COUNTY OF LETHBRIDGE
IN THE PROVINCE OF ALBERTA

BY-LAW NO. 1343

A BY-LAW OF THE COUNTY OF LETHBRIDGE BEING A BY-LAW PURSUANT TO SECTION 633(1) OF THE MUNICIPAL GOVERNMENT ACT, CHAPTER M.26.1

WHEREAS Martin Geomatic Consultants Ltd. on behalf of the Landowner, Garnet Stacey wish to develop a Grouped Country Residential Subdivision on a portion of the N.E. Section 31, Township 8, Range 20, West of the Fourth Meridian containing approximately 26 acres;

AND WHEREAS By-Law 1327 to reclassify the above land to Grouped Country Residential (G.C.R.) was adopted by County Council on September 3, 2009;

AND WHEREAS the Developer has submitted the "Windy Acres Area Structure Plan" which will provide a framework for subsequent subdivision and development of the area;

NOW THEREFORE BE IT RESOLVED that the Council of the County of Lethbridge does hereby adopt the "Windy Acres Area Structure Plan" attached as Appendix "A".

GIVEN first reading this 6th day of May, 2010.

Reeve

County Manager

GIVEN second reading this 3rd day of June, 2010.

Reeve

County Manager

GIVEN third reading this 3rd day of June, 2010.

Reeve

County Manager

WINDY ACRES
AREA STUCTURE PLAN

PORTION OF N.E. 1/4-SEC.31-8-20-W4

Prepared for: **GARNET STACEY & MARION REID**

Prepared by: **MARTIN GEOMATIC CONSULTANTS LTD.**

PROJECT 092251CE
March 30, 2010

TABLE OF CONTENTS

TABLE OF FIGURES iii
APPENDICES iii
1. INTRODUCTION 1
A. PURPOSE OF THE PLAN 1
B. BACKGROUND TO THE AREA STRUCTURE PLAN 1
C. THE APPROVAL PROCESS 1
D. PLAN PREPARATION 2
I. PRELIMINARY CONSULTATION 2
E. LEGISLATIVE FRAMEWORK 2
I. THE MUNICIPAL GOVERNMENT ACT 2
II. COUNTY MUNICIPAL DEVELOPMENT PLAN 2
III. COUNTY LAND USE BYLAW 3
F. INTERPRETATION 3
2. THE PLAN AREA 3
A. LOCATION AND DEFINITION OF PLAN AREA 3
II. GENERAL PHYSICAL DESCRIPTION 3
3. PLAN GOALS AND OBJECTIVES 4
A. PLAN GOALS 4
B. PLAN OBJECTIVES 4
4. SITE ANALYSIS 4
A. SITE CHARACTERISTICS 4
B. SOILS 5
C. TOPOGRAPHY 5
D. WATER AND HYDROLOGY 6
E. HABITAT AND VEGETATION 6
F. ENVIRONMENTAL, HISTORICAL AND ARCHAEOLOGICAL SIGNIFICANCE 6
G. EXISTING LAND USE 7
5. CONSTRAINTS & OPPORTUNITIES 7
A. CONSTRAINT EVALUATION 7
I. SOIL CAPABILITY FOR RESIDENTIAL DEVELOPMENT 7
II. TOPOGRAPHY 7
III. TRAFFIC IMPACT & ACCESS CONSIDERATIONS 7
IV. AGRICULTURAL CONSIDERATIONS 8
V. NATURAL RESOURCE DEVELOPMENT 9
B. DEVELOPMENT OPPORTUNITIES 9
I. LOCATION 9
II. HOUSING CHOICE 9
III. LAND USE RE-CLASSIFICATION 9
IV. EASE OF DEVELOPMENT 9
6. PROPOSED LAND USE & DESIGN 9
A. PROPOSED LAND USE 9
B. PHASING 10

C. DENSITY AND POPULATION 10
D. RESERVE REQUIREMENTS 10
I. MUNICIPAL RESERVE 10
II. ENVIRONMENTAL 10
E. TRANSPORTATION 10
I. SITE ACCESS AND CIRCULATION 10
II. EXTERNAL ROADWAYS 11
F. SERVICING 11
I. POTABLE WATER SUPPLY AND DISTRIBUTION 11
II. SEWAGE DISPOSAL 12
III. STORM WATER MANAGEMENT 12
(A) EXISTING CONDITION 13
(B) DRAINAGE CONCEPT 13
(C) SITE GRADING 14
I. UTILITIES 15
I. ELECTRICITY 15
II. NATURAL GAS 15
III. TELECOMMUNICATIONS/CABLE SERVICE 15
IV. SOLID WASTE MANAGEMENT 15
J. PROTECTIVE SERVICES 15
I. FIRE PROTECTION 15
II. POLICE PROTECTION 15
7. DEVELOPMENT CONTROL 16
8. DEVELOPMENT AGREEMENT 16
9. BUILDING CONTROL STANDARDS 16
A. INDIVIDUAL SITE DEVELOPMENT 16
B. BUILDING CONTROL ELEMENT 16
I. HOUSING FORM 16
II. HOUSE SIZE 17
III. SITE DESIGN FEATURES 17
10. IMPLEMENTATION 17

TABLE OF FIGURES

1.0 GENERAL LOCATION PLAN
2.0 LAND OWNERSHIP MAP
3.0 EXISTING LAND CONDITIONS
4.0 LAND USE CONCEPT
5.0 TYPICAL ROAD CROSS SECTION

APPENDICES

1. Stormwater Management Plan
2. Property Ownership (Titles)
3. Potable Water Supply
4. Geotechnical & Septic Field Feasibility Assessment

1. INTRODUCTION

a. PURPOSE OF THE PLAN

i. The purpose of the Windy Acres Area Structure Plan (ASP) is to provide a comprehensive planning framework for development of the land within portion of N.E. ¼ Sec. 31-8-20-W4. The Plan Area is located in the County of Lethbridge and is shown on **Figure 1.** The plan area is located immediately east of the proposed future alignment of Highway 4 as part of the Lethbridge Trade Corridor (this alignment is gazetted as Highway 4X). Prior to consideration of subdividing or re-subdividing a property, the County of Lethbridge requires preparation of an Area Structure Plan to address all planning issues related thereto. The purpose of this area structure plan is thus to provide all pertinent information to the County and its advisors that will enable re-subdivision of the subject property.

b. BACKGROUND TO THE AREA STRUCTURE PLAN

i. The subject property containing approximately 26.34 acres (10.64 ha) more or less has been approved for re-zoning from Rural Agriculture (RA) to Grouped Country Residential(GRA) with the passing of the Land Use By-Law Amendment 1327. This will allow the developer to proceed with the preparation of an Area Structure Plan to further re-subdivide the plan area into smaller parcels with a minimum lot size of 2 acres (0.8 ha).

c. THE APPROVAL PROCESS

i. The County of Lethbridge requires submission of planning documents that are of sufficient detail and clarity to permit comprehensive review by the various agencies, government departments, and utility companies which provide community planning advice to the County.

ii. In this case, a draft plan will be submitted, reviewed, commented upon and amended accordingly by the consulting team.

The amended plan will then be resubmitted for approval according to provincial statutory requirements. This plan will also support a land use reclassification pursuant to County of Lethbridge Land Use Bylaw #1211

d. PLAN PREPARATION

i. PRELIMINARY CONSULTATION

(a) Prior to commencing the preparation of the area structure plan document, Martin Geomatic Consultants Ltd.(MGCL) met with:

(i) the landowner of the proposed plan area;

(ii) County of Lethbridge staffs

(iii) St. Mary River Irrigation System

(iv) water co-op staff,

(v) Alberta Transportation staff,

(b) Given the proposed development's location adjacent to a future provincial highway corridor, MGCL assessed the "as-built" situation to, as much as practical; identify any issues that need to be addressed in undertaking the Country Residential subdivision. Issues that were identified, relating to existing services and access will be discussed under the appropriate headings in the utilities and transportation sections of this plan.

e. LEGISLATIVE FRAMEWORK

i. THE MUNICIPAL GOVERNMENT ACT

(a) The Windy Acres Area Structure Plan has been produced in accordance with Section 633 of the Municipal Government Act. It is the intention of this plan to create a framework for the re-subdivision of portion of N.E ¼ Sec. 31-8-20-4 into Grouped Country Residential classified area. In particular, this document will outline:

(i) the sequence of development;

(ii) proposed land uses;

(iii) the proposed population density;

(iv) the access and circulation;

(v) the location of public utilities;

(vi) Other related matters.

ii. COUNTY MUNICIPAL DEVELOPMENT PLAN

(a) Section 6.3.3 of the Draft County of Lethbridge Municipal Development Plan (MDP) sets criteria with respect to the development of Grouped

Country Residential subdivisions. The plan area has been re-designated from Rural Agriculture to Grouped Country Residential after having met these criteria.

(b) The Draft MDP also outlines specific requirements necessary for the creation of an Area Structure Plan which sets the stage for development within the County of Lethbridge.

iii. COUNTY LAND USE BYLAW

(a) The Grouped Country Residential Land Use District (GCR) is intended to provide for a high quality clustered residential development in areas where no conflict to agriculture can be anticipated pursuant to the municipal development plan.

(b) The minimum lot size is 2 acres (0.8 ha) to facilitate on-site sewage disposal systems

(c) Additional requirements of the Land Use Bylaw will be noted in subsequent sections of the plan where necessary.

f. INTERPRETATION

i. This document shall be referred to as "*The Windy Acres Area Structure Plan"*, County of Lethbridge Bylaw # ___.

ii. All terms referred to in this Bylaw shall have the same meaning as in the Municipal Government Act, the Municipal Development Plan or the Land Use Bylaw unless otherwise indicated.

2. THE PLAN AREA

a. LOCATION AND DEFINITION OF PLAN AREA

i. The plan area is located in the County of Lethbridge within N.E.1/4-Sec. 31-8-20-W4. It is bordered on the north by Highway 512; on the south by the SMRID Coaldale Lateral canal; on the east by the property of Lethbridge Handicapped Riding Association and on the west by the corridor for Highway 4X *(refer to **Figure 2**)*. The existing Vista Meadows subdivision is located adjacent the site, on the south side of the Coaldale Lateral.

ii. GENERAL PHYSICAL DESCRIPTION

(a) The site is relatively flat (generally, slopes are on the order of 1%) and is

split by a slight ridge approximately 300 m south of Highway 512. The northerly portion of the site generally drains east-northeasterly toward Highway 512. Two small draws pass through the southerly portion and drain east toward the SMRID Coaldale Lateral canal.

3. PLAN GOALS AND OBJECTIVES

a. PLAN GOALS

i. The Windy Acres Area Structure Plan will respond to the needs, issues and requirements identified by the owners, the County of Lethbridge as well as those agencies and organizations having an interest in the planning of this area.

ii. When adopted by the County Council, this Area Structure Plan will create the framework for subdividing and developing the subject property.

iii. This document will function as the required plan and as such will outline:

(a) the sequence of development;

(b) proposed land use;

(c) proposed lot layout;

(d) the access and circulation;

(e) the location of public utilities;

(f) other related matters

b. PLAN OBJECTIVES

i. The Windy Acres Area Structure Plan will adhere to the following objectives:

(a) create lots with a minimum size of 2 acres (0.8 ha).

(b) institute a storm water management system for the planned development.

(c) utilize potable water from the County of Lethbridge Rural Water Association Ltd.;

4. SITE ANALYSIS

a. SITE CHARACTERISTICS

i. The plan area is comprises approximately 26.34 acres (10.64 ha). A farmstead parcel of 6.39 acres (2.58 ha) sits within the planned development which reduces the developable area to approximately 19.95 acres (8.06 ha).

ii. SMRID's Coaldale Lateral canal runs along the south boundary of the plan

area and serves as a buffer that separates the plan area from the Vista Meadows subdivision.

iii. Access thru Hwy 512 is via an existing 8.0m wide gravel road located west of the plan area and terminates on the bottom southwest portion of Lot 4. A new service road will then be connected to this existing road along the entire stretch of the west boundary of the subdivision

iv. Implications of any restrictive covenants, caveats, road right-of-way, easements and notices on the properties within the plan area on the subdivision or development of land within the area structure plan will be duly referenced in the appropriate sections of the plan document.

b. SOILS

i. According to the Alberta Soils Information System, the site's soils are characterized as a "Lethbridge (LET) Series" soil - "…Orthic Dark Brown Chernozem on medium textured ([loam], [silt-loam]) sediments deposited by wind and water" - in the low areas and depressions and a "Whitney (WNY) Series" soil – "…Orthic Dark Brown Chernozem on medium textured (L, SiCL, CL) materials over medium ([loam], [clay-loam]) or fine ([clay]) textured till" – in the higher areas.

ii. A Geotechnical Report was prepared and is included in Appendix 4 as part of the County of Lethbridge requirements for new developments.

c. TOPOGRAPHY

i. The site is relatively flat. A slight ridge splits the site into two general drainage areas as shown in **Figure 3**:

(a) North: runoff from the west drains to a natural depression in the north-central area of the site. Runoff from east of the site also drains toward this depression. Overflow from this depression would drain north into the south ditch of Highway 512. The high point is located approximately 300 m south of Highway 512 at approximate elevation 894.2 m – this also the highest elevation within the site. The low point of the north portion of the site is at approximate elevation 893.3 m.

(b) South: runoff from the west is conveyed across the site in two natural

draws which drain eastward onto the neighboring property, where they meet and discharge into the Coaldale Lateral. The highpoint of this area is the same as the north portion of the site, 894.2 m. The low point of the south portion of the site (and the low point for the whole site) is located at the extreme southeast corner of the site adjacent the Coaldale Lateral at approximate elevation 890.6 m.

d. WATER AND HYDROLOGY

i. There are no natural bodies of water within the plan area.

ii. The SMRID Coaldale Lateral exists along the south side of the site. As it is located within a historic natural channel, this canal acts as both a conveyance for water to SMRID customers and a conveyance for runoff toward the South Coaldale and Malloy Drains (and, eventually, Stafford Lake).

iii. The Coaldale Lateral's historic catchment likely included land as far west as 43 Street in Lethbridge.

iv. MGCL has no record of historic flood data or floodway mapping for the Coaldale Lateral.

v. Two dugouts exist in the Highway 4X road allowance, adjacent the site. Presently these are filled by Alberta Transportation and water is provided to the site through an agreement with the present landowners. In an agreement with Alberta Transportation when the bypass road gets built Alberta Transportation will move the dugout onto Lot 2.

e. HABITAT AND VEGETATION

i. The plan area consists mainly of mixed grasses that produce a hay crop and is also used for grazing purposes. There are mature trees around the existing residential sites within the plan area providing habitat for birds and small animals.

f. ENVIRONMENTAL, HISTORICAL AND ARCHAEOLOGICAL SIGNIFICANCE

i. The "Environmentally Significant Areas in the Oldman River Region" report prepared for the County of Lethbridge indicates:

(a) no environmentally significant sites within the plan area;

(b) no hazard lands; and

(c) no archaeologically significant sites.

g. EXISTING LAND USE

i. The plan area has never been seeded because the land is fragmented and not feasible for agricultural farming.

ii. Barns and shelters makes up most of the existing structures within the plan area. There is a house situated on the westerly portion of the plan area approximately 27 m north of the access road. A shop is also located south of the access road *(refer to **Figure 3**).*

iii. The remaining property immediately east of the plan area is zoned as Rural Agriculture (RA) while on the southeast side is Grouped Country Residential which is the Vista Meadows subdivision *(refer to **Figure 4**).*

iv. Land north of the plan area is mainly farmland.

V. Highway 512 passes along the north side of the site which provides access to the plan area via an existing access road which also serves the 2 residences that are not part of this plan.

5. CONSTRAINTS & OPPORTUNITIES

a. CONSTRAINT EVALUATION

i. SOIL CAPABILITY FOR RESIDENTIAL DEVELOPMENT

(a) A geotechnical Evaluation of the plan area development will be conducted prior to Detailed Engineering Design stage to provide the necessary information on the ground and/or sub-surface characteristics that is necessary for proper design of both the surface and underground utilities for the subdivision as well as the appropriate footings and foundations for houses.

ii. TOPOGRAPHY

(a) The gentle slope of the site will require careful grading of the lots as well as the swales/ditches to ensure proper drainage is achieved and runoff directed towards the designated discharge points within the storm water management system.

iii. TRAFFIC IMPACT & ACCESS CONSIDERATIONS

(a) The proposed Lethbridge Trade Corridor (Highway 4X) is to be

constructed to freeway standard. Therefore, no direct access will be provided between the new freeway and any adjacent parcels.

(b) The only access to the freeway will be via grade-separated interchanges at locations designated by Alberta Transportation. The present functional design for the Lethbridge Trade Corridor can be obtained from Alberta Transportation. This design shows accesses to Highway 4X only at 24 Avenue South (Brown Road) to the south and the existing Highway 3 to the north.

(c) Alberta Transportation has approved a service road to be built within the Highway 4X road allowance adjacent to the west boundary of the site.

(d) A temporary connection to Highway 512 to serve the new development and the two residences west of the subdivision is approved by Alberta Transportation and is shown on **Figure 4**.

(e) Future access will be designed as part of the detailed design for Highway 4X.

(f) It may be necessary to include visual buffering and/or sound attenuation for the lots adjacent to Highway 4X because of headlights and noise from freeway traffic. This will be provided as part of the design for Highway 4X.

(g) Should a Traffic Impact Analysis (TIA) for the plan area be required by Alberta Transportation during the subdivision and/or prior to the final approval of the subdivision detailed design plans, the TIA will have to be prepared by a qualified transportation engineer at the expense of the developer. A TIA should include, but may not be limited to an analysis and evaluation of:

(i) potential impact of a proposed subdivision and/or development on the existing transportation network; and

(ii) a program of future expansion and/or improvement of the transportation network to accommodate the proposed growth and to preserve the function and integrity of the transportation network.

iv. AGRICULTURAL CONSIDERATIONS

(a) The proposed development of the plan area is not likely to constrain any

existing agricultural land use. Agricultural operations in the vicinity of the development area may, at times, create dust or noise. This is normal rural farming activity which may have to be explained to potential residents as a factor to consider when choosing rural living.

(b) Development setbacks and screening may be employed to help mitigate visual or audible impacts.

v. NATURAL RESOURCE DEVELOPMENT

(a) There is no natural resource development within the vicinity of the study area which can either restrict or be impacted by the proposed subdivision development.

b. DEVELOPMENT OPPORTUNITIES

i. LOCATION

(a) The proposed development is bounded to the north by Highway 512 which offers direct access to the City of Lethbridge where a wide variety of educational, medical, commercial, recreational and community services and amenities exist.

ii. HOUSING CHOICE

(a) The proposed development provides for a type of residential land use that would allow families to build and live in a community offering rural lifestyle in an urban-like setting.

iii. LAND USE RE-CLASSIFICATION

(a) The County Land Use Bylaw Amendment 1327 has re-designated the plan area for a grouped country residential development.

iv. EASE OF DEVELOPMENT

(a) All of the basic utilities are at or near the site boundary which will make it easier and less expensive to service and develop the new lots.

6. PROPOSED LAND USE & DESIGN

a. PROPOSED LAND USE

i. A total of 10 lots with a minimum size of 2 acres (0.8 ha) will be created on the proposed development which has been re-zoned as a grouped country residential area shown on **Figure 4**.

ii. Site contours will be utilized to minimize site grading.

iii. Stormwater within the development will be managed such that runoff will be directed towards the appropriate discharge point adjacent to the development. Post-development runoff rate shall not exceed pre-development as per County of Lethbridge Engineering Guidelines and Minimum Service Standards.

b. PHASING

i. The Windy Acres subdivision will be undertaken in one phase.

ii. The development can also be staged into sub-phases depending on the wishes of the owners.

c. DENSITY AND POPULATION

i. The housing density within the proposed development comprises 10 lots or 0.38 units per acre (0.95 units per ha.) of net area.

ii. Based on an average occupancy of 3 persons per household, the population within the plan area is estimated to be approximately 30 persons.

d. RESERVE REQUIREMENTS

i. MUNICIPAL RESERVE

(a) There is no land within the proposed area structure plan dedicated for municipal reserve. Municipal Reserve will be dedicated as cash-in-lieu to the County of Lethbridge.

ii. ENVIRONMENTAL

(a) There is no apparent need for environmental reserve within the plan area.

e. TRANSPORTATION

i. SITE ACCESS AND CIRCULATION

(a) The main access into the proposed development area will be on Highway 512. A new gravel service road along the west boundary of the plan area which will connect to the existing access road leading to Highway 512 has been approved by Alberta Transportation. The new gravel road will be treated for dust control with Magnesium Chloride or an approved alternate.

(b) The internal road will have a gravel width of 8.0m and a 20.0m right of way as per the County of Lethbridge's "Engineering Guidelines and Minimum

Service Standards". A typical road cross section is as shown on **Figure 5**. This road will also be treated for dust control.

(c) If a TIA study is required by Alberta Transportation prior to commencement of the Detailed Engineering design works, a qualified Transportation Consultant shall be hired to prepare the said report at the expense of the owner.

ii. EXTERNAL ROADWAYS

(a) The proposed Highway 4X runs parallel to the new service road. However, no direct access from Highway 4X to the proposed subdivision will be provided.

(b) The present functional design of the Lethbridge Trade Corridor calls for interchanges only at 24 Avenue South (Brown Road) and the present Highway 3. Existing Highway 512 is not shown as connecting across Highway 4X.

(c) It is understood from discussions with Alberta Transportation that a flyover will be constructed to carry Highway 512 over Highway 4X. However, no interchange between Highway 512 and Highway 4X is proposed at this point.

(d) All gravel roads will be treated with magnesium chloride to control dust.

f. SERVICING

i. POTABLE WATER SUPPLY AND DISTRIBUTION

(a) Domestic Water and Fire Protection Requirement for ASP Area

(i) The domestic water requirements for the subdivision will be supplied by the Lethbridge County Rural Water Association Ltd. via a new water distribution pipe running parallel along the west boundary property line of the ASP area. This will be either a metered turnout or a trickle system with individual cisterns. Each cistern will be installed by the homeowners at their expense.

(ii) Cisterns will be installed in accordance with requirements of the Chinook Health Region and Safety Codes Council of Alberta.

(iii) The onsite fire protection will be by means of a wet pond located in lot

2 with a dry hydrant connection located at or near the cul-de-sac bulb.

ii. SEWAGE DISPOSAL

(1) Each lot will have its own on-site wastewater treatment and dispersal system.

(2) "Licensed installer" means a contractor who holds a valid "private sewage" installers' license from Alberta Municipal Affairs.

(3) "System designers" must also hold a valid installers license or must be otherwise qualified professionals (e.g. P.Eng., R.Biol., others).

(4) As per Alberta Regulations AR229/97 and AR485/2009, the *Alberta Private Sewage Systems Standard of Practice 2009* (the "SOP") describes the requirements for the design of on-site wastewater treatment and disposal systems.

(5) To assist the County in ensuring these standards are met, building controls registered against the title for the lots will require:

a. Assessment of soil's suitability using methods described by the SOP for sewage effluent dispersal will be done by a licensed installer or system designer for each system (it must be noted that, pursuant to the new SOP, percolation tests are not acceptable for design of on-site wastewater dispersal systems)

b. As per the SOP, the required soil analysis will be provided at two locations on each lot in close proximity to the proposed effluent dispersal location,

c. All homeowners to obtain a permit from the County's designated inspection agency prior to installation,

d. All homeowners to engage only qualified, licensed installers for installation and commissioning of their on-site wastewater system.

e. All Homeowners to engage in an on-going service and maintenance contract with a licensed installer.

(6) No on-site wastewater management system components shall be installed in areas designated for conveyance or detention of runoff.

iii. STORM WATER MANAGEMENT

(a) EXISTING CONDITION

(i) A detailed description of the site and existing surface drainage is described in the stormwater management plan, which is appended to this document.

