

**AREA STRUCTURE PLAN  
WESTSIDE DEVELOPMENTS LTD.  
TOWN OF BARRHEAD**

**PART OF THE NE 29-59-3-W5M**

**19-07-33**

**DCL SIEMENS ENGINEERING LTD.  
101, 10630 172 Street  
Edmonton, Alberta  
T5S 1H8**

## **1.0 INTRODUCTION**

### **1.1 BACKGROUND**

The NE ¼ Section of 29-59-3-W5M (Westside Developments) Area Structure Plan is limited to approximately 40 Acres of the quarter section of the same description. The detailed area is outlined further in Figure 1.0: Context Plan.

### **1.2 PLAN PURPOSE & OBJECTIVES**

The Town of Barrhead Municipal Development Plan identifies the Westside Developments as future development along the Highway Commercial Corridor on Highway 33. It also identifies the commercial development as dependant of traveling public and encourages related businesses.

The policies of the MDP dealing with these and other issues provide a basis for more specific policy direction contained in the Area Structure Plan. Section 633 of the Municipal Government Act, R.S.A., 2000, as amended, states that the purpose of an Area Structure Plan is to prepare "... a framework for subsequent subdivision and development of an area of land" in a municipality. The Westside Developments Plan accomplishes this goal by addressing the following objectives:

- Ensure that proposed development within the Plan area conforms to the policies, goals and objectives of Barrhead's Municipal Development Plan.
- Provide a framework for development within the Plan area by describing land use, transportation networks, and public utility systems.

### **1.3 PLAN IMPLEMENTATION AND AMENDMENT**

Once adopted, the area structure plan becomes a statutory planning instrument in conjunction with the Municipal Development Plan and Land Use Bylaw. All subdivision and development proposals will be required to conform to its land use designations, road systems and other planning controls.

This plan establishes a long-term development pattern for the plan area; however, future conditions may require Council to undertake amendments. When considering any

amendment, Council will review the effect of the Plan modification on this or any other adopted Statutory Plan in accordance with the Municipal Government Act.

## **2.0 SITE ANALYSIS**

### **2.1 TOPOGRAPHY**

The land in this quarter section slopes gradually to the south and west, eventually terminating at a ravine tributary of the Paddle River. The ravine system captures surface storm water drainage and runs from the north to south into the Paddle River through the western portion of Section 29-59-3-5. This ravine is currently being protected as an environmental reserve within the town boundaries.

The neighboring developments to the south have been generally sloped in a manner consistent with the natural direction of drainage.

### **2.2 RESERVES**

Reserve land for highway widening and buffering has been set aside for this development. The MR will be developed into a grassed berm for buffering between highway commercial and existing lands. The highway widening will be developed into grassed boulevard between Highway 33 and the service road.

### **2.3 EXISTING DEVELOPMENT/DEVELOPMENT CONSTRAINTS**

The Plan area consists of vacant land. The topography within the Plan area is sloping to the south and east. The natural topography has not been altered.

To the east, the land has a natural low area that is dry excepting for rain events and spring run off. Storm drainage from the subdivision will be controlled and directed to the natural low area.

There are no natural development constraints in regards to the Plan Area. Existing Highway and arterial roadways are major considerations. Development along the Highway will require a service road for the local traffic to minimize intersections along Highway 33. Upgrading of the roads and intersections to handle traffic outside of the Plan will be addressed by the Traffic Impact Assessment and will require municipal coordination.

## **2.4 GEOTECHNICAL**

Soils geotechnical analysis was carried out for the development of commercial subdivision with attention to sewer and water servicing, building structures and roadway construction. Piezometers were left at select test holes to monitor ground water.

The soils were found to be 150 to 400mm of topsoil over clay or clay till to a depth of 8.85 metres. Clay shale was found at depths in excess of 8.85 metres. Ground water was found in deep holes at 4.88 metres and 7.32 metres. Piezometer in test hole 1 showed water at 1.6m after 30 days.

Ground conditions are favorable for buildings with grade beams on piles and floor slabs on grade.

The ground conditions will support road construction for heavy duty paving.

Appendix 1 - Geotechnical Report provides detailed site information and test hole logs.

## **2.5 ADJACENT DEVELOPMENT/DEVELOPMENT PLANS**

The land within the Plan Area is owned by Mr. Sean Steele.

The surrounding lands to the North, West and South are owned Mr. Schneider. Highway 33 runs along the length of the East boundary of the Plan.

## **UTILITIES**

Sanitary Sewer mains will be connected to the existing sewer system in Barr Manor at 55 Street through an easement granted on Mr. Schneider's land. Water mains will connect to existing water mains across Highway 33 at the intersection of the West Service Road and 62 Avenue. Lines have been designed in a manner that allow for additional capacity. The Plan's drainage is directed toward the east low lands that drain north in rain events or snow melt to the natural unnamed creek, that drains south and west to the Paddle River.

## **2.6 OIL AND GAS ACTIVITY**

The Plan area is unencumbered by any oil and/or gas installations.

## **2.7 SUMMARY OF DEVELOPMENT CONSIDERATIONS**

- Development will be contained within the 40 Acre (16.1875 Ha) portion of the quarter section which is bound by Highway 33 and existing lands owned by Mr Schnieder.
- Topography will partially dictate the landscaping of the "finished" properties.
- The need for local access will require a service road paralleling Highway 33.
- Existing sewer and water infrastructure will support the development.
- Storm water control will be addressed at the design stage.

## **3.0 PLAN AND POLICIES**

### **3.1 CONCEPT PLAN**

*The Concept "Plan is sensitive to the existing development of the site as well at the natural flow of drainage.*

The development concept shows generalized land uses as well as a conceptual roadway network, including alignments for local roadways within the plan area.

Vacant land within the Plan Area comprises approximately 40.0 acres and an approximate breakdown of land areas for various uses is depicted below:

1.	Commercial Development	12.58 Ha.	77%
2.	Roadways	1.62 Ha.	10%
3.	Municipal Reserve	1.99 Ha.	12%

Development will essentially be sequential from east to west. Sixteen (16) commercial lots will be brought on stream in the Plan Area.

### **3.2 GENERAL DEVELOPMENT**

*This section of the Plan sets forth general policies relating to conformity with existing statutory plans (Land Use Bylaw, Municipal Development Plan).and the general development concept plan set forth in this Area Structure Plan. This section also*

*requires that any proposed development will take into consideration the development constraints associated with the subject lands.*

- 3.2.1 Applications for redesignation, subdivision and/or development permits which occur within the Plan area shall conform to the Town of Barrhead's Land Use Bylaw, Municipal Development Plan.
- 3.2.2 Proposed development shall take into consideration existing utility infrastructure. The developer shall be responsible for any costs involved with the relocation or extension of any existing utilities.
- 3.2.3 Developer will enter into a development agreement where required by the Town of Barrhead for subdivisions and development permits.
- 3.2.4 Subdivision applications and substantive amendments in the Plan area shall require referrals for comment to Alberta Transportation.

### **3.3 COMMERCIAL LANDS**

*Typically, the lands within the plan area shall all be developed at as highway commercial and conform to the Town of Barrhead Municipal Development Plan.*

- 3.3.1 Proposals for commercial subdivision, re-designation or development permits shall conform to Figure 3.0: Development Concept.
- 3.3.2 The projected number of lots within this Plan is 16.
- 3.3.4 The commercial lot sizes will vary from 0.44 Ha to 1.38 Ha. Lots may be consolidated to accommodate development of an interested purchaser.

### **3.4 TRANSPORTATION**

*Transportation routes in the Plan area will reflect the commercial development of the Plan. Roads will be designed to parallel existing utility routes.*

- 3.4.1 The arterial roads and collector street alignments required to service Westside Developments are shown in Figure 5.0: Transportation System.
- 3.4.2 The Subdivision Authority shall refer all subdivision applications within the Plan Area to Alberta Transportation for review and comment, regardless of the nature of that application.
- 3.4.3 All roadway design and construction shall conform to the Town of Barrhead Development Standards as adopted by Council and amended from time-to-time. Roadways in the development shall be of a rural gravel surfacing standard with ditching for drainage. Businesses will be required to provide onsite parking.
- 3.4.4 Direct access shall not be permitted from lots adjacent to arterial and primary collector roads. Where access is required, the frequency of access points shall be limited.
- 3.4.5 The Transportation routes shall follow the pattern outlined in this Plan. Where utilities are not completed, the subdivision authority may request that the same are located either within roads or dedicated rights-of-way where necessary.
- 3.4.6 Improvements to roads outside the corporate boundaries of the Town of Barrhead, necessitated by development within the Plan area, shall be the responsibility of the Developer.
- 3.4.9 As it intersects with, 62 Avenue, an acceleration lane shall be provided onto Highway 33. The nature of the acceleration lane shall be determined by a professional engineer at such time as Alberta Transportation and the town of Barrhead deem the lane to be necessary.
- 3.4.10 Provision shall be made for pedestrian crossing of arterial roads to Town standards in order to facilitate pedestrian movement. Cross walk signage and roadway markings will be the responsibility of the Developer. The crossing of 49 Street (Highway 33) will be at the intersection of 62 Avenue and be coordinated with the Town of Barrhead.



