BY-LAW NUMBER 2016/04

BY-LAW NO. 2016/04 is a by-law of the County of Wetaskiwin No. 10 in the Province of Alberta, to authorize the adoption of an Area Structure Plan for the purpose of providing a framework for an Area Structure Plan for Wescott Consulting Group. within SW 19-46-23-W4M in accordance with Section 633 of the Municipal Government Act, Chapter M-26.1, Revised Statutes of Alberta 2000, and amendments thereto.

WHEREAS: at the requirements of County Council, as per Policy 6606, an Area Structure Plan has been prepared for Wescott Consulting Group within SW 19-46-23-W4M.

AND WHEREAS: the proposed Area Structure Plan has been widely circulated and discussed within the County pursuant to Section 230, 606(1), and 633(1) of the Municipal Government Act, 2000, Chapter M-26.1, and amendments thereto.

NOW THEREFORE: the County of Wetaskiwin No. 10, duly assembled, hereby enacts as follows:

(a) The document attached to this By-law as "Appendix A", together with accompanying maps, is hereby adopted as the Simpson Park Area Structure Plan within SW 19-46-23-W4M

2. This by-law comes into effect on the date of third reading.

READ: A First time this 11 day of February , A.D., 2016.

READ: A Second time this 11 day of February , A.D., 2016

READ: A Third time and finally passed this 11 day of February , A.D., 2016

REEVE

SECRETARY-TREASURER

Bylaw 2016/04

SIMPSON PARK AREA STRUCTURE PLAN

JUNE 2015

SIMPSON PARK AREA STRUCTURE PLAN

Within the

S.W. 19 - 46 – 23 - 4

WETASKIWIN COUNTY

PREPARED FOR

MUMECO PROPERTIES LTD.

BY

Robert Wescott, B.Sc. AICP

Wescott Consulting Group Ltd.

JUNE 2015

SIMPSON PARK AREA STRUCTURE PLAN – JANUARY 2016
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1.0 PURPOSE

This Area Structure Plan provides for the orderly and economic approach to the subdivision and development of the lands within that portion of the SW ¼ Section 19, Township 46, Range 23, West of the 4th Meridian which lies ½ mile to the south of Highway 13 and directly east of 36th Street in the City of Wetaskiwin.

The Simpson Park Area Structure Plan is intended to identify key issues such as land use, servicing, aesthetic design, transportation network and municipal reserve issues, and to provide viable options in the solution of those issues.

The Area Structure Plan is intended to establish a process of sequencing to ensure that development occurs in a logical, efficient and sequential manner.

1.1 PLAN AREA JURISDICTION

The Plan Area (as shown in Figure 1 Regional Context) is located within the municipal jurisdiction of the County of Wetaskiwin. This plan consists of policy statements and conceptual representations that provide the framework to promote the following principles:

- Promote sustainable development;
- Promote the expansion of the tax base within the City of Wetaskiwin and the County of Wetaskiwin;
- Acknowledge and promote the development potential of the lands while recognizing the geographical importance within both the local and regional context;
- Create a visually appealing mixed use built environment.

The Plan Area is also located within the Joint Economic Development Area (JEDI) which is a municipal partnership among the City of Wetaskiwin, County of Wetaskiwin and the Town of Millet to foster and promote industrial development in the region.

1.2 PLAN COMPLIANCE

The final result of the approval of the Area Structure Plan, Rezoning and subsequent subdivision allows the City of Wetaskiwin to annex the property as outlined in the Inter-municipal Development Plan between the County and the City. The County and City are working together to review and provide recommendations on the Area Structure Plan with the understanding that the steps outlined below will follow. Should the developer change direction with the development that changes the scope, an amendment to the ASP will be required and the subsequent approvals and process may not fall under the Inter-municipal Development Plan.

The approval process is as follows:

1) The Area Structure Plan (ASP) application is presented to the County of Wetaskiwin. The County and the City work together to ensure the plan complies to the applicable bylaws and then both municipalities refer the plan out for comment. Once comments are received and ASP amended (if necessary) a public hearing date is set and advertised by the County. City and County staff present the Area Structure Plan at the public hearing and County Council is responsible to make the final decision on the approval of the statutory plan bylaw (ASP).

2) If the ASP bylaw is approved, the Rezoning application is presented to the County of Wetaskiwin. The County ensures that the application complies with the approved ASP and sets a public hearing date which is also advertised. County Council is responsible to make the final decision on the approval of the rezoning bylaw.

3) The County approves a Bylaw authorizing the City of Wetaskiwin as the subdivision authority with regards to the property. The applicant will apply for subdivision through West Central Planning Agency but the file will be processed by the City of Wetaskiwin in accordance with the ASP and Rezoning.

4) Once the application for subdivision is approved, the City of Wetaskiwin can make application for annexation under the provisions of the Inter-municipal Development Plan agreement. The County of Wetaskiwin will support the annexation application."

This Area Structure Plan hereinafter referred to as the Plan Area', has been prepared at the request of City of Wetaskiwin in compliance with the City of Wetaskiwin and the County of Wetaskiwin Inter-municipal Development Plan, which requires that such plans be prepared for select study areas.

The Area Structure Plan is prepared in accordance with the requirements as stipulated of the Municipal Government Act. The specific legislation under Section 633 of the MGA enabling the creation of Area Structure Plans states:

(1) For the purpose of providing a framework for subsequent subdivision and development of an area of land, a council may, by bylaw, adopt an area structure plan.

(2) An area structure plan

(a) must describe

(i) the sequence of development proposed for the area;

(ii) the land uses proposed for the area, either generally or with respect to specific parts of the area;

(iii) the density of population proposed for the area either generally or with respect to specific parts of the area;

(iv) the general location of major transportation routes and public utilities, and

(b) may contain any other matters the council considers necessary.

1.3 KEY ELEMENTS OF THE PLAN

The two key elements in the Area Structure Plan are:

- A process that is structured to coordinate development intensification in concert with transportation capacities and servicing capabilities.
- Policy Statements supplemented with a Land Use Concept Plan to establish a logical and sequential pattern of development.

1.4 POLICY INTERPRETATION

The explanatory text accompanying a policy within the Plan is provided for information purposes only to enhance the understanding of the policy. If an inconsistency arises between this text and a policy, the policy will take precedence.

Where "shall" is used in a policy, the policy is considered mandatory. However, where actual quantities or numerical standards are contained within the policy, such quantities or standards may be varied, provided that the variance is necessary to address unique circumstances that would otherwise render compliance impractical or impossible, and the general intent of the policy is still achieved.

Where "should" is used in a policy, the intent is that the policy is to be complied with. However, the policy may be varied in a specific situation provided that the variance is necessary to address unique circumstances that will otherwise render compliance impractical or impossible, or to introduce an acceptable alternate means to otherwise achieve the general intent of the policy.

1.5 PLAN AMENDMENTS

In order to amend this Plan, including any changes to the text or maps within, an amendment to the Plan will be required to be approved by Bylaw. An amendment will require the holding of a statutory public hearing together with public notification carried out in accordance with procedures established by the City of Wetaskiwin.

Where an amendment to the Plan is requested, the applicant will be required to submit supporting information necessary to evaluate and justify the amendment. Such changes will be made from time to time as determined necessary to ensure that the text and maps remain accurate.

1.6 MAP INTERPRETATION

Unless otherwise specified within the Plan, the boundaries or locations of any symbols or areas shown on a map are approximate only, not absolute, and shall be interpreted as such. They are not intended to define exact locations except where they coincide with clearly recognizable physical features or fixed boundaries, such as property lines or road and utility rights-of-way.

1.7 CONSISTENCY AND MONITORING OF THE PLAN

It is intended that consistency between the Plan and any other policy directives which have been approved by Council be maintained, including but not limited to, the Municipal Development Plan of the City of Wetaskiwin.

