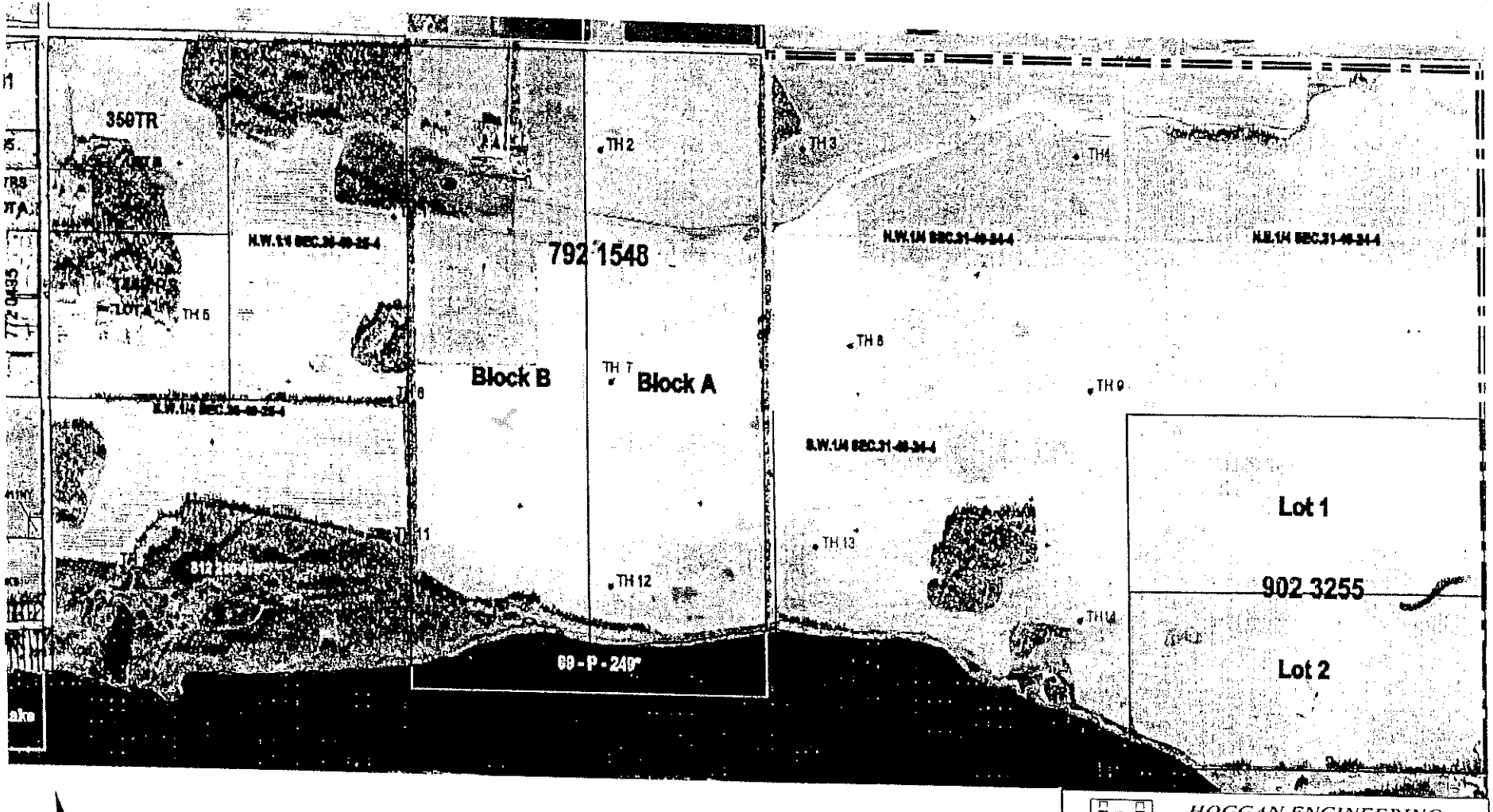
Yours truly,
HOGGAN ENGINEERING AND TESTING (1980) LTD.



Robert Rau, P. Eng.

Reviewed By: Robert V. Weldon, P, Eng

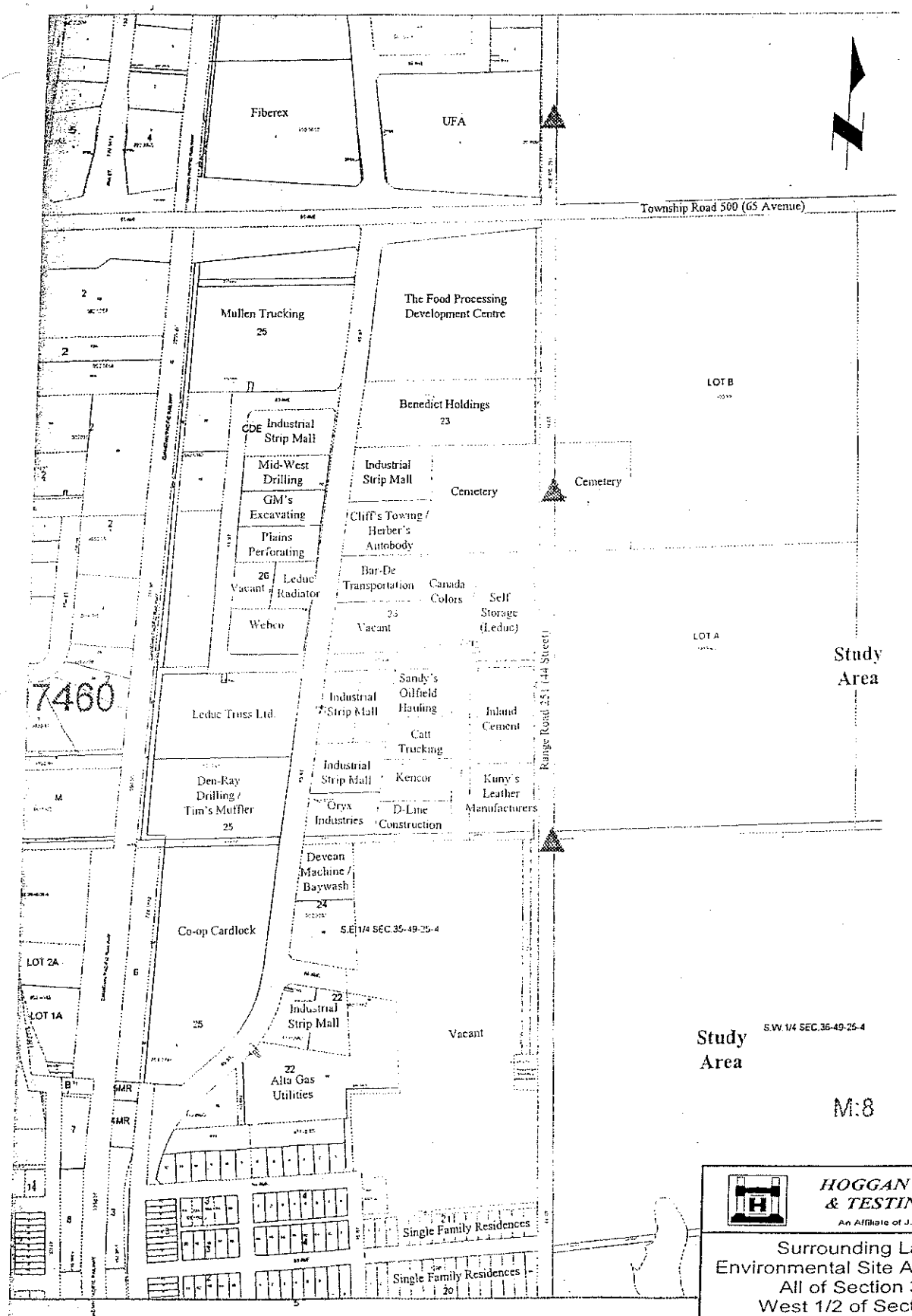
APPENDIX A



HOGGAN ENGINEERING & TESTING (1980) LTD.
An Affiliate of J.R. Paine & Associates Ltd

Key Plan
Environmental Site Assessment Phase I
All of Section 36-49-25-4 &
West 1/2 of Section 31-49-24-4
Leduc, Alberta

SCALE: NTS	DATE: February, 2002



HOGGAN ENGINEERING & TESTING (1980) LTD.
An Affiliate of J.R. Paine & Associates Ltd.

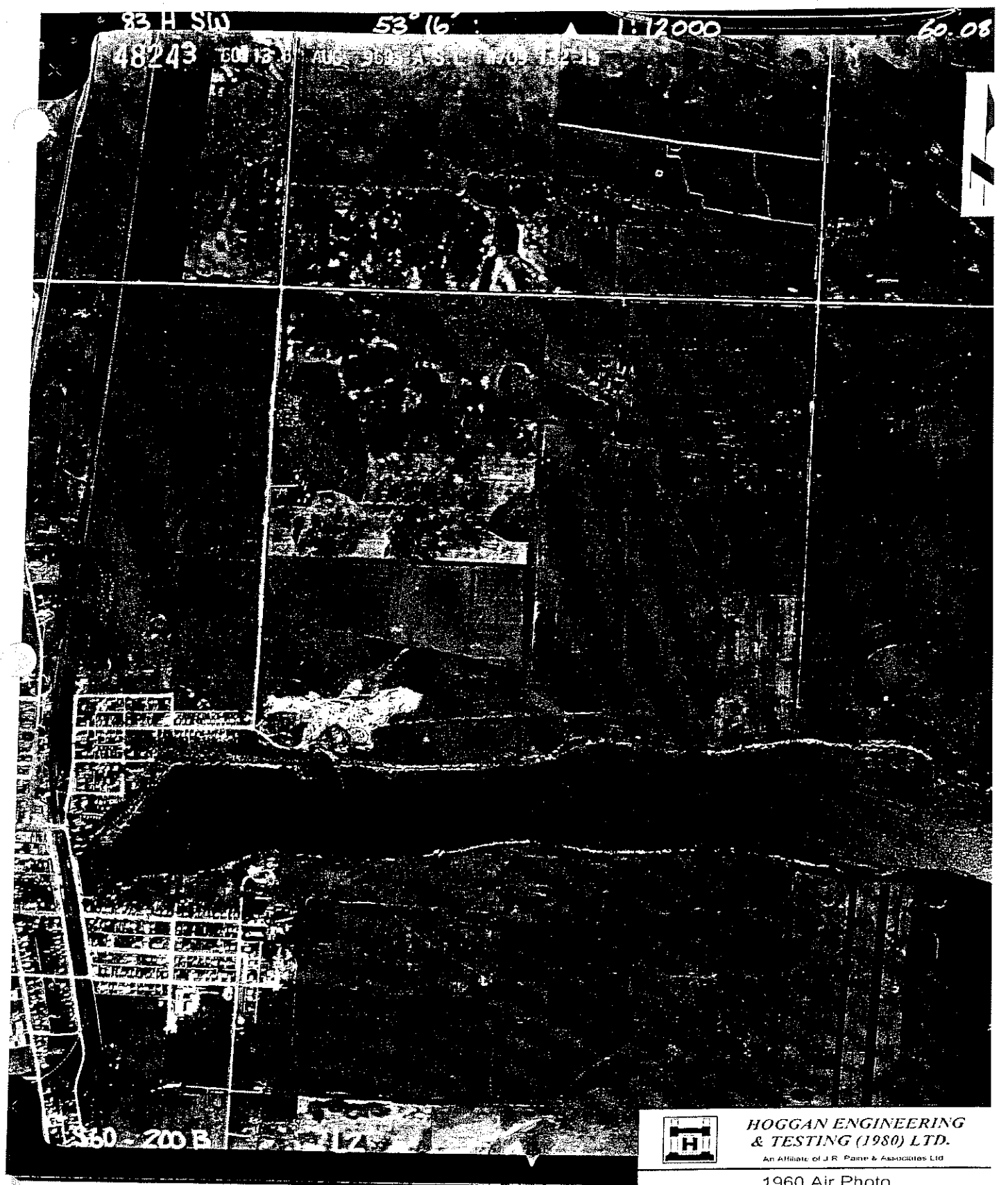
Surrounding Land Use Plan
Environmental Site Assessment Pha
All of Section 36-49-25-4 &
West 1/2 of Section 31-49-24-4
Leduc, Alberta

SCALE: NTS	DATE: February, 2002
FILE #: 6052-2	FIGURE #: 2

HOGGAN ENGINEERING & TESTING (1980) LTD.
An Affiliate of J.R. Paine & Associates Ltd.

1949 Air Photo
Environmental Site Assessment Phase I
All of Section 36-49-25-4 &
West 1/2 of Section 31-49-24-4
Leduc, Alberta

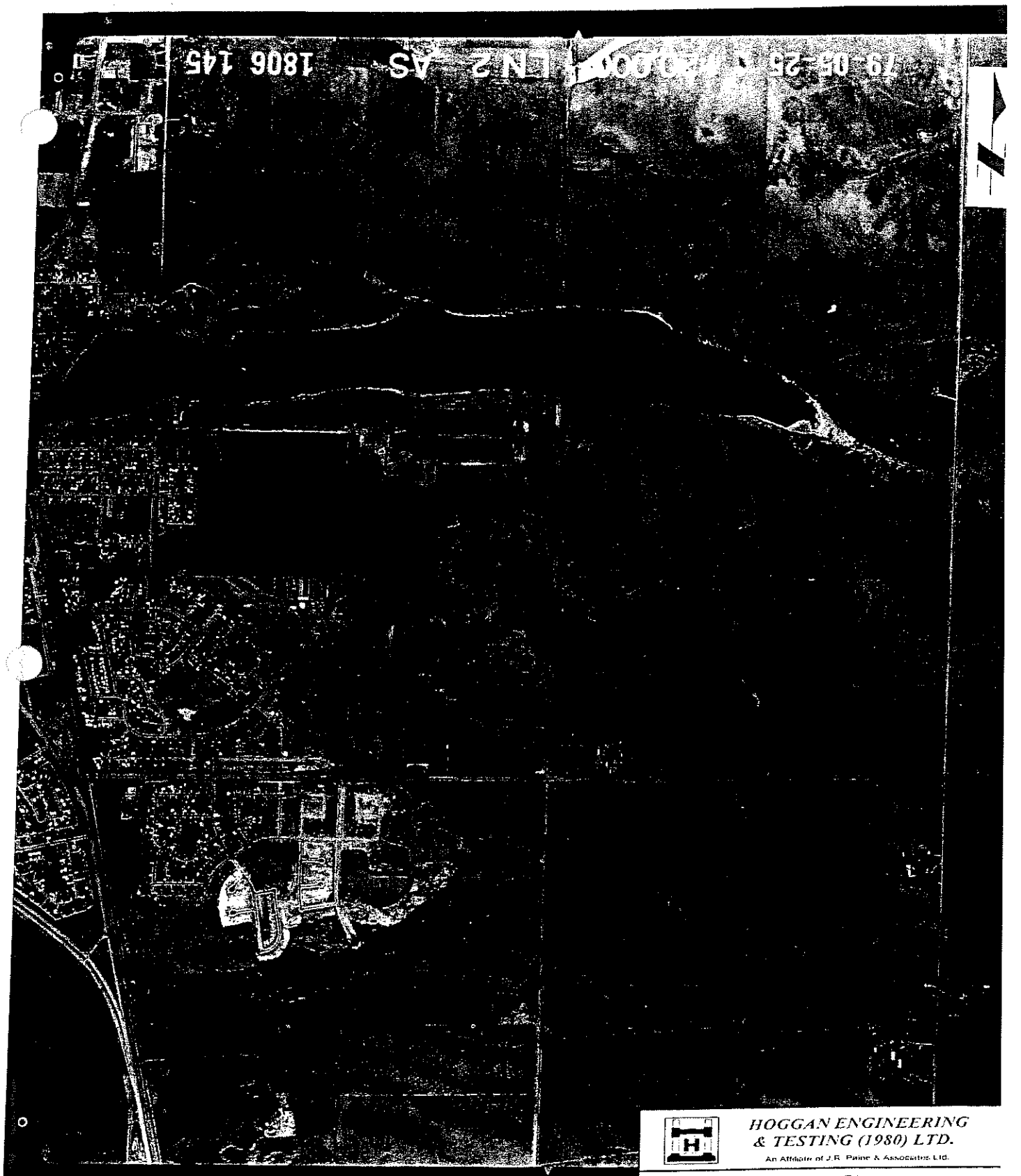
SCALE: 1:40000	DATE: February, 2002
FILE #: 6052-2	FIGURE #: 3



HOGGAN ENGINEERING
& TESTING (1980) LTD.
An Affiliate of J.R. Paine & Associates Ltd

1960 Air Photo
Environmental Site Assessment Phase
All of Section 36-49-25-4 &
West 1/2 of Section 31-49-24-4
Leduc, Alberta

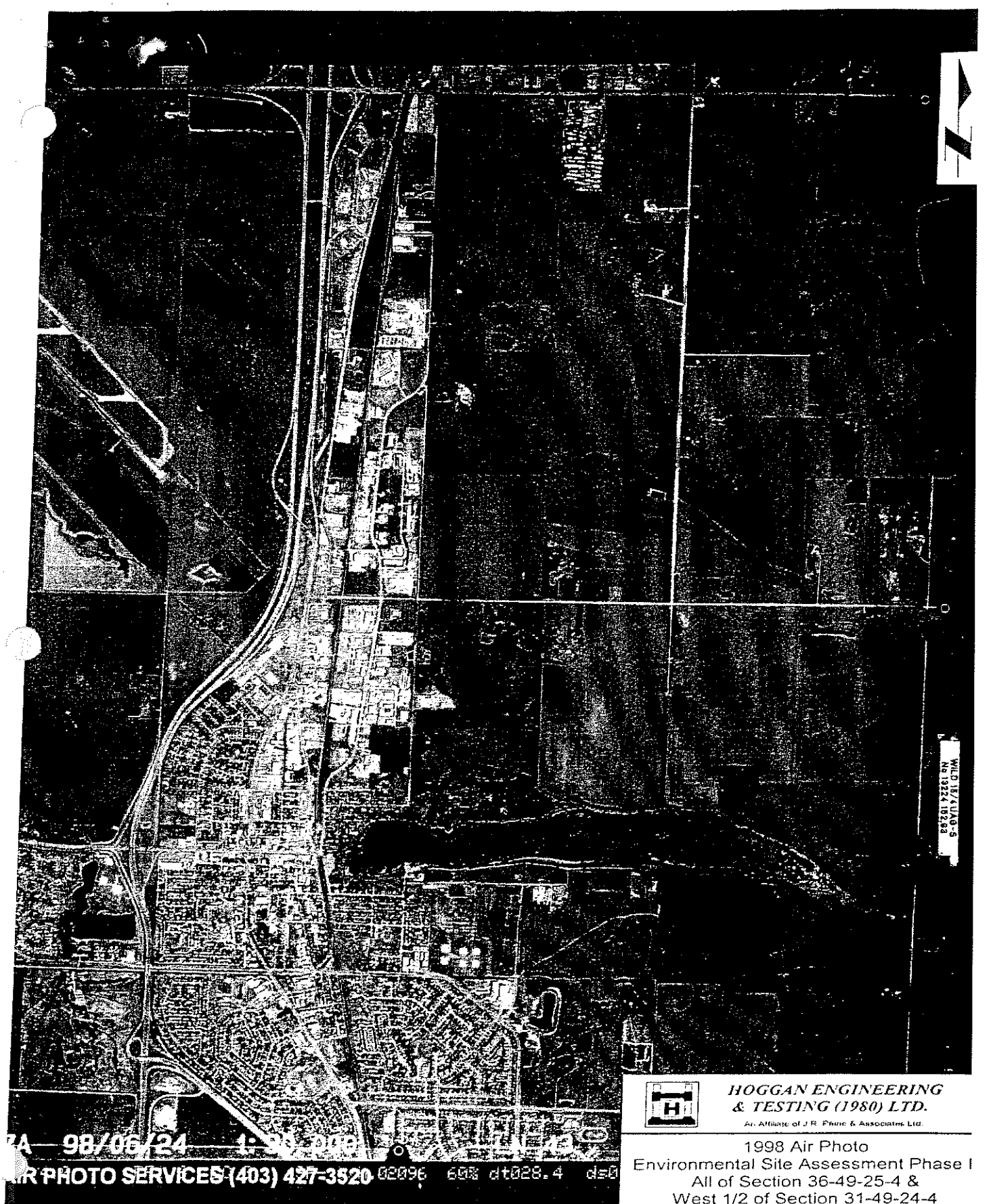
SCALE: 1:12000	DATE: February, 2002
FILE #: 6052-2	FIGURE #: 4



HOGGAN ENGINEERING & TESTING (1980) LTD.
An Affiliate of J.R. Paine & Associates Ltd.

1979 Air Photo
Environmental Site Assessment Phase I
All of Section 36-49-25-4 &
West 1/2 of Section 31-49-24-4
Leduc, Alberta

SCALE: 1:20000	DATE: February, 2002
FILE #: 6052-2	FIGURE #: 5



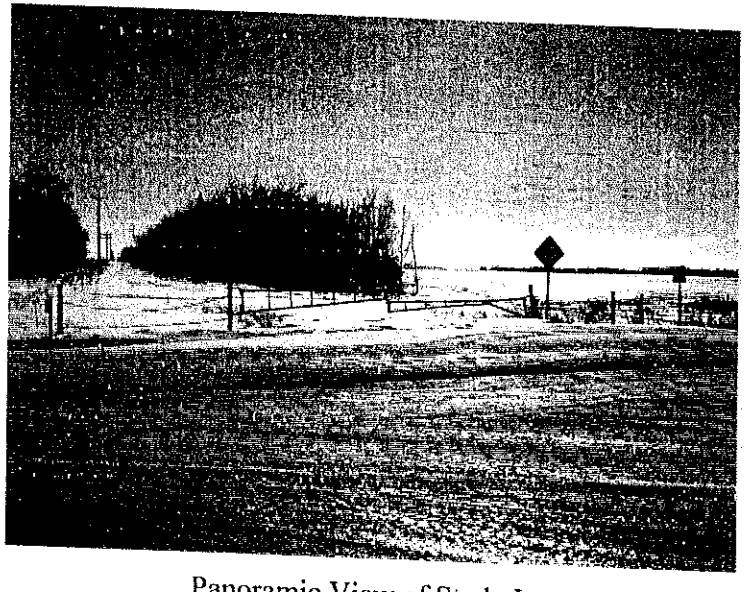
HOGGAN ENGINEERING & TESTING (1980) LTD.
An Affiliate of J.R. Paine & Associates Ltd.

1998 Air Photo
Environmental Site Assessment Phase I
All of Section 36-49-25-4 &
West 1/2 of Section 31-49-24-4
Leduc, Alberta

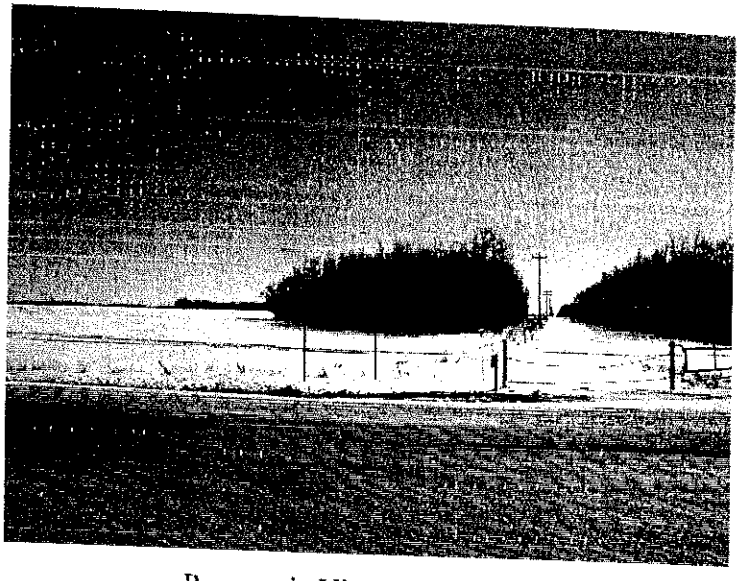
SCALE: 1:30000	DATE: February, 2002
FILE #: 6052-2	FIGURE #: 6

APPENDIX B

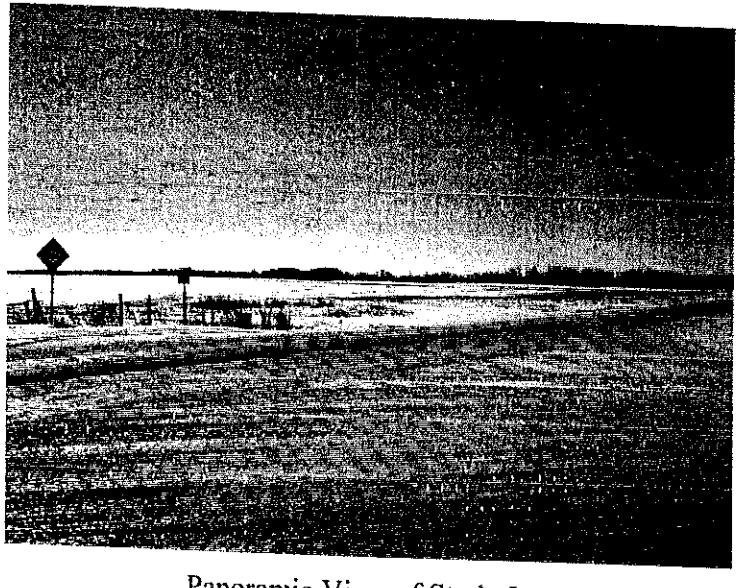
Panoramic View of Study Lot
Looking South at Twp Rd 500 and Rge Rd 250



Panoramic View of Study Lot
Looking South at Twp Rd 500 and Rge Rd 250



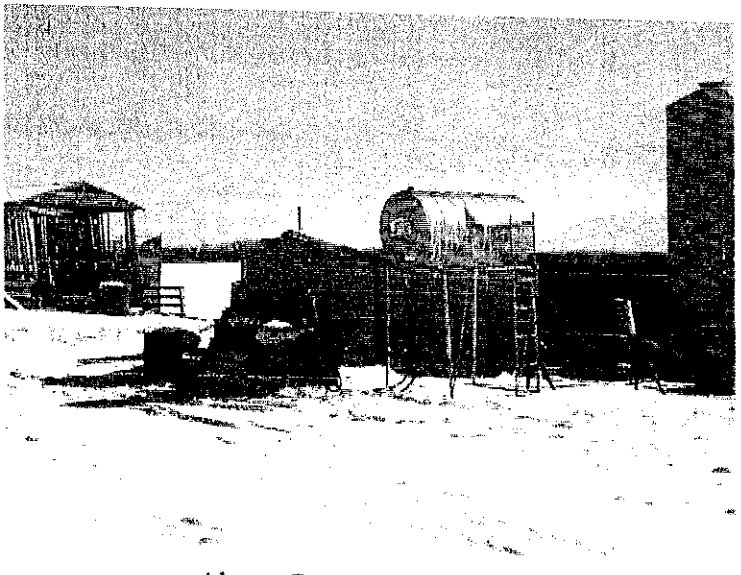
Panoramic View of Study Lot
Looking South at Twp Rd 500 and Rge Rd 250



Panoramic View of Study Lot
Looking South at Twp Rd 500 and Rge Rd 250

Farm House in NE36-49-25-4

Barnyard and Pasture Area

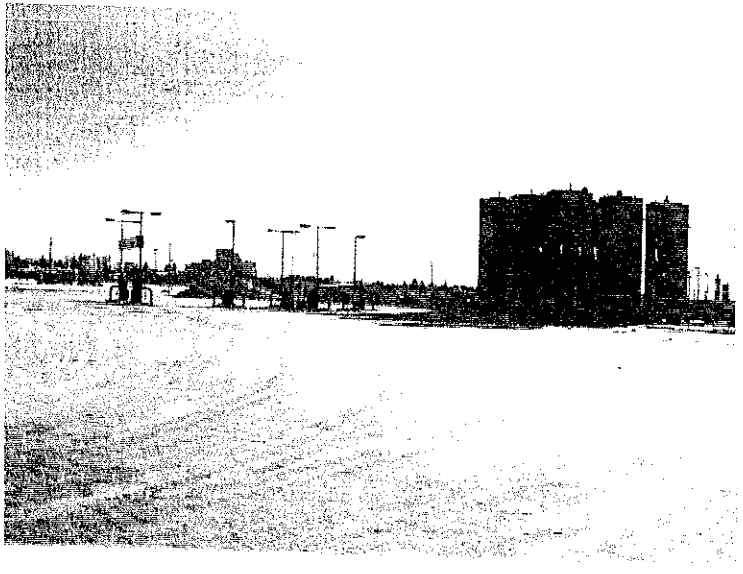


Above Ground Storage Tank

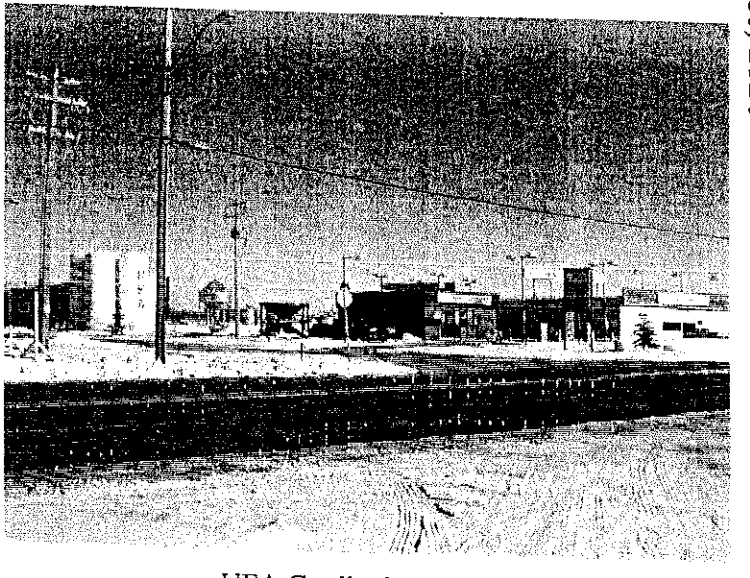
Tool Shed in Farm Yard

Trucking Office and Shop in NW36-49-25-4

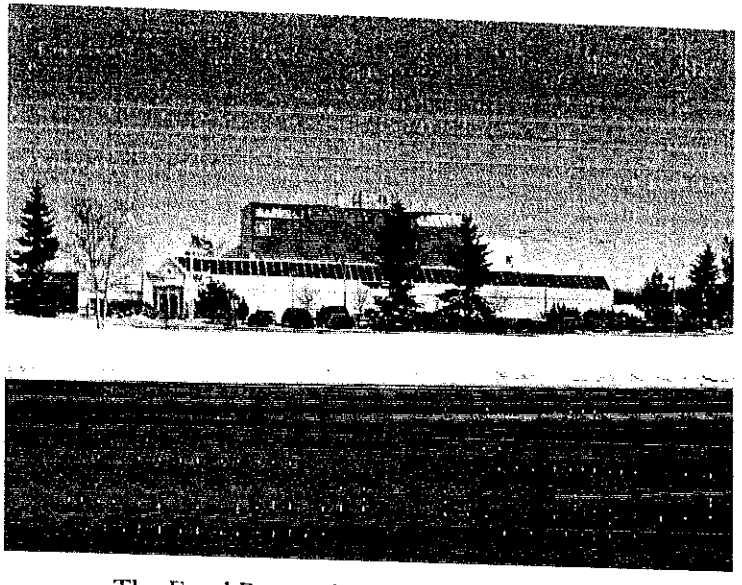
Trucking Yard



Co-op Cardlock Location
Approximately 400m West of Study Area

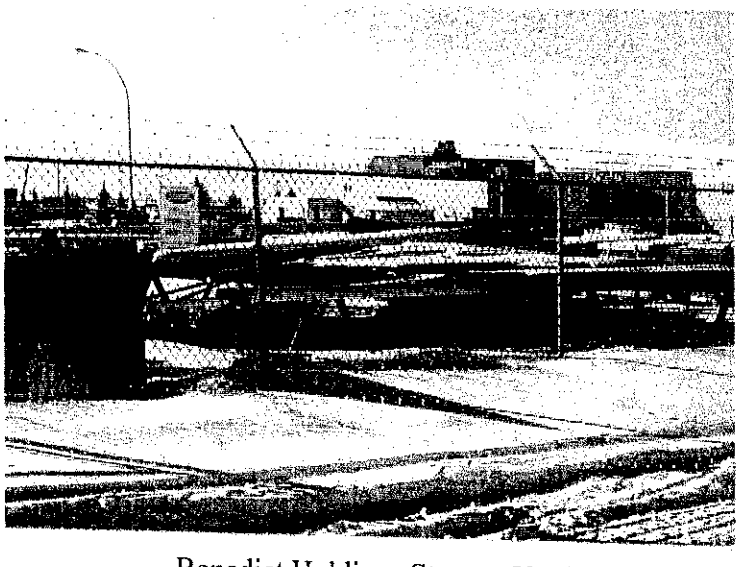


UFA Cardlock Location
Approximately 200m Northwest of Study Area

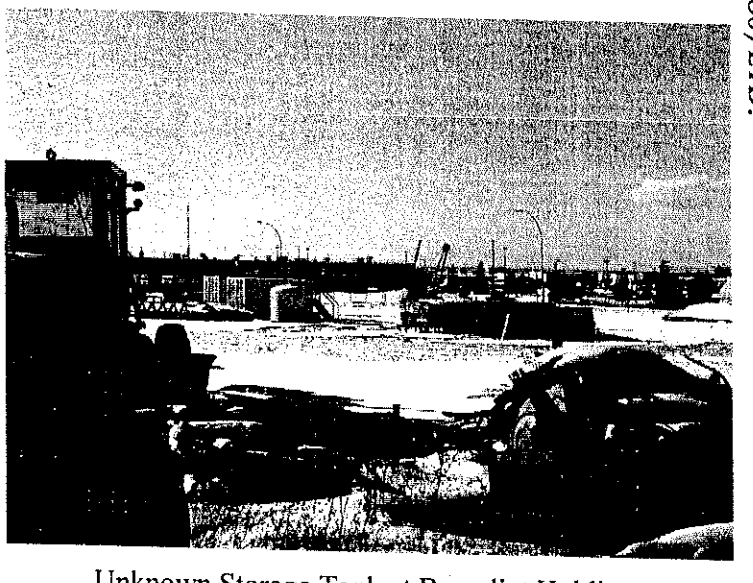


The Food Processing Development Centre
West of Study Area

Benedict Holdings Storage Yard
West of Study Area

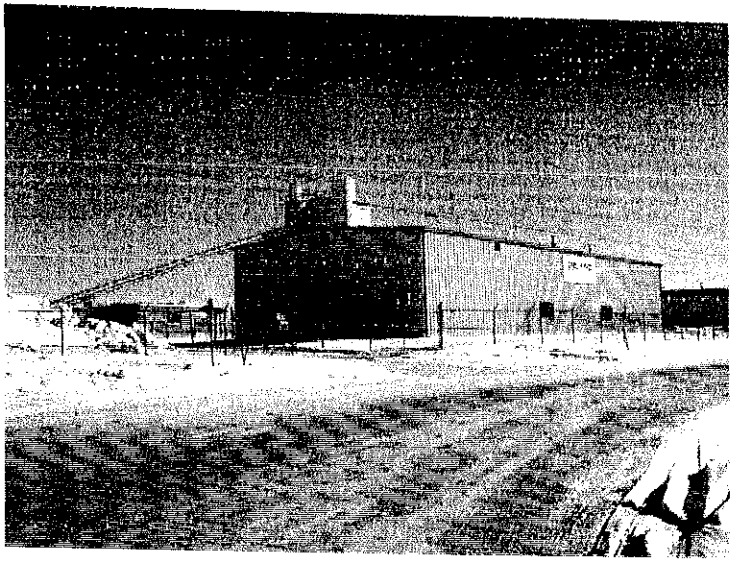


Benedict Holdings Storage Yard
West of Study Area



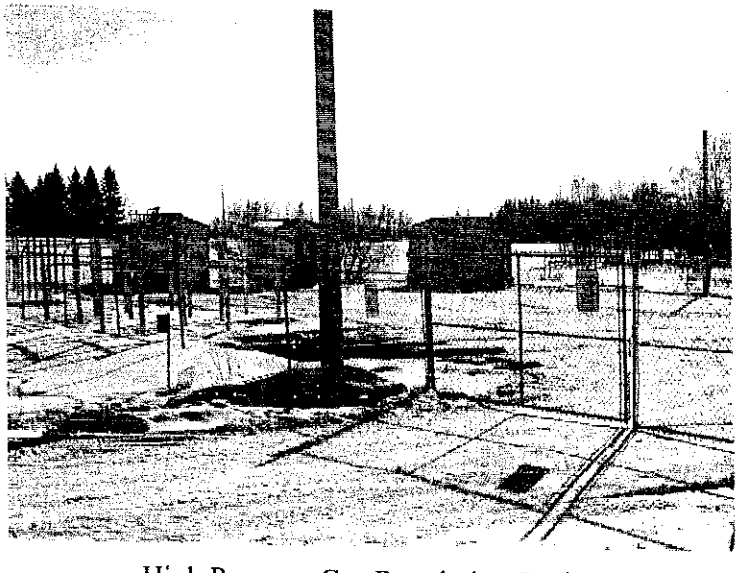
Unknown Storage Tank at Benedict Holdings
West of Study Area

Self Storage (Leduc)
West of Study Area



Inland Cement Plant
West of Study Area

Inland Cement Plant
West of Study Area

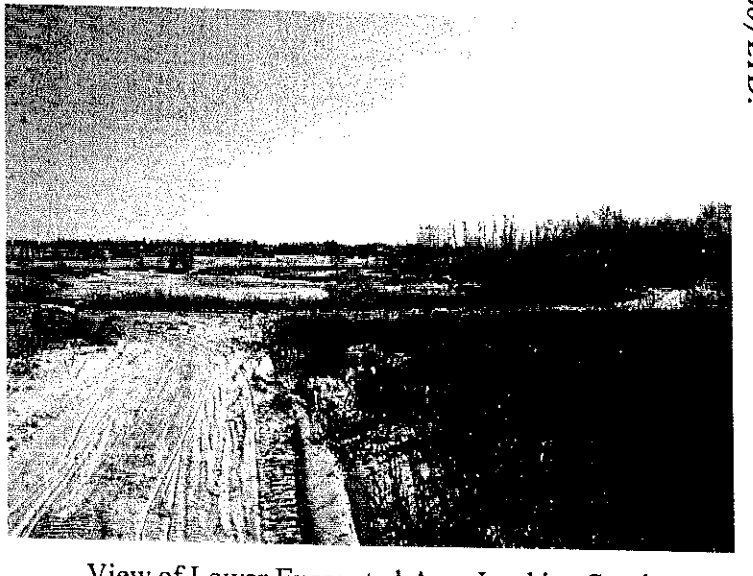


High Pressure Gas Regulation Station
West of Study Area

Panoramic View of Lower Excavated Area Looking East
Disturbed Area in SW36-49-25-4

Panoramic View of Lower Excavated Area Looking East
Disturbed Area in SW36-49-25-4

Panoramic View of Lower Excavated Area Looking East
Disturbed Area in SW36-49-25-4

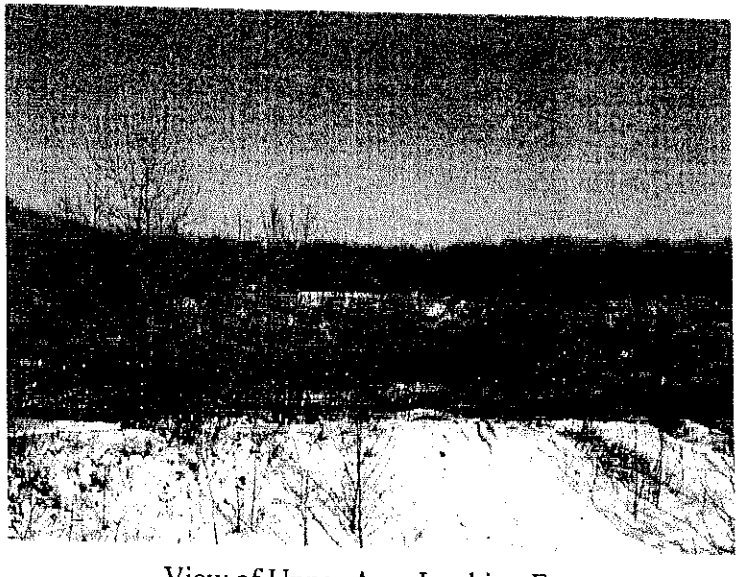


View of Lower Excavated Area Looking South
Disturbed Area in SW36-49-25-4

Mounded Material in Upper Area
Disturbed Area in SW36-49-25-4

Mounded Material in Upper Area
Disturbed Area in SW36-49-25-4

Mounded Material in Upper Area
Disturbed Area in SW36-49-25-4



View of Upper Area Looking East
Disturbed Area in SW36-49-25-4

APPENDIX C

HOGGAN ENGINEERING & TESTING (1980) LTD.
An Affiliate of J. R. Paine & Associates Ltd.
17505 - 106 Avenue, Edmonton, Alberta T5S 1E7

March 5, 2002
File No. 6052-2

PETROLEUM TANK MANAGEMENT
ASSOCIATION OF ALBERTA
Suite 1560, 10303 Jasper Avenue
Edmonton, AB T5J 3N6

Attention: Mr. Joe Petrie, P. Geol.

Dear Sir:

Re: Information Request
Environmental Site Assessment - Phase I
All of Section 36-49-25-4, and the West ½ of 31-49-24-4
(includes Lots A&B / Plan1449RS and Blocks A&B / Plan 792 1548)
Leduc, Alberta

HOGGAN ENGINEERING & TESTING (1980) LTD. is in the process of conducting an environmental site assessment on the above noted property. The work is being done for GPEC Consulting and various landowners. Enclosed is a letter authorizing the release of information for this purpose. Could you please forward any information, past or present, regarding any underground storage tanks on the site, or in the area surrounding the subject lot.

Thank-you in advance for any assistance supplied. If you should have any questions or comments, please contact the undersigned by phone at 489-0990, or by fax at 489-0800.

Yours truly,
HOGGAN ENGINEERING & TESTING (1980) LTD.

Robert Rau, P.Eng.

RR/rr/lm1050gpe

Petroleum Tank Management Association of Alberta
Suite 980, 10303 Jasper Avenue
Edmonton, Alberta T5J 3N6
PH: (780)425-8265 or 1-866-222-8265
FAX: (780)425-4722

March 6, 2002

Robert Rau
Hoggan Engineering & Testing
17505 106 Avenue
Edmonton, AB
T5S 1E7

Dear Robert Rau:

As per your request, the PTMAA has checked the registration of active tank sites and inventory of abandoned tank sites and there are no records for the property with the legal land description:

All sections-36-49-25-W4M, Leduc, AB
W1/2-- 31-49-24-W4M, Leduc, AB
Lots A-B, Plan 1449RS
Blocks A-B, Plan 7921548

Please note that both databases are not complete. The main limitation of these databases is that they only include information reported through registration or a survey of abandoned sites completed in 1992 and should not be considered as a comprehensive inventory of all past or present storage tank sites. The PTMAA **cannot** guarantee that tanks do not or have not existed at this location. Information in the databases is based on information supplied by the owner and the PTMAA can not guarantee its accuracy. Information on storage tanks or on past or present contaminant investigations may be filed with the local Fire Department or Alberta Environment.

Yours truly,

Valerie Hague.

Valerie Hague
Data Coordinator

HOGGAN ENGINEERING & TESTING (1980) LTD.
An Affiliate of J. R. Paine & Associates Ltd.
17505 - 106 Avenue, Edmonton, Alberta T5S 1E7

March 5, 2002
File No. 6052-2

ENVIRONMENTAL PROTECTION
Freedom of Information and Privacy Coordinator
6th Floor, South Tower, 9915 - 108 Street
Edmonton, AB T5K 2G9

Attention: Ms. Karen Henderson

Dear Madame:

Re: Information Request
Environmental Site Assessment - Phase I
All of Section 36-49-25-4, and the West ½ of 31-49-24-4
(includes Lots A&B / Plan1449RS and Blocks A&B / Plan 792 1548)
Leduc, Alberta

HOGGAN ENGINEERING & TESTING (1980) LTD. is in the process of conducting an environmental site assessment on the above noted property. The work is being done for GPEC Consulting and various landowners. Enclosed is a letter authorizing the release of information. Could you please forward any information, past or present, regarding the environmental condition of the site subsoil or groundwater. This includes any records of environmental contamination or remediation.

Charges should be billed to our credit card number which you should have on file. Please ensure that a receipt is faxed to us for each search, to the attention of Roman Stefaniw. Thank-you in advance for any assistance supplied. If you should have any questions or comments, please contact the undersigned by phone at 489-0990, or by fax at 489-0800.

Yours truly,
HOGGAN ENGINEERING & TESTING (1980) LTD.

Robert Rau, P.Eng.

RR/rr/hm1050gpe

CHECK LIST

FOR IDENTIFYING RESPONSIVE RECORDS PERTAINING TO SPILLS, RELEASES, OR SITE CONTAMINATION

Important: Please read the Information Guide that accompanies this Checklist prior to filling out this form.

Please print to ensure information provided is legible.

1. SITE DESCRIPTORS [SUBJECT PROPERTY]

A. *Alberta Township System*

[e.g., South ½; Section 10; Township 52; Range 25; West of the 4th Meridian]

Ptn. All West ½ Sec 36 31 Twp 49 49 Rge 25 24 W 4 W4M

If this is the only site descriptor that you have, indicate the nearest town or city Leduc.

Above Information is: ☐ Not Applicable ☐ Not Available

B. *Civic Address* [e.g., 12345 – ABC Street, Edmonton]

_____

Above information is: ☒ Not Applicable ☐ Not Available

C. *Subdivision Plan* Plan 1449 Block – Lot A & B (792-1548 – Blocks A & B)

Above information is: ☐ Not Applicable ☐ Not Available

D. *Other particulars about the site*

[e.g., agricultural land, residential, commercial, industrial or other types of land use, any current development on the site or has the land use changed]

mostly agricultural

2. NAME OF COMPANY(IES) AND/OR INDIVIDUALS ASSOCIATED WITH THE SITE

Current Owner(s) of the Site

Ziad Properties Ltd.
Ray-Ann Holdings Inc.
Walter P. Twinn
Kevin James Gaetz
Geoffrey Leonard Gaetz
Province of Alberta Treasury Branches
Paul Larsen
Melcor Developments Ltd.

Previous Owner(s) of the Site

* (see attached for previous owners)

Current and Former Operator(s) (agents or managers) of the Site

Current and Former Occupant(s) of the Site

3. TIME FRAME OF SEARCH

☑ **Historical Search**
☐ **Other:** _____

Specify a Specific Time Period for the Search

The names of the previous owners of the properties are as follows:

NW36-49-25-4

- Royal Bank of Canada
- Crakim Holdings Ltd.
- City of Leduc
- Alexander William Currie
- Arden Buss
- Apex Loan & Investments Ltd.
- John George Mucha

NW31-49-24-4

- Nora Josephine Gaetz
- Glasgow Farms Ltd.
- Marie Elizabeth Russell
- Charles Walter Russell
- Wilda Maye Storer

SW36-49-25-4

- Core-Mix Concrete
- Victor Ivan MacLaren
- William Henry Ronald MacLaren

East ½ of 36-49-25-4

- Leduc Acceptance Corporation
- Glasgow Farms Ltd.

SW31-49-24-4

- Romulus Holdings Ltd.
- Leduc Acceptance Corporation
- Charles Walter Russell
- Wilda Maye Storer

4. TYPES OF RECORDS FOR WHICH ACCESS IS BEING REQUESTED

IMPORTANT: Please put a check mark in the box(es) below to specify the types of records you are requesting. **Note:** We cannot reduce the search fee if this service has already been provided. You may be required to pay fees for services if the total fee for providing you with the records is expected to be greater than $150.00. We recommend you ONLY request records that would meet your information needs.

☑ **Scientific & technical reports documenting the nature and extent of soil, ground and surface water contamination, remedial measures taken to clean up the site or status of the site. The reports may also document the investigation and assessment of migration of contaminants off-site to adjacent properties.**

☑ **Internal correspondence/documentation relating to either deficiencies in the reports, additional investigations or assessments that should be undertaken at the site, or status of the site.**

☑ **External correspondence/documentation [with either the Company or Consultants commissioned to prepare the reports or other agencies involved in the review of the reports] relating to either deficiencies in the reports, new information not contained in the reports, or status of the site.**

☑ **Records where a spill or release was reported. These are simply notification records and may not provide details as to the nature of the release or extent of contamination or potential for contamination.**

[Please check the scenario that is responsive to your request.]