### 3.5 SERVICING

*The utility system for the area of the Plan will be extended from existing utility areas. Engineered Drawings of Westside Developments were prepared by DCL Siemens Engineering.*

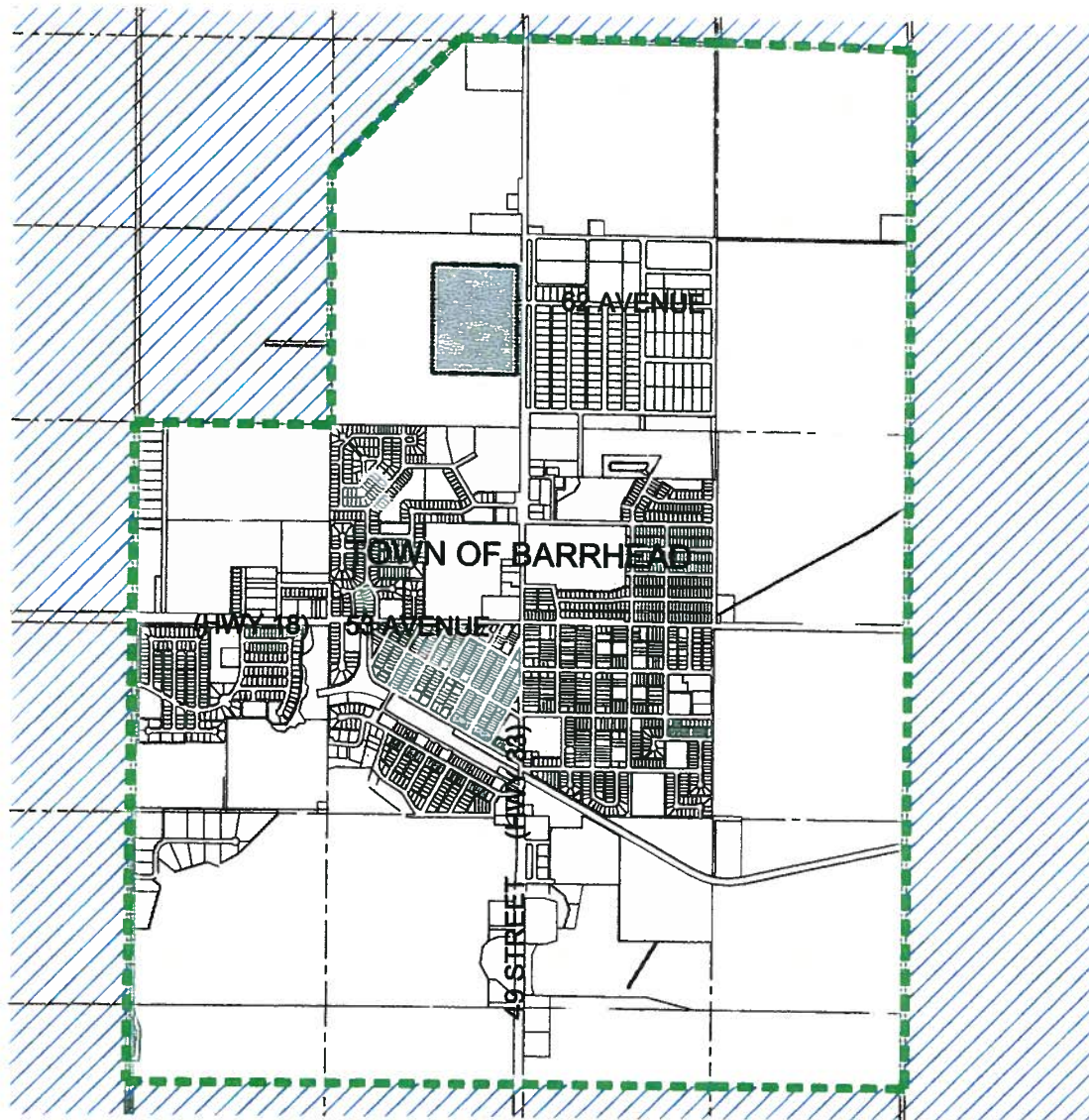
- 3.5.1 All utilities within the Plan area are to be designed and installed in accordance with accepted engineering practices, and shall be satisfactory to the Town. Whenever possible, all services should be installed below ground.
- 3.5.2 The Town of Barrhead shall charge an off-site levy assessment in respect of land within the Plan area, which is to be developed or subdivided.
- 3.5.3 Proposed sanitary sewage collection systems shall be connected to the existing municipal system and shall be designed to meet projected flows.
- 3.5.4 Shallow utilities and streetlights are to be the responsibility of the developer. Gas service to the Plan area is provided by Alta Gas Utilities, power by Utilicorp and telephone by Telus. Cable service is provided by Shaw Cable. These service providers should be contacted by the developer prior to, or during, the subdivision and development process to determine service requirements.
- 3.5.5 The proposed concept to accommodate the flows generalized by the development in NE 29-59-3-W5M is to provide direct drainage of storm water flows into the unnamed creek in the north eastern portion of the quarter section. In keeping with the dual drainage concept, minor flows can be conveyed to the creek via piped storm water systems and major flows will be directed overland as identified in the *Town of Barrhead Stormwater Management Study*, prepared by DCL Siemens, in June, 1996. Initial development will see drainage overland to the low land west of the development which eventually flows into the unnamed creek. Controlled drainage flows within the development will not have an adverse effect on the existing lowland area and unnamed creek. When development takes place west of the commercial site piped drainage for minor flows will convey drainage to the westerly low land or storm retention facility. Major flows will be conveyed overland to the same westerly low land or storm retention facility. All flows will be directed to the unnamed creek at controlled discharged rates as per Alberta Environment standards.

- 3.5.6 A 250mm sanitary main will be connected from Westside Development to the existing stubbed main on 55 Street and 60 Avenue in Barr Manor Estates. A 250mm Watermain will be extended across Highway 33 at 62 Avenue into Westside Development and reduced to a 200mm distribution main through the development.
- 3.5.7 Utilities and drainage are further defined on Figure 6.0: Servicing.

### **3.6 NAMING**

*Names of streets, subdivisions and other features are the result of a co-operative effort between the developer, the community and the municipality. The following policies shall apply to the naming of features.*

- 3.6.1 The larger name for the Plan Area shall be at the choice of the developer. Unless otherwise specified, the area shall continue to be known as "Westside Developments".
- 3.6.2 The numbers of roadways within the Plan area shall be consistent with the Town of Barrhead's numerical street and avenue convention.
- 3.6.3 Business numbers shall be set and assigned by the Town of Barrhead.
- 3.6.4 The developer may consider the placement of neighbourhood identification signs within municipal rights-of-way where permitted by the Town of Barrhead.



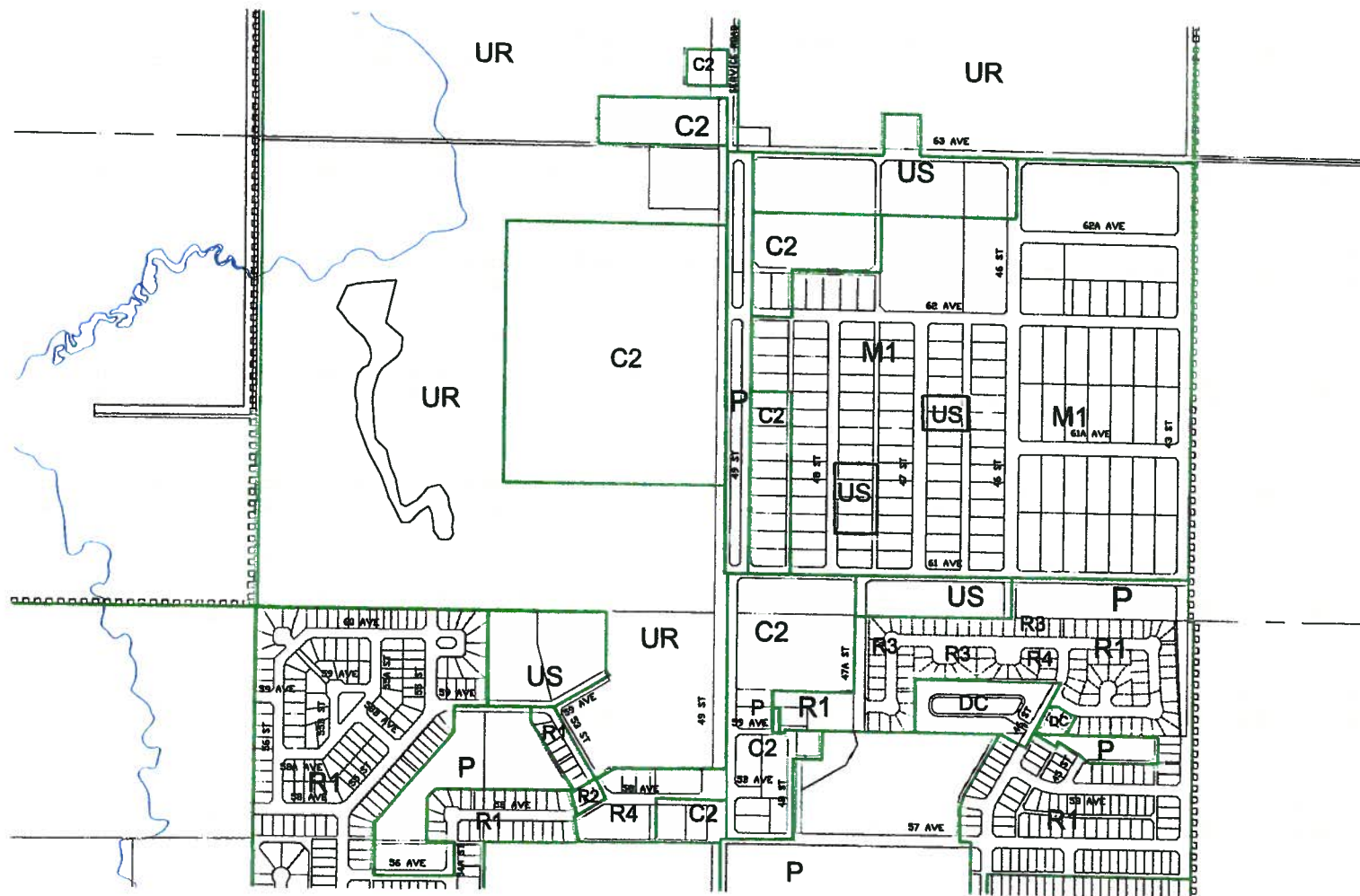
TOWN BOUNDARY	--- --
PLAN BOUNDARY	---
PLAN AREA	■
URBAN FRINGE	///

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WEST SIDE DEVELOPMENT LTD.