(ii) The site is located within the Malloy basin. Runoff from the site presently enters the SMRID Coaldale Lateral canal – either directly, via overland flow across property or via road ditches. The Coaldale Lateral provides both irrigation water conveyance for SMRID customers and stormwater conveyance for a watershed encompassing the surrounding area. The Coaldale Lateral flows east-northeast in a natural valley toward the Town of Coaldale. The Coaldale Lateral then discharges into the South Coaldale Drain. East of Coaldale, the South Coaldale Drain discharges into the Malloy Drain. The Malloy Drain discharges into Stafford Lake.

(iii) Upland drainage presently runs onto the site from the west and east. As stated previously, drainage is split by a shallow ridge which runs west-to-east across the site, approximately 300 m south of Highway 512. North of the ridge, runoff flows to a natural depression. Overflow from this depression would discharge northward into the south ditch of Highway 512. South of the ridge, runoff flows into two shallow draws which discharge directly into the Coaldale Lateral immediately east of the ASP land.

(b) DRAINAGE CONCEPT

(i) The stormwater management concept is detailed in the attached stormwater management plan.

(ii) Runoff in the north portion of the site, including some parts of the Highway 4X road allowance will drain to the above-noted existing low area:

- Improvements will be made to the outflow from this low area to allow drainage to Highway 512 at a low elevation.
- Detention storage in this area will be enhanced to contain a 100-

year storm on site below the elevation of the outflow.

- This enhancement may allow for provision of a dugout to provide irrigation water.
- Elevation of the Highway 512 ditch may be such that pumping is required to draw down the low area after a storm.

(iii) Runoff from the west draining into the south part of the site will be directed by a ditch along the west side of the proposed service road to the Coaldale Lateral.

(iv) A berm will be constructed along the east and south boundaries of the site.

(v) Detention storage will be provided in the south part of the site to hold all runoff from the 100-year storm.

(vi) Discharge through the proposed berm will be via a culvert complete with a sluice gate, which can be closed when high flows in the Coaldale Lateral, South Coaldale Drain or Malloy Drain are anticipated. This will ensure the following:

- The proposed development will not be inundated by water in the Coaldale Lateral
- Runoff from the proposed development does not contribute to downstream flooding.

(vii) It is assumed that stormwater management will be addressed by Alberta Transportation in future Lethbridge Trade Corridor/Highway 4X studies and designs and that runoff from the provincial road allowance will not be directed onto private property.

(viii) All drainage areas will be protected by caveat, easement or right-of-way as required.

(c) SITE GRADING

(i) The subdivision will be graded to be consistent with the overall stormwater management plan. Individual lots will be graded such that all surface runoff will be directed to perimeter swales designed to carry the stormwater runoff into the road ditches, stormwater detention

facilities and towards the designated outfall. The required size and cross section of these conveyance facilities will be determined during Detailed Design stage

i. UTILITIES

i. ELECTRICITY

(a) Epcor is the electricity provider for the County of Lethbridge and the distributor is Fortis Alberta. All necessary applications for the detailed design and installation of electric utilities will be submitted to Fortis for their approval.

ii. NATURAL GAS

(a) Natural gas is available through ATCO Gas. A domestic gas line will be located within the service road right-of-way.

iii. TELECOMMUNICATIONS/CABLE SERVICE

(a) Telephone service may be provided through the TELUS network in underground cable throughout the development. Alternatively, cellular phone service may be available. Shaw Communications provides cable service for the area.

iv. SOLID WASTE MANAGEMENT

(a) Individual/Private solid waste will be disposed of at local transfer station for the development unless a municipal fee-for-service is available.

j. PROTECTIVE SERVICES

i. FIRE PROTECTION

(a) The County of Lethbridge has emergency services stationed in Coaldale which includes a command unit, a pumper truck, water tanker and wildland unit that can be called upon if needed. Coaldale is approximately 8.0 km from the plan area. Further fire protection will be via a dry hydrant located in the cul-de-sac drawing from the storm pond/fire pond located in lot 2.

ii. POLICE PROTECTION

(a) Policing in the County of Lethbridge is provided by the R.C.M.P. which has detachments located in the City of Lethbridge and in Coaldale. The City

and Coaldale detachments are approximately 14 km and 8.0 km respectively from the plan area.

7. DEVELOPMENT CONTROL

a. Purchasers must apply for development approval according to the process in effect for the appropriate Land Use District in the County of Lethbridge Land Use Bylaw # 1211

b. No cattle will be allowed on the new development

c. Subject to approval of the County development authority, residents may be restricted in the number of pets allowed to be kept within the development site. Lot owners will be allowed 1-2 horses per acreage. On the bigger size lot (6 acre), 4-6 horses may be allowed on the property.

d. Houses and wastewater treatment and dispersal shall be located outside runoff conveyances and detention areas.

8. DEVELOPMENT AGREEMENT

a. The Developer will enter into a Development Agreement with the County of Lethbridge regarding the following matters:

   i. Service Road access and construction along the west side of the development site;

   ii. road construction;

   iii. easements for runoff conveyance and detention as per the stormwater management plan; and

   iv. other services or matters considered necessary by the County of Lethbridge.

9. BUILDING CONTROL STANDARDS

a. INDIVIDUAL SITE DEVELOPMENT

   i. Individual site development will utilize a basic level of control to achieve quality within the development site as well as to protect property values.

b. BUILDING CONTROL ELEMENT

   i. HOUSING FORM

      (a) Single detached houses will be the dwelling type allowed within the development.

      (b) Mobile homes, double–wide mobile homes and moved-in homes may be

allowed within the development.

ii. HOUSE SIZE

(a) Primary dwellings within the subdivision will be required to have a minimum footprint of 1000 square feet (92.9 m²) in area.

iii. SITE DESIGN FEATURES

(a) HOUSE DESIGN

(i) Residents will be encouraged to work with a designer in the planning and design of their homes to ensure that a consistent level of development is achieved.

(ii) Proper setbacks are to be maintained especially on the last lot bounding the existing SMRID canal. The lot owner or its representative should consult with the County and SMRID if necessary.

(b) ACCESSORY BUILDINGS

(i) Accessory buildings, such as garages may be allowed subject to the appropriate control guidelines and approval by the County of Lethbridge development authority.

(c) BUILDING MATERIALS

(i) Residents will be encouraged to co-ordinate the finishing materials for their homes in order to achieve a unified appearance within the development site.

10. IMPLEMENTATION

a. This Area Structure Plan will become a Bylaw of the County of Lethbridge.

b. All subsequent subdivision applications must adhere to provisions of this A.S.P. Bylaw and the Land Use Bylaw.

c. Subdivision of land can only occur through established provincial (Municipal Government Act and Subdivision Regulation) in conjunction with the Oldman River Regional Services Commission; and municipal processes that will ensure appropriate municipal and environmental reserves are bestowed and that appropriate fees, levies and service agreements are provided.

d. Development applications, within the boundaries of the plan area, must comply with the requirements of the respective land use districts for which they are

proposed.

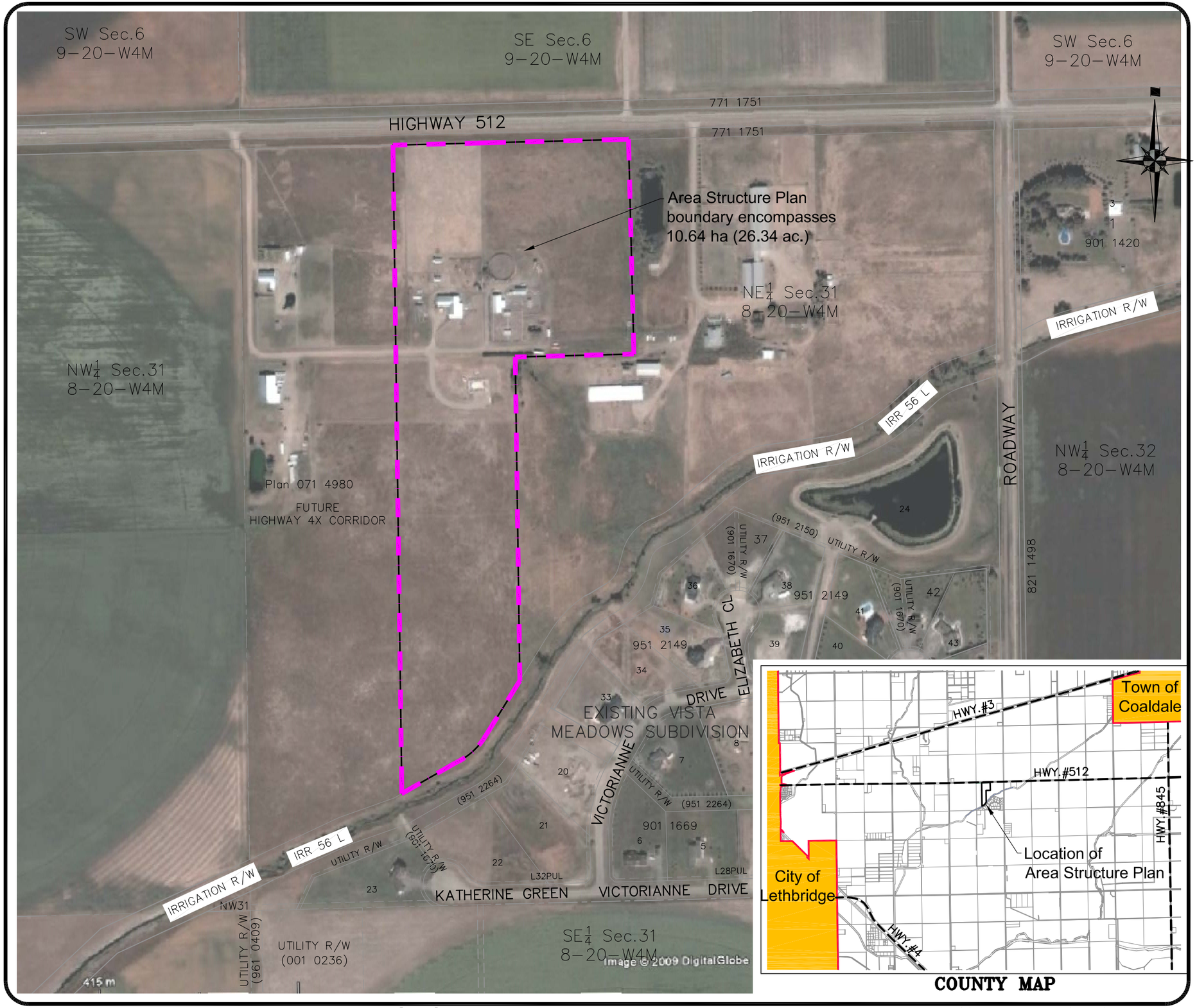
e. Building permits must be reviewed through a safety codes process approved by the County of Lethbridge.

f. The developer of Windy Acres subdivision will establish a level of architectural standards and development limitations in order to achieve the desired results within the proposed subdivision. These standards and limitations are beyond the normal statutory requirements of the County of Lethbridge and will thus be administered by either the Developers or agents acting on their behalf and within their legal authority).

g. The County of Lethbridge may utilize other bylaws and policies that will regulate aspects of activity within the boundaries of the Area Structure Plan.

h. Farming on adjacent lands is considered a compatible land use activity in the County of Lethbridge and future purchasers will be advised of the types of agricultural activities that take place in the vicinity of Windy Acres subdivision.

FIGURES (MAPS)



COUNTY MAP

LEGEND:

ASP BOUNDARY

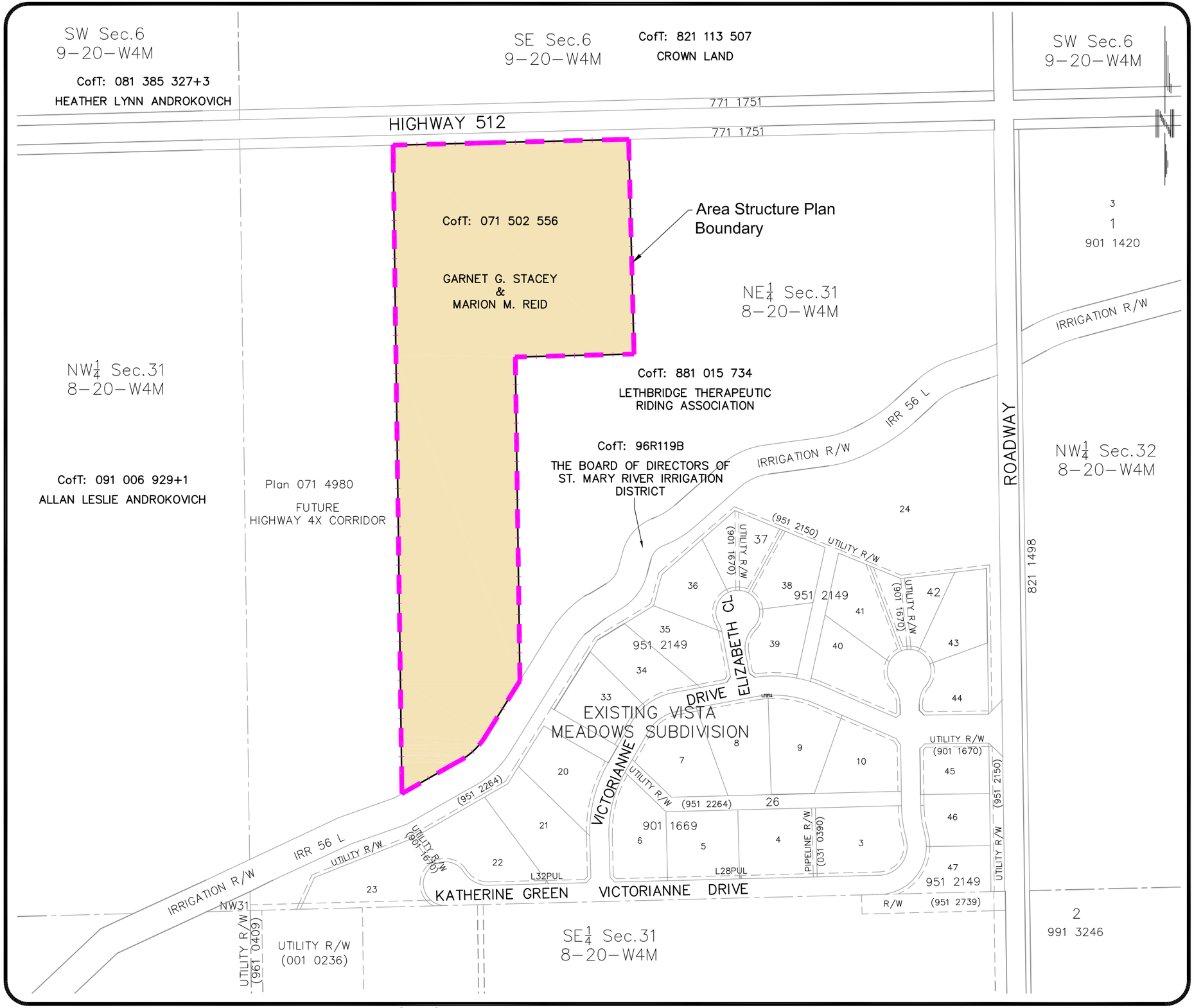
Windy Acres

AREA STRUCTURE PLAN

GENERAL LOCATION PLAN
FIGURE 1.0

MARTIN GEOMATIC CONSULTANTS LTD

SCALE:	1:4,000
DRAWN:	Robert Martin
DATE:	JAN 6th, 2010
JOB #:	092251CE



LEGEND:

ASP BOUNDARY

AREA STRUCTURE PLAN AREA

CofT 071 502 556 – GARNET G STACEY & MARION M REID

CofT 881 015 734 – LETHBRIDGE THERAPEUTIC RIDING ASSOCIATION

CofT 821 113 507 – HER MAJESTY THE QUEEN IN RIGHT OF CANADA OF AGRICULTURE CANADA

CofT 091 006 929+1 – ALLAN LESLIE ANDROKOVICH

CofT 081 385 327+3 – HEATHER LYNN ANDROKOVICH

CofT 96R119B – THE BOARD OF DIRECTORS OF THE ST. MARY RIVER IRRIGATION DISTRICT

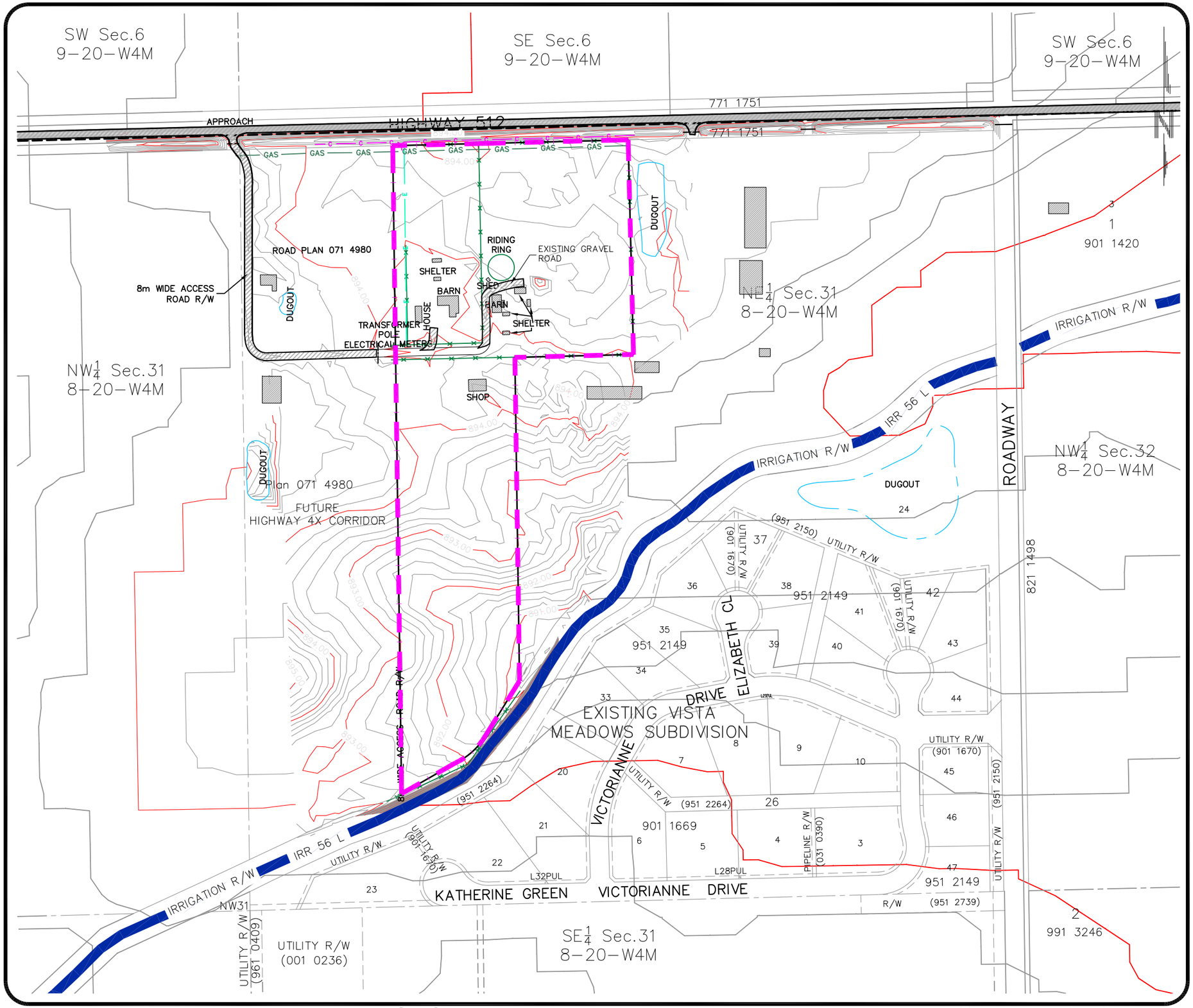
Windy Acres

AREA STRUCTURE PLAN

LAND OWNERSHIP MAP
FIGURE 2.0

MARTIN GEOMATIC CONSULTANTS LTD

SCALE:	1:4,000
DRAWN:	Robert Martin
DATE:	JAN 6th, 2010
JOB #:	092251CE



LEGEND:

- ASP BOUNDARY
- LS ☼ — LIGHT STANDARD
- PP ● — POWER POLE w/ OH LINE
- PED — TELEPHONE PEDESTALS
- EX.HOUSES/STRUCT.
- EX. C.S.P.
- GAS — EX. GAS LINE
- C — EX. TELUS LINE
- X — EX. FENCE LINE
- 911.0 — EX. CONTOUR LINE

Windy Acres

AREA STRUCTURE PLAN

EXISTING LAND CONDITIONS
FIGURE 3.0

MARTIN GEOMATIC CONSULTANTS LTD

SCALE:	1:4,000
DRAWN:	Robert Martin
DATE:	JAN 6th, 2010
JOB #:	092251CE

Last Saved Date: Tuesday, March 30, 2010 1:19:36 PM – By: [robm]

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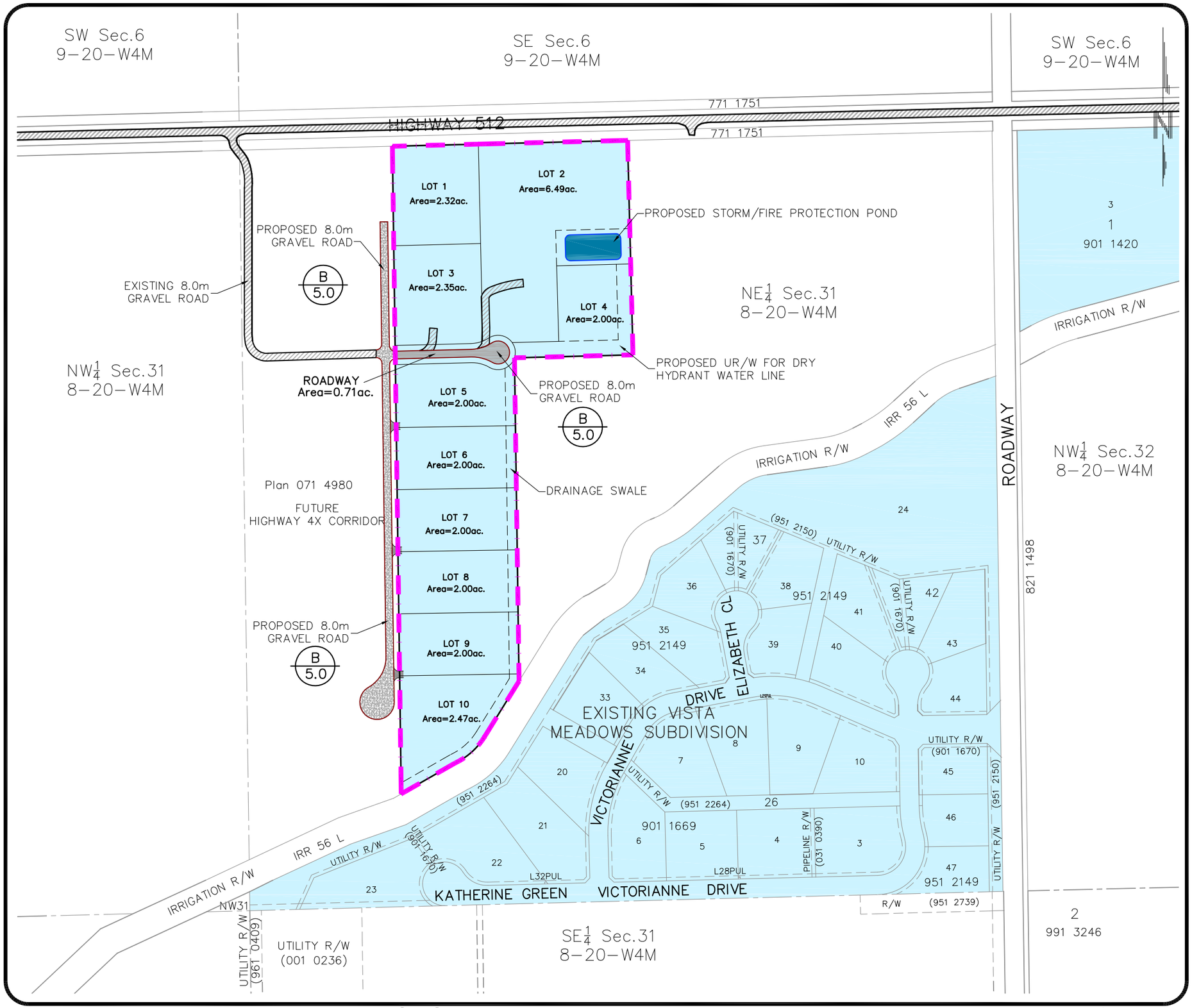