☐ **The spill or release may have been to a containment system on site with no direct contact with the environment**

☐ **The spill or release may have had direct contact with the environment but was cleaned up immediately with no resultant impact to the environment**

☐ **The spill or release may have had direct contact with the environment and there is the potential for contamination**

☐ **Records documenting the follow-up action by Alberta Environment (AENV) for records where a spill or release was reported.**

☑ **Records of investigations and where required, the enforcement action taken.**

☑ **Records that reference any activity on site where the activity could potentially be associated with contamination.**

[For example, Alberta Environment was notified that underground storage tanks were either removed or were to be removed from the site. These records may simply be notification of the event or activity. Details on the nature of the spill or release or extent of contamination or potential contamination may not be recorded.]

☐ **Other Types of Records Requested [Identify nature of these records]**

5. INFORMATION ON ADJACENT PROPERTIES

☒ **Records pertaining to adjacent properties are not requested.**

☐ **Records pertaining to adjacent properties where off site migration may have potentially affected the subject property are requested.**
[For each adjacent site, provide (attach) information outlined in points 1 through 2].

6. EXCLUSION OF RECORDS/REPORTS

If you already have reports relating to the subject property, please provide a listing of these reports. [At a minimum, who commissioned the reports and the date they were prepared]. This will assist the FOIP Office in narrowing the scope of your access request to exclude those records that you already have.

7. DISCLOSURE OF APPLICANT'S IDENTITY

Please indicate whether you consent to the disclosure of your identity to third parties by selecting the appropriate box below.

☐ **Does not consent to the disclosure of my identity for the purpose of this access request.**

☑ **Does consent to the disclosure of my identity for the purpose of this access request as follows:**

Name (please print) Robert Rau

Company Name: Hoggan Engineering & Testing Ltd.

Signature: Bob Rau

Date of Consent: March 5/02

8. CONFIRMATION OF SEARCH PARAMETERS

Please indicate how you would like our Office to proceed regarding this request.

☑ **Conduct the search for responsive records based on the foregoing search parameters. No additional information will be submitted regarding this access request.**

☐ **Put the access request on hold until additional search parameters are submitted to the FOIP Office.**

Return this form by Fax or mail to:

Alberta Environment
Freedom of Information and Protection of Privacy Office
6th Floor, South Tower, Petroleum Plaza
9915 – 108 Street
Edmonton, Alberta
T5K 2J8

FAX Number (780) 427-9838

If you require additional information or have any questions please call (780) 427-4429.

Alberta
ENVIRONMENT

FREEDOM OF INFORMATION AND PROTECTION OF PRIVACY

Strategic Corporate Services
Freedom of Information and
Protection of Privacy Office

6th fl., South Petroleum Plaza
9915 – 108 Street
Edmonton, Alberta
T5K 2G8

Telephone: (780) 422-7407
Fax: (780) 427-9838

March 7, 2002

Mr. Robert Rau
Hoggan Engineering & Testing (1980) Ltd.
17505 – 106 Avenue
Edmonton, AB T5S 1E7

[Fax: (780) 489-0800]

Access Request: E02-G-109
Dear ,

SUBJECT: **Freedom of Information and Protection of Privacy Act**
Request is for Records Pertaining to the Properties Located at
Sec 36 Twp 049 Rge 25 W4M and Sec 31 Twp 049 Rge 24 W4M, Leduc

Your request under the Freedom of Information and Protection of Privacy Act *(the Act)* for access to records and $25.00 initial fee were received by the Freedom of Information & Protection of Privacy Office, Alberta Environment on March 6, 2002. Enclosed is a receipt for your initial fee.

We will make every effort to provide the records available to you under *the Act* within 30 calendar days from the date your request was received. Your request due date is April 5, 2002. You will be advised in writing of a new due date if we need to extend the time limit for response under Section 14 of *the Act* or if we need to consult with third parties under Section 30 of *the Act*.

In processing an access request, a search for responsive records is conducted based on the legal land description [e.g. municipal address and/or the Alberta Township System], the corporate names of owners, operators or occupants [existing or previous] associated with that property, and the types of records requested. Although Alberta Environment may potentially have records responsive to the scope of your request, responsive records can only be retrieved based on the search parameters provided by the applicant. The search for responsive records will be conducted using the search parameters you have specified. These parameters have been reflected in the clarified scope of your request as follows:

Location 1: Sec 36 Twp 049 Rge 25 W4M, Leduc
Plan 1449RS, Blocks A & B
Plan 792 1548, Blocks A & B

Location 2: W½ Sec 31 Twp 049 Rge 24 W4M, Leduc

Current Owners: Ziad Properties Ltd., Ray-Ann Holdings Inc., W. Twinn, K. Gaetz, G. Gaetz, Province of Alberta Treasury Branches, P. Larson, Melcor Developments Ltd.

Former Owners: *Sec 36* – **Royal Bank of Canada, Crankim Holdings Ltd., City of Leduc, A. Currie, A. Buss, Apex Loan & Investments Ltd., J. Mucha, Core-Mix Concrete, V. MacLaren, W. MacLaren, Leduc Acceptance Corporation, Glasgow Farms Ltd.**
Sec 31 – **N. Gaetz, Glasgow Farms Ltd., M. Russell, C. Russell, W. Storer, Romulus Holdings Ltd., Leduc Acceptance Corp.,**

Time Frame: **Historical Search**

Records: **Scientific & technical reports documenting the nature and extent of soil, ground and surface water contamination, remedial measures taken to clean up the site or status of the site. Internal or external correspondence/documentation relating to either deficiencies in the reports, additional investigation assessments that should be undertaken or new information not contained in the reports.**

Notification records where a spill or release was reported and any records documenting the follow-up action taken. Records of investigations and where required, the enforcement action taken.

Records that reference any activity on site where the activity could potentially be associated with contamination.

We have initiated a search for records based on the above search parameters. If this does not accurately reflect the scope of your request, please call me as soon as possible so we can amend your search. This will enable our office to respond to your access request as completely and accurately as possible. Once we receive and review potentially responsive records you will be contacted, if necessary, to further refine or clarify the scope of your access request.

If you are acting on behalf of a corporation, organization or person referenced within the scope of your access request, the Freedom of Information and Protection of Privacy Office requires:

1. written confirmation from your client that you are acting as their agent, and
2. written authorization to disclose to you any records/information responsive to access request E02-G-109 that either pertains or belongs to your client.

Without such an authorization, Alberta Environment may be obligated to seek their representations on the disclosure of such records, which could extend your request by an additional 30 days.

Section 93 of *the Act* states that in addition to the initial fee, you may be required to pay fees for services if the total fee for providing you with the records is expected to be greater than $150.00. If costs are expected to exceed $150.00 you will receive a fee estimate letter. [Note: the amount of fees charged for locating and retrieving a record, which is calculated at $6.75 per ¼ hour, cannot be reduced if this service has already been provided.]

If you have any questions or concerns, please write or call me at (780) 427-2256.

Sincerely,

Della Gerbrandt
FOIP Officer

Enclosure (receipt)

Alberta
ENVIRONMENT

Freedom of Information and
Protection of Privacy Office

6th Floor
Petroleum Plaza South
9915 - 108 Street
Edmonton, Alberta T5K 2G8

Telephone 780/427-4429
Fax 780/427-9838

RECEIVED
MAR 2 1 2002

Mr. Robert Rau
Hoggan Engineering & Testing (1980) Ltd.
17505 - 106 Avenue
Edmonton, Alberta
T5S 1E7
Fax: (780) 489 - 0800

Date: March 19, 2002

File Reference Number: **E02-G-109**

Re: ***Freedom of Information and Protection of Privacy Act***
Request is for records pertaining to the property located at Sec 36 Twp 049 Rge 25 W4M and Sec 31 Twp 049 Rge 24 W4M, Leduc, Alberta.

Dear: Mr. Rau,

The following is in response to your request of March 6, 2002 for access under the *Freedom of Information and Protection of Privacy Act* to the subject records.

A search of Alberta Environment record holdings has not identified any records relating to the subject of your request, based on the search parameters you provided to this office.

If you have any questions or concerns about the processing of your request, please write or call me at (780) 427 - 2256, so that we can look at ways to address these issues. If, however, we are unable to resolve your concerns, you have the right to ask the Information and Privacy Commissioner to conduct a review under section 65 of the Act. You have 60 days from the receipt of this notice to request a review by writing to:

Information and Privacy Commissioner
410, 9925 - 109 Street
Edmonton, Alberta, T5K 2J8
Telephone (780) 422-6860
Fax (780) 422-5682

If you request a review, please provide the Commissioner with a copy of your original request, any letters of clarification, a copy of this letter and the reason why you are requesting a review.

Sincerely,

Della Gerbrandt,
FOIP Officer

HOGGAN ENGINEERING & TESTING (1980) LTD.
An Affiliate of J. R. Paine & Associates Ltd.
17505 - 106 Avenue, Edmonton, Alberta T5S 1E7

March 5, 2002
File No. 6052-2

ALBERTA ENERGY AND UTILITIES BOARD
640 - 5 Avenue SW
Calgary, AB T2P 3G4

Attention: Ms. Cheryl Sellars

Dear Madame:

Re: Information Request
Environmental Site Assessment - Phase I
All of Section 36-49-25-4, and the West ½ of 31-49-24-4
(includes Lots A&B / Plan1449RS and Blocks A&B / Plan 792 1548)
Leduc, Alberta

HOGGAN ENGINEERING & TESTING (1980) LTD. is in the process of conducting an environmental site assessment on the above noted property. The work is being done for GPEC Consulting and various landowners. Enclosed is a letter authorizing the release of information for this purpose. Could you please forward any information, past or present, regarding any wells located within this section. Our account number is 26-0398. Please fax any information, as our office does not have the means to read microfiche.

Thank-you in advance for any assistance supplied. If you should have any questions or comments, please contact the undersigned by phone at (780)489-0990, or by fax at (780)489-0800.

Yours truly,
HOGGAN ENGINEERING & TESTING (1980) LTD.

Robert Rau, P.Eng.

RR/rr/hm1050gpe

EUB

Information Reques

Company Name J. R. PAINE

Date MAR. 6TH/2002.

Requested information on the well(s) listed below has not been supplied. Please see code index for reason.

LE	LSD	SEC	TWP	RGE	M	E	CODE	ADDITIONAL INFORMATION
								NO COMPLAINTS, SPILLS OR INCIDENTS REPORTED TO THE BOARD.

Details (if necessary)

CODES

1 WELL IDENTIFIER NOT ON FILE
2 CONFIDENTIAL
3 WELL NOT ON PRODUCTION
4 NO CORES CUT
5 CORE CUT, NOT ANALYZED
6 PRIOR TO 1992 D.S.T. NOT REQUESTED BY BOARD
7 NO CHARGE - POOR COPY
8 NO COMPLETION
9 NO D.S.T. RUN
10 NO PRESSURE TEST(S) RECORDED
11 NO FLUID ANALYSES DONE
12 LOG NOT RECORDED AS RUN
13 NO PIPELINE(S) RECORDED
14 FILE OUT (FOR INTERNAL USE)
15 REQUESTED INFORMATION NOT ON FILE AT THIS TIME

AD - 92 - 08 - 07

L. L. 00.

MAR-06-2002 10:32 T-657 P.03/03

DDN0604-01 ALBERTA ENERGY AND UTILITIES BOARD 06 MAR 2002
DATA DISSEMINATION - GENERAL QUERY

WELL ID : 00/16-36-049-25W4/0 IMP 721 JOARCAM TH 16-36-49-25
LICENSE NO. : B0001394A LICENSEE: 0EX10 IMPERIAL OIL
LICENSE DATE: 10 JUL 1946 AGENT :
CONTRACTOR CODE: RIG NO :

---------- BASIC DRILLHOLE DATA ----------

FIELD : 998 UNDEFINED
POOL :
OS AREA :
DEPOSIT :
LAHEE CLASS: 12 TEST HOLE
WELL STATUS: 00 02 00 00
ABD
STATUS DATE: 10 JUL 1946

--------- DEPTHS (M) ---------
TOTAL: 271.00 SS: 456.90
PB : SS:
TVD : SS:
CONF : (NC)

------- DATES --------
SPUD : 10 JUL 1946
FIN-DRILL: 10 JUL 1946
RIG REL. :
ON PROD. :
ON INJ. :

--CO-OR--	---LONGITUDE----	---LATITUDE---	--ELEV (M)---	
S 30.5	ACT: 113.512037	ACT: 53.279220	GRD:	727.90
W .9	THE:	THE:	KB :	727.90
			CF :	

BOTTOM HOLE CO-ORDINATES = SURFACE CO-ORDINATES

DDN0604-01 ALBERTA ENERGY AND UTILITIES BOARD 06 MAR 2002
DATA DISSEMINATION - GENERAL QUERY

WELL ID : W0/13-31-049-24W4/0 IMP 340 EDMONTON TH 13-31-49-24
LICENSE NO. : K0004494F LICENSEE: 00070 IMP OIL RES LT
LICENSE DATE: 28 APR 1952 AGENT :
CONTRACTOR CODE: RIG NO :

---------- BASIC DRILLHOLE DATA ----------

FIELD : 535 KNELLER
POOL :
OS AREA :
DEPOSIT :
LAHEE CLASS: 12 TEST HOLE
WELL STATUS: 00 02 00 00
ABD
STATUS DATE: 28 APR 1952

-------- DEPTHS (M) ---------
TOTAL: 268.00 SS: -267.10
PB : SS:
TVD : SS:
CONF : (NC)

------- DATES --------
SPUD : 28 APR 1952
FIN-DRILL: 28 APR 1952
RIG REL. : 28 APR 1952
ON PROD. :
ON INJ. :

--CO-OR-- ---LONGITUDE---- ---LATITUDE--- --ELEV (M)---
S 21.3 ACT: 113.511936 ACT: 53.279303 GRD: .90
W 1619.3 THE: THE: KB : .90
CF :

BOTTOM HOLE CO-ORDINATES = SURFACE CO-ORDINATES

HOGGAN ENGINEERING & TESTING (1980) LTD.
An Affiliate of J. R. Paine & Associates Ltd.
17505 - 106 Avenue, Edmonton, Alberta T5S 1E7

March 5, 2002
File No. 6052-2

CITY OF LEDUC
#1 Alexander Place
Leduc, AB T9E 4C4

Attention: Ms. Sandra Birkholz

Dear Madame:

Re: Information Request
Environmental Site Assessment - Phase I
All of Section 36-49-25-4, and the West ½ of 31-49-24-4
(includes Lots A&B / Plan1449RS and Blocks A&B / Plan 792 1548)
Leduc, Alberta

HOGGAN ENGINEERING & TESTING (1980) LTD. is in the process of conducting an environmental site assessment on the above noted property. The work is being done for GPEC Consulting and various landowners. Enclosed is a letter authorizing the release of information for this purpose. Could you please forward any information, past or present, regarding any underground storage tanks, chemicals used on-site, or any other environmental information pertinent to this site. Please include in this search the Planning and Development Department, and the Fire Department.

Thank-you in advance for any assistance supplied. If you should have any questions or comments, please contact the undersigned by phone at 489-0990, or by fax at 489-0800.

Yours truly,
HOGGAN ENGINEERING & TESTING (1980) LTD.

Robert Rau, P.Eng.

RR/rr/lm1050gpe

DATE: March 12, 2002

TO: Sandra Birkholz, Manager Records, Access & Privacy

FROM: Carol Hammermeister, Subdivision/Development Officer

SUBJECT: **Section 36-49-25-W4th**
West ½ Section 31-49-25-W4th
Request for Environmental Information
File No. I1117R002-2002
Doc No. 2002-01887

The City of Leduc Planning and Development has reviewed its files and offers the following information:

SW ¼ Sec. 36-49-25-W4th

The Planning records indicate that in the late sixties this land was used as a sand pit. Over the years, the owners of the property have been requested to clean up various debris on the lands, including oil drums and car parts.

Block A, Plan 1449RS

The City's Planning records indicate that a development permit was issued in 1996 for a truck shop with storage.

Block B, Plan 359TR

The City's Planning records do not indicate any approved development on this site and to our knowledge the site is still vacant and is being farmed.

NW ¼ Sec. 36-49-25-W4th

The City's Planning records indicate that 1.41 ha. of land is used as the City's cemetery. The west 32.34 ha. is vacant land that is being farmed.

Block A and B, Plan 7921548

Planning records indicate the lands are used as farmland with a house on Block B.

NW ¼ Sec. 31-49-25-W4th

Planning records indicate that the lands are vacant and being farmed.

SW ¼ Sec. 31-49-25-W4th

Planning records indicate that the lands are vacant and being farmed.

The Planning and Development Department provides this information in good faith; however, makes no representation as to the accuracy or completeness of these findings and accepts no responsibility for any errors or damage to persons or property, whether direct or indirect that may result from this information's use.

Carol H.

The Living City
With The Right Connections

MEMORANDUM

DATE: March 19, 2002

File No.: I1117R002-2002
Doc No.: 2002-01887

TO: Sandra Birkholz
Manager, Records Access & Privacy

xc: Carol Hammermeister, Ron Hanson

FROM: Rick Sereda, Fire Chief

SUBJECT: **Request for Environmental Information**
Legal: All of Section 36-49-25-W4th and West ½ of 31-49-25-W4 (including Plan 1449RS, Lots A & B; and Plan 792 1548, Blocks A & B, Leduc

A search of our files has revealed **NO RECORD** of the storage of above-ground or underground substances at the aforecaptioned properties.

Please note that there was a major airplane crash during the early 1970's, which would have caused spillage of potentially hazardous materials on the properties (ie: aircraft fuel).

Several grass fires have occurred during the past years on these lands.

"The City of Leduc provides this information in good faith but it provides no warranty, nor accepts any liability arising from any incorrect, incomplete or misleading information".

Should you require any further information in respect to the above, please contact the writer at (780) 980-7290.

Rick Sereda, Fire Chief
Safety Codes Officer, Fire Discipline S0671
Accreditation No. M0365
Designation No. D0854

Rsereda@city.leduc.ab.ca
(780) 980-7290

RS/tw

G:\Protective Services\Documents\FIRE SERVICES\RickSeredaFiles\SUBSURF\Sec 36 49 25 W4 and W 1.5 31 49 25 W4 Sawridge.doc

The Living City
With The Right Connections

MEMORANDUM

CONFIDENTIAL

DATE: **March 20, 2002**

File No.:I1117R002-2002
Doc. No.: 2002-01887

TO: **Sandra Birkholz, Manager, Records & Access**

FROM: **Miro Frybort, Environmental Coordinator**

cc: **Ron Hanson, Manager, Environmental & Engineering Services**
Qumars Fani, Senior Engineering Technician

SUBJECT: Request for Environmental Information
Legal: All of Section 36-49-25-W4 and West ½ of 31-49-25-W4,
(including Plan 1449RS, Lots A & B); and Plan 7912548, Blocks A & B; Leduc

---

The Engineering Department has reviewed its files regarding the environmental information request on the above parcels. In 1992, the land located at SW ¼ Sec. 36-49-25-W4 was the subject of a complaint regarding unsightly premises. Litter consisted of oil drums, car bodies and auto parts.

The Engineering Department provides this information in good faith; however, makes no representation as to the accuracy or completeness of these findings and accepts no responsibility for any errors or damage to persons or property, whether direct or indirect that may result from this information's use.

Miro Frybort
Environmental Coordinator

/mf

HOGGAN ENGINEERING & TESTING (1980) LTD.
An Affiliate of J. R. Paine & Associates Ltd.
17505 - 106 Avenue, Edmonton, Alberta T5S 1E7

March 5, 2002
File No. 6052-2

CAPITAL REGIONAL HEALTH AUTHORITY
Environmental Health Division
500, 10216 - 124 Street
Edmonton, AB T5N 4A3

Attention: Mr. Elson Zazulak

Dear Sir:

Re: Information Request
Environmental Site Assessment - Phase I
All of Section 36-49-25-4, and the West ½ of 31-49-24-4
(includes Lots A&B / Plan1449RS and Blocks A&B / Plan 792 1548)
Leduc, Alberta

HOGGAN ENGINEERING & TESTING (1980) LTD. is in the process of conducting an environmental site assessment on the above noted property. The work is being done for GPEC Consulting and various landowners. Enclosed is a letter authorizing the release of information for this purpose. Could you please forward any information, past or present, regarding any environmental health concerns, orders, etc. regarding the subject lot. Please include the Public Health and the Environmental Health Divisions in your search.

Thank-you in advance for any assistance supplied. If you should have any questions or comments, please contact the undersigned by phone at 489-0990, or by fax at 489-0800.

Yours truly,
HOGGAN ENGINEERING & TESTING (1980) LTD.

Robert Rau, P.Eng.

RR/rr/hm1050gpe

Capital Health

Healthier people in healthier communities

Community Care and Public Health

Regional Public Health

Environmental Health

Leduc Public Health Centre
4219 – 50 Street
Leduc, Alberta
Canada T9E 8C9
Office: (780) 980-4644
Fax: (780) 980-4666

Hoggan Engineering & Testing (1980) Ltd.
17505-106 Avenue
Edmonton, Alberta
T5S 1E7

March 8, 2002

Attention: Robert Rau, P.Eng Fax: (780) 489-0800

RE: File No. 6052-2 section 36-49-25-W4 and West1/2 of 31-49-24-4

A review of our files has been completed and has found no information regarding outstanding orders or contamination of the site on or around the above named property.

Should you have any further questions, please contact the undersigned Environmental Health Officer in Leduc at 980-4679.

Yours truly,

Debra Langier-Blythe B.Sc. C.P.H.I. (C) IFT
Environmental Health Officer/Executive Officer

APPENDIX E

March 12, 2009

GeoMedia. File: G1612

Gentech Developments Ltd.
29665 Sangara Avenue
Abbotsford, BC V4X 2G3

Attention: Randy Brown

Re: **Geotechnical Assessment Report**
Proposed Industrial Subdivision
Portions of NE1/4 and SE1/4 36-49-25-4
North Telford Lake, Leduc, AB

1.0 INTRODUCTION

GeoMedia Engineering Ltd. presents herein our geotechnical report for the proposed industrial subdivision at the above referenced site. This report describes the soil and groundwater conditions for the site and provides geotechnical comments and recommendations with respect to the following aspects of the project:

- Site preparation
- Building foundation design options including footings and piles
- Geotechnical aspects of building drainage
- Pavement structure
- Geotechnical aspects of watermain and sanitary sewer construction including trench cut slopes, control of groundwater seepage, pipe bedding and trench backfill requirements
- Backfill and compaction requirements for native and import fills
- Suitability of on-site soils for reuse as structural fill

Attachments to this report include a borehole location plan and the borehole logs. Testing or assessment of soils with respect to environmental considerations is outside the scope of this geotechnical report.

2.0 SITE DESCRIPTION AND PROPOSED DEVELOPMENT

The proposed development is located within portions of the NE1/4 and SE1/4 36-49-25-4 in Leduc, Alberta. Conceptual plans indicate that the proposed development will consist of:

1. Onsite works, which include a 19 lot industrial subdivision serviced by internal roads on a 52 ha (130 acre) parcel of land.

2. Offsite works, which include 1200 m of watermain and sanitary sewer along 65 Avenue and 660 m of sanitary sewer along 43 Street.

GeoMedia. Engineering Ltd
#18 – 3275 McCallum Road
Abbotsford, British Columbia
Canada V2S 7W5
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The site is a rural residential property of rolling farmland which is bounded by 65 Avenue to the north, Telford Lake to the south and undeveloped farmland to the east and west. Panoramic photographs of the site are attached in Appendix A.

3.0 FIELD INVESTIGATION AND LABORATORY TESTING

The field exploration of February 16 to 18, 2009 consisted of 16 boreholes as shown on Figures 1 and 2 in Appendix B. Onsite boreholes (BH1 to BH8) were advanced to depths of 12.2 to 15.3 m with a track mounted drilling rig equipped with continuous flight solid stem augers. Offsite boreholes along existing roads (BH9 to BH16) were advanced to depths of 4.6 to 6.1 m using a truck drill.

A representative of GeoMedia laid out the boreholes, logged the subsurface conditions and collected soil samples. The soil sampling and testing procedures were generally as follows:

1. Samples and auger cuttings were classified based on visual examination.

2. Standard Penetration Tests (SPT's) were performed at 1.5 m depth intervals to evaluate the consistency and relative density of the soils. The SPT 'N' value shown on the logs is the number of blows required to drive the split spoon sampler 300 mm into the soil.

3. A slotted 25 mm diameter PVC pipe was installed at boreholes BH1, BH4, BH6, BH7 and BH8. The standpipes were backfilled with the auger cuttings and sealed at the surface with bentonite. The groundwater conditions were noted during drilling and groundwater levels in the standpipe piezometers were recorded on February 20, 2009.

4. Soil samples were transported to GeoMedia's laboratory for selected testing to assess the soil properties. The laboratory testing included moisture contents and Atterberg Limits tests.

4.0 SUBSURFACE CONDITIONS

The soil profile in the boreholes generally consisted of topsoil over clay till over hard silts, which appears to be a soft, weathered siltstone with the consistency of a hard soil. Detailed soil descriptions and the results of insitu and laboratory testing are shown on the borehole logs in Appendix B attached.

Topsoil

A topsoil layer was encountered at the surface in all boreholes. This layer was typically 0.3 m in thickness and was considered to be weak and compressible.

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Clay Till

Overconsolidated clay till was encountered below the topsoil layer in all boreholes. The thickness of this layer generally ranged between 4.3 and 7.0 m across the site, but was 12.8 thick at borehole BH7 nearest to Telford Lake. This layer was described as being stiff to very stiff. The moisture contents ranged from 11 to 25 percent. SPT N values ranged from of 11 to 94, and generally increased with increasing depth. Based on the results of 12 Atterberg Limits tests, the clay is low to medium plastic.

Shallow refusal on a boulder was encountered at a depth of 1.5 m in borehole BH8, which was then moved to another location. Note that such till-soils can contain localized pockets of sand and random gravel sizes including cobbles and boulders.

Silt

Very stiff to hard silt was encountered below the clay layer in all of the onsite boreholes and 7 of 9 offsite boreholes. The depth to this very stiff to hard silt generally ranged between 4.3 and 7.0 m across the site, but was at a depth of 12.8 m in borehole BH8 nearest to Telford Lake. This layer is considered to be a soft, weathered siltstone with the consistency of a hard soil. The competency of this material generally increases with depth. The moisture contents ranged from 13 to 23 percent. SPT N values generally exceeded 50 blows in this layer.

Groundwater

The depth to groundwater measured on February 20, 2009 was 5.2 m in a standpipe at borehole BH1, 2.5 m in BH4, 4.1 m in BH6, 2.1 m in BH7 and 4.9 m in BH8.

Frost: The depth to frost was approximately 1.5 m at the time of drilling.

The results of the Atterberg Limits testing are outlined in Table 1 below:

TABLE 1 – SUMMARY OF ATTERBERG LIMITS TESTING

BH	Depth (m)	Moisture Content%	Plastic Limit	Liquid Limit	Plastic Index	Classification
BH1	1.5	18	16	34	18	CL
BH1	4.5	17	17	38	21	CL
BH2	1.5	16	28	35	7	ML
BH2	4.5	19	22	36	14	CL-ML
BH3	1.5	11	13	46	33	CI
BH4	1.5	19	23	49	26	CI
BH5	1.5	12	17	34	17	CL
BH6	1.5	16	16	28	12	CL
BH6	4.5	16	21	34	13	CL
BH7	3.0	16	18	28	10	CL
BH7	6.0	14	16	24	8	CL-ML
BH7	10.0	17	19	28	10	CL

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5.0 DISCUSSIONS AND RECOMMENDATIONS

5.1 GENERAL

Geotechnical recommendations presented in this report are based on information from widely spaced boreholes. Further geotechnical reviews are therefore recommended for each individual building lot. Such reviews should be at the discretion of the geotechnical engineer and may include, but not be limited to, additional boreholes, testpits, laboratory testing and field work.

The results of the subsurface exploration indicate that the proposed industrial buildings may be designed with:

1. Conventional footings that bear on the stiff to very stiff clay tills.
2. Cast-in-place concrete piles including straight shaft friction piles and belled end bearing piles.
3. Driven steel pipe piles, which are a feasible foundation option but are locally less common.

Based on the expectation that the structures will not have basements, pile foundations may be more cost effective and less weather sensitive. The final selection of the foundation system will need to be evaluated in consideration of time of year of construction. Footings may be a practical option for some independent equipment foundations within a building or for smaller structures outside of the main building. A combination of piles and footings in the same building is not recommended, due to concerns of differential settlement between the two foundation types.

Based on observations of the rolling topography of the site, it is expected that the site development may require extensive cutting and filling to achieve the design grades. The site is generally underlain by low to medium plastic clay tills which are considered suitable for use as structural fill. However, careful selection of these soils in combination with moisture adjustment may be required to achieve the specified compaction. The clays are moisture sensitive and may become weak when wet. Therefore, it is recommended that earthworks involving these soils take place during dry weather. Otherwise, some problems may be encountered during compaction of these soils if they are placed during wet weather periods.

Cast-in-place concrete piles may be designed as straight shaft friction piles or, alternatively, belled end-bearing piles which derive their support on the weathered siltstone. Steel pipe piles would be driven to set in the weathered siltstone layer. Further geotechnical reviews are recommended for each individual building lot to arrive at the appropriate foundation type.

5.2 SITE PREPARATION

Building and structural fill areas should be stripped and cleared of existing fill soils, organic soils, loose/soft soils, old building foundations and any other deleterious material to expose an undisturbed non-organic subgrade consisting of the stiff, very stiff native and/or hard clay till. Depending on the design foundation bearing pressures, additional subexcavation may be required to expose a competent bearing stratum for footing support.

Pavement, sidewalk, slab and structural fill areas should be similarly stripped to expose an undisturbed subgrade of non-organic stiff, very stiff and/or hard clay till. Alternatively, localized soft/weak soils may be left in place if the depth of subexcavation is considered sufficient for the pavement structure to bridge over these areas and provide proper support for construction traffic.

Structural fill is defined as fill placed beneath any load bearing area, such as buildings, pavements, slabs and sidewalks. Structural fill should extend horizontally beyond the footing edges, pavement sections or other structures by 1 m, or a distance equal to or greater than the lift thickness if it is greater than 1 m. Structural fill should consist of well graded pit run gravel containing less than 10% by weight passing the 0.075 mm sieve, or low to medium plastic clay with a low potential for swelling, a plasticity index of less than 20 and a liquid limit less than 40. High plastic clay is not recommended for use as structural fill, particularly in floor slab areas.

Limited laboratory testing indicates that the surface native clay tills are generally low to medium plastic, and that they meet the requirements for structural fill. Structural fill should be approved by the geotechnical engineer, prior to importing and/or use at the site.

Structural fill should generally be placed in maximum lifts of 150 mm for clays and 300 mm for pit run gravel, and compacted to a minimum of 95% Standard Proctor maximum dry density (SPMDD, ASTM D-698) in building floor slab areas and 100% SPMDD beneath footings and pavement sections. Pit run gravel should be placed within ±3% of the Optimum Moisture Content (OMC). Clay structural fills should be placed within 0 to 2% above OMC.

Note that heavy rainfall could result in softening of the subgrade and loss of support, and extended dry conditions could result in drying of the subgrade and increased swelling potential of the clays. Therefore, subgrade preparation should be undertaken in one continuous operation and construction should be carried out immediately after site stripping. Subgrades should be smoothly sloped to promote positive drainage. Shallow temporary ditches may be required to control surface runoff. The subgrade may be protected by a granular layer, or by leaving about 150 mm of unexcavated material which would be later removed immediately prior to construction. Stripping of unsuitable materials should be undertaken with a tracked excavator equipped with a clean-out bucket. The excavator should progressively retreat from the stripped area to avoid disturbance to the exposed subgrade.

Subgrade preparation for buildings, pavements, slabs and sidewalks should be reviewed by the Geotechnical Engineer. Proofrolling of the subgrade may also be performed by multiple passes of a single axle, dual wheel truck with an 8.2 tonne rear axle load. Any soft areas found during the subgrade review and/or proofrolling should be removed and replaced with structural fill.

Subgrade preparation for road structures should be carried out to the approval of the Geotechnical Engineer in order to meet or exceed the City of Leduc Minimum Engineering Design Standards.

Finished grades should slope down away from buildings. The upper 0.5 m of backfill around the building should consist of compacted low to medium plastic clay till to seal the ingress of running water. The clay

should extend a distance of 3 m beyond the grade beam or foundation walls, and should be graded at 2 percent away from the buildings. The slope of the exterior backfill should be checked periodically by the owner to verify that the water is positively drained away from the building. Settling backfill should be regraded to ensure that no water ponds against the foundation wall.

Roof water leaders and other drains should discharge into storm sewers or into a permanent drainage area located well away from buildings. Site grading in pavement and exterior slabs should result in rapid draining of water runoff to a permanent drain. A minimum grade of 1.5% is recommended to promote surface water runoff, and to reduce the potential for saturation and degradation of the subgrade. High traffic areas within the site should be kept high, especially in the gravel surfaced areas. The surface of the top of the subgrade should follow the surface grades to direct water seepage into perforated pipes installed into the sides of catch basins. Landscaping should be designed to minimize the need for watering adjacent to buildings. Water should not be allowed to pond on or adjacent to pavements.

5.3 FOUNDATIONS

5.3.1 Footings

Shallow foundations must be based below the depth of frost penetration. The soil cover over footings should be at least 1.5 m below surrounding site grades for continually heated buildings and 2.5 m for unheated facilities.

Footing subgrades should be thoroughly cleaned of any loose or water softened material prior to pouring concrete. Subgrade protection may include a layer of approved granular fill or lean concrete.

Footings founded on frozen soil will settle after thawing occurs. Therefore, footing subgrades must not be allowed to freeze prior to and after casting the footings. Any frozen soil should be removed and replaced with concrete. Alternatively, footings can be extended to unfrozen soil.

Footings for the buildings should generally be constructed below a line of 2H:1V projected up from the invert level of buried services to reduce the risk of undermining such footings.

Footings placed on the undisturbed very stiff native clays or overlying properly compacted structural fill may be designed for a factored ultimate bearing resistance in the order of 200 kPa and a serviceability limit pressure of 125 kPa. Site specific studies will be required for the confirmation of soil bearing pressures, and the estimation of total and differential footing settlements.

5.3.2 Cast-in-Place Concrete Piles

- **Straight Shaft Friction Pile**

Pile comments and recommendations are based on widely spaced boreholes. It is expected that soil conditions will vary across the site. Therefore, geotechnical limit states design as noted above and

allowable bearing pressures should be subject to review and possible revision by the Geotechnical Engineer retained for each individual building lot.

Geotechnical review of the preliminary structural drawings will be required during the initial design stages. The aim of the geotechnical designer would be to review the conditions of driveability (in the case of steel pipe piles) and load carrying capacity of the piles.

Straight shaft friction piles may be designed for a serviceability limit state using the factored geotechnical resistances for shaft friction provided in Table 2. The ultimate limit state can be back calculated by using a geotechnical resistance factor of 0.4.

TABLE 2: DESIGN PARAMETERS FOR CAST-IN-PLACE CONCRETE PILES

Depth Below Existing Grade (m)	Soil Type	Geotechnical Factored Resistance Skin Friction (kPa)
0 – 2.0	Clay Till	0
3.0 – 5.0	Clay Till	25
> 5.0	Clay Till/ Weathered Siltstone	25

The skin friction for the upper 2.0 m should be neglected due to freeze/thaw and soil desiccation effects. A minimum shaft diameter of 400 mm is recommended. Straight shaft piles subjected to uplift loads, including frost jacking forces should have a minimum embedment of 8 m and should be reinforced over their entire length.

The piles should be installed under the full-time inspection of qualified geotechnical personnel. The pile design parameters noted above may need to be reviewed and revised, if necessary, if conditions observed on site do not conform to design assumptions. Where a group of 4 or more piles are used, the allowable working load may need to be modified to allow for group effects.

Piles should be spaced no closer than 2.5 times the pile diameter, measured centre to centre. In general, piles should be installed within a tolerance of 75 mm plan distance in any direction and within a verticality of 1 in 75. Where drilling might affect the concrete of an adjacent pile (i.e. where pile spacings are less than about four pile diameters), drilling should not be carried out before the previous pile concrete has set for 24 hours.

The base of piles should be cleared of loose/soft soil and should be founded on undisturbed soil or weathered siltstone. Any slough material should be removed, and the concrete should be placed immediately after the pile excavation has been approved by the inspector. Where groundwater accumulations are present in pile excavations, concrete placement by tremie methods will be required.

If sloughing soil hampers pile construction, the installation of a temporary steel casing in the pile excavations will be required. The level of fresh concrete in the casing should be maintained above any sloughing or seepage zones as the casing is being withdrawn, and it should be high enough to counteract external groundwater pressure.

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- **Belled End-Bearing Piles**

Belled end bearing piles may also be considered if possible seepage and sloughing can be controlled. Pile borings will have to be cased if sloughing or seepage hampers construction.

Belled piles founded to a depth of at least 8 m in the weathered siltstone may be designed for a geotechnical factored resistance of 400 kPa for end bearing. Friction should not be included for belled end-bearing piles due to differences in load-settlement behaviour between the two pile types. A minimum shaft diameter of 400 mm is recommended. The ratio of bell diameter to shaft diameter should not exceed 3. The edge-to-edge spacing of two adjacent piles should not be less than 0.5 bell diameters. Belled end-bearing piles subjected to uplift loads, including frost jacking forces should have a minimum embedment of 8 m and should be reinforced over their entire length.

If sand or sloughing silt layers are encountered at the proposed bell elevation, the piles should be extended deeper into the weathered siltstone. The minimum distance from the top of the bell to the underside of the sloughing layer should be 0.6 m.

Pile borings should be inspected immediately prior to concreting to ensure that the base of the bell is thoroughly cleaned of loose soil.

5.3.3 Driven Steel Pipe Piles

Driven closed-end steel pipe piles may be designed using the allowable static skin friction values given in Table 3 below:

TABLE 3: DESIGN PARAMETERS FOR DRIVEN STEEL PIPE PILES

Depth Below Existing Grade (m)	Soil Type	Geotechnical Factored Resistance Skin Friction (kPa)	Geotechnical Factored Resistance End Bearing (kPa)
0 – 2.0	Clay Till	0	-
3.0 – 5.0	Clay Till	25	-
> 5.0	Clay Till/ Weathered Siltstone	25	500

The piles should not be driven beyond practical refusal which may be taken as 10 to 12 blows per each 25 mm interval for the last 300 mm of the pile set. This practical refusal criterion is a preliminary guide and the actual criteria for this should be established once the hammer energies and pile details are established. For steel pipe piles driven to practical refusal into the weathered siltstone, the geotechnical factored load capacity may be determined by multiplying the cross-sectional area of the steel (making an allowance for corrosion on both sides of the pile) by 0.25 Fy, where Fy is the yield strength of the steel.

The minimum pile spacing, measured centre-to-centre should be taken as three pile diameters. Driven steel piles should be installed under the full-time inspection of qualified geotechnical personnel. Complete driving records in number of blows per 300 mm penetration should be recorded for each pile.

The elevations of the tops of piles already installed should be monitored as adjacent piles are driven to determine if heaving of the pile has occurred. Piles that have heaved must be re-driven.

Steel piles should be driven using typical hammer energies of 450 to 600 J per square centimetre of the cross-sectional area of steel. A minimum pipe wall thickness of 12.5 mm is recommended. The hammer energy to pile cross-sectional area proposed by the Contractor should be reviewed and approved prior to equipment being mobilized to the site.

Steel pipe piles that are installed through frozen ground may need to be predrilled through the frost zone. If pre-drilling is required, the drill holes should be undersized by approximately 80 to 90 percent of the pile diameter. If hard driving conditions are expected, a pile point may be required.

Concrete infilling of the pipe pile is recommended to add strength to the section and reduce the corrosion potential inside the pipe.

5.4 GRADE BEAMS AND PILE CAPS

Grade beams and pile caps should be underlain by a void forming product that is at least 100 mm in depth. The uplift pressure acting on the underside of the grade beams or pile caps may be calculated from the crushing strength of the void form product. If water is allowed to accumulate in the void space or the compressible medium becomes saturated, the beneficial effect will be eliminated and frost heaving pressures may then occur. Therefore, the finished grade adjacent to each pile cap or grade beam should be capped with well compacted clay of low swelling potential and sloped away to direct water away from this area.

5.5 SLABS-ON-GRADE

The site subgrade is suitable for the support of grade supported concrete floor slabs provided that the subgrade is prepared in accordance with Section 5.2. Lightly loaded (10 kPa, or less) floor slabs should be underlain with a minimum of 150 mm of well graded, free draining crushed gravel, or 50 mm minus pit run gravel with less than 10% passing 0.075 mm sieve. The thickness of this layer should be increased to at least 250 mm for more heavily loaded floor slabs (greater than 10 kPa). A vapour barrier should be installed below the floor slab.

The existing subgrade soils possess moderate potential for swelling or shrinking with changes in moisture. The following design details are recommended to mitigate the effects of swelling or shrinking of the clay subgrade:

1. Slabs should be provided with construction joints or sawcuts in accordance with local practice. The concrete slab should be reinforced with steel bars or equivalent wire mesh and dimensioned in accordance with the structural engineer's requirements. The slabs should be designed to be independent of all walls, columns or grade beams. The slabs should be designed so as to not hang up on pile caps if some minor slab settlement occurs.

2. At doorways, slab-on-grade floors should be tied into grade beams with dowels. Alternatively the slab may be tied to grade beams if a construction joint is placed parallel to the wall a couple of metres away.

3. Non-bearing walls should be designed to accommodate vertical movements of 50 to 75 mm and should not be rigidly connected to bearing walls or columns.

4. Mechanical equipment supported on the floor slab should have a provision for relevelling.

5. Heating ducts placed beneath the floor slab are to be insulated to minimize drying of the clay soils.

6. All service connections should be designed to be flexible and to accommodate differential movements.

7. If possible, water lines should not be placed beneath slab-on-grade floors. Piping and conduits beneath floor slabs should be laid out to permit some flexibility. The design should minimize any potential for leaky water lines, or drainage pipes. If required, water lines should be placed in trenches which are lined with a geo-membrane and graded to collection areas, so that water from leaks can be contained.

5.6 FOUNDATION CONCRETE

Foundation concrete should be manufactured with Type 50 Portland cement having a maximum water cement ratio of 0.45 and a minimum compressive strength of 32 MPa. Concrete air entrainment as per CSA specifications CAN/CSA-A23.1-04, Clause 14.3 is recommended for concrete exposed to groundwater or freezing and thawing.

Water soluble sulphate testing is recommended for each individual building lot in order to determine the soil's potential for sulphate attack. If a potential exists, concrete exposed to such soils should be resistant to sulphate attack, as per CAN/CSA-A231-M04 standards.

5.7 PERIMETER DRAIN

A perimeter drainage system, consisting of a perforated rigid wall 150 mm diameter PVC pipe, should be placed around all external sides of the building. The perimeter drainage pipes should be provided with permanent clean-outs. The pipe should be oriented with its perforations pointing downward. The drainage pipe should be surrounded by a minimum of 150 mm of 19 mm clear crushed gravel or drain rock. A layer of non-woven geotextile should then be blanketed over the top of the gravel drainage layer to act as a filter against piping of fines from the general backfill and surrounding native soil. The roof and surface runoff should be collected and directed to a storm sewer or permanent drain in solid wall pipes separate from the perimeter drainage. Subfloor drains in the gravel drainage layer may be required for some main building areas.

5.8 EXTERIOR SIDEWALKS AND SLABS

Due to frost action, there is a potential for differential heave to occur between exterior grade supported structures and structural elements of a heated building. Unprotected sidewalks dowelled into foundations walls can tip up and rotate around the dowel connection due to heave, blocking doors and crushing exterior wall facing not provided with sufficient clearance above the sidewalk.

To minimize the potential for heave related damage, exterior sidewalks should be moved away from the foundation walls, where possible, and should not be doweled into grade beams, pile caps or interior slabs. Where it is necessary to dowel exterior sidewalks and slabs into the building, high strength extruded polystyrene insulation below concrete slabs or sidewalks should be considered to reduce the frost penetration.

Additional measures to reduce the risk of frost heave include sloping the sidewalks away from the building and sealing the sidewalk/building interface to limit seepage of surface water into the subgrade soils. Planters or landscape areas that may otherwise introduce water adjacent to the building perimeter are not recommended.

5.9 PAVEMENT

The proposed pavement section is based on the assumption that the pavement will be constructed on an undisturbed subgrade of stiff to very stiff silt till with a soaked California Bearing Ratio of at least 3.0. This value is indicative of a low level of subgrade support expected during spring thaw when the subgrade soil will exist in a weakened condition.

The following minimum pavement section is recommended for the local industrial roads:

- 40 mm of Asphaltic Concrete Surface (placed after 2 years)
- 85 mm of Asphaltic Concrete Base
- 300 mm of 20 mm minus Crushed Gravel Base Course
- 150 mm of Cement Modified Subgrade Preparation
- Approved subgrade

The base and subbase course should be compacted to a minimum of 100% Standard Proctor maximum dry density and conform to the City of Leduc Minimum Engineering Design Standards.

Cement modified subgrade preparation should conform to the City of Leduc Minimum Engineering Design Standards using a minimum of 13 kg of cement per square metre per 150 mm of compacted depth.

5.10 EXCAVATIONS AND SERVICE TRENCHES

Based on the borehole investigation, it is expected that trenches will be founded in the stiff to hard clay tills where stable and competent support is expected. Temporary excavations in the clay and clay till should be backsloped at 3H:4V (Horizontal:Vertical), or flatter, if groundwater is encountered. Based on

the borehole information, appreciable groundwater seepage into the excavations is not expected at depths less than 3 m, unless preceded by spring thaws or heavy rainfall. If seepage is encountered, groundwater seepage should be handled by grading the base of the excavation to a pumped sump area. If excavations are greater than 4 to 5 m, groundwater seepage from the clay till may result in erosion and loss of ground. In this case, a trench box or further flattening of slopes may be required.

The construction of service trenches and utilization and compaction of the reused native clays should be carried out in accordance with the City of Leduc Minimum Design Standards.

6.0 CLOSURE

Recommendations presented herein are based on the geotechnical evaluation of the findings of 16 boreholes completed on February 16 and 18, 2009 and our understanding or the proposed development. The material in this report reflects GeoMedia's best judgement in light of the information available to GeoMedia at the time of preparation of the report. If conditions other than those are noted during subsequent phases of the project, GeoMedia should be notified and given the opportunity to review and revise the current recommendations, if necessary.

This report has been prepared for the exclusive use of Gentech Developments Ltd., the City of Leduc and their consultants for the specific application to the development described within this report. Any use which a third party makes of this report, or any reliance on or decisions made based on it are the responsibility of such third parties. GeoMedia accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions taken based on this report. We appreciate the opportunity to be of service to you. If you have any questions regarding the contents of this report, or if we can be of further assistance to you on this project, please call the undersigned.