AREA STRUCTURE PLAN  
CONTEXT PLAN

DATE: JUNE, 2008 SCALE 1:20000 FIGURE 1.0

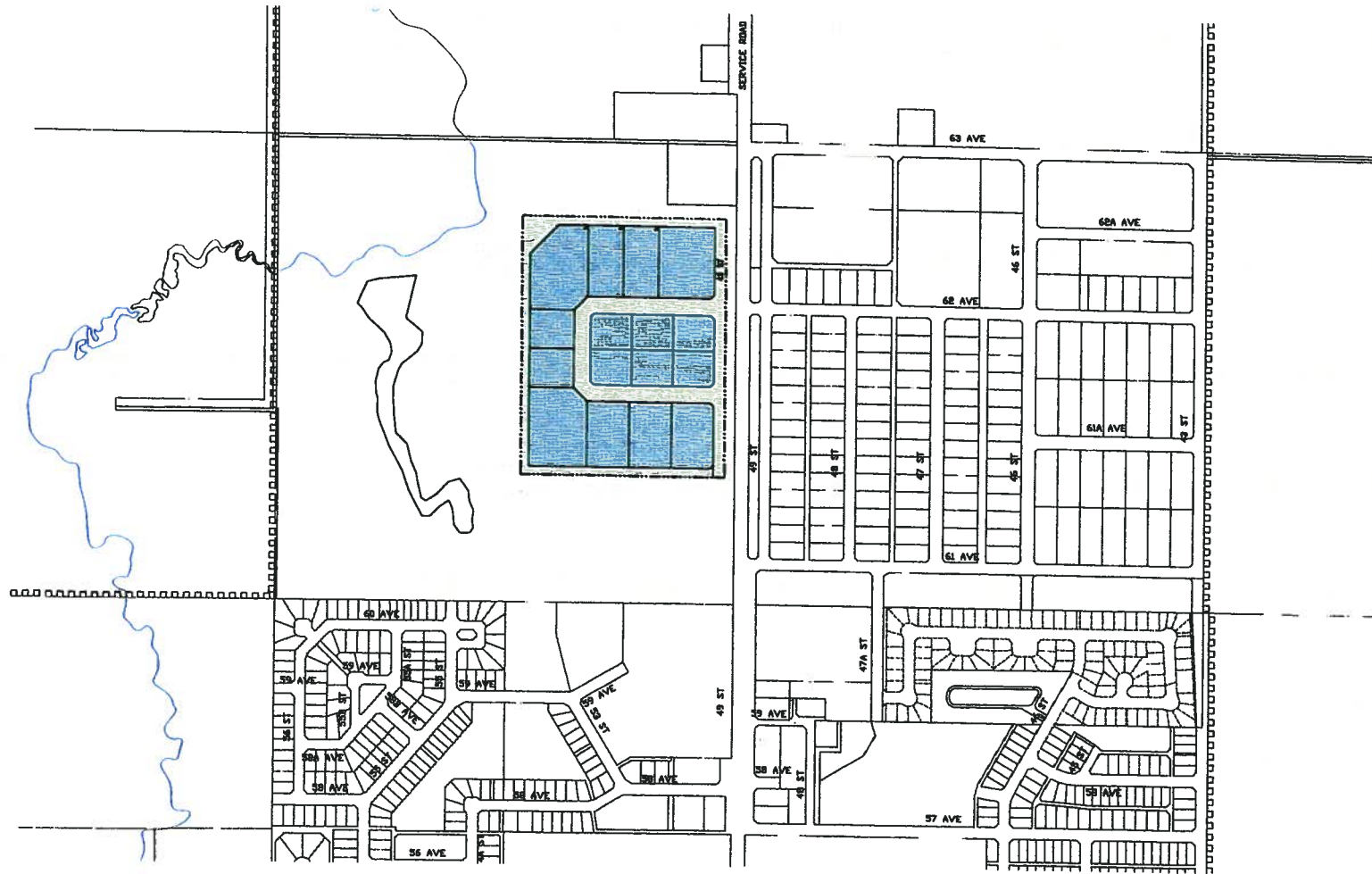


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WEST SIDE DEVELOPMENTS LTD

AREA STRUCTURE PLAN  
EXISTING LAND USE AND  
DEVELOPMENT CONSTRAINTS

DATE: JUNE, 2008 SCALE 1:7500 FIGURE 2.0



PLAN BDG.	
COMMERCIAL DEVELOPMENT	■
• 12.58 ha	
ROADWAYS	■
• 1.62 ha	
MUNICIPAL RESERVE	■
• 1.99 ha	

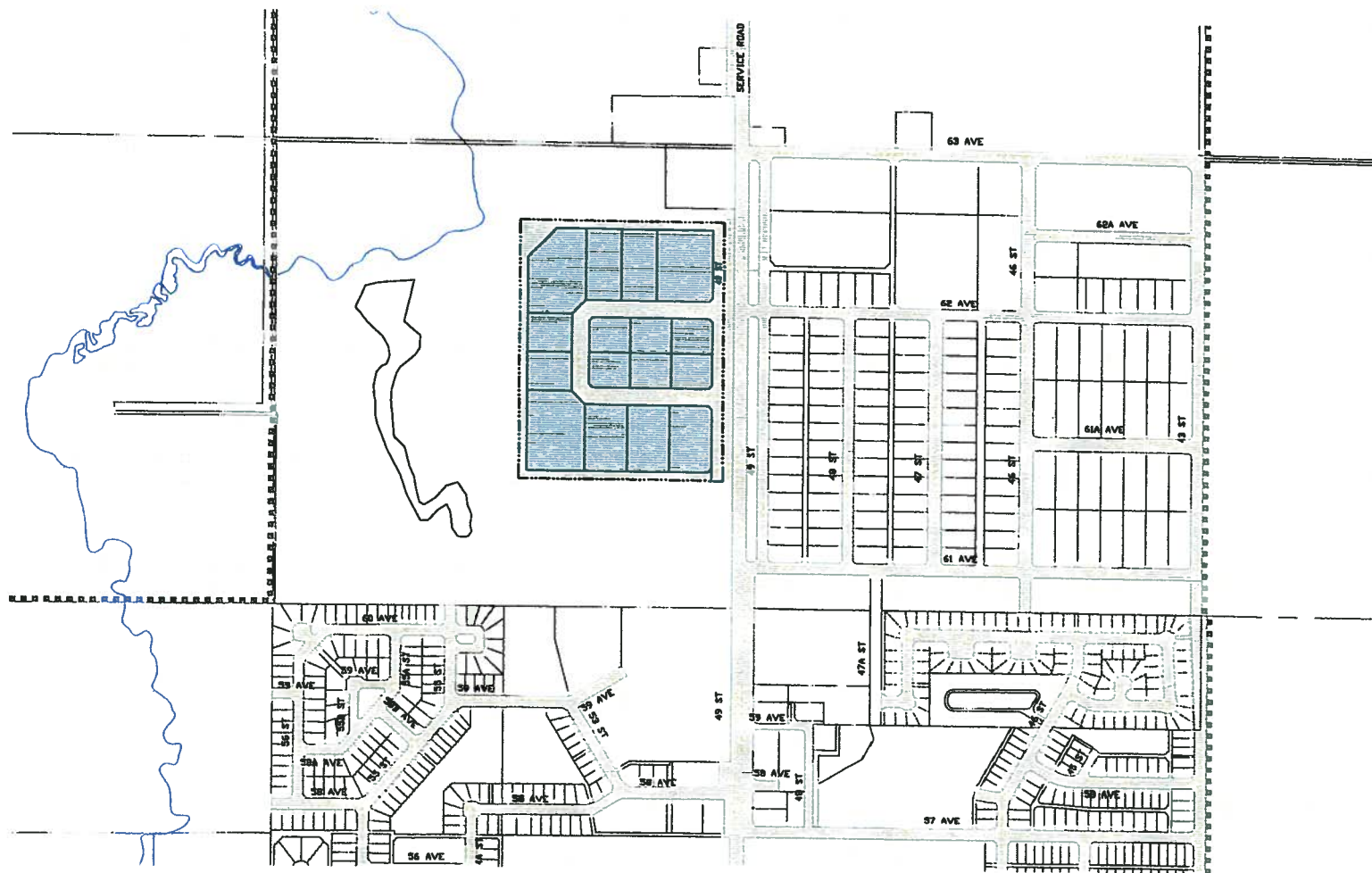
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WEST SIDE DEVELOPMENT LTD.