In order to ensure the Plan remains current and relevant, it will be monitored over time. If any changes are deemed necessary as a result of future monitoring, the Plan will be modified through the amendment process.

2.0 PLAN AREA

2.1 REGIONAL CONTEXT

The City of Wetaskiwin is located at the junction of Highway 2A, Highway 13 and the Canadian Pacific railroad and approximately 12 kms east of Queen Elizabeth II Highway. In addition, the city is approximately 43 miles south of the City of Edmonton and the Edmonton International Airport. Anecdotally, Wetaskiwin as a stage coach stop between Edmonton and Calgary.

The City of Wetaskiwin is the center of a thriving mixed farming and oil and gas region, and is the gateway to some excellent recreational facilities centrally located amongst many lakes and rivers, and close to the foothills.

Based on the 2014 census the City of Wetaskiwin supports a primary trading area of 50,264 people and a secondary trading area population of 93,637.

3.0 EXISTING SITE FEATURES & CHARACTERISTICS

The Plan Area (as shown in Figure 2) consists of approximately 61.9 ha. (153 Acres) of land intended to accommodate a mixed use development which shall include Industrial / Commercial / Public Utilities / and Municipal Reserve.

3.1 SITE CHARACTERISTICS

The Plan Area as shown in Figure 3 *(Topographical Features)* has a gently rolling topography. The plan area varies approximately 8 meters in elevation with the high point located in the south quadrant of the plan area to the lowest point which is the extreme north quadrant of the plan area.

3.2. DRAINAGE BASIN

The plan area is part of the Battle River drainage system and as is the case with most undeveloped parcels of land the plan area is the subject of imperfect drainage.

Drainage within the parcel flows in a south to north direction. Historically the drainage would flow through a natural drainage pattern within the adjacent quarter section to the north with outflow to a drainage channel paralleling the railroad.
With the development of the City of Wetaskiwin waste water lagoons the natural flow has been disrupted. The ponding of water in the north quadrant of the plan area has become more evident in the past few years. This view is supported through the interpretation of both current and historical aerial photography.

3.3 UTILITY RIGHTS OF WAY & ROAD DEDICATIONS

Road Right of Way Plans have been removed from the lands in title. Road Plan 1838L consisting of approximately 4.0 acres (more or less) was removed from the south boundary of the parcel and Road Plan 902-1681 was taken from the western boundary adjacent to 36th Street for road widening.

In addition, two Utility Rights of Way are dedicated within the parcel. Utility Right of Way Plan 522PI is a 13.72 m dedication along the south boundary of the parcel while an additional Utility Right of Way dedicated to the City of Wetaskiwin for infrastructure placement is dedicated as shown in *Figure 2 (Pipelines and Rights of Way)*.

3.4 ADJACENT LAND USES

Lands to the east and south of the plan area are predominantly cultivated lands.
Directly north of the plan area is the waste water treatment facilities of the City of Wetaskiwin. To the west of 36th Street and the plan area is the 'built environment' of the City of Wetaskiwin.

Within the 'Plan Area' the proposed development lands are presently designated as Agricultural/Inter-municipal Development Plan District "A/ID'.

3.5 BUILDINGS

There are no buildings contained within the plan area.

3.6 VEGETATION & SOILS

The Plan area is presently in cultivation. The lands within the plan area are identified as having a soil rating of Canada Land Inventory 2c. This rating is defined as soils having moderate limitations that restrict the range of crops or require moderate conservation practices. The soils are deep and hold moisture well. However, the subclass C indicates that the main limitation is low temperature or low or poor distribution of rainfall during the cropping season, or a combination of these.

3.7 SURFICIAL GEOLOGY

The review of Alberta Geological Survey Map 601, *Surficial Geology of Alberta,* published in 2013 indicated that the site surficial geology may comprise of *glaciolacustrine* deposits:

"...sediments deposited in or along the margins of glacial lakes; includes a) offshore sediment; rhythmically laminated to massive fine sand, silt, and clay, locally containing debris released by the melting of floating ice; and b) littoral (nearshore) sediments; massive to stratified, well-sorted silty sand, pebbly sand, and minor gravel; occurs in beaches, bars, and deltas."

3.8 BEDROCK GEOLOGY

The review of Alberta Geological Survey Map 600, *Bedrock Geology of Alberta,* published in 2013 indicated that the site bedrock geology may consists of *Horseshoe*

"...pale grey, fine to very fine grained, feldspathic sandstone interbedded with siltstone, bentonitic mudstone,carbonaceous mudstone, concretionary sideritic layers, and laterally continuous coal seams; includes white,pedogenically altered sandstone and mudstone interval at top (formerly assigned to the Whitemud Formation); nonmarine to locally marginal marine."

3.8 EXISTING TRANSPORTATION NETWORK

Figure 2 *(Pipelines & Rights of Way)* illustrates the major features of the area's existing transportation network. The system impacting the plan area is comprised of 36th Street to the west and the extension of 56th Avenue to the south.

These features are described as follows:

- 36th Avenue is directly adjacent to west of the plan area. This street is designated as a major arterial road in accordance with the City of Wetaskiwin Master Transportation Plan.

3.9 ACCESS

Existing access to the plan area is via 36th Street, as well as 56th Avenue extension to the south.

3.10 WATER AND SANITARY SEWER SERVICES

The Plan area is not presently serviced with municipal water or waste water services.

A 1200mm waste water collection line is located within a Utility Right of Way located in the north west quadrant of the plan area. In addition, there is a 300mm PVC potable water line stubbed on the west boundary of the plan area and directly west of the Utility Right of Way

3.11 MAJOR FRANCHISED UTILITIES

Fortis Alberta owns an overhead power transmission line, which is located on the west and south boundary of the Plan area. Future subdivision will require connection to this line for electrical servicing.

ATCO Gas is presently located within the right of way which parallels the east boundary of 36th Street. Future subdivision and subsequent development will require connection to this line for natural gas service.

4.0 STRATEGY

4.1 PLAN PRINCIPLES

4.1.1 SUSTAINABLE DEVELOPMENT

The first principle is focused on a sustainable community or sense of place that will encompass the core values of a 'Triple Bottom Line' consisting of social responsibility, economic viability and ecological integrity.

- All development shall be in an environmentally sustainable manner, which includes the protection of groundwater supply to ensure that this resource lasts well into the future.
- Development shall be restricted to non-polluting uses and practices.
- All development shall be serviced with municipal water, waste water and storm water management systems.

4.1.2 SIGNIFICANT ENVIRONMENTAL FEATURES

The second principle is one of identifying and protecting environmental features of significance.

- Low lying areas, which at the present time serve as a seasonal surface runoff retention area, need be protected where possible.

4.1.3 INTEGRITY OF TRANSPORTATION INFRASTRUCTURE

The third principle is maintaining the integrity of the transportation network:

- Ensuring that development is accommodated in a fashion that public safety is first and foremost.

4.1.4 EXPANSION OF THE TAX BASE

The fourth principle is taking the necessary steps to broaden the tax base of the City of Wetaskiwin in a manner that limits the demands of new development on the City's existing infrastructure.

- Proposing the uses of land that demand reasonable and practical levels of service from the City of Wetaskiwin.
- Encourage the location of land uses in which assessment are sustained at a high level (minimal depreciation).

4.1.5 GEOGRAPHICAL IMPORTANCE AND VISUAL APPEAL

The last principle relates to the highest and best use of lands:

- Ensuring that the nature of development is one that reflects positively on the City of Wetaskiwin.
- Development espouses the values of a proud, prosperous, healthy, and vibrant community.
- Consistent site development guidelines are implemented to ensure that development within the Plan Area is visually appealing and environmentally sustainable.

4.2 PLAN PROCESS

The Plan preparation process began by gathering, reviewing and analyzing all relevant information pertaining to future development options within and around the Plan Area. In addition, inventories relating to hydrology and soil permeability are referenced in support of this Plan.