Yours truly,

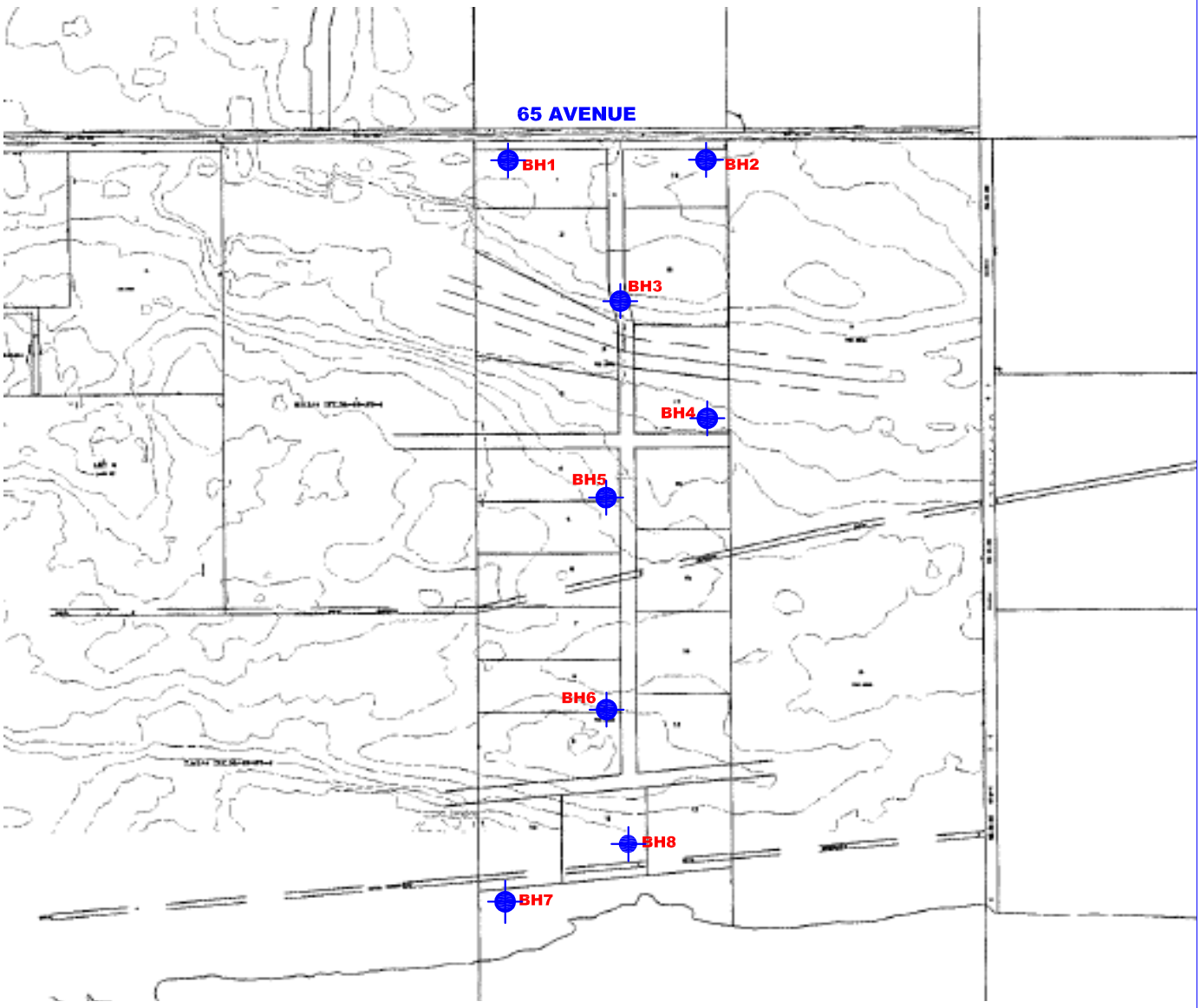
GeoMedia Engineering Ltd.

Reviewed by:

Darryl Grandberg, P.Eng.
Senior Geotechnical Engineer

Chander Khosla, P. Eng.
Senior Engineer, Principal

DG/
Enclosures: Site Photographs
Site Plan
Soil Logs



- BOREHOLES LOCATION

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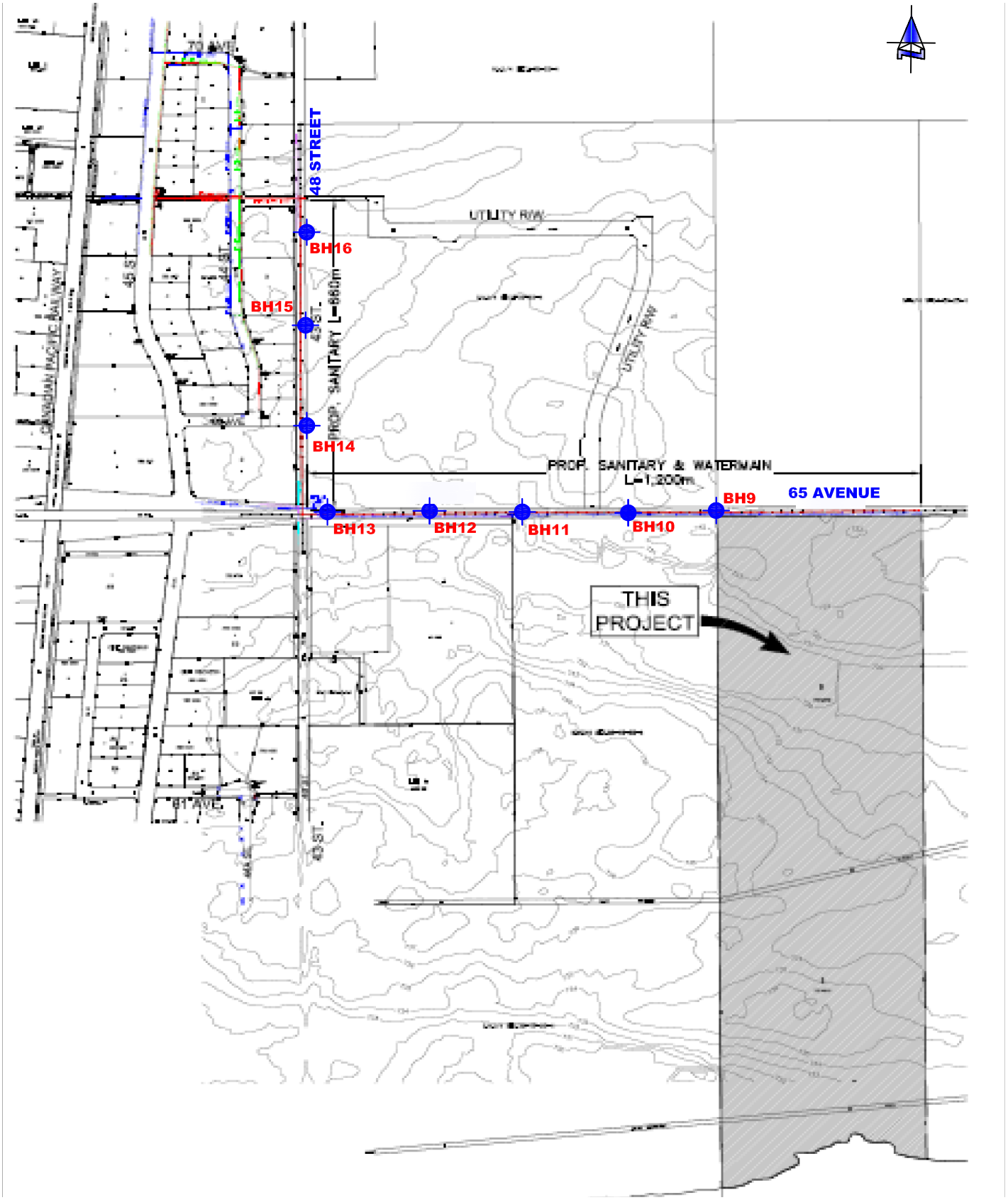
Foundation & Soil Consultants
#18-3275 Mc Callum Road
Abbotsford, BC
V2S 7W5
Tel: (604) 853-5390
Fax: (604) 854-5135

TESTED DG	CLIENT GENTECH DEVELOPMENT LTD		PROJ. NO. G1612
DRAWN TM	TITLE ON-SITE BOREHOLE LOCATION PLAN		DWG G1612 -1
CHECKED DG	PROJECT PROPOSED INDUSTRIAL SUBDIVISION		DATE 12 MAR 09
SCALE NTS	LOCATION TELFORD LAKE, LEDUC, AB		REVISION



- BOREHOLES LOCATION

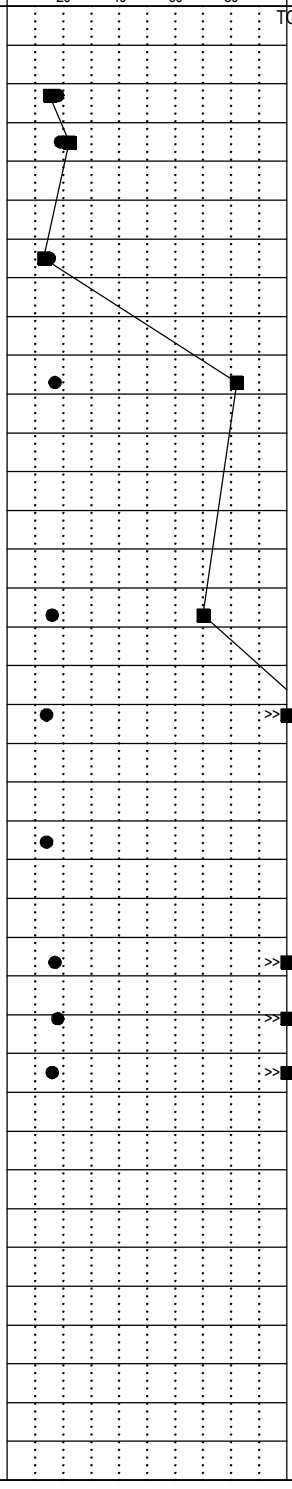
GEO MEDIA ENGINEERING LTD
Foundation & Soil Consultants
#18-3275 Mc Callum Road
Abbotsford, BC
V2S 7W5
Tel: (604) 853-5390
Fax: (604) 854-5135

TESTED DG	CLIENT GENTECH DEVELOPMENT LTD		PROJ. NO. G1612
DRAWN TM	TITLE OFF-SITE BOREHOLE LOCATION PLAN		DWG G1612 -2
CHECKED DG	PROJECT PROPOSED INDUSTRIAL SUBDIVISION		DATE 12 MAR 09
SCALE NTS	LOCATION TELFORD LAKE, LEDUC, AB		REVISION

Gentech Developments Ltd.	Proposed Industrial Subdivision	BOREHOLE NO: **BH-01**
SPT Drilling	North Telford Lake, Leduc, Alberta	PROJECT NO: GP1334
150mm Solid Stem Auger	See borehole location plan.	ELEVATION:

SAMPLE TYPE: SHELBY TUBE | NO RECOVERY | SPT | DISTURBED | A-CASING | CONTINUOUS

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND



Depth (m)	USCS	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	OTHER TESTS COMMENTS	INSTRUMENTATION DATA	Depth (m)
0	TOPSOIL		TOPSOIL.						0
			SILT, some sand, trace clay and gravel, light brown, frozen.						
						15	MC = 18%		
			-- some clay and sand, trace gravel, blocky, moist.			22	MC = 19%		
2									2
						13	MC = 15%		
4			CLAY, trace sand and gravel, stiff, dark brownish grey with grey flecks, moist.						4
						82	MC = 17%		
6			SILT, some sand and clay, hard / very dense, low plastic, light grey, moist.						6
8						70	MC = 16%		8
			-- WATER ENCOUNTERED.						
			-- sandy.			50/ 0.07	MC = 14%		
10									10
			SAND, silty, trace fine gravel, very dense, light brown, moist.			50/ 150	MC = 14%		
			SILT, clayey, trace sand, hard, light brown, moist.						
12									12
			-- sandy, trace clay.			50/ 0.10	MC = 17%		
						50/ 0.10	MC = 18%		
14						50/ 0.09	MC = 16%		14
			REFUSAL.						
			Monitoring Well Installed.						
			Screen from 14.2 to 11.2 m.						
			Solid from 11.2 m to surface.						
			Cuttings from 14.2 m to 0.3 m.						
			Bentonite from 0.3 m to surface.						
			Groundwater level on February 22, 2009 = 5.2 m below surface.						
16									16
			End of borehole at 14.2 m.						
18									18

LOGGED BY: DG	COMPLETION DEPTH: 14.2 m
REVIEWED BY: RM	COMPLETION DATE: 16/2/09
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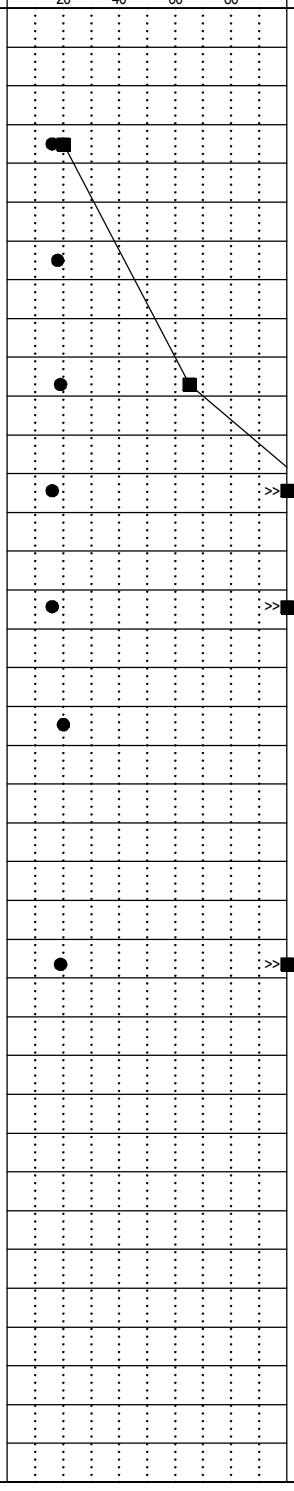
BOREHOLE LOG GP1334.GPJ NORTHERN GEO.GDT 13/3/09

Gentech Developments Ltd.	Proposed Industrial Subdivision	BOREHOLE NO: **BH-02**
SPT Drilling	North Telford Lake, Leduc, Alberta	PROJECT NO: GP1334
150mm Solid Stem Auger	See borehole location plan.	ELEVATION:

SAMPLE TYPE: SHELBY TUBE | NO RECOVERY | SPT | DISTURBED | A-CASING | CONTINUOUS

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND



Depth (m)	USCS	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	OTHER TESTS COMMENTS	INSTRUMENTATION DATA	Depth (m)
			SILT, some sand, trace clay and gravel, light brown, frozen.						
2			-- some clay, trace sand and gravel, very stiff, medium plastic, medium brown, moist.			20	MC = 16%		2
			-- stiff. -- light brown specks.				MC = 18%		
4			-- trace clay, sand and gravel, hard, low plastic, light brown, moist.						4
			-- some sand, hard, low to non-plastic, grey, moist.			65	MC = 19%		
			-- sandy.						
6			SAND & SILT, very dense, light grey, moist.			50/ 0.09	MC = 16%		6
			SILT, sandy, light plastic, hard, light grey, moist.						
8						50/ 0.08	MC = 16%		8
			-- WATER ENCOUNTERED.			50/ 150	MC = 20%		
10									10
12						50/ 0.10	MC = 19%		12
			Backfilled to surface with cuttings. End of borehole at 12.7 m.						
14									14
16									16
18									18

LOGGED BY: DG	COMPLETION DEPTH: 12.7 m
REVIEWED BY: RM	COMPLETION DATE: 16/2/09
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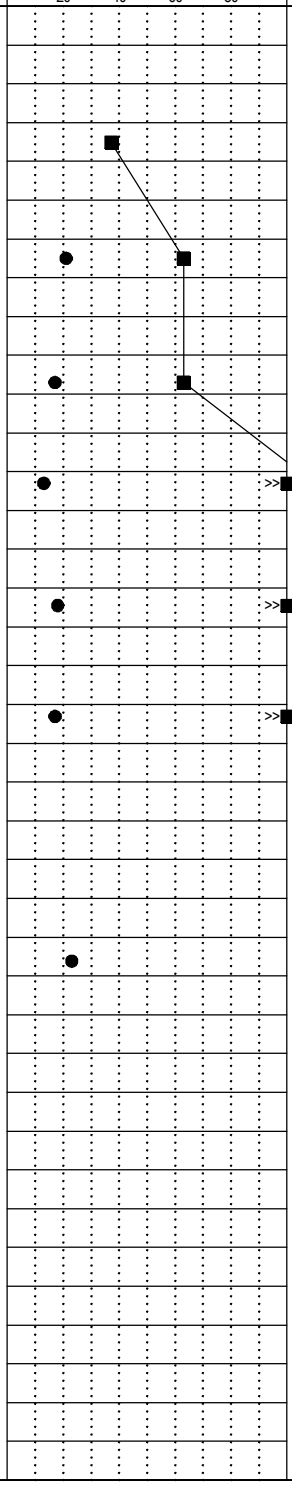
BOREHOLE LOG GP1334.GPJ NORTHERN GEO.GDT 13/3/09

Gentech Developments Ltd.	Proposed Industrial Subdivision	BOREHOLE NO: **BH-03**
SPT Drilling	North Telford Lake, Leduc, Alberta	PROJECT NO: GP1334
150mm Solid Stem Auger	See borehole location plan.	ELEVATION:

SAMPLE TYPE: SHELBY TUBE | NO RECOVERY | SPT | DISTURBED | A-CASING | CONTINUOUS

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND



Depth (m)	USCS	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	OTHER TESTS COMMENTS	INSTRUMENTATION DATA	Depth (m)
0			TOPSOIL SILT, some sand, trace clay and gravel, light brown, frozen.						0
2			-- some clay, trace sand and gravel, very stiff, medium brown with grey specks, moist.	☒		37			2
			-- trace clay, no gravel, blocky, low plastic, light brown to yellow brown.	☒		63	MC = 21%		
4			-- some clay, medium plastic.	☒		63	MC = 17%		4
6			SILT, some sand and clay, hard / very dense, low plastic, light grey, moist.	⋈		50/ 0.10	MC = 13%		6
			-- WATER ENCOUNTERED.	☒		50/ 0.10	MC = 18%		
8				⋈		50/ -0.04	MC = 17%		8
10									10
12				☒			MC = 23%		12
			Groundwater level @ 9.1 m at completion of drilling. End of borehole at 12.7 m.						
14									14
16									16
18									18

LOGGED BY: DG	COMPLETION DEPTH: 12.7 m
REVIEWED BY: RM	COMPLETION DATE: 16/2/09
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BOREHOLE LOG GP1334.GPJ NORTHERN GEO.GDT 13/3/09

Gentech Developments Ltd.	Proposed Industrial Subdivision	BOREHOLE NO: **BH-04**
SPT Drilling	North Telford Lake, Leduc, Alberta	PROJECT NO: GP1334
150mm Solid Stem Auger	See borehole location plan.	ELEVATION:

SAMPLE TYPE: SHELBY TUBE | NO RECOVERY | SPT | DISTURBED | A-CASING | CONTINUOUS

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

STANDARD PEN (N) 20 40 60 80

PLASTIC MC LIQUID 20 40 60 80

Depth (m)	USCS	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	OTHER TESTS COMMENTS	INSTRUMENTATION DATA	Depth (m)
0			TOPSOIL						0
			SILT, some sand, trace gravel, stiff, low plastic, brown ,moist.						
			-- light brown.						
2			-- trace sand, no gravel..			25	MC = 19%		2
			-- blocky, light grey with rust mottle.			63	MC = 17%		
4			SILT, trace sand, trace clay, low plastic, hard, light grey, moist.			50/ 0.11	MC = 13%		4
			-- sandy.						
6						90	MC = 16%		6
8			-- some clay, trace sand.			50/ 0.10	MC = 16%		8
			-- some sand, trace clay.						
						50/ 0.10	MC = 15%		
10			-- some clay, trace sand.						10
12						50/ 0.11	MC = 19%		12
			Groundwater level @ 6.7 m at completion of drilling. Monitoring Well Installed. Screen from 12.7 to 9.7 m. Solid from 9.7 m to surface. Cuttings from 12.7 to 0.3 m. Bentonite from 0.3 m to surface. Groundwater level on February 22, 2009 = 2.5 m below surface. End of borehole at 12.7 m.						
14									14
16									16
18									18

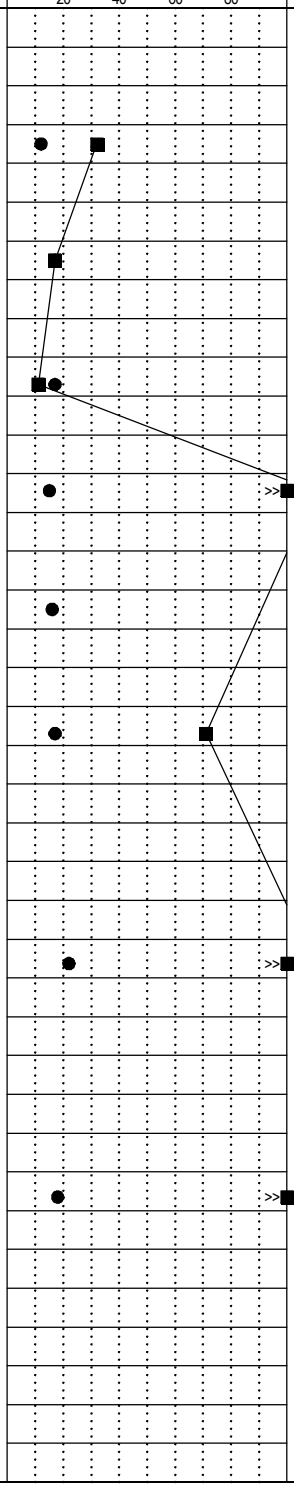
LOGGED BY: DG	COMPLETION DEPTH: 12.7 m
REVIEWED BY: RM	COMPLETION DATE: 16/2/09

BOREHOLE LOG GP1334.GPJ NORTHERN GEO.GDT 13/3/09

Gentech Developments Ltd.	Proposed Industrial Subdivision	BOREHOLE NO: **BH-05**
SPT Drilling	North Telford Lake, Leduc, Alberta	PROJECT NO: GP1334
150mm Solid Stem Auger	See borehole location plan.	ELEVATION:

SAMPLE TYPE: SHELBY TUBE | NO RECOVERY | SPT | DISTURBED | A-CASING | CONTINUOUS

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND



Depth (m)	USCS	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	OTHER TESTS COMMENTS	INSTRUMENTATION DATA	Depth (m)
0			TOPSOIL SILT, sandy, trace gravel, frozen, light brown.						0
2			-- some clay, some sand, trace gravel, very stiff, light brown, moist.	☒		32	Frozen. MC = 12%		2
			-- trace sand.	☒		17	MC = 17%		
4			-- clayey, medium plastic, in-situ, increasing moisture with depth.	☒		11	MC = 17%		4
			SILT, some clay, trace to some sand, low plastic, hard, light grey, moist.						
6				☒		50/ 0.09	MC = 15%		6
			-- sandy, trace clay.						
8			-- WATER ENCOUNTERED.	☒		50/ 150	MC = 16%		8
				☒		71	MC = 17%		
10			-- some clay, trace sand.						10
12				☒		50/ 0.08	MC = 22%		12
14									14
16			Groundwater @ 6.7 m at completion of drilling. End of borehole at 15.7 m.	☒		50/ 0.10	MC = 18%		16
18									18

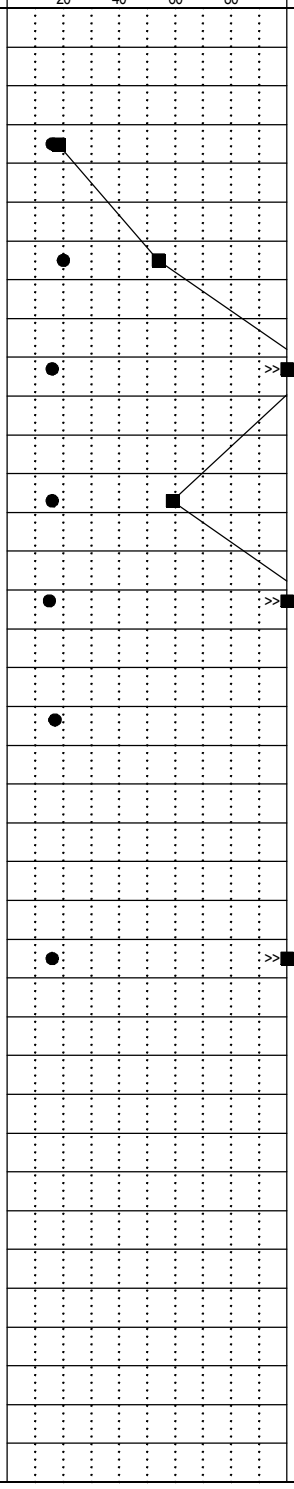
	LOGGED BY: DG	COMPLETION DEPTH: 15.7 m
	REVIEWED BY: RM	COMPLETION DATE: 17/2/09
		Page 1 of 1

BOREHOLE LOG GP1334.GPJ NORTHERN GEO.GDT 13/3/09

Gentech Developments Ltd.	Proposed Industrial Subdivision	BOREHOLE NO: **BH-06**
SPT Drilling	North Telford Lake, Leduc, Alberta	PROJECT NO: GP1334
150mm Solid Stem Auger	See borehole location plan.	ELEVATION:

SAMPLE TYPE: SHELBY TUBE | NO RECOVERY | SPT | DISTURBED | A-CASING | CONTINUOUS

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND



Depth (m)	USCS	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	OTHER TESTS COMMENTS	INSTRUMENTATION DATA
0			TOPSOIL					
			SILT, sandy, trace gravel, stiff, crumbly, frozen.					
2			-- very stiff, moist.			18	MC = 16%	
			-- some sand to sandy, trace clay, hard, light brown.			54	MC = 20%	
4			-- sandy.			50/ 0.10	MC = 16%	
6			-- some clay, trace sand, low plastic.			59	MC = 16%	
			SILT, some clay, trace sand, low plastic, hard, moist.					
			-- WATER ENCOUNTERED, trace sand.			50/ 0.08	MC = 15%	
8			-- some sand to sandy.					
						50/ 150	MC = 17%	
10			-- some clay.					
12						50/ 0.10	MC = 16%	
			Monitoring Well Installed. Screen from 12.7 to 9.7 m. Solid from 9.7 m to surface. Cuttings from 12.7 to 0.3 m. Bentonite from 0.3 m to surface. Groundwater level on February 22, 2009 = 4.1 m below surface. End of borehole at 12.7 m.					
14								
16								
18								

LOGGED BY: DG	COMPLETION DEPTH: 12.7 m
REVIEWED BY: RM	COMPLETION DATE: 17/2/09
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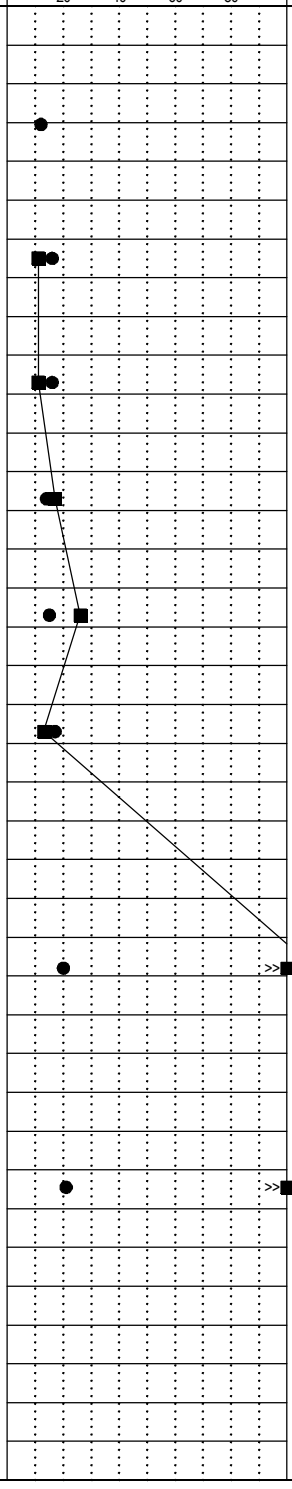
BOREHOLE LOG GP1334.GPJ NORTHERN GEO.GDT 13/3/09

Gentech Developments Ltd.	Proposed Industrial Subdivision	BOREHOLE NO: **BH-07**
SPT Drilling	North Telford Lake, Leduc, Alberta	PROJECT NO: GP1334
150mm Solid Stem Auger	See borehole location plan.	ELEVATION:

SAMPLE TYPE: SHELBY TUBE | NO RECOVERY | SPT | DISTURBED | A-CASING | CONTINUOUS

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND



Depth (m)	USCS	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	OTHER TESTS COMMENTS	INSTRUMENTATION DATA	Depth (m)
0			TOPSOIL SILT, some sand and clay, frozen, light brown.						0
2			-- trace sand, very stiff, grey specks, moist.				MC = 12%		2
4			-- small carbon inclusions.			11	MC = 16%		4
			-- greyish-brown.			11	MC = 16%		
6			-- very stiff.			17	MC = 14%		6
8			-- trace sand and clay, hard, low to non-plastic.			26	MC = 15%		8
10			-- some clay to clayey, trace sand, stiff.			13	MC = 17%		10
12			SAND with fine gravels, silty, very dense, light brown, moist.			92/ 150.1	MC = 20%		12
			SILT, some sand, trace clay and gravel, very dense, light grey.						
14						50/ 0.05	MC = 21%		14
16			Groundwater @ 3.0 m at completion of drilling. Monitoring Well Installed. Screen from 15.7 m to 12.7 m. Solid from 12.7 m to surface. Cuttings from 15.7 m to 0.3 m. Bentonite from 0.3 m to surface. Groundwater level on February 22, 2009 = 2.1 m below surface. End of borehole at 15.7 m.						16
18									18

LOGGED BY: DG	COMPLETION DEPTH: 15.7 m
REVIEWED BY: RM	COMPLETION DATE: 17/2/09
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BOREHOLE LOG GP1334.GPJ NORTHERN GEO.GDT 13/3/09

Gentech Developments Ltd.	Proposed Industrial Subdivision	BOREHOLE NO: **BH-08**
SPT Drilling	North Telford Lake, Leduc, Alberta	PROJECT NO: GP1334
150mm Solid Stem Auger	See borehole location plan.	ELEVATION:

SAMPLE TYPE: SHELBY TUBE | NO RECOVERY | SPT | DISTURBED | A-CASING | CONTINUOUS

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

STANDARD PEN (N) 20 40 60 80

PLASTIC MC LIQUID 20 40 60 80

Depth (m)	USCS	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	OTHER TESTS COMMENTS	INSTRUMENTATION DATA	Depth (m)
0			TOPSOIL SILT, some sand, trace gravel, frozen, light brown.						0
			– SPT refusal, drilled out.				MC = 11%		
2			SILT & SAND, trace fine gravel, very dense, low to non-plastic, yellowish-brown, moist.						2
						94	MC = 15%		
4									4
			SILT, some sand, hard, low plastic, light brown, damp.			50/ 150	MC = 14%		
			– sandy.						
6						50/ 0.09	MC = 14%		6
			SILT, some sand, trace clay, hard, light grey, moist.						
						50/ 0.10	MC = 16%		
8									8
			– some sand to sandy.			50/ 0.09	MC = 16%		
10									10
12						50/ 0.08	MC = 17%		12
14									14
16			Groundwater @ 9.8 m at completion of drilling. Monitoring Well Installed. Screen from 15.7 m to 12.7 m. Solid from 12.7 m to surface. Cuttings from 15.7 m to 0.3 m. Bentonite from 0.3 m to surface. Groundwater level on February 22, 2009 = 4.9 m below surface. End of borehole at 15.2 m.						16
18									18

LOGGED BY: DG	COMPLETION DEPTH: 15.2 m
REVIEWED BY: RM	COMPLETION DATE: 17/2/09
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BOREHOLE LOG GP1334.GPJ NORTHERN GEO.GDT 13/3/09

Gentech Developments Ltd.	Proposed Industrial Subdivision	BOREHOLE NO: **BH-09**
SPT Drilling	North Telford Lake, Leduc, Alberta	PROJECT NO: GP1334
150mm Solid Stem Auger	See borehole location plan.	ELEVATION:

SAMPLE TYPE: SHELBY TUBE | NO RECOVERY | SPT | DISTURBED | A-CASING | CONTINUOUS

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

STANDARD PEN (N) 20 40 60 80

PLASTIC MC LIQUID 20 40 60 80

Depth (m)	USCS	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	OTHER TESTS COMMENTS	INSTRUMENTATION DATA	Depth (m)
0			ASPHALT (80 mm thickness).						0
			SILT, trace clay, sand, and gravel, hard, light brown, frozen.						
			– trace to some clay.						
2			– very stiff.				MC = 18%		2
							MC = 17%		
4			SILT, some clay, trace sand and gravel, very stiff, medium brown, moist.						4
			– light brown.				MC = 24%		
			– sandy, trace clay.						
6			Borehole dry upon completion.				MC = 16%		6
			Backfilled to surface with cuttings.						
			End of borehole at 6.1 m.						
8									8
10									10
12									12
14									14
16									16
18									18

LOGGED BY: DG	COMPLETION DEPTH: 6.1 m
REVIEWED BY: RM	COMPLETION DATE: 18/2/09
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BOREHOLE LOG GP1334.GPJ NORTHERN GEO.GDT 13/3/09

Gentech Developments Ltd.	Proposed Industrial Subdivision	BOREHOLE NO: **BH-10**
SPT Drilling	North Telford Lake, Leduc, Alberta	PROJECT NO: GP1334
150mm Solid Stem Auger	See borehole location plan.	ELEVATION:

SAMPLE TYPE: SHELBY TUBE | NO RECOVERY | SPT | DISTURBED | A-CASING | CONTINUOUS

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	STANDARD PEN (N) 20 40 60 80 / PLASTIC MC LIQUID 20 40 60 80	USCS	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	OTHER TESTS COMMENTS	INSTRUMENTATION DATA	Depth (m)
0				ASPHALT (80 mm thickness).						0
				GRAVEL.						
				SILT, trace organics, trace sand and clay, hard, dark brown, frozen.						
				SAND, fine gravels, trace silt, compact, light brown, damp.				MC = 14%		
2										2
				SILT, some sand, trace clay, firm to soft, light brown.				MC = 20%		
				– thin sand seam.						
4				– firm.						4
				Groundwater level @ 3.0 m at completion of drilling.				MC = 24%		
				End of borehole at 4.6 m.						
6										6
8										8
10										10
12										12
14										14
16										16
18										18

LOGGED BY: DG	COMPLETION DEPTH: 4.6 m
REVIEWED BY: RM	COMPLETION DATE: 18/2/09
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BOREHOLE LOG GP1334.GPJ NORTHERN GEO.GDT 13/3/09

Gentech Developments Ltd.	Proposed Industrial Subdivision	BOREHOLE NO: **BH-11**
SPT Drilling	North Telford Lake, Leduc, Alberta	PROJECT NO: GP1334
150mm Solid Stem Auger	See borehole location plan.	ELEVATION:

SAMPLE TYPE: SHELBY TUBE | NO RECOVERY | SPT | DISTURBED | A-CASING | CONTINUOUS

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	STANDARD PEN (N) 20 40 60 80 / PLASTIC MC LIQUID 20 40 60 80	USCS	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	OTHER TESTS COMMENTS	INSTRUMENTATION DATA	Depth (m)
0				ASPHALT (80 mm thickness).						0
				FILL, sand and gravel, trace to some silt, compact, medium brown, frozen.						
				SILT, trace organics, trace sand and clay, dark brown, frozen.						
2				SILT, some clay, trace sand and gravel, very stiff, light brown, moist.				MC = 25%		2
4				-- some clay and clayey.				MC = 22%		4
				Borehole dry upon completion. Backfilled with cuttings to surface. End of borehole at 4.6 m.				MC = 17%		
6										6
8										8
10										10
12										12
14										14
16										16
18										18

LOGGED BY: DG	COMPLETION DEPTH: 4.6 m
REVIEWED BY: RM	COMPLETION DATE: 18/2/09
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BOREHOLE LOG GP1334.GPJ NORTHERN GEO.GDT 13/3/09

Gentech Developments Ltd.	Proposed Industrial Subdivision	BOREHOLE NO: **BH-12**
SPT Drilling	North Telford Lake, Leduc, Alberta	PROJECT NO: GP1334
150mm Solid Stem Auger	See borehole location plan.	ELEVATION:

SAMPLE TYPE: SHELBY TUBE | NO RECOVERY | SPT | DISTURBED | A-CASING | CONTINUOUS

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	STANDARD PEN (N) 20 40 60 80 / PLASTIC MC LIQUID 20 40 60 80	USCS	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	OTHER TESTS COMMENTS	INSTRUMENTATION DATA	Depth (m)
0				ASPHALT (90 mm thickness).						0
				GRAVEL.						
				SILT, trace sand and clay, dark brown, frozen.						
				SILT, trace gravel, sand and clay, light brown, frozen.						
2								MC = 13%		2
				-- some clay to clayey, very stiff, medium brown.						
								MC = 15%		
				-- mottled light / dark brown.						
4										4
				SILT, some sand and clay, hard / very dense, low plastic, light grey, moist.				MC = 18%		
				Borehole dry upon completion.						
				Backfilled with cuttings to surface.						
				End of borehole at 4.6 m.						
6										6
8										8
10										10
12										12
14										14
16										16
18										18

LOGGED BY: DG	COMPLETION DEPTH: 4.6 m
REVIEWED BY: RM	COMPLETION DATE: 18/2/09
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BOREHOLE LOG GP1334.GPJ NORTHERN GEO.GDT 13/3/09

Gentech Developments Ltd.	Proposed Industrial Subdivision	BOREHOLE NO: **BH-13**
SPT Drilling	North Telford Lake, Leduc, Alberta	PROJECT NO: GP1334
150mm Solid Stem Auger	See borehole location plan.	ELEVATION:

SAMPLE TYPE: SHELBY TUBE | NO RECOVERY | SPT | DISTURBED | A-CASING | CONTINUOUS

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	STANDARD PEN (N) 20 40 60 80 / PLASTIC MC LIQUID 20 40 60 80	USCS	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	OTHER TESTS COMMENTS	INSTRUMENTATION DATA	Depth (m)
0				ASPHALT (60 mm thickness).						0
				GRAVEL.						
				SILT, trace sand, clay and organics, dark brown, frozen.						
				SILT, some clay, trace sand, light brown, frozen.						
2				-- very stiff, moist.				MC = 13%		2
				-- medium brown.				MC = 15%		
4				-- wet.						4
				SILT, some sand and clay, hard / very dense, low plastic, light grey, moist.				MC = 18%		
6				-- sandy, hard.						6
				Groundwater @ 4.0 m below surface at completion of drilling.						
				End of borehole at 4.6 m.						
8										8
10										10
12										12
14										14
16										16
18										18

LOGGED BY: DG	COMPLETION DEPTH: 4.6 m
REVIEWED BY: RM	COMPLETION DATE: 18/2/09
	Page 1 of 1

BOREHOLE LOG GP1334.GPJ NORTHERN GEO.GDT 13/3/09

Gentech Developments Ltd.	Proposed Industrial Subdivision	BOREHOLE NO: **BH-14**
SPT Drilling	North Telford Lake, Leduc, Alberta	PROJECT NO: GP1334
150mm Solid Stem Auger	See borehole location plan.	ELEVATION:

SAMPLE TYPE: SHELBY TUBE | NO RECOVERY | SPT | DISTURBED | A-CASING | CONTINUOUS

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	STANDARD PEN (N) 20 40 60 80 / PLASTIC MC LIQUID 20 40 60 80	USCS	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	OTHER TESTS COMMENTS	INSTRUMENTATION DATA	Depth (m)
0				ROAD MULCH.						0
				SILT FILL, some gravel, trace clay, light brown, frozen.						
				SILT, some clay, trace sand and gravel, light brown, frozen.						
2				-- very stiff, medium brown.				MC = 24%		2
				SILT, sandy, trace clay, very stiff, light brown, moist.				MC = 20%		
4				SILT, some sand to sandy, trace clay, very stiff to hard, light grey, moist.				MC = 18%		4
				Borehole dry upon completion. Backfilled to surface with cuttings. End of borehole at 4.6 m.						
6										6
8										8
10										10
12										12
14										14
16										16
18										18

LOGGED BY: DG | COMPLETION DEPTH: 4.6 m

REVIEWED BY: RM | COMPLETION DATE: 18/2/09

BOREHOLE LOG GP1334.GPJ NORTHERN GEO.GDT 13/3/09

Gentech Developments Ltd.	Proposed Industrial Subdivision	BOREHOLE NO: **BH-15**
SPT Drilling	North Telford Lake, Leduc, Alberta	PROJECT NO: GP1334
150mm Solid Stem Auger	See borehole location plan.	ELEVATION:

SAMPLE TYPE: SHELBY TUBE | NO RECOVERY | SPT | DISTURBED | A-CASING | CONTINUOUS

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	STANDARD PEN (N) 20 40 60 80 / PLASTIC MC LIQUID 20 40 60 80	USCS	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	OTHER TESTS COMMENTS	INSTRUMENTATION DATA	Depth (m)
0				ROAD MULCH.						0
				SILT FILL, trace clay and gravel, light brown, frozen.						
				SILT, trace clay and gravel, light brown, frozen.						
2				-- some clay, trace sand, very stiff, medium brown, moist.				MC = 16%		2
				-- clayey, trace sand, stiff, light brown.						
				-- some clay, trace sand, very stiff, medium brown.				MC = 25%		
4				-- stiff.						4
				Borehole dry upon completion.				MC = 24%		
				Backfilled to surface with cuttings.						
				End of borehole at 4.6 m.						
6										6
8										8
10										10
12										12
14										14
16										16
18										18

LOGGED BY: DG	COMPLETION DEPTH: 4.6 m
REVIEWED BY: RM	COMPLETION DATE: 18/2/09
	Page 1 of 1

BOREHOLE LOG GP1334.GPJ NORTHERN GEO.GDT 13/3/09

Gentech Developments Ltd.	Proposed Industrial Subdivision	BOREHOLE NO: **BH-16**
SPT Drilling	North Telford Lake, Leduc, Alberta	PROJECT NO: GP1334
150mm Solid Stem Auger	See borehole location plan.	ELEVATION:

SAMPLE TYPE: SHELBY TUBE | NO RECOVERY | SPT | DISTURBED | A-CASING | CONTINUOUS

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

STANDARD PEN (N) 20 40 60 80

PLASTIC MC LIQUID 20 40 60 80

Depth (m)	USCS	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	OTHER TESTS COMMENTS	INSTRUMENTATION DATA	Depth (m)
0			ROAD MULCH.						0
			SILT, some clay, trace sand and gravel, light brown, frozen.						
			-- very stiff, moist.				MC = 16%		
2			-- stiff.						2
			-- trace to some sand, very stiff.				MC = 17%		
4									4
			SILT, some sand, trace clay, hard / very dense, low plastic, light grey, moist.				MC = 23%		
6			Borehole dry upon completion. Backfilled with cuttings to surface. End of borehole at 4.6 m.				MC = 16%		6
8									8
10									10
12									12
14									14
16									16
18									18

LOGGED BY: DG	COMPLETION DEPTH: 4.6 m
REVIEWED BY: RM	COMPLETION DATE: 18/2/09
	Page 1 of 1

BOREHOLE LOG GP1334.GPJ NORTHERN GEO.GDT 13/3/09

APPENDIX F

AltaGas utilities

Alta Gas Utilities Inc.
Inquiry: 1-866-222-2067
Emergency: 1-866-222-2068
Alberta One-Call
1-800-242-3447

LOCATE RECORD

TICKET # 8383186

Map Ref:
Send To: AGUWET

Header Code: ROUTINE
Type: REGULAR

Work Planned for: Tue, 02/12/2008 10:00 AM
Locate to be completed by: Tue, 02/12/2008 10:00 AM 1 HOUR
Original Call Date: Fri, 28/11/2008 10:07 AM

Contractor: GENTECH DEVELOPMENTS LTD
Contact Name: RANDY BROWN
Alt. Contact: OFFICE
Working for: GENTECH DEVELOPMENTS LTD

Contact Phone: (780)-220-8226 ext.
Contact Fax: (604)-859-8195 ext.
Alt Contact Phone: (780)-985-2448 ext.

City: LEDUC
Address: Street:250 RR
Nearest Intersecting Street: 65 AV

Subdivision:

Add. Dig Info:

Depth: 8-10 FT,Lot: B Block:,Plan: 792 1548,

Type Of Work: RD ALLOW SURVEY FOR W & S
Add. info:

N OF TELFORD LAKE, ON 65 AV IN LEDUC MD BOUNDARY. MAPPED BY
: SW-31 49/24/W4. W 1/2 OF SW QTR. PLS LOCATE BOTH SI OF RD. FR 65 AV S TO
: TELFORD LAKE, 132.2 ACRES. FR E PROP LINE OF BLK B, W TO 43 ST, RD ALLOW ON
: BOTH SI OF 65 AV, ALSO N OF 43 ST, BOTH SI OF RD 1/2 MI, RUNNING PIPELINES.
: PLS CALL PRIOR. TWO TKTS, PLS LOCATE TOGETHER.
Type of Property: PUBLIC AND PRIVATE/COMMERCIAL SEE ADD INFO
<END

Remarks:
HAS THE DIG SITE BEEN PREMARKED (OUTLINED) WITH WHITE PAINT: N
TICKET SENT TO :EMTLEDC FTALED27 AGUWET <END

Completion Info: EUB Guide 30:
Digging Safely Pamphlet:
Locate Form:

Paint:N
Flag:N

Work done at : 12/09/2008 13:48:38 Status: Site Located Locator: JZIJLSTR
Notes:

Date: 12/31/2008 Time: 6:26 AM To: 8,16048598195

AltaGas utilities

Alta Gas Utilities Inc.
Inquiry: **1-866-222-2067**
Emergency: **1-866-222-2068**
Alberta One-Call
1-800-242-3447

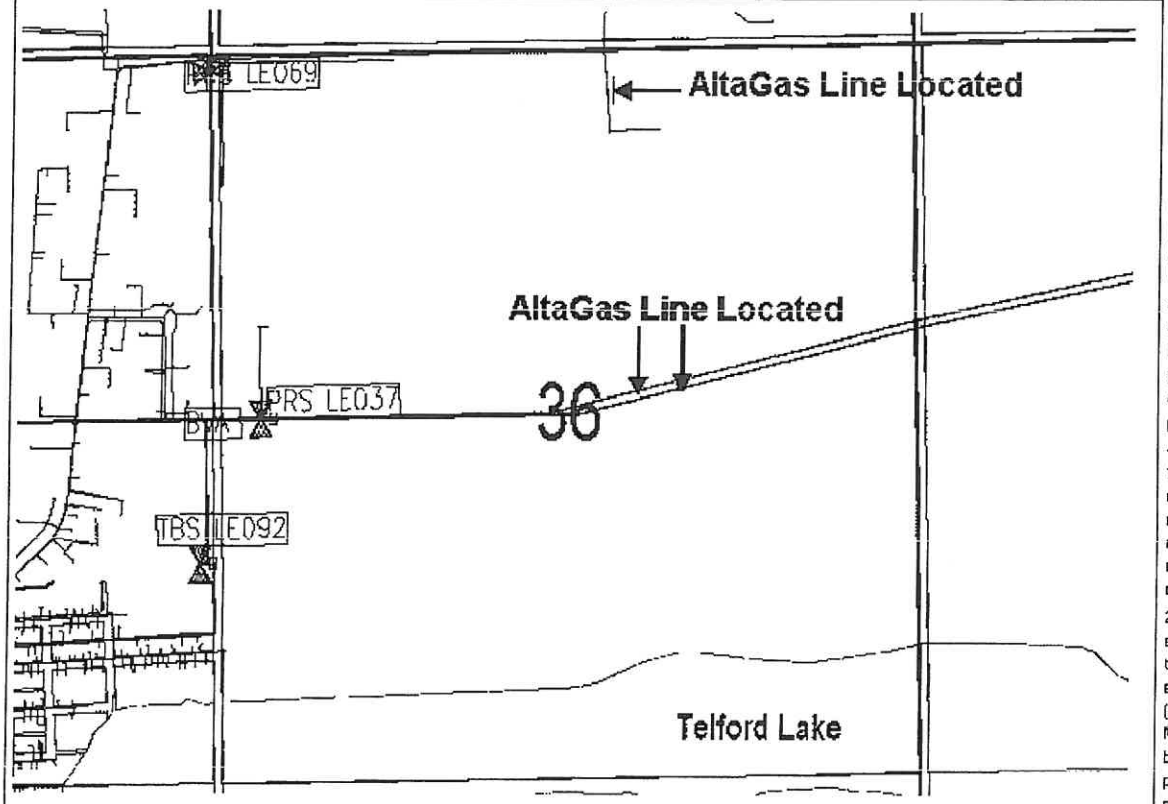
8383186_AGUWET

SKETCH RECORD

TICKET # 8383186

TYPE OF FACILITY | X SERVICE | ☐ SECONDARY | ☐ MAIN | X HIGH PRESSURE

NOTES:



Contractor to Remove Flags After Excavation

CAUTION: IT IS UNLAWFUL TO BUILD ANY STRUCTURE OVER GAS LINES

APPLICANT'S SIGNATURE	TITLE	COMPANY

THIS LOCATE VALID FOR 14 DAYS OR UNTIL MARKINGS HAVE CHANGED OR BECOME OBSCURED

AltaG 7/15

RULES FOR EXCAVATION - MAINS & SERVICE LINES

Consent to crossing and/or excavation is hereby given subject to the applicant's compliance with the terms and conditions on this form.

1. AltaGas Utilities Inc. (AGUI) pipeline must be exposed by hand digging before the use of mechanical excavation equipment is permitted within one(1) metre of the pipeline. Mechanical equipment must not be used within 30 cm of the pipeline, even after hand exposure.

2. Prior to commencement of any work in the proximity of the gas lines, AGUI must be informed so that our personnel may witness the following operations:
A. Initial exposure of company pipelines
B. Inspection of same prior to backfill

3. There must be at least thirty(30) centimetres clearance between the bottom of AGUI pipeline(s) and the top of the crossing pipeline(s) or works.

RULES FOR EXCAVATION - HIGH PRESSURE LINES

1. Written consent must be obtained from AGUI prior to excavation within the pipeline right-of-way, this locate record does not constitute such written consent.