AREA STRUCTURE PLAN  
DEVELOPMENT CONCEPT

DATE: JUNE, 2008 SCALE 1:7500 FIGURE 3.0





TOWN BOUNDARY	-----
PLAN BOUNDARY	-----
C2	-----
MUNICIPAL RESERVE	-----
ROADWAYS	-----
AGRICULTURAL	-----

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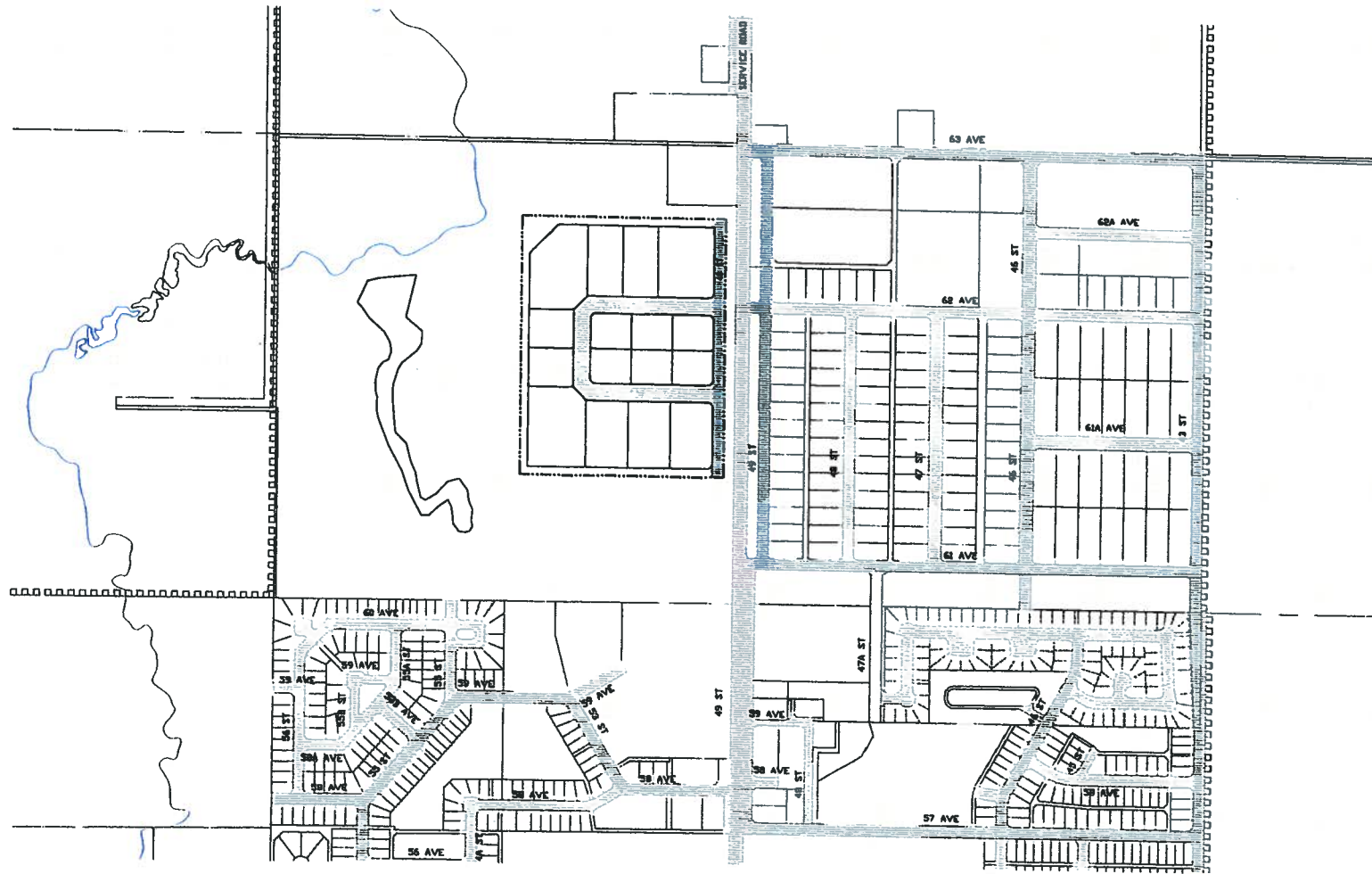
AREA STRUCTURE PLAN

LAND USE CONCEPT

DATE: JUNE, 2008

SCALE 1:7500

FIGURE 4.0



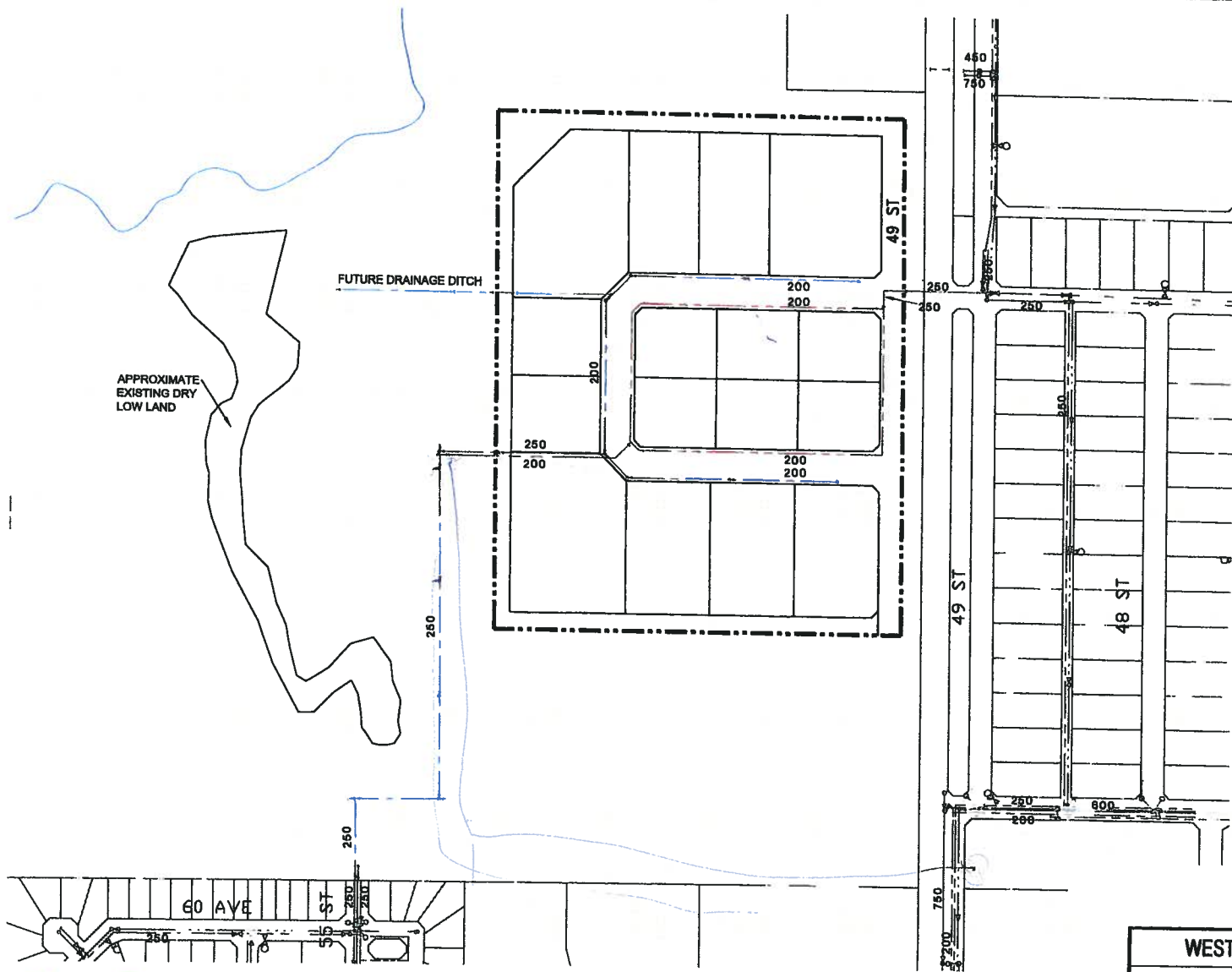
TOWN BOUNDARY	-----
PLAN BOUNDARY	-----
HIGHWAY	-----
LOCAL COLLECTOR	-----
LOCAL	-----
SERVICE ROAD	-----

**DCL SIEMENS**  
DCL SIEMENS ENGINEERING LTD.

WEST SIDE DEVELOPMENT LTD.