4.2.1 BIOPHYSICAL ASSESSMENT

The overall purpose of the Biophysical Assessment *(Appendix 'A')* was to determine the environmental features found on the subject property, including any watercourses or wetlands subject to the *Alberta Water Act* or the *Public Lands Act*.

- To determine the importance and conservation value of various natural areas located in the study area with respect to future development;
- To determine the value of existing wetlands, woodlots and other ecological features within the study area;
- To assess the connectivity with other surrounding ecological features;
- To identify potential environmental and municipal reserves;
- To identify applicable legislation; and
- Provide recommendations for conservation measures.

4.2.2 GEOTECHNICAL INVESTIGATION

In compliance with the requirements stipulated within the City of Wetaskiwin Design Guidelines and Construction Standards for Development, a geotechnical investigation was undertaken by Levelton Consultants Ltd. *(Appendix 'B')* The objectives of the geotechnical investigation were:

- Determine subsurface soil and groundwater conditions. This was completed by drilling a series of boreholes within the property and installing groundwater monitor wells.

- Evaluate the proposed work plan and make recommendations on soil densification and/or preloading for the foundation system.

- Provide a summary of the subsurface soil and groundwater conditions, summary of stratigraphy, suitability as fill soils, and make recommendations with respect to foundation types, pavement design and lateral earth pressure calculations to be used in the design limitations for local infrastructure and buildings.

4.2.3 TRAFFIC IMPACT ASSESSMENT

The purpose of the Traffic Impact Assessment *(Appendix 'C')* was to assess the potential impact of additional traffic on both the existing local and regional transportation network as a direct result of the proposed development.

The assessment identified and defined the study area, the planning horizon, the analysis period and estimated traffic demand coupled with existing traffic conditions.

In addition, the assessment incorporated a safety analysis, site access analysis, traffic collision analysis, sight distance evaluation and provides overall recommendations for addressing local and regional traffic impacts for incorporation into the ASP.

5.0 PLAN OBJECTIVES

In the preparation of the ASP a detailed review of existing planning policy was conducted to ensure alignment with City of Wetaskiwin planning and policy principles. Without restricting the generality of the foregoing the following documents were referenced within the ASP:

- City of Wetaskiwin Land Use Bylaw;
- City of Wetaskiwin Municipal Development Plan;
- City of Wetaskiwin Development and Design Standards;
- City of Wetaskiwin Inter-municipal Development Plan;
- City of Wetaskiwin Master Transportation Plan;
- City of Wetaskiwin Recreation & Open Space Master Plan;
- City of Wetaskiwin Corporate Strategic Plan;
- City of Wetaskiwin Economic Master Strategy.

Having regard for the City of Wetaskiwin planning and policy principles and based on the premise of the triple bottom line as the foundation for creating a sustainable development the objectives of the ASP are to:

- Prepare a future development concept for the plan area and provide policy direction describing the manner in which land may be developed.
- Promote a transportation network that includes multiple modes of transportation including automobiles, cycling and walking.
- Identify a strategy for providing open space and trails, including linkage to the existing open spaces and trail system and promote interconnected road and path systems that facilitate efficient provision of municipal services and maintenance.
- Provide for the efficient and phased conceptual design of water/wastewater servicing and storm water drainage systems and develop the strategies necessary to support development.
- Identify lands suitable for public recreational opportunities and include both active and passive recreational opportunities.
- Ensure proper protection for environmentally sensitive areas.
- Recognize and maintain the landscape and other environmental qualities of the plan area.
- Promote the diversification of the local economy by examining economic opportunities and economic viability.

- Incorporate diversity of use that may include and promote home, work and play in close proximity.
- Promote the inclusion of various energy efficiencies in the design of the community by orientating streets to maximize solar gain and reduce northern exposures.
- Promote crime deterrence through safe neighbourhood design by incorporating into the design visible public spaces, clear boundaries between public and private spaces, and identifiable points of entry.
- Provide Industrial lands which the full range of municipal services including water, waste water and storm management systems.

6.0 CONCEPT PLAN

The land use prescribed for the site is reflected in Figure 4 *(Land Use Concept Plan).* This concept plan outlines the land uses, transportation network, municipal reserve, open space and utility infrastructure for the Plan Area.

It is acknowledged that much of the plan area is considered as lands possessing agricultural capabilities. It is further acknowledged that development pressures, existing parcel configuration, general public input and the needs of the community to broaden the economic base of the City suggests strong support for the proposed use of the lands.

The public acknowledges that with the proximity of the plan area to the City of Wetaskiwin, the resultant increases in land values have reduced the viability of conventional agricultural operations. As such, the plan area has been identified as having characteristics favorable for future development as per Figure 4 *(Land Use Concept Plan).*

Development of the Plan Area could provide the opportunity for properties adjacent to the plan area to take advantage of upgraded infrastructure.

The Land Use Concept Plan proposed for the Simpson Park Area Structure Plan is shown on Figure 4 *(Land Use Concept Plan).*

Specifically, the Land Use Concept Plan responds to the following critical factors:

- The City of Wetaskiwin existing statutory plans and in particular the Municipal Development Plan.
- Acknowledgment of the existing conditions, such as natural features, current uses of land, parcel boundaries, and subdivision and development opportunities, which result in both opportunities and constraints for future land use.
- The existing transportation network infrastructure including proposed improvements.
- Acknowledgement that infrastructure services are readily available.

6.1 PHASED DEVELOPMENT

The Simpson Park Area Structure Plan envisions that the Plan Area will be a phased development, the timing of which is influenced by several factors notwithstanding:

- The immediate needs of the landowner.
- Market conditions.
- A coordinated approach in the provision and construction of both the 'on-site' and 'external' infrastructure requirements such as a water distribution system, waste water collection system, road design, storm water management, and shallow utility installation.

- The establishment of an economic model that reflects the nature of the development and the limitations of front-loading financial obligations.

6.2 PLAN POLICIES

The policies listed below are unique to the Simpson Park Area Structure Plan and are to be applied at the time of the new subdivision and development. All existing statutory plans and policies, particularly those policies referenced in the City of Wetaskiwin Municipal Development Plan, as well as the Inter-Municipal Development Plan, shall be applied.

Municipal officials and industry representatives have indicated that the demand for a demand for lots ranging from one acre to parcels in excess of twenty acres in size. To address the need for flexibility in parcel size, a 'scalable' development is proposed in which parcels may be consolidated to achieve specific needs

6.2.1 PHASE I

Phase I shall consist of approximately 7.24 ha (17.89 acres) as shown in Figure 4 *(Future Land Use Concept Plan).*

6.2.2 FUTURE PHASING

Future Phasing shall include the subdivision and development of the residual lands in title as shown in Figure 4 *(Land Use Concept Plan).*

6.3 LAND USE

6.3.1 LAND USE POLICIES

Notwithstanding the above, all future subdivision and development within the Plan Area shall have regard to the spirit and intent of the City of Wetaskiwin Municipal Development Plan and the Simpson Park Area Structure Plan.

6.3.1.1 All future subdivision and development within the Plan Area shall comply with the generalized Land Use Concept shown in Figure 4 *(Land Use Concept Plan).*

6.3.1.2 All future subdivision and development within the Plan Area shall be in accordance with the requirements of the City of Wetaskiwin.

6.3.1.3 Prior to approval of future phasing as shown in Figure 4 (*Land Use Concept Plan*), a comprehensive geotechnical investigation may be required by the developer in support of future phasing development.

6.3.1.4 Prior to the approval of future phasing a traffic impact assessment relating to the construction of the point of intersection with 36th Street as shown in Figure 4 (*Land Use Concept Plan*), may be required by

the developer.

6.3.1.5 Development of land within the plan area shall be in strict accordance with provincially mandated setbacks from sewage lagoons and landfills.