2. The AGUI pipeline must be exposed by hand digging before the use of mechanical excavation equipment is permitted within five (5) metre of the pipeline. Mechanical equipment must not be used within 30 cm of the pipeline, even after hand exposure.

3. Representatives of AGUI must be on site to inspect all excavations within the pipeline right-of-way.

ALL EXCAVATIONS

1. The Applicant shall indemnify AGUI and save AGUI harmless from all manner of action, suits, debts, claims or demands which may occur as a result of the Applicants crossing or excavation of AGUI pipelines.

2. The Applicant is responsible for all damages to AGUI facilities that result from the activities of the Applicant.

3. ALL LOCATIONS MARKED are APPROXIMATE only.

4. All coating damage to natural gas lines must be reported and will be repaired free of charge. Please contact AGUI during normal work hours at 1-866-222-2067

5. Gas lines may be relocated at the property owners expense.

IF YOU ARE PLANNING TO create a ground disturbance

READ THIS BROCHURE CAREFULLY!

Ground disturbance includes such activities as excavating, digging, trenching, plowing, drilling, drilling, augering, backfilling, blasting, stripping soil, levelling; removing peat, quarrying, clearing, grading, or pounding posts.

These actions are all defined as "ground disturbances" in the Pipeline Act and the Pipeline Regulation. Careless construction near pipelines can cause serious accidents—and cost you a lot of money—if you do not follow proper pre- and post-construction procedures.

EXCEPTIONS

Two situations do not qualify as ground disturbances:

1) land disturbances of less than 30 centimetres (cm) that do not reduce the pipeline cover to less than that when first installed, and

2) normal cultivation that does not exceed a 45 cm depth.

The requirements in this brochure apply to all pipelines in Alberta that are licensed by the Energy Resources Conservation Board (ERCB). These include

- operating pipelines,
- discontinued pipelines, and
- abandoned pipelines.

Pipelines under the jurisdiction of the National Energy Board and the Rural Utilities Branch have their own requirements that must be followed.

If you are planning to carry out a GROUND DISTURBANCE anywhere, you must

- search for pipelines for a distance 30 metres (m) beyond the entire perimeter of the area in which you plan to dig, and
- call Alberta One-Call at 1-800-242-3447 to request the location of any buried services.

Note that not all underground services are registered on the One-Call system; do not assume that they are!

Other methods to search for pipelines:

- Call the ERCB to check area records for the existence of pipelines.
- Check with local utility providers.
- Check the land title for the easements or rights-of-way.
- Look for pipeline warning signs near the site. Signs are typically found at road or water crossings.
- Look for wells, tanks, valve stations, and meter stations, which might indicate the presence of pipelines.
- Look for ground settling from previous work.
- Talk to nearby residents and landowners.

Note that in this brochure, the term "dig" includes any of the activities identified as a ground disturbance.

DETERMINE where your project will be in relation to the existing pipeline.

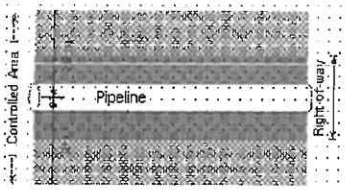
What is a controlled area?

A pipeline's controlled area is the land bordering it for 30 m along each side, measured from the centre of the pipeline.

What is a right-of-way?

A pipeline right-of-way is the land allocated for the pipeline and its maintenance as set out in the agreement between the landowner and the pipeline company. The right-of-way is usually less than the 30 m controlled area, but it may sometimes be more. The width of the right-of-way should be identified on the title or easement.

Do not assume that the pipeline is in the middle of the right-of-way.



If you will be working in the controlled area OUTSIDE the pipeline right-of-way, you must

1) call the pipeline owner at least two full working days before you dig, so the pipeline can be located and marked before you dig, and

2) install temporary fencing, if necessary, to restrict heavy equipment from operating over the pipeline.

If you will be working WITHIN the pipeline right-of-way, you must

1) get written approval from the pipeline owner before you dig;

2) call the pipeline owner at least two full working days before you dig, so the pipeline can be located and marked before you dig;

3) expose the pipeline by hand (hydrovac is acceptable) before digging with machinery within 5 m of the pipeline, requesting attendance of pipeline owner;

4) ensure that NO machinery is used to dig within 60 cm of the pipeline or any distance underneath the pipeline without the supervision of the pipeline owner; and

5) call the pipeline owner at least one full working day before you cover any exposed pipeline.

Remember,

The excavator's responsibilities are to

- search 30 m beyond the dig area;
- check records for the existence of pipelines;
- obtain written permission if working within the pipeline right-of-way;
- call pipeline owner at least two full working days before you dig, so the pipeline position can be marked;
- erect temporary fencing along the right-of-way, if needed;
- construct proper crossings to allow access over the right-of-way, if needed;
- hand expose pipeline before using machinery within 5 m, requesting attendance of pipeline owner;
- not use machinery to dig within 60 cm of pipeline, unless supervised by the owner; and
- call the pipeline owner at least one full working day before covering any exposed pipeline.

The pipeline licensee's responsibilities are to

- provide pipeline information upon request;
- provide reasonable assistance to anyone carrying out a ground disturbance;
- mark the position of the pipeline before a ground disturbance takes place;
- be present, if asked, during hand exposure;
- inspect the pipeline for damage prior to backfilling and keep a written record of this inspection;
- supervise any mechanical excavation taking place within 60 cm of the pipeline or under the pipeline; and
- provide all assistance without cost.

STOP If you hit a pipeline, stop work and notify the owner immediately. Hidden damage could cause a future pipeline failure.

The information in this brochure is intended for use as a guide only. Consult the Pipeline Act and the Pipeline Regulation for the exact wording of these requirements.

For more information, call your local ERCB Field Centre, available 24 hours a day.

Bonnyville (780) 826-5352

Drayton Valley (780) 542-5162

Grande Prairie (780) 538-5138

High Level (780) 926-5399

Medicine Hat (780) 527-3385

Midnapore (403) 297-8303

Red Deer (403) 340-5454

St. Albert (780) 460-3800

Wainwright (780) 842-7570

For more information about the ERCB, contact

Information Services
Energy Resources Conservation Board
640 - 5 Avenue SW
Calgary, AB T2P 3G4
Telephone: (403) 297-8311

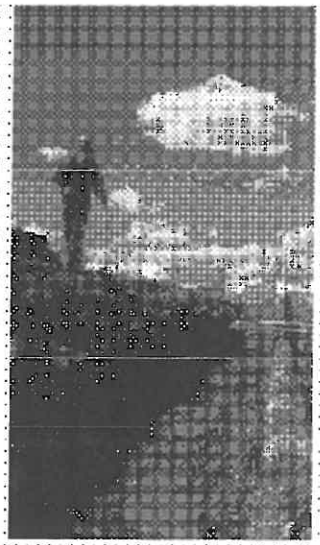
or visit the ERCB Web site www.ercb.ca.

Fourth edition, February 2008

ERCB Energy Resources Conservation Board

Safe Excavation Near Pipelines

Requirements for Landowners and Industry



AltaGas utilities

"A MEMBER OF THE ALBERTA ONE-CALL SYSTEM"

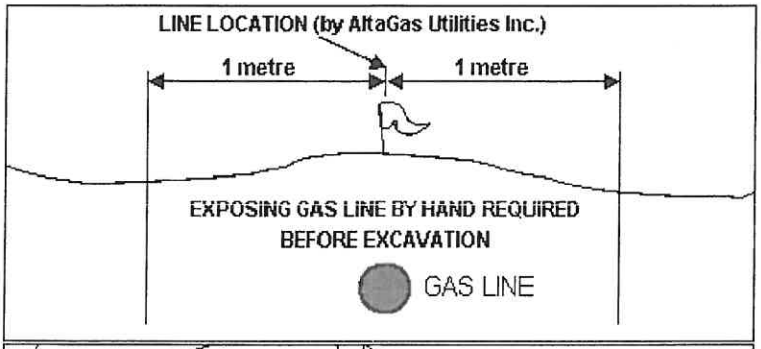
DIGGING SAFELY AROUND NATURAL GAS LINES

Call Before You Dig: **1-800-242-3447**

STEP 1: CALL BEFORE YOU DIG

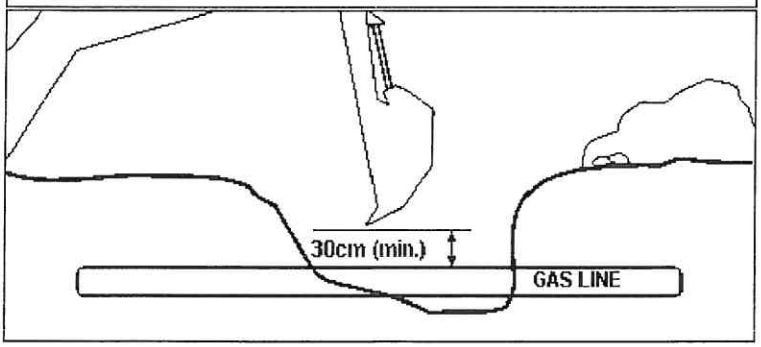
Provincial Regulations make it mandatory that the location of all underground pipelines, cables, and conduits be established and marked in an area where there will be excavation. AltaGas Utilities Inc. is part of the Alberta One-Call system. To request a gas line location from us, call **1-800-242-3447** at least two full working days before your planned excavation.

BE SAFE INSTEAD OF SORRY. Sometimes mix-ups happen. If we have not contacted you within two working days of your location request, don't assume the area is clear of gas lines. Please call us again to make sure there hasn't been confusion of some kind. Your safety and the safety of others is too important to allow it to be the victim of an assumption.



STEP 2: HAND EXPOSE THE GAS LINE

Do not excavate with mechanical equipment within one (1) metre of a gas line without first exposing the line by hand digging. Pipelines may change direction, so expose the pipeline by hand at enough locations to make sure it's where you think it is before using mechanical equipment. Once the gas line has been exposed by hand-digging, mechanical equipment may be used to dig carefully in the vicinity of the line - **but no closer than 30 cm!**



STEP 3: DIG CAREFULLY & SAFELY

Sometimes a gas line is exposed by hand-digging and then damaged once mechanical equipment is used to complete the excavation. Observing the following points can help to ensure that you are not the victim of such damage:

> Be careful not to move or alter any stakes or flags that mark the gas line location - if this happens, DON'T GUESS! Be safe, request another locate.

> If you will be digging in an area away from where the gas line is exposed, don't assume there are no other lines unless we have indicated that our locate covers that area as well.

> Don't use mechanical excavating equipment within 30 cm of a gas line even after it's been exposed - sometimes there are fittings on the line that you can't see and, even if you are careful, the lines can be scratched or punctured.

> Make sure the person operating the equipment understands where the gas lines are and where it is or is not safe to dig. It is strongly recommended you have a helper present at the edge of the excavation to watch for pipelines that the operator might not see and to warn when the operation is getting too close for safe excavation.

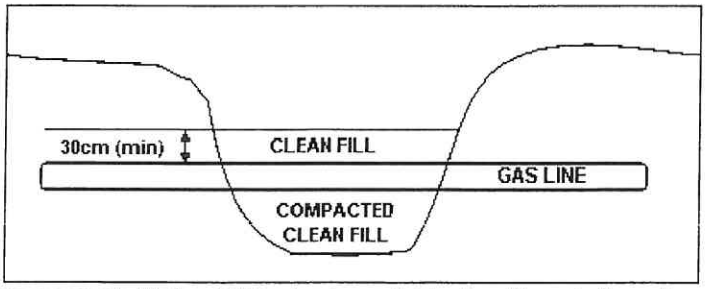
STEP 4: BACKFILL WITH CARE

Gas lines can be broken from the weight of backfill material, if care is not taken. Even if the line isn't broken, the protective coating may be damaged and corrosion may occur in the future. Follow these basic guidelines when backfilling around a gas line:

> Make sure the pipe is properly supported underneath by clean compact fill.

> Make sure fill material that has rocks, sharp objects or frozen dirt does not come in contact with the pipe or pipe coating - padding with clean fill for a minimum of 30 cm on top of the pipe may be required to achieve this.

> Even if the pipe is padded, place but don't dump backfill material over the pipe to prevent stress on the gas line while backfilling is being completed.



Remember - any damage to the pipe, its coating, or tracer wire must be reported to AltaGas Utilities Inc. immediately. **Even if you don't smell or hear escaping gas, the line may be leaking at a point away from the actual damage.**

EMERGENCY INFORMATION

If an AltaGas Utilities Inc. pipeline is damaged during an excavating procedure:

1. Clear people from the vicinity and prevent people from approaching the area from which gas is escaping.
2. Shut off all vehicles and equipment and remove or extinguish all other potential sources of ignition. Do not smoke or allow open flame anywhere near the site.
3. Call AltaGas Utilities Inc. immediately at **1-866-222-2067** or in the case of an emergency at **1-866-222-2068.**
4. Do not attempt to stop the flow of gas if you are not qualified to do so. Do not attempt to extinguish a gas fire until control of the gas flow has been achieved unless it is necessary for rescue or to prevent injury.

APPENDIX G

Julie Vincent

From: Margret Ingibergsson [Margret.Ingibergsson@gov.ab.ca]
Sent: Tuesday, January 20, 2009 7:56 AM
To: Julie Vincent
Subject: 36-49-25-W4M

Thank you for providing the Historic Resources Management Branch of Alberta Culture and Community Spirit with information regarding a proposed development in section 36-49-25-W4M (Block B). There are no previously recorded historic resource sites that will be impacted by this development and as the area appears to be primarily disturbed, there is low likelihood of encountering such sites. Therefore, an Historic Resources Impact Assessment is not required.

Reporting the discovery of historic resources: Pursuant to Section 31 of the *Historical Resources Act*, should any archaeological resources, palaeontological resources and/or historic period sites be encountered during any activities associated with land disturbance operations, the Historic Resources Management Branch must be contacted immediately. It will then be necessary for to issue further instructions regarding the documentation of these resources. If you have any questions regarding the above, please do not hesitate to contact me.

Margret Ingibergsson
Land Use Planner
Historic Resources Management
Alberta Culture and Community Spirit
Old St. Stephen's College
8820 - 112 Street
Edmonton, Alberta T6C 2P8
Phone: (780) 431-2374 / Fax: (780) 422-3106
www.culture.gov.ab.ca

APPENDIX H

Active Earth
Engineering Ltd

April 3, 2009 File 159

Gentech Developments Ltd.
#101C - 33140 Mill Lake Road
Abbotsford, BC
V2S 2A5

Attention: Mr. Randy Brown.

Re: Heartland Industrial Park – Leduc Alberta
Best Management Practices
Concrete Producing Plant

INTRODUCTION

We understand that a concrete producing plant is planned for Lot 22 of the proposed Heartland Industrial Park, just west of the town of Leduc, Alberta. In accordance with your request, Active Earth Engineering Ltd. has prepared a best management practices approach for a concrete producing plant to develop environmental guidelines for construction and operation of the plant. The following letter presents the results of the regulatory review and site conditions, and provides recommendations to mitigate any potential environmental impacts resulting from the construction and operation of the plant.

REGULATORY CONTEXT

Concrete producing plants are regulated in Alberta by the Substance Release Regulation (A,R. 124/93) of the Environmental Protection Act. Specifically, the Regulation provides a Code of Practice for Concrete Producing Plants.

Concrete producers generally also belong to the Alberta Ready Mixed Concrete Association which prescribes to the above-referenced Code of Practice (Code).

This report presents a summary of the requirements of the above documents within the context of the site conditions. A copy of the Code of Practice is included in the Appendix.

Active Earth has also reviewed the following geotechnical report to gain an understanding of the site conditions:

GeoMedia Engineering Ltd., Geotechnical Assessment Report, Proposed Industrial Subdivision, Portions of NE1/4 and SE1/4 36-49-25-4, North Telford Lake, Leduc, AB.

SITE DESCRIPTION AND PROPOSED DEVELOPMENT

The proposed development is located within portions of the NE1/4 and SE1/4 36-49-25-4 in Leduc, Alberta. The location of the site is shown on the attached Site Location Plan (Drawing 159-1). Conceptual plans indicate that the proposed development will consist of a 19 lot industrial subdivision serviced by internal roads on a 52 ha (130 acre) parcel of land. The location of the concrete producing plant is not accurately known at this time.

The site is currently farmland and is bounded by 65 Avenue to the north, Telford Lake to the south and undeveloped farmland to the east and west. The land is developed for industrial purposes further to the west.

The proposed industrial site consists of rolling farmland, which has an approximate 5% slope at the southern portion of the site downward towards Telford Lake. A drainage ditch is located on the northern third of the site. The highest point of land occurs in the southern one-third of the site.

HYDROGEOLOGY

The soil stratigraphy generally consists of:

- Topsoil; overlying
- Clay Till, stiff to very stiff with increasing stiffness with depth, low to medium plastic, and between 4.3 and 7.0 m in depth. Localized pockets of sand and random gravel including cobbles and boulders were also identified; overlying
- Silt, very stiff to hard, between 4.3 and 7.0 m in depth. This layer is considered to be a soft, weathered siltstone with the consistency of a hard soil. The competency of this material generally increases with depth.

Detailed soil descriptions are contained in the GeoMedia geotechnical report.

The depth to groundwater measured on February 20, 2009 varied between 2.1 and 5.2 m in depth in four wells located across the site. Groundwater generally occurs within the upper stiff to very stiff silt. Well locations were not surveyed but have been plotted on a topographic plan provided by Wedler Engineering LLP. Based on this plot groundwater flow is split into two directions; the northern two-thirds flows to the north and the southern third flows to the south towards Telford Lake.

The estimated hydraulic gradient towards Telford Lake is 0.009. The silt is estimated to have a median bulk hydraulic conductivity of 1×10^{-7} m/sec[1]. Based on the above assumptions, the groundwater flow velocity is estimated to be less than 1 m per year. This estimate also assumes that the sand seams identified during the geotechnical investigation are discontinuous and do not provide a direct hydraulic connection to the lake.

[1] Groundwater, Freeze R.A. and Cherry J.A., Prentice-Hall Inc., 1979

DISCUSSION

Concrete producing plants have the following potential environmental issues.

Air Quality

Particulate matter associated with storage of fly ash and cement powder and dust created by on-site traffic.

Wastewater Disposal

Wastewater may be alkaline with typical pH in the range of 11 to 12. It may also contain dissolved solids, including:

- sulphates and hydroxides from cement;
- small amounts of oil and grease from equipment; and
- derivatives of admixtures.

Batch plant effluent is generally discharged into a multi-chambered settling tank equipped with baffles, and an overflow alarm. The settling tank should be equipped with a lid to reduce rainwater accumulation. Typically, a retention time of at least 24 hours is recommended prior to discharge. The pH should be tested and neutralized with a CO_2 percolating system installed in the second chamber as required. Wastewater is generally discharged manually to ground as needed or to a sanitary sewer collection system.

Noise Impacts

Noise impacts associated with plant operations.

Visual Impacts

Visual impacts may result from plant equipment and stockpiles and mobile equipment.

RECOMMENDATIONS

Construction and operation of the concrete plant should conform to the City of Leduc bylaw requirements.

Site Preparation/Conservation

Site preparation will include salvaging all topsoil prior to construction and in accordance with *Soil Quality Relative to Disturbance and Reclamation, Alberta Agriculture, Food and Rural Development, 1987.* Topsoil salvage should not take place during high winds, wet or frozen conditions.

Soil stockpiles should be:

- located on stable ground;
- separated by at least 3m distance from any other stockpile;
- stabilized to prevent erosion; and
- located at least 60 m from any undisturbed buffer zone established next to a watercourse.

Upon completion of operations, the site should be reclaimed to an equivalent land capability as authorized by regulatory authorities. All precautions to prevent erosion should be taken during reclamation operations.

Air Quality

Fugitive emissions should be controlled from fly ash and cement storage silos using a baghouse collection system and should conform to the following standards:

- Opacity (visual emissions) shall not exceed 40%, averaged over six consecutive months and 20% opacity averaged over a period of 6 minutes from each source;
- Concentration of particulates in the effluent stream from the cement and fly ash silos to the ambient air shall not exceed 0.20 gram per kilogram of effluent; and
- Fugitive dust emissions shall not cause an adverse affect.

The baghouse or dust collection system and associated equipment should be inspected on a regular (i.e. weekly) basis. Damaged or malfunctioning equipment should be repaired or replaced as needed.

The proposed development also includes significant paved areas that will enhance dust suppression. A dust management plan should be implemented to include the addition of water on access routes as needed.

Industrial Wastewater

Industrial run-off should be controlled and disposed of in a manner to prevent adverse effects. Potential impacts to groundwater and surface water can be mitigated by developing an operation, monitoring and maintenance plan to include the following environmental components:

1. Based on the topography of the ground surface and the direction of groundwater flow, it is recommended that the concrete plant be located on the northern two-thirds of the property, where groundwater flows away from the lake. The proposed plant location is Lot 22, on the north side of the development.
2. Monitor the level of sludge accumulation in the settling tank and remove the sludge using a vacuum truck when the sludge accumulation reaches 50% of the

depth below the top of the baffle. Allow sludge to dry in a designated area, collect runoff and discharge it through the settling tank and deposit the hardened sludge in a landfill. All concrete wastes should be allowed to harden before landfilling.

3. Adjust the pH of water to meet local discharge requirements.

4. Concrete trucks should be washed out in a designated area. Only concrete from mixer trucks should be discharged into the washout.

5. Surface drainage within the washout area should be contained by berms.

6. The washout area and the disposal pit should be located at least 10 m from any drainage ditches.

7. The disposal pit should be sized to ensure that groundwater mounding does not occur to the point of allowing breakout. An *Industrial Runoff Management Plan* should be developed in accordance with the Code of Practice, such that industrial runoff will not enter any surface water within 500m of the plant. The ground has a relatively low permeability and wastewater will not likely infiltrate the subsurface sufficiently to handle the waste discharge. It is therefore recommended that wastewater be stored in a lined lagoon and discharged to the sanitary sewer as required. The lagoon should be sized based on the waste wastewater discharge volume. Discharge to the sanitary sewer should be acceptable to the City of Leduc.

8. Monitor discharge water quality prior to disposal for pH, dissolved metals, sulphate, alkalinity, Total Dissolved Solids (TDS), Total Suspended Solids (TSS), and mineral oil and grease. The material safety data sheets associated with concrete production should be reviewed for any additives. A monitoring well should be installed downgradient of the disposal lagoon and monitored for the same indicator parameters noted for the discharge. Initially, each batch of discharge water should be analysed for pH to allow for adequate pH adjustment. Groundwater monitoring and sampling should be carried out quarterly.

Reporting and Record Keeping

The registration holder is required to immediately report any contravention of the Code of Practice (Code) in accordance with Part 8 of the Code.

Record keeping shall be in accordance with Part 9 of the Code.

Noise

Plant operations should conform to the City of Leduc bylaw requirements.

Visual Impacts

Visual impacts will be reduced by construction of a 3m high concrete fence set back 1.5m all around the site. An evergreen tree buffer is proposed for the outside of the concrete fence. Access points should be limited to a maximum of two.

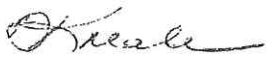
CLOSURE

The findings and conclusions documented in this report have been prepared for specific application to this site and have been developed in a manner consistent with that level of care normally exercised by qualified professionals in accordance with standard practices. The conclusions made in this report reflect Active Earth's best judgement in light of the information available at the time of testing. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Active Earth accepts no responsibility for damages, if any, suffered by a third party as a result of decisions made or actions based on this letter.

We trust that this provides the information you currently require. If you have any questions or require comment, please feel free to contact the undersigned.

Yours truly,

ACTIVE EARTH ENGINEERING LTD



David Kneale, P.Geo.
Senior Hydrogeologist

Appendix A: Drawings
159-1 Site Location Plan
159-2 Site Plan

Appendix B: Code of Practice for Concrete Producing Plants

cc Wedler Engineering LLP

APPENDIX A

DRAWINGS

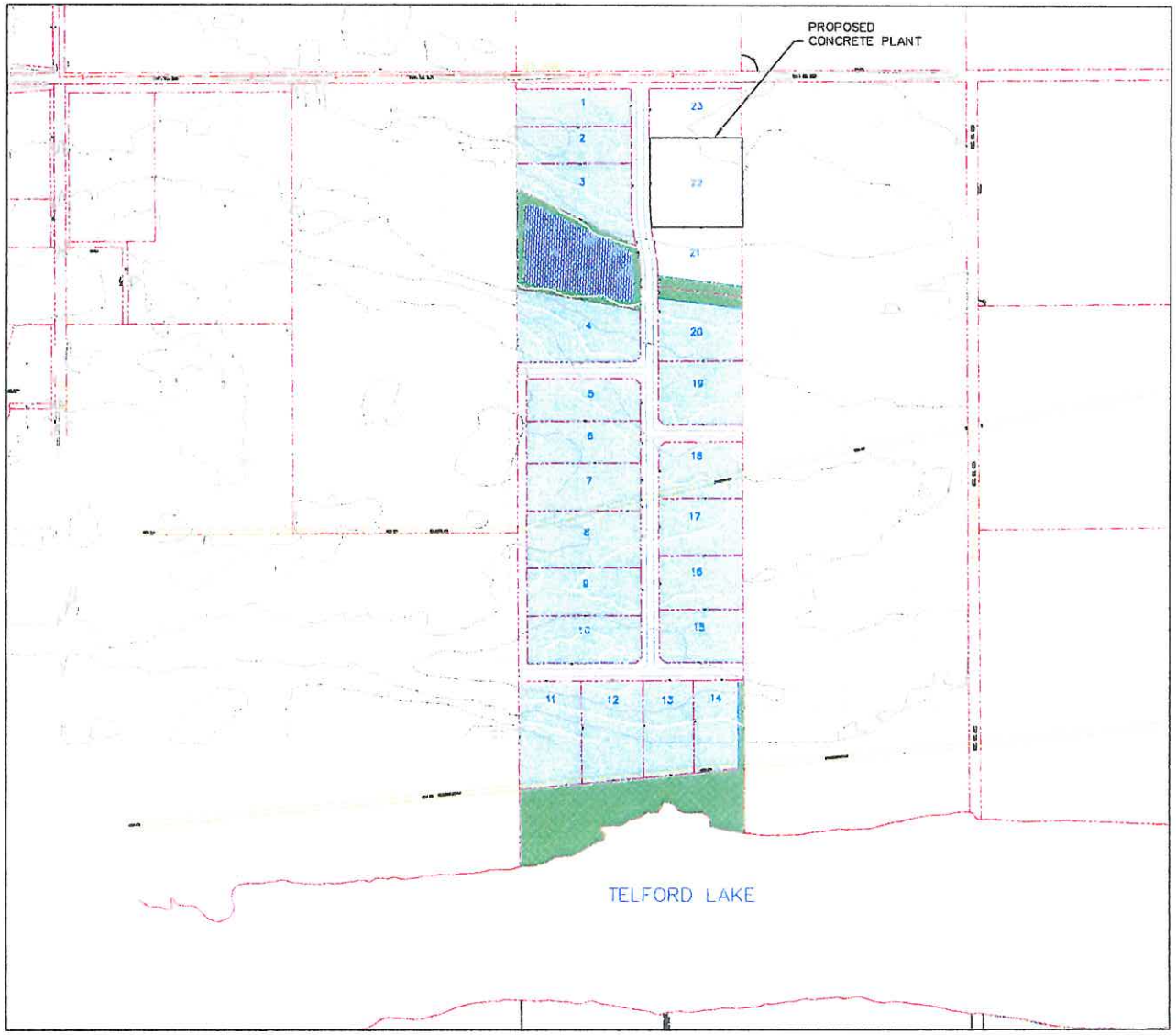
GENTECH DEVELOPMENTS

Active Earth Engineering Ltd

HEARTLAND INDUSTRIAL PARK

LOCATION PLAN

Date: APR 09	Scale: N.T.S.
	Designed: GM
	Checked: DK
	Date:
Drawing No.: 159-1	Issued: A



REFERENCE DRAWINGS		
–	–	–
DWG. NO.	DATE	DESCRIPTION

REVISIONS

0	–	WEDLER ENGINEERING SITE PLAN	–	–
REV.	DATE	DESCRIPTION	BY	CHK

0 125 250

Active Earth Engineering Ltd

CLIENT NAME:	PROJECT LOCATION:
GENTECH DEVELOPMENTS	LEDUC, AB

TITLE:

HEARTLAND INDUSTRIAL PARK
SITE PLAN

DRN BY: GM	SCALE: 1:7500	DATE: 2009-04-07	DWG No: 159-2	REV.: 0
CHK'D: DK	PLOT:	CADFILE:		

APPENDIX B

CODE OF PRACTICE FOR CONCRETE PRODUCING PLANTS

Code of Practice

For

Concrete Producing Plants

Draft: (Dec 6. 2007)

able of Contents

PART 1: DEFINITIONS

1.1.1 All definitions in the Act and the regulations under the Act apply except where expressly defined in this Code of Practice.

1.1.2 In this Code of Practice:

(a) "Act" means the Environmental Protection and Enhancement Act, R.S.A 2000, cE-12, as amended;

(b) "air contaminant" means any solid, liquid, or gas or combination of any of them in the atmosphere resulting directly or indirectly from activities at a concrete producing plant;

(c) "baghouse" means a device that removes particulates from air through a fabric filter;

(d) "concrete producing plant" means a stationary plant that manufactures concrete and has a designed production rate of at least 120 tonnes of concrete per hour or 50 cubic meters of concrete per hour;

(e) "existing concrete producing plant" means a concrete producing plant that was registered before January 1, 2009;

(f) "fugitive emissions" means air contaminant emissions to the atmosphere originating from a concrete producing plant source other than a flue or vent but does not include sources which may occur due to breaks or ruptures in process equipment;

(g) "grab" means an individual sample collected in less than 30 minutes and which is representative of the stream sampled;

(h) "industrial runoff" means surface water resulting from precipitation that falls or traverses the plant developed area;

(i) "industrial wastewater" means the composite of liquid wastes and water-carried wastes, any portion of which results directly from an industrial process carried on by a concrete producing plant;

(j) "ISO 17025" means the international standard, developed and published by the International Organization for Standardization (ISO), specifying the management and technical requirements for laboratories;

(k) "month" means calendar month;

(l) "new concrete producing plant" means any concrete producing plant registered on or after January 1, 2009;

(m) "plant developed area" means the areas of the concrete producing plant used for storage, processing or handling of raw material, recycled material, by-product, finished product, process chemicals, or waste material;

(n) "professional engineer" means a professional member or registered professional technologist (engineering) under the *Engineering, Geological and Geophysical Professions Act*;

(o) "regulations" mean the regulations under the Act;

(p) "subsoil" means the layer of soil directly below the topsoil, to a maximum depth of 1.2 meters below the topsoil surface, that consists of the B and C horizons as defined in *The Canadian System of Soil Classification, 3rd Edition*, Publication 1646, published by Agriculture and Agri-Food Canada, 1998, as amended;

(q) "this Code of Practice" means the Code of Practice for Concrete Producing Plants, published by the Department of Environment, as amended;

(r) "topsoil" means the uppermost layers of soil to a maximum depth of seventy (70) centimeters that consists of:

(i) all of the L, F, and H organic horizons;

(ii) the A and Bp mineral horizons; and

(iii) the O organic horizon to a maximum depth of forty (40) centimeters as defined in The Canadian System of Soil Classification, 3rd edition, Publication 1646, published by Agriculture and Agri-Food Canada, 1998, as amended;

(s) "upper subsoil" means B soil horizons, as defined in *The Canadian System of Soil Classification, 3rd Edition*, Publication 1646, published by Agriculture and Agri-Food Canada, 1998, as amended;

(t) "week" means any consecutive 7-day period.

PART 2: GENERAL REQUIREMENTS

SECTION 2.1: General Requirements

2.1.1 Any registration holder who constructs, operates or reclaims a concrete producing plant must do so in accordance with this Code of Practice.

2.1.2 Any conflict between the application and the terms and conditions of this Code of Practice shall be resolved in favour of this Code of Practice.

2.1.3 The terms and conditions of this Code of Practice do not affect or negate any other requirements under the Act, the regulations or any other applicable legislation.

2.1.4 The terms and conditions of this Code of Practice do not affect any other authorization issued by the Department of Environment.

2.1.5 The terms and conditions of this Code of Practice are severable. If any term or condition of this Code of Practice or the application of any term or condition is held invalid, the application of such term or condition to other circumstances and to the remainder of this Code of Practice shall not affect that invalidity.

2.1.6 If the registration holder monitors for any substances which are the subject of this Code of Practice more frequently than required, using procedures authorized in this Code of Practice, the registration holder shall provide the results of such monitoring to the next report required by this Code of Practice.

2.1.7 The registration holder shall immediately notify the Director in writing if any of the following events occurs:

(a) the registration holder is served with a petition into bankruptcy;

(b) the registration holder files an assignment in bankruptcy or Notice of Intent to make such a proposal;

(c) a receiver or receiver-manager is appointed;

(d) an application for protection from creditors is filed for the benefit of the registration holder under any creditor protection legislation; or

(e) any of the assets which are the subject matter of this Code of Practice are seized for any reason.

2.1.8 The registration holder shall notify the Director in writing within 30 days of when a concrete producing plant either:

(a) permanently ceases operations; or

(b) indefinitely ceases operations for a time period extending more than 6 consecutive months.

2.1.9 If the registration holder has provided notification under 2.1.8(b), the registration holder shall notify the Director in writing within 30 days of recommencement of subsequent operations.

SECTION 2.2: Analytical Requirements

2.2.1 With respect to any monitoring required pursuant to this Code of Practice, the registration holder shall:

(a) collect;

(b) preserve;

(c) store;

(d) handle; and

(e) analyze;

all samples in accordance with the following unless otherwise authorized in writing by the Director:

(i) for air monitoring:

(A) the Methods *Manual for Chemical Analysis of Atmospheric Pollutants*, AEC V93-M1 (1993), published by Alberta Environment, as amended; or

(B) the *Air Monitoring Directive* (1989), published by Alberta Environment, as amended or replaced;

(ii) for industrial wastewater, industrial runoff, and groundwater monitoring:

(A) the *Standards Methods for the Examination of Water and Wastewater* (2005), published by the American Public Health Association, the American Waterworks Association and the Water Environment Federation, as amended; or

(B) the *Methods manual for Chemical Analysis for Water and Wastes* (1996), published by the Alberta Research Council, as amended;

(iii) for wastes:

(A) the *Test Methods for Evaluating Solid Waste, Physical-Chemical Methods*, SW-846 manual, published by the United States Environmental Protection Agency, 1998, as amended; and

(iii) for effluent toxicity tests:

(A) the Biological *Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout*, Environment Canada, Environmental Protection Series 1/RM/13, July 1990, as amended;

(iv) for soil samples:

(A) *Soil Sampling and Methods of Analysis*, Lewis Publishers, 1993, as amended;

(B) the *Test Methods for Evaluating Solid Waste, Physical-Chemical Methods*, USEPA, SW-846; September 1986, as amended;

(C) the Soil Quality Criteria Relative to Disturbance and Reclamation, Alberta Agriculture, March 1987, as amended;

(D) the *Guidance Manual on Sampling, Analysis and Data Management for Contaminated Sites* – Volume I: Main Report, CCME EPC-NCS62E, 1993, as amended;

(E) the *Guidance Manual on Sampling, Analysis and Data Management for Contaminated Sites - Volume II: Analytical Method Summaries*, CCME EPC-NCS66E, 1993, as amended; and

(F) The *Canadian System of Soil Classification, 3rd Edition*, Publication 1646, published by Agriculture and Agri-Food Canada, 1998, as amended

2.2.2 The registration holder shall analyze all samples that are required to be obtained by this Code of Practice in a laboratory accredited with ISO 17025 standard, as amended, for the specific parameters(s) to be analyzed, unless authorized in writing by the Director.

2.2.3 The registration holder shall comply with the terms and conditions of any written authorization issued by the Director under 2.2.2.

PART 3: REGISTRATION APPLICATION/ADMINISTRATION REQUIREMENTS

SECTION 3.1: Application for Registration

3.1.1 An application for registration of a concrete producing plant shall contain at minimum, the following information:
(a) all the information set in Schedule 1; and

(b) any other information requested by the Director.

SECTION 3.2: Reporting of Changes

3.2.1 In addition to any reporting under this Code of Practice, the Act and the regulations, the registration holder shall inform the Director in writing within three (3) months after any change to the information submitted to the Director in an application respecting the concrete producing plant.

3.2.2 The information submitted under 3.2.1 shall include at a minimum, all the following information:
(a) description of the change;

(b) description of the change in emissions or releases resulting from the change; and

(c) description of pollution abatement equipment installed or to be installed as result of the change and includes manufacturers specifications for the pollution abatement equipment.

PART 4: AIR REQUIREMENTS

SECTION 4.1: General Air Requirements

4.1.1 The registration holder shall not release any effluent streams to the atmosphere except as authorized in this Code of Practice.

4.1.2 The registration holder shall release effluent streams to the atmosphere only from the following sources, as designated in the application:
(a) the cement storage silo vent(s);

(b) the flyash storage silo vent(s); or

(c) any other specific sources identified in the application.

4.1.3 Except as provided for by the Director in writing, the registration holder shall control fugitive emissions and any source not specified in 4.1.2 in accordance with 4.1.4.

4.1.4 With respect to fugitive emissions and any source not specified in 4.1.2, the registration holder shall not release a substance or cause to be released a substance that causes or may cause any of the following:
(a) impairment, degradation or alteration of the quality of natural resources; or

(b) material discomfort, harm or adverse effect of the well being or health of a person; or

(c) harm to property or to plant or animal life.

4.1.5 The registration holder shall only operate the process equipment when all the pollution abatement equipment associated with the process equipment is:
(a) fully operational; and

(b) operating.

4.1.6 Particulate matter collected using emission control equipment must be contained and not released into the atmosphere.

SECTION 4.2: Air Emission Limits for Existing Concrete Producing Plants

4.2.1 Until December 31, 2010, all existing concrete producing plants shall comply with 4.2.2 through 4.2.4.

4.2.2 Each storage silo used for the storage of either cement or flyash shall be equipped and operated with a baghouse dust collection system or a dust collection system that is equivalent to or better than a baghouse dust collection system with respect to particulate collection efficiency.

4.2.3 At all times during the operation, the registration holder shall not exceed the visible emission limit of 40% opacity, averaged over a period of six minutes for each source.

SECTION 4.3: Air Emission Limits for existing Concrete Producing Plants, Effective January 1, 2011

4.3.1 Effective January 1, 2011, all existing concrete producing plants shall comply with 4.3.2 through 4.3.3.

4.3.2 Each storage silo used for the storage of either cement or flyash shall be equipped and operated with a baghouse dust collection system or a dust collection system that is equivalent to or better than a baghouse dust collection system with respect to particulate collection efficiency

4.3.3 At all times during the operation, the registration holder shall not exceed the visible emission limit of 20% opacity, averaged over a period of six minutes for each source.

SECTION 4.4: Air Emission Limits for New Concrete Producing Plants, Effective January 1, 2009

4.4.1 Effective January 1, 2009, all new concrete producing plants shall comply with 4.4.2 through 4.4.3.

4.4.2 Each storage silo used for the storage of either cement or flyash shall be equipped and operated with a baghouse dust collection system or a dust collection system that is equivalent to or better than a baghouse dust collection system with respect to particulate collection efficiency.

4.4.3 At all times during the operation, the registration holder shall not exceed the visible emission limit of 20% opacity, averaged over a period of six minutes for each source.

SECTION 4.5: Air Monitoring Requirements

4.5.1 The registration holder shall check the integrity of the baghouse or the equivalent dust collection system and associated equipment on a weekly basis for the following:
(a) damaged or improper connections and seals, and

(b) malfunctioning bags or filtration media.

SECTION 4.6: Fugitive Dust Suppression

4.6.1 The registration holder shall design a dust suppression program to control fugitive dust emissions sources including but not limited to:
(a) raw material storage areas;

(b) roads on plant developed area;

(c) silo and load out areas of plant developed area, and

(d) any other emission source that has potential for fugitive dust emissions.

5.2 The registration holder shall implement the dust suppression program developed in 4.6.1.

5.3 The registration holder shall have a copy of the required document in 4.6.1 on-site and available to the Director upon request.

[illegible] 5: WASTEWATER REQUIREMENTS

[illegible]ON 5.1: Industrial Wastewater

5.1.1 Subject to 5.1.2, the registration holder shall not release industrial wastewater from the concrete producing plant to the surrounding watershed.

5.1.2 For new plants, the registration holder shall manage industrial wastewater consisting only of water used in the concrete producing plant, only using one of these methods or processes:

(a) storage in a lined effluent settling pond; or

(b) to an approved wastewater treatment system; or

(c) as authorized in writing by the Director.

5.1.3 For existing plants, effective January 1, 2011, the registration holder shall manage industrial wastewater consisting only of water used in the concrete producing plant, only using one of these methods or processes:

(a) storage in a lined effluent settling pond; or

(b) to an approved wastewater treatment system; or

(c) as authorized in writing by the Director.

5.1.4 All process liquids contained in aboveground storage tanks, shall be contained in accordance with the *Guidelines for Secondary Containment for Above Ground Storage Tanks* (1997), published by Alberta Environment, as amended.

5.1.5 The approval holder shall use the following when transferring substances to, from, or between tanks, or between trucks:

(a) couplings equipped with seals that are compatible with the substance transferred;

(b) the necessary precautions to prevent spills when the couplings are disconnected;

(c) emergency shut-off valves; and

(d) established transfer areas and associated curbing, paving and catchment areas.

5.1.6 The registration holder shall not install any underground storage tanks, except as authorized in 5.3.1 or for freshwater storage.

5.1.7 Releases from the industrial wastewater system to the surrounding watershed shall meet the requirements specified in TABLE 5.1-A.

TABLE 5.1-A: LIMITS AND MONITORING

PARAMETER	LIMITS	MONITORING FREQUENCY
Acute Lethality Test Using Rainbow Trout (Oncorhynchus mykiss)	50% or greater survival in 100% industrial wastewater sample	One grab sample prior to discharge and one grab sample ONCE PER WEEK during discharge, at the location of the discharge point
pH	6.0 - 9.5 pH units	
Total Suspended Solids	50 mg/L	
Floating solids	Must not be present except in trace amounts	Daily
Visible foam	Must not be present except in trace amounts	Daily
Oil or other substances	Must not be present in amounts sufficient to create a visible film or sheen	Daily

SECTION 5.2: Industrial Runoff

5.2.1 The registration holder shall within nine (9) months after the date this Code of Practice coming into effect, design an Industrial Runoff Management Plan for the management and control of industrial runoff from the concrete producing plant area.

5.2.2 The registration holder shall implement the Industrial Runoff Management Plan developed in 5.2.1.

5.2.3 The registration holder shall have a copy of the required document in 5.2.1 on-site and available to the Director upon request.

5.2.4 The registration holder shall not release industrial runoff in a manner that may result in the industrial runoff entering any surface water within 500 meters of the concrete producing plant, unless otherwise authorized in writing by the Director.

SECTION 5.3: Domestic Wastewater Operational Requirements

5.3.1 The registration holder shall release domestic wastewater generated at the plant only to:

(a) a private sewage disposal system that complies with the Safety Codes Act and its regulations, as amended, for treatment and release of domestic wastewater;

(b) a holding tank from which all domestic wastewater is transferred to a wastewater system that is the subject of an approval or registration under the Act; or

(c) a wastewater system that is the subject of a valid approval, or registration under the Act or a private sewage disposal system that complies with Safety Codes Act and its regulations, where the owner(s) of the wastewater disposal system have provided prior written consent for the release.

SECTION 5.4: Groundwater Monitoring

5.4.1 Only if required in writing by the Director, and in addition to any other monitoring required pursuant to the Act, the regulations, or this Code of Practice, the registration holder shall conduct a

groundwater monitoring program for the plant, in accordance with Schedule 3.

PART 6: WASTE MANAGEMENT REQUIREMENTS

SECTION 6.1: General Waste Management

6.1.1 The registration holder shall within six (6) months after this Code of Practice coming into effect prepare a Spill Response Plan for the concrete producing plant,

6.1.2 The registration holder shall implement the Spill Response Plan developed in 6.1.1.

6.1.3 The registration holder shall have a copy of the required document in 6.1.1 on-site and available to the Director upon request.

6.1.4 The registration holder shall dispose of waste generated at the concrete producing plant only to:
(a) a waste management facility approved or registered under the Act to accept such waste; or

(b) to a facility outside of Alberta approved by a local environmental authority outside of Alberta to accept such waste.

PART 7: CONSERVATION AND RECLAMATION REQUIREMENTS

SECTION 7.1: General

7.1.1 Part 7 applies to all conservation and reclamation at a concrete producing plant, except the conservation and reclamation that are governed by
(a) the Code of Practice for Pits, published by the Department, as amended from time to time; or

(b) the terms and conditions of a disposition or authorization issued under the Public Lands Act.

SECTION 7.2: Conservation

Soil Salvage

7.2.1 Sections 7.2.2 through 7.2.9 apply to new concrete producing plants.

7.2.2 The registration holder shall salvage all topsoil such that all topsoil shall be
(a) salvaged from the area where the concrete producing plant, access road, or subsoil stockpiles will be constructed; and,

(b) salvaged separately from subsoil;

7.2.3 Where topsoil depth is less than 15 cm, topsoil may be salvaged with upper subsoil to a depth of 15 cm from the original land surface provided that the upper subsoil is not rated as 'unsuitable' according to the criteria described in the *Soil Quality Criteria Relative to Disturbance and Reclamation*, published by Alberta Agriculture, Food and Rural Development, 1987, as amended.

7.2.4 The registration holder shall immediately suspend topsoil salvage or subsoil salvage when:
(a) wet, frozen, or other conditions will result in the admixing, degradation or compaction of topsoil or subsoil;

(b) high wind velocities create the potential for the loss of topsoil or subsoil; or

(c) directed in writing by an Inspector.

7.2.5 The registration holder shall only recommence topsoil and subsoil salvage when suspended under 7.2.3 when
(a) conditions referred to in 7.2.4 no longer exist; or

(b) directed in writing by an Inspector.

7.2.6 The person who conducts or reclaims a concrete producing plant, access road, topsoil stockpile, or subsoil stockpile shall record the salvage depths of all:
(a) topsoil; and

(b) upper subsoil.

Soil Stockpiles

7.2.7 All material excavated during the construction of any concrete producing plant, access road, topsoil stockpile, or subsoil stockpile shall be stored in stockpiles until required for reclamation purposes.

7.2.8 The registration holder shall prepare stockpile sites for topsoil, subsoil, or other materials so that:
(a) all stockpile sites are located on stable ground;

(b) all stockpiles are separated from each other by a minimum horizontal distance greater than three (3) metres from any other stockpile;

(c) all topsoil stockpiles are placed directly on topsoil at a location that is not affected by operations;

(d) all subsoil stockpiles are placed directly on subsoil at a location that is not affected by operations;

(e) all other stockpiles are placed on areas where topsoil and upper subsoil have been salvaged;

(f) all topsoil and subsoil stockpiles are stabilized to prevent erosion; and

(g) all topsoil and subsoil stockpiles are located 60 metres or more from any undisturbed buffer zone established next to a watercourse unless otherwise directed in writing by an Inspector.

7.2.9 The requirement in 7.2.8 (b) does not apply where the stockpiles are composed of the same material.

SECTION 7.3: Reclamation

7.3.1 Sections 7.3.2 thru 7.3.17 apply to new concrete producing plants.

7.3.2 The registration holder shall commence reclamation when operations are being abandoned and will cease permanently.

7.3.3 Upon completion of operations, the registration holder shall reclaim concrete producing plant sites, storage areas, and related facility sites to equivalent land capability as authorized in writing by the Director.

7.3.4 The registration holder shall take all necessary precautions to prevent erosion during operations and reclamation, and as directed in writing by an Inspector.

7.3.5 The registration holder shall complete reclamation activities before:
(a) the expiration, surrender or termination of any surface lease; or

(b) the expiry of the operation registration.

7.3.6 All material that was collected or imported during operations shall be removed prior to any reclamation activities.

7.3.7 The registration holder shall obtain written direction from an inspector before importing to, or exporting from, any topsoil or upper subsoil from any operation conducted on public land.

7.3.8 The registration holder shall immediately suspend topsoil salvage or subsoil replacement when:
(a) wet, frozen, or other conditions will result in the admixing, degradation or compaction of topsoil or subsoil;

(b) high wind velocities create the potential for the loss of topsoil or subsoil; or

(c) directed in writing by an Inspector.

7.3.9 The registration holder shall only recommence topsoil and subsoil replacement when suspended under 7.3.8 when
(a) conditions referred to in 7.3.8 no longer exist; or

(b) directed in writing by an Inspector.