LEGEND:

ASP BOUNDARY

GROUPED COUNTRY RESIDENTIAL (GCR)

RURAL AGRICULTURE (RA)

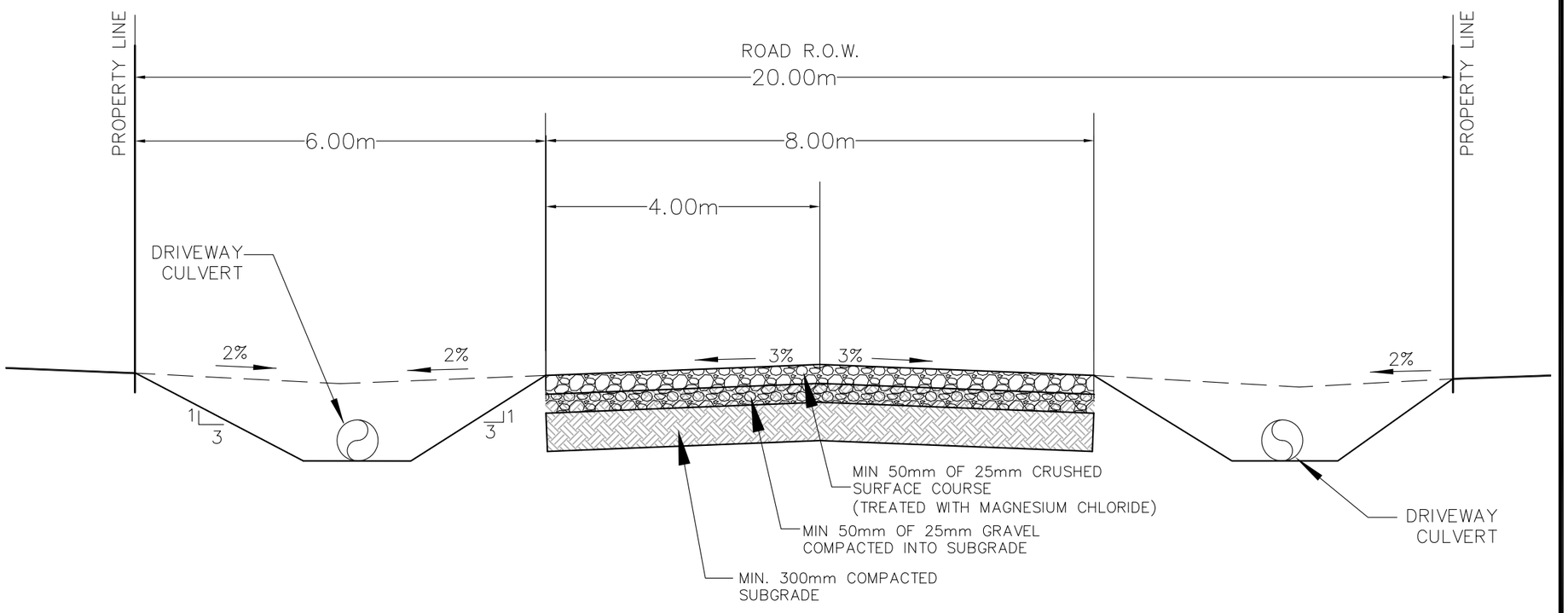
Windy Acres

AREA STRUCTURE PLAN

LAND USE CONCEPT
FIGURE 4.0

MARTIN GEOMATIC CONSULTANTS LTD

SCALE:	1:4,000
DRAWN:	Robert Martin
DATE:	JAN 6th, 2010
JOB #:	092251CE



Windy Acres

AREA STRUCTURE PLAN

TYPICAL ROAD CROSS SECTION
FIGURE 5.0

MARTIN GEOMATIC CONSULTANTS LTD

SCALE:	NOT TO SCALE
DRAWN:	Robert Martin
DATE:	JAN 6th, 2010
JOB #:	092251CE

APPENDIX

APPENDIX 1 ~ STORMWATER MANAGEMENT PLAN

10 December 2009 File: 092251CE 2.1

County of Lethbridge
100, 905 – 4 Avenue S.
Lethbridge, AB
T1J 4E4

Attention: Michel Savard, R.P.T.(Eng.)

Dear Sir:

Re: Windy Acres (NE31-8-20-4)
Country Residential Subdivision
Stormwater Management Plan

On behalf of our client, Mr. Garnet Stacey, MGCL presents the following stormwater management plan for the above-noted proposed development.

Background

The subject property is located immediately south of Highway 512 (Jail Road), east of Alberta Transportation's road allowance for future Highway 4X (Lethbridge trade corridor), north of the St. Mary River Irrigation District (SMRID) Coaldale Lateral Canal and west of other private land (remainder of NE31-8-20-4). The Vista Meadows subdivision is located adjacent the proposed development on the south side of the Coaldale Lateral.

The land is presently a farmstead complete with several paddocks, pasture and several buildings as shown on **Figure 1**. The land is supplied with water from a dugout located on the Highway 4X road allowance. This dugout is fed from SMRID.

The landowner proposes a country residential subdivision which will consist of 10 lots, all greater than 0.8 ha (2 acres) in area. A tentative layout is shown on **Figure 1**.

The area is entirely tributary to the Coaldale Lateral Canal – which is tributary to the South Coaldale and Malloy drains within the Malloy basin. The point of discharge for the Malloy Basin is Stafford Lake.

Presently, the southerly portion of the subject parcel is crossed by a draw which empties into the Coaldale Lateral near the intersection of the east property line of the subject parcel and the north property line of the Coaldale Lateral. This draw presently drains upland areas to the west, including a portion of the Highway 4X road allowance. In the northerly portion of the subject parcel, there exists a low area (shown on **Figure 1**) approximately 100 m south of Highway 512. Into this low area drains the much of the northerly portion of the subject parcel and a portion of the Highway 4X road allowance. When full (at approximate elevation 894.6 m), this low area will spill north into the south ditch of Highway 512. An area in the extreme northeast corner of the parcel drains directly into the south ditch of Highway 512. Runoff from Highway 512 discharges into the Coaldale Lateral east of the subject parcel.

It is noted that SMRID and Alberta Environment have concerns with urbanization in the Malloy Basin – especially due to flooding which has occurred during several historic rain events. It is also noted that, given its location in a natural draw, the

Coaldale Lateral serves as both a conveyance for irrigation water and a drain for surrounding land.

Methodology

The following explains the methodology used in designing the stormwater management plan for the subject parcel.
The EPA-SWMM5 computer model (release 5.0.017) was used to estimate rates of runoff at critical points resulting from precipitation in the upstream catchment. Input parameters were estimated as follows:

- Subcatchment area was estimated from available topographic mapping (AltaLIS base features and MGCL survey data). Proposed subcatchments assume that 10 m of road allowance to the west is to be included in the development's catchment (this accounts for half a road and its embankments). These subcatchments and selected parameter values are shown in **Figure 2**.
- Subcatchment flowpath length is the longest flowpath for runoff from the high point of the subcatchment to the point of discharge. It was estimated from available topography (this length is used to calculate the SWMM5 "Subcatchment Width" parameter).
- Subcatchment slope was estimated based on the elevations at the top and bottom of the flowpath.
- Imperviousness for the existing case is assumed to be zero. Impervious area for the developed lands was assumed to consist of 1000 m^2 of hard surfaced area on each new lot. This would allow for a 300 m^2 (approximately 3,000 sq.ft.) home and a further 700 m^2 of driveway/parking pad/patio/outbuildings. As is typical in surface-drained rural areas, impervious area was assumed to flow onto pervious areas.
- Soil is assumed to be loam (L) and silt-loam (SiL) consistent with the soil type noted for the soil polygon corresponding to the subject parcel in the Alberta Soil Information Viewer[1] (from). For soil polygon #5870, AGRISID indicates a "Lethbridge" series soil for lowland areas consisting of medium textured soils (loam, silt-loam) deposited by wind or water. An estimate of Green-Ampt infiltration parameters for the less permeable soil (L) is (from):[2]
    - hydraulic conductivity, K = 3.3 mm/hr (0.13"/hr)
    - suction head, ψ = 89 mm (3.5")
    - initial moisture deficit (IMD) was to be 0.1 (wet)
- The depression storage parameter is assumed to be 5 mm (pasture land) for the existing case. Developed areas assume 2.5 mm of depression storage (lawn).[3] Where a catchment area included both developed and undeveloped land, a weighted average depression storage value was used. For impervious areas, depression storage was calculated using the formula:[4]
    - $DS = 0.77 \cdot [\text{catchment slope}]^{-0.49}$ (slope in %, DS in mm)
- Evaporation is neglected in this model.

[1] AGRISID, URL: http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/sag10372.
[2] W.J. Rawls et al., 1983, J. Hyd. Engr., 109:1316.
[3] ASCE, *Design & Construction of Urban Stormwater Management Systems*, New York, 1992
[4] W. James et al, *User's Guide to SWMM*, CHI, Guelph, ON, 2005, p. 150.

Although there is as yet no conveyance agreement between the County of Lethbridge and the Town of Coaldale or SMRID, a design consistent with the recently-signed conveyance agreement between the Town of Coaldale and SMRID is assumed. Based on discussion with Alberta Environment, this is assumed to require the following:

- Storage capacity to detain all runoff resulting from the 100-year storm with no release until such time as release is permitted,
- Provision of control which allows the system's outflow to be stopped until such time as the downstream conveyance has capacity,
- Outflow from the site will not exceed pre-development discharge rate.

Generally, all works will be designed to be consistent with Alberta Environment's published guidelines. Any detention storage will have an emergency overflow to ensure no homes are inundated due to detention of runoff. Building elevations will be set to ensure homes are not flooded.

Results

For the existing case, the drainage areas modeled are shown on **Figure 3**. In the 100-year storm (109.9 mm of rainfall in 24 hours), these areas produced the following runoff:

Subcatchment (ID)	Area	Peak discharge	Runoff volume
North to Hwy 512 (0011)[5]	10.40 ha	0.16 m^3/s	910 m^3 (8.8 mm)
South to Coaldale Lat. (0001)	33.53 ha	1.40 m^3/s	8,460 m^3 (25 mm)
Total	**43.93 ha**	**1.40 m^3/s**	**12,180 m^3 (21 mm)**

For the proposed case, the drainage areas modeled are shown on **Figure 3**. In the 100-year storm, these areas produced the following runoff:

Subcatchment (ID)	Area	Peak discharge	Runoff volume
Onsite North to Hwy 512 from W (2001)	8.01 ha	0.80 m^3/s	2,970 m^3 (37 mm)
Onsite runoff to Coaldale Lat. (1001)	6.18 ha	1.00 m^3/s	2,680 m^3 (43 mm)
Offsite South to Coaldale Lat. from W (0011)	26.46 ha	1.30 m^3/s	7,190 m^3 (27 mm)
Offsite East to Coaldale Lat. (0001)	3.29 ha	0.40 m^3/s	1,220 m^3 (37 mm)
Total	**43.94 ha**	**3.40 m^3/s**	**14,050 m^3 (32 mm)**

Digital files for the SWMM5 models, including input, binary output, reports and shape files can be obtained by the County from MGCL upon request – for review purposes.

[5] The existing low area in the north part of the subject parcel attenuates runoff to Highway 512. This area likely holds water after a storm event, which may be evaporated, infiltrated or pumped away off-peak – thus reducing the runoff volume to Highway 512.

Discussion

As expected, the development results in an increase in both peak discharge and runoff volume. To mitigate this, stormwater management is proposed for the proposed development as follows:

- Runoff from the west, external to the proposed development, will be routed to the Coaldale Lateral by means of a ditch along the west side of the proposed subdivision road which is to be constructed along the west property line of the Highway 4X road allowance. All other offsite runoff will be directed to its existing point of discharge.
- Runoff from the northerly portion of the site (and part of the Highway 4X road allowance) will flow to the existing low area. Storage in this area will be enhanced such that in excess of **3,000 m^3** is stored below elevation 893.4 m.
- Drainage from the low area will be lowered to allow overflow to Highway 512 above elevation 893.4 m. As such, houses and onsite wastewater disposal systems (e.g. septic fields) should be located above this elevation and away from any stormwater detention areas.
- Drainage from the detention area may require pumping due to the elevation of the adjacent Highway 512 ditch. An alternative design of a dugout to irrigate the proposed 6-acre lot where the low point is located is possible. However, the operator must ensure that the water level in the dugout is drawn down after a storm to ensure a minimum active storage (i.e. storage above the normal water level but below the outflow ditch) of 3,000 m^3 (approximately 2.4 acre-feet) is maintained.
- Runoff from the southerly portion of the proposed development will be routed generally southward.
- A berm will be constructed along the east property line of the proposed development and along the property line common with the Coaldale Lateral. This berm will be high enough to divert and contain runoff from the proposed development in the 100-year storm. Emergency overflow across the berm and into the Coaldale Lateral will be at an elevation above 892.0 m.
- Rear areas in lots closest to the Coaldale Lateral will be designed to detain runoff during storm events. The required volume detained is approximately **2,700 m^3**. The area could also be designed to detain water for use in irrigation, with similar operational requirements as previously noted for the north detention facility.
- Discharge to the Coaldale Lateral will be via a culvert with a sluice gate. The sluice gate will be operated by [SMRID/the local water co-operative]. Generally, the sluice gate will be open; however, during periods when flows in the Coaldale Lateral or downstream are considered excessive, the sluice gate can be closed, thus containing onsite runoff within the development.
- Generally, lot and building construction will be such that runoff will be shed toward common ditches.
- **Any septic fields, mounds or other sewage effluent dispersal will be located such that they are not in areas subject to inundation.**
- Easements and development controls will be registered against titles to ensure drainage and detention are maintained and not blocked.

Details of the above are shown on **Figure 4**. Given what is proposed (i.e. no discharge from the site during the storm), a reduction in runoff flow and volume can be expected during the storm event – only the offsite flows (1.20 m^3/s) will be entering the Coaldale Lateral system. Although runoff volume does increase over

predevelopment, the flow rate will be controlled and, if the system is operated properly, this discharge will occur when the downstream conveyances can accept the flow. Collection and use of runoff for irrigation and construction of low-impact features within the development will result in reduced runoff volume.

Conclusion

Given the location of the proposed subdivision within the Malloy Basin, MGCL understands the need for stormwater management in Windy Acres. Given the particular constraints in this area, detention facilities have been designed to hold all runoff from a 100-year storm with no release. It is assumed these facilities will be drawn down after a storm subsides. Additional long-term reduction of runoff can be achieved by constructing low impact development features and extended retention of runoff for other uses such as irrigation. Detailed design of all features will be presented on the engineering plans submitted for County and Alberta Environment approval.

Closing

The above report provides the background for the design of drainage and stormwater management facilities for the country residential subdivision proposed in NE31-8-20-4. MGCL is confident that it addresses the concerns of SMRID and downstream landowners. Once the County has reviewed and accepted MGCL's design, this report will be formally submitted to Alberta Environment as part of an application to construct works under the *Water Act*. If you have any questions or concerns, please contact the undersigned.

Yours truly,

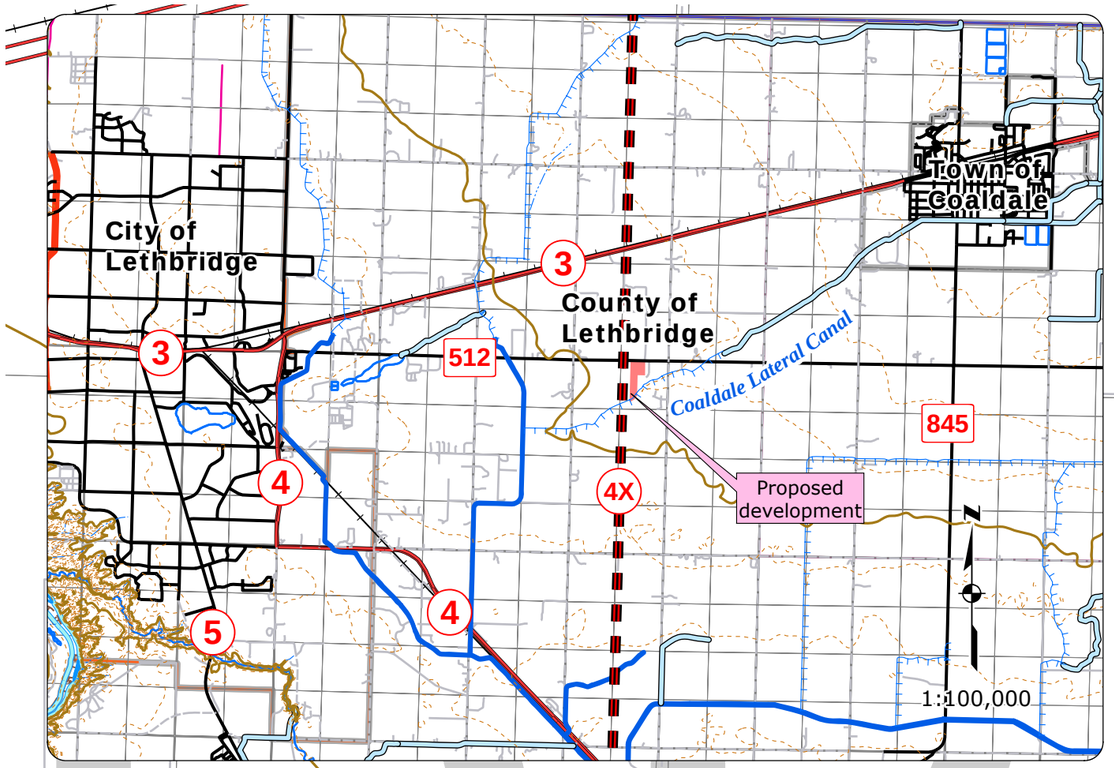
MARTIN GEOMATIC CONSULTANTS LTD.
APEGGA Permit to Practice #P05852

Michael A. Kitchen, P.Eng.

MAK/

Enclosures

cc: Garnet Stacey – Landowner/Developer



Windy Acres

Residential Subdivision
NE31-8-20-4
Stormwater Management Plan
December 2009

Figure 1

General Location

1:10,000

Legend

- Development Boundary
- Proposed Property Lines

Contours

- Minor (10 m)
- Major (50 m)
- Future Highway
- Existing Drainage Area
- General Drainage Flowpath
- Low Area
- Existing Interim Access Road

Highway 4X (future Highway 4)

Highway 512 (Jail Road)

Overflow to South Ditch of Highway 512

Runoff from west of interim access road flows north to Highway 512

Low Area

Location of discharge to Coaldale Lateral

Runoff from west captured by existing draws is conveyed to Coaldale Lateral

Coaldale Lateral Canal (SMRID)

MARTIN GEOMATIC CONSULTANTS LTD.

Project No. 092251CE

Windy Acres

Residential Subdivision
NE31-8-20-4
Stormwater Management Plan
November 2009

Figure 2
Model Assumptions

1:6,000

Highway 512 (Jail Road)

0011
Area = 10.4 ha
Flowpath Length = 283 m
Slope = 0.5%

0001
Area = 33.53 ha
Flowpath Length = 1134 m
Slope = 1.3%

Highway 4X

Coaldale Lateral

Existing Case

Highway 512 (Jail Road)

2001
Area = 8.01 ha
Flowpath Length = 205 m
Slope = 0.3%

0001
Area = 3.29 ha
Flowpath Length = 276 m
Slope = 1.4%

1001
Area = 6.18 ha
Flowpath Length = 177 m
Slope = 0.7%

0011
Area = 26.46 ha
Flowpath Length = 927 m
Slope = 1.3%

Highway 4X

Coaldale Lateral

Proposed Case

Legend

- Development Boundary
- Proposed Property Lines
- Future Highway
- General Drainage Flowpath
- Low Area
- "Critical Point"
- Subcatchment Modeled

Contours

- Major (1.0 m)
- Minor (0.2 m)

MARTIN GEOMATIC CONSULTANTS LTD.

Project No. 092251CE

Windy Acres

Residential Subdivision
NE31-8-20-4
Stormwater Management Plan
November 2009

Figure 3
Model Results

1:6,000

Highway 512 (Jail Road)

Highway 512
Peak Runoff = 0.16 m³/s
Total Volume = 910 m³

0011
Area = 10.4 ha
Peak Runoff = 0.87 m³/s
Total Volume = 3470 m³

Volume stored after storm = 1,830 m³

0001
Area = 33.53 ha
Peak Runoff = 1.403 m³/s
Total Volume = 8460 m³

Coaldale Lateral

Highway 4X

Existing Case

Highway 512 (Jail Road)

2001
Area = 8.01 ha
Peak Runoff = 0.799 m³/s
Total Volume = 2970 m³

0001
Area = 3.29 ha
Peak Runoff = 0.403 m³/s
Total Volume = 1220 m³

1001
Area = 6.18 ha
Peak Runoff = 0.996 m³/s
Total Volume = 2680 m³

0011
Area = 26.46 ha
Peak Runoff = 1.301 m³/s
Total Volume = 7190 m³

Coaldale Lateral

Highway 4X

Proposed Case

Legend

- Development Boundary
- Proposed Property Lines
- Future Highway
- General Drainage Flowpath
- Low Area
- "Critical Point"
- Subcatchment Modeled

Contours

- Major (1 m)
- Minor (0.2 m)

MARTIN GEOMATIC CONSULTANTS LTD.

Project No. 092251CE

Windy Acres

Residential Subdivision
NE31-8-20-4
Stormwater Management Plan
November 2009

Figure 4
Stormwater Management
Concept

1:3,000

Highway 512 (Jail Road)

Highway 4X

Coaldale Lateral

Grade swale to provide overflow at elev. 893.4 m

Provide depression storage
Volume = 2,900 m^3
Max elev = 893.4 m
Dugout to be pumped dry.

Berm top
elev. 893.0 m

Berm as required:
3H:1V side slope
2-m wide top

Grade area to provide
on-site runoff detention:
Active Volume = 2,600 m^3
Max Depth = 1.0 m

Berm top
elev. 892.0 m

Control Culvert:
300-mm dia. CSP
c/w lockable sluice gate
u/s invert elev. 890.7

Berm top
elev. 892.0 m

Berm top
elev. 893.0 m

Berm top
elev. 893.0 m

Legend

- Development Boundary
- Proposed Property Lines
- Future Highway

Contours

- Major (1 m)
- Minor (0.2 m)
- Existing Road
- Proposed Road
- Proposed Culvert
- Proposed Berm
- Proposed Ditch/Swale
- Proposed Runoff Detention

MARTIN GEOMATIC CONSULTANTS LTD.

Project No. 092251CE

APPENDIX

APPENDIX 2 ~ PROPERTY OWNERSHIP [TITLES]

ALBERTA GOVERNMENT SERVICES
LAND TITLES OFFICE

IMAGE OF DOCUMENT REGISTERED AS:

061501331

ADVISORY

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Alberta

INFRASTRUCTURE AND TRANSPORTATION

CAVEAT

File No. NE31-8-20-4 (3)

To the Registrar of the **SOUTH** Alberta Land Registration District:

Take notice that HER Majesty the QUEEN in the Right of the Province of Alberta as represented by the Minister of Infrastructure and Transportation ("the Caveator") claims an interest in the **N.E. ¼ SECTION 31-8-20-W4M (C. OF T. No. 981 376 375)** under an Agreement dated the **17** day of **OCTOBER** 2006, and made between **CALICO BROILER FARM INC. (Purchaser as to 35% Interest More of Less in said land)** of **235, 4512 - 52 AVENUE, RED DEER, ALBERTA** and the Caveator, whereby it was agreed on certain consideration to transfer to the Caveator a portion of the aforementioned land required for the establishing of a public work (**ROAD**) upon the said land standing in the register in the name of **GARNET G. STACEY and MARION M. REID** and I forbid the registration of any person as transferee or owner of, or of any instrument affecting that estate or interest, unless the certificate of title is expressed to be subject to such claim.