6.3.1.6 In recognizing the financial burden and opportunity constraints that front loading development costs place on a development the City of Wetaskiwin and the Developer shall work collectively and collaboratively to create a financial environment that would encourage growth and stimulate development through deferred servicing.

6.3.1.7 The Developer shall be required to enter into a deferred services agreement with the City prior to receipt of subdivision approval of Phase I, and the City may register a caveat respecting the said deferred services agreement for the purpose of informing lot owners of the requirement to connect to a municipal water and/or wastewater system when such services become available.

6.4 TRANSPORTATION NETWORK

The proposed development is to be served by both a proposed access to 36th Street as well as an additional access point on the extension of 56th Avenue as shown in *Figure 5 (Infrastructure Plan)*.

6.4.1 TRANSPORTATION POLICIES

6.4.1.1 All road improvements, including new construction shall be constructed to municipal standards as stipulated in the City of Wetaskiwin Development and Design Standards, and shall be at the sole cost and expense of the Developer.

6.4.1.2 Required future road widening to any existing roads including 36th Street and 56th Avenue extension shall be dedicated at the time of subdivision.

6.4.1.3 Temporary direct access to 36th Street from the proposed lots within Phase I shall be permitted.

6.4.1.4 All internal development (Future Phasing) within the Plan Area will access a proposed internal road system as shown in Figure 4 (*Land Use Concept Plan*).

6.4.1.5 The Developer shall (if necessary) dedicate land for the upgrading of the point of intersection of the proposed internal road with 36th Street as shown in Figure 5 *(Infrastructure)*.

6.4.1.6 Temporary direct access to 36th Street from the proposed lots within Phase I shall be removed at the Developers sole cost and expense upon completion of that portion of the internal road identified within Phase I as shown in Figure 4*(Land Use Concept Plan)*.

6.5 ENVIRONMENTALLY SIGNIFICANT FEATURES

Policies are proposed to ensure that the existing environmentally significant features within the Plan Area are protected, while also providing opportunities for the development of new environmental features.

6.5.1 ENVIRONMENTALLY SIGNIFICANT FEATURES & SUSTAINABLITY POLICIES

6.5.1.1 All development within the plan area shall be the subject of the Simpson Park Site Design Guidelines (*Appendix 'E'*) as amended.

6.5.1.2 The use of high efficiency and energy efficient building materials, fixtures and appliances shall be encouraged.

6.5.1.3 The individual harvesting of rain water for irrigation purposes on each lot shall be encouraged.

6.5.1.4 Where possible buildings shall be orientated to provide the greatest exposure to the sun and create solar heating and solar capture opportunities.

6.5.1.5 Each lot owner shall be encouraged to plant shelter belts along the north boundary of their lot to provide additional protection from the northern winds.

6.5.1.6 When feasible the harvesting of surface runoff and rainfall captured from buildings and used in the business process shall be encouraged.

6.6 MUNICIPAL RESERVE /OPEN SPACE

The Simpson Park Area Structure Plan supports the policies within the City of Wetaskiwin Municipal Development Plan with respect to encouraging development of an integrated and contiguous trail system.

6.6.1 Municipal Reserve, as shown in Figure 4 *(Land Use Concept Plan)* will be dedicated in a manner which will enhance and compliment both the Plan Area and the community at large.

6.6.2 Municipal Reserve shall be provided by either the dedication of land, disposition through cash in lieu, or a combination of both. The disposition of reserve including the disposition of the existing reserve caveat shall be at the sole discretion of the City of Wetaskiwin at the time of subdivision.

6.6.3 Pedestrian and bicycle linkages to the adjacent community shall be incorporated into each phase of the development.

6.6.4 Pathways/trail systems shall be aligned with existing and future external pathway/trail systems.

6.6.5 Pathway/trail systems shall, where possible, be incorporated into landscape buffers and sound attenuation berms thereby increasing both the utility and the aesthetics of the berms and buffers.

6.6.6 Pathway/trail systems shall where possible serve as a 'transition' between differing proposed and existing land uses.

6.7 SERVICING INFRASTRUCTURE

The purpose of the strategy is to provide for the installation of appropriate utility infrastructure necessary to support industrial development. In acknowledging that Municipal water, sewer and fire protection services will be available to each lot within the Plan area. Storm water ponding will be constructed within the Plan area to prevent downstream impacts due to surface water runoff.

Sizing and detailed design of the servicing infrastructure including the storm management will be completed in conjunction with the subdivision and development of the project and administered through the development agreement process.

All infrastructure service development shall be designed and constructed in accordance with the specifications and guidelines as provided in the City of Wetaskiwin Development & Design Standards.

6.7.1.1 All infrastructural development within the plan area shall have regard for the possible extension of services to adjacent lands.

6.7.1.2 Where identified, oversizing of infrastructural services within the plan area will be incorporated into the design and construction process.

6.7.1.3. The developer and the City of Wetaskiwin may enter into a 'shared services agreement' or an 'Endeavor to Assist' to recover costs where oversizing has been a requirement of the City of Wetaskiwin.

6.7.1.4 Where possible, the developer in conjunction with the City of Wetaskiwin shall examine an innovative approach to infrastructure improvements and services that are based on sound economic business practices.

6.7.2 POTABLE WATER POLICIES

Water supply and distribution for the Simpson Park plan area is through the connection to the existing municipal water distribution system which is located within 36th Street and in the upper north quadrant of the plan area as shown on Figure 5 *(Infrastructure)*

All subdivisions and development shall be capable of being connected to the municipally owned and operated water supply and distribution system.

A lot levy, as a connection fee, may be imposed at the time of subdivision approval.

6.7.2.1 Design for constructed water distribution system shall follow the 'Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems,' Alberta Environment, latest edition as a minimum.

6.7.3 SANITARY SEWER SYSTEM

Waste Water collection for the plan area is through a connection to the existing municipal waste water collection main which is located within 36th Street and in the upper north quadrant of the plan area as shown on Figure 5 *(Infrastructure)*

All subdivisions and development shall be capable of being connected to the municipally owned and operated waste water collection system.

A lot levy, as a connection fee, may be imposed at the time of subdivision approval or consideration may be given to deferment subject to the approval of the City of Wetaskiwin.

6.7.3.1 SANITARY SEWER SYSTEM POLICIES

6.7.3.1 Prior to the issuance of a development permit for any construction on each specific lot, the Developer shall provide the approved plans of the proposed construction including a site plan indicating the topographical features.

6.7.3.2 Design for constructed waste water collection system shall follow the 'Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems,' Alberta Environment, latest edition as a minimum.

6.7.4 STORM WATER MANAGEMENT

The Storm water management system (*Appendix 'D'*) will consist primarily of piping and overland drainage. Storm water run-off from the Plan Area will be restricted to pre-development flows in accordance with the City and ESRD standards unless otherwise approved by the City of Wetaskiwin. This will be accomplished by using dedicated public utility lots, joint use recreational lands, roadway ditches, culverts, and drainage swales along lot lines. Individual lots will be graded to direct runoff water to the drainage swales, ditches or catchment basins. These ditches will be used to convey water from the lots to the storm pond.

The layout of the overland flow system is designed to work closely with existing topography, as well as the lot layout. The slopes of the ditches and the drainage

swales should be maintained between 0.5% and 2.0%. The ditches and swales should be protected with grass vegetation as soon as possible to reduce erosion, and help with storm water quality.

STORM WATER MANAGEMENT POLICIES

6.7.4.1 Prior to the subdivision and development of 'Future Phasing' the Developer shall implement a storm water management plan to the satisfaction of the City of Wetaskiwin.