7.3.10 The registration holder shall replace topsoil and subsoil as follows:
(a) all subsoil shall be spread evenly and contoured over the operation site; and

(b) all topsoil shall be spread evenly over the replaced subsoil.

7.3.11 The registration holder shall reduce root zone compaction in any replaced subsoil by ripping or fracturing all compacted areas to the depth of compaction, or 30 cm, whichever is greater, before topsoil replacement.

7.3.12 The registration holder shall cultivate any compacted topsoil or alleviate any compaction in topsoil as directed in writing by an inspector.

7.3.13 The registration holder shall remove all infrastructure, contamination, rocks or other debris debris resulting from operations.

7.3.14 The registration holder shall establish integrated surface drainage between all operations and adjacent lands.

7.3.15 The registration holder shall establish a plant community is compatible with the land use intended:
(a) on private land, by the landowner; or

(b) on public land, by the public land manager.

7.3.16 Unless the concrete products plant is exempt pursuant to section 15.1 of the Conservation and Reclamation Regulation, the registration holder shall apply for a reclamation certificate within three (3) full growing seasons following the anticipated completion date of operations, as specified in the registration.

7.3.17 Clause 7.3.16 does not apply to a concrete producing plant, access road, topsoil stockpile, or subsoil stockpile occurring on land that is the subject of an approval issued pursuant to the Act for the construction, operation, and reclamation of specified land.

8: REPORTING REQUIREMENTS

8.1.1 In addition to any other reporting required pursuant to this Code of Practice, the Act, or the regulations under the Act, the registration holder shall immediately report to the Director any contravention of this Code of Practice, either:
(a) by telephone at (780) 422-4505; or

(b) by a method:
(ii) in compliance with the release reporting provisions in the Act and regulations; or

(iii) as authorized in writing by the Director.

8.1.2 In addition to the immediate reporting report in 8.1.1, the registration holder shall provide a report to the Director:
(a) in writing; or
(b) by a method:
(i) in compliance with the release reporting provisions in the Act and the regulations; or

(ii) as authorized in writing by the Director

within seven calendar days of the discovery of the contravention, or within a time period specified in writing by the Director, unless the requirement for the report is waived by the Director.

8.1.3 The report required under 8.1.2 shall contain at a minimum the following information:
(a) a description of the contravention;

(b) the date of the contravention;

(c) the duration of the contravention;

(d) the legal land description of the location of the contravention;

(e) an explanation as to why the contravention occurred;

(f) a summary of all preventative measures and actions that were taken prior to the contravention;

(g) a summary of all measures and actions that were taken to mitigate any effects of the contravention;

(h) a summary of all measures that will be taken to address any remaining effects and potential effects related to the contravention;

(i) the number of the registration issued under the Act for the concrete producing plant, and the name of the person who held the registration at the time the contravention occurred;

(j) the name, and address of the persons responsible for operating the equipment at the time the contravention occurred;

(k) the name, address, phone number and responsibilities of all persons who had charge, management or control of the concrete producing plant at the time the contravention occurred;

(l) a summary of proposed measures that will prevent future contraventions, including a schedule of implementation for these measures;

(m) any information that was maintained or recorded under this Code of Practice, as a result of the incident; and

(n) any other information required by the Director in writing.

1.4 The registration holder shall immediately report to the Director any potential for groundwater contamination resulting from the operation of the concrete producing plant.

: RECORD KEEPING REQUIREMENTS

.1.1 The registration holder shall:

(a) record the following information:

(i) all records that are required to be created under this Code of Practice;

(ii) records for the following:

(A) the performance of air pollution abatement equipment;

(B) details of any modifications to the plant operations; and

(C) a summary of the actions taken by the registration holder to minimize and reduce any emissions;

(iii) a summary of any emissions reductions reports or studies that the registration holder either participated in or conducted independently;

(iv) results of all visual inspections conducted pursuant to 4.5.1;

(v) results of monitoring conducted pursuant to 5.2.5;

(vi) description of all maintenance and repairs to pollution abatement equipment including the date of the maintenance or repairs, the description of maintenance or repairs conducted, the name of the individual or contractor conducting the maintenance or repairs, and the signature of the person conducting the work; and

(vii) all monitoring results required pursuant to this Code of Practice;

(b) keep the records required in (a) available for 5 years from the date the record is created; and

(c) maintain an environmental log and include the information as described in Schedule 2.

9.1.2 The registration holder shall:

(a) retain copies of the following records:

(i) applications submitted to the Department for a registration;

(ii) engineering plans and drawings for the concrete producing plant but not limited to design specifications of the pollution abatement equipment;

(iii) a copy of inspection reports issued by the Department regarding the concrete producing plant;

(iv) the Dust Suppression Plan;

(v) the Industrial Runoff Management Plan;

(vi) the Spill Response Plan;

(vii) all contravention reports;

(viii) all registrations issued under the Act for the concrete producing plant;

(ix) a copy of any written authorizations issued regarding the concrete producing plant; and

(x) any correspondence sent to the Department of Environment; and

(b) make the records required under (a) available for the life of the concrete producing plant.

9.1.3 The results and records in 9.1.1(a) (vii) shall contain at a minimum, all the following information:

(a) the date, location and time of the monitoring, and the name of the person collecting the sample;

(b) the date of analysis;

(c) the laboratory name and person responsible for performing the analysis;

(d) the results of the analysis.

9.1.4 Upon request, the registration holder shall immediately provide any records, reports or data retained in accordance with this Code of Practice to the Director .

PART 10: CODE OF PRACTICE

10.1.1 This Code of Practice will be reviewed as changes in technological or other standards warrant.

Schedule 1

Registration Information for Concrete Producing Plants

eneral Information Regarding the Concrete Producing Plant

(a) Name of person (company) that will construct , operate or reclaim the concrete producing plant,
(b) operating name;
(c) mailing address;
(d) phone number;
(e) facsimile number;
(f) email address;
(g) legal land description;
(h) contact person;
(i) hourly design production capacity of the concrete producing plant;
(j) description of concrete producing plant (e.g. stationary or mobile)
(k) diagram showing the general layout of the facility, including but not limited to:
  (i) vent locations,
  (ii) raw material storage areas,
  (iii) flyash and cement storage silos,
  (iv) mixing plant and load-out areas,
  (v) washout and wastewater locations,
  (vi) surface water drainage and containment ponds
  (vii) access roads
  (viii) areas subject to potential contamination (e.g. fuel tanks, etc.)
(l) description of emission sources,
(m) description of abatement equipment on each emissions source (e.g. dust collection system type, capacity, etc.),
(n) design specifications and manufacturer specifications for abatement technology,
(o) method of domestic wastewater handling
(p) industrial runoff management plan for the management and control of industrial runoff for the site
(q) land use (e.g. agricultural, forested, commercial, industrial)
  (a) pre-operation
  (b) post- operation (anticipated)

Schedule 2

Environmental Log for Concrete Producing Plants

Company Name: _____

Registration No.: _____

Annual Baghouse Inspection

Name of person doing inspection: _____
Baghouse identification (e.g. make, model, number): _____

Notes on the condition of the baghouse:
_____
_____

Actions taken as a result of the inspection:
_____

Inspection by: _____ Date Performed: _____

Notes:
1. One report is required for each baghouse located at the plant.
2. Normally three weekly report pages are required for each baghouse at the plant per year (one line per week). If the baghouse is not used during an entire week and weekly check in conducted, an explanation as to why the baghouse was not used should be entered onto the appropriate line.

Weekly Baghouse Integrity Check

Baghouse Identification (e.g. make, model, number) _____

Name of Person conducting baghouse inspection: _____

Date	Dust passing (yes or no)	Notes: (e.g. damage, incorrect connections, action taken)

Schedule 3

Groundwater Monitoring Protocol

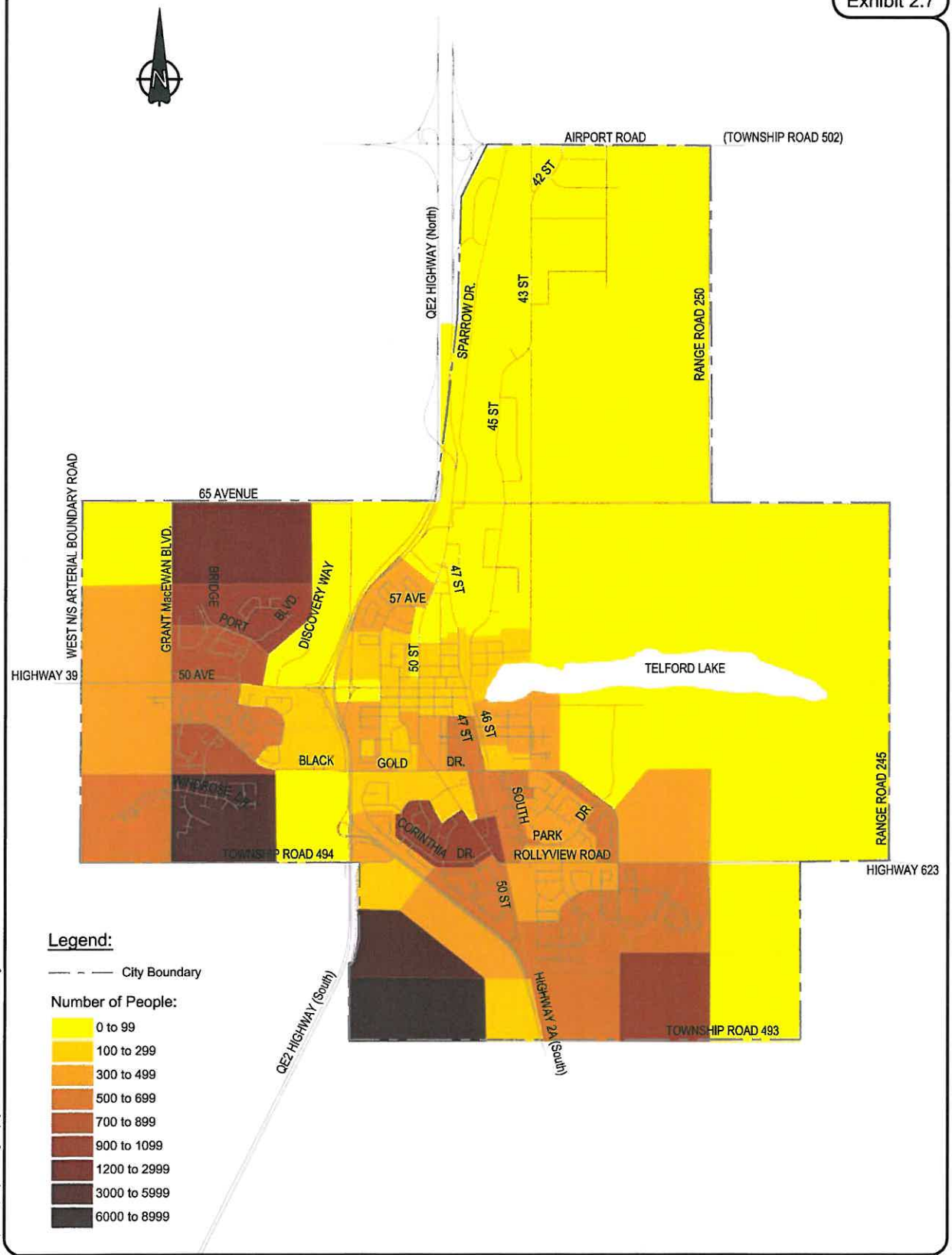
1. The groundwater monitoring program shall:
   (a) be designed by a professional engineer; and
   (b) be conducted in accordance with the design.

2. The registration holder shall analyze each sample obtained under the groundwater monitoring program for each of the following parameters:
   (a) pH;
   (b) conductivity;
   (c) calcium;
   (d) magnesium;
   (e) total hardness;
   (f) sodium;
   (g) potassium;
   (h) iron;
   (i) chloride;
   (j) fluoride;
   (k) sulphate;
   (l) carbonate;
   (m) bicarbonate;
   (n) total alkalinity;
   (o) total dissolved solids (TDS); and
   (p) chemical oxygen demand (COD).

3. In addition to the groundwater monitoring program required under 5.4.1, the registration holder shall take the following measurements at the location of each groundwater monitoring well:
   (a) measure the depth to water at each groundwater monitoring well at the same time as monitoring is conducted pursuant to 5.4.1; and
   (b) after the first year of operation of the industrial effluent settling pond, measure the depth to water at each groundwater monitoring well:
      (i) immediately before effluent settling pond discharge;
      (ii) immediately after each effluent settling pond discharge is complete; and
      (iii) approximately one month after the end of each effluent settling pond discharge.

APPENDIX I

Exhibit 2.7



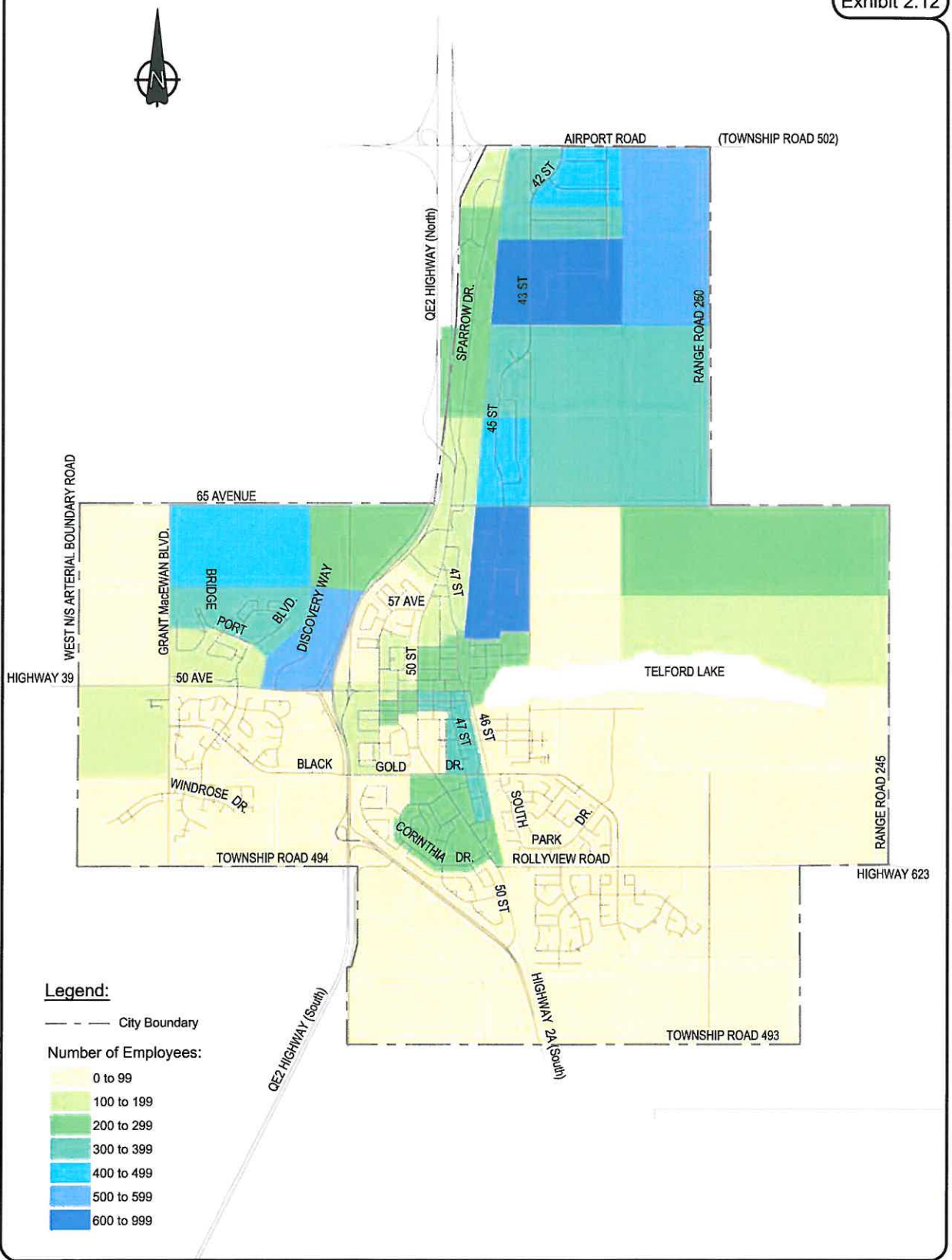
CITY of LEDUC
Transportation Master Plan 2006 - 2016

40,000 Population Distribution

ISL Engineering and Land Services

Theresec Nov. 6, 08 J:\111700\111704_Leduc_2006_Transportation_Study\02-drafting\02a-proj\ect\EXHIBITS-OCT-08\111704-EXH-2.7.dwg

Exhibit 2.12

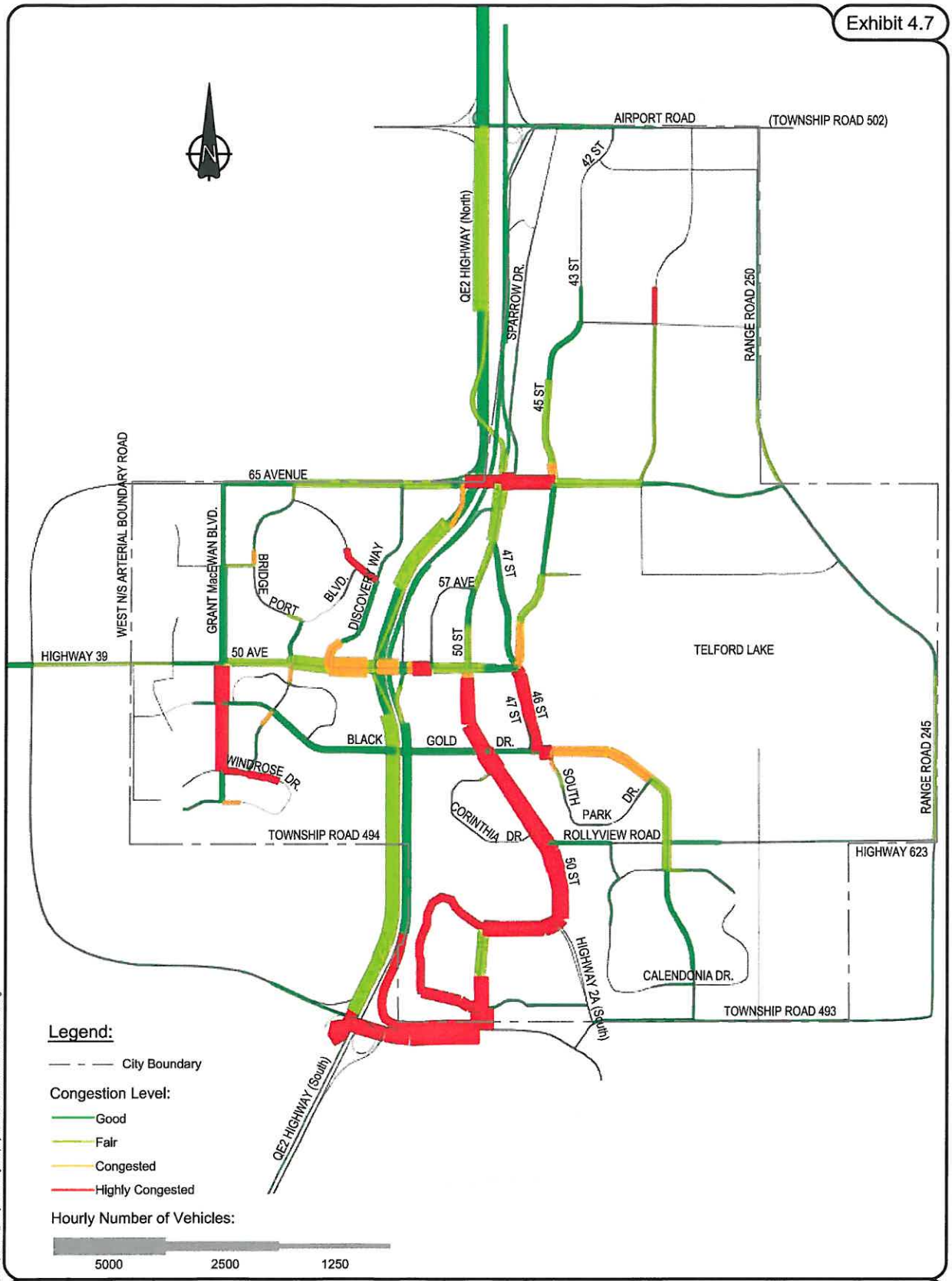


CITY of LEDUC
Transportation Master Plan 2006 - 2016

40,000 Employment Distribution

ISL Engineering and Land Services

Exhibit 4.7



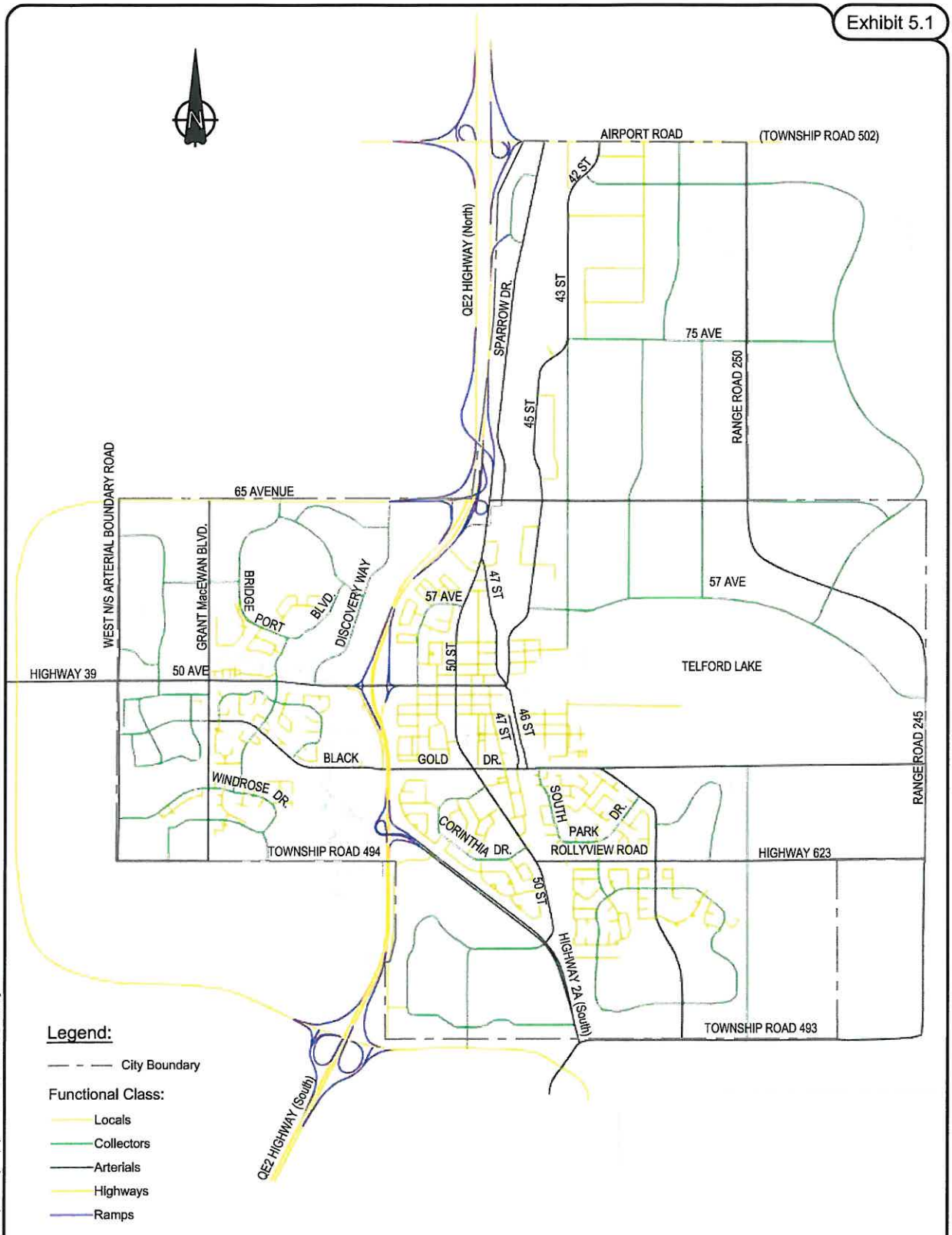
CITY of LEDUC
Transportation Master Plan 2006 - 2016

40,000 Traffic

Engineering and Land Services

Thanssec Nov. 6, 08 J:\11700\11704_Leduc_2005_Transportation_Study\02-drafting\02a-project\EXHIBITS-OCT-08\11704-EXH-4.7.dwg

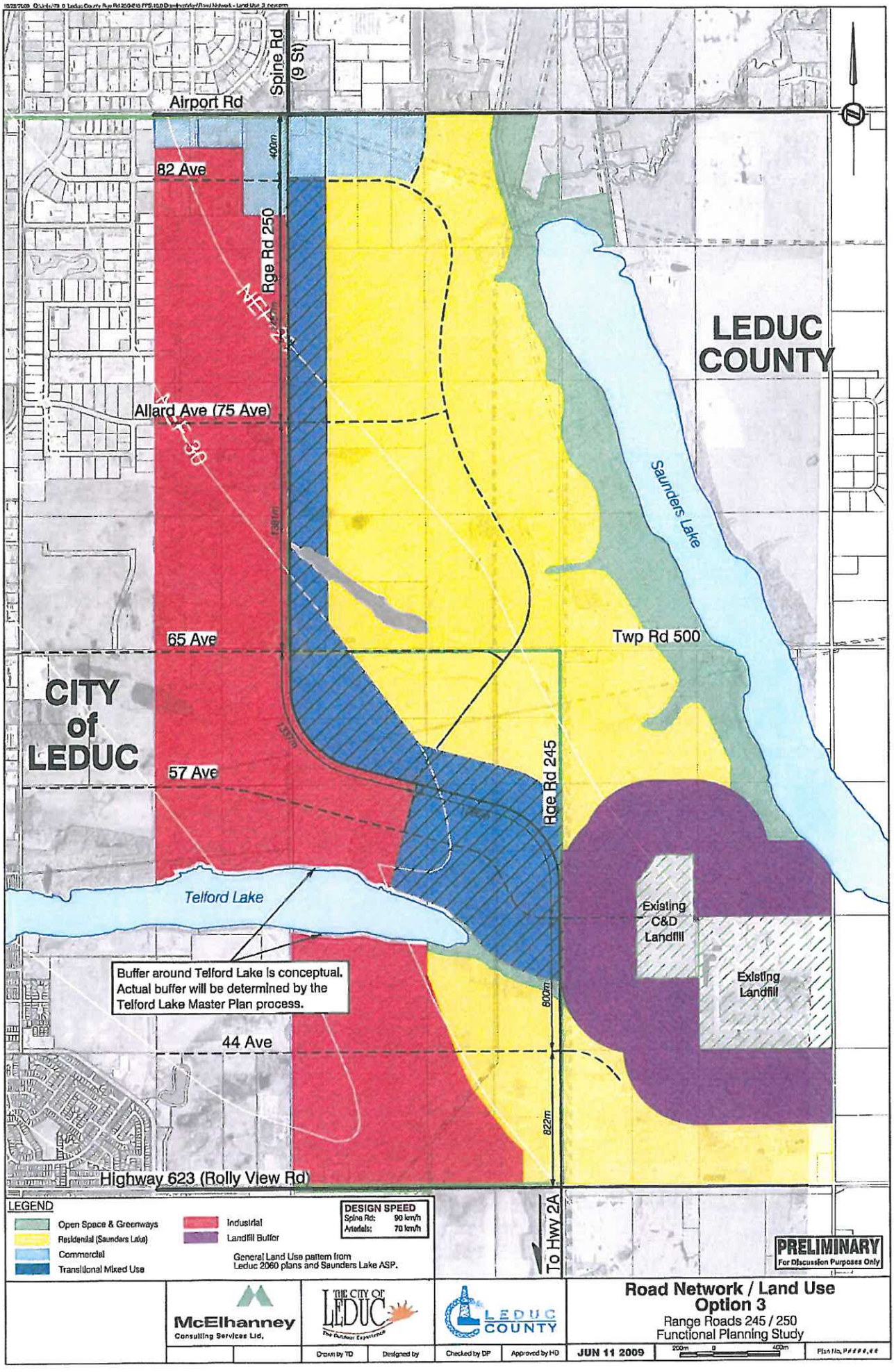
Exhibit 5.1



CITY of LEDUC
Transportation Master Plan 2006 - 2016

Long Term Network

Engineering and Land Services


Airport Rd
Spine Rd (9 St)
82 Ave
Rge Rd 250
NEF 25
NEF 30
Allard Ave (75 Ave)
400m
1381m
1337m
LEDUC COUNTY
Saunders Lake
65 Ave
Twp Rd 500
CITY of LEDUC
57 Ave
Rge Rd 245
Telford Lake
Existing C&D Landfill
Existing Landfill
Buffer around Telford Lake is conceptual. Actual buffer will be determined by the Telford Lake Master Plan process.
800m
44 Ave
822m
Highway 623 (Rolly View Rd)
To Hwy 2A
LEGEND
Open Space & Greenways
Residential (Saunders Lake)
Commercial
Transitional Mixed Use
Industrial
Landfill Buffer
DESIGN SPEED
Spine Rd: 90 km/h
Arterials: 70 km/h
General Land Use pattern from Leduc 2060 plans and Saunders Lake ASP.
PRELIMINARY
For Discussion Purposes Only
McElhanney Consulting Services Ltd.
THE CITY OF LEDUC
LEDUC COUNTY
Road Network / Land Use
Option 3
Range Roads 245 / 250
Functional Planning Study
Drawn by TD
Designed by
Checked by DP
Approved by HD
JUN 11 2009
200m 0 400m

APPENDIX J

TRAFFIC IMPACT ASSESSMENT
NE & SE ¼ SEC 36-49-25-W4M

LEDUC, ALBERTA

Prepared For
INDEPENDENT PERSISTENT MANAGEMENT

Prepared By
WILLIAMS ENGINEERING CANADA INC.

WE FILE NO.: TR-20050.00
APRIL 2009

TRAFFIC IMPACT ASSESSMENT
NE & SE ¼ SEC 36-49-25-W4M

Prepared For

INDEPENDENT PERSISTENT MANAGEMENT

April 2009
WE FILE NO.: TR-20050.00

Prepared by,

Philip Kirkham, E.I.T.
Municipal Engineer

Reviewed by,

Bob Doull, P.Eng.
Municipal Engineer

PERMIT TO PRACTICE
A. D. WILLIAMS ENGINEERING INC.

Signature _____

Date _____

PERMIT NUMBER: P6394

The Association of Professional Engineers, Geologists and Geophysicists of Alberta

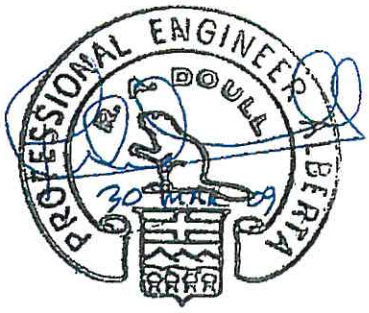


TABLE OF CONTENTS

APPENDICES

RECOMMENDATIONS

Williams Engineering Canada Inc. was retained by Independent Persistent Management to conduct a traffic impact study for a proposed light and medium industrial development in the City of Leduc, Alberta. Two existing and one proposed intersections were studied to establish the impact of the development traffic from the proposed development site as well as the background traffic over a 25-year period. The study evaluated the need for turning lanes at the intersections, requirements for signalization, and illumination requirements. With the addition of one new intersection from the subdivision, the stopping sight distance on the existing roadway alignments were evaluated. An adequate stopping site distance is necessary to allow a driver to react to intersection traffic and safely bring their vehicle to a stop.

This report has been prepared based on the best information available at the time. It is intended to provide a conceptual review of the specific issues. Should assumptions or parameters change, amendments to the study should be made.

Based upon the information contained herein, we have the following comments and conclusions based on full build-out (25-year horizon):

65 Avenue (TWP RD 500) and Site Access

1. The intersection should be built as a Type IVd intersection (see **Figure D-7m** in **Appendix E**) with a highway design speed of 80 kph. The Type IVd intersection design incorporates an eastbound right turning lane and a westbound left turning lane for traffic entering the development from 65 Avenue.
2. Signalization is not required. A stop sign is required for traffic entering 65 Avenue via the site access road.
3. Delineation lighting is required to illuminate vehicles entering the intersection via the site access road.

4. The current level of service along 65 Avenue in the vicinity of the proposed site access road is classified as Type 'A'. The level of service will be reduced to a Type 'B' once the full build-out year is reached.

65 Avenue (TWP RD 500) and Range Road 250

1. The intersection is currently modelled after a Type Ia intersection and should be upgraded to a modified Type IIa intersection (**Figure D-7c** from the Alberta Highway Geometric Design Guide) to handle the increased traffic volumes. See **Appendix E** for intersection figures. Modifications to the Type IIa intersection include:
   - Omitting the 55-18-55 metre three-centred curve along the northeast curb return of the intersection.
   - Omitting the 87.5 metre taper at a ratio of 25:1 along the north side of the east leg of the intersection.
   - Omitting the 25:1 taper along the east side of the north leg of the intersection.
   - All other design details shown on **Figure D-7c** are to be included.
2. Signalization is not required.
3. No illumination is required at this intersection.
4. The current level of service is classified as Type 'A' and will remain a Type 'A' once the full build-out year is reached.

65 Avenue and 45 Street

1. The intersection is currently modelled after **Figure D-7b** (see **Appendix E**) with the following additional design details:
   - Larger turning radii (approximately 35.0 metres in length) on both the northwest and southwest curb returns.
   - The north, south, and west legs of the intersection are approximately 15.0 metres in width and contain four lanes, while the east leg is approximately 9.5 metres in width and contains two lanes.

2. The intersection is currently fully signalized with an advance green for the northbound left turning movement. The signal timing at this intersection may need to be modified to accommodate the additional traffic volumes.

3. The intersection is fully illuminated.

4. 65 Avenue should be widened directly east of 45 Street in order to create a shared through/right lane for westbound traffic. 55.0 metres of storage length are required to accommodate westbound left turning vehicles. Therefore, this shared westbound through/right lane should be approximately 60.0 metres in length to allow vehicles to bypass the westbound left turning vehicle queue.

5. The northeast and southeast curve radii should be increased to 55-18-55 metre three-centered curves to accommodate the turning movements of the larger vehicles generated from the development site.

INTRODUCTION

Williams Engineering Canada Inc. (WE) was retained by Independent Persistent Management to review the traffic impacts associated with the proposed subdivision development in the City of Leduc, Alberta. A traffic impact study was conducted for the location and the findings are covered in this report. A site plan, outline plan, and legal land title plan may be found in **Appendix A**.

BACKGROUND

The development of a light/medium industrial subdivision is proposed to be located on land in Leduc, Alberta. The development site contains approximately 54 hectares (133 acres). The short legal land location is 7921548;B, which is made up of the western halves of both NE ¼ Sec 36-49-25-W4M and SE ¼ Sec 36-49-25-W4M. The east side of the property is bounded by property 7921548;A, while the west side is bounded by both NW ¼ Sec 36-49-25-W4M and SW ¼ Sec 36-49-25-W4M. The north and south sides of the property are bounded by 65 Avenue (Township Road 500) and Telford Lake, respectively.

Three intersections will be analyzed within this assessment. These will include the intersection of 65 Avenue and the site access, the intersection of 65 Avenue and Range Road 250, and the intersection of 65 Avenue and 45 Street. 65 Avenue becomes Township Road 500 outside of the City of Leduc limits, but for ease of presentation will be referred to as 65 Avenue in the report.

EXISTING INFRASTRUCTURE AND CONDITIONS

The existing condition of the infrastructure is as follows:

65 Avenue and Site Access

The proposed intersection will have a "T" configuration. The east and west legs of the intersection consist of 65 Avenue. The south leg of the intersection will consist of the access road leading into the property, which is located approximately 580.0 metres west of Range Road 250. A narrow access road already exists along the northern portion of the proposed site access road alignment. Refer to the outline plan in **Appendix A** for the location of this intersection. The site access road runs north-south through the development and links development phases 1 through 3. The posted speed limit along 65 Avenue in the vicinity of the proposed site access is 70 kph. 65 Avenue is a two-lane cold mix asphalt roadway with an approximate width of 9.0 metres in the vicinity of the proposed site access. It is assumed that the site access road will have a design speed of 60 kph. The development property currently exists as undeveloped farmland.

65 Avenue and Range Road 250

The intersection is a three-way, stop-controlled intersection with the right of way given to traffic along 65 Avenue. The north leg of the intersection consists of Range Road 250. The east and west legs of the intersection consist of 65 Avenue. A private roadway extends into farmland directly to the south of this "T" intersection and is barricaded by a hinged gate at 65 Avenue. The posted speed limit along 65 Avenue in the vicinity of Range Road 250 is 60 kph for trucks and 70 kph for all other vehicles. The posted speed limit along Range Road 250 in the vicinity of 65 Avenue is 60 kph for trucks and not posted for all other vehicles (80 kph on unmarked rural roadways). 65 Avenue is a two-lane cold mix roadway with gravel shoulders and is approximately 8.5 metres in width in the vicinity of Range Road 250. Range Road 250 is a two-lane cold mix asphalt roadway with gravel shoulders and is approximately 7.5 metres in width in the vicinity of 65 Avenue.

65 Avenue and 45 Street

The intersection is a four-way, signalized intersection. The north and south legs of the intersection consist of 45 Street. The east and west legs of the intersection consist of 65 Avenue. The posted speed limit along 65 Avenue west of 45 Street is 50 kph. The speed limit along 65 Avenue immediately east of 45 Street is 50 kph and increases to 70 kph east of 43 Street. The posted speed limit along 45 Street in the vicinity of the intersection is 60 kph. 65 Avenue west of 45 Street is a four-lane paved roadway with lane widths of 3.7 metres. East of 45 Street, 65 Avenue becomes a two-lane paved roadway with an approximate total width of 9.5 metres. 45 Street is a four-lane, paved roadway with lane widths of 3.7 metres.

Design Vehicle and Existing Intersection Turning Radius

The design vehicle used to calculate the minimum turning radii for the three intersections is a Super B-Train (WB-23). The minimum turning radius for this type of vehicle is 12.2 metres. This value was taken from the Alberta Highway Geometric Design Guide.

Design Speed

The design speeds for the intersections are listed below:

Table 1:

Intersection Design Speed

Intersection	Design Speed
65 Avenue and Site Access	80 kph
65 Avenue and Range Road 250	90 kph
65 Avenue and 45 Street	70 kph

Intersection Sight Distance and Stopping Sight Distance

The design should ensure adequate pavement widths of turning roadways and sight distances. Sight distances are factors included in this study. The intersection sight distance considers the speed and distance required for a vehicle to safely conduct a left hand turning movement at an intersection. The stopping sight distance requirements involve factors such as the driver's perception and reaction time and the safe stopping distance at various speeds. **Tables 2 through 7** show those requirements.

Table 2:

Intersection Sight Distance – Site Access and 65 Avenue

Intersection	Intersection Sight Distance			
	Driver Side	Passenger Side	Distance Required (Driver Side)	Distance Required (Passenger Side)
Site Access and 65 Avenue (south leg)	600+ m	600+ m	410 m	410 m

Table 3:

Stopping Sight Distance – Site Access and 65 Avenue

Intersection	Stopping Sight Distance	
	Available Distance	Distance Required
Site Access and 65 Avenue (south leg)	300± m	85 m
Site Access and 65 Avenue (east leg)	600+ m	140 m
Site Access and 65 Avenue (west leg)	600+ m	140 m

Table 4:

Intersection Sight Distance – 65 Avenue and Range Road 250

Intersection	Intersection Sight Distance			
	Driver Side	Passenger Side	Distance Required (Driver Side)	Distance Required (Passenger Side)
65 Avenue and Range Road 250 (north leg)	600+ m	600+ m	410 m	410 m

Table 5:

Stopping Sight Distance – 65 Avenue and Range Road 250

Intersection	Stopping Sight Distance	
	Available Distance	Distance Required
65 Avenue and Range Road 250 (north leg)	250± m	170 m
65 Avenue and Range Road 250 (east leg)	600+ m	140 m
65 Avenue and Range Road 250 (west leg)	600+ m	140 m

Table 6:

Intersection Sight Distance – 65 Avenue and 45 Street

Intersection	Intersection Sight Distance			
	Driver Side	Passenger Side	Distance Required (Driver Side)	Distance Required (Passenger Side)
65 Avenue and 45 Street (north leg)	600+ m	600+ m	410 m	310 m
65 Avenue and 45 Street (south leg)	600+ m	600+ m	310 m	410 m
65 Avenue and 45 Street (east leg)	600+ m	400± m	360 m	360 m
65 Avenue and 45 Street (west leg)	400± m	600+ m	360 m	360 m

Table 7:

Stopping Sight Distance – 65 Avenue and 45 Street

Intersection	Stopping Sight Distance	
	Available Distance	Distance Required
65 Avenue and 45 Street (north leg)	300± m	110 m
65 Avenue and 45 Street (south leg)	600+ m	110 m
65 Avenue and 45 Street (east leg)	600+ m	140 m
65 Avenue and 45 Street (west leg)	600+ m	85 m

The minimum distances required are taken from the Highway Geometric Design Guide. All of the minimum required distances are satisfied.

Site Access

A review of the proposed road intersections was carried out using three considerations: proximity to other access points, proximity to existing intersections, and proximity to existing utilities and structures. Separation is based on the end-point of the nearest edge of approach. With respect to the intersection of 65 Avenue and the site access road, there is a utility box immediately east of the proposed site access road, indicating the presence of a buried cable. Consideration will have to be taken when constructing the access road to ensure the cable is not disturbed. Located approximately 750.0 metres south of 65 Avenue and intersecting the alignment of the proposed site access road is a gas pipeline utility right of way. The gas pipeline enters the west side of the development site approximately 800.0 metres south of 65 Avenue and runs in a northeast direction. The pipeline exits the east side of the development approximately 700.0 metres south of 65 Avenue. Further consideration will have to be taken when constructing the site access road to ensure the gas pipeline is not disturbed.

TRAFFIC VOLUMES

Development/Background Traffic

To determine the development/background traffic volumes, published data available from the City of Leduc was reviewed and summarized.

65 Avenue and Range Road 250

A traffic count, performed on August 12, 2008, was obtained from the City of Leduc at the intersection of 65 Avenue and Range Road 250. A turning movement diagram showing AADT volumes through the intersection is attached in **Appendix B**.

Only Average Annual Daily Traffic (AADT) volumes were recorded in the City of Leduc's traffic counts, so the Design Hourly Volume (DHV) or AM/PM peak hour traffic volume was calculated using **Table A.6.1** from the Alberta Highway Geometric Design Guide. 65 Avenue is currently classified as a Service Class 1B (minor arterial) road, while Range Road 250 is currently classified as a Service Class 3 (local rural) road. According to **Table A.6.1** of the Alberta Highway Geometric Design Guide a K-value of 0.117 corresponds to the aforementioned roadway classes and is used in calculating the DHV.

$$DHV = K*(AADT)$$
$$DHV = 0.117*(AADT)$$

Table 8 shows the 2008 AADT and peak hour volumes acquired from the aforementioned data.

Table 8:

Traffic Volumes: 65 Avenue and Range Road 250

Road	AADT	DHV
East leg (65 Avenue)	200	23
West leg (65 Avenue)	242	28
North leg (Range Road 250)	176	21

65 Avenue and 45 Street

A traffic count, performed on June 5, 2008, was obtained from the City of Leduc at the intersection of 65 Avenue and 45 Street. A turning movement diagram showing AADT volumes through the intersection is attached in **Appendix B**.

Only Average Annual Daily Traffic (AADT) volumes were recorded in the City of Leduc's traffic counts, so the Design Hourly Volume (DHV) or AM/PM peak hour traffic volume was calculated using **Table A.6.1** from the Alberta Highway Geometric Design Guide. In the vicinity of this intersection, 65 Avenue is classified as a Service Class 1B (minor arterial) roadway. 45 Street south of 65 Avenue is currently classified as a Service Class 2 (collector) road, while 45 Street north of 65 Avenue is currently classified as a Service Class 3 (local) road. Therefore, a K-value of 0.117 was used in calculating the DHV.

$$DHV = K*(AADT)$$
$$DHV = 0.117*(AADT)$$

Table 9 shows the 2008 AADT and peak hour volumes acquired from the aforementioned data.

Table 9:

Traffic Volumes: 65 Avenue and 45 Street

Road	AADT	DHV
East leg (65 Avenue)	821	96
West leg (65 Avenue)	9,878	1,156
North leg (45 Street)	11,233	1,314
South leg (45 Street)	8,680	1,016

Projected Background Traffic

Traffic growth rates are calculated as non-compounded. In order to support the average annual growth rate used for analysis purposes, it is important to consider growth rates over various time frames (every five years). This will ensure that a reasonable average annual growth rate is used for analysis purposes. Population data obtained from Alberta Municipal Affairs Official Population List and Statistics Canada from 1991 to 2006 is as follows:

- From 1991-1996: 2.34% growth in population
- From 1996-2001: 4.82% growth in population
- From 2001-2006: 3.84% growth in population

Based on the above rates, an average growth rate of 3.7% was used in calculating future background traffic volumes.

Table 10:

Projected Traffic Volumes: 65 Avenue and Range Road 250 (East Leg)

Year	Projected AADT	Projected Peak Hour
Base Year (2009)	200	23
2014 (5 year)	237	28
2019 (10 year)	274	32
2024 (15 year)	311	36
2029 (20 year)	348	41
2034 (25 year)	385	45

Table 11:

Projected Traffic Volumes: 65 Avenue and Range Road 250 (West Leg)

Year	Projected AADT	Projected Peak Hour
Base Year (2009)	242	28
2014 (5 year)	287	34
2019 (10 year)	332	39
2024 (15 year)	376	44
2029 (20 year)	421	49
2034 (25 year)	466	55

Table 12:

Projected Traffic Volumes: 65 Avenue and Range Road 250 (North Leg)

Year	Projected AADT	Projected Peak Hour
Base Year (2009)	176	21
2014 (5 year)	209	24
2019 (10 year)	241	28
2024 (15 year)	274	32
2029 (20 year)	306	36
2034 (25 year)	339	40

Table 13:

Projected Traffic Volumes: 65 Avenue and 45 Street (East Leg)

Year	Projected AADT	Projected Peak Hour
Base Year (2009)	821	96
2014 (5 year)	973	114
2019 (10 year)	1,125	132
2024 (15 year)	1,277	149
2029 (20 year)	1,429	167
2034 (25 year)	1,580	185

Table 14:

Projected Traffic Volumes: 65 Avenue and 45 Street (West Leg)

Year	Projected AADT	Projected Peak Hour
Base Year (2009)	9,878	1,156
2014 (5 year)	11,705	1,370
2019 (10 year)	13,533	1,583
2024 (15 year)	15,360	1,797
2029 (20 year)	17,188	2,011
2034 (25 year)	19,015	2,225

Table 15:

Projected Traffic Volumes: 65 Avenue and 45 Street (North Leg)

Year	Projected AADT	Projected Peak Hour
Base Year (2009)	11,233	1,314
2014 (5 year)	13,311	1,557
2019 (10 year)	15,389	1,801
2024 (15 year)	17,467	2,044
2029 (20 year)	19,545	2,287
2034 (25 year)	21,624	2,530

Table 16:

Projected Traffic Volumes: 65 Avenue and 45 Street (South Leg)

Year	Projected AADT	Projected Peak Hour
Base Year (2009)	8,680	1,016
2014 (5 year)	10,286	1,203
2019 (10 year)	11,892	1,391
2024 (15 year)	13,497	1,579
2029 (20 year)	15,103	1,767
2034 (25 year)	16,709	1,955

Projected Development Traffic

The development is a 23-lot light and medium industrial subdivision with associated road network, utility infrastructure, municipal and environment reserve land, and public utility lots. Lots 21, 22, and 23 are designated as medium industrial, while Lots 1 through 20 are designated as light industrial. Traffic generation estimates contained herein are based upon the Institute of Transportation Engineers (ITE) Manual, 7th Edition's General Light Industrial Land Use (Code 110). All relevant charts have been attached to **Appendix C**.

ITE estimates are based upon observed measurement. ITE data provides a range of trip generation rates for the specific types of development, along with suggested averages. Estimates are categorized by typical weekday and AM/PM peak hour volumes along the roadway and can be applied on a "per unit area" basis.