I designate the following address as the place at which notices and proceedings relating hereto may be served:

Alberta Infrastructure and Transportation
Southern Region
Box 314, 3rd Floor, Administration Building
909 - 3rd Avenue, North
Lethbridge, Alberta T1H 0H5

Dated this 26 day of **OCTOBER** 2006

.....
Regional Director, Lethbridge
For: Minister of Infrastructure and Transportation

I, **Darrell Camplin** make oath and say:

1. I am the agent for the above named Caveator.

2. I believe that the Caveator has a good and valid claim upon the said land and I say that this Caveat is not being filed for the purpose of delaying and embarrassing any person interested in or proposing to deal therewith.

Sworn before me at Lethbridge in the

Province of Alberta, this 26 day

of **OCTOBER** 2006

.....
A Commissioner for Oaths

Richard M Davison
My Commission Expires
October 14, 2008

.....

NE31-8-20-4.3.c1

061501331 REGISTERED 2006 12 04
CAVE - CAVEAT
DOC 1 OF 1 DRR#: 3263555 ADR/AKWAN
LINC/S: 0026697342

LAND TITLE CERTIFICATE

S

LINC	SHORT LEGAL	TITLE NUMBER
0032 769 317	4;20;8;31;NE	071 502 556

LEGAL DESCRIPTION

MERIDIAN 4 RANGE 20 TOWNSHIP 8
SECTION 31
QUARTER NORTH EAST
CONTAINING 64.7 HECTARES (160 ACRES) MORE OR LESS
EXCEPTING THEREOUT:
A) 14.97 HECTARES (36.99 ACRES) MORE OR LESS DESCRIBED AS FOLLOWS:
COMMENCING AT THE INTERSECTION OF THE EAST BOUNDARY OF SAID QUARTER SECTION WITH THE NORTH LIMIT OF CANAL RIGHT OF WAY ON PLAN IRR56;
THENCE NORTHERLY ALONG THE SAID EAST BOUNDARY TO INTERSECTION WITH THE SOUTH LIMIT OF ROAD PLAN 7711751;
THENCE WESTERLY ALONG THE SAID SOUTH LIMIT, 381.245 METRES;
THENCE SOUTHERLY AND AT RIGHT ANGLES THERETO, 224.32 METRES;
THENCE WESTERLY AND PARALLEL TO THE SAID SOUTH LIMIT, 123.94 METRES;
THENCE SOUTHERLY AND PARALLEL TO THE EAST BOUNDARY OF SAID QUARTER SECTION TO A POINT ON THE NORTH LIMIT OF CANAL RIGHT OF WAY ON PLAN IRR56;
THENCE NORTHEASTERLY THEREON TO THE POINT OF COMMENCEMENT

B)

PLAN	NUMBER	HECTARES	(ACRES)	MORE OR LESS
CANAL R/W	IRR56	2.99	7.4	
ROAD	7711751	0.817	2.02	
SUBDIVISION	9011669	22.58	55.8	
ROAD	0714980	11.326	27.99	

EXCEPTING THEREOUT ALL MINES AND MINERALS
AND THE RIGHT TO WORK THE SAME

ESTATE: FEE SIMPLE

MUNICIPALITY: COUNTY OF LETHBRIDGE

REFERENCE NUMBER: 981 376 375

(CONTINUED)

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
071 502 556	10/10/2007	ROAD PLAN		

OWNERS

GARNET G STACEY

AND
MARION M REID
BOTH OF:
BOX 1443
LETHBRIDGE
ALBERTA T1J 4K2
AS JOINT TENANTS
(DATA UPDATED BY: CHANGE OF ADDRESS 081014977)

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
8013JV .	14/12/1967	CAVEAT RE : EASEMENT CAVEATOR - CANADIAN WESTERN NATURAL GAS COMPANY LIMITED.
1485KX .	21/06/1971	IRRIGATION ORDER/NOTICE THIS PROPERTY IS INCLUDED IN THE ST. MARY RIVER IRRIGATION DISTRICT
961 084 531	24/04/1996	RESTRICTIVE COVENANT
971 334 640	07/11/1997	CAVEAT RE : PIPELINE AGREEMENT CAVEATOR - THE BOARD OF DIRECTORS OF ST. MARY RIVER IRRIGATION DISTRICT. P.O. BOX 278, LETHBRIDGE

(CONTINUED)

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
		ALBERTA T1J3Y7
971 334 641	07/11/1997	CAVEAT RE : ACCESS AGREEMENT CAVEATOR - THE BOARD OF DIRECTORS OF ST. MARY RIVER IRRIGATION DISTRICT. P.O. BOX 278, LETHBRIDGE ALBERTA T1J3Y7
971 339 899	14/11/1997	CAVEAT RE : EASEMENT CAVEATOR - 618360 ALBERTA LTD.. C/O NORTH & COMPANY 600, 200-4 ST S LETHBRIDGE ALBERTA T1J4J7 AGENT - GARRY W KASKIW
991 306 943	20/10/1999	CAVEAT RE : AGREEMENT OF PURCHASE & SALE CAVEATOR - 774589 ALBERTA LTD.. CAVEATOR - GARRY MARTHALLER CAVEATOR - GERRI MARTHALLER ALL OF : C/O P.O. BOX 1360 COALDALE ALBERTA T1M1N2 AGENT - LEONARD D FAST SEE CAVEAT FOR MORE CAVEATORS
001 148 810	05/06/2000	UTILITY RIGHT OF WAY GRANTEE - ATCO GAS AND PIPELINES LTD..
061 363 507	05/09/2006	EASEMENT AS TO PORTION OR PLAN:9512739 0010236 AS TO AREA 'D' ON PLAN 9512739 AS TO AREA 'E' ON PLAN 0010236 SEE INSTRUMENT
061 501 331	04/12/2006	CAVEAT RE : PUBLIC ROAD WORK CAVEATOR - HER MAJESTY THE QUEEN IN RIGHT OF ALBERTA AS REPRESENTED BY THE MINISTER OF INFRASTRUCTURE AND TRANSPORTATION ALBERTA INFRASTRUCTURE & TRANSPORTATION

(CONTINUED)

SOUTHERN REGION
BOX 314, 3 FLR., ADMINISTRATION BUILDING
909-3 AVE N
LETHBRIDGE
ALBERTA T1H0H5
AGENT - DARRELL CAMPLIN

TOTAL INSTRUMENTS: 010

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 5 DAY OF FEBRUARY, 2009 AT 01:31 P.M.

ORDER NUMBER:13250162

CUSTOMER FILE NUMBER: EST. STACEY

END OF CERTIFICATE

ALBERTA GOVERNMENT SERVICES
LAND TITLES OFFICE

IMAGE OF DOCUMENT REGISTERED AS:

991306943

ADVISORY

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Oct 20/?? Ck 14

CAVEAT FORBIDDING REGISTRATION

TAKE NOTICE that 774589 ALBERTA LTD., GARRY MARTHALLER, GERRI MARTHALLER, STANLEY MARKS, GRACE MARKS and CALICO BROILER FARM LTD. all of c/o P.O. Box 1360, Coaldale, Alberta T1M 1N2, the Caveator, claim an interest in the following legally described lands and premises:

MERIDIAN 4 RANGE 20 TOWNSHIP 8
SECTION 31
QUARTER NORTH EAST
CONTAINING 64.7 HECTARES (160 ACRES) MORE OR LESS
EXCEPTING THEREOUT:
FIRST:
THAT PORTION OF THE SAID QUARTER SECTION DESCRIBED AS FOLLOWS:
COMMENCING ON THE EAST BOUNDARY OF SAID QUARTER SECTION AT THE POINT OF INTERSECTION WITH THE NORTH BOUNDARY OF IRRIGATION RIGHT OF WAY NO. IRR56
THENCE NORTHERLY ALONG THE EAST BOUNDARY OF SAID QUARTER SECTION TO THE POINT
OF INTERSECTION WITH THE SOUTH BOUNDARY OF REGISTERED ROAD WIDENING PLAN NO. 7711751
THENCE WESTERLY ALONG THE SOUTH BOUNDARY OF SAID ROAD PLAN, 381.245 METRES
THENCE SOUTHERLY AND PERPENDICULAR TO SAID ROAD PLAN, 224.32 METRES
THENCE WESTERLY AND PARALLEL TO SAID ROAD PLAN 123.940 METRES
THENCE SOUTHERLY AND PARALLEL TO THE EAST BOUNDARY OF SAID QUARTER SECTION TO
A POINT ON THE NORTH BOUNDARY OF SAID REGISTERED PLAN NO. IRR56
THENCE NORTH EASTERLY ALONG SAID REGISTERED PLAN NO. IRR56 TO THE POINT OF COMMENCEMENT
CONTAINING 14.97 HECTARES (36.99 ACRES) MORE OR LESS
SECONDLY:
THAT PORTION OF THE NORTH EAST QUARTER OF SAID SECTION 31 LYING SOUTH OF THE SOUTH BOUNDARY OF IRRIGATION RIGHT OF WAY ON PLAN IRR56
CONTAINING 22.63 HECTARES (55.9 ACRES) MORE OR LESS
THIRDLY:

PLAN	NUMBER	HECTARES	ACRES MORE OR LESS
CANAL RIGHT OF WAY	IRR56	2.85	7.4
ROAD WIDENING	7711751	0.817	2.02

EXCEPTING THEREOUT ALL MINES AND MINERALS
AND THE RIGHT TO WORK THE SAME

standing in the register in the name of GARNET G STACEY and MARION M REID both of: RR8, Site 34, Comp 0, Lethbridge, Alberta T1J 4P4 as Joint Tenants.

The nature of the said interest and the grounds upon which the same is founded are as follows:

The Caveators have entered into an Agreement for Sale and Purchase with the said GARNET G STACEY and MARION M REID dated September 27, 1999 for the purchase of a 35% interest

(M/L) interest in the said lands.

The Caveators have not received a transfer of their interest in the aforesaid lands and claim an interest therein pursuant to the terms of the aforesaid Agreement for Sale and Purchase.

The Caveator forbids the registration of any person as transferee or owner of, or of any instrument affecting that estate or interest, unless the certificate of title is expressed to be subject to my claim.

The Caveator designates the office of LEONARD D. FAST, BARRISTER & SOLICITOR, P.O. BOX 1360, COALDALE, ALBERTA T1M 1N2 as the place at which notices and proceeds relating hereto may be served.

DATED at the Town of Coaldale, in the Province of Alberta, this 11 day of October, 1999.

Per: _____
LEONARD D. FAST, Agent of the Caveator

CANADA)
PROVINCE OF ALBERTA)
TO WIT:)

I, LEONARD D. FAST, BARRISTER & SOLICITOR of the Town of Coaldale, in the Province of Alberta MAKE OATH AND SAY:

1. I am the agent of the above named Caveator.
2. I believe that the said Caveator has a good and valid claim upon the said land and I say that this Caveat is not being filed for the purpose of delaying or embarrassing any person interested in or proposing to deal therewith.

SWORN BEFORE ME at the Town of Coaldale, in the Province of Alberta, this 11 day of October, 1999.

_____
A COMMISSIONER FOR OATHS IN AND FOR THE PROVINCE OF ALBERTA

SONYA M.A. LAWRENCE
My Commission Expires April 15, 2000

991306943 REGISTERED 1999 10 20
CAVE - CAVEAT
DOC 1 OF 1 DRR#: 8257756 ADR/AKEIR
LINC/S: 0026697342

APPENDIX

APPENDIX 3 ~ POTABLE WATER SUPPLY

COUNTY OF LETHBRIDGE
RURAL WATER ASSOCIATION LTD.
Box 15
Lethbridge, AB
T1J 3Y3

November 30, 2009

To whom it may concern,

This is to confirm that on the property NW 31 – 8 – 20 W4M owned by Garnet Stacey and Marion Reid there are currently 2 water shares installed and in good standing. Further we have a deposit of 8 more shares on the named property to be installed in the future.

Sincerely,

Paul de Jonge
County of Lethbridge Rural Water Association Ltd.

APPENDIX

APPENDIX 4 ~ GEOTECHNICAL & SEPTIC FIELD FEASIBILITY ASSESSMENT

Martin Geomatic Consultants Ltd.

ISSUED FOR USE

GEOTECHNICAL & SEPTIC FIELD FEASIBILITY ASSESSMENT
PROPOSED WINDY ACRES RESIDENTIAL SUBDIVISION
EAST OF LETHBRIDGE, ALBERTA

L12101702

March 2010

EBA Engineering Consultants Ltd.
p. 403.329.9009 • f. 403.328.8817
442 - 10 Street N • Lethbridge, Alberta T1H 2C7 • CANADA

TABLE OF CONTENTS

PAGE

1.0 INTRODUCTION 1
2.0 PROJECT DETAILS AND SCOPE OF WORK 1
3.0 GEOTECHNICAL FIELD WORK 2
4.0 SITE AND SUBSURFACE CONDITIONS 2
4.1 Site Conditions 2
4.2 Subsurface Conditions 3
4.2.1 Topsoil 3
4.2.2 Clay Fill 3
4.2.3 Sand 3
4.2.4 Clay 3
4.2.5 Clay Till 3
4.2.6 Groundwater Conditions 4
5.0 GENERAL RECOMMENDATIONS 4
5.1 Septic Field Analysis 5
5.2 Backfill Materials and Compaction 6
5.3 Storm Water Dry Pond 6
5.4 Road Subgrade Preparation 7
5.5 Gravel Paved Areas 7
6.0 DESIGN AND CONSTRUCTION GUIDELINES 8
7.0 REVIEW OF DESIGN AND CONSTRUCTION 8
8.0 LIMITATIONS 8
9.0 CLOSURE 9

TABLE OF CONTENTS

FIGURES

Figure 1 Site Plan

APPENDICES

Appendix A Geotechnical Report – General Conditions

Appendix B Borehole Logs

Appendix C Recommended General Design and Construction Guidelines

Appendix D Laboratory Results

1.0 INTRODUCTION

This report presents the results of a geotechnical evaluation conducted by EBA Engineering Consultants Ltd. (EBA) for the purpose of an Area Structural Plan for a rural residential subdivision development, to be located in a portion of the NE ¼ Section 31-8-20 W4M, County of Lethbridge, Alberta.

The scope of work for the geotechnical evaluation was described in a proposal issued to Mr. Garnet Stacey, of Martin Geomatic Consultants Ltd. (MGCL), on December 7, 2009 (EBA reference PL12101702). The objective of this evaluation was to determine the general subsurface conditions in the area of the proposed development, to provide recommendations for the geotechnical aspects of site grading and roadworks, and to assess the feasibility of septic disposal fields and a proposed storm water dry pond. Recommendations for foundations are not requested at this time.

Authorization to proceed with this evaluation was provided by Mr. Stacey.

Pursuant to the Alberta Building Code (the Building Code), the proposed project will require compliance with the professional Design and Review requirements set out in Section 2.6 of the Building Code. These require that a geotechnical engineer be retained as a Registered Professional of Record to provide such field reviews as are necessary to ensure compliance with the Building Code, and to ensure that the geotechnical aspects of the project are constructed so as to substantially comply with the plans and specifications as well as the requirements of this report. EBA will provide these services if retained to do so.

2.0 PROJECT DETAILS AND SCOPE OF WORK

Based on discussions with MGCL, it is understood that the proposed subdivision development will consist of 11 rural residential lots and new gravel-paved access roadways.

The requested work scope for this evaluation consisted of the drilling of twelve (12) geotechnical boreholes, a laboratory program to assist in classifying the subsurface soils, and a report providing the following design and construction recommendations.

- Recommendations on soil suitability for septic fields.
- Recommendations for backfill materials and compaction.
- Recommendations for construction of gravel-paved roadways.
- Preliminary recommendations for the dry pond.

3.0 GEOTECHNICAL FIELD WORK

The fieldwork for this evaluation was carried out on February 5, 2010 using a truck-mounted drill rig contracted from Chilako Drilling Services Ltd. of Coaldale, Alberta. The rig was equipped with 150 mm diameter solid stem continuous flight augers. EBA's field representative was Mr. Jackson Meadows, C.E.T.

Eight boreholes were drilled within the estimated septic disposal field footprints in select residential lots [boreholes (BH) 10BH001 through 10BH008] to depths of approximately 3 m below ground surface. Two boreholes (10BH009 and 10BH010) were drilled within the proposed gravel-paved roadway alignment to depths of approximately 1.5 m below ground surface. Two boreholes (10BH011 and 10BH012) were drilled within the proposed footprint of the dry pond. The approximate borehole locations are shown on Figure 1.

In all of the boreholes, disturbed grab samples were obtained at a depth of 600 mm below ground surface. All soil samples were visually classified in the field and the individual soil strata and the interfaces between them were noted. The borehole logs are presented in Appendix B. An explanation of the terms and symbols used on the borehole logs is also included in Appendix B.

A slotted 25 mm diameter PVC standpipe was installed in each of the boreholes in order to monitor groundwater levels. Auger cuttings were used to backfill around the standpipes and they were sealed at the ground surface with bentonite chips.

The locations of the boreholes were selected by MGCL, and the approximate geodetic ground surface elevations at the borehole locations were surveyed by MGCL. The ground elevations at the borehole locations are provided on the borehole logs.

4.0 SITE AND SUBSURFACE CONDITIONS

4.1 SITE CONDITIONS

Visual site reconnaissance was completed by Mr. Trevor Curtis, E.I.T. on February 26, 2010. The site is located east of Lethbridge, Alberta, along Highway 512. Access to the site is via a gravel road from Highway 512. South of the highway, the northern portion of the site is occupied by a residence, stables and various other buildings as well as a fenced area for horse riding (equestrian centre). The southern portion of the site is undeveloped and extends for several hundred meters. The site is bounded on the east and west by barbed wire fences, with residential developments beyond. The site is bounded on the north by Highway 512 and on the south by an irrigation canal running in a NE-SW direction, with residential developments further to the south.

The ground surface was noted to be generally flat to slightly undulating, with a mild slope toward the south. The ground is generally surfaced with prairie grass and/or weeds.

4.2 SUBSURFACE CONDITIONS

It should be noted that geological conditions are innately variable. At the time of preparation of this report, information on subsurface stratigraphy was available only at discrete borehole locations. In order to develop recommendations from this information, it is necessary to make some assumptions concerning conditions other than at borehole locations. Adequate field reviews should be provided during construction to check that these assumptions are reasonable.

The following subsections provide a summary of the stratigraphic units encountered at the project site at the specific borehole locations. A more detailed description is provided on the borehole logs provided in Appendix B. Laboratory test results are in Appendix D.

4.2.1 Topsoil

A surficial layer of topsoil was encountered at the borehole locations (with the exception of BH009 and BH010, which were drilled on the existing roadway), with a general thickness of approximately 100 mm (except in BH002 at approximately 500 mm thickness). The topsoil was generally described as clay, sandy, damp and dark brown with trace roots and organics.

4.2.2 Clay Fill

A surficial layer of clay fill was encountered at boreholes BH009 and BH010, extending to depths of approximately 1.2 m, attributed to roadway embankment. The clay fill was described as silty, some sand, trace gravel, frozen, medium plastic, brown in colour with coal, oxide and red shale specks. Moisture contents derived from samples taken in this layer indicated values of approximately 18%.

4.2.3 Sand

Underlying the topsoil, a sand deposit was generally encountered at the borehole locations with the exception of BH002, BH009, and BH010. The sand extended to depths ranging between 0.8 m and 1.6 m below ground surface. The sand was generally described as silty, trace clay, poorly graded, fine grained, damp, compact, light brown in colour with occasional silt pockets, roots and white precipitates. Moisture contents derived from samples taken in this layer indicated values ranging between 6% and 11%.

4.2.4 Clay

Underlying the sand, a layer of clay was generally encountered at the borehole locations (except in BH004, BH011, and BH012). The clay generally extended to depths ranging between 2.2 m to borehole termination depths of 3.0 m. The clay was generally described as silty, sandy, damp to moist, stiff, low plastic, light brown to brown with white precipitates. Moisture content derived from a sample of clay indicated a value of 15%.

4.2.5 Clay Till

Underlying the upper lacustrine and/or fill layers, a glacial clay till deposit was encountered at borehole locations BH002, BH004, BH005, BH007, BH011, and BH012, extending to

borehole termination depth. The clay till was generally described as silty, some sand, trace gravel, moist to very moist, stiff, medium plastic and brown with coal and oxide specks and white precipitates. Moisture contents taken on random samples of clay till were determined to range between 13% and 21%.

4.2.6 Groundwater Conditions

At the time of drilling, seepage and sloughing were generally not encountered within the boreholes. Groundwater levels were measured within the standpipes on February 19, 2010. The following table summarizes the groundwater monitoring data.

TABLE 4.2.6-1

Borehole Number	Depth of Standpipe (m)	Geodetic Ground Elevation of Borehole (m)	Groundwater Monitoring Data February 19, 2009	
			Depth to Groundwater (m)	Elevation of Groundwater (m)
001	3.0	893.71	Dry	-
002	3.0	893.51	2.21	891.30
003	3.0	894.37	Dry	-
004	3.0	893.57	Dry	-
005	3.0	893.57	Dry	-
006	3.0	892.16	Dry	-
007	3.0	891.84	Dry	-
008	3.0	891.86	Dry	-
009	1.5	894.19	Dry	-
010	1.5	894.07	1.02	893.05
011	4.6	892.14	Dry	-
012	4.6	892.51	4.45	888.06

Groundwater levels may fluctuate seasonally and in response to climatic conditions and therefore should be monitored prior to development.

5.0 GENERAL RECOMMENDATIONS

The recommendations that follow provide varying options for design and construction, intended to aid in the development of project concepts and specifications. The recommendations are provided with the understanding and condition that EBA will be retained to review the relevant aspects of the final design (drawings and specifications), and will be retained to conduct such field reviews as are necessary to ensure compliance with geotechnical aspects of the Alberta Building Code, this report, and the final plans and specifications. EBA accepts no liability for any use of this report for design and construction in the event that EBA is not retained to provide these review services.

5.1 SEPTIC FIELD ANALYSIS

EBA performed soil texture analyses on soil samples obtained from the proposed septic disposal field sites. The hydrometer /grain size analyses results are included in Appendix D. The results are indicated in the following table.

TABLE 5.1-1

Borehole Number	Lot Number	% Sand	% Silt	% Clay	Soil Classification
001	1	29	34	37	Clay Loam
002	4	28	48	24	Loam
003	6	58	23	19	Sandy Loam
004	7	27	50	23	Silt Loam
005	8	32	42	26	Loam
006	9	68	15	17	Sandy Loam
007	10	74	15	11	Sandy Loam
008	11	43	37	20	Loam

The soil samples were classified as above (referenced from Figure 8.1.1.10. of the Alberta Private Sewage Systems Standard of Practice 2009 Handbook). Based on these classifications, the surficial soils at the borehole locations generally satisfy the requirements of the Safety Code Council (as required by the 2009 Handbook) in the general area for design and construction of a septic disposal field.

The 2009 Handbook stipulates that when using the results of a soil texture classification (determined in Figure 8.1.1.10 of the Handbook) to size a system, the disposal field shall be sized so that the effluent loading rate per day shall not exceed the following rates:

- 40.7 litres per square meter (0.83 Imperial gallons per square foot) in loam to clay textured soils.
- 29.4 litres per square meter (0.6 Imperial gallons per square foot) in sandy loam soils.

In addition, the natural separation between the point of effluent infiltration into the soil and the groundwater should be a minimum of 1.5 m.

It is recommended that the specific site selection of the proposed septic fields be carefully considered by the septic field installer to satisfy these requirements and those of the Regulations Having Jurisdiction [Municipality, Alberta Environment (AENV), Alberta Labour]. This requirement is in accordance with the provincial regulations, which state that two percolation tests are required within the final footprint of the field by the installer. Following the site-specific testing, the septic disposal field should be designed and sized accordingly by the disposal field designer. It is further recommended that the design footprint of any building structures be determined once the final disposal field is selected, to ensure the appropriate gravity flow or pumping requirements are satisfied.