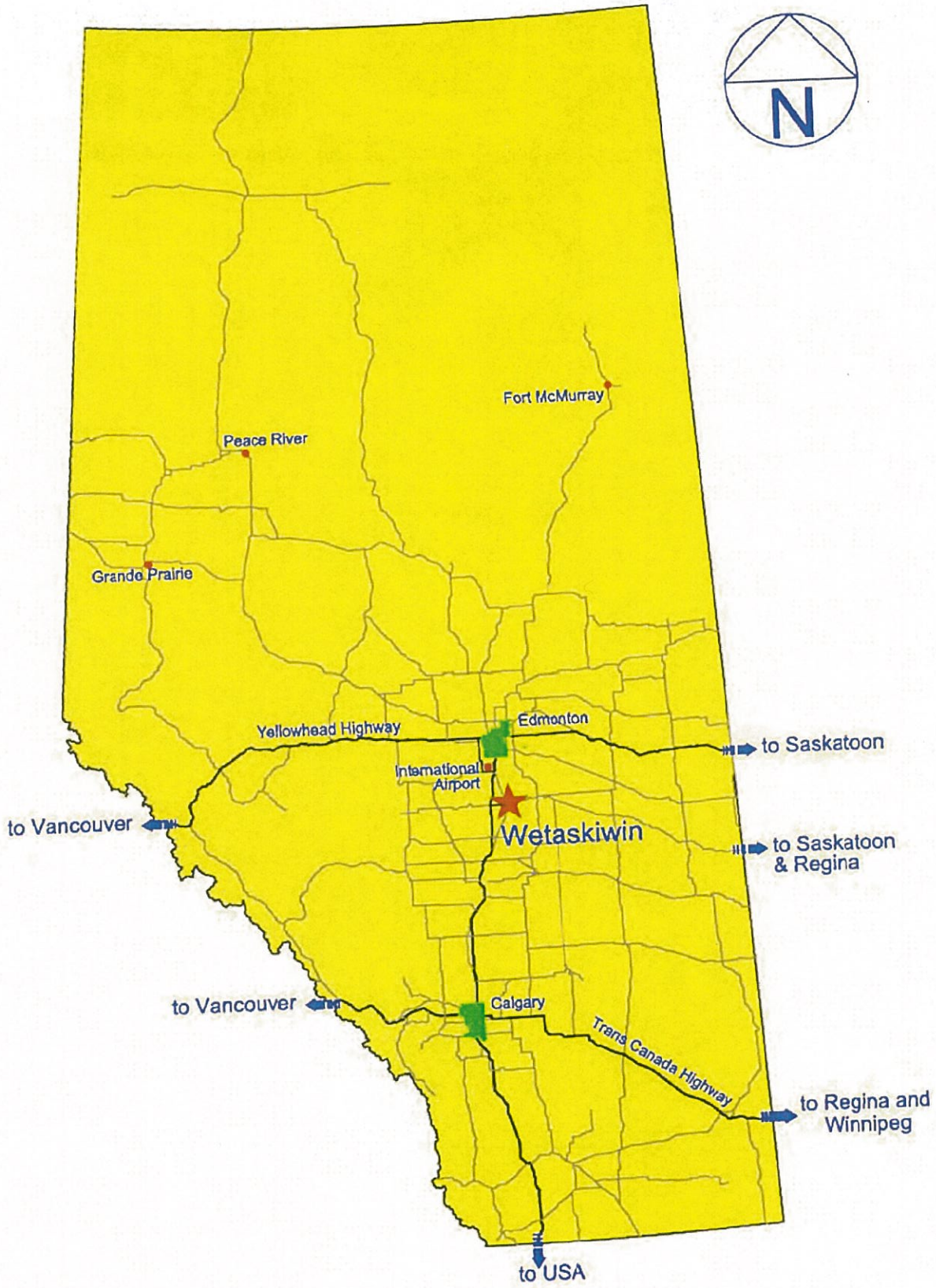
6.7.4.2 Design for constructed storm water management facilities shall follow the 'Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems,' Alberta Environment, latest edition as a minimum.

6.7.4.3 Native soils shall be salvaged and stockpiled and reused as topsoil and planting bed material.

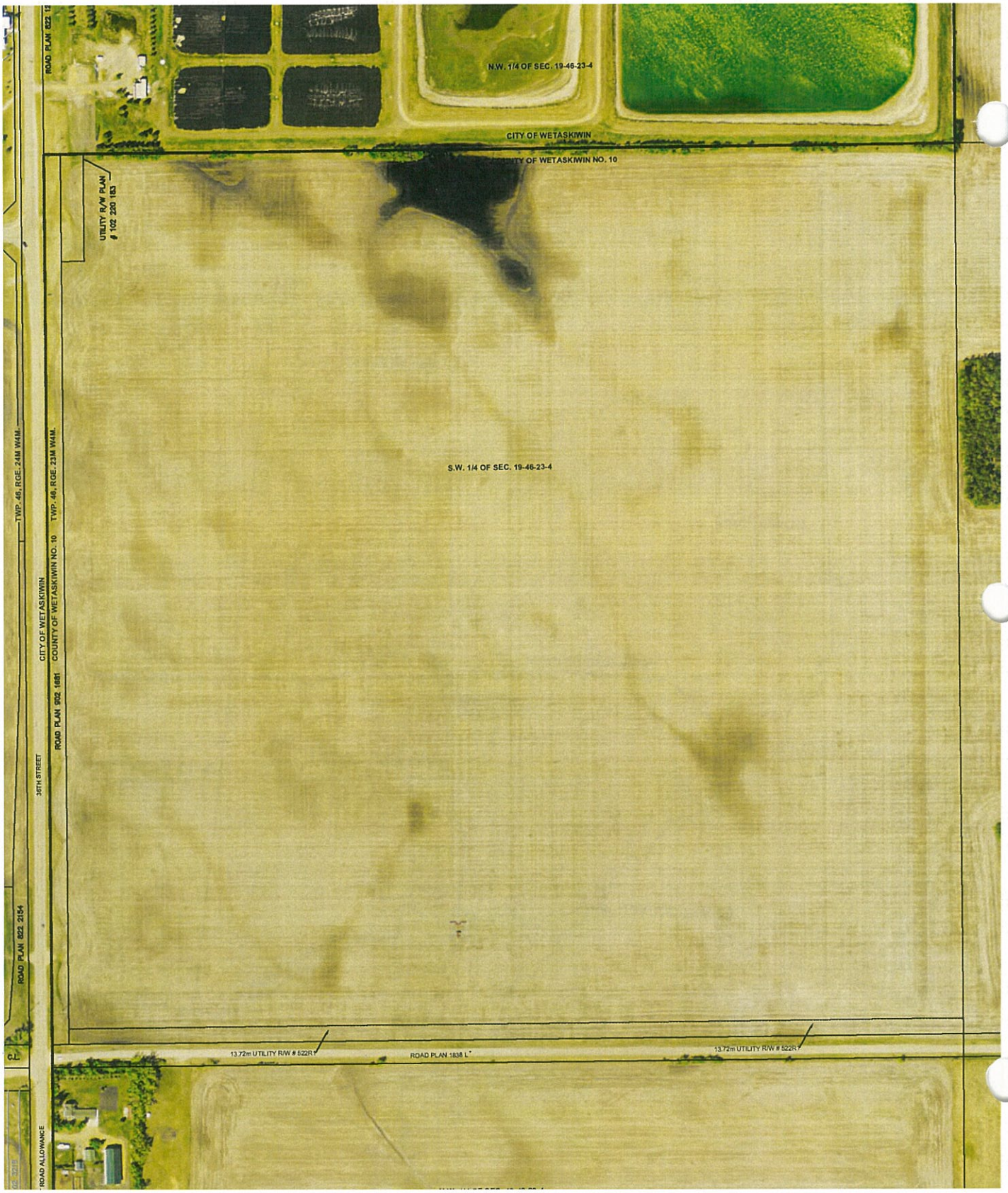
6.7.4.4 Prior to the subdivision and development of each lot a 'lot grading plan' in accordance with the Storm Water Management Pan will be provided for each lot created.