Weekday AADT and peak hourly traffic generation rates were calculated using ITE's fitted curve equations for Land Use Code 110 (Average Vehicle Trip Ends vs. No. of Acres). There was no fitted curve equation given for the AM Peak Hour Trip Generation sheet, so a trip rate was estimated using the following methodology:

- Average Rate for AM Peak Hour = 7.51
- Average Rate for PM Peak Hour = 7.26
- Percent difference between the two rates = {(7.51-7.26)/7.26}*100 = 3.44%
- Fitted Curve Rate for PM Peak Hour = 4.56
- Therefore, Estimated Fitted Curve Rate for AM Peak Hour = 4.56*1.0344 = 4.72

Table 17:

Estimated Traffic Volumes from ITE's Light Industrial Land Use (Code 110)

Traffic Volume Period	Acres	Trip Rate	% In	% Out	In	Out	Total
AADT	133	44.20	50	50	2,939	2,939	5,878
AM Peak Hour	133	4.72	83	17	521	107	628
PM Peak Hour	133	4.56	22	78	133	473	606

Development Traffic Intersection Allotment

In order to establish design traffic flows at the intersections, the following traffic flow assumptions have been made:

- The development site has a proposed internal roadway network that links into other proposed tie-ins to 65 Avenue. However, for this study we are assuming 100% of vehicles generated by this development will utilize the single proposed north-south site access road shown on the site plan in **Appendix A.**

- Of the total volume of vehicles entering the subdivision, it is assumed that 80% of them will come from the west along 65 Avenue, while 20% will come from the east along 65 Avenue. It is also assumed that of the total volume of vehicles leaving the subdivision, 80% will take 65 Avenue west, while 20% will head east along 65 Avenue.

- Of the 20% of vehicles entering the development from the east along 65 Avenue the following vehicular distribution is assumed for the intersection of 65 Avenue and Range Road 250:

    - 10% of vehicles will perform a westbound through movement at this intersection. These vehicles will come from the south along Range Road 245, make a left turn onto 65 Avenue, and travel west through the intersection of 65 Avenue and Range Road 250. The remaining 10% of vehicles will come from the north along Range Road 250 and make a southbound right turn onto 65 Avenue.

- The same percentages are assumed for vehicular distribution when exiting the development site with the reverse turning movements at the aforementioned intersections.

- Of the 80% of vehicles entering the development from the west along 65 Avenue, the following vehicular distribution is assumed for the intersection of 65 Avenue and 45 Street:

  - 50% of vehicles will come from 50 Street, head east along 65 Avenue, and perform an eastbound through movement at the intersection of 65 Avenue and 45 Street. 20% of vehicles will come from the south along 45 Street and perform a northbound right turning movement at 65 Avenue and 45 Street. 10% of vehicles will come from the north along 45 Street and perform a southbound left turning movement at 65 Avenue and 45 Street.

  - The same percentages are assumed for vehicular distribution when exiting the development site with the reverse turning movements at the aforementioned intersections.

Background and Development Traffic

The background traffic and development traffic have been combined for the determined projection years. The projected traffic numbers are shown in **Tables 18 through 24** and are broken up according to direction of travel. Note that development traffic volumes remain constant throughout the 25-year development horizon. Full build-out of the development is assumed during the base year and is carried through to the 25th year of development. This provides a more liberal traffic volume estimate.

Table 18:

Projected and Development Traffic Volumes: 65 Avenue East at Range Road 250

Year	Projected AADT	Development Traffic	Combined Traffic
Base Year (2009)	200	588	788
2014 (5 year)	237	588	825
2019 (10 year)	274	588	862
2024 (15 year)	311	588	899
2029 (20 year)	348	588	936
2034 (25 year)	385	588	973

Table 19:

Projected and Development Traffic Volumes: 65 Avenue West at Range Road 250

Year	Projected AADT	Development Traffic	Combined Traffic
Base Year (2009)	242	1,176	1,418
2014 (5 year)	287	1,176	1,462
2019 (10 year)	332	1,176	1,507
2024 (15 year)	376	1,176	1,552
2029 (20 year)	421	1,176	1,597
2034 (25 year)	466	1,176	1,641

Table 20:

Projected and Development Traffic Volumes: Range Road 250 North at 65 Avenue

Year	Projected AADT	Development Traffic	Combined Traffic
Base Year (2009)	176	588	764
2014 (5 year)	209	588	796
2019 (10 year)	241	588	829
2024 (15 year)	274	588	861
2029 (20 year)	306	588	894
2034 (25 year)	339	588	927

Table 21:

Projected and Development Traffic Volumes: 65 Avenue East at 45 Street

Year	Projected AADT	Development Traffic	Combined Traffic
Base Year (2009)	821	4,702	5,523
2014 (5 year)	973	4,702	5,675
2019 (10 year)	1,125	4,702	5,827
2024 (15 year)	1,277	4,702	5,979
2029 (20 year)	1,429	4,702	6,131
2034 (25 year)	1,580	4,702	6,283

Table 22:

Projected and Development Traffic Volumes: 65 Avenue West at 45 Street

Year	Projected AADT	Development Traffic	Combined Traffic
Base Year (2009)	9,878	2,939	12,817
2014 (5 year)	11,705	2,939	14,644
2019 (10 year)	13,533	2,939	16,472
2024 (15 year)	15,360	2,939	18,299
2029 (20 year)	17,188	2,939	20,127
2034 (25 year)	19,015	2,939	21,954

Table 23:

Projected and Development Traffic Volumes: 45 Street North at 65 Avenue

Year	Projected AADT	Development Traffic	Combined Traffic
Base Year (2009)	11,233	588	11,821
2014 (5 year)	13,311	588	13,899
2019 (10 year)	15,389	588	15,977
2024 (15 year)	17,467	588	18,055
2029 (20 year)	19,545	588	20,133
2034 (25 year)	21,624	588	22,211

Table 24:

Projected and Development Traffic Volumes: 45 Street South at 65 Avenue

Year	Projected AADT	Development Traffic	Combined Traffic
Base Year (2009)	8,680	1,176	9,856
2014 (5 year)	10,286	1,176	11,461
2019 (10 year)	11,892	1,176	13,067
2024 (15 year)	13,497	1,176	14,673
2029 (20 year)	15,103	1,176	16,279
2034 (25 year)	16,709	1,176	17,885

ANALYSIS

Illumination Warrant Analysis

A warrant for illumination is based on Geometric, Operational, Environmental, and Collision factors. Charts in Transportation Association of Canada's (TAC's) guide for Illumination of Isolated Rural Intersections were used to conduct this analysis. Charts have been attached to **Appendix D**.

The intersection of 65 Avenue and 45 Street is currently illuminated with lighting structures located on all quadrants of the intersection. Illumination structures are also located along the north side of 65 Avenue and along the east side of 45 Street in the vicinity of the intersection of these two roadways. The intersection of 65 Avenue and Range Road 250 does not currently require any form of illumination nor will a warrant exist for illumination once the full build-out year has been reached. The intersection of 65 Avenue and the site access road will require partial or delineation lighting to illuminate traffic entering 65 Avenue from the development. The table below represents a summary of the data from the illumination warrant charts in **Appendix D**. A value of 120 – 240 warrants partial and/or delineation lighting, whereas a score of less than 120 does not warrant any illumination. **Table 25** summarizes the illumination warrant scores for each intersection.

Table 25:

Illumination Warrants for Base Year and Full Build-Out Year Scenarios

Intersection	Illumination Warrant Score (Base Year – 2009)	Partial and/or Delineation Lighting Warranted	Illumination Warrant Score (Full Build-Out Year – 2034)	Partial and/or Delineation Lighting Warranted
65 Avenue and Site Access	133	Yes	148	Yes
65 Avenue and Range Road 250	28	No	38	No
65 Avenue and 45 Street	156	Yes	161	Yes

The following terminology is used in the illumination warrant:

- "Full intersection lighting" denotes illumination covering an intersection in a uniform manner over the traveled portion of the roadway.
- "Partial lighting" refers to the illumination of key decision areas, potential conflict points, and/or hazards in and on the approach to an intersection. Partial lighting may also guide a driver from one key point to the next, and (if sufficient luminaries are used) place the driver on a safe heading after leaving an illuminated area.
- "Delineation lighting" refers to "sentry" lighting that marks an intersection location for approaching traffic, or to the illumination of vehicles on a cross street or median crossing.

Pedestrian Analysis

It is anticipated that there will be no pedestrian traffic at the three intersections analyzed in this study. Therefore, no pedestrian movement accommodation is warranted.

Intersection Analysis

An intersection configuration was designed for the projected 25-year build out (2034). **Figure D-7.4** from the Alberta Highway Geometric Design Guide has been used to represent initial traffic volume warrants for the intersections at the site. A copy of the intersection types and **Figure D-7.4** has been included in **Appendix E**. This review identifies the need for upgrading of the intersection, and suggests further analysis to determine whether an allowance must be made for left-turn vehicles through provision of a larger intersection configuration.

65 Avenue and Site Access

For the intersection of 65 Avenue and the site access road, the type of intersection needed is shown in **Table 26**. The intersection information was taken from **Figure D-7.4** and **Figure D-7m** of the Alberta Highway Geometric Design Guide. These figures are attached in **Appendix E**.

Table 26:

Intersection Types for 65 Avenue and Site Access Road

	Current Needs (2009)	Full Build-Out (2034)
South Leg	N/A	Type IVd
East Leg	Type Ia	Type IVd
West Leg	Type Ia	Type IVd

Left turn warrants are based upon the level of probability that a vehicle in the advancing traffic stream in the design hour will not arrive at an intersection when another vehicle, traveling in the same direction, is stopped waiting to make a left turn. Taking into account projected and background traffic for the full build-out scenario, more than 50% of vehicles in the advancing traffic stream (westbound along 65 Avenue) will be turning left into the development. Utilizing **Figure D-7.6-4d** from the Alberta Highway Geometric Design Guide reveals that the intersection requires a Type II intersection treatment and there is no additional left storage length required for a left turning lane. However, due to the high level of westbound left turning movements into the development, it is recommended that the intersection be modelled after a higher intersection type.

The Alberta Transportation warrant for a right turn lane requires that the following three conditions are met: the main road have an average daily volume in excess of 1,800 vehicles; the intersecting road have an average daily volume in excess of 900 vehicles; and a right turn volume in excess of 360 vehicles. For this analysis both the main and intersecting roads have AADT volumes in excess of 1,800 and 900 vehicles, respectively. With approximately 2,350 vehicles turning right into the development per day, a right turn lane is warranted for the eastbound right turning movement at this intersection. The volume of vehicles turning right into the development is significant enough to warrant a section of parallel lane to accommodate this turning movement. Therefore, the intersection of 65 Avenue and the site access road should be modelled after a Type IVd intersection design.

Pavement widths of turning roadways depend jointly upon the dimension of the design vehicle and the radius of the turning roadway. According to **Table D.6.3.2**, the minimum pavement width to accommodate a Super B-Train (WB-23) vehicle is 4.6 metres. An additional pavement width of 3.7 metres (7.4 metres total width) exists on all legs of the intersection where tapering and roadway widening is in place as per the Type IVd intersection design. As per **Table 2** in **Figure D-7m** of the Alberta Highway Geometric Design Guide, incorporating a highway design speed of 80 kph results in the following design parameters:

- 87.5 metre taper at a ratio of 25:1 for the right turn taper
- 50.0 metre parallel right turn lane
- 137.5 metres for deceleration (taper plus parallel lane)
- 7.5 metres of storage length

All other design parameters as shown on **Figure D-7m** are to be followed.

65 Avenue and Range Road 250

For the intersection of 65 Avenue and Range Road 250, the type of intersection needed is shown in **Table 27**. The intersection information was taken from **Figure D-7.4** and **Figure D-7c** of the Alberta Highway Geometric Design Guide. These figures are attached in **Appendix E**.

Table 27:

Intersection Types for 65 Avenue and Range Road 250

	Current Needs (2009)	Full Build-Out (2034)
North Leg	Type Ia	Type IIa
East Leg	Type Ia	Type IIa
West Leg	Type Ia	Type IIa

Left turn warrants are based upon the level of probability that a vehicle in the advancing traffic stream in the design hour will not arrive at an intersection when another vehicle, traveling in the same direction, is stopped waiting to make a left turn. Taking into account projected and background traffic for the full build-out scenario, approximately 50% of vehicles in the advancing traffic stream (eastbound along 65 Avenue) will be turning left onto Range Road 250. Utilizing **Figure D-7.6-4d** from the Highway Geometric Design Guide reveals that the intersection requires a Type II intersection treatment and there is no additional storage length required for a left turning lane.

The Alberta Transportation warrant for a right turn lane requires that the following three conditions are met: the main road have an average daily volume in excess of 1,800 vehicles; the intersecting road have an average daily volume in excess of 900 vehicles; and a right turn volume in excess of 360 vehicles. For this analysis both the main and intersecting roads are in excess of 1,800 and 900 vehicles per day, respectively. The westbound right turning movement, however, is less than 360 vehicles per day and therefore a right turn lane is not warranted at this intersection. Taking this data into account, the intersection of 65 Avenue and Range Road 250 should be modelled after a modified Type IIa intersection.

Traffic generated from the industrial development will only perform the eastbound through, eastbound left, westbound through, and southbound right turning movements at the intersection of 65 Avenue and Range Road 250. Therefore, the current northeast curb return radius of 15.0 metres may remain as is. With regards to the recommended modified Type IIa intersection design parameters, the 87.5 metre taper at a ratio of 25:1 on the north side of the eastern leg of the intersection and the 25:1 taper along the east side of the northern leg of the intersection need not be incorporated into the intersection design. The northwest curb return, however, should indeed be designed as per **Figure D-7c** of the Alberta Geometric Highway Design Guide and incorporate a two-centered radius of 16-18 metres. All other design details as shown in **Figure D-7c** are to be followed.

Pavement widths of turning roadways depend jointly upon the dimension of the design vehicle and the radius of the turning roadway. According to **Table D.6.3.2**, the minimum pavement width to accommodate a Super B-Train (WB-23) vehicle is 4.6 metres. An additional pavement width of 3.7 metres (7.4 metres total width) exists on all legs of the intersection where tapering is in place to accommodate vehicle turning movements.

65 Avenue and 45 Street

For the intersection of 65 Avenue and 45 Street, the type of intersection needed is shown in **Table 28**. The intersection information was taken from **Figure D-7.4** and **Figure D-7b** of the Alberta Highway Geometric Design Guide. These figures are attached in **Appendix E**.

Table 28:

Intersection Types for 65 Avenue and 45 Street

	Current Needs (2009)	Full Build-Out (2034)
North Leg	Type Ib	Type Ib
South Leg	Type Ib	Type Ib
East Leg	Type Ib	Type Ib
West Leg	Type Ib	Type Ib

Both the current 2009 scenario and the full build-out (2034) scenario incorporate modified versions of the intersection design seen in **Figure D-7b**. The intersection is currently incorporating the following modifications to the Type Ib intersection:

- A greater turning radius along the northwest and southwest curb returns.
- Two lanes in each direction of travel along the north, south, and west legs.

No visible tapering was observed along any of the four legs of the intersection. Lane widths within the vicinity of the intersection were measured to be 3.7 metres. There is an advance-green filter for vehicles performing a northbound left turning movement and vehicles must yield to opposing southbound traffic during the solid green phase. The southern-most lane along the west leg of the intersection is a right turn only lane onto 45 Street southbound.

Left turn warrants are based upon the level of probability that a vehicle in the advancing traffic stream in the design hour will not arrive at an intersection when another vehicle, traveling in the same direction, is stopped waiting to make a left turn. Currently, shared left/through lanes exist as the inner-most lanes along the north, south, and west legs of the intersection. A left turn warrant analysis was conducted for each leg of the intersection assuming the full build-out scenario. The results are as follows:

- North leg: Approximately 5% of vehicles will be turning left onto 65 Avenue eastbound. A left turn lane is warranted and 10.0 metres of additional storage is required. A shared left/through lane already exists along this leg of the intersection and no modifications are required.

- South leg: Approximately 25% of vehicles will be turning left onto 65 Avenue westbound. A left turn lane is warranted and 55.0 metres of additional storage is required. Assuming 20% of vehicles performing a northbound left turning movement are heavy vehicles, 20.0 metres of additional storage for trucks is required according to **Table D.7.6a** of the Alberta Highway Geometric Design Guide. The total additional storage length required is 75.0 metres. A shared left/through lane already exists along this leg of the intersection and an advance-green turning filter is currently in place to assist in the northbound left turning movement. Therefore, no modifications are required.

- East leg: Approximately 15% of vehicles will be turning left onto 45 Street southbound. A left turn lane is warranted and 40.0 metres of additional storage is required. Assuming 20% of vehicles performing a westbound left turning movement are heavy vehicles, 15.0 metres of additional storage for trucks is required according to **Table D.7.6a** of the Alberta Highway Geometric Design Guide. The total additional storage length required is 55.0 metres. A shared left/through/right lane currently exists for westbound vehicles on the east leg of this intersection. It is recommended that 65 Avenue directly east of 45 Street be widened to allow for the construction of a westbound, shared through/right lane at a length of approximately 60.0 metres. This would allow westbound through/right traffic to bypass the westbound left turning queue.

- West leg: Approximately 40% of vehicles will be turning left onto 45 Street northbound. A left turn lane is warranted and 80.0 metres of additional storage is required. Assuming 20% of vehicles performing an eastbound left turning movement are heavy vehicles, 20.0 metres of additional storage for trucks is required according to **Table D.7.6a** of the Alberta Highway Geometric Design Guide. The total additional storage length required is 100.0 metres. A shared through/left lane already exists along this leg of the intersection. No modifications to this leg of the intersection are required.

The Alberta Transportation warrant for a right turn lane requires that the following three conditions are met: the main road have an average daily volume in excess of 1,800 vehicles; the intersecting road have an average daily volume in excess of 900 vehicles; and a right turn volume in excess of 360 vehicles. For each leg of the intersection, all of the above criteria are met and right turn lanes are warranted. Right turn lanes or shared through/right lanes are already in place along the north, south, and west legs of the intersection. It is recommended that 65 Avenue east of 45 Street be widened for a distance of approximately 60.0 metres to create a shared through/right lane for westbound traffic.

Pavement widths of turning roadways depend jointly upon the dimension of the design vehicle and the radius of the turning roadway. According to **Table D.6.3.2**, the minimum pavement width to accommodate a Super B-Train (WB-23) vehicle is 4.6 metres. It is recommended that the northeast and southeast curb return radii be increased to 55-18-55 metre three-centred curves to accommodate the turning movements of the design vehicle.

Capacity Analysis

The capacity analysis is based on the methods outlined in the Highway Capacity Manual 2000 and HCS+ 2000 analysis software and includes assessments using Alberta Infrastructure and Transportation intersection configuration warrants where necessary. With respect to the Highway Capacity Manual, intersection operations are typically rated by the intersections Level of Service (LOS). LOS is based on the estimated average delay per vehicle among all traffic passing through the intersection. A low average delay merits a LOS 'A' rating, whereas high average delay merits a LOS rating of 'F'. If the level of service drops below 'D', signalization is warranted. Copies of the LOS analysis worksheets have been included in **Appendix F**.

Table 29:

Capacity Analysis/Level of Service

	65 Avenue and Site Access Road	65 Avenue and Range Road 250	65 Avenue and 45 Street
LOS (2009)	N/A	A	N/A
LOS (Full Build Out)	B	A	N/A
Warrant Signalization	No	No	Currently Signalized
Trigger Point	N/A	N/A	N/A

The intersection of 65 Avenue and 45 Street will require additional analysis to aid in vehicular flow through the intersection, specifically, retiming of the signalization cycle lengths. The desired level of service cannot be achieved until such further analysis has been conducted.

Signalization Analysis

A warrant for signalization was conducted for each of the intersections. Charts in the Manual of Uniform Traffic Control Devices for Canada, 4th Edition, were used to conduct this analysis. According to the priority rating worksheet analysis, the intersection must generate 100 priority points to trigger the need for signalization. Priority rating worksheets consider traffic volumes, pedestrian volumes, vehicular stops, crossing gaps, and collisions, the last of which is difficult to forecast over 25 years. Based on the charts for warranting signalization, only the intersection of 65 Avenue and 45 Street requires signalization. This intersection is currently fully signalized and may require additional analysis to ensure the signal timing offers the highest level of service possible through the intersection.

A copy of the signalization analysis worksheets has been included in **Appendix G**. The trigger for signalization is when the traffic levels generate a level of service that drops to Type 'E'.

Operational Analysis

The operational analysis is necessary to ensure that the design vehicle is capable of safely manoeuvring the intersection without interfering with other traffic movements. The design vehicle used to calculate the minimum turning radii for the intersections is a Super B-Train (WB-23). The minimum turning radius for this type of vehicle is 12.2 metres. This value has been taken from the Alberta Highway Geometric Design Guide. Minimum pavement widths and turning radii are met for each of the four intersections.

Roadway Design Standards

Standard cross-sections should meet the minimum design standards as outlined in the City of Leduc Engineering Design Standards. It is recommended that the site access road running through the development follow the design standard for a two-lane industrial/commercial local-rural roadway (**Drawing 3.11** of the City of Leduc's Roadway Design Standards). 65 Avenue should follow the design standard for a four-lane industrial/commercial arterial-rural roadway (**Drawing 3.15** of the City of Leduc's Roadway Design Standards).

Copies of the standard cross-sections have been included in **Appendix H.**

Additional Remarks

The City of Leduc is currently involved in updating its Transportation Master Plan and is looking at upgrading several existing roads within the surrounding area of the industrial site analyzed in this report. The following information has been taken from the Draft Final Report of the "Transportation Study Update – 2006" prepared for the City of Leduc by ISL Engineering and Land Service. Such upgrades being considered include:

- Upgrading 65 Avenue/TWP RD 500 in order to create a continuous arterial roadway from the west to the east of the City of Leduc. This would be achieved by constructing an all-directional interchange at QE2 Highway.

- Connecting Range Road 250 and Range Road 245 along the City's east boundary to create a continuous north-south arterial boundary road along the City of Leduc's east edge.

The aforementioned roadway upgrades would have a significant effect on the trip assignments for developments in the surrounding area. As previously mentioned, Williams Engineering Canada has prepared this Traffic Impact Assessment by utilizing the best information available at the time of this study. Additional analysis may be required as the surrounding area undergoes further development.

CLOSURE

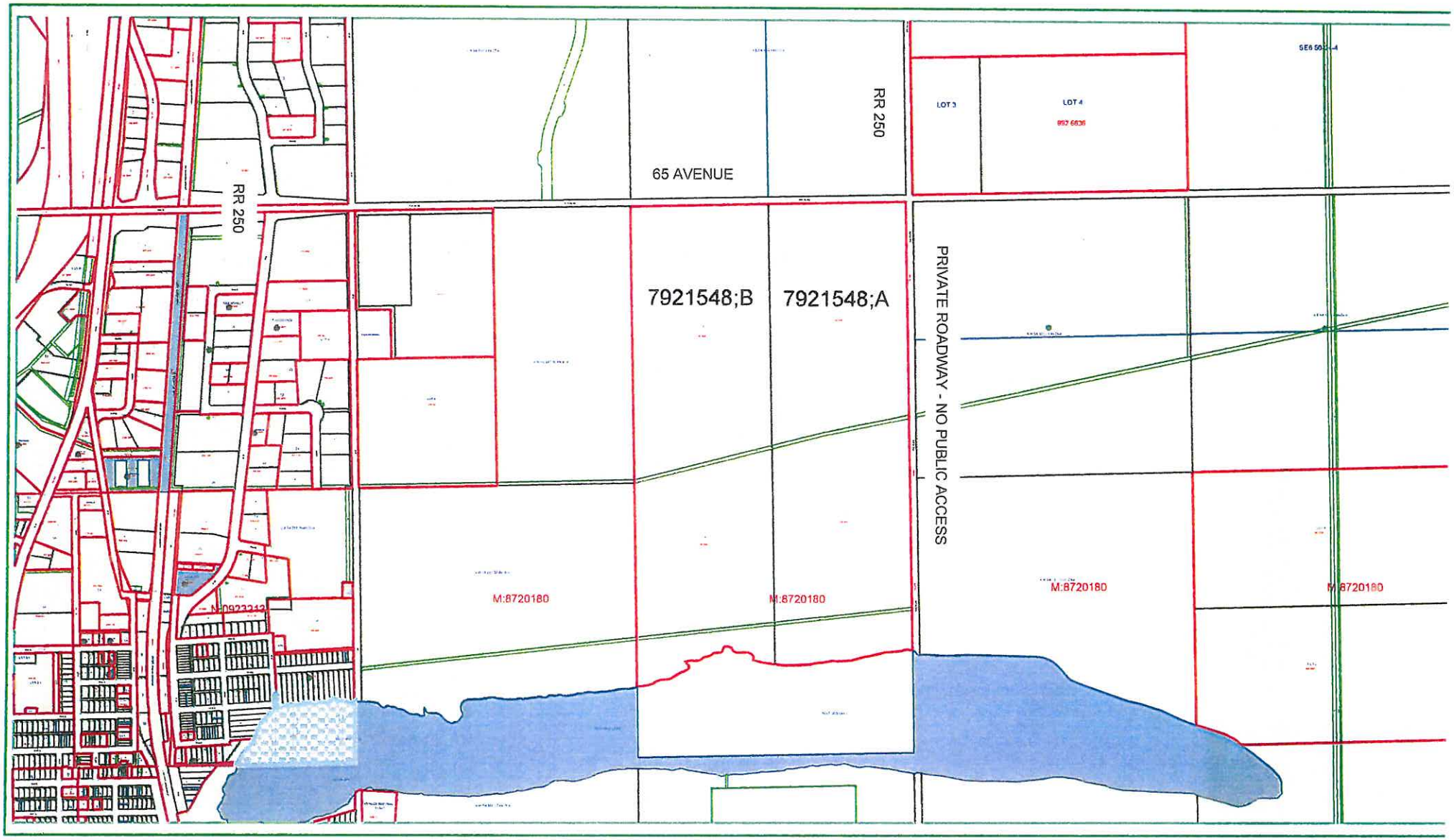
This report has been prepared based upon the information referenced herein. It has been prepared in a manner consistent with good engineering judgement. Should new information come to light, Williams Engineering Canada Inc. requests the opportunity to review this information, and our conclusions contained in this report. This report has been prepared for the exclusive use of Independent Persistent Management and there are no representations made by Williams Engineering Canada Inc. to any other party. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties.

APPENDIX A

SITE MAPS

Alberta Spatial Information System

LEGAL LAND TITLE PLAN



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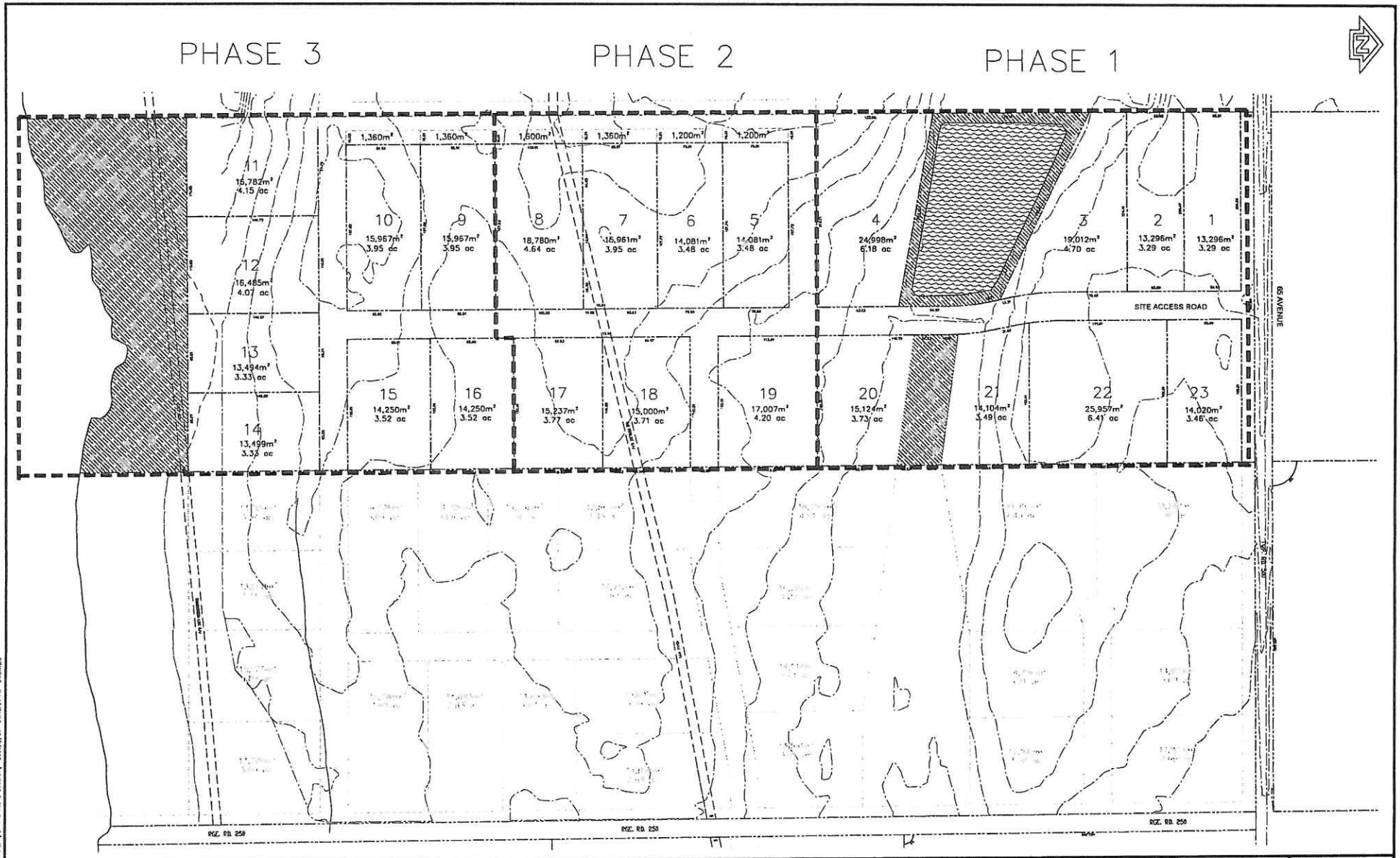

LEGAL:

REMARKS:

NO.	ISSUE / REVISION	YYYY/MM/DD	BY
A	ISSUED FOR REVIEW		

SEAL

PROJ. MGR. ABC
DESIGN/DRAWN ABC
CHECKED
HORZ. SCALE
VERT. SCALE

WEDLER ENGINEERING
201 - 8300 Hunnel Street
Chilliwack, B.C.
V2P 4V7
Tel: (604) 792-0451
Fax: (604) 792-0455
Email: info@wedler.com

CLIENT
PROJECT LOCATION
KEY PLAN

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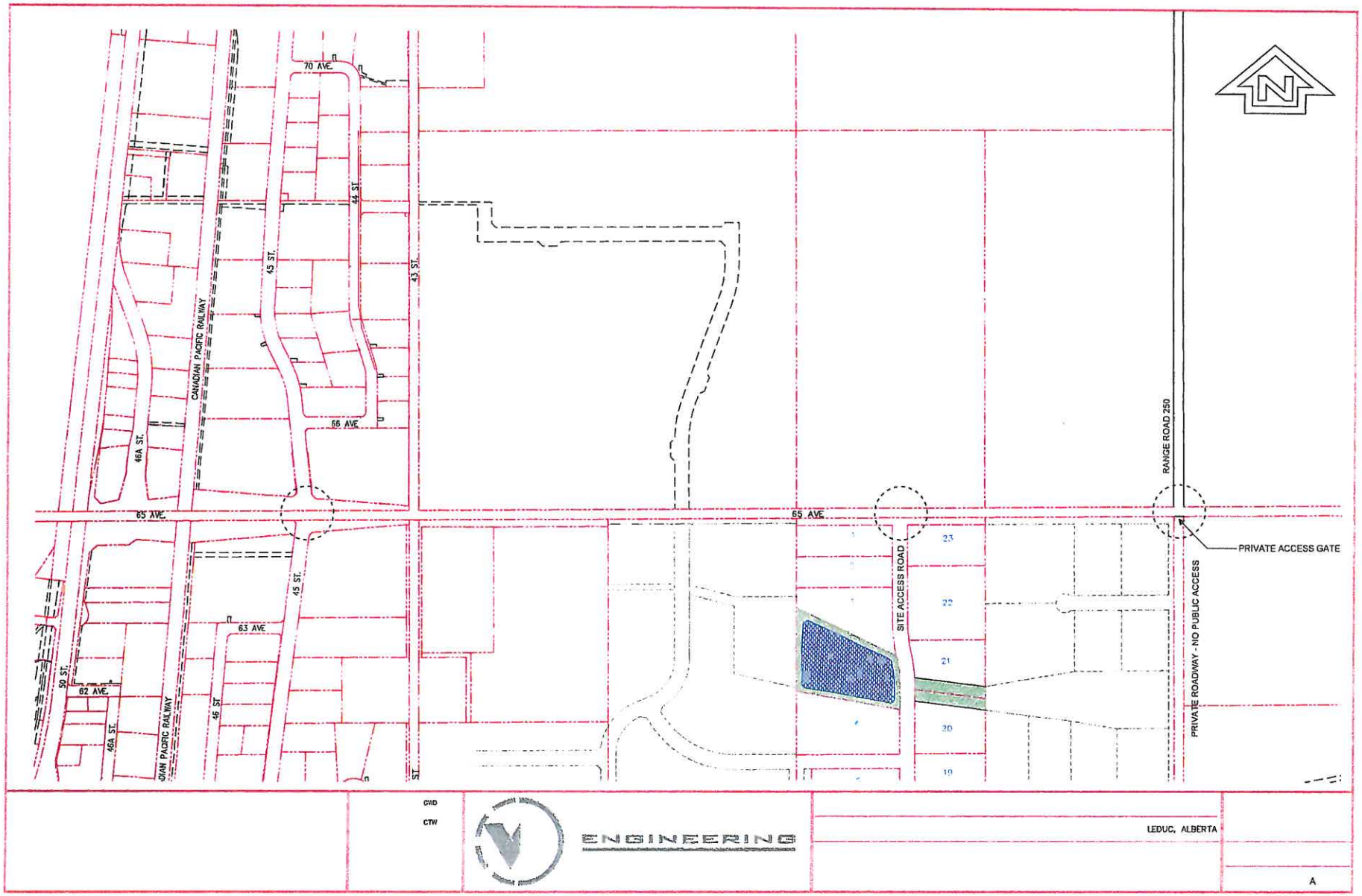

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APPENDIX B

TRAFFIC COUNT DATA AND AADTS

Vehicle Volume Sheet

Range Road 250 and 65th Avenue

Count Date: 12-Aug-08

TIME		Movement												
		1 SB RT		2 SB Through		3 SB LT		4 WB RT		5 WB Through		6 WB LT		7 NB
		PV	HV	PV	HV	PV	HV	PV	HV	PV	HV	PV	HV	PV
7:00 -	7:15	0	0	0	0	0	0	0	0	2	0	0	0	0
7:15 -	7:30	0	0	0	0	0	0	3	0	2	0	0	0	0
7:30 -	7:45	2	0	0	0	0	1	1	0	4	0	0	0	0
7:45 -	8:00	0	0	0	0	0	0	1	0	5	0	0	0	0
8:00 -	8:15	2	0	0	0	0	0	1	0	2	0	0	0	0
8:15 -	8:30	0	0	0	0	1	0	0	0	0	0	0	0	0
8:30 -	8:45	1	0	0	0	0	0	0	0	2	0	0	0	0
8:45	9:00	0	0	0	0	0	0	0	0	0	0	0	0	0
9:00 -	9:15	0	0	0	0	0	0	0	0	0	0	0	0	0
9:15 -	9:30	0	0	0	0	0	0	0	1	1	0	0	0	0
9:30 -	9:45	1	0	0	0	0	1	1	0	2	0	0	0	0
9:45 -	10:00	1	0	0	0	1	0	0	0	0	1	0	0	0
10:00 -	10:15	0	0	0	0	0	0	0	0	0	1	0	0	0
10:15 -	10:30	1	0	0	0	0	0	1	0	3	1	0	0	0
10:30 -	10:45	1	0	0	0	1	1	0	0	1	0	0	0	0
10:45	11:00	0	0	0	0	0	0	1	1	1	0	0	0	0
11:00 -	11:15	0	0	0	0	3	0	1	1	0	1	0	0	0
11:15 -	11:30	1	0	0	0	0	0	0	0	1	0	0	0	0
11:30 -	11:45	1	0	0	0	0	0	0	3	0	0	0	0	0
11:45 -	12:00	4	0	0	0	2	1	1	0	1	1	0	0	0
12:00 -	12:15	3	0	0	0	1	1	0	0	2	0	0	0	0
12:15 -	12:30	0	0	0	0	0	0	0	0	0	1	0	0	0
12:30 -	12:45	0	0	0	0	1	0	0	0	1	0	0	0	0
12:45 -	13:00	0	0	0	0	0	0	1	1	2	1	0	0	0
13:00 -	13:15	1	0	0	0	0	0	0	0	0	0	0	0	0
13:15 -	13:30	1	0	0	0	1	0	0	0	1	0	0	0	0
13:30 -	13:45	0	0	0	0	0	1	0	0	0	0	0	0	0
13:45 -	14:00	1	0	0	0	0	1	0	0	0	0	0	0	0
14:00 -	14:15	3	0	0	0	1	1	0	0	2	0	0	0	0
14:15 -	14:30	1	0	0	0	0	0	0	0	0	0	0	0	0
14:30 -	14:45	0	0	0	0	0	0	0	2	0	0	0	0	0
14:45 -	15:00	1	0	0	0	0	0	0	0	2	0	0	0	0
15:00 -	15:15	0	0	0	0	0	1	0	0	4	0	0	0	0
15:15 -	15:30	2	0	0	0	2	0	0	0	3	1	0	0	0
15:30 -	15:45	4	0	0	0	1	0	0	1	2	0	0	0	0
15:45 -	16:00	2	1	0	0	1	0	1	0	1	0	0	0	0
16:00 -	16:15	0	1	0	0	3	0	0	0	0	0	0	0	0
16:15 -	16:30	2	0	0	0	0	0	1	0	0	0	0	0	0
16:30 -	16:45	7	0	0	0	4	0	0	0	1	0	0	0	0
16:45 -	17:00	0	0	0	0	3	0	1	0	0	0	0	0	0
17:00 -	17:15	2	0	0	0	4	0	0	0	1	0	0	0	0
17:15 -	17:30	2	0	0	0	0	0	0	0	0	0	0	0	0
17:30 -	17:45	2	0	0	0	3	0	0	0	0	0	0	0	0
17:45 -	18:00	1	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL		50	2	0	0	33	9	15	10	49	8	0	0	0

Vehicle Volume Summary Sheet

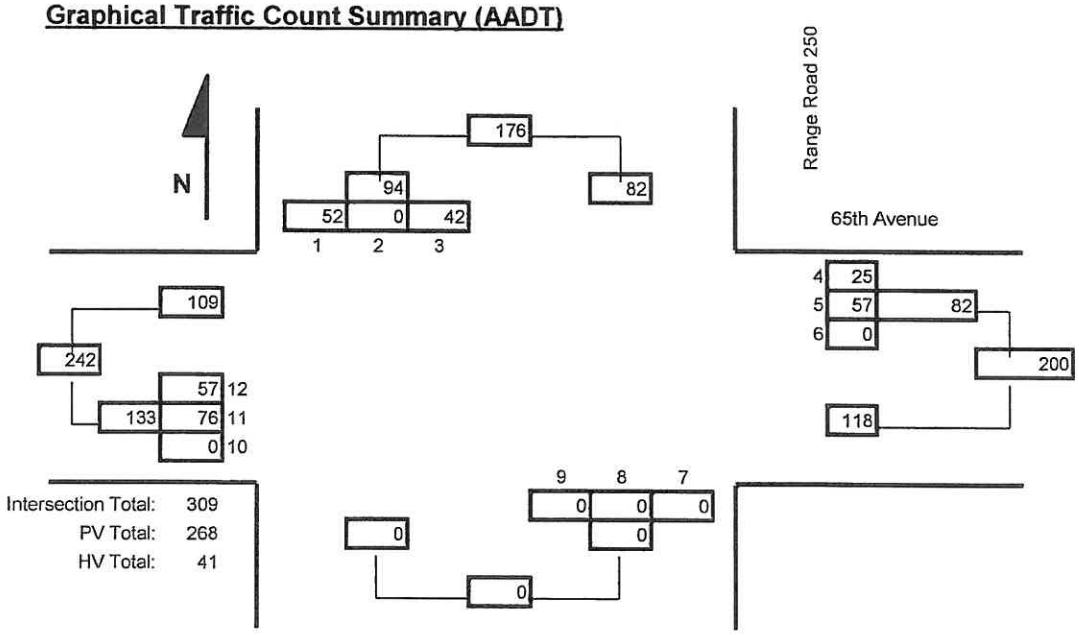
Range Road 250 and 65th Avenue
Count Date: 12-Aug-08

TIME		MOVEMENT												Total
		1	2	3	4	5	6	7	8	9	10	11	12	
7:00 -	7:15	0	0	0	0	2	0	0	0	0	0	0	0	2
7:15 -	7:30	0	0	0	3	2	0	0	0	0	0	0	1	6
7:30 -	7:45	2	0	1	1	4	0	0	0	0	0	2	3	13
7:45 -	8:00	0	0	0	1	5	0	0	0	0	0	2	2	10
8:00 -	8:15	2	0	0	1	2	0	0	0	0	0	3	2	10
8:15 -	8:30	0	0	1	0	0	0	0	0	0	0	0	0	1
8:30 -	8:45	1	0	0	0	2	0	0	0	0	0	0	1	4
8:45	9:00	0	0	0	0	0	0	0	0	0	0	2	1	3
9:00 -	9:15	0	0	0	0	0	0	0	0	0	0	1	0	1
9:15 -	9:30	0	0	0	1	1	0	0	0	0	0	0	1	3
9:30 -	9:45	1	0	1	1	2	0	0	0	0	0	0	0	5
9:45 -	10:00	1	0	1	0	1	0	0	0	0	0	1	1	5
10:00 -	10:15	0	0	0	0	1	0	0	0	0	0	2	1	4
10:15 -	10:30	1	0	0	1	4	0	0	0	0	0	3	0	9
10:30 -	10:45	1	0	2	0	1	0	0	0	0	0	2	1	7
10:45	11:00	0	0	0	2	1	0	0	0	0	0	0	0	3
11:00 -	11:15	0	0	3	2	1	0	0	0	0	0	1	1	8
11:15 -	11:30	1	0	0	0	1	0	0	0	0	0	1	1	4
11:30 -	11:45	1	0	0	3	0	0	0	0	0	0	1	1	6
11:45 -	12:00	4	0	3	1	2	0	0	0	0	0	2	2	14
12:00 -	12:15	3	0	2	0	2	0	0	0	0	0	2	2	11
12:15 -	12:30	0	0	0	0	1	0	0	0	0	0	2	0	3
12:30 -	12:45	0	0	1	0	1	0	0	0	0	0	0	2	4
12:45 -	13:00	0	0	0	2	3	0	0	0	0	0	1	4	10
13:00 -	13:15	1	0	0	0	0	0	0	0	0	0	1	1	3
13:15 -	13:30	1	0	1	0	1	0	0	0	0	0	0	5	8
13:30 -	13:45	0	0	1	0	0	0	0	0	0	0	1	1	3
13:45 -	14:00	1	0	1	0	0	0	0	0	0	0	0	0	2
14:00 -	14:15	3	0	2	0	2	0	0	0	0	0	2	1	10
14:15 -	14:30	1	0	0	0	0	0	0	0	0	0	2	1	4
14:30 -	14:45	0	0	0	2	0	0	0	0	0	0	1	1	4
14:45 -	15:00	1	0	0	0	2	0	0	0	0	0	1	0	4
15:00 -	15:15	0	0	1	0	4	0	0	0	0	0	3	1	9
15:15 -	15:30	2	0	2	0	4	0	0	0	0	0	2	1	11
15:30 -	15:45	4	0	1	1	2	0	0	0	0	0	1	1	10
15:45 -	16:00	3	0	1	1	1	0	0	0	0	0	1	5	12
16:00 -	16:15	1	0	3	0	0	0	0	0	0	0	4	2	10
16:15 -	16:30	2	0	0	1	0	0	0	0	0	0	6	1	10
16:30 -	16:45	7	0	4	0	1	0	0	0	0	0	4	0	16
16:45 -	17:00	0	0	3	1	0	0	0	0	0	0	1	3	8
17:00 -	17:15	2	0	4	0	1	0	0	0	0	0	7	2	16
17:15 -	17:30	2	0	0	0	0	0	0	0	0	0	5	1	8
17:30 -	17:45	2	0	3	0	0	0	0	0	0	0	5	1	11
17:45 -	18:00	1	0	0	0	0	0	0	0	0	0	1	2	4
TOTAL		52	0	42	25	57	0	0	0	0	0	76	57	309

Entering Intersection		Exiting Intersection		Leg Totals	
North Leg (1+2+3)	94	North Leg (4+8+12)	82	North Leg	176
East Leg (4+5+6)	82	East Leg (3+7+11)	118	East Leg	200
South Leg (7+8+9)	0	South Leg (2+6+10)	0	South Leg	0
West Leg (10+11+12)	133	West Leg (1+5+9)	109	West Leg	242
Total	309	Total	309		

'	8		9		10		11		12		TOTAL		EQIV VEHICLES
RT	NB Through		NB LT		EB RT		EB Through		EB LT				EQ/HV: 3
HV	PV	HV	PV	HV	PV	HV	PV	HV	PV	HV	PV	HV	
0	0	0	0	0	0	0	0	0	0	0	2	0	2
0	0	0	0	0	0	0	0	0	1	0	6	0	6
0	0	0	0	0	0	0	2	0	3	0	12	1	15
0	0	0	0	0	0	0	2	0	2	0	10	0	10
0	0	0	0	0	0	0	3	0	2	0	10	0	10
0	0	0	0	0	0	0	0	0	0	0	1	0	1
0	0	0	0	0	0	0	0	0	1	0	4	0	4
0	0	0	0	0	0	0	1	1	1	0	2	1	5
0	0	0	0	0	0	0	1	0	0	0	1	0	1
0	0	0	0	0	0	0	0	0	1	0	2	1	5
0	0	0	0	0	0	0	0	0	0	0	4	1	7
0	0	0	0	0	0	0	1	0	1	0	4	1	7
0	0	0	0	0	0	0	2	0	1	0	3	1	6
0	0	0	0	0	0	0	2	1	0	0	7	2	13
0	0	0	0	0	0	0	1	1	1	0	5	2	11
0	0	0	0	0	0	0	0	0	0	0	2	1	5
0	0	0	0	0	0	0	1	0	1	0	6	2	12
0	0	0	0	0	0	0	0	1	1	0	3	1	6
0	0	0	0	0	0	0	0	1	1	0	2	4	14
0	0	0	0	0	0	0	2	0	2	0	12	2	18
0	0	0	0	0	0	0	2	0	2	0	10	1	13
0	0	0	0	0	0	0	1	1	0	0	1	2	7
0	0	0	0	0	0	0	0	0	2	0	4	0	4
0	0	0	0	0	0	0	1	0	4	0	8	2	14
0	0	0	0	0	0	0	1	0	1	0	3	0	3
0	0	0	0	0	0	0	0	0	4	1	7	1	10
0	0	0	0	0	0	0	1	0	1	0	2	1	5
0	0	0	0	0	0	0	0	0	0	0	1	1	4
0	0	0	0	0	0	0	1	1	0	1	7	3	16
0	0	0	0	0	0	0	2	0	1	0	4	0	4
0	0	0	0	0	0	0	1	0	1	0	2	2	8
0	0	0	0	0	0	0	1	0	0	0	4	0	4
0	0	0	0	0	0	0	2	1	1	0	7	2	13
0	0	0	0	0	0	0	2	0	1	0	10	1	13
0	0	0	0	0	0	0	1	0	1	0	9	1	12
0	0	0	0	0	0	0	1	0	5	0	11	1	14
0	0	0	0	0	0	0	4	0	2	0	9	1	12
0	0	0	0	0	0	0	6	0	1	0	10	0	10
0	0	0	0	0	0	0	3	1	0	0	15	1	18
0	0	0	0	0	0	0	1	0	3	0	8	0	8
0	0	0	0	0	0	0	7	0	2	0	16	0	16
0	0	0	0	0	0	0	5	0	1	0	8	0	8
0	0	0	0	0	0	0	4	1	1	0	10	1	13
0	0	0	0	0	0	0	1	0	2	0	4	0	4
0	0	0	0	0	0	0	66	10	55	2	268	41	391

Graphical Traffic Count Summary (AADT)