During installation of the weeping trenches, the installer should pay close attention to the soil conditions to define the extent of high plastic clay layers which generally indicate areas with percolation rates below the minimum guidelines. These should be reported to the disposal field designer for review prior to completion of the septic disposal field.

The information provided herein is intended to be a preliminary assessment of the feasibility of septic disposal fields for the proposed development as per the provincial regulations. Site specific municipal regulations or siting requirement guidelines with respect to the local health unit, if applicable, have not been addressed.

5.2 BACKFILL MATERIALS AND COMPACTION

All lots should be initially graded for drainage at a minimum gradient of 2.0 percent.

The existing site soils comprising sand are suitable for use as 'landscape fill'. The site's low to medium plastic clay are suitable for use as 'landscape fill' materials and for use as 'general engineered fill' materials, as defined in Appendix C. Any deleterious materials encountered should be removed from the site.

Sand soils may be adequate for use as general engineered fill, but may be challenging to work with. The sand will require compaction at very close to its optimum moisture content and will become easily disturbed. An experienced contractor will be required.

The moisture content of the upper site soil materials is expected to be variable with respect to the estimated optimum moisture contents for these materials. It is anticipated therefore, that moisture conditioning will be required at the site for proper backfill placement. The earthwork contractor should make his own estimate of the requirements for moisture conditioning to the recommended standards and should consider such factors as weather and construction procedures.

General engineered fill materials in all development areas and for trenches should be moisture conditioned to within a range of optimum to +2% of the optimum moisture content (OMC) prior to compaction and compacted to a minimum of 98% of SPD.

Further recommendations regarding backfill materials and compaction are contained in Appendix C.

5.3 STORM WATER DRY POND

The approximate location of the stormwater dry pond proposed for this subdivision is in the south end of the site, adjacent to the canal, as shown on Figure 1. Specific details of the pond design have not yet been finalized; however, it is understood that the invert of pond will be approximately 2 m below final design grades. It is also understood that the stormwater pond will not retain water for a significant length of time throughout the year and is therefore considered as a "dry pond" according to the "Stormwater Management Guidelines for the Province of Alberta".

Within the dry pond area, following base shaping, the upper 300 mm of native soils should be scarified and uniformly moisture conditioned to within 2 percent of OMC. The subgrade should then be uniformly compacted to a minimum of 98 percent of SPD. Although the Stormwater Management Guidelines do not have a provision for liner thickness for dry ponds, the above-noted recommendations are intended to provide a "tighter" pond surface and should facilitate access for maintenance equipment.

5.4 ROAD SUBGRADE PREPARATION

Within all proposed paved areas, the upper 300 mm of native soils or prepared general engineered fill subgrade should be scarified and uniformly moisture conditioned to within 2 percent of OMC. The subgrade should then be uniformly compacted to a minimum of 98 percent of SPD.

Backfill to raise road areas to subgrade level should be general engineered cohesive fill materials, as defined in the report text or Appendix C, moisture conditioned and compacted as noted previously. The subgrade should be prepared and graded to allow drainage to the road shoulders. Proof-rolling of the prepared surface is recommended to identify localized soft areas and for an indication of overall subgrade support characteristics.

It is imperative that positive surface drainage be provided to prevent ponding of water within the roadway structure and subsequent softening and loss of strength of the subgrade materials. Surrounding landscaping should be such that runoff water is prevented from ponding beside paved areas in order to avoid softening and premature failure of the pavement surface.

Given the general soil moisture regime, moisture conditioning by the contractor will be required to achieve the above recommended standards for construction of the subgrades in most areas. If small localized areas of soft subgrade soils are encountered, provisions may be required to subcut each small area and replace with engineered fill, or alternatively, with granular (pit-run) fill with the use of a geotextile grid or geotextile fabric to strengthen the subgrade support characteristics. Further design information can be provided following initial proof-rolling of the subgrade soils.

5.5 GRAVEL PAVED AREAS

It is understood that the gravel paved roadways will likely be exposed to both light and heavy duty traffic. The following minimum gravel pavement is recommended.

- 100 mm of crushed gravel or base gravel (25 mm minus) over
- 250 mm of pit-run gravel or sub-base gravel over prepared clay subgrade.

The properties of the materials used in the gravel pavement structure should conform to the specifications found in Appendix C. Both gravel materials should be compacted to 100% of SPD.

It should be noted that this gravel surface requires periodic maintenance. For this reason, a surficial layer of finer graded crushed gravel is recommended. If pit-run is used as the surfacing layer, it will likely be very coarse, with a significant portion of rounded cobbles, making periodic blading difficult and is not recommended for this reason. Should rutting occur in the future, it is recommended to fill the ruts with crushed granular material and compact rather than simply use a grader to level the uneven areas. It will be much easier to place and compact the crushed gravel and then blade smooth as part of the long-term maintenance program. General guidelines for gravel roadway construction and maintenance are provided in Appendix C.

The use of a woven geotextile underlying the gravel is recommended for this development in areas of frequent traffic turning.

6.0 DESIGN AND CONSTRUCTION GUIDELINES

Recommended general design and construction guidelines are provided in Appendix C, under the following headings.

- Backfill Materials and Compaction
- Maintenance of Gravelled Yards

These guidelines are intended to present standards of good practice. Although supplemental to the main text of this report, they should be interpreted as part of the report. Design recommendations presented herein are based on the premise that these guidelines will be followed. The design and construction guidelines are not intended to represent detailed specifications for the works although they may prove useful in the preparation of such specifications. In the event of any discrepancy between the main text of this report and Appendix C, the main text should govern.

7.0 REVIEW OF DESIGN AND CONSTRUCTION

EBA should be given the opportunity to review details of the design and specifications, related to geotechnical aspects of this project, prior to development of the site.

8.0 LIMITATIONS

Recommendations presented herein are based on a geotechnical evaluation of the findings of an in-situ drilling program at twelve (12) locations. The conditions encountered during the fieldwork are considered to be reasonably representative of the site. If, however, conditions other than those reported are noted during subsequent phases of the project, EBA should be notified and given the opportunity to review our current recommendations in light of new findings. Recommendations presented herein may not be valid if an adequate level of monitoring is not provided during development of the site.

This report and its contents are intended for the sole use of Martin Geomatic Consultants Ltd., and their agents. EBA does not accept any responsibility for the accuracy

of any of the data, the analysis or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than Martin Geomatic Consultants Ltd., or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this report is subject to the terms and conditions stated in EBA's Services Agreement and in the General Conditions provided in Appendix A of this report.

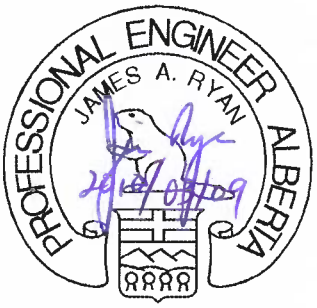
9.0 CLOSURE

We trust this report satisfies your present requirements. We would be pleased to provide further information that may be needed during design and to advise on the geotechnical aspects of specifications for inclusion in contract documents. Should you require additional information or monitoring services, please do not hesitate to contact our office.

Respectfully submitted,
EBA Engineering Consultants Ltd.

Prepared by:

Reviewed by:



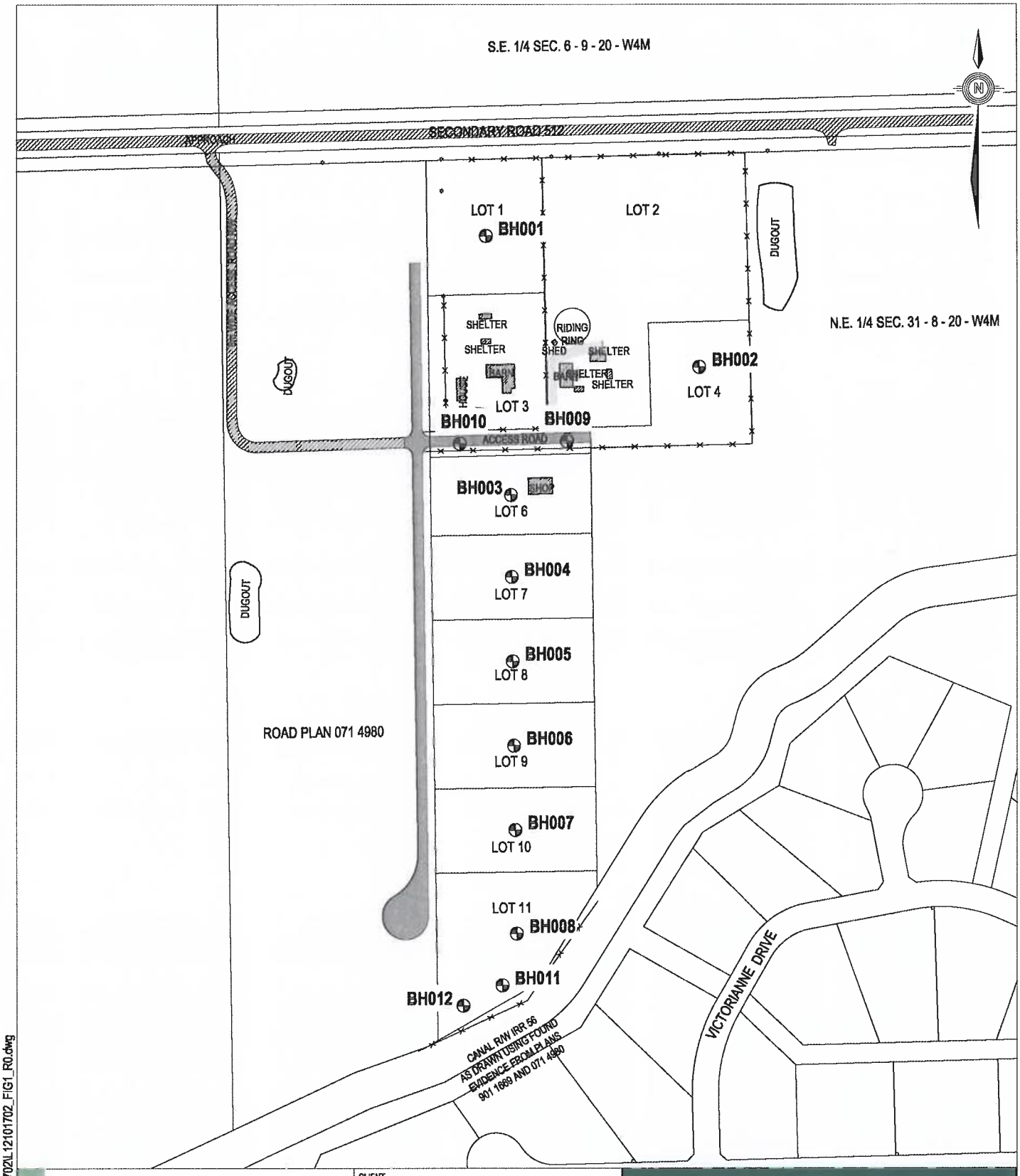
Trevor Curtis, E.I.T.
Project Engineer
Engineering Practice
Phone: 403.329.9009 Ext. 252
tcurtis@eba.ca

J.A. (Jim) Ryan, M.Eng., P. Eng.
Senior Project Engineer
Engineering Practice
Phone: 403.203.3305 Ext. 871
jryan@eba.ca

/hms

PERMIT TO PRACTICE
EBA ENGINEERING CONSULTANTS LTD.
Signature: _____
Date: March 9/2010
PERMIT NUMBER: P245
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

FIGURES



LEGEND

BH# BOREHOLE LOCATION

0 40 100 200m

SCALE 1:4000

CLIENT

Mr. Garnet Stacey

WINDY ACRES RURAL SUBDIVISION

SITE PLAN AND BOREHOLE LOCATIONS

EBA Engineering Consultants Ltd.

PROJECT NO.	DWN	CKD	REV
L12101702	LCH	TC	0
OFFICE: Lethbridge	DATE: March 3, 2010		

Figure 1

\\lethbridge\drafting\L121 Projects\L12101702\L12101702_FIG1_R0.dwg

APPENDIX A

APPENDIX A GEOTECHNICAL REPORT – GENERAL CONDITIONS

GEOTECHNICAL REPORT - GENERAL CONDITIONS

This report incorporates and is subject to these "General Conditions".

1.0 USE OF REPORT AND OWNERSHIP

This geotechnical report pertains to a specific site, a specific development and a specific scope of work. It is not applicable to any other sites nor should it be relied upon for types of development other than that to which it refers. Any variation from the site or development would necessitate a supplementary geotechnical assessment.

This report and the recommendations contained in it are intended for the sole use of EBA's Client. EBA does not accept any responsibility for the accuracy of any of the data, the analyses or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than EBA's Client unless otherwise authorized in writing by EBA. Any unauthorized use of the report is at the sole risk of the user.

This report is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of EBA. Additional copies of the report, if required, may be obtained upon request.

2.0 ALTERNATE REPORT FORMAT

Where EBA submits both electronic file and hard copy versions of reports, drawings and other project-related documents and deliverables (collectively termed EBA's instruments of professional service), only the signed and/or sealed versions shall be considered final and legally binding. The original signed and/or sealed version archived by EBA shall be deemed to be the original for the Project.

Both electronic file and hard copy versions of EBA's instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party except EBA. EBA's instruments of professional service will be used only and exactly as submitted by EBA.

Electronic files submitted by EBA have been prepared and submitted using specific software and hardware systems. EBA makes no representation about the compatibility of these files with the Client's current or future software and hardware systems.

3.0 ENVIRONMENTAL AND REGULATORY ISSUES

Unless stipulated in the report, EBA has not been retained to investigate, address or consider and has not investigated, addressed or considered any environmental or regulatory issues associated with development on the subject site.

4.0 NATURE AND EXACTNESS OF SOIL AND ROCK DESCRIPTIONS

Classification and identification of soils and rocks are based upon commonly accepted systems and methods employed in professional geotechnical practice. This report contains descriptions of the systems and methods used. Where deviations from the system or method prevail, they are specifically mentioned.

Classification and identification of geological units are judgmental in nature as to both type and condition. EBA does not warrant conditions represented herein as exact, but infers accuracy only to the extent that is common in practice.

Where subsurface conditions encountered during development are different from those described in this report, qualified geotechnical personnel should revisit the site and review recommendations in light of the actual conditions encountered.

5.0 LOGS OF TESTHOLES

The testhole logs are a compilation of conditions and classification of soils and rocks as obtained from field observations and laboratory testing of selected samples. Soil and rock zones have been interpreted. Change from one geological zone to the other, indicated on the logs as a distinct line, can be, in fact, transitional. The extent of transition is interpretive. Any circumstance which requires precise definition of soil or rock zone transition elevations may require further investigation and review.

6.0 STRATIGRAPHIC AND GEOLOGICAL INFORMATION

The stratigraphic and geological information indicated on drawings contained in this report are inferred from logs of test holes and/or soil/rock exposures. Stratigraphy is known only at the locations of the test hole or exposure. Actual geology and stratigraphy between test holes and/or exposures may vary from that shown on these drawings. Natural variations in geological conditions are inherent and are a function of the historic environment. EBA does not represent the conditions illustrated as exact but recognizes that variations will exist. Where knowledge of more precise locations of geological units is necessary, additional investigation and review may be necessary.

7.0 SURFACE WATER AND GROUNDWATER CONDITIONS

Surface and groundwater conditions mentioned in this report are those observed at the times recorded in the report. These conditions vary with geological detail between observation sites; annual, seasonal and special meteorologic conditions; and with development activity. Interpretation of water conditions from observations and records is judgemental and constitutes an evaluation of circumstances as influenced by geology, meteorology and development activity. Deviations from these observations may occur during the course of development activities.

8.0 PROTECTION OF EXPOSED GROUND

Excavation and construction operations expose geological materials to climatic elements (freeze/thaw, wet/dry) and/or mechanical disturbance which can cause severe deterioration. Unless otherwise specifically indicated in this report, the walls and floors of excavations must be protected from the elements, particularly moisture, desiccation, frost action and construction traffic.

9.0 SUPPORT OF ADJACENT GROUND AND STRUCTURES

Unless otherwise specifically advised, support of ground and structures adjacent to the anticipated construction and preservation of adjacent ground and structures from the adverse impact of construction activity is required.

10.0 INFLUENCE OF CONSTRUCTION ACTIVITY

There is a direct correlation between construction activity and structural performance of adjacent buildings and other installations. The influence of all anticipated construction activities should be considered by the contractor, owner, architect and prime engineer in consultation with a geotechnical engineer when the final design and construction techniques are known.

11.0 OBSERVATIONS DURING CONSTRUCTION

Because of the nature of geological deposits, the judgmental nature of geotechnical engineering, as well as the potential of adverse circumstances arising from construction activity, observations during site preparation, excavation and construction should be carried out by a geotechnical engineer. These observations may then serve as the basis for confirmation and/or alteration of geotechnical recommendations or design guidelines presented herein.

12.0 DRAINAGE SYSTEMS

Where temporary or permanent drainage systems are installed within or around a structure, the systems which will be installed must protect the structure from loss of ground due to internal erosion and must be designed so as to assure continued performance of the drains. Specific design detail of such systems should be developed or reviewed by the geotechnical engineer. Unless otherwise specified, it is a condition of this report that effective temporary and permanent drainage systems are required and that they must be considered in relation to project purpose and function.

13.0 BEARING CAPACITY

Design bearing capacities, loads and allowable stresses quoted in this report relate to a specific soil or rock type and condition. Construction activity and environmental circumstances can materially change the condition of soil or rock. The elevation at which a soil or rock type occurs is variable. It is a requirement of this report that structural elements be founded in and/or upon geological materials of the type and in the condition assumed. Sufficient observations should be made by qualified geotechnical personnel during construction to assure that the soil and/or rock conditions assumed in this report in fact exist at the site.

14.0 SAMPLES

EBA will retain all soil and rock samples for 30 days after this report is issued. Further storage or transfer of samples can be made at the Client's expense upon written request, otherwise samples will be discarded.

APPENDIX B

APPENDIX B BOREHOLE LOGS

TERMS USED ON BOREHOLE LOGS

TERMS DESCRIBING CONSISTENCY OR CONDITION

COARSE GRAINED SOILS (major portion retained on 0.075mm sieve): includes (1) clean gravels and sands, and (2) silty or clayey gravels and sands. Condition is rated according to relative density, as inferred from laboratory or in situ tests.

DESCRIPTIVE TERM	RELATIVE DENSITY	N (blows per 0.3m)
Very Loose	0 to 20%	0 to 4
Loose	20 to 40%	4 to 10
Compact	40 to 75%	10 to 30
Dense	75 to 90%	30 to 50
Very Dense	90 to 100%	greater than 50

The number of blows, N, on a 51mm O.D. split spoon sampler of a 63.5kg weight falling 0.76m, required to drive the sampler a distance of 0.3m from 0.15m to 0.45m.

FINE GRAINED SOILS (major portion passing 0.075mm sieve): includes (1) inorganic and organic silts and clays, (2) gravelly, sandy, or silty clays, and (3) clayey silts. Consistency is rated according to shearing strength, as estimated from laboratory or in situ tests.

DESCRIPTIVE TERM	UNCONFINED COMPRESSIVE STRENGTH (kPa)
Very Soft	Less Than 25
Soft	25 to 50
Firm	50 to 100
Stiff	100 to 200
Very Stiff	200 to 400
Hard	Greater Than 400

NOTE: Slickensided and fissured clays may have lower unconfined compressive strengths than shown above, because of planes of weakness or cracks in the soil.

GENERAL DESCRIPTIVE TERMS

Slickensided	- having inclined planes of weakness that are slick and glossy in appearance.
Fissured	- containing shrinkage cracks, frequently filled with fine sand or silt; usually more or less vertical.
Laminated	- composed of thin layers of varying colour and texture.
Interbedded	- composed of alternate layers of different soil types.
Calcareous	- containing appreciable quantities of calcium carbonate.
Well Graded	- having wide range in grain sizes and substantial amounts of intermediate particle sizes.
Poorly graded	- predominantly of one grain size, or having a range of sizes with some intermediate size missing.

MODIFIED UNIFIED SOIL CLASSIFICATION

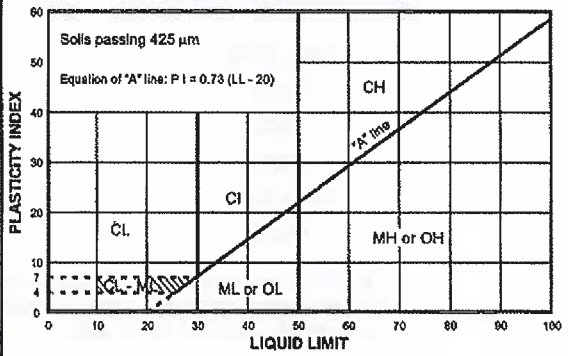
MAJOR DIVISION			GROUP SYMBOL	TYPICAL DESCRIPTION	LABORATORY CLASSIFICATION CRITERIA
COARSE-GRAINED SOILS More than 50% retained on 75 µm sieve*	GRAVELS 50% or more of coarse fraction retained on 4.75 mm sieve	CLEAN GRAVELS	GW	Well-graded gravels and gravel-sand mixtures, little or no fines	$C_U = D_{60}/D_{10}$ Greater than 4; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines	Not meeting both criteria for GW
		GRAVELS WITH FINES	GM	Silty gravels, gravel-sand-silt mixtures	Atterberg limits plot below "A" line or plasticity index less than 4
			GC	Clayey gravels, gravel-sand-clay mixtures	Atterberg limits plot above "A" line or plasticity index greater than 7
	SANDS More than 50% of coarse fraction passes 4.75 mm sieve	CLEAN SANDS	SW	Well-graded sands and gravelly sands, little or no fines	$C_U = D_{60}/D_{10}$ Greater than 6; $C_C = \frac{(D_{30})^2}{D_{30} \times D_{60}}$ Between 1 and 3
			SP	Poorly graded sands and gravelly sands, little or no fines	Not meeting both criteria for SW
		SANDS WITH FINES	SM	Silty sands, sand-silt mixtures	Atterberg limits plot below "A" line or plasticity index less than 4
			SC	Clayey sands, sand-clay mixtures	Atterberg limits plot above "A" line or plasticity index greater than 7
FINE-GRAINED SOILS (by behavior) 50% or more passes 75 µm sieve*	SILTS Liquid limit <50		ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands of slight plasticity	
	SILTS Liquid limit >50		MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts	
	CLAYS Above "A" line on plasticity chart negligible organic content Liquid limit <30		CL	Inorganic clays of low plasticity, gravelly clays, sandy clays, silty clays, lean clays	
	CLAYS Above "A" line on plasticity chart negligible organic content Liquid limit 30-50		CI	Inorganic clays of medium plasticity, silty clays	
	CLAYS Above "A" line on plasticity chart negligible organic content Liquid limit >50		CH	Inorganic clays of high plasticity, fat clays	
	ORGANIC SILTS AND CLAYS Liquid limit <50		OL	Organic silts and organic silty clays of low plasticity	
	ORGANIC SILTS AND CLAYS Liquid limit >50		OH	Organic clays of medium to high plasticity	
HIGHLY ORGANIC SOILS			PT	Peat and other highly organic soils	

Classification on basis of percentage of fines
GW, GP, SW, SP
GM, GC, SM, SC
Borderline Classification requiring use of dual symbols
Less than 5% Pass 75 µm sieve
More than 12% Pass 75 µm sieve
5% to 12% Pass 75 µm sieve

Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols

For classification of fine-grained soils and fine fraction of coarse-grained soils.