AREA STRUCTURE PLAN  
TRANSPORTATION SYSTEM

DATE: JUNE, 2008 SCALE 1:7500 FIGURE 5.0



**EXISTING**

WATER 150 mm  
• UNLESS OTHERWISE SHOWN

SANITARY 200 mm  
• UNLESS OTHERWISE SHOWN

STORM  
• AS SHOWN

**PROPOSED**

WATER 150 mm  
• UNLESS OTHERWISE SHOWN

SANITARY 200 mm  
• UNLESS OTHERWISE SHOWN

STORM DRAINAGE  
• AS SHOWN

<b>WEST SIDE DEVELOPMENT LTD.</b>		
AREA STRUCTURE PLAN		
EXISTING UTILITIES		
DATE: JUNE, 2008	SCALE N.T.S.	FIGURE 6.0

**DCL SIEMENS**  
DCL SIEMENS ENGINEERING LTD.



## **APPENDIX I**

**GEOTECHNICAL EVALUATION**  
**PROPOSED COMMERCIAL SUBDIVISION DEVELOPMENT**  
**49 STREET AND 62 AVENUE**  
**BARRHEAD, ALBERTA**

Prepared For:

**STEELTECH STRUCTURES**

Prepared By:

**SHELBY ENGINEERING LTD.**

9632 - 54 Avenue  
Edmonton, Alberta  
T6E 5V1

Phone: (780) 438-2540  
Fax: (780) 434-3089  
email: [contact@shelbyengineering.ca](mailto:contact@shelbyengineering.ca)

File No. 1-12,452

AUGUST 2008

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### **APPENDIX I**

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### **APPENDIX II**

Standard Terms and Conditions For The Provision  
Of Services By Shelby Engineering Ltd.

## **1.0 INTRODUCTION**

Shelby Engineering Ltd. has conducted a Geotechnical Evaluation for the proposed commercial subdivision development in the Town Barrhead, Alberta.

Mr. Sean Steel of Steeltech Structures, authorized this investigation on July 4, 2008. This evaluation is subject to the Standard Terms and Conditions enclosed in Appendix II. The field drilling and sampling program was undertaken on July 22, 2008 and was comprised of 4 test holes.

The purpose of our geotechnical investigation was to determine the general subsoil stratigraphy and to provide recommendations pertinent to underground utility servicing, roadways, and preliminary recommendations pertinent to commercial building foundations. It is understood the proposed development will be 16 commercial lots. Water and sewer services will be developed beneath roads to a maximum depth of about 4 meters. Roadways will be developed to an urban standard.

## **2.0 SITE DESCRIPTION**

The site is located on the west side of 49 Street at 62 Avenue in the northwest part of Barrhead, Alberta. The site was an open field covered with tall grasses and weeds. The site is generally level on the eastern side and drops off to the northwest. A maximum difference in the test hole elevations of about 4 meters was noted at the test hole locations.

### 3.0 GENERAL SOIL CONDITIONS

The generalized subsoil stratigraphy at this site is based on the findings in four test holes and consists primarily of topsoil underlain by clay, clay till and bedrock. Detailed soil logs are shown on the attached Drawings 1 through 4, Appendix I. The test hole locations are detailed on the attached Drawing 5, Appendix I.

Topsoil was noted in the test holes to depths that varied from negligible in test hole 3 to 300-mm in test hole 1. The topsoil was underlain by clay that extended to an average depth of about 900-mm. The clay is medium plastic and stiff consistency. Clay till was encountered below the clay extending to depths of as shallow as 4 meters in test hole 4 to the depth of drilling (6.9 meters) in test hole 2. The clay till is stiff to very stiff and medium plastic. Bedrock consisting of clay shale and sandstone was encountered in test holes 1, 2, and 4. The bedrock was very stiff to hard and had some wet lenses.

Water and slough were noted at the completion of drilling and the following table indicates the levels encountered and the water levels in the standpipes installed in test holes 2, 4 and 9.

Test Hole	Slough Level on Completion meters	Water Level on Completion meters
1	No slough	6.1
2	No slough	Dry
3	No slough	Dry
4	No slough	Dry

## 4.0 RECOMMENDATIONS

The following recommendation and intended to be utilized in site development planning for roads and underground services. Foundation recommendations should be confirmed on a site-specific basis prior to final site development.

### 4.1 SUBSURFACE UTILITIES

Trench excavations shall conform to the guidelines outlined in the Occupational Health and Safety Act with respect to shoring and cutback. Temporary trench sideslopes (open for less than 7 days) may be constructed at 1.65 vertical to 1 horizontal. Excavations open for longer time periods should have the side slopes trimmed to no greater than 1.5 vertical to 1.0 horizontal. Excavated material should not be stockpiled within one half a trench depth of the side of the trench.

The clay or clay till excavated from the trenches may be reused as backfill. All trench excavations should be backfilled as soon as possible. Ground water was encountered during drilling of the test hole 1. The ingress of groundwater into the trench excavations may be encountered. Should ground water flow into the excavations occur it should be removed by pumping. Excessive ground water flows are not expected and should be able to be accommodated by normal pumping techniques.

Backfill of trenches should be undertaken in 200 mm thick lifts and compacted to 95 percent of Standard Proctor maximum dry density. The upper 300 mm of the trench beneath roadways or surface improvements should be compacted to 100 percent of Standard Proctor maximum dry density. Compaction activities must be verified by the appropriate inspection, laboratory and field-testing. Shelby Engineering Ltd. can provide recommendations regarding inspection and testing requirements upon request.

## 4.2 BUILDINGS

Shallow foundations, such as spread footings may be used to support structures providing they are based on undisturbed soil. Pile foundations such as cast-in-place concrete friction or belled end bearing piles may also be utilized to support commercial buildings. These foundation types may be proportioned on the basis of the following preliminary design parameters. These design parameters should be confirmed on a site-specific basis once the precise location and details of the structure are known.

### 4.2.1. Strip and Square Footings

Strip and square footings based on stiff clay or clay till may be proportioned on the basis of the following bearing values.

	Factored Geotechnical Bearing Resistance at ULS	Maximum Allowable Bearing Pressure at SLS
Strip Footing	150 Kpa	100 Kpa
Square Footing	180 Kpa	120 Kpa

The maximum allowable bearing pressure at Serviceability Limit State (SLS) is based on settlement of 25 mm or less.

Footings should be based on undisturbed stiff clay or clay till. If an acceptable bearing surface cannot be prepared using mechanical equipment, hand cleaning will be required.

Minimum footing widths of 400 mm and 750 mm are recommended for strip and square footings respectively.

Exterior and interior footings should be based at a depth of at least 1.5 and 0.5 meters below final grade.

The bearing soils are medium plastic and volume change may result due to moisture variations. Consequently the bearing surface should be protected from drying or wetting.

Footings should not be placed on frozen soil, and neither should the soil be allowed to freeze after casting of the footings.

Backfill adjacent to and above the footings should be compacted to 95 percent of Standard Proctor maximum dry density in lifts not exceeding 200 mm in thickness.

#### 4.2.2. Cast-In-Place Concrete Friction Piles

Cast-in-place concrete friction piles may be proportioned on the basis of the following preliminary skin friction:

Depth Below Existing Grade (meters)	Factored Geotechnical Skin Friction at ULS*	Maximum Allowable Skin Friction at SLS
0.0 to 1.5 meters	0 Kpa	0 Kpa
Below 1.5 meters	31.1 Kpa	23.0 Kpa

**\* Based on Geotechnical Resistance Factor of 0.65 as per AASHTO**

The effect of potential end bearing should not be included in the design of the pile.

The upper 1.5 meters of the pile, or any portion of the pile encountering fill soil or organics, which ever is greater, should be neglected in skin friction due to potential frost penetration, seasonal moisture variations and soil volume changes.



Casing should be on site and utilized as required to prevent seepage or sloughing from having a detrimental effect on the pile installation.

Concrete should be placed as soon as possible after drilling of the pile hole. The upper 3 meters of concrete should be vibrated to ensure complete consolidation of the concrete.

The upper 4.5 meters of all piles should be reinforced to prevent adverse effects of seasonal frost penetration or moisture content variations.

A minimum shaft diameter of 300 mm and length of 4.5 meters is recommended.

A void form at least 100 mm in thickness should be placed beneath all grade beams to facilitate any expansion due to frost action or seasonal moisture variations.

#### 4.2.3. Cast-In-Place Concrete Belled End Bearing Piles

Cast-in-place concrete belled end bearing piles based in stiff clay till at a depths of about 4.0 meters below existing grade may be designed on the basis of an allowable bearing pressure of 287 kilopascals.

Depth Below Existing Grade	Factored Geotechnical End Bearing Resistance at ULS	Maximum Allowable End Bearing Pressure at SLS
4.0 meters*	360 Kpa	240 Kpa

\*Established in stiff clay till

The maximum allowable bearing pressure at Serviceability Limit State (SLS) is based on pile settlement of less than 25 mm.

A minimum shaft diameter of 400 mm is recommended. A shaft to bell diameter ratio of 1 to 3 should not be exceeded.

The surface of the bells should be visually inspected to ensure that all loose or remoulded material is removed from the base of the bell.

Casing should be used in the event that seepage or sloughing occurs. Concrete should be placed as soon as possible after drilling and inspection of the pile hole to reduce the risk of seepage or sloughing from having a detrimental effect on the pile installation.

Reinforcing steel should extend into the pile bells or at least 4.5 meters below grade.