6.7.4.5 Prior to the subdivision and development of Phase I as shown in Figure 6 – *(Storm Water Management Plan)* the developer and the City of Wetaskiwin shall enter into an agreement with respect to the implementation of a phased storm water management plan.

6.7.4.6 Storm water retention devices such as 'dry ponds' may be designed as joint utility/recreational uses.

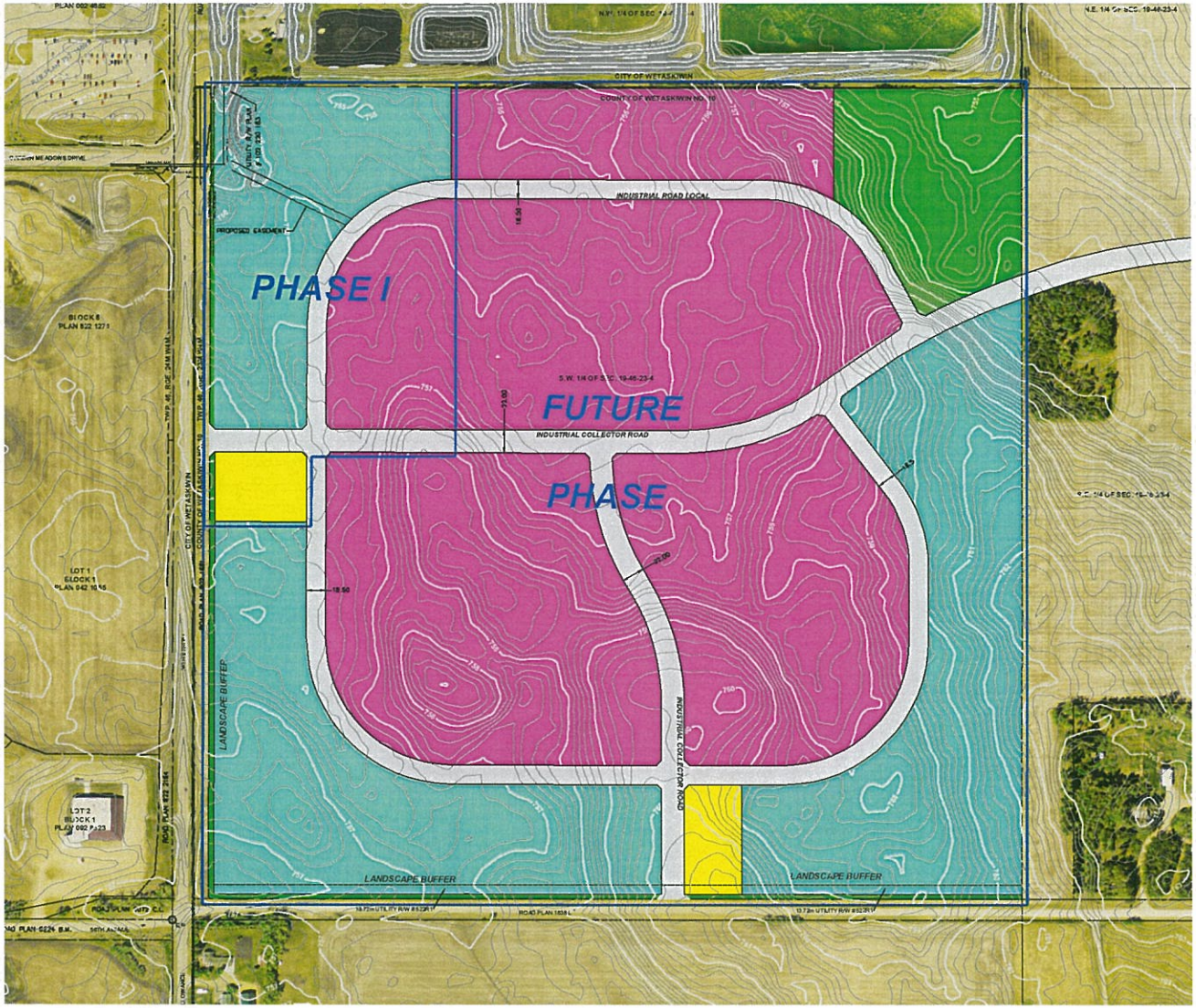


FILE # RTW107		FIGURE 1 REGIONAL CONTEXT	**WESCOTT CONSULTING GROUP**
DATE: NOV 2014	SCALE: 1: 1000	SIMPSON PARK AREA STRUCTURE PLAN	28 Cougarstone Common S.W. Calgary, Alberta T3H 5P5 Phone 403-981-7566 Cell 403-862-9323 bob_wescott@shaw.ca



FILE # RTW107		FIGURE 2 - PIPELINES & RIGHTS OF WAY	**WESCOTT CONSULTING GROUP**
DATE: NOV 2014	SCALE: 1: 1000	SIMPSON PARK AREA STRUCTURE PLAN	28 Cougarstone Common S.W. Calgary, Alberta T3H 5P5 Phone 403-981-7566 Cell 403-862-9323 bob_wescott@shaw.ca

FILE # RTW107		FIGURE 3 - PLAN AREA & TOPOGRAPHICAL FEATURES	**WESCOTT CONSULTING GROUP**
DATE: NOV 2014	SCALE: 1: 1000	SIMPSON PARK AREA STRUCTURE PLAN	28 Cougarstone Common S.W. Calgary, Alberta T3H 5P5 Phone 403-981-7566 Cell 403-862-9323 bob_wescott@shaw.ca



SIMPSON PARK

AREA STRUCTURE PLAN

WITHIN THE

S.W. 19-46-23-4

COUNTY OF WETASKIWIN

FOR

MUMECO PROPERTIES LTD.

LAND USE

COMMERCIAL	(1.09 ha.)
LIGHT INDUSTRIAL	(19.87 ha.)
HEAVY INDUSTRIAL	(29.86 ha.)
MUNICIPAL RESERVE	(4.02 ha.)
ROAD WIDENING	(2.90 ha.)
ROADS ETC.	(17.96 ha.)
TOTAL	64.7 ha.

ROAD CLASSIFICATION

INDUSTRIAL COLLECTOR	22m
INDUSTRIAL LOCAL	18m

PHASE I

NOTES:

1. ALL DISTANCES ARE IN METRES AND DECIMALS THEREOF.
2. ELEVATIONS ARE GEODETIC AND DERIVED FROM ALSCM.

NO	DD/MM/YY	DESCRIPTION	BY
6			
5			
4			
3			
2			
1			

REVISIONS

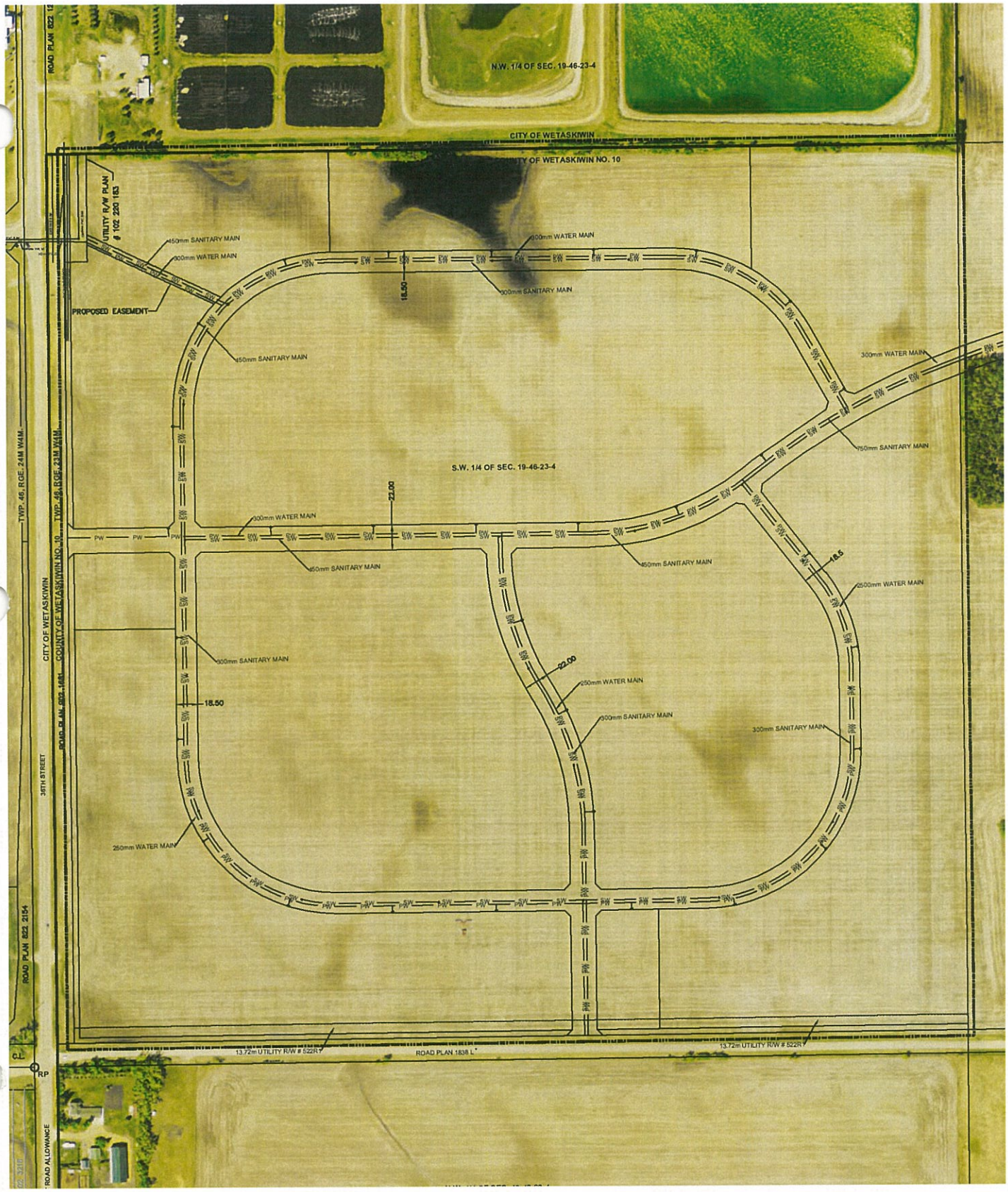
PROJECT
SIMPSON PARK AREA STRUCTURE PLAN

CLIENT
MUMECO PROPERTIES LTD.

DRAWING TITLE
FIGURE 4 CONCEPT PLAN
SITE GUIDELINES

FILE #	SCALE	DATE	DRAWN BY
R1W021	1:2000	13/12/2014	RTW

WESCOTT CONSULTING GROUP
28 Cougarstone Common S.W. Calgary, Alberta T3H 5P5
Phone 403-981-7365 Cell 403-862-8323
bob_wescott@shaw.ca



FILE # RTW107		FIGURE 5 INFRASTRUCTURE	**WESCOTT CONSULTING GROUP**
DATE: NOV 2014	SCALE: 1: 1000	SIMPSON PARK AREA STRUCTURE PLAN	28 Cougarstone Common S.W. Calgary, Alberta T3H 5P5 Phone 403-981-7566 Cell 403-862-9323 bob_wescott@shaw.ca

FILE # RTW107		FIGURE 6 STORM WATER MANAGEMENT	**WESCOTT CONSULTING GROUP**
DATE: NOV 2014	SCALE: 1: 1000	SIMPSON PARK AREA STRUCTURE PLAN	28 Cougarstone Common S.W. Calgary, Alberta T3H 5P5 Phone 403-981-7566 Cell 403-862-9323 bob_wescott@shaw.ca

"Wetaskiwin Biophysical Assessment"

SW 19-46-23-4

PREPARED BY

MCA Environmental Management

APPENDIX 'A'

January 2015

MCA Environmental Management

Wetaskiwin
Biophysical Assessment Report
SW 1/4 19-46-23 W4M
January, 2015

Submitted to Mumeco Properties Ltd.

MCA FILE: 2014-1127

MCA Environmental Management

Wetaskiwin
Biophysical Assessment Report
SW 1/4 19-46-23 W4M
January, 2015

Submitted to Mumeco Properties Ltd.

MCA FILE: 2014-1127

EXECUTIVE SUMMARY

This Biophysical Assessment has been completed for Mumeco Properties Ltd. and their consultants Westcott Consulting Group (Cochrane, Alberta), as part of the City of Wetaskiwin and County of Wetaskiwin Planning requirements. The client objective is to develop a parcel of land comprising approximately 44 ha at the north east corner of Wetaskiwin, Alberta south of the city sewage lagoons.

The land description of the property is SW 19-46-23 W4M. The land is currently considered land within the jurisdiction of County of Wetaskiwin, however it is within the inter-municipal development plan area

The Biophysical Assessment will serve as the base for planning the future development of the property as required by an area structure plan (ASP).

The Biophysical assessment is a necessary requirement for the approval of a more detailed Area Structure Plan for the proposed project site, as well as approval of the storm water management plan for the subdivision, under the *Alberta Water Act* and the *Environmental Protection and Enhancement Act.*

A Biophysical assessment is conducted to identify significant and sensitive environmental components on the project site prior to the development of an Area Structure Plan (ASP), and to make recommendations on the sustainability of the site, whether parts of it can or should be preserved in the natural state, and if so, what mitigation and monitoring measures are necessary to achieve sustainability. The Assessment provides recommendations for dedication of lands to be conserved in their existing state within the context of the proposed development project, for the purposes of conservation of habitat, hydrology, and protection of erodible land, water quality or other environmental needs.

The results of the biophysical assessment indicate that the property presents a relatively biologically inert setting with poor range of habitat available for plant and animal species. There were no indications of potential species at risk on site, and the area provides little in the way of ecological linkages with adjacent properties that could be considered valuable to the property.

One issue of note on the property relates to the pooling water near the north central portion of the site (Figure X). Pooling water in this area of the site has visibly increased in recent years as observed in aerial photos.

Factors contributing to the pooling water on site should be further investigated to identify whether it has been exacerbated by possible subsurface leaks from the sewage lagoon, or if it is just a function of the natural surface water drainage toward this area of lower elevation.

Regardless no classified wetland was observed in this area or elsewhere on site.

The subject property has been in use for agricultural purposes since at least 1949 and consists of productive agricultural land in the form of a class 2 soil. While there are no specific limitations related to the development of the land for wildlife habitat, regulators and the developer will likely recognize that development of the site will result in a decrease to local productive agricultural land. This can be considered a common consequence of city expansion to adjacent properties.

Recommendations for future studies prior to the development of the land include the following:

- Assess the potential for sub-surface leakage from sewage lagoon to the north through inquiries with the City of Wetaskiwin.

- Development of a master drainage plan prior to site development as per the Storm water management guidelines
- Fire prevention and control strategies
- Site hazard management planning

These recommendations are not intended to be exclusive. Administrators and regulators may have additional requirements not listed here. Reference should be made to the recommendations provided in this report along with various other planning tools during future site development including the inter-municipal Development Plan.

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Appendices

1.0 INTRODUCTION

1.1 Background and Purpose

This Biophysical Assessment has been completed for Mumeco Properties Ltd. and their consultants Westcott Consulting Group (Cochrane, Alberta), as part of the City of Wetaskiwin and County of Wetaskiwin Planning requirements. The client objective is to develop a parcel of land comprising approximately 44 ha at the north east corner of Wetaskiwin, Alberta south of the city sewage lagoons.