PLASTICITY CHART



*Based on the material passing the 75 mm sieve
Reference: ASTM Designation D2487, for identification procedure see D2488. USC as modified by PFRA

SOIL COMPONENTS

FRACTION	SIEVE SIZE PASSING	SIEVE SIZE RETAINED	DEFINING RANGES OF PERCENTAGE BY MASS OF MINOR COMPONENTS: PERCENTAGE	DESCRIPTOR
GRAVEL			>35 %	"and"
coarse	75 mm	19 mm	21 to 35 %	"y-adjective"
fine	19 mm	4.75 mm	10 to 20 %	"some"
SAND			>0 to 10 %	"trace"
coarse	4.75 mm	2.00 mm		
medium	2.00 mm	425 µm		
fine	425 µm	75 µm		
SILT (non plastic) or CLAY (plastic)	75 µm		as above but by behavior	

OVERSIZE MATERIAL

Rounded or subrounded	
COBBLES	75 mm to 300 mm
BOULDERS	> 300 mm
Not rounded	
ROCK FRAGMENTS	>75 mm
ROCKS	> 0.76 cubic metre in volume

EBA Engineering Consultants Ltd.

2046 - Revised July 09.cdr

PROJECT: WINDY ACRES RURAL SUBDIVISION	CLIENT: MARTIN GEOMATIC CONSULTANTS LTD.	PROJECT NO. - BOREHOLE NO.
LOCATION: NE 1/4 SEC. 31-8-20 W4M	DRILL METHOD: 150mm SOLID STEM AUGER	L12101702 - 10BH001
	PROJECT ENGINEER: JIM RYAN	ELEVATION: 893.71m

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

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

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT	PLASTIC / M.C. / LIQUID (20 40 60 80)	STANDARD PENETRATION (N) (20 40 60 80) / UNCONFINED (kPa) (50 100 150 200) / POCKET PEN. (kPa) (100 200 300 400)	Elevation (m)
0	TOPSOIL - clay, silty, sandy, damp, dark brown, roots, organics						
	SAND - silty, trace clay, poorly graded, fine grained, damp, compact, light brown, occasional silt pockets, white precipitates		B1				893.0
1			B2				
	CLAY - silty, sandy, damp to moist, stiff, low plastic, light brown to brown, white precipitates		B3			▲	892.0
2			B4			▲	
	... moist,						891.0
3			B5			▲	
	End of Borehole @ 3.0m						
	No Seepag or Sloughing on Completion Slotted PVC Pipe Installed to 3.0m Borehole Measured Dry Feb. 19, 2010						890.0
4							
							889.0
5							
							888.0
6							

eba

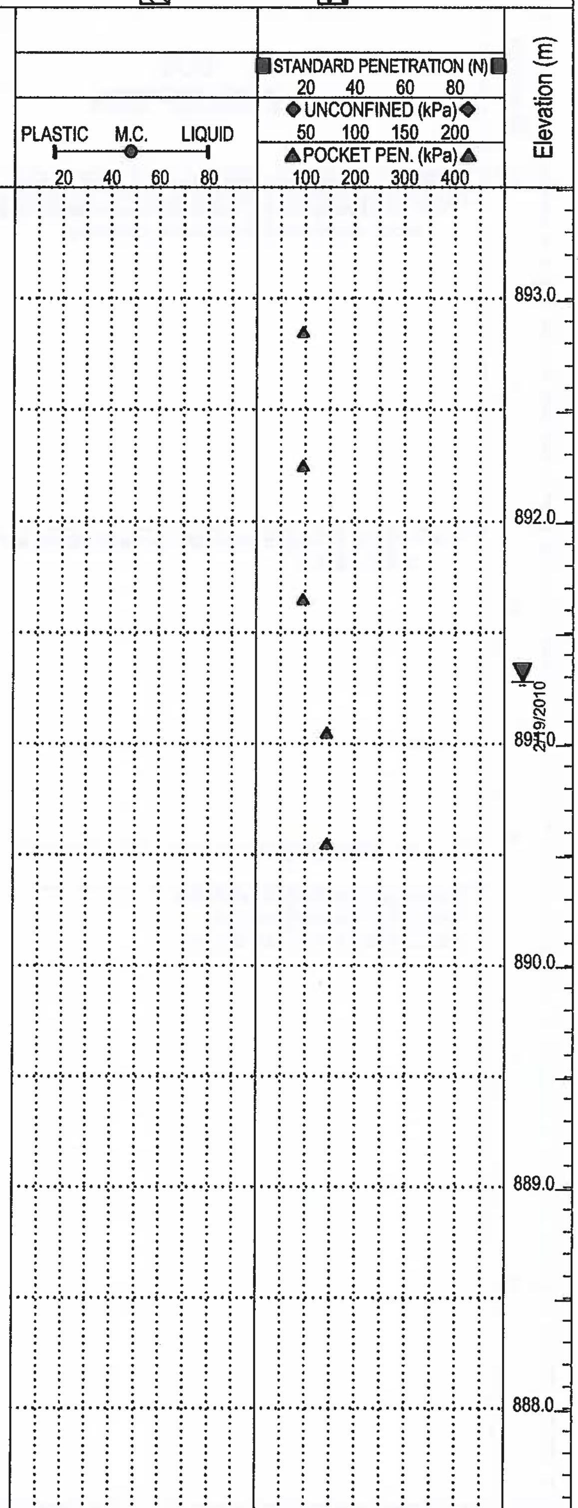
LOGGED BY: JKM	COMPLETION DEPTH: 3m
REVIEWED BY: JAR	COMPLETE: 2/5/2010
DRAWING NO: B1	Page 1 of 1

PROJECT: WINDY ACRES RURAL SUBDIVISION	CLIENT: MARTIN GEOMATIC CONSULTANTS LTD.	PROJECT NO. - BOREHOLE NO.
LOCATION: NE 1/4 SEC. 31-8-20 W4M	DRILL METHOD: 150mm SOLID STEM AUGER	L12101702 - 10BH002
	PROJECT ENGINEER: JIM RYAN	ELEVATION: 893.51m

SAMPLE TYPE: DISTURBED, NO RECOVERY, SPT, A-CASING, SHELBY TUBE, CORE

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

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT
0	TOPSOIL - clay, silty, sandy, damp, dark brown, roots, organics			
	CLAY - silty, sandy, moist, stiff, low plastic, brown, occasional hihg plastic clay inclusions	Disturbed	B1	
1		Disturbed	B2	
2		Disturbed	B3	
2/19/2010 (water level)	CLAY (TILL) - silty, some sand, trace gravel, moist to very moist, stiff, medium plastic, brown, coal and oxide specks, white precipitates	Disturbed	B4	
3		Disturbed	B5	
	End of Borehole @ 3.0m			
	No Seepag or Sloughing on Completion Slotted PVC Pipe Installed to 3.0m Indicated Water Level Measured Feb. 19, 2010			
4				
5				
6				



LOGGED BY: JKM	COMPLETION DEPTH: 3m
REVIEWED BY: JAR	COMPLETE: 2/5/2010
DRAWING NO: B2	Page 1 of 1

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PROJECT: WINDY ACRES RURAL SUBDIVISION	CLIENT: MARTIN GEOMATIC CONSULTANTS LTD.	PROJECT NO. - BOREHOLE NO.
LOCATION: NE 1/4 SEC. 31-8-20 W4M	DRILL METHOD: 150mm SOLID STEM AUGER	L12101702 - 10BH003
	PROJECT ENGINEER: JIM RYAN	ELEVATION: 894.37m

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

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

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT: PLASTIC / M.C. / LIQUID (20 40 60 80)	STANDARD PENETRATION (N) (20 40 60 80); UNCONFINED (kPa) (50 100 150 200); POCKET PEN. (kPa) (100 200 300 400)	Elevation (m)
0	TOPSOIL - clay, silty, sandy, damp, dark brown, roots, organics					894.0
	SAND - silty, trace clay, poorly graded, fine grained, moist, compact, brown		B1			
1			B2			893.0
	CLAY - silty, sandy, moist to very moist, stiff, low to medium plastic, brown, high plastic clay inclusions, slightly laminated, grey mottling, oxide specks		B3		▲	
2			B4		▲	892.0
3	End of Borehole @ 3.0m		B5		▲	
	No Seepag or Sloughing on Completion Slotted PVC Pipe Installed to 3.0m Borehole Measured Dry Feb. 19, 2010					891.0
4						890.0
5						889.0
6						

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LOGGED BY: JKM	COMPLETION DEPTH: 3m
REVIEWED BY: JAR	COMPLETE: 2/5/2010
DRAWING NO: B3	Page 1 of 1

PROJECT: WINDY ACRES RURAL SUBDIVISION	CLIENT: MARTIN GEOMATIC CONSULTANTS LTD.	PROJECT NO. - BOREHOLE NO.
LOCATION: NE 1/4 SEC. 31-8-20 W4M	DRILL METHOD: 150mm SOLID STEM AUGER	L12101702 - 10BH004
	PROJECT ENGINEER: JIM RYAN	ELEVATION: 893.57m

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

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

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT (PLASTIC / M.C. / LIQUID; 20 40 60 80)	STANDARD PENETRATION (N) 20 40 60 80; UNCONFINED (kPa) 50 100 150 200; POCKET PEN. (kPa) 100 200 300 400	Elevation (m)
0	TOPSOIL - clay, silty, sandy, damp, dark brown, roots, organics					
	SAND - silty, trace clay, poorly graded, fine grained, moist, compact, brown					
			B1			893.0
1	... occasional silt pockets, clay inclusions					
			B2			
	CLAY (TILL) - silty, some sand, trace gravel, moist, very stiff, medium plastic, brown, coal and oxide specks, occasional high plastic clay inclusions, white precipitates					892.0
2			B3		▲	
			B4		▲	891.0
3			B5		▲	
	End of Borehole @ 3.0m					
	No Seepag or Sloughing on Completion Slotted PVC Pipe Installed to 3.0m Borehole Measured Dry Feb. 19, 2010					890.0
4						
						889.0
5						
						888.0
6						

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LOGGED BY: JKM	COMPLETION DEPTH: 3m
REVIEWED BY: JAR	COMPLETE: 2/5/2010
DRAWING NO: B4	Page 1 of 1

PROJECT: WINDY ACRES RURAL SUBDIVISION	CLIENT: MARTIN GEOMATIC CONSULTANTS LTD.	PROJECT NO. - BOREHOLE NO.
LOCATION: NE 1/4 SEC. 31-8-20 W4M	DRILL METHOD: 150mm SOLID STEM AUGER	L12101702 - 10BH005
	PROJECT ENGINEER: JIM RYAN	ELEVATION: 893.57m

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

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

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT	Elevation (m)
0	TOPSOIL - clay, silty, sandy, damp, dark brown, roots, organics				
	SAND - silty, trace clay, poorly graded, medium grainied, damp, compact, brown		B1		893.0
1	... trace to some sand, moist, clay inclusions		B2		
	CLAY - silty, sandy, moist, stiff, low plastic, brown				892.0
2			B3		
	CLAY (TILL) - silty, some sand, trace gravel, moist, very stiff, medium plastic, brown, coal and oxide specks, occasional high plastic clay inclusions, oxide staining, weathered		B4		891.0
3	End of Borehole @ 3.0m		B5		
	No Seepag or Sloughing on Completion Slotted PVC Pipe Installed to 3.0m Borehole Measured Dry Feb. 19, 2010				890.0
4					
					889.0
5					
					888.0
6					

PLASTIC M.C. LIQUID: 20 40 60 80

STANDARD PENETRATION (N): 20 40 60 80

UNCONFINED (kPa): 50 100 150 200

POCKET PEN. (kPa): 100 200 300 400

eba	LOGGED BY: JKM	COMPLETION DEPTH: 3m
	REVIEWED BY: JAR	COMPLETE: 2/5/2010
	DRAWING NO: B5	Page 1 of 1

PROJECT: WINDY ACRES RURAL SUBDIVISION	CLIENT: MARTIN GEOMATIC CONSULTANTS LTD.	PROJECT NO. - BOREHOLE NO.
LOCATION: NE 1/4 SEC. 31-8-20 W4M	DRILL METHOD: 150mm SOLID STEM AUGER	L12101702 - 10BH006
	PROJECT ENGINEER: JIM RYAN	ELEVATION: 892.16m

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

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

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT: PLASTIC 20 40 60 80 M.C. LIQUID	STANDARD PENETRATION (N) 20 40 60 80; UNCONFINED (kPa) 50 100 150 200; POCKET PEN. (kPa) 100 200 300 400	Elevation (m)
0	TOPSOIL - clay, silty, sandy, damp, dark brown, roots, organics					892.0
	SAND - silty, trace clay, poorly graded, medium grained, moist, compact, light brown to brown, occasional white precipitates		B1			
1	... occasional clay inclusions		B2			891.0
	CLAY - silty, sandy, moist, stiff, low plastic, brown, occasional high plastic clay inclusions		B3		▲	
2	... oxide staining, weathered		B4		▲	890.0
3	End of Borehole @ 3.0m		B5		▲	889.0
	No Seepag or Sloughing on Completion Slotted PVC Pipe Installed to 3.0m Borehole Measured Dry Feb. 19, 2010					
4						888.0
5						887.0
6						

eba

LOGGED BY: JKM	COMPLETION DEPTH: 3m
REVIEWED BY: JAR	COMPLETE: 2/5/2010
DRAWING NO: B6	Page 1 of 1

PROJECT: WINDY ACRES RURAL SUBDIVISION	CLIENT: MARTIN GEOMATIC CONSULTANTS LTD.	PROJECT NO. - BOREHOLE NO.
LOCATION: NE 1/4 SEC. 31-8-20 W4M	DRILL METHOD: 150mm SOLID STEM AUGER	L12101702 - 10BH007
	PROJECT ENGINEER: JIM RYAN	ELEVATION: 891.84m

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

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

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT (PLASTIC / M.C. / LIQUID; 20 40 60 80)	STANDARD PENETRATION (N) 20 40 60 80; UNCONFINED (kPa) 50 100 150 200; POCKET PEN. (kPa) 100 200 300 400	Elevation (m)
0	TOPSOIL - clay, silty, sandy, damp, dark brown, roots, organics					
	SAND - silty, trace clay, poorly graded, medium grained, moist, compact, brown		B1			891.0
1			B2			
	CLAY - silty, sandy, moist, stiff, low plastic, brown, slightly laminated, occasional high plastic clay inclusions		B3		▲	890.0
2						
	CLAY (TILL) - silty, some sand, trace gravel, moist to very moist, stiff, medium plastic, brown, coal and oxide specks, high plastic clay inclusions, oxide staining, weathered		B4		▲	889.0
3			B5		▲	
	End of Borehole @ 3.0m					
	No Seepag or Sloughing on Completion Slotted PVC Pipe Installed to 3.0m Borehole Measured Dry Feb. 19, 2010					888.0
4						
						887.0
5						
						886.0
6						

eba

LOGGED BY: JKM	COMPLETION DEPTH: 3m
REVIEWED BY: JAR	COMPLETE: 2/5/2010
DRAWING NO: B7	Page 1 of 1

PROJECT: WINDY ACRES RURAL SUBDIVISION	CLIENT: MARTIN GEOMATIC CONSULTANTS LTD.	PROJECT NO. - BOREHOLE NO.
LOCATION: NE 1/4 SEC. 31-8-20 W4M	DRILL METHOD: 150mm SOLID STEM AUGER	L12101702 - 10BH008
	PROJECT ENGINEER: JIM RYAN	ELEVATION: 891.86m

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

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

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT: PLASTIC — M.C. — LIQUID (20 40 60 80)	STANDARD PENETRATION (N) 20 40 60 80; UNCONFINED (kPa) 50 100 150 200; POCKET PEN. (kPa) 100 200 300 400	Elevation (m)
0	TOPSOIL - clay, silty, sandy, damp, dark brown, roots, organics					
	SAND - silty, trace clay, poorly graded, medium grained, moist, compact, light brown to brown		B1			891.0
1			B2			
	CLAY - silty, sandy, damp to moist, stiff, low plastic, brown, white precipitates		B3			890.0
2			B4			
	... some sand, moist, medium plastic, thin sand lenses, occasional high plastic clay inclusions					889.0
3	... oxide staining, weathered, slightly laminated		B5			
	End of Borehole @ 3.0m					888.0
4	No Seepag or Sloughing on Completion Slotted PVC Pipe Installed to 3.0m Borehole Measured Dry Feb. 19, 2010					
5						887.0
6						886.0

eba

LOGGED BY: JKM	COMPLETION DEPTH: 3m
REVIEWED BY: JAR	COMPLETE: 2/5/2010
DRAWING NO: B8	Page 1 of 1

PROJECT: WINDY ACRES RURAL SUBDIVISION	CLIENT: MARTIN GEOMATIC CONSULTANTS LTD.	PROJECT NO. - BOREHOLE NO.
LOCATION: NE 1/4 SEC. 31-8-20 W4M	DRILL METHOD: 150mm SOLID STEM AUGER	L12101702 - 10BH009
	PROJECT ENGINEER: JIM RYAN	ELEVATION: 894.19m

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

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

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT	PLASTIC / M.C. / LIQUID (20 40 60 80)	STANDARD PENETRATION (N) (20 40 60 80) / UNCONFINED (kPa) (50 100 150 200) / POCKET PEN. (kPa) (100 200 300 400)	Elevation (m)
0	CLAY (FILL) - silty, some sand, trace gravel, frozen, medium plastic, brown, coal and oxide specks, red shale specks, white precipitaes						894.0
	... moist, stiff, brown with dark brown inclusions						
	... organics		B1	16.5			
1							893.0
	CLAY - silty, some sand, moist, very stiff, medium plastic, brown		B2	14.8			
	End of Borehole @ 1.5m						
	No Seepag or Sloughing on Completion Slotted PVC Pipe Installed to 1.5m Borehole Measured Dry Feb. 19, 2010						
2							892.0
3							891.0
4							890.0
5							889.0
6							

eba

LOGGED BY: JKM	COMPLETION DEPTH: 1.5m
REVIEWED BY: JAR	COMPLETE: 2/5/2010
DRAWING NO: B9	Page 1 of 1

PROJECT: WINDY ACRES RURAL SUBDIVISION	CLIENT: MARTIN GEOMATIC CONSULTANTS LTD.	PROJECT NO. - BOREHOLE NO.
LOCATION: NE 1/4 SEC. 31-8-20 W4M	DRILL METHOD: 150mm SOLID STEM AUGER	L12101702 - 10BH010
	PROJECT ENGINEER: JIM RYAN	ELEVATION: 894.07m

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

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

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT	PLASTIC / M.C. / LIQUID (20 40 60 80)	STANDARD PENETRATION (N) (20 40 60 80); UNCONFINED (kPa) (50 100 150 200); POCKET PEN. (kPa) (100 200 300 400)	Elevation (m)
0	CLAY (FILL) - silty, some sand, trace gravel, frozen, medium plastic, brown, coal and oxide specks, red shale specks, white precipitaes						894.0
	... moist, stiff, brown with dark brown inclusions						
			B1	18.4			
1	2/19/2010						893.0 2/19/2010
			B2	16			
	CLAY - silty, some sand to sandy, moist, stiff, low to medium plastic, brown, sand lenses						
	End of Borehole @ 1.5m						
	No Seepag or Sloughing on Completion Slotted PVC Pipe Installed to 1.5m Indicated Water Level Measured Feb. 19, 2010						
2							892.0
3							891.0
4							890.0
5							889.0
6							

eba

LOGGED BY: JKM	COMPLETION DEPTH: 1.5m
REVIEWED BY: JAR	COMPLETE: 2/5/2010
DRAWING NO: B10	Page 1 of 1

PROJECT: WINDY ACRES RURAL SUBDIVISION	CLIENT: MARTIN GEOMATIC CONSULTANTS LTD.	PROJECT NO. - BOREHOLE NO.
LOCATION: NE 1/4 SEC. 31-8-20 W4M	DRILL METHOD: 150mm SOLID STEM AUGER	L12101702 - 10BH011
	PROJECT ENGINEER: JIM RYAN	ELEVATION: 892.14m

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

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

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT	PLASTIC / M.C. / LIQUID (20 40 60 80)	STANDARD PENETRATION (N) (20 40 60 80) / UNCONFINED (kPa) (50 100 150 200) / POCKET PEN. (kPa) (100 200 300 400)	Elevation (m)
0	TOPSOIL - clay, silty, sandy, damp, dark brown, roots, organics						892.0
	SAND - silty, trace to some clay, poorly graded, medium grained, damp to moist, compact, brown, occasional clay inclusions		B1	8.8			
1	CLAY (TILL) - silty, some sand to sandy, trace gravel, moist, stiff, low to medium plastic, brown, coal and oxide specks, thin sand lenses, white precipitates		B2	12.6			891.0
	... some sand, medium plastic		B3	19.9			
2			B4				890.0
3	... stiff to very stiff, oxide staining, weathered		B5	20.5			889.0
			B6				
4			B7	15.9			888.0
	End of Borehole @ 4.6m						
5	No Seepag or Sloughing on Completion Slotted PVC Pipe Installed to 4.6m Borehole Measured Dry Feb. 19, 2010						887.0
6							

eba	LOGGED BY: JKM	COMPLETION DEPTH: 4.6m
	REVIEWED BY: JAR	COMPLETE: 2/5/2010
	DRAWING NO: B11	Page 1 of 1

PROJECT: WINDY ACRES RURAL SUBDIVISION	CLIENT: MARTIN GEOMATIC CONSULTANTS LTD.	PROJECT NO. - BOREHOLE NO.
LOCATION: NE 1/4 SEC. 31-8-20 W4M	DRILL METHOD: 150mm SOLID STEM AUGER	L12101702 - 10BH012
	PROJECT ENGINEER: JIM RYAN	ELEVATION: 892.51m

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

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

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT	PLASTIC / M.C. / LIQUID (20 40 60 80)	STANDARD PENETRATION (N) (20 40 60 80) / UNCONFINED (kPa) (50 100 150 200) / POCKET PEN. (kPa) (100 200 300 400)	Elevation (m)
0	TOPSOIL - clay, silty, sandy, damp, dark brown, roots, organics						
	SAND - silty, trace to some clay, poorly graded, medium grained, damp to moist, compact, brown, occasional clay inclusions						892.0
			B1	11			
1			B2	6.3			891.0
	CLAY (TILL) - silty, some sand to sandy, trace gravel, moist, stiff, low to medium plastic, brown, coal and oxide specks, thin sand lenses, white precipitates		B3	19.1			
2	... oxide staining, weathered		B4				890.0
3	... some sand, medium plastic, occasional high plastic clay inclusions		B5	17.8			889.0
			B6				
4			B7	17.4			888.0
	End of Borehole @ 4.6m						
5	No Seepag or Sloughing on Completion Slotted PVC Pipe Installed to 4.6m Indicated Water Level Measured Feb. 19, 2010						887.0
6							

2/19/2010

2/19/2010

eba

LOGGED BY: JKM	COMPLETION DEPTH: 4.6m
REVIEWED BY: JAR	COMPLETE: 2/5/2010
DRAWING NO: B12	Page 1 of 1

APPENDIX C

APPENDIX C RECOMMENDED GENERAL DESIGN AND CONSTRUCTION GUIDELINES

BACKFILL MATERIALS AND COMPACTION

Maximum density as used in this section means Standard Proctor Maximum Dry Density (ASTM Test Method D698) unless specifically noted otherwise. Optimum moisture content is as defined in this test.

"Landscape fill" material may comprise soils without regard to engineering quality. Such soils should be placed in compacted lifts not exceeding 300 mm and compacted to a density of not less than 90 percent of maximum density.

"General engineered fill" materials should comprise clean, inorganic granular or clay soils. "Select engineered fill" materials should comprise clean, well-graded granular soils or inorganic low plastic clay soils. Engineered fill materials should be placed in layers of 150 mm compacted thickness and should be compacted to 98 percent of maximum density.

Granular soils used for select engineered fills should consist of relatively clean, well graded, sand or mixture of sand and gravel (maximum size 75 mm).

Low plastic clay with the following range of Atterberg limits is generally considered suitable for use as select engineered fill.

Liquid Limit	= 20 to 40%
Plastic Limit	= 10 to 20%
Plasticity Index	= 10 to 30%

Clay fill materials should be compacted at or slightly above the optimum moisture content.