65 Avenue and 45 Street

Count Date: Thursday, Jun 5, 2008

City of Leduc

Vehicle Volume Summary Sheet

TIME	MOVEMENT												Total
	1	2	3	4	5	6	7	8	9	10	11	12	
7:00 - 7:15	11	20	0	0	4	1	0	54	26	22	7	42	187
7:15 - 7:30	16	11	1	1	0	0	2	56	36	16	5	54	198
7:30 - 7:45	18	15	0	0	2	0	0	135	30	28	5	99	332
7:45 - 8:00	15	19	3	3	5	0	1	109	33	59	5	94	346
8:00 - 8:15	23	27	2	2	3	1	1	44	40	41	7	60	251
8:15 - 8:30	22	19	1	0	3	1	2	43	37	26	6	28	188
8:30 - 8:45	15	16	0	1	1	2	2	25	30	28	10	23	153
8:45 9:00	14	19	1	1	4	1	0	18	29	37	2	23	149
11:30 - 11:45	59	33	2	2	2	2	2	24	35	36	4	32	233
11:45 - 12:00	93	58	0	2	2	0	5	30	37	44	0	63	334
12:00 - 12:15	102	71	2	1	3	4	0	21	39	59	1	61	364
12:15 - 12:30	64	41	2	0	6	2	1	23	37	38	5	74	293
12:30 - 12:45	55	31	1	1	4	1	2	39	32	36	6	60	268
12:45 - 13:00	45	23	1	3	5	1	1	65	26	50	7	106	333
13:00 - 13:15	41	32	1	2	2	1	0	35	30	37	9	46	236
13:15 13:30	26	19	0	4	8	1	2	22	28	41	1	50	202
16:00 - 16:15	76	69	0	1	0	0	0	28	45	44	1	25	289
16:15 - 16:30	72	77	1	0	5	0	1	23	36	36	1	27	279
16:30 - 16:45	123	121	1	0	9	0	3	29	58	39	3	36	422
16:45 - 17:00	84	96	2	2	6	4	1	22	59	43	10	34	363
17:00 - 17:15	111	129	1	2	5	2	2	22	29	55	6	22	386
17:15 - 17:30	67	58	1	0	6	2	0	20	38	44	8	26	270
17:30 - 17:45	48	72	0	0	4	2	1	19	25	48	7	19	245
17:45 18:00	30	39	0	0	3	0	2	12	26	28	6	17	163
TOTAL	1230	1115	23	28	92	28	31	918	841	935	122	1121	6484
Factored Total (2.533 x Total)	3116	2824	58	71	233	71	79	2325	2130	2368	309	2839	16424

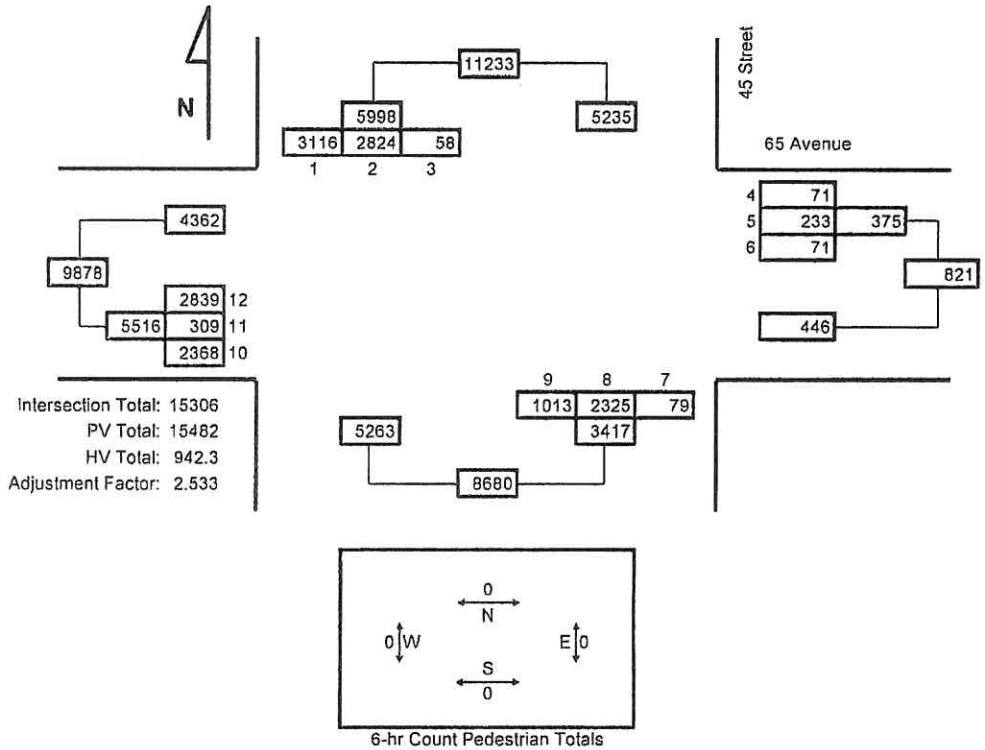
Entering Intersection	
North Leg (1+2+3)	5998
East Leg (4+5+6)	375
South Leg (7+8+9)	4534
West Leg (10+11+12)	5516
Total	16423

Exiting Intersection	
North Leg (4+8+12)	5235
East Leg (3+7+11)	446
South Leg (2+6+10)	5263
West Leg (1+5+9)	5479
Total	16423

Leg Totals	
North Leg	11233
East Leg	821
South Leg	9797
West Leg	10995

City of Leduc

Graphical Traffic Count Summary (AADT)



6-hr Count Pedestrian Totals
(for each leg)

65 Avenue and 45 Street

Count Date: Thursday, Jun 5, 2008

City of Leduc

Pedestrian Volume Sheet

City of Leduc

TIME	COMBINED PED & JAY-WALKER VOL.										TOTAL X & O'S
	CORNER J/W'S		NORTH LEG		EAST LEG		SOUTH LEG		WEST LEG		
	O	X	O	X	O	X	O	X	O	X	
7:00 - 7:15											0
7:15 - 7:30											0
7:30 - 7:45											0
7:45 - 8:00											0
8:00 - 8:15											0
8:15 - 8:30											0
8:30 - 8:45											0
8:45 9:00											0
11:30 - 11:45											0
11:45 - 12:00											0
12:00 - 12:15											0
12:15 - 12:30											0
12:30 - 12:45											0
12:45 - 13:00											0
13:00 - 13:15											0
13:15 13:30											0
16:00 - 16:15											0
16:15 - 16:30											0
16:30 - 16:45											0
16:45 - 17:00											0
17:00 - 17:15											0
17:15 - 17:30											0
17:30 - 17:45											0
17:45 18:00											0
TOTAL	0	0	0	0	0	0	0	0	0	0	0
	0		0		0		0		0		

O- Pedestrians (15 - 64 Years Old) X/O Factor: 1.5

X- Ederly/Young Pedestrians (0 - 16 Years Old and 65+)

65 Avenue and 45 Street

Count Date: Thursday, Jun 5, 2008

City of Leduc

Vehicle Volume Sheet

TIME	Movement																								TOTAL	
	1 SB RT		2 SB Through		3 SB LT		4 WB RT		5 WB Through		6 WB LT		7 NB RT		8 NB Through		9 NB LT		10 EB RT		11 EB Through		12 EB LT			
	PV	HV	PV	HV	PV	HV	PV	HV	PV	HV	PV	HV	PV	HV	PV	HV	PV	HV	PV	HV	PV	HV	PV	HV	PV	HV
7:00 - 7:15	11	0	19	1	0	0	0	0	4	0	1	0	0	0	53	1	21	5	22	0	6	1	39	3	176	11
7:15 - 7:30	15	1	8	3	1	0	1	0	0	0	0	0	2	0	56	0	35	1	16	0	5	0	51	3	190	8
7:30 - 7:45	16	2	15	0	0	0	0	0	2	0	0	0	0	0	135	0	28	2	27	1	4	1	99	0	326	6
7:45 - 8:00	14	1	17	2	2	1	3	0	4	1	0	0	1	0	107	2	31	2	57	2	5	0	94	0	335	11
8:00 - 8:15	23	0	26	1	2	0	2	0	3	0	0	1	1	0	43	1	36	4	40	1	7	0	55	5	238	13
8:15 - 8:30	21	1	15	4	0	1	0	0	3	0	1	0	2	0	38	5	31	6	24	2	6	0	27	1	168	20
8:30 - 8:45	12	3	14	2	0	0	1	0	1	0	2	0	2	0	22	3	26	4	26	2	9	1	22	1	137	18
8:45 9:00	13	1	17	2	1	0	1	0	4	0	1	0	0	0	17	1	27	2	35	2	2	0	21	2	139	10
11:30 - 11:45	56	3	30	3	2	0	1	1	2	0	2	0	2	0	21	3	34	1	30	6	4	0	31	1	215	18
11:45 - 12:00	90	3	54	4	0	0	1	1	2	0	0	0	4	1	28	2	34	3	43	1	0	0	57	6	313	21
12:00 - 12:15	100	2	67	4	2	0	1	0	3	0	4	0	0	0	20	1	34	5	55	4	1	0	59	2	346	18
12:15 - 12:30	61	3	37	4	1	1	0	0	6	0	2	0	0	1	20	3	32	5	32	6	5	0	72	2	268	25
12:30 - 12:45	49	6	29	2	1	0	0	1	4	0	1	0	2	0	36	3	27	5	32	4	6	0	59	1	246	22
12:45 - 13:00	40	5	20	3	1	0	3	0	5	0	1	0	1	0	61	4	23	3	47	3	7	0	104	2	313	20
13:00 - 13:15	40	1	32	0	1	0	2	0	2	0	1	0	0	0	34	1	25	5	34	3	9	0	42	4	222	14
13:15 13:30	26	0	18	1	0	0	2	2	8	0	1	0	2	0	20	2	23	5	36	5	1	0	50	0	187	15
16:00 - 16:15	75	1	68	1	0	0	1	0	0	0	0	0	0	0	25	3	40	5	37	7	1	0	25	0	272	17
16:15 - 16:30	71	1	73	4	1	0	0	0	5	0	0	0	1	0	21	2	30	6	29	7	0	1	24	3	255	24
16:30 - 16:45	122	1	119	2	1	0	0	0	9	0	0	0	3	0	25	4	58	0	34	5	3	0	32	4	406	16
16:45 - 17:00	84	0	96	0	2	0	2	0	4	2	4	0	1	0	20	2	52	7	37	6	9	1	31	3	342	21
17:00 - 17:15	109	2	127	2	1	0	2	0	5	0	2	0	2	0	22	0	26	3	51	4	6	0	22	0	375	11
17:15 - 17:30	67	0	57	1	0	1	0	0	4	2	2	0	0	0	19	1	35	3	41	3	8	0	24	2	257	13
17:30 - 17:45	45	3	67	5	0	0	0	0	4	0	2	0	1	0	18	1	24	1	44	4	7	0	18	1	230	15
17:45 18:00	28	2	38	1	0	0	0	0	3	0	0	0	2	0	12	0	23	3	27	1	6	0	17	0	156	7
TOTAL	1188	42	1063	52	19	4	23	5	87	5	27	1	29	2	873	45	755	86	856	79	117	5	1075	46	6112	372

PV- Passenger Vehicles

HV- Heavy Vehicles(vehicles with 4 or more rear wheels)

APPENDIX C

TRIP GENERATION SHEETS

General Light Industrial
(110)

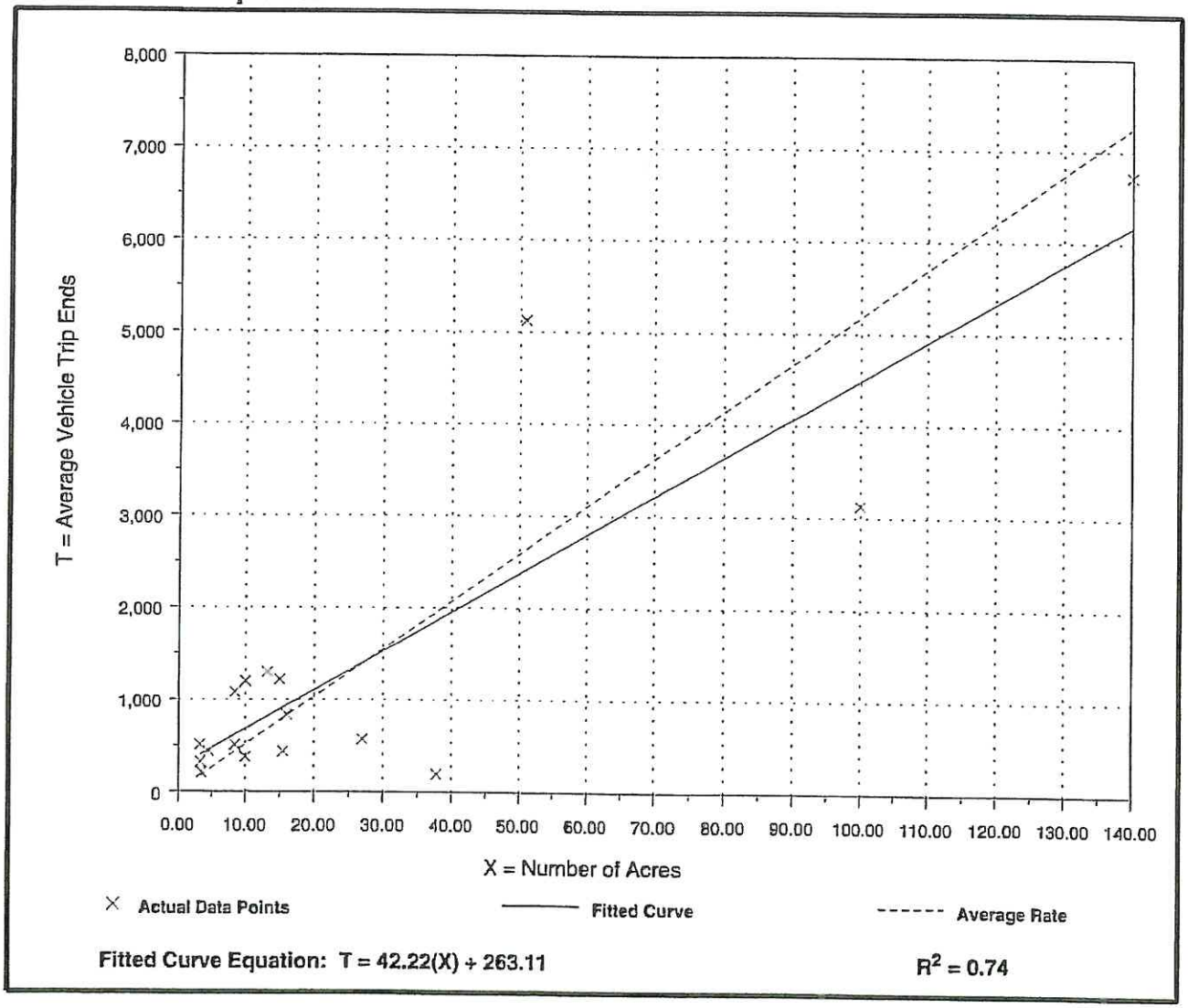
Average Vehicle Trip Ends vs: Acres
On a: Weekday

Number of Studies: 17
Average Number of Acres: 27
Directional Distribution: 50% entering, 50% exiting

Trip Generation per Acre

Average Rate	Range of Rates	Standard Deviation
51.80	5.21 - 159.38	32.69

Data Plot and Equation



Fitted Curve Equation: T = 42.22(X) + 263.11

R^2 = 0.74

General Light Industrial
(110)

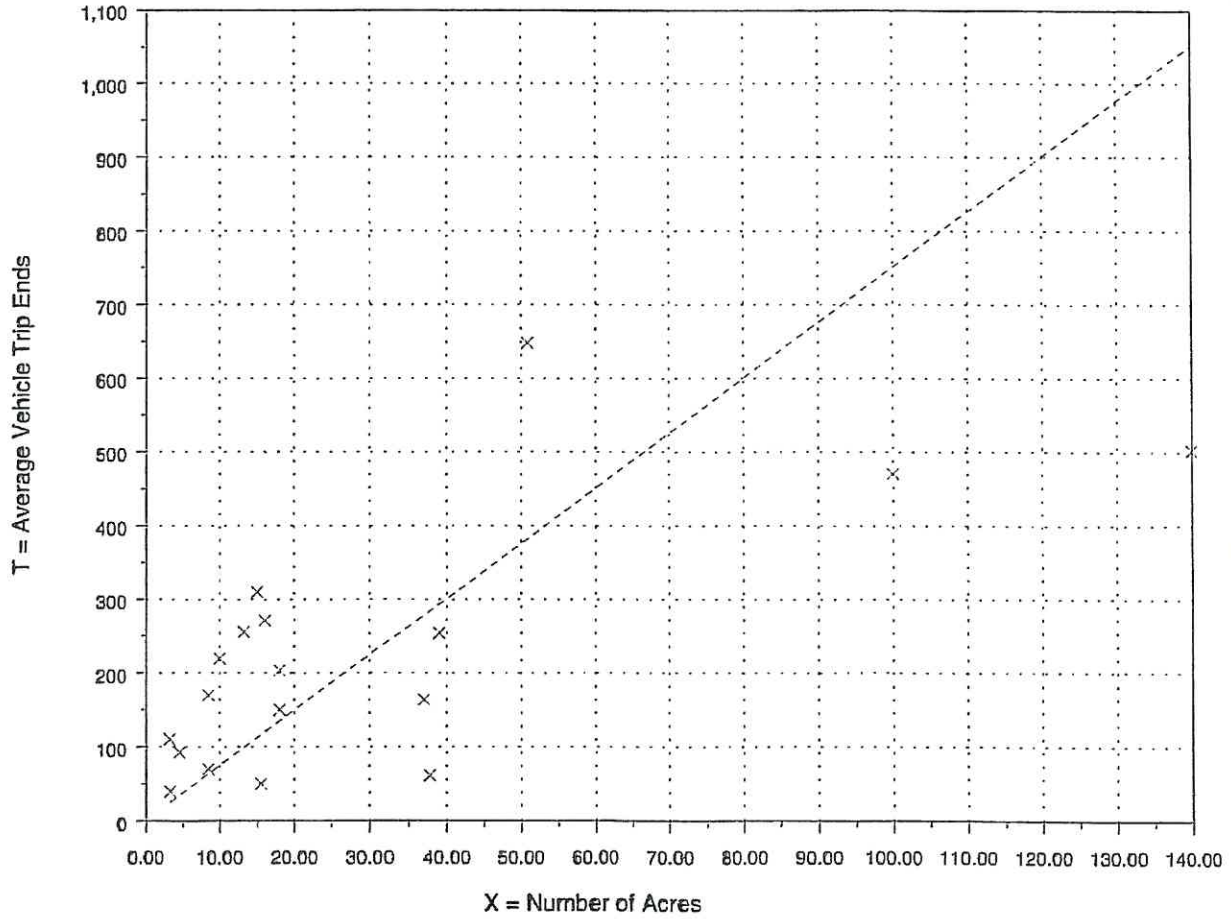
Average Vehicle Trip Ends vs: Acres
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.

Number of Studies: 18
Average Number of Acres: 30
Directional Distribution: 83% entering, 17% exiting

Trip Generation per Acre

Average Rate	Range of Rates	Standard Deviation
7.51	1.61 - 34.38	6.51

Data Plot and Equation



Fitted Curve Equation: Not given

R^2 = ****

General Light Industrial
(110)

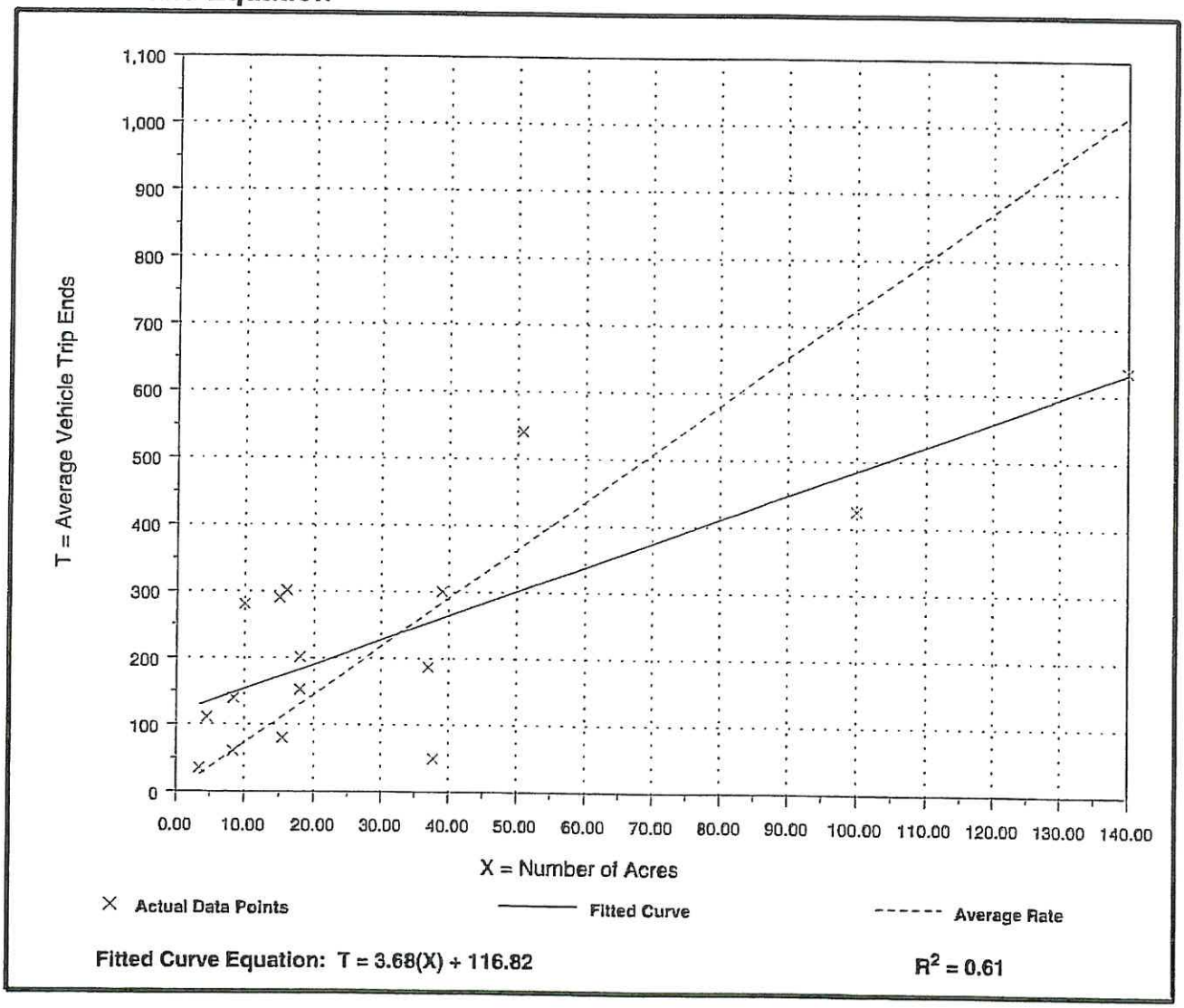
Average Vehicle Trip Ends vs: **Acres**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.

Number of Studies: 16
Average Number of Acres: 33
Directional Distribution: 22% entering, 78% exiting

Trip Generation per Acre

Average Rate	Range of Rates	Standard Deviation
7.26	1.32 - 28.00	5.99

Data Plot and Equation



Fitted Curve Equation: T = 3.68(X) + 116.82

R^2 = 0.61

APPENDIX D

ILLUMINATION WARRANT SPREADSHEET

Illumination of Isolated Rural Intersections
LIGHTING WARRANT SPREADSHEET

This spreadsheet is to be used in conjunction with *Illumination of Isolated Rural Intersections*, Transportation Association of Canada, February 2001.

Please enter information in the cells with yellow background

INTERSECTION CHARACTERISTICS

65 Avenue	Main Road	Date	April 2, 2009
Site Access Road	Minor Road	Other	AADT values based on base year (2009) traffic volumes
City of Leduc	City/Town		

GEOMETRIC FACTORS

	Value	Rating	Weight	Comments	Check	Score
Channelization Rating	Descriptive	0		Refer to Table 1(A) to determine rating value	OK	
Presence of raised channelization? (Y / N)	n				OK	
Highest operating speed on raised, channelized approach (km/h)	0		5		OK	
Channelization Factor					OK	0
Approach Sight Distance on most constrained approach (%)	100	0	10	Relative to the recommended minimum sight distance	OK	0
Posted Speed limit (in 10's of km/h)	70				OK	
Radius of Horizontal Curve (m)	T			Enter "T" for tangent (no horizontal curve at the intersection)	OK	
Posted Speed Category =		0				
Posted Speed Category =		0				
Posted Speed Category =	C	0				
Posted Speed Category =		0				
Horizontal Curvature Factor		0	5		OK	0
Angle of Intersection (10's of Degrees)	90	0	5		OK	0
Downhill Approach Grade (x.x%)	1.0	0	3	Rounded to nearest tenth of a percent	OK	0
Number of Intersection Legs	3	1	3	Number of legs = 3 or more	OK	3
					Geometric Factors Subtotal	3

OPERATIONAL FACTORS

Is the intersection signalized ? (Y/ N)	n			Calculate the Signalization Warrant Factor		
AADT on Major Road (2-way)	6941	4	10	Either Use the two AADT inputs OR the Descriptive Signalization Warrant (Unused values should be set to Zero) Refer to Table 1(B) for description and rating values for signalization warrant.	OK	40
AADT on Minor Road (2-way)	5878	4	20		OK	80
Signalization Warrant	Descriptive	0	30		OK	0
					OK	
Night-Time Hourly Pedestrian Volume	0	0	10	Refer to Table 1(B), note #2, to account for children and seniors	OK	0
Intersecting Roadway Classification	Descriptive	0	5	Refer to Table 1(B) for ratings.	OK	0
Operating Speed or Posted Speed on Major Road (km/h)	70	2	5	Refer to Table 1(B), note #3	OK	10
Operating Speed on Minor Road (km/h)	50	0	5	Refer to Table 1(B), note #3	OK	0
					Operational Factors Subtotal	130

ENVIRONMENTAL FACTOR

Lighted Developments within 150 m radius of intersection	0	0	5	Maximum of 4 quadrants	OK	0
					Environmental Factor Subtotal	0

COLLISION HISTORY

Average Annual night-time collision frequency due to inadequate lighting (collisions/yr, rounded to nearest whole #)	0.0	0	0	Enter either the annual frequency (See Table 1(C), note #4) OR the number of collisions / MEV (Unused values should be set to Zero)	OK	0
OR						
Collision Rate over last 3 years, due to inadequate lighting (/MEV)	0	0	0		OK	0
Is the average ratio of all night to day collisions >= 1.5 (Y/N)	n	0			OK	
					OK	
					Collision History Subtotal	0

Check Intersection Signalization:
Intersection is not Signalized

ILLUMINATION WARRANTED
DELINEATION LIGHTING TO ILLUMINATE PEDESTRIANS OR CROSS STREET TRAFFIC

SUMMARY

Geometric Factors Subtotal	3
Operational Factor Subtotal	130
Environmental Factor Subtotal	0
Collision History Subtotal	0
TOTAL POINTS	133

Illumination of Isolated Rural Intersections
LIGHTING WARRANT SPREADSHEET

This spreadsheet is to be used in conjunction with *Illumination of Isolated Rural Intersections*, Transportation Association of Canada, February 2001.

Please enter information in the cells with yellow background

INTERSECTION CHARACTERISTICS

65 Avenue	Main Road
Range Road 250	Minor Road
City of Leduc	City/Town

Date: April 2, 2009

Other: AADT values based on base year (2009) traffic volumes

GEOMETRIC FACTORS

	Value	Rating	Weight	Comments	Check	Score
Channelization Rating	Descriptive	0		Refer to Table 1(A) to determine rating value	OK	
Presence of raised channelization? (Y / N)	n				OK	
Highest operating speed on raised, channelized approach (km/h)	0		5		OK	
Channelization Factor					OK	0
Approach Sight Distance on most constrained approach (%)	100	0	10	Relative to the recommended minimum sight distance	OK	0
Posted Speed limit (in 10's of km/h)	80				OK	
Radius of Horizontal Curve (m)	T			Enter "T" for tangent (no horizontal curve at the intersection)	OK	
Posted Speed Category =		0				
Posted Speed Category =		0				
Posted Speed Category =	C	0				
Posted Speed Category =		0				
Horizontal Curvature Factor		0	5		OK	0
Angle of Intersection (10's of Degrees)	90	0	5		OK	0
Downhill Approach Grade (x.x%)	1.0	0	3	Rounded to nearest tenth of a percent	OK	0
Number of Intersection Legs	3	1	3	Number of legs = 3 or more	OK	3
					Geometric Factors Subtotal	3

OPERATIONAL FACTORS

Is the intersection signalized ? (Y/ N)	n			Calculate the Signalization Warrant Factor		
AADT on Major Road (2-way)	795	0	10	Either Use the two AADT inputs OR the Descriptive Signalization	OK	0
AADT on Minor Road (2-way)	284	0	20	Warrant (Unused values should be set to Zero) Refer to Table	OK	0
Signalization Warrant	Descriptive	0	30	1(B) for description and rating values for signalization warrant.	OK	0
					OK	
Night-Time Hourly Pedestrian Volume	0	0	10	Refer to Table 1(B), note #2, to account for children and seniors	OK	0
Intersecting Roadway Classification	Descriptive	0	5	Refer to Table 1(B) for ratings.	OK	0
Operating Speed or Posted Speed on Major Road (km/h)	70	2	5	Refer to Table 1(B), note #3	OK	10
Operating Speed on Minor Road (km/h)	80	3	5	Refer to Table 1(B), note #3	OK	15
					Operational Factors Subtotal	25

ENVIRONMENTAL FACTOR

Lighted Developments within 150 m radius of intersection	0	0	5	Maximum of 4 quadrants	OK	0
					Environmental Factor Subtotal	0

COLLISION HISTORY

Average Annual night-time collision frequency due to inadequate lighting (collisions/yr, rounded to nearest whole #)	0.0	0	0	Enter either the annual frequency (See Table 1(C), note #4)	OK	0
OR				OR the number of collisions / MEV		
Collision Rate over last 3 years, due to inadequate lighting (/MEV)	0	0	0	(Unused values should be set to Zero)	OK	0
Is the average ratio of all night to day collisions >= 1.5 (Y/N)	n	0			OK	
					OK	
					Collision History Subtotal	0

Check Intersection Signalization:
Intersection is not Signalized

LIGHTING IS NOT WARRANTED

SUMMARY	
Geometric Factors Subtotal	3
Operational Factor Subtotal	25
Environmental Factor Subtotal	0
Collision History Subtotal	0
TOTAL POINTS	28

Illumination of Isolated Rural Intersections
LIGHTING WARRANT SPREADSHEET

This spreadsheet is to be used in conjunction with *Illumination of Isolated Rural Intersections*, Transportation Association of Canada, February 2001.

Please enter information in the cells with yellow background

INTERSECTION CHARACTERISTICS

45 Street	Main Road
65 Avenue	Minor Road
City of Leduc	City/Town

Date: April 2, 2009

Other: AADT values based on base year (2009) traffic volumes

GEOMETRIC FACTORS

	Value	Rating	Weight	Comments	Check	Score
Channelization Rating	Descriptive	0		Refer to Table 1(A) to determine rating value	OK	
Presence of raised channelization? (Y / N)	n				OK	
Highest operating speed on raised, channelized approach (km/h)	0		5		OK	
Channelization Factor					OK	0
Approach Sight Distance on most constrained approach (%)	100	0	10	Relative to the recommended minimum sight distance	OK	0
Posted Speed limit (in 10's of km/h)	60				OK	
Radius of Horizontal Curve (m)	T			Enter "T" for tangent (no horizontal curve at the intersection)	OK	
Posted Speed Category =		0				
Posted Speed Category =		0				
Posted Speed Category =		0				
Posted Speed Category =	D	0				
Horizontal Curvature Factor		0	5		OK	0
Angle of Intersection (10's of Degrees)	80	1	5		OK	5
Downhill Approach Grade (x.x%)	1.0	0	3	Rounded to nearest tenth of a percent	OK	0
Number of Intersection Legs	4	2	3	Number of legs = 3 or more	OK	6
				Geometric Factors Subtotal		11

OPERATIONAL FACTORS

Is the intersection signalized ? (Y/ N)	y			Illumination is Warranted		
AADT on Major Road (2-way)	21323	4	10	Either Use the two AADT inputs OR the Descriptive Signalization Warrant (Unused values should be set to Zero) Refer to Table 1(B) for description and rating values for signalization warrant.	OK	40
AADT on Minor Road (2-way)	16812	4	20		OK	80
Signalization Warrant	Descriptive	0	30		OK	0
					OK	
Night-Time Hourly Pedestrian Volume	0	0	10	Refer to Table 1(B), note #2, to account for children and seniors	OK	0
Intersecting Roadway Classification	Descriptive	1	5	Refer to Table 1(B) for ratings.	OK	5
Operating Speed or Posted Speed on Major Road (km/h)	60	1	5	Refer to Table 1(B), note #3	OK	5
Operating Speed on Minor Road (km/h)	50	0	5	Refer to Table 1(B), note #3	OK	0
				Operational Factors Subtotal		130

ENVIRONMENTAL FACTOR

Lighted Developments within 150 m radius of intersection	3	3	5	Maximum of 4 quadrants	OK	15
				Environmental Factor Subtotal		15

COLLISION HISTORY

Average Annual night-time collision frequency due to inadequate lighting (collisions/yr, rounded to nearest whole #)	0.0	0	0	Enter either the annual frequency (See Table 1(C), note #4)	OK	0
OR				OR the number of collisions / MEV		
Collision Rate over last 3 years, due to inadequate lighting (/MEV)	0	0	0	(Unused values should be set to Zero)	OK	0
Is the average ratio of all night to day collisions >= 1.5 (Y/N)	n	0			OK	
					OK	
				Collision History Subtotal		0

Check Intersection Signalization:
Intersection is Signalized

FULL ILLUMINATION WARRANTED

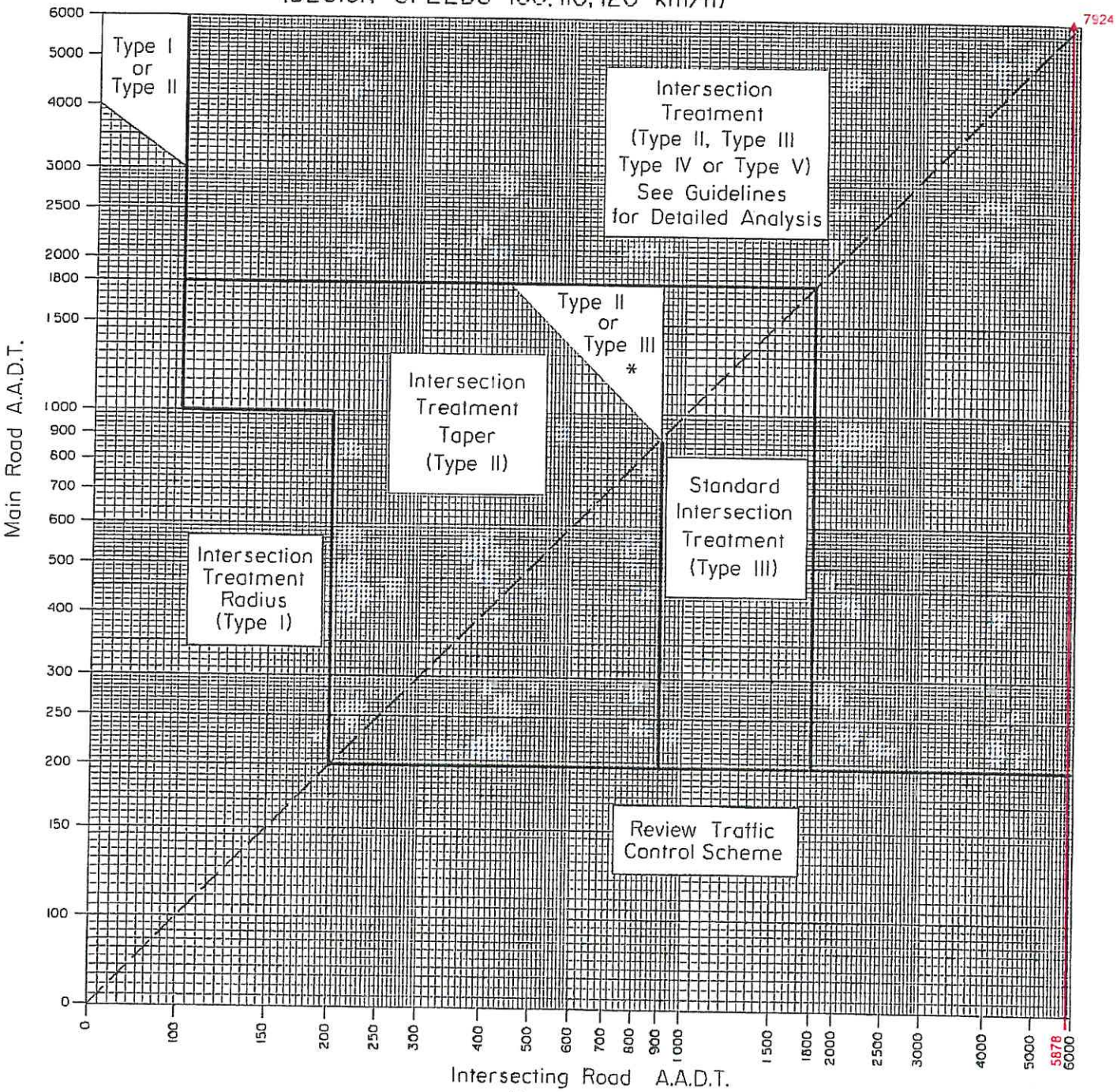
SUMMARY

Geometric Factors Subtotal	11
Operational Factor Subtotal	130
Environmental Factor Subtotal	15
Collision History Subtotal	0
TOTAL POINTS	**156**

APPENDIX E

INTERSECTION ANALYSIS CHARTS AND TYPES

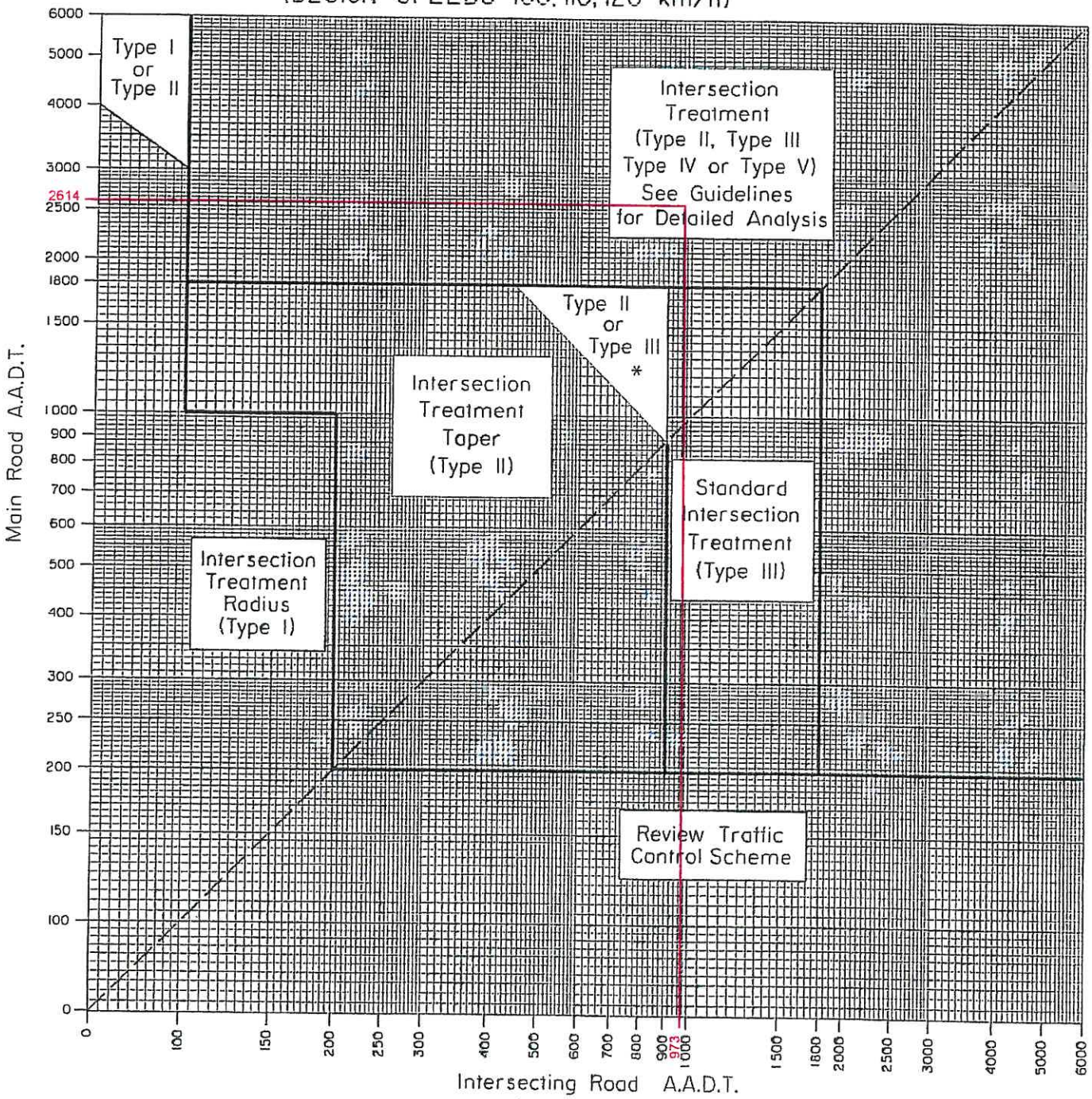
FIGURE D-7.4 TRAFFIC VOLUME WARRANT CHART FOR AT-GRADE INTERSECTION TREATMENT ON TWO-LANE RURAL HIGHWAYS (DESIGN SPEEDS 100, 110, 120 km/h)



Notes:

1. If main road, or intersecting road, is <100 AADT provide Type I Intersection Treatment (15m radius), except as shown for the higher volume main roads on this chart (Type I or II zone) where engineering judgement may be used to select the appropriate treatment.
2. If main road is >4000 AADT Review Access Management
   - — — If Intersecting Road AADT is > Main Road AADT: Review Traffic Control Scheme
3. Use projected traffic volumes for design
   Sloping line is defined by Main Road AADT x Intersecting Road AADT = 800,000

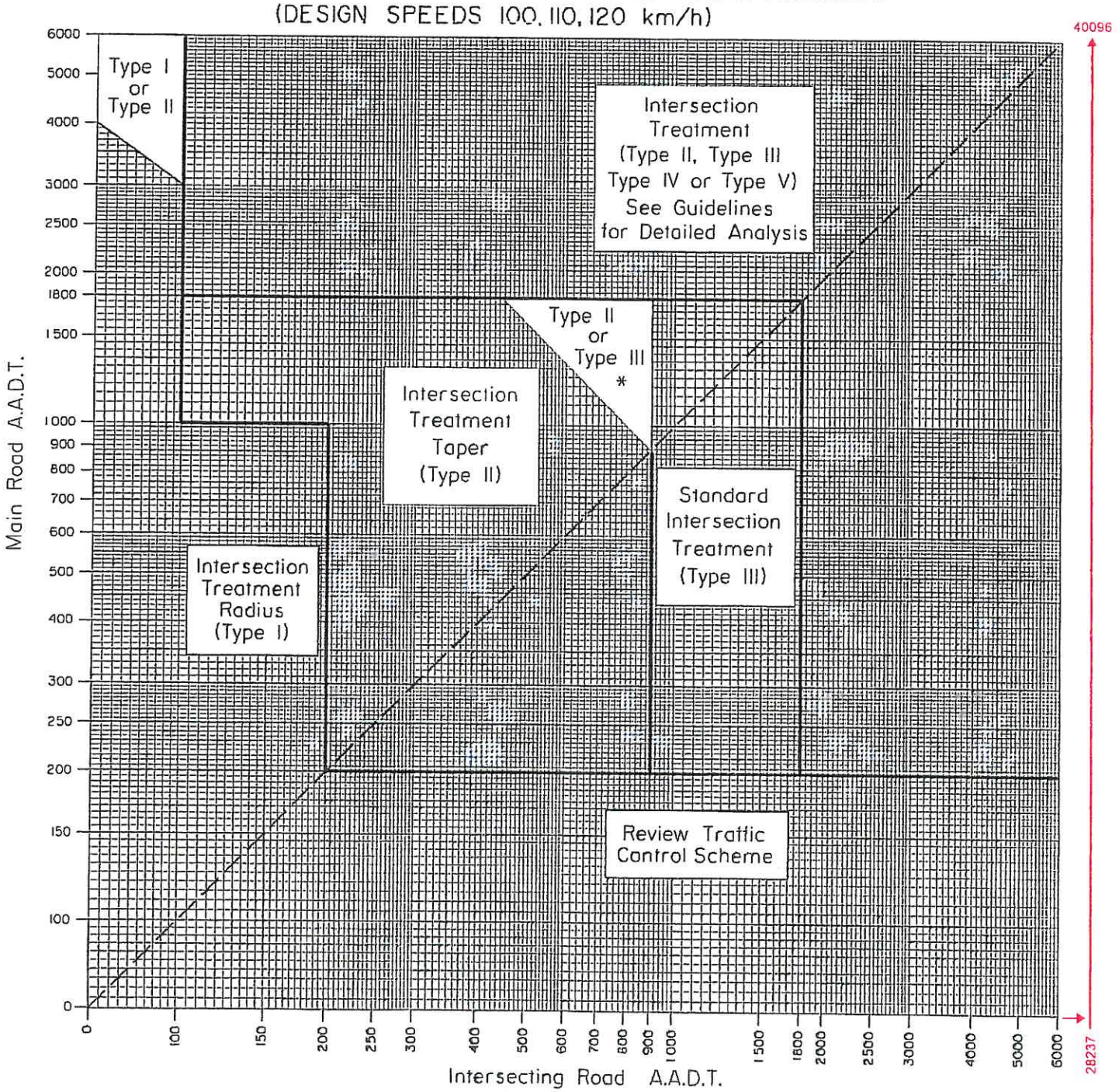
FIGURE D-7.4 TRAFFIC VOLUME WARRANT CHART FOR AT-GRADE INTERSECTION TREATMENT ON TWO-LANE RURAL HIGHWAYS (DESIGN SPEEDS 100, 110, 120 km/h)



Notes:

1. If main road, or intersecting road, is <100 AADT provide Type I Intersection Treatment (15m radius), except as shown for the higher volume main roads on this chart (Type I or II zone) where engineering judgement may be used to select the appropriate treatment.
2. If main road is >4000 AADT Review Access Management
   - — — If Intersecting Road AADT is > Main Road AADT: Review Traffic Control Scheme
3. Use projected traffic volumes for design
   Sloping line is defined by Main Road AADT x Intersecting Road AADT = 800,000

FIGURE D-7.4 TRAFFIC VOLUME WARRANT CHART FOR AT-GRADE INTERSECTION TREATMENT ON TWO-LANE RURAL HIGHWAYS (DESIGN SPEEDS 100, 110, 120 km/h)



Notes:

1. If main road, or intersecting road, is <100 AADT provide Type I Intersection Treatment (15m radius), except as shown for the higher volume main roads on this chart (Type I or II zone) where engineering judgement may be used to select the appropriate treatment.
2. If main road is >4000 AADT Review Access Management
   - — — If Intersecting Road AADT is > Main Road AADT: Review Traffic Control Scheme
3. Use projected traffic volumes for design
   Sloping line is defined by Main Road AADT x Intersecting Road AADT = 800,000

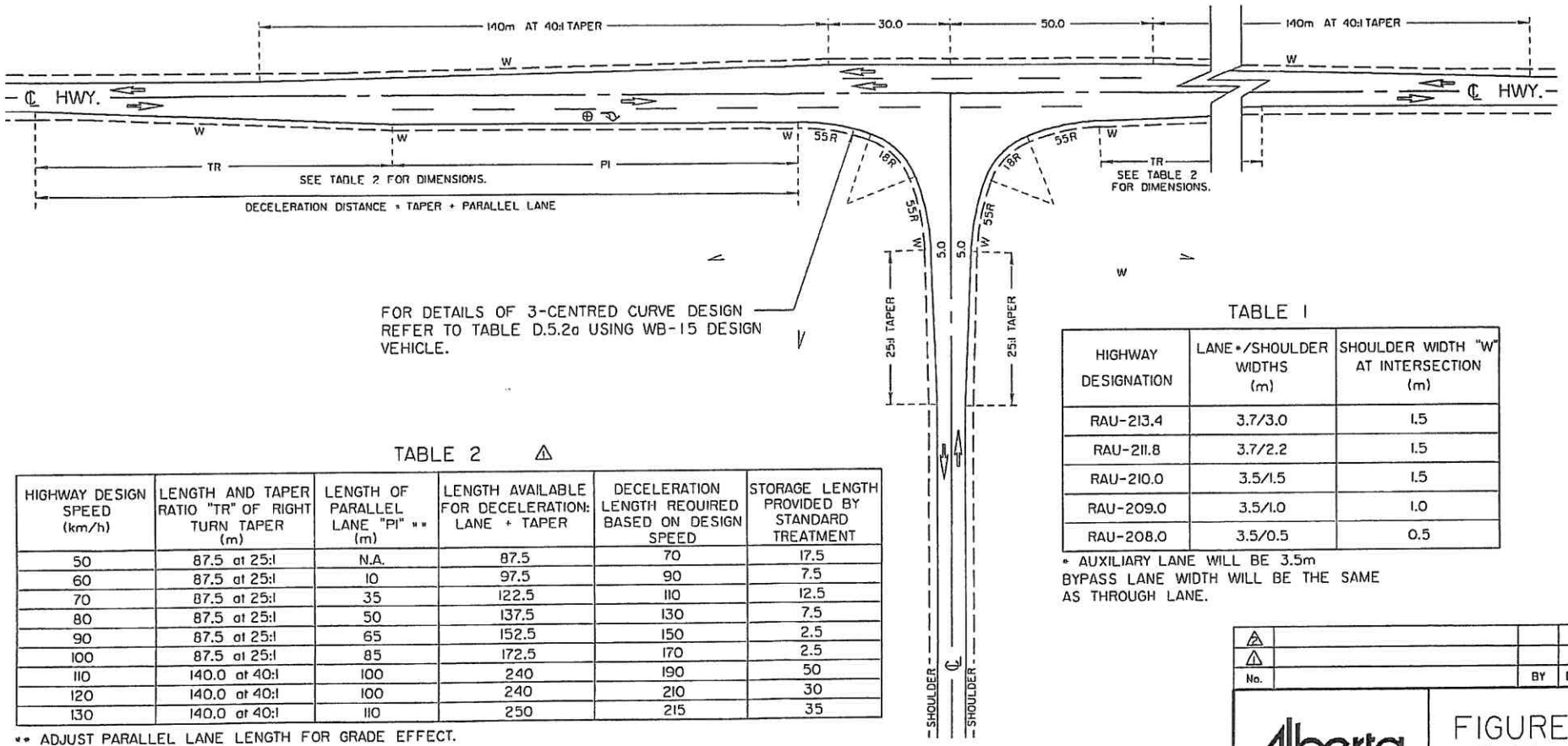


TABLE 2 ⚠

HIGHWAY DESIGN SPEED (km/h)	LENGTH AND TAPER RATIO "TR" OF RIGHT TURN TAPER (m)	LENGTH OF PARALLEL LANE "PI" ** (m)	LENGTH AVAILABLE FOR DECELERATION: LANE + TAPER	DECELERATION LENGTH REQUIRED BASED ON DESIGN SPEED	STORAGE LENGTH PROVIDED BY STANDARD TREATMENT
50	87.5 at 25:1	N.A.	87.5	70	17.5
60	87.5 at 25:1	10	97.5	90	7.5
70	87.5 at 25:1	35	122.5	110	12.5
80	87.5 at 25:1	50	137.5	130	7.5
90	87.5 at 25:1	65	152.5	150	2.5
100	87.5 at 25:1	85	172.5	170	2.5
110	140.0 at 40:1	100	240	190	50
120	140.0 at 40:1	100	240	210	30
130	140.0 at 40:1	110	250	215	35

** ADJUST PARALLEL LANE LENGTH FOR GRADE EFFECT.

TABLE 1

HIGHWAY DESIGNATION	LANE*/SHOULDER WIDTHS (m)	SHOULDER WIDTH "W" AT INTERSECTION (m)
RAU-213.4	3.7/3.0	1.5
RAU-211.8	3.7/2.2	1.5
RAU-210.0	3.5/1.5	1.5
RAU-209.0	3.5/1.0	1.0
RAU-208.0	3.5/0.5	0.5

* AUXILIARY LANE WILL BE 3.5m
BYPASS LANE WIDTH WILL BE THE SAME AS THROUGH LANE.