A depth of cover of 2.5 times the bell diameter has been assumed in calculating the above allowable bearing pressure. If less cover is provided then the specified pressure must be reduced.

A void form at least 100 mm in thickness should be placed beneath all grade beams to facilitate any soil expansion due to frost action or seasonal moisture content variations.

#### 4.3 CONCRETE

Negligible concentrations of soluble sulphates were measured in samples tested from the site. Type GU General Use Portland Cement may be used for concrete in contact with natural soil or ground water. A minimum "28 day" compressive strength of 25 Mpa is recommended for foundation concrete. Concrete exposed to freeze thaw cycles should be air entrained 5 to 7 percent to increase its durability.

#### 4.4 FLOOR SLAB SUPPORT:

It is recommended grade supported concrete floor slabs be supported on a minimum of 150 millimeters of well-graded crushed gravel (20 mm maximum). This material should be compacted to 100 percent of the corresponding Standard Proctor Maximum Dry Density.

#### 4.5 ROADWAYS:

The anticipated traffic for the pavement areas will be passenger cars as well as light and heavy trucks. The proposed roads are anticipated as urban cross sections with a 20-year design life. The design traffic number of 40 has been applied.

##### 4.5.1 Subgrade Preparation

The subgrade should be shaped to mirror the final grade on the asphalt surface allowing for a uniform pavement structure across the roadway as well as to provide good subgrade drainage. Subgrade preparation beneath roadways will require the upper 150-mm of subgrade should be moisture conditioned to be 1 to 2 percent over the optimum moisture content and re-compacting to 100 % of Standard Proctor maximum dry density. The subgrade should be subjected to a proof rolling with a heavily loaded truck. The subgrade should show no visible signs of movement. Recommendations for repair of soft areas can be made at the time of the proofrolling test.

Fill material that may be required for grading purposes can be comprised of medium plastic clay or clay till borrowed from other areas of the site. Fill material should be compacted to a minimum of 95% the Standard Proctor Maximum dry density in lifts of 150 mm in compacted thickness. The upper 300-mm of the subgrade should be moisture

conditioned as noted above and compacted to 100 percent of Standard Proctor maximum dry density. The upper portion of the subgrade and the overlying pavement structure should be crowned to shed water to the curbs and storm sewer or drainage system.

#### 4.5.2 Pavement Structure

A CBR of 2.5 has been determined for the subgrade. The following asphalt pavement structure is recommended for this site over the prepared subgrade:

##### Asphalt

125 mm of asphalt (compacted thickness)

350 mm of crushed gravel (20-mm Maximum size)

Staged construction is recommended for roadways underlain by underground services. The upper 25 to 30 mm of the asphalt surface should be placed in 2 years time.

The crushed gravel base must be compacted to 100 percent of Standard Proctor Maximum dry density using vibratory equipment in lifts not exceeding 150 millimeters in thickness.

Appropriate laboratory and field testing inspection must verify the acceptability of all compacted materials both native and imported. To ensure a high level of performance from pavement sections, the subgrade must not be allowed to dry and/or become wetted prior to or subsequent to construction.

Asphalt and gravel used in the pavement structure should meet the following minimum specifications.

A. ASPHALTIC CONCRETE

1. The 50 blow Marshall Mix shall meet the following specification.

Stability - 5000 Newtons minimum

Flow - 2-4 mm

Air Voids, 3-5%

Voids in Mineral Aggregate - 14% minimum

2. The asphaltic cement used in the asphaltic concrete should be 150 - 200 penetration grade.

3. Aggregate shall be sound, hard, strong, free from adherent coatings and organics and be uniformly graded to the following gradation limits.

Sieve Size	Percent Passing
20 mm	100
10 mm	62 - 82
5 mm	44 - 63
1.25 mm	27 - 46
315 um	15 - 32
80 um	3 - 10

4. Material shall have a minimum crushed faces count (1 face) of 40 percent by weight retained on the 5-mm sieve.

5. Material shall have a Los Angeles Abrasion number of not greater than 40 percent.

6. The asphaltic concrete should be compacted to 98 percent of the 50 blow Marshall density.

B. 20 mm CRUSHED GRAVEL

1. Material shall be sound, hard durable particles free from elongated particles, organic or other foreign matter.
2. Lightweight particles shall not exceed 2-percent when tested in heavy liquid with relative density of 2.0.
3. Material shall be uniformly graded between the following gradation limits.

<u>Sieve Size</u>	<u>Percent Passing</u>
20 mm	100
5 mm	40 - 60
1.25 mm	20 - 40
315 um	8 - 25
80 um	3 - 10

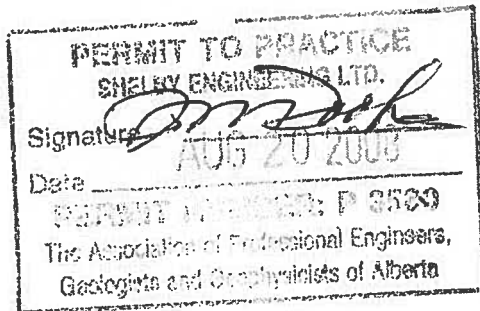
4. Material shall have a liquid limit of the minus 315 um fraction not greater than 25 percent and plasticity index not greater than 6 percent.

5. Material shall have crushed faces count of plus 5-mm material of at least 40 percent.

6. Crushed gravel shall be compacted to 100 percent of Maximum Standard Proctor Density.

## 5.0 CLOSURE

All services provided by Shelby Engineering Ltd. are subject to our Standard Terms and Conditions, which are attached in Appendix II.



Respectfully submitted,

SHELBY ENGINEERING LTD.

A circular seal for a Professional Engineer in Alberta. The outer ring contains the text "PROFESSIONAL ENGINEER" at the top and "ALBERTA" at the bottom. The inner circle contains the name "JAMES P. DOOHAN". A handwritten signature is written across the seal.

James P. Doohan, M.A.Sc., P.Eng.

JPD:ab/Encl.  
File No. 1-12,452  
August 2008

## **APPENDIX I**



LIGHT INDUSTRIAL SUBDIVISION		STEELTECH STRUCTURES INC.		TEST HOLE NO: TH-1	
BARRHEAD, AB		START DATE: 22/07/08		PROJECT NO: I-12452	
PROJECT ENGINEER: JPD		SOLID STEM AUGERS & SPTS		ELEVATION: 97.88 m	
SAMPLE TYPE <input checked="" type="checkbox"/> GRAB		<input checked="" type="checkbox"/> SHELBY TUBE		<input checked="" type="checkbox"/> SPT	
		<input type="checkbox"/> NO RECOVERY		<input type="checkbox"/> HOLLOW STEM	
				<input checked="" type="checkbox"/> SOLID STEM	

Depth(m)	STANDARD PENETRATION (N) ▲ 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80	SAMPLE TYPE	RUN NO	SPT(N)	SOIL DESCRIPTION	USC	SOIL SYMBOL	ADDITIONAL TESTING	ELEVATION(m)
0.0			1		TOPSOIL: Black, clayey, trace rootlets to 300mm depth.	OL			
			2		CLAY: Brown, silty, medium plastic, trace oxides. -stiff, trace gravel, oxides from 600mm depth.	CI			97.0
1.0			3	15	CLAY TILL: Brown & grey, silty, sandy, medium plastic, stiff, trace gravel, oxides, coal, white deposits. -trace gravel, oxides, coal.			SO4 = 0.00%	
			4						96.0
2.0			5					H2O in adjacent standpipe (2.2m)	
			6	10		CI			95.0
3.0			7						
			8						94.0
4.0			9	9	-grey, silty, some clay shale, trace gravel, sand, coal.				
			10		CLAY SHALE: Grey, silty, very stiff, trace oxides.				93.0
5.0			11						
			12	26		CS			92.0
6.0			13		-trace wet sand & gravel.				
			14						91.0
7.0					DEPTH OF TESTHOLE 6.90 METRES. H2O @ 6.1 METRES ON COMPLETION. NO SLOUGH. TESTHOLE BACKFILLED.				

SHELBY ENGINEERING LTD Edmonton, Alberta		LOGGED BY: GWD REVIEWED BY: JPD Fig. TH-1	COMPLETION DEPTH: 6.9 m COMPLETE: 22/07/08 Page 1 of 1
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LIGHT INDUSTRIAL SUBDIVISION		STEELTECH STRUCTURES INC.		TEST HOLE NO: TH-2	
BARRHEAD, AB		START DATE: 22/07/08		PROJECT NO: 1-12452	
PROJECT ENGINEER: JPD		SOLID STEM AUGERS & SPTS		ELEVATION: 93.87 m	
SAMPLE TYPE <input checked="" type="checkbox"/> GRAB		<input checked="" type="checkbox"/> SHELBY TUBE		<input checked="" type="checkbox"/> SPT	
		<input type="checkbox"/> NO RECOVERY		<input type="checkbox"/> HOLLOW STEM	
		<input type="checkbox"/> SOLID STEM			

Depth(m)	▲ STANDARD PENETRATION (N) ▲ 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80	SAMPLE TYPE	RUN NO	SPT(N)	SOIL DESCRIPTION	USC	SOIL SYMBOL	ADDITIONAL TESTING	ELEVATION(m)
0.0			1		TOPSOIL: Black, clayey, trace rootlets to 200mm depth.	OL			
			2		CLAY: Brown, and silt, medium plastic, trace oxides.	CI			93.0
1.0			3	13	CLAY TILL: Brown, silty, sandy, medium plastic, stiff, trace gravel, oxides, coal, white deposits.				
			4		-trace gravel, oxides, coal.				92.0
2.0			5						
			6	13	-brown & grey.				91.0
3.0			7						
			8						90.0
4.0			9	13	-silty, medium to high plastic, trace sand, gravel, oxides.	CI			
			10		-brownish grey, silty, medium plastic, stiff, some sand, trace gravel, oxides, coal.				89.0
5.0			11						
			12	11	-grey, silty, some sand, trace gravel, clay shale.				88.0
6.0			13						
			14						87.0
7.0					DEPTH OF TESTHOLE 6.90 METRES. DRY ON COMPLETION. NO SLOUGH. STANDPIPE INSTALLED.				