"Structural fill" materials should comprise clean, well-graded inorganic granular soils. Such fill should be placed in compacted lifts not exceeding 150 mm and compacted to not less than 100 percent of maximum density.

Backfill adjacent to and above footings, abutment walls, basement walls, grade beams and pile caps or below highway, street or parking lot pavement sections and base courses should comprise "general engineered fill" materials as defined above.

Backfill below slabs-on-grade or where increased volumetric stability is desired should comprise "select engineered fill" materials as defined above.

Backfill supporting structural loads should comprise "structural fill" materials as defined above.

Exterior backfill adjacent to footings, foundation walls, grade beams and pile caps and within 300 mm of final grade should comprise inorganic clay "general engineered" fill as defined above. Such backfill should provide a relatively impervious surface layer to reduce seepage into the subsoil.

Backfill should not be placed against a foundation structure until the structure has sufficient strength to withstand the earth pressures resulting from placement and compaction. During compaction,

careful observation of the foundation wall for deflection should be carried out continuously. Where deflections are apparent, the compactive effort should be reduced accordingly.

In order to reduce potential compaction induced stresses, only hand held compaction equipment should be used in the compaction of fill within 500 mm of retaining walls or basement walls.

Backfill materials should not be placed in a frozen state, or placed on a frozen subgrade. All lumps of materials should be broken down during placement.

Where the maximum-sized particles in any backfill material exceed 50 percent of the minimum dimension of the cross-section to be backfilled, such particles should be removed and placed at other more suitable locations on-site or screened off prior to delivery to site.

Bonding should be provided between backfill lifts, if the previous lift has become desiccated. For fine-grained materials the previous lift should be scarified to the base of the desiccated layer, properly moisture-conditioned and recompacted and bonded thoroughly to the succeeding lift. For granular materials, the surface of the previous lift should be scarified to about a 75 mm depth followed by proper moisture-conditioning and recompaction.

Suggested specifications for various backfill types are presented below.

"Pit-Run gravel" and fill sand shall be reasonably well graded and should conform to the following gradings:

PERCENT PASSING BY WEIGHT		
SIEVE SIZE	PIT RUN GRAVEL (A.T. D6-C80)	FILL SAND
80.0 mm	100	--
50 mm	55-100	--
25 mm	38 – 100	100
16 mm	32 – 85	--
5.0 mm	20 – 65	75 – 100
630 µm	--	45 – 80
315 µm	6 – 30	--
80 µm	2 – 10	2 - 10

The Pit-Run gravel should be free of any form of coating and any gravel or sand containing clay, loam or other deleterious materials should be rejected. No oversize material should be tolerated. The percent of material passing the 80 µm sieve should not exceed 2/3 of the material passing the 315 µm sieve.

20 mm and 40 mm crushed gravel should be hard, clean, well graded, crushed aggregate, free of organics, coal, clay lumps, coatings of clay, silt and other deleterious materials. The aggregates should conform to the following Alberta Transportation gradation requirements when tested in accordance with ASTM C136:

PERCENT PASSING BY WEIGHT		
SIEVE SIZE	20 mm CRUSH (A.T. D2-C20)	40 mm CRUSH (A.T. D2-C40)
40 mm	--	100
25 mm	--	70 – 94
20 mm	100	--
16 mm	84 – 94	55 – 85
10 mm	63 – 86	44 – 74
5.0 mm	40 – 67	32 – 62
1.25 mm	20 – 43	17 – 43
630 µm	14 – 34	12 – 34
315 µm	9 – 26	8 – 26
160 µm	5 – 18	5 – 18
80 µm	2 – 10	2 – 10

A minimum of 60 percent of the material retained on the 5 mm sieve for the 20 mm crushed gravel should have at least two freshly crushed faces. Not less than 50 percent of the material retained on the 5 mm sieve for the 40 mm crushed gravel should have at least two freshly crushed faces.

The 20 mm granular course should be compacted in lifts not exceeding 150 mm to 100 percent of Standard Proctor maximum dry density.

"Coarse gravel" for bedding and drainage should conform to the following grading:

PERCENT PASSING BY WEIGHT		
SIEVE SIZE	28 mm GRAVEL	20 mm GRAVEL
40 mm	100	--
28 mm	95 - 100	100
20 mm	--	85 – 100
14 mm	25 - 60	60 – 90
10 mm	--	25 – 60
5 mm	0 - 10	0 – 10
2.5 mm	0 - 5	0 - 5

"Coarse sand" for bedding and drainage should conform to the following grading:

MAINTENANCE OF GRAVELLED YARDS

Gravel surfaced yards are susceptible to rapid deterioration if not properly maintained. For most gravel surfaced roads and yards this will involve grading at least three times yearly, twice in the spring and once in late summer or fall, with occasional touch up in problem areas. No noticeable rutting should be allowed to persist in spring time when frost is coming out of the ground. High wheel loads from forklifts, poor surface drainage and/or a high water table and clay subgrade soils can all result in a need for increased maintenance.

Ruts should not be allowed to exceed 25 mm in 1.2 m (1" in 4'). Areas that rut should be repaired as soon as possible. If not repaired promptly, the rutted areas will hold water, which reduces the ability of the gravel to bridge over soft areas and can lead to softening of the subgrade. Rutting will get progressively worse and more costly and difficult to repair.

In rutted areas, 20 mm crushed gravel should be placed to fill low spots. The high areas should not be graded off to fill in low areas. This creates areas of reduced gravel thickness in the high spots, which will eventually lead to future punchouts and/or soft spots.

The overloading of forklifts can lead to excessively high stresses under the front axle. This should be avoided. High wheel loads from an overloaded forklift could exceed the allowable stresses for the gravel thickness, especially in rutted areas where ponded water can lead to softening.

Excessive regrading will also negatively impact performance. Gravel surfacing tends to form a crust with traffic. This crust provides improved stability and helps shed water. Excessive regrading can breakup this crust and reduce the ability of the gravel surfacing to shed water. There is also a tendency to pull gravel from high spots to fill minor ruts. As noted above, this can cause problems with the reduced gravel thicknesses in areas that initially perform well.

SIEVE SIZE (Square Openings)	PERCENT PASSING (By Weight)
10 mm	100
5 mm	95 - 100
2.5 mm	80 - 100
1.25 mm	50 - 90
630 µm	25 - 65
315 µm	10 - 35
160 µm	2 - 10
80 µm	0 - 4

"Lean-mix concrete" should be low strength concrete having a minimum 28-day compressive strength of 3.5 MPa.

APPENDIX D

APPENDIX D LABORATORY RESULTS

MOISTURE-DENSITY RELATIONSHIP (Proctor) REPORT

ASTM D698, D1557, or D2049

Project: Windy Acres Rural Subdiv. Geotech Evaluation
Sample No.: X - 053

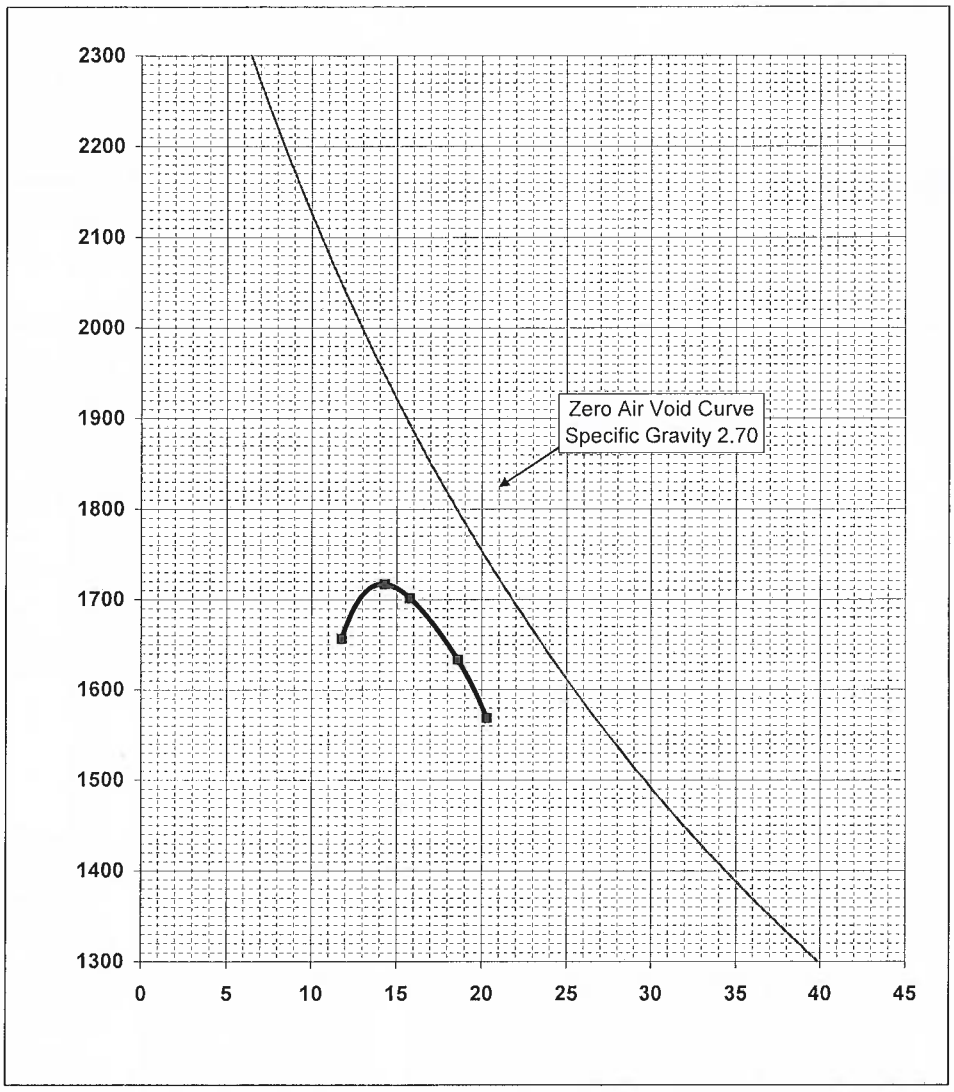
Project No.: L12101702
Test Date: February 10, 2010

Client: Martin Geomatic Consultants Ltd.
Moisture Content (as recieved): 17.4%

Description: Clay, sandy, trace silt
Maximum Dry Density: 1720 kg/m³

Location: Bore Holes 11 &12, 1.5m - 3.0m
Optimum Moisture Content: 14.0%

Compaction: Manual **Preparation:** Moist



Standard Proctor

ASTM D698, Method

Hammer Mass: 2.494 kg

Hammer Drop: 304.8 mm

Number of Layers: 3

Number of Blows/Layer: 25

Diameter of Mould: 101.4 mm

Height of Mould: 116.6 mm

Mould Volume: 0.000942 m³

Compactive Effort: 593.5 kJ/m³

Remarks:

Reviewed By: _____ C.E.T.

EBA Engineering Consultants Ltd.

GRAIN SIZE DISTRIBUTION & ATTERBERG LIMIT TEST RESULTS

ASTM D422 & D4318

PROJECT: Windy Acres Rural Subdivision, Geotech. Evaluation Sample Number: _____

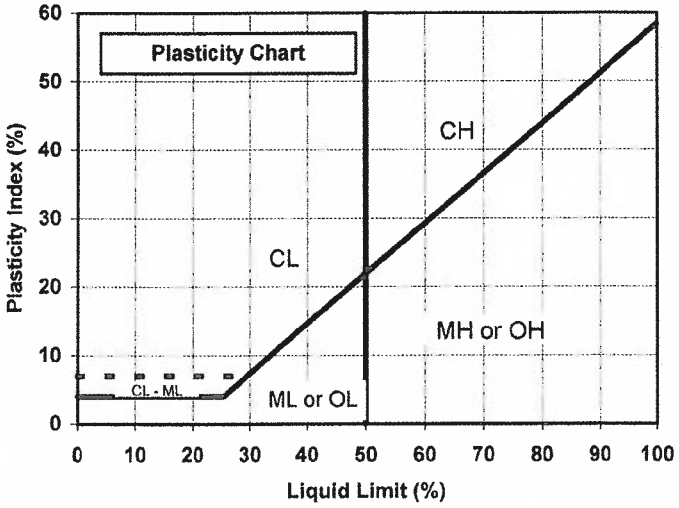
Project No.: L12101702

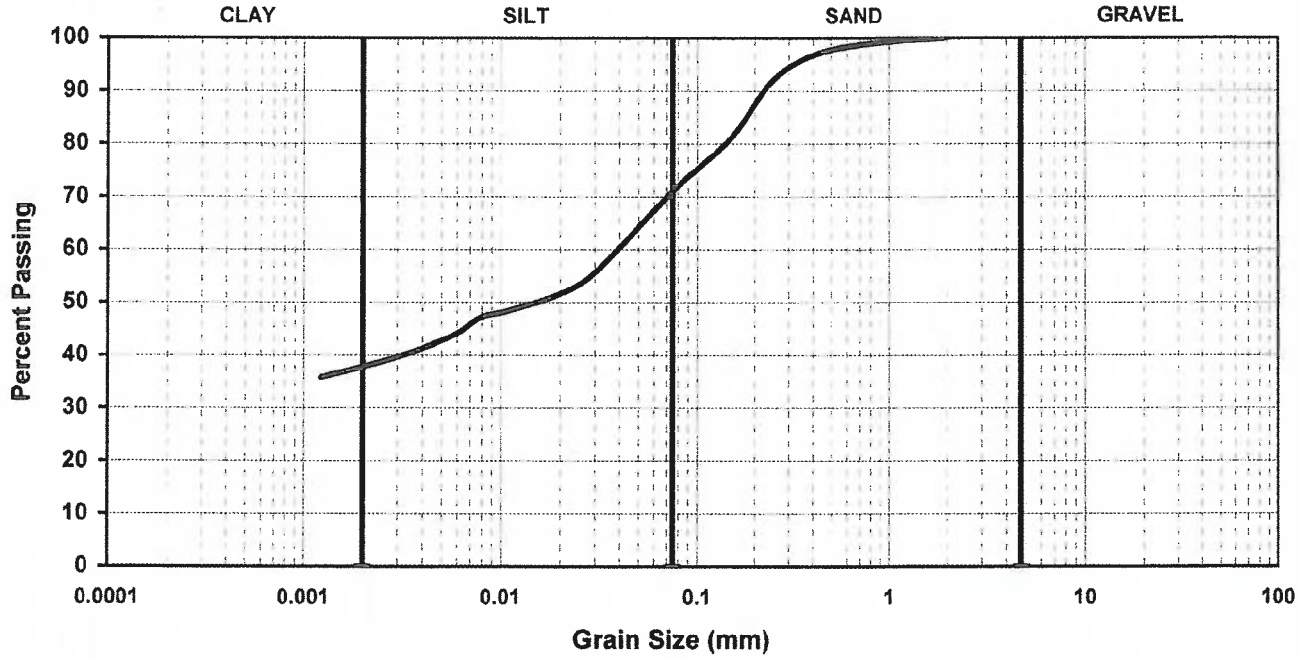
Client: Martin Geomatic Consultants Ltd.

Attention: Mr. Ray Martin, P.Eng.

Sample ID: 10BH001 @ 0.9m

Description (%)			
Gravel	0	Plastic Limit	
Sand	29	Liquid Limit	
Silt	34	Plasticity Index	
Clay	37	Natural Moisture	





Remarks: * The upper clay size of 2 μm is as per the Canadian Foundation Manual.

Classification: CLAY, silty, sandy

Reviewed by: _____

EBA Engineering Consultants Ltd.

GRAIN SIZE DISTRIBUTION & ATTERBERG LIMIT TEST RESULTS

ASTM D422 & D4318

PROJECT: Windy Acres Rural Subdivision, Geotech. Evaluation Sample Number: _____

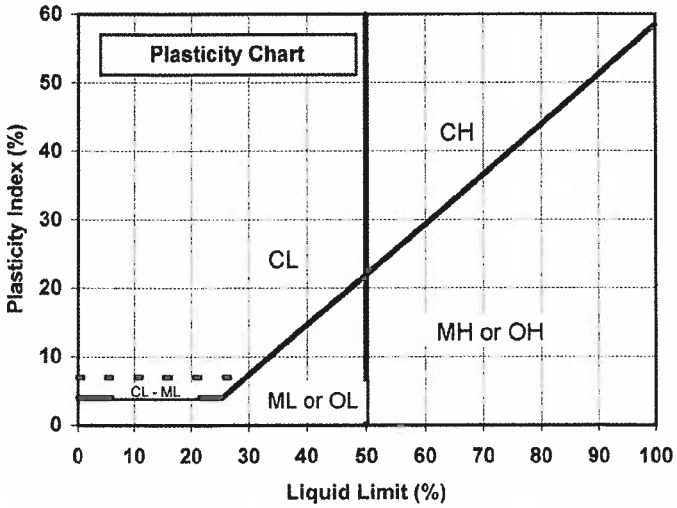
Project No.: L12101702

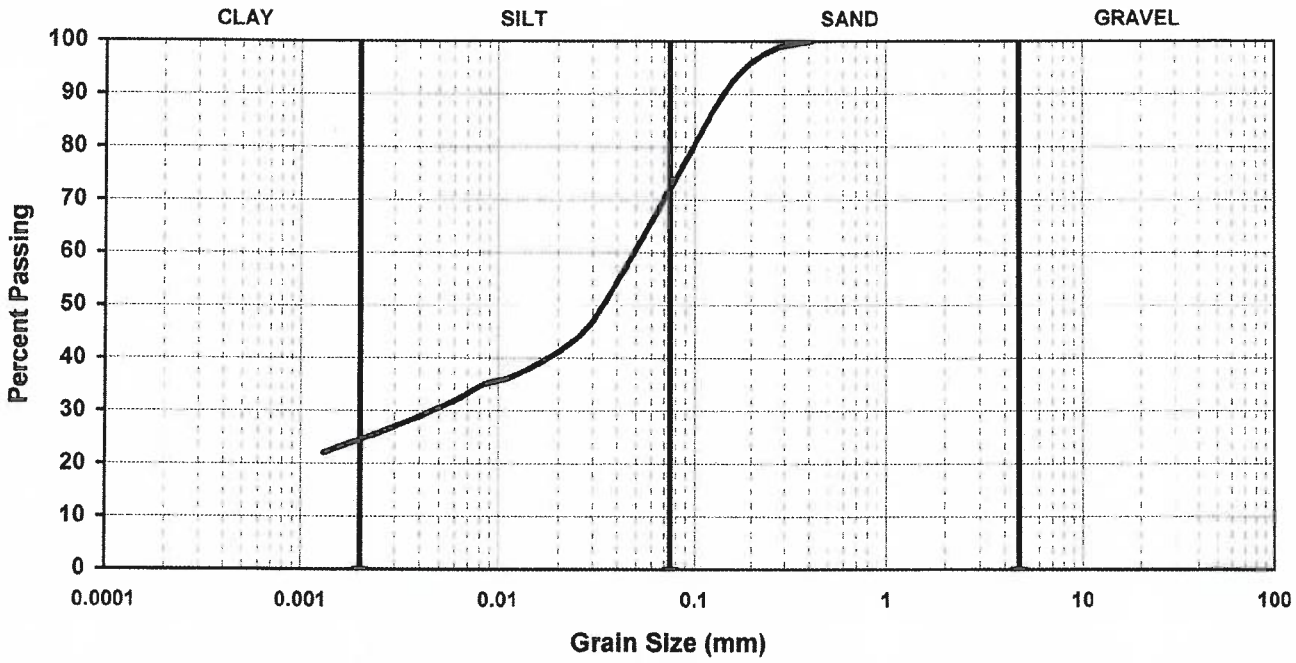
Client: Martin Geomatic Consultants Ltd.

Attention: Mr. Ray Martin, P.Eng.

Sample ID: 10BH002 @ 0.9m

Description (%)			
Gravel	0	Plastic Limit	
Sand	28	Liquid Limit	
Silt	48	Plasticity Index	
Clay	24	Natural Moisture	





Remarks: * The upper clay size of 2 µm is as per the Canadian Foundation Manual.

Classification: CLAY, silty, sandy

Reviewed by: _____

EBA Engineering Consultants Ltd.

GRAIN SIZE DISTRIBUTION & ATTERBERG LIMIT TEST RESULTS

ASTM D422 & D4318

PROJECT: Windy Acres Rural Subdivision, Geotech. Evaluation Sample Number: _____

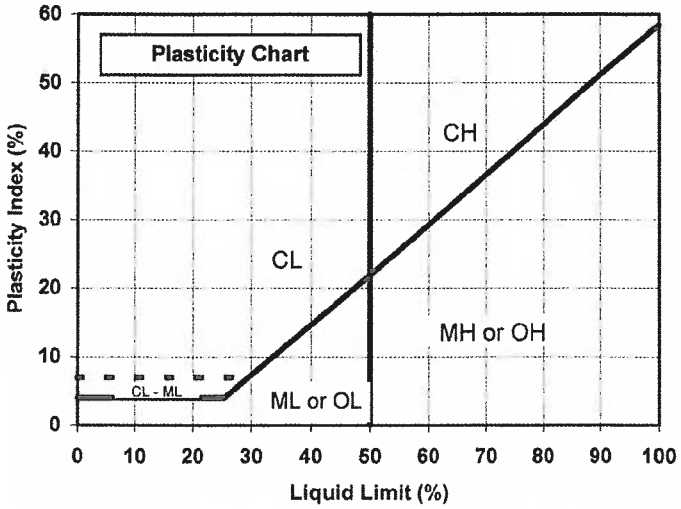
Project No.: L12101702

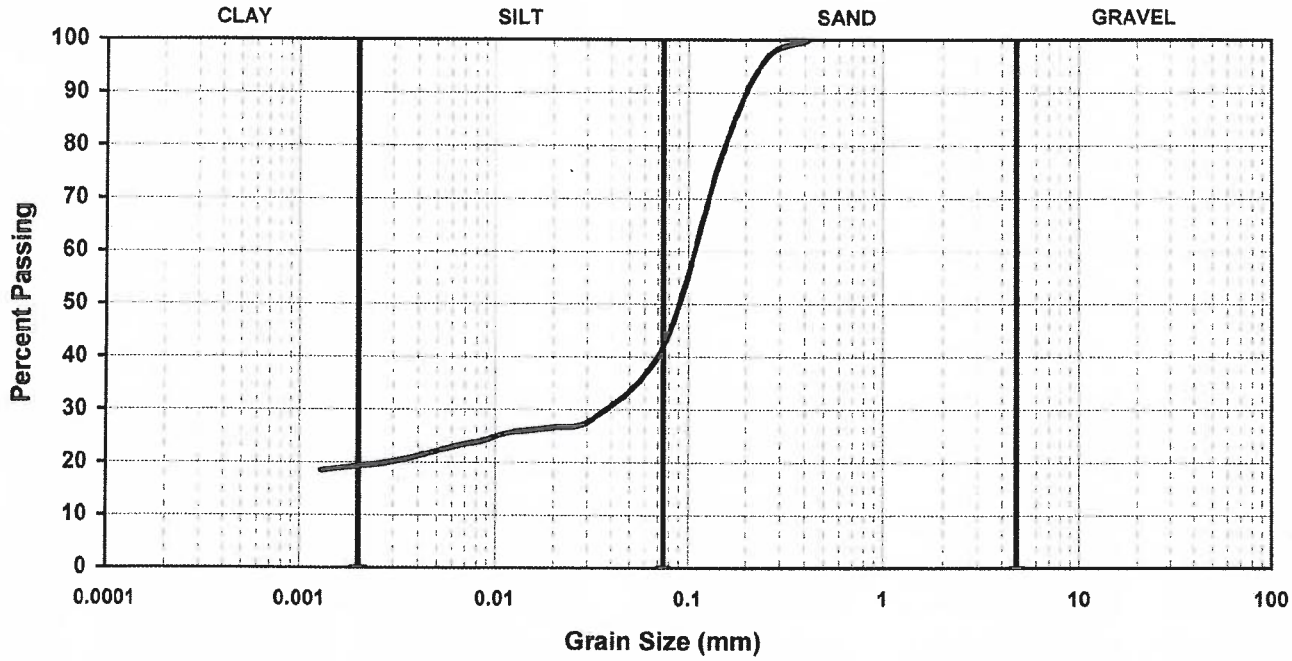
Client: Martin Geomatic Consultants Ltd.