NOTES

1. DIMENSIONS SHOWN ARE FINISHED SURFACE PAVEMENT WIDTHS. ADDITIONAL SUBGRADE WIDTHS TO BE PROVIDED TO ALLOW FOR DEPTH OF BASE COURSE AND PAVEMENT.
2. THE DESIGNER MUST COMPLETE "INTERSECTION ANALYSIS" PROCEDURE TO JUSTIFY THE TYPE IV TREATMENT.
   i.e. exclusive right turn lane must be warranted for the movement shown ⊕

No.		BY	DATE
⚠			
⚠			

Alberta INFRASTRUCTURE

FIGURE D-7m

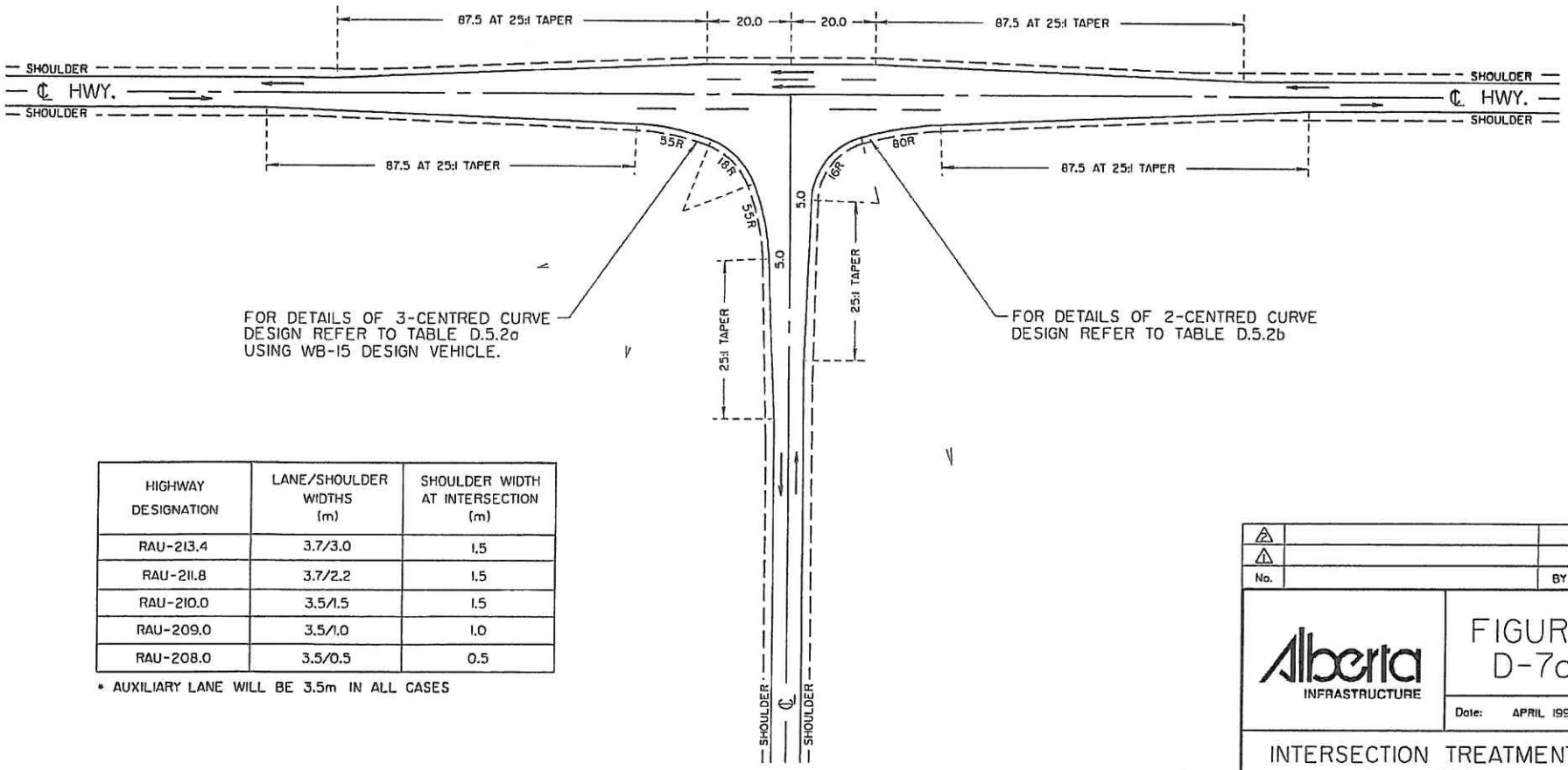
Date: APRIL 1995

INTERSECTION TREATMENT
TYPE IVd
EXCLUSIVE RIGHT TURN TREATMENT
WARRANTED (TWO-LANE HIGHWAY)

Prepared By: Cgk	Checked By: B.K.	Scale: N.T.S.	PAGE D-137

GRAPHIL ILE: debd7m.mon

NOTES: DIMENSIONS SHOWN ARE FINISHED SURFACE PAVEMENT WIDTHS. ADDITIONAL SUBGRADE WIDTHS TO BE PROVIDED TO ALLOW FOR DEPTH OF BASE COURSE AND PAVEMENT.



HIGHWAY DESIGNATION	LANE/SHOULDER WIDTHS (m)	SHOULDER WIDTH AT INTERSECTION (m)
RAU-213.4	3.7/3.0	1.5
RAU-211.8	3.7/2.2	1.5
RAU-210.0	3.5/1.5	1.5
RAU-209.0	3.5/1.0	1.0
RAU-208.0	3.5/0.5	0.5

* AUXILIARY LANE WILL BE 3.5m IN ALL CASES

No.		BY	DATE
2			
1			

Alberta INFRASTRUCTURE

FIGURE D-7c

Date: APRIL 1995

INTERSECTION TREATMENT (TYPE IIa) (TWO-LANE HIGHWAY)

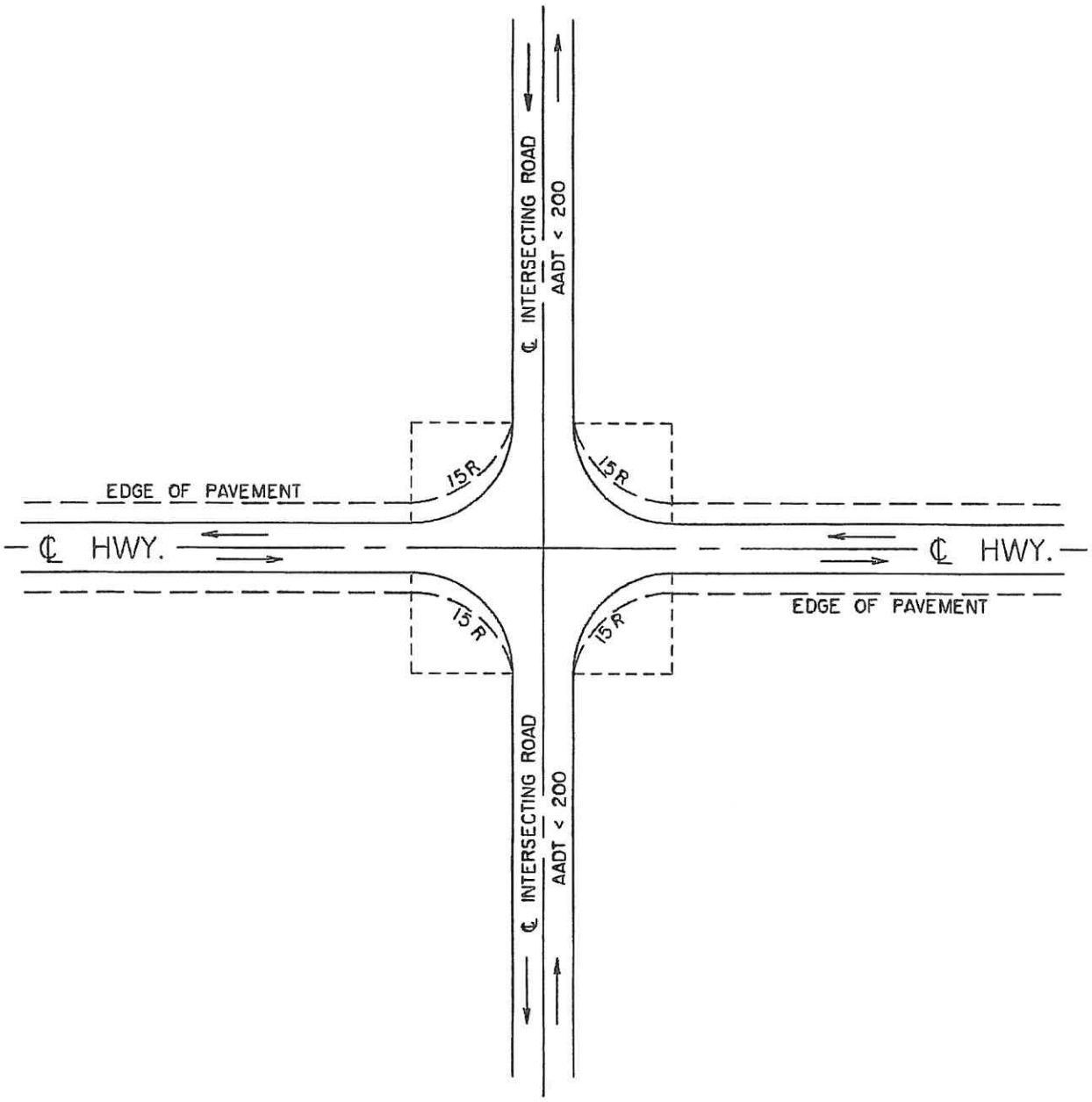
Prepared By: R.T.	Checked By: B.K.	Scale: N.T.S.	PAGE D-117

Graphics F.. .bd7c.man

APPENDIX F

SIGNALIZATION WARRANT WORKSHEET

FIGURE D-7b INTERSECTION TREATMENT (TYPE Ib)
(Two-Lane Highway)



NOTE: DIMENSIONS SHOWN ARE FINISHED SURFACE PAVEMENT WIDTHS. ADDITIONAL SUBGRADE WIDTHS TO BE PROVIDED TO ALLOW FOR DEPTH OF

FIGURE B2-6

TRAFFIC CONTROL SIGNAL INSTALLATION WARRANT AND PRIORITY RATING WORK SHEET

Location 65 Avenue & Site Access Year 2034 Date of Count 2009.04.02

I Collisions (Figure B2-1)

Priority points = P_a 0

II Crossing Gaps, Progression, Delay and Vehicular Stops

A. One-Way Street (Figure B2-2) N/A

Priority points	=	P_1	x	V_{tew}	x	F_{eew}		
E-W Street - E. of int.	=	___	x	___	x	___	=	
E-W Street - W. of int.	=	___	x	___	x	___	=	___
Priority points	=	P_1	x	V_{tns}	x	F_{ens}		
N-S street - N. of int.	=	___	x	___	x	___	=	___
N-S street - S. of int.	=	___	x	___	x	___	=	___

B. Two-Way Street (Figure B2-3)

Priority points =	=	P_2	x	V_{tew}	x	F_{eew}		
E-W Street - E. of int.	=	2	x	3.22	x	1.0	=	6.44
E-W Street - W. of int.	=	2	x	6.75	x	1.0	=	13.50
Priority points	=	P_2	x	V_{tns}	x	F_{ens}		
N-S street - N. of int.	=	N/A	x	N/A	x	N/A	=	0
N-S street - S. of int.	=	2	x	5.88	x	1.0	=	11.76 31.70 *

III Crossing Gaps, Intersecting Volumes, and Pedestrian Volumes

A. Through Street One-Way (Figures B2-4 and B2-5) N/A

1). Priority points

= (V_{aew} ÷ P_{ew}) x (V_{ans} + P_{ns}) x F_{ow} x F_r
= (___ ÷ ___) x (___ + ___) x ___ x ___ = ___

2). Priority points

= P_3 x F_t = ___

B. Through Street Two-Way

Priority points

= (V_{aew} + P_{ew}) x (V_{ans} + P_{ns}) x F_{ow}
= (4.99 ÷ 0) x (2.94 + 0) x 1.0 = 14.67

TOTAL PRIORITY POINTS 46.37 < 100

NOTE: Complete I; the appropriate equation for each intersection leg in Section II A and/or II B; and either Section IIIA or III B.

* **Maximum points for II = 80**

FIGURE B2-6

FIGURE B2-6

TRAFFIC CONTROL SIGNAL INSTALLATION WARRANT AND PRIORITY RATING WORK SHEET

Location 65 Avenue & RR 250 Year 2009 Date of Count 2009 04.02

I Collisions (Figure B2-1)

Priority points = P_2 0

II Crossing Gaps, Progression, Delay and Vehicular Stops

A. One-Way Street (Figure B2-2) N/A

Priority points	=	P_1	x	V_{few}	x	F_{eew}		
E-W Street - E. of int.	=	___	x	___	x	___	=	
E-W Street - W. of int.	=	___	x	___	x	___	=	___
Priority points	=	P_1	x	V_{fns}	x	F_{ens}		
N-S street - N. of int.	=	___	x	___	x	___	=	___
N-S street - S. of int.	=	___	x	___	x	___	=	___

B. Two-Way Street (Figure B2-3)

Priority points =	=	P_2	x	V_{few}	x	F_{eew}		
E-W Street - E. of int.	=	2	x	0.97	x	1.0	=	1.94
E-W Street - W. of int.	=	2	x	1.64	x	1.0	=	3.28
Priority points	=	P_2	x	V_{fns}	x	F_{ens}		
N-S street - N. of int.	=	2	x	0.93	x	1.0	=	1.86
N-S street - S. of int.	=	N/A	x	N/A	x	N/A	=	0

7.08 *

III Crossing Gaps, Intersecting Volumes, and Pedestrian Volumes

A. Through Street One-Way (Figures B2-4 and B2-5) N/A

1). Priority points

= (V_{aew} + P_{ew}) x (V_{ans} + P_{ns}) x F_{ow} x F_r
= (___ + ___) x (___ + ___) x ___ x ___ = ___

2). Priority points

= P_3 x F_t = ___

B. Through Street Two-Way

Priority points

= (V_{aew} + P_{ew}) x (V_{ans} + P_{ns}) x F_{ow}
= (1.59 + 0) x (0.47 + 0) x 1.0 = 0.75

TOTAL PRIORITY POINTS 7.83 < 100

NOTE: Complete I; the appropriate equation for each intersection leg in Section II A and/or II B; and either Section IIIA or III B.

* Maximum points for II = 80

FIGURE B2-6

FIGURE B2-6

TRAFFIC CONTROL SIGNAL INSTALLATION WARRANT AND PRIORITY RATING WORK SHEET

Location 65 Avenue & 45 Street Year 2009 Date of Count 2009.04.02

I Collisions (Figure B2-1)

Priority points = P_a 0

II Crossing Gaps, Progression, Delay and Vehicular Stops

A. One-Way Street (Figure B2-2) N/A

Priority points	=	P_1	x	V_{few}	x	F_{eew}		
E-W Street - E. of int.	=	___	x	___	x	___	=	
E-W Street - W. of int.	=	___	x	___	x	___	=	___
Priority points	=	P_1	x	V_{fns}	x	F_{ens}		
N-S street - N. of int.	=	___	x	..	x	___	=	___
N-S street - S. of int.	=	..	x	___	x	___	=	___

B. Two-Way Street (Figure B2-3)

Priority points =	=	P_2	x	V_{few}	x	F_{eew}		
E-W Street - E. of int.	=	1	x	6.28	x	1.0	=	6.28
E-W Street - W. of int.	=	1	x	21.95	x	1.0	=	21.95
Priority points	=	P_2	x	V_{fns}	x	F_{ens}		
N-S street - N. of int.	=	1	x	22.21	x	1.0	=	22.21
N-S street - S. of int.	=	1	x	17.89	x	1.0	=	17.89 68.33 *

III Crossing Gaps, Intersecting Volumes, and Pedestrian Volumes

A. Through Street One-Way (Figures B2-4 and B2-5) N/A

1). Priority points

= (Vaew + Pew) x (Vans + Pns) x Fow x Fr
= (___ + ___) x (___ + ___) x ___ x ___ = ___

2). Priority points

= Pa x Ft = ___

B. Through Street Two-Way

Priority points

= (Vaew + Pew) x (Vans + Pns) x Fow
= (15.16 + 0) x (19.00 + 0) x 1.0 = 288.04

TOTAL PRIORITY POINTS 356.37 > 100

NOTE: Complete I; the appropriate equation for each intersection leg in Section II A and/or II B; and either Section IIIA or III B.

* Maximum points for II = ÷ 80

FIGURE B2-6

APPENDIX G

CAPACITY ANALYSIS

65 Avenue & Site Access - 2009
HCS+: Unsignalized Intersections Release 5.21

TWO-WAY STOP CONTROL SUMMARY

Analyst: PK
Agency/Co.: Williams Engineering Canada
Date Performed: 4/02/2009
Analysis Time Period:
Intersection: 65 Avenue & Site Access
Jurisdiction: City of Leduc
Units: U. S. Metric
Analysis Year: 2009
Project ID: 20050.00
East/West Street: 65 Avenue
North/South Street: Site Access Road
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		52	275	69	13	
Peak-Hour Factor, PHF		1.00	1.00	1.00	1.00	
Hourly Flow Rate, HFR		52	275	69	13	
Percent Heavy Vehicles		--	--	20	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes		1	0	0	1	
Configuration		TR		LT		
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	275		69			
Peak Hour Factor, PHF	1.00		1.00			
Hourly Flow Rate, HFR	275		69			
Percent Heavy Vehicles	20		20			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No	/		/
Lanes	0		0			
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		69		344				
C(m) (vph)		1138		617				
v/c		0.06		0.56				
95% queue length		0.19		3.43				
Control Delay		8.4		17.9				
LOS		A		C				
Approach Delay				17.9				
Approach LOS				C				

65 Avenue & Site Access - 2009
HCS+: Unsignalized Intersections Release 5.21

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: PK
Agency/Co.: Williams Engineering Canada
Date Performed: 4/02/2009
Analysis Time Period:
Intersection: 65 Avenue & Site Access
Jurisdiction: City of Leduc
Units: U. S. Metric
Analysis Year: 2009
Project ID: 20050.00
East/West Street: 65 Avenue
North/South Street: Site Access Road
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume		52	275	69	13	
Peak-Hour Factor, PHF		1.00	1.00	1.00	1.00	
Peak-15 Minute Volume		13	69	17	3	
Hourly Flow Rate, HFR		52	275	69	13	
Percent Heavy Vehicles		--	--	20	--	--
Median Type/Storage RT Channelized?	Undivided			/		
Lanes		1	0	0	1	
Configuration			TR	LT		
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	275		69			
Peak Hour Factor, PHF	1.00		1.00			
Peak-15 Minute Volume	69		17			
Hourly Flow Rate, HFR	275		69			
Percent Heavy Vehicles	20		20			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage RT Channelized			No	/		/
Lanes	0		0			
Configuration		LR				

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0
Lane Width (m)	3.6	3.6	3.6	3.6
Walking Speed (m/sec)	1.2	1.2	1.2	1.2
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed kph	Distance to Signal meters
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		13
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1	7.1		6.2			
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		20	20		20			
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Grade/100			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.70		0.00			
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage		4.3	6.6		6.4			
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)		2.20	3.50		3.30			
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		20	20		20			
t(f)		2.4	3.7		3.5			

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)
V prog				
Total Saturation Flow Rate, s (vph)				
Arrival Type				
Effective Green, g (sec)				
Cycle Length, C (sec)				
Rp (from Exhibit 16-11)				
Proportion vehicles arriving on green P				

g(q1)
g(q2)
g(q)

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p		0.000		0.000

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x		327	341		190			
s								
Px								
V c,u,x								

C r,x	
C plat,x	

Two-Stage Process	7		8		10		11	
	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500						
P(x)								
V(c,u,x)								

C(r,x)	

C(plat,x)

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	190	
Potential Capacity	808	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	808	
Probability of Queue free St.	0.91	1.00
Step 2: LT from Major St.	**4**	**1**
Conflicting Flows	327	
Potential Capacity	1138	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1138	
Probability of Queue free St.	0.94	1.00
Maj L-Shared Prob Q free St.	0.94	
Step 3: TH from Minor St.	**8**	**11**
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.94	0.94
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	**7**	**10**
Conflicting Flows	341	
Potential Capacity	620	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.94
Maj. L, Min T Adj. Imp Factor.		0.95
Cap. Adj. factor due to Impeding mvmnt	0.94	0.87
Movement Capacity	582	

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		

Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.94	0.94
Movement Capacity		
Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	341	
Potential Capacity	620	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.94
Maj. L, Min T Adj. Imp Factor.		0.95
Cap. Adj. factor due to Impeding mvmnt	0.94	0.87
Movement Capacity	582	
Results for Two-stage process:		
a		
y		
C t	582	

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	275		69			
Movement Capacity (vph)	582		808			
Shared Lane Capacity (vph)		617				

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep	582		808			
Volume	275		69			
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						

n max	
C sh	617
SUM C sep	
n	
C act	

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		69		344				
C(m) (vph)		1138		617				
v/c		0.06		0.56				
95% queue length		0.19		3.43				
Control Delay		8.4		17.9				
LOS		A		C				
Approach Delay				17.9				
Approach LOS				C				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.94
v(il), Volume for stream 2 or 5		13
v(i2), Volume for stream 3 or 6		0
s(il), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		0.94
d(M,LT), Delay for stream 1 or 4		8.4
N, Number of major street through lanes		1
d(rank,1) Delay for stream 2 or 5		0.5

65 Avenue & Site Access - 2034
HCS+: Unsignalized Intersections Release 5.21

TWO-WAY STOP CONTROL SUMMARY

Analyst: PK
Agency/Co.: Williams Engineering Canada
Date Performed: 4/02/2009
Analysis Time Period:
Intersection: 65 Avenue & Site Access
Jurisdiction: City of Leduc
Units: U. S. Metric
Analysis Year: 2034
Project ID: 20050.00
East/West Street: 65 Avenue
North/South Street: Site Access Road
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		100	275	69	25	
Peak-Hour Factor, PHF		1.00	1.00	1.00	1.00	
Hourly Flow Rate, HFR		100	275	69	25	
Percent Heavy Vehicles		--	--	20	--	--
Median Type/Storage	Undivided			/		
RT Channelized?			No			
Lanes		1	1	1	1	
Configuration		T	R	L	T	
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	275		69			
Peak Hour Factor, PHF	1.00		1.00			
Hourly Flow Rate, HFR	275		69			
Percent Heavy Vehicles	20		20			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			Yes	/20		/
Lanes	0		0			
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		L		LR				
v (vph)		69		344				
C(m) (vph)		1091		807				
v/c		0.06		0.43				
95% queue length		0.20		2.15				
Control Delay		8.5		13.6				
LOS		A		B				
Approach Delay				13.6				
Approach LOS				B				

65 Avenue & Site Access - 2034
HCS+: Unsignalized Intersections Release 5.21

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: PK
Agency/Co.: Williams Engineering Canada
Date Performed: 4/02/2009
Analysis Time Period:
Intersection: 65 Avenue & Site Access
Jurisdiction: City of Leduc
Units: U. S. Metric
Analysis Year: 2034
Project ID: 20050.00
East/West Street: 65 Avenue
North/South Street: Site Access Road
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume		100	275	69	25	
Peak-Hour Factor, PHF		1.00	1.00	1.00	1.00	
Peak-15 Minute Volume		25	69	17	6	
Hourly Flow Rate, HFR		100	275	69	25	
Percent Heavy Vehicles		--	--	20	--	--
Median Type/Storage	Undivided			/		
RT Channelized?			No			
Lanes		1	1	1	1	
Configuration		T	R	L	T	
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	275		69			
Peak Hour Factor, PHF	1.00		1.00			
Peak-15 Minute Volume	69		17			
Hourly Flow Rate, HFR	275		69			
Percent Heavy Vehicles	20		20			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			Yes	/20		/
RT Channelized						
Lanes	0		0			
Configuration		LR				

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0
Lane Width (m)	3.6	3.6	3.6	3.6
Walking Speed (m/sec)	1.2	1.2	1.2	1.2
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed kph	Distance to Signal meters
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		
Shared ln volume, major rt vehicles:		
Sat flow rate, major th vehicles:		
Sat flow rate, major rt vehicles:		
Number of major street through lanes:		

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)			4.1	7.1		6.2			
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)			20	20		20			
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Grade/100				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)			0.00	0.70		0.00			
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage		4.3	6.6		6.4			
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)		2.20	3.50		3.30			
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		20	20		20			
t(f)		2.4	3.7		3.5			

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)
V prog				
Total Saturation Flow Rate, s (vph)				
Arrival Type				
Effective Green, g (sec)				
Cycle Length, C (sec)				
Rp (from Exhibit 16-11)				
Proportion vehicles arriving on green P				

g(q1)
g(q2)
g(q)

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p		0.000		0.000

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x		375	263		100			
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process	7		8		10		11	
	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500						
P(x)								
V(c,u,x)								
C(r,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	100	
Potential Capacity	909	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	909	
Probability of Queue free St.	0.92	1.00
Step 2: LT from Major St.	**4**	**1**
Conflicting Flows	375	
Potential Capacity	1091	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1091	
Probability of Queue free St.	0.94	1.00
Maj L-Shared Prob Q free St.		
Step 3: TH from Minor St.	**8**	**11**
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.94	0.94
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	**7**	**10**
Conflicting Flows	263	
Potential Capacity	689	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.94
Maj. L, Min T Adj. Imp Factor.		0.95
Cap. Adj. factor due to Impeding mvmnt	0.94	0.88
Movement Capacity	645	

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		

Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.94	0.94
Movement Capacity		
Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	263	
Potential Capacity	689	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.94
Maj. L, Min T Adj. Imp Factor.		0.95
Cap. Adj. factor due to Impeding mvmnt	0.94	0.88
Movement Capacity	645	
Results for Two-stage process:		
a		
y		
C t	645	

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	275		69			
Movement Capacity (vph)	645		909			
Shared Lane Capacity (vph)		685				

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep	645		909			
Volume	275		69			
Delay	14.7		9.3			
Q sep	1.12		0.18			
Q sep +1	2.12		1.18			
round (Qsep +1)	2		1			

n max	2
C sh	685
SUM C sep	807
n	20
C act	807

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		L		LR				
v (vph)		69		344				
C(m) (vph)		1091		807				
v/c		0.06		0.43				
95% queue length		0.20		2.15				
Control Delay		8.5		13.6				
LOS		A		B				
Approach Delay				13.6				
Approach LOS				B				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.94
v(i1), Volume for stream 2 or 5		
v(i2), Volume for stream 3 or 6		
s(i1), Saturation flow rate for stream 2 or 5		
s(i2), Saturation flow rate for stream 3 or 6		
P*(oj)		
d(M,LT), Delay for stream 1 or 4		8.5
N, Number of major street through lanes		
d(rank,1) Delay for stream 2 or 5		

65 Avenue & RR 250 - 2009
HCS+: Unsignalized Intersections Release 5.21

TWO-WAY STOP CONTROL SUMMARY

Analyst: PK
Agency/Co.: Williams Engineering Canada
Date Performed: 4/02/2009
Analysis Time Period:
Intersection: 65 Avenue & Range Road 250
Jurisdiction: City of Leduc
Units: U. S. Metric
Analysis Year: 2009
Project ID: 20050.00
East/West Street: 65 Avenue
North/South Street: Range Road 250
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	41	43			41	3
Peak-Hour Factor, PHF	1.00	1.00			1.00	1.00
Hourly Flow Rate, HFR	41	43			41	3
Percent Heavy Vehicles	20	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				5		40
Peak Hour Factor, PHF				1.00		1.00
Hourly Flow Rate, HFR				5		40
Percent Heavy Vehicles				20		0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	41						45	
C(m) (vph)	1456						994	
v/c	0.03						0.05	
95% queue length	0.09						0.14	
Control Delay	7.5						8.8	
LOS	A						A	
Approach Delay							8.8	
Approach LOS							A	

65 Avenue & RR 250 - 2009
HCS+: Unsignalized Intersections Release 5.21

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: PK
Agency/Co.: Williams Engineering Canada
Date Performed: 4/02/2009
Analysis Time Period:
Intersection: 65 Avenue & Range Road 250
Jurisdiction: City of Leduc
Units: U. S. Metric
Analysis Year: 2009
Project ID: 20050.00
East/West Street: 65 Avenue
North/South Street: Range Road 250
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	41	43			41	3
Peak-Hour Factor, PHF	1.00	1.00			1.00	1.00
Peak-15 Minute Volume	10	11			10	1
Hourly Flow Rate, HFR	41	43			41	3
Percent Heavy Vehicles	20	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume				5		40
Peak Hour Factor, PHF				1.00		1.00
Peak-15 Minute Volume				1		10
Hourly Flow Rate, HFR				5		40
Percent Heavy Vehicles				20		0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		No /
RT Channelized						
Lanes				0		0
Configuration					LR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0
Lane Width (m)	3.6	3.6	3.6	3.6
Walking Speed (m/sec)	1.2	1.2	1.2	1.2
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed kph	Distance to Signal meters
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	43	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	1	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)	4.1					7.1		6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	20					20		0
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Grade/100			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)	0.00					0.70		0.00
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.3					6.6		6.2
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20					3.50		3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	20					20		0
t(f)	2.4					3.7		3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)
V prog				
Total Saturation Flow Rate, s (vph)				
Arrival Type				
Effective Green, g (sec)				
Cycle Length, C (sec)				
Rp (from Exhibit 16-11)				
Proportion vehicles arriving on green P				

g(q1)
g(q2)
g(q)

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	44					167		42
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process	7		8		10		11	
	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s						1500		
P(x)								
V(c,u,x)								
C(r,x)								

C(plat,x)

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		42
Potential Capacity		1034
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1034
Probability of Queue free St.	1.00	0.96
Step 2: LT from Major St.	**4**	**1**
Conflicting Flows		44
Potential Capacity		1456
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1456
Probability of Queue free St.	1.00	0.97
Maj L-Shared Prob Q free St.		0.97
Step 3: TH from Minor St.	**8**	**11**
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.97	0.97
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	**7**	**10**
Conflicting Flows		167
Potential Capacity		783
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.97	
Maj. L, Min T Adj. Imp Factor.	0.98	
Cap. Adj. factor due to Impeding mvmnt	0.94	0.97
Movement Capacity		761

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		

Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.97	0.97
Movement Capacity		
Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		167
Potential Capacity		783
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.97	
Maj. L, Min T Adj. Imp Factor.	0.98	
Cap. Adj. factor due to Impeding mvmnt	0.94	0.97
Movement Capacity		761
Results for Two-stage process:		
a		
y		
C t		761

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)				5		40
Movement Capacity (vph)				761		1034
Shared Lane Capacity (vph)					994	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep				761		1034
Volume				5		40
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						

n max	
C sh	994
SUM C sep	
n	
C act	

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	41						45	
C(m) (vph)	1456						994	
v/c	0.03						0.05	
95% queue length	0.09						0.14	
Control Delay	7.5						8.8	
LOS	A						A	
Approach Delay							8.8	
Approach LOS							A	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.97	1.00
v(i1), Volume for stream 2 or 5	43	
v(i2), Volume for stream 3 or 6	0	
s(i1), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.97	
d(M,LT), Delay for stream 1 or 4	7.5	
N, Number of major street through lanes	1	
d(rank,1) Delay for stream 2 or 5	0.2	

65 Avenue & RR 250 - 2034
HCS+: Unsignalized Intersections Release 5.21

TWO-WAY STOP CONTROL SUMMARY

Analyst: PK
Agency/Co.: Williams Engineering Canada
Date Performed: 4/02/2009
Analysis Time Period:
Intersection: 65 Avenue & Range Road 250
Jurisdiction: City of Leduc
Units: U. S. Metric
Analysis Year: 2034
Project ID: 20050.00
East/West Street: 65 Avenue
North/South Street: Range Road 250
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	47	52			47	6
Peak-Hour Factor, PHF	1.00	1.00			1.00	1.00
Hourly Flow Rate, HFR	47	52			47	6
Percent Heavy Vehicles	20	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	1	1			1	0
Configuration	L	T				TR
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				9		0
Peak Hour Factor, PHF				1.00		1.00
Hourly Flow Rate, HFR				9		0
Percent Heavy Vehicles				20		0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			Yes /20
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	L						LR	
v (vph)	47						9	
C(m) (vph)	1445							
v/c	0.03							
95% queue length	0.10							
Control Delay	7.6						10.0	
LOS	A							
Approach Delay							10.0-	
Approach LOS							A	

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: PK
Agency/Co.: Williams Engineering Canada
Date Performed: 4/02/2009
Analysis Time Period:
Intersection: 65 Avenue & Range Road 250
Jurisdiction: City of Leduc
Units: U. S. Metric
Analysis Year: 2034
Project ID: 20050.00
East/West Street: 65 Avenue
North/South Street: Range Road 250
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	47	52			47	6
Peak-Hour Factor, PHF	1.00	1.00			1.00	1.00
Peak-15 Minute Volume	12	13			12	2
Hourly Flow Rate, HFR	47	52			47	6
Percent Heavy Vehicles	20	--	--		--	--
Median Type/Storage RT Channelized?	Undivided			/		
Lanes	1	1			1	0
Configuration	L	T				TR
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume				9		0
Peak Hour Factor, PHF				1.00		1.00
Peak-15 Minute Volume				2		0
Hourly Flow Rate, HFR				9		0
Percent Heavy Vehicles				20		0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage RT Channelized				/		Yes /20
Lanes				0		0
Configuration					LR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0
Lane Width (m)	3.6	3.6	3.6	3.6
Walking Speed (m/sec)	1.2	1.2	1.2	1.2
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed kph	Distance to Signal meters
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		
Shared ln volume, major rt vehicles:		
Sat flow rate, major th vehicles:		
Sat flow rate, major rt vehicles:		
Number of major street through lanes:		

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)	4.1					7.1		6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	20					20		0
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Grade/100			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)	0.00					0.70		0.00
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.3					6.6		6.2
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20					3.50		3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	20					20		0
t(f)	2.4					3.7		3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)
V prog				
Total Saturation Flow Rate, s (vph)				
Arrival Type				
Effective Green, g (sec)				
Cycle Length, C (sec)				
Rp (from Exhibit 16-11)				
Proportion vehicles arriving on green P				

g(q1)	
g(q2)	
g(q)	

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p		0.000		0.000

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	53					196		50
s								
Px								
V c,u,x								

C r,x	
C plat,x	

Two-Stage Process	7		8		10		11	
	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s						1500		
P(x)								
V(c,u,x)								

C(r,x)	

C(plat,x)

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		50
Potential Capacity		1024
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1024
Probability of Queue free St.	1.00	1.00
Step 2: LT from Major St.	**4**	**1**
Conflicting Flows		53
Potential Capacity		1445
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1445
Probability of Queue free St.	1.00	0.97
Maj L-Shared Prob Q free St.		
Step 3: TH from Minor St.	**8**	**11**
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.97	0.97
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	**7**	**10**
Conflicting Flows		196
Potential Capacity		754
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.97	
Maj. L, Min T Adj. Imp Factor.	0.98	
Cap. Adj. factor due to Impeding mvmnt	0.98	0.97
Movement Capacity		729

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		

Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.97	0.97
Movement Capacity		
Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		196
Potential Capacity		754
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.97	
Maj. L, Min T Adj. Imp Factor.	0.98	
Cap. Adj. factor due to Impeding mvmnt	0.98	0.97
Movement Capacity		729
Results for Two-stage process:		
a		
y		
C t		729

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)				9		0
Movement Capacity (vph)				729		1024
Shared Lane Capacity (vph)					729	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep				729		1024
Volume				9		0
Delay				10.0		8.5
Q sep				0.02		0.00
Q sep +1				1.02		1.00
round (Qsep +1)				1		1

n max	1
C sh	729
SUM C sep	
n	20
C act	

Worksheet 10-Delay, Queue Length, and Level of Service

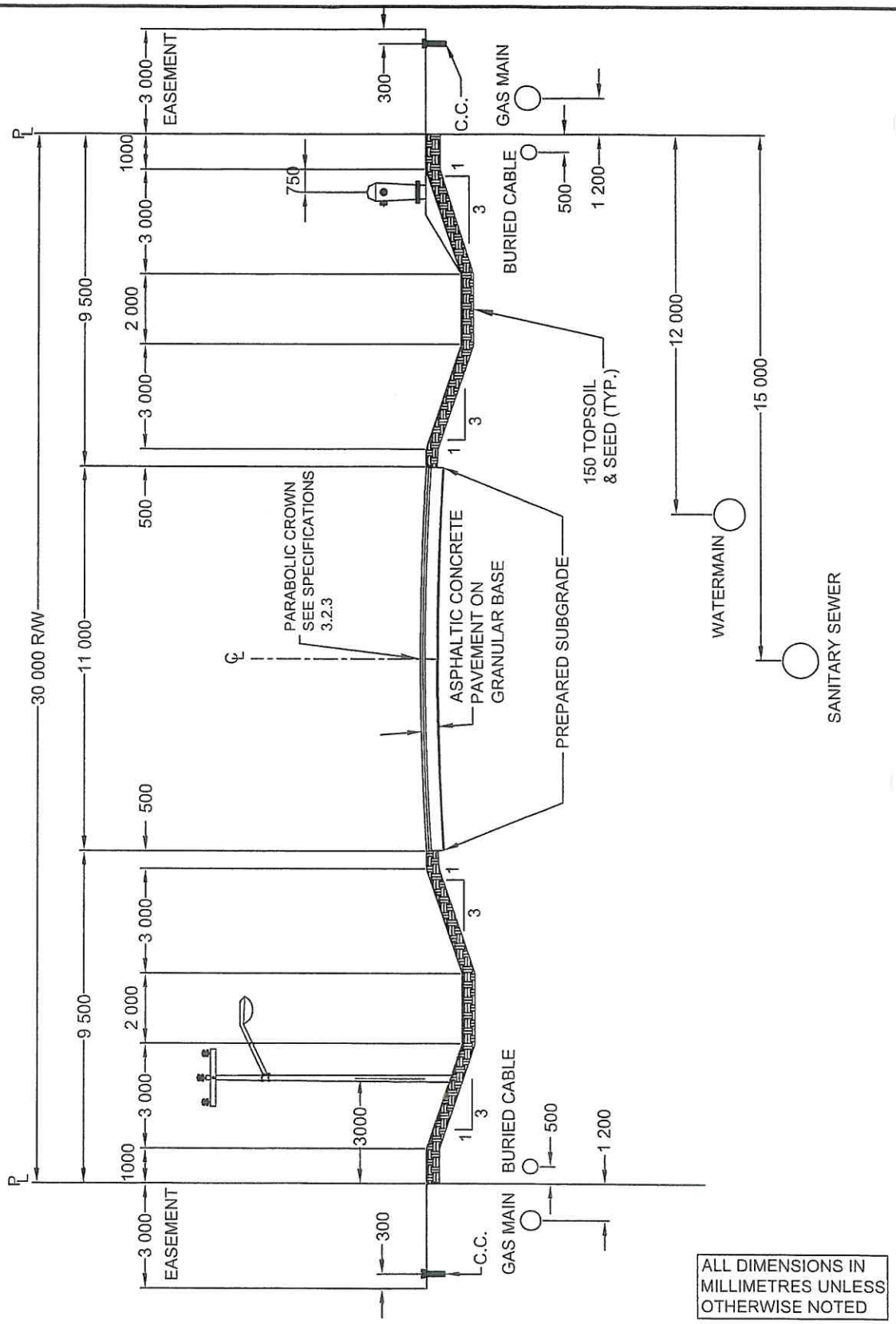
Movement	1	4	7	8	9	10	11	12
Lane Config	L						LR	
v (vph)	47						9	
C(m) (vph)	1445							
v/c	0.03							
95% queue length	0.10							
Control Delay	7.6						10.0	
LOS	A							
Approach Delay							10.0-	
Approach LOS							A	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.97	1.00
v(i1), Volume for stream 2 or 5		
v(i2), Volume for stream 3 or 6		
s(i1), Saturation flow rate for stream 2 or 5		
s(i2), Saturation flow rate for stream 3 or 6		
P*(oj)		
d(M,LT), Delay for stream 1 or 4	7.6	
N, Number of major street through lanes		
d(rank,1) Delay for stream 2 or 5		

APPENDIX H

ROADWAY DESIGN STANDARDS



ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED

REVISIONS		
Date	Details	Drawn

THE CITY OF LEDUC

#1 Alexandra Park, Leduc Alberta, T9E 4C4, Canada

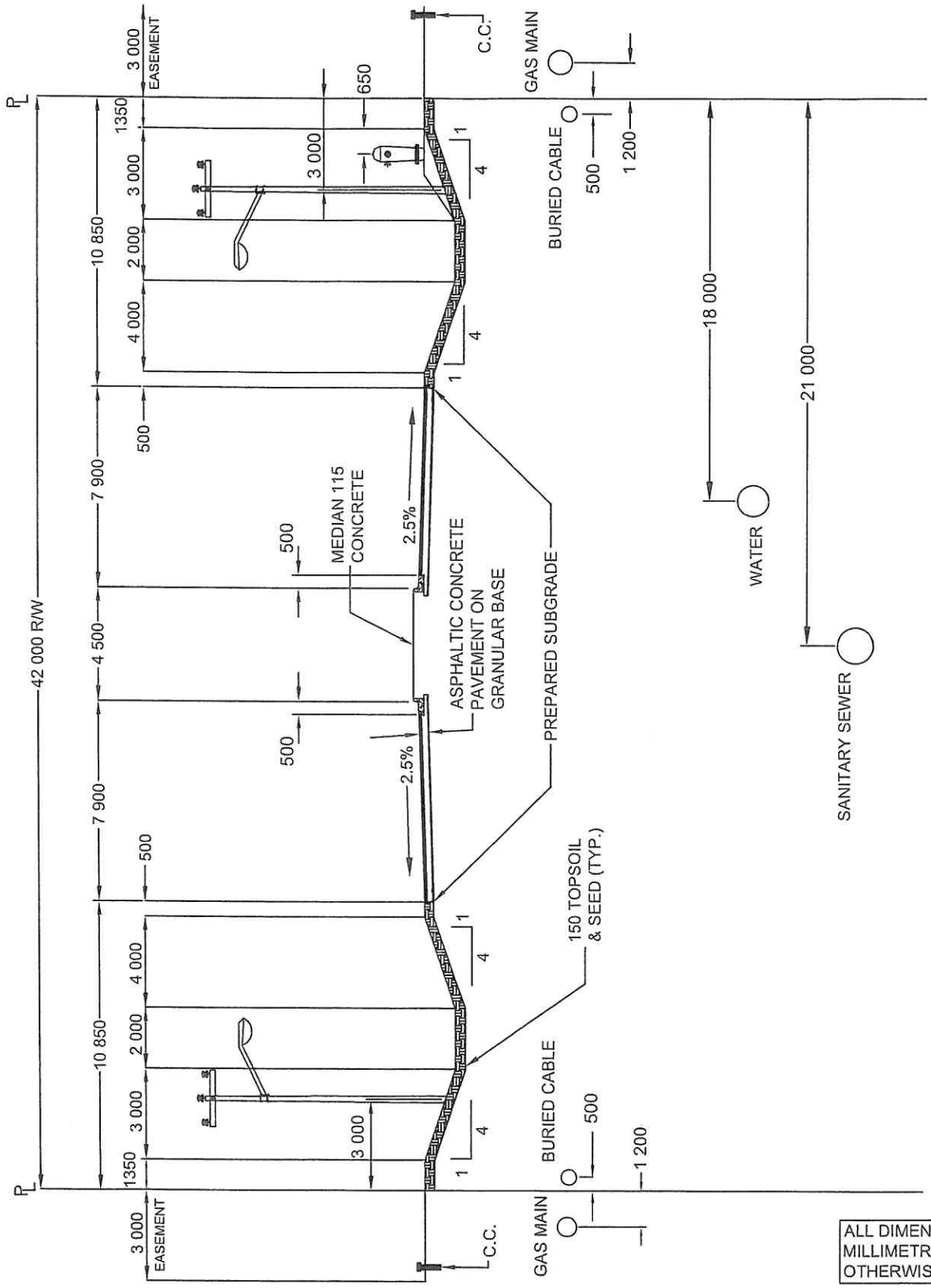
2 LANE INDUSTRIAL / COMMERCIAL LOCAL - RURAL

Director of Engineering:

City Engineer:

Date: Nov. 2005 | Scale: N.T.S. | Drawn: S. Salmas

DWG. NO. 3.11



ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED

REVISIONS		
Date	Details	Drawn

THE CITY OF LEDUC
The Outdoor Experience

#1 Alexandra Park, Leduc Alberta,
T9E 4C4, Canada

4 LANE INDUSTRIAL / COMMERCIAL ARTERIAL - RURAL

Director of Engineering:

City Engineer:

DWG. NO. 3.15

Date: Nov. 2005 | Scale: N.T.S. | Drawn: S. Salmas