SHELBY ENGINEERING LTD		LOGGED BY: GWD	COMPLETION DEPTH: 6.9 m
Edmonton, Alberta		REVIEWED BY: JPD	COMPLETE: 22/07/08
		Fig. No: 2	Page 1 of 1

LIGHT INDUSTRIAL SUBDIVISION		STEELTECH STRUCTURES INC.		TEST HOLE NO: TH-3	
BARRHEAD, AB		START DATE: 22/07/08		PROJECT NO: 1-12452	
PROJECT ENGINEER: JPD		SOLID STEM AUGERS & SPTS		ELEVATION: 97.44 m	
SAMPLE TYPE <input checked="" type="checkbox"/> GRAB		<input checked="" type="checkbox"/> SHELBY TUBE		<input checked="" type="checkbox"/> SPT	
		<input type="checkbox"/> NO RECOVERY		<input type="checkbox"/> HOLLOW STEM	
				<input checked="" type="checkbox"/> SOLID STEM	

Depth(m)	STANDARD PENETRATION (N) ▲ 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80	SAMPLE TYPE	RUN NO	SPT(N)	SOIL DESCRIPTION	USC	SOIL SYMBOL	ADDITIONAL TESTING	ELEVATION(m)
0.0			1		CLAY: Brown, and silt, medium plastic, stiff, trace oxides.	CI			97.0
1.0			2		CLAY TILL: Brown, silty, sandy, medium plastic, stiff, trace gravel, oxides, coal, silt lenses.  -trace gravel, oxides, coal, clay shale.	CI			96.0
			3	12					
			4						
2.0			5		-brown & grey.	CI			95.0
			6	18					
			7						
3.0			8		-trace gravel, oxides, coal, sand lenses.	CI			94.0
			9	17					
			10						
4.0			11		-brown, silty, some sand, trace gravel, oxides, coal.	CS			93.0
			12	20					
			13						
5.0			14		CLAY SHALE: Grey, silty, very stiff, trace ironstone, oxides.	CS			92.0
6.0					SANDSTONE: Light grey, silty, compact.	SS			91.0
7.0					CLAY SHALE: Light grey, silty, very stiff, trace sandstone, coal.	CS			90.0
					DEPTH OF TESTHOLE 6.90 METRES. DRY ON COMPLETION. NO SLOUGH. TESTHOLE BACKFILLED.				

SHELBY ENGINEERING LTD Edmonton, Alberta		LOGGED BY: CWD REVIEWED BY: JPD Fig. No: 3	COMPLETION DEPTH: 6.9 m COMPLETE: 22/07/08 Page 1 of 1
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LIGHT INDUSTRIAL SUBDIVISION		STEELTECH STRUCTURES INC.		TEST HOLE NO: TH-4	
BARRHEAD, AB		START DATE: 22/07/08		PROJECT NO: 1-12452	
PROJECT ENGINEER: JPD		SOLID STEM AUGERS & SPTS		ELEVATION: 97.95 m	
SAMPLE TYPE <input checked="" type="checkbox"/> GRAB		<input type="checkbox"/> SHELBY TUBE		<input checked="" type="checkbox"/> SPT	
		<input type="checkbox"/> NO RECOVERY		<input type="checkbox"/> HOLLOW STEM	
				<input checked="" type="checkbox"/> SOLID STEM	

Depth(m)	STANDARD PENETRATION (N) 20 40 60 80	SAMPLE TYPE	RUN NO	SPT(N)	SOIL DESCRIPTION	USC	SOIL SYMBOL	ADDITIONAL TESTING	ELEVATION(m)
0.0					TOPSOIL: Black, clayey, trace rootlets to 250mm depth.	OL			
					CLAY: Brown, and sill, medium plastic, stiff, trace oxides.	CI			
					-brown & grey, silty, high plastic, stiff trace oxides, sill lenses, white deposits	CH			97.0
1.0				14	CLAY TILL: Brown & grey, silty, medium plastic, stiff, some sand, trace gravel, oxides, coal.				
2.0									96.0
				10		CI			
3.0				7					95.0
				8	-silty, some clay shale, trace gravel, sand, oxides, coal.				
4.0				45	CLAY SHALE: Brown, silty, hard, trace coal				94.0
				10					
					-grey.				93.0
5.0									
				11	-brown, trace coal.	CS			
				12	-grey.				92.0
6.0									
				13					
				14	SANDSTONE: Light grey, silty, dense.	SS			91.0
7.0					DEPTH OF TESTHOLE 6.90 METRES. DRY ON COMPLETION. NO SLOUGH. TESTHOLE BACKFILLED.				

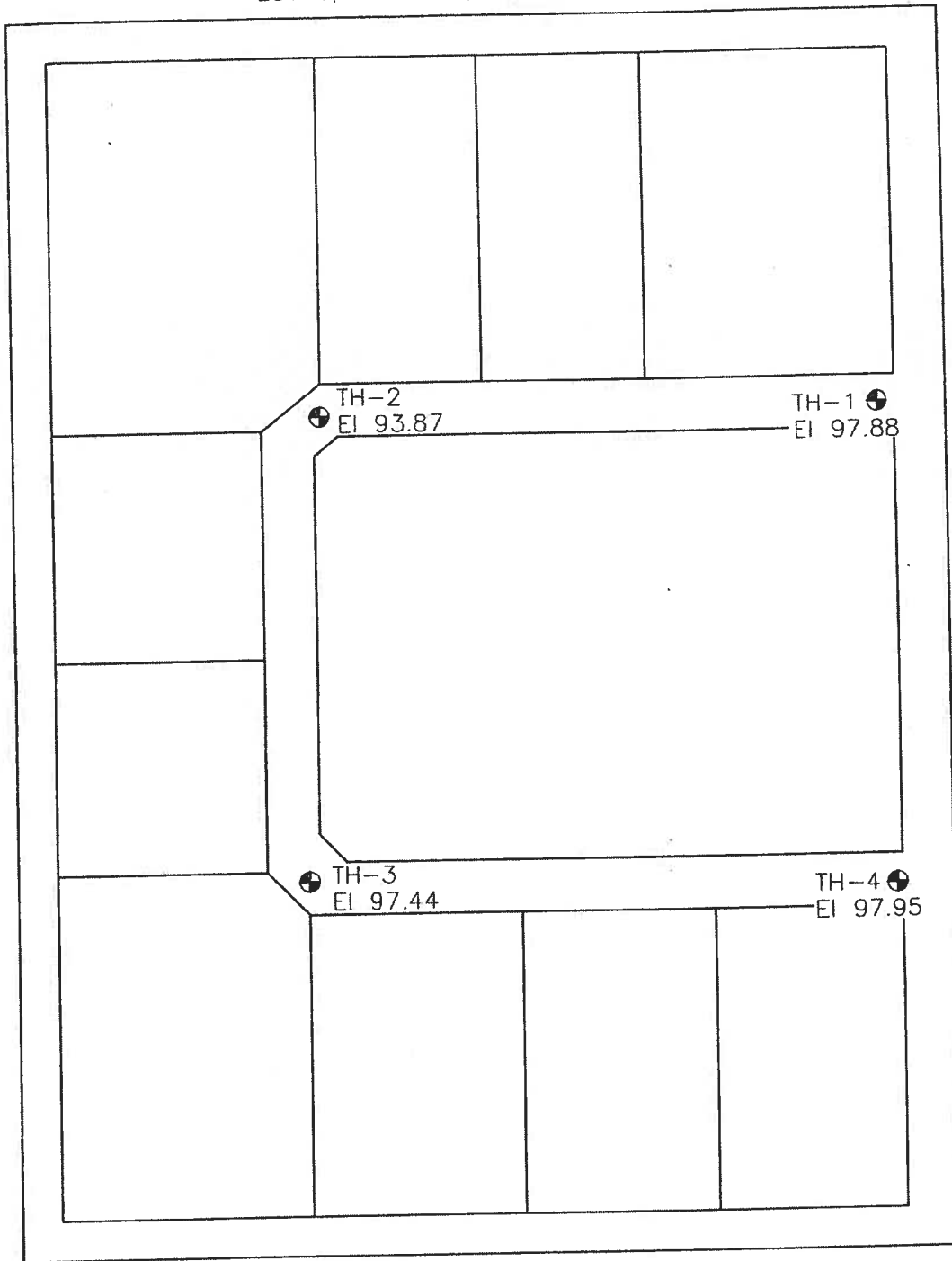
  

SHELBY ENGINEERING LTD Edmonton, Alberta		LOGGED BY: GWD REVIEWED BY: JPD Fig. No: 1	COMPLETION DEPTH: 5.9 m COMPLETE: 22/07/08 Page 1 of 1
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PROPOSED SUBDIVISION OF  
LOT 1, BLOCK 1, PLAN 082-3123



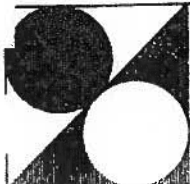
NE 29-59-3 W5



TBM  $\Delta$

Highway 33

TBM Rim of manhole  
Assumed elevation 100.00m



SHELBY  
ENGINEERING  
LTD.