Attention: Mr. Ray Martin, P.Eng.

Sample ID: 10BH003 @ 0.9m

Description (%)			
Gravel	0	Plastic Limit	
Sand	58	Liquid Limit	
Silt	23	Plasticity Index	
Clay	19	Natural Moisture	





Remarks: * The upper clay size of 2 µm is as per the Canadian Foundation Manual.

Classification: CLAY, silty, very sandy

Reviewed by: Jim Ryan

EBA Engineering Consultants Ltd.

GRAIN SIZE DISTRIBUTION & ATTERBERG LIMIT TEST RESULTS

ASTM D422 & D4318

PROJECT: Windy Acres Rural Subdivision, Geotech. Evaluation Sample Number: _____

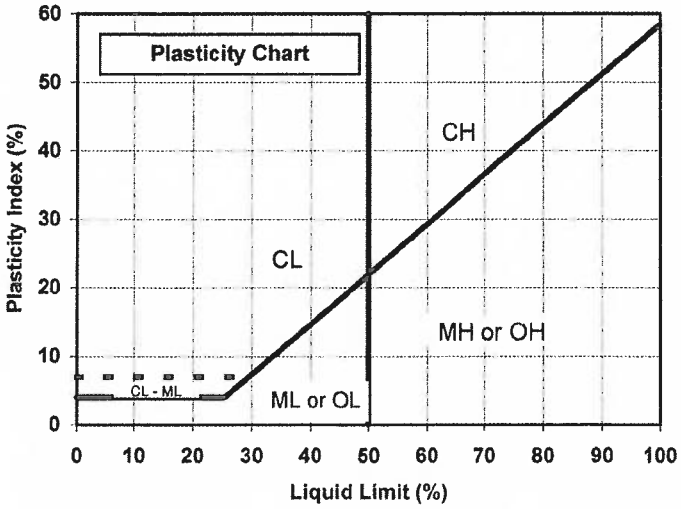
Project No.: L12101702

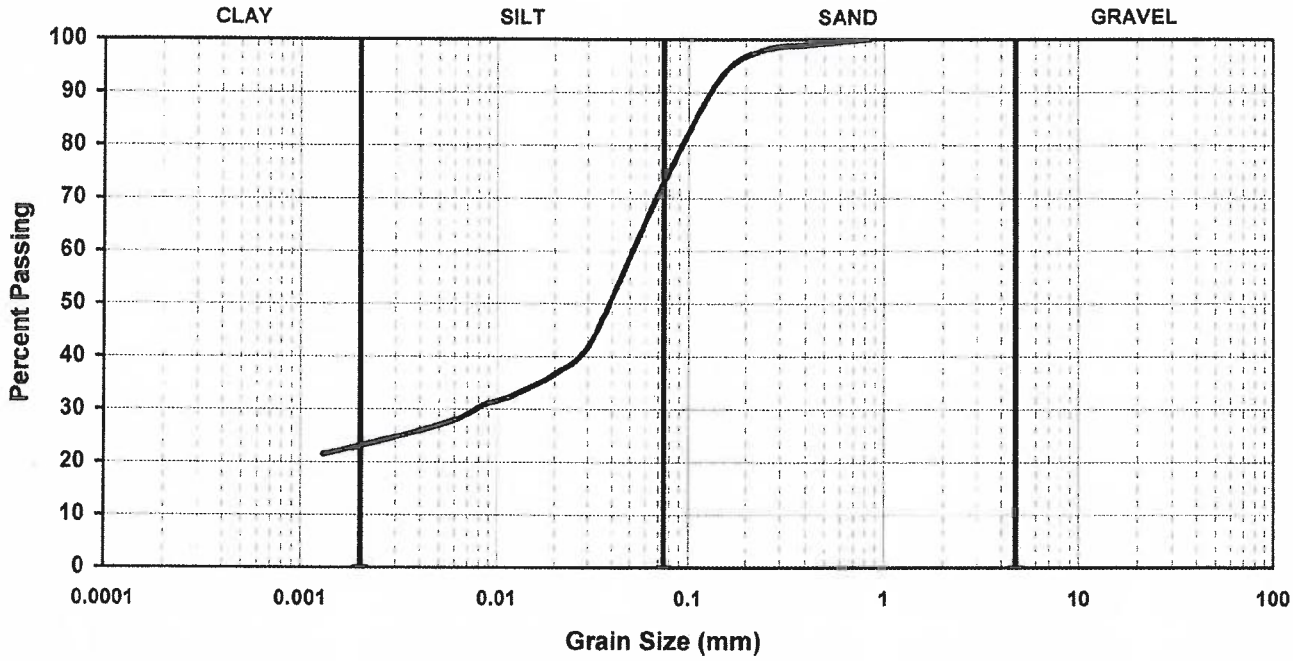
Client: Martin Geomatic Consultants Ltd.

Attention: Mr. Ray Martin, P.Eng.

Sample ID: 10BH004 @ 0.9m

Description (%)			
Gravel	0	Plastic Limit	
Sand	27	Liquid Limit	
Silt	50	Plasticity Index	
Clay	23	Natural Moisture	





Remarks: * The upper clay size of 2 µm is as per the Canadian Foundation Manual.

Classification: CLAY, silty, sandy

Reviewed by: _____

EBA Engineering Consultants Ltd.

GRAIN SIZE DISTRIBUTION & ATTERBERG LIMIT TEST RESULTS

ASTM D422 & D4318

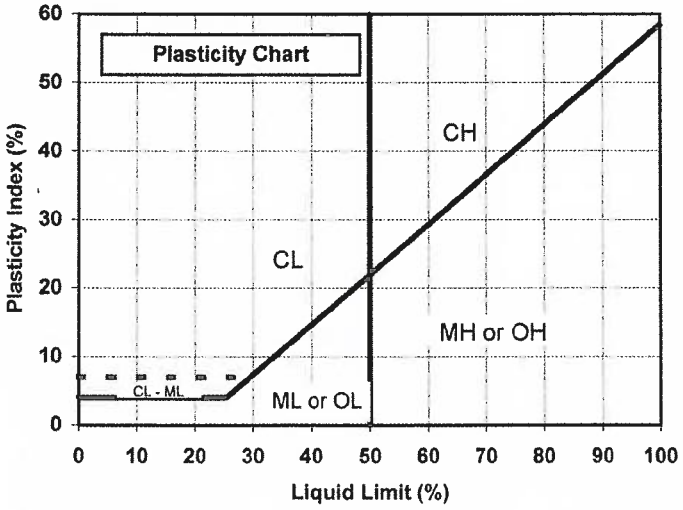
PROJECT: Windy Acres Rural Subdivision, Geotech. Evaluation Sample Number: _____

Project No.: L12101702

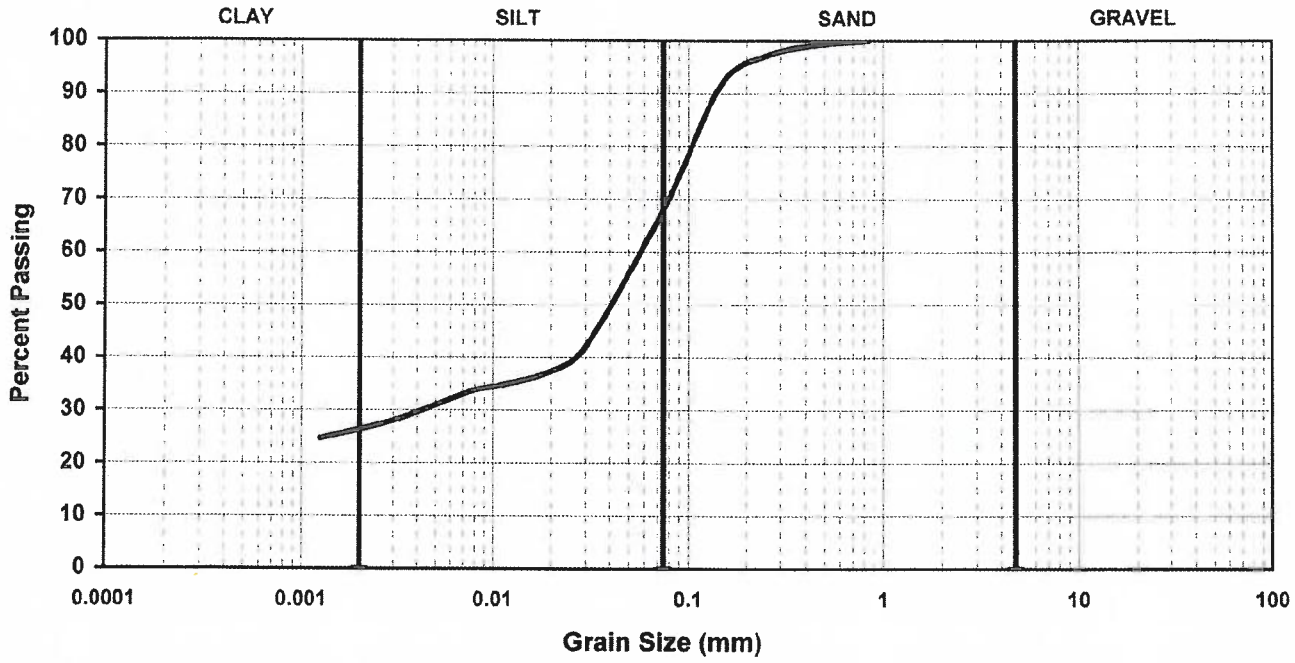
Client: Martin Geomatic Consultants Ltd.

Attention: Mr. Ray Martin, P.Eng.

Sample ID: 10BH005 @ 0.9m



Description (%)			
Gravel	0	Plastic Limit	
Sand	32	Liquid Limit	
Silt	42	Plasticity Index	
Clay	26	Natural Moisture	



Remarks: * The upper clay size of 2 µm is as per the Canadian Foundation Manual.

Classification: CLAY, silty, sandy

Reviewed by: _____

EBA Engineering Consultants Ltd.

GRAIN SIZE DISTRIBUTION & ATTERBERG LIMIT TEST RESULTS

ASTM D422 & D4318

PROJECT: Windy Acres Rural Subdivision, Geotech. Evaluation Sample Number: _____

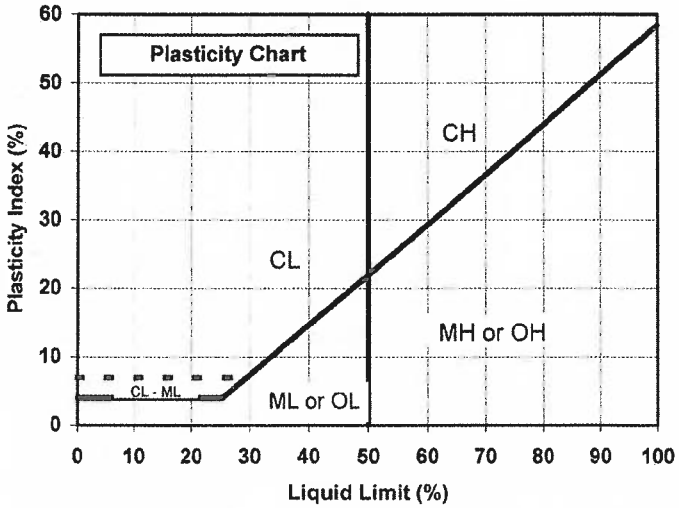
Project No.: L12101702

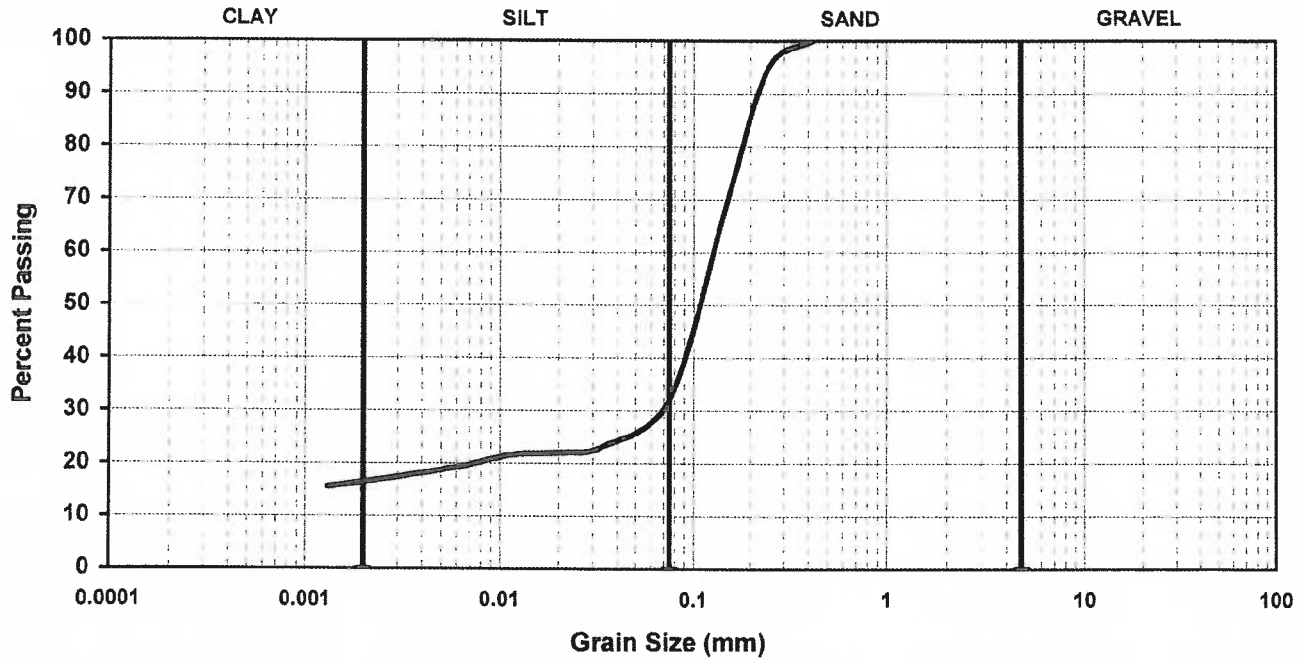
Client: Martin Geomatic Consultants Ltd.

Attention: Mr. Ray Martin, P.Eng.

Sample ID: 10BH006 @ 0.9m

Description (%)			
Gravel	0	Plastic Limit	
Sand	68	Liquid Limit	
Silt	15	Plasticity Index	
Clay	17	Natural Moisture	





Remarks: * The upper clay size of 2 µm is as per the Canadian Foundation Manual.

Classification: SAND, some silt and clay

Reviewed by: _____

EBA Engineering Consultants Ltd.

GRAIN SIZE DISTRIBUTION & ATTERBERG LIMIT TEST RESULTS

ASTM D422 & D4318

PROJECT: Windy Acres Rural Subdivision, Geotech. Evaluation Sample Number: _____

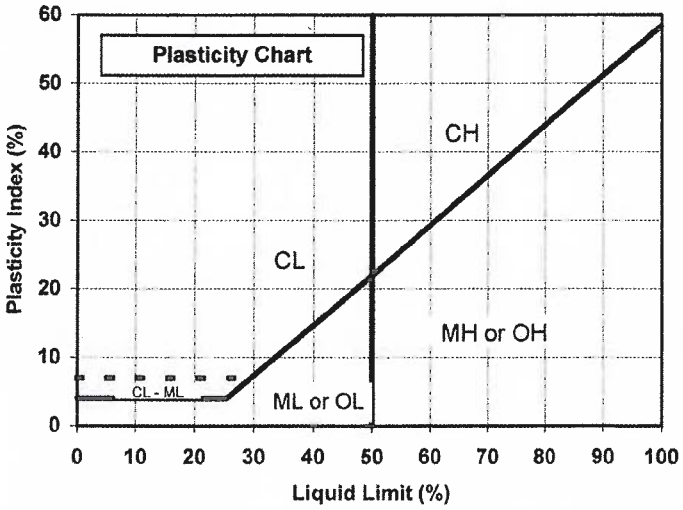
Project No.: L12101702

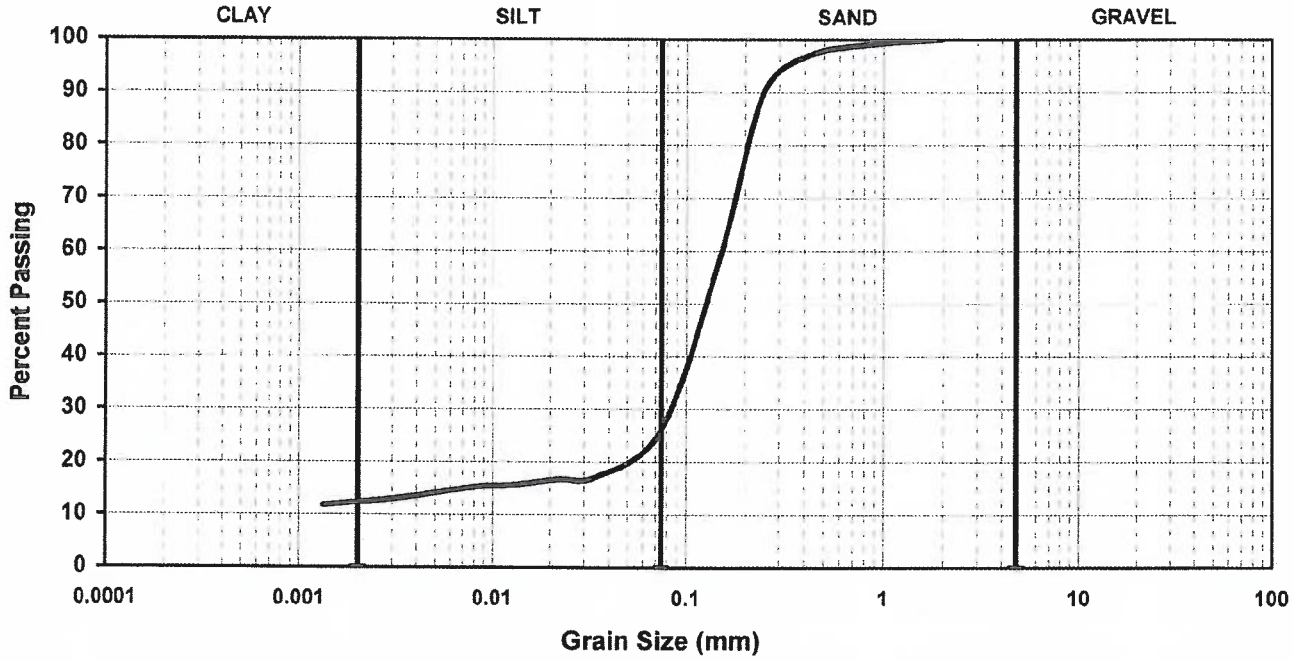
Client: Martin Geomatic Consultants Ltd.

Attention: Mr. Ray Martin, P.Eng.

Sample ID: 10BH007 @ 0.9m

Description (%)			
Gravel	0	Plastic Limit	
Sand	74	Liquid Limit	
Silt	15	Plasticity Index	
Clay	11	Natural Moisture	





Remarks: * The upper clay size of 2 μm is as per the Canadian Foundation Manual.

Classification: SAND, some silt and clay

Reviewed by: _____

EBA Engineering Consultants Ltd.

GRAIN SIZE DISTRIBUTION & ATTERBERG LIMIT TEST RESULTS

ASTM D422 & D4318

PROJECT: Windy Acres Rural Subdivision, Geotech. Evaluation Sample Number: _____

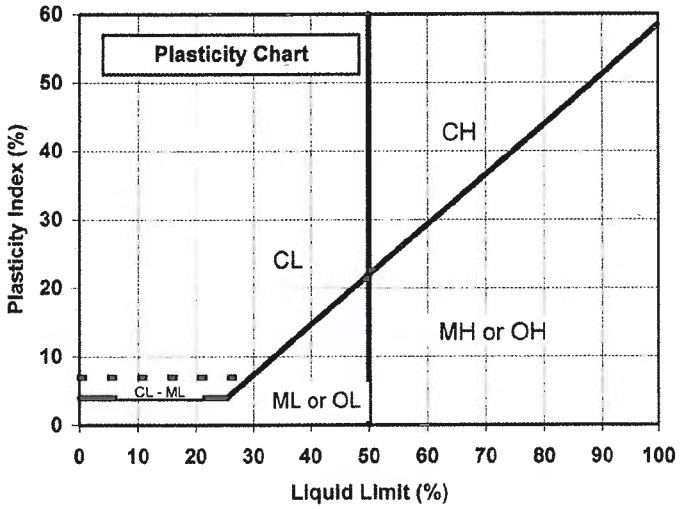
Project No.: L12101702

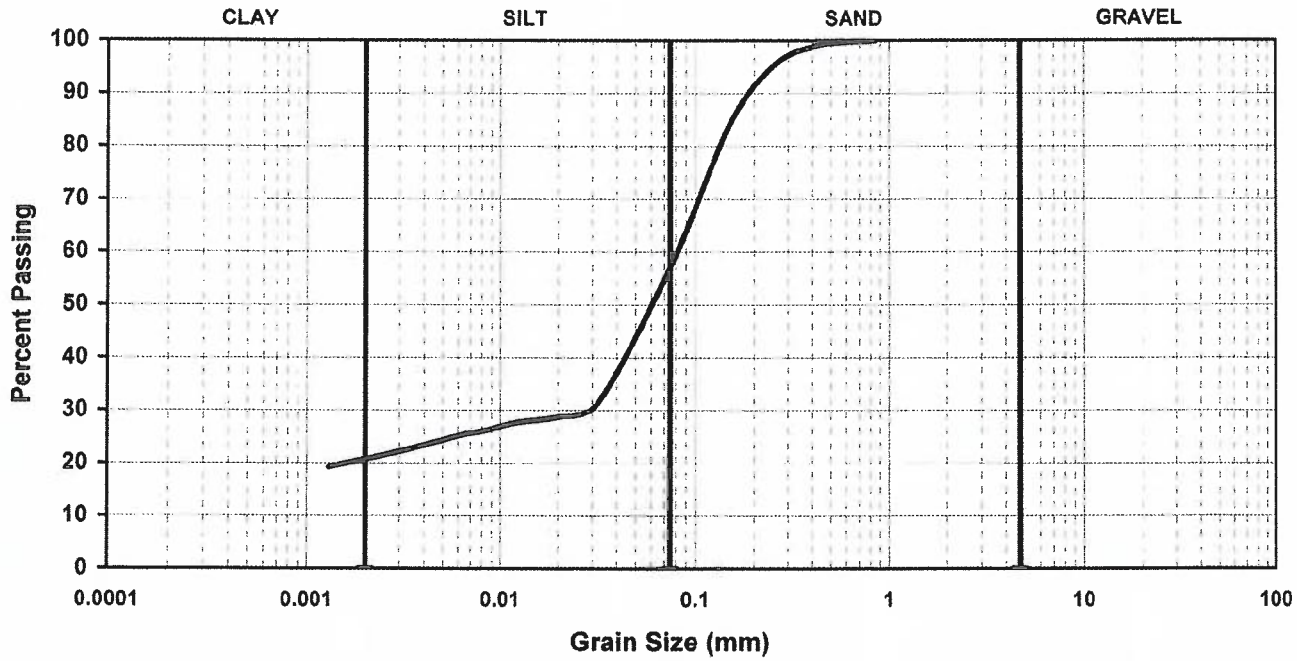
Client: Martin Geomatic Consultants Ltd.

Attention: Mr. Ray Martin, P.Eng.

Sample ID: 10BH008 @ 0.9m

Description (%)			
Gravel	**0**	Plastic Limit	
Sand	**43**	Liquid Limit	
Silt	**37**	Plasticity Index	
Clay	**20**	Natural Moisture	





Remarks: * The upper clay size of 2 μm is as per the Canadian Foundation Manual.

Classification: CLAY, silty, sandy

Reviewed by: _____

EBA Engineering Consultants Ltd.