JOB NO.: 1-12452

DATE: July 2008

SCALE: 1:2500

DWN BY: GWD

DWG NO: 5

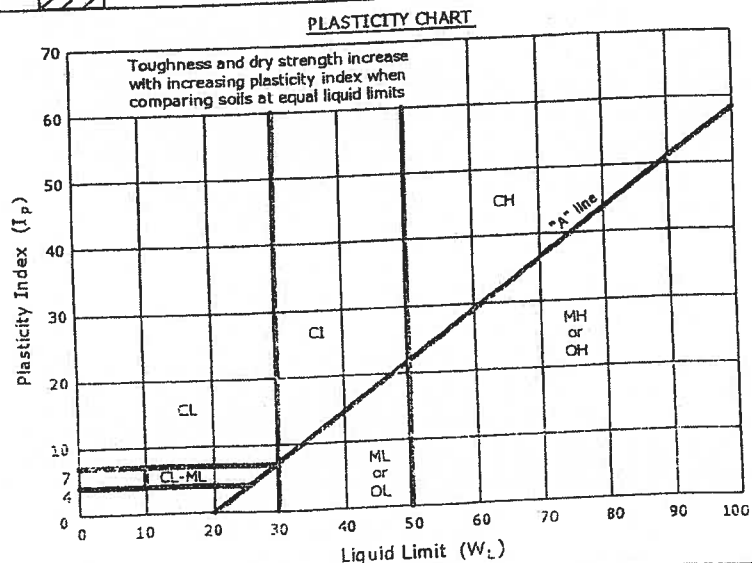
# SOIL CLASSIFICATION SYSTEM (MODIFIED U.S.C.)

MAJOR DIVISION			GROUP SYMBOL	GRAPHIC SYMBOL	GROUP NAME	LABORATORY CLASSIFICATION CRITERIA	
HIGHLY ORGANIC SOILS			PT		PEAT AND OTHER HIGHLY ORGANIC SOILS	STRONG COLOR OR ODOR, AND OFTEN FIBROUS TEXTURE	
MORE THAN 50% RETAINED ON NO. 200 SIEVE	GRAVELS  MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS  LESS THAN 5% FINES	GW		WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, < 5% FINES	$C_u = \frac{D_{60}}{D_{10}} > 4$ $1 \leq C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} \leq 3$	
			GP		POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, < 5% FINES	NOT MEETING ALL ABOVE REQUIREMENTS	
		DIRTY GRAVELS  MORE THAN 12% FINES	GM		SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES, > 12% FINES	ATTERBERG LIMITS BELOW "A" LINE OR $I_p < 4$	
			GC		CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES, > 12% FINES	ATTERBERG LIMITS ABOVE "A" LINE OR $I_p > 7$	
	SANDS  MORE THAN 50% OF COARSE FRACTION PASSES NO. 4 SIEVE	CLEAN SANDS  LESS THAN 5% FINES	SW		WELL-GRADED SANDS, GRAVELLY SANDS, < 5% FINES	$C_u > 6$ and $1 \leq C_c \leq 3$	
			SP		POORLY-GRADED SANDS, OR GRAVELLY SANDS, < 5% FINES	NOT MEETING ALL ABOVE REQUIREMENTS	
		DIRTY SANDS  MORE THAN 12% FINES	SM		SILTY SANDS, SAND-SILT MIXTURES, > 12% FINES	ATTERBERG LIMITS BELOW "A" LINE OR $I_p < 4$	
			SC		CLAYEY SANDS, SAND-CLAY MIXTURES, > 12% FINES	ATTERBERG LIMITS ABOVE "A" LINE OR $I_p > 7$	
FINE: MORE THAN 50% PASSES NO. 200 SIEVE	SILTS		ML		INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY SANDS OF SLIGHT PLASTICITY	$W_L < 50$	
	BELOW "A" LINE ON PLASTICITY CHART; NEGLECTIBLE ORGANIC CONTENT		MH		INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS, FINE SANDY OR SILTY SOILS	$W_L > 50$	
	CLAYS	ABOVE "A" LINE ON PLASTICITY CHART; NEGLECTIBLE ORGANIC CONTENT	CL		INORGANIC CLAYS OF LOW PLASTICITY, GRAVELLY, SANDY, OR SILTY CLAYS, LEAN CLAYS	$W_L < 30$	
			CI		INORGANIC CLAYS OF MEDIUM PLASTICITY, SILTY CLAYS	$30 < W_L < 50$	
			CH		INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS	$W_L > 50$	
	ORGANIC SILTS AND ORGANIC CLAYS		OL		ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY	$W_L < 50$	
	BELOW "A" LINE ON PLASTICITY CHART		OH		ORGANIC CLAYS OF HIGH PLASTICITY	$W_L > 50$	
						SEE PLASTICITY CHART BELOW	

PLASTICITY CHART

- All sieve sizes mentioned on this chart are U.S. Standard, ASTM E11
- Boundary classifications possessing characteristics of two groups are given combined group symbols. eg. GW-GC is a well-graded gravel-sand mixture with clay binder of between 5% and 12%.
- Soil fractions and limiting textural boundaries are in accordance with the Unified Soil Classification System (ASTM D2487), except that an inorganic clay of medium plasticity (CI) is recognized.
- The following adjectives may be employed to define percentage ranges by weight of minor components (per ASTM D2488):

And - 36% to 50%  
Some - 21% to 35%  
Little - 11% to 20%  
Trace - 1% to 10%



**SHELBY  
ENGINEERING  
LTD**

SOIL CLASSIFICATION CHART

PLATE NO. 6

## **APPENDIX II**



**STANDARD TERMS AND CONDITIONS FOR THE PROVISION OF SERVICES  
BY SHELBY ENGINEERING LTD.**

1. "The services ("the Services") performed for the client (the "Client") by Shelby Engineering Ltd. ("Shelby") described in the report to which these Standard Terms and Conditions are attached (the "Report") have been conducted in a manner consistent with the level of skill ordinarily exercised by ~~members of the engineering profession currently practicing in the jurisdiction in which the Services have~~ been provided."
2. In consideration of the provision of the Services, the Client agrees to the limitation of liability provisions herein contained, both on its own behalf, and as agent on behalf of its employees and principals.
3. The total amount of all claims the Client may have against Shelby with respect to the Services, including, without limitation, claims in tort or contract, shall be strictly limited to the amount of the fee charged to the Client by Shelby for the Services. Shelby shall not be liable for loss, injury or damage caused by delays beyond Shelby's control, or for any indirect, economic or consequential loss, injury or damage incurred by the Client, including, without limitation, claims for loss of profits, loss of contracts, loss of use, loss of production or business opportunity, loss of contracts or continued overhead expense. No claim shall be brought by the Client against Shelby more than two (2) years after completion of the Services or termination of the agreement to provide the Services.
4. The Client shall have no right to set off against any amounts owed to Shelby with respect to the Services.
5. The Client agrees that Shelby's employees and principals shall have no personal liability with respect to the Services and the Client shall make no claim or bring any proceedings of any kind whatsoever whether in contract, tort or any other cause of action in law or equity, against Shelby's employees and principals in their personal capacity.
6. The Client acknowledges that the Services entail an investigation which by its nature involves the risk that certain conditions between points investigated will not be detected, and that certain other conditions may change with time after provision of the written report of the Services. The Client acknowledges and accepts such risk and is aware that the Report can only provide for the conditions at the investigated points at the time of investigation. Extrapolation between the investigated points is at the Client's risk. If the Client requires additional or special investigations outside the scope of the Report, the Client must request such additional investigations from Shelby.
7. The Report has been prepared for a specific site and in light of the specific purposes communicated to Shelby by the Client. Shelby accepts no responsibility for the findings contained in the Report if applied to a different site, or if there is a material change in the purposes communicated to Shelby by the Client. The information and opinions described in the Report are provided solely for the benefit of the Client. **NO OTHER PARTY MAY USE OR RELY UPON THE REPORT OR ANY PORTION THEREOF WITHOUT THE WRITTEN CONSENT OF SHELBY.** The Client shall maintain confidentiality of the Report and ensure that the Report is not distributed to third parties. The Client hereby agrees to indemnify Shelby for any claims brought against Shelby by third parties and arising out of the Client's failure to maintain the confidentiality required under this paragraph 7.
8. Except as stipulated in the Report, Shelby has not been retained to address, investigate or consider, and has not addressed, investigated or considered environmental or regulatory issues with respect to the site on which the Services have been performed. Notwithstanding the foregoing, Shelby may be required to disclose to regulatory bodies certain hazardous conditions discovered through provision of the Services, and the Client shall not make any claim against Shelby for such disclosure.

July 2005 Revised