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A Biophysical assessment is conducted to identify significant and sensitive environmental components on the project site prior to the development of an Area Structure Plan (ASP), and to make recommendations on the sustainability of the site, whether parts of it can or should be preserved in the natural state, and if so, what mitigation and monitoring measures are necessary to achieve sustainability. The Assessment provides recommendations for dedication of lands to be conserved in their existing state within the context of the proposed development project, for the purposes of conservation of habitat, hydrology, and protection of erodible land, water quality or other environmental needs.

Accordingly, the purpose of this Assessment is:

- to identify and evaluate existing ecological features on the site as they appear at the present time;
- to provide practical recommendations for preserving or enhancing ecologically significant features within the context of the ASP;
- To provide general recommendations for mitigation of potential adverse environmental effects resulting from the development, on the site and on surrounding lands;
- To identify potential environmental and municipal reserves;
- To identify applicable legislation; and,
- Provide recommendations for conservation measures.

1.2 Project Overview and Site Location

The quarter section of land containing the proposed development site is located approximately 400 meters south of the highway #13 on the northeast corner of the City Wetaskiwin on 36th street. The legal description is SW 19-23-46- W4M containing 44 ha.

Figure. 1 Shows the location of the project site in regional contexts. Figure 2 shows the boundaries of the proposed development site, and hence the study area for this Assessment (from August 2011 imagery). Figure 3 shows a comparison of the property in aerial photographic imagery from 1949 and 1983.

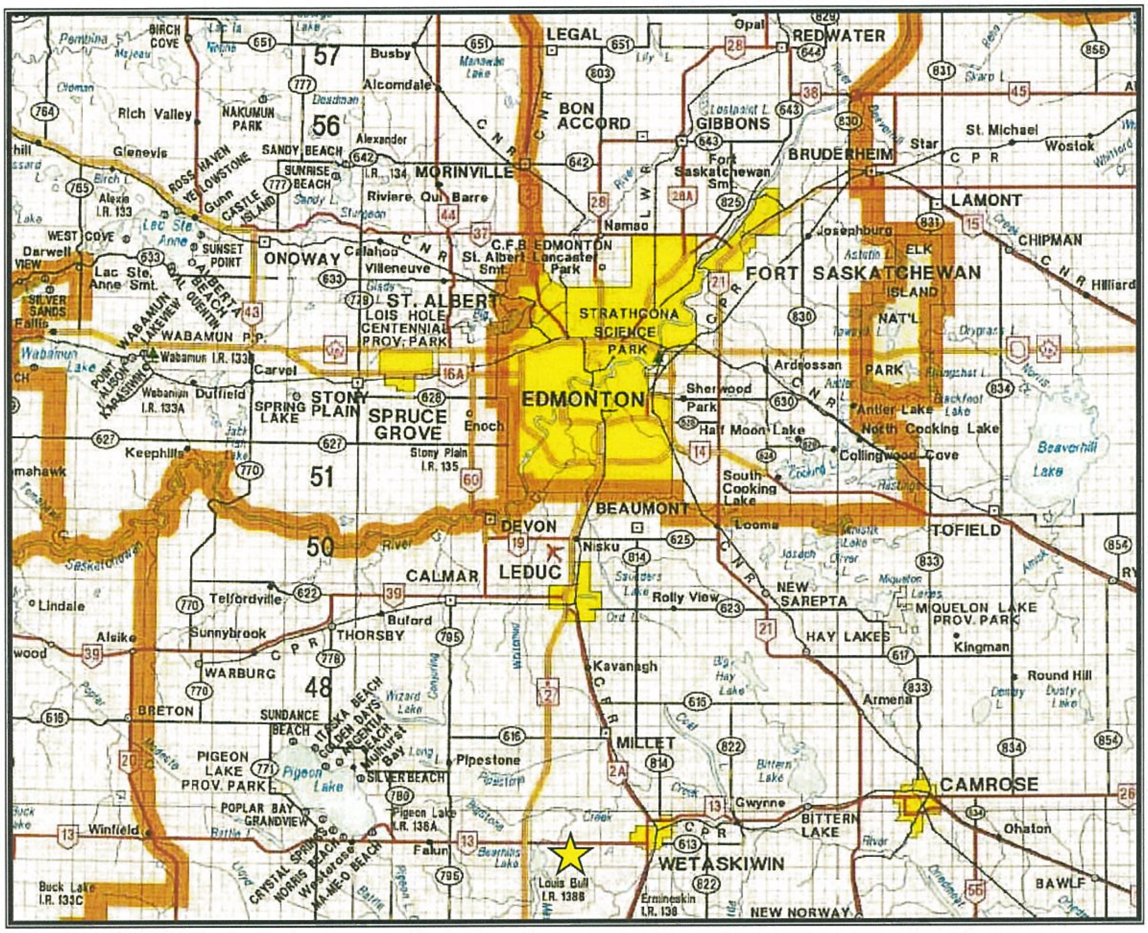

Figure 1: Site *Location (Star) (Source: ASRD Provincial Base Map 2009).*

Figure 2: *Approximate boundary of the site (Source: 2011 Google Earth)*

Figure 3: *Aerial photo imagery of the property in August 1949 (upper) and May 1983 (lower) (Source:ASRD).*

1.3 Scope of the Assessment

The Biophysical assessment addresses all parts of the natural environment, and includes:

- Topography, geology and soils;
- Hydrology (surface water, ground water);
- Vegetation (terrestrial, wetland);
- Wildlife (birds, fish, herptiles, invertebrates, mammals) and potential habitat;
- Sustainability of ecosystems;
- Linkages with adjacent ecosystems (connectivity); and,
- Biodiversity and species at risk (rare, threatened and endangered species).

The geographical scope of the Assessment is the proposed project site, whose boundaries are shown in Figure 2. However, where relevant the Assessment takes into account adjacent land uses and ecological linkages with the subject property in a regional context if warranted.

2.0 APPROACH AND METHODS

The Biophysical assessment was conducted to describe and interpret site features as they existed at the time of the field reconnaissance, which took place in October of 2014. The study included the following activities:

- Consultation with Wescott Consulting Group undertaking the detailed design of the proposed site development;
- Review of any maps, previous reports, etc., completed for this project;
- Examination of historical aerial photographs, to assess surrounding land use, vegetation areas, developments, etc.;
- Database searches, e.g., ANHIC database for tracked and listed species;
- Field reconnaissance of the site; and,
- Analysis of the information, and drafting the Biophysical assessment report.

The scope of the field reconnaissance was to observe features of vegetation, drainage, wildlife and other components of the natural environment, as existed at the time of the field reconnaissance. The types and distribution of vegetation, the type of forest, drainage features, wildlife and wildlife signs (e.g., tracks, feces, hair, burrows, nests, rubs, scrapes, etc.), and any other environmental features, were noted by location and documented with photographs.

The contours of the site were observed on topographical map sheets and directly in the field, and note was made of any depressions which might form a wetland, gully or natural drainage course. Digital historical aerial photos were obtained from Alberta Sustainable Resource Development (ASRD) and examined at intervals of 5 to 10 years from July 1949, through to August 2007 to learn about past and present vegetation cover, earthworks, human activities or places on the site water tends to collect. Potential wetlands were also identified by noting lower topographical areas, and dark-shaded areas in the aerial photographs. The potential wetlands were then observed in the field, and the vegetation growing there was examined. Classification of these areas as potential wetlands was done mainly according to the Stewart and Kantrud Wetland Classification System (Stewart and

Kantrud, 1971). The historical aerial photographs were examined to determine the configuration of each low, wet area and the amount of surface water present in various years.

2.1 Previous Assessments and Reports

Background information for the site was provided by Wescott Consulting and included the following.

- Inter-municipal development plan
- Geotechnical site investigation
- Site survey

Details related to the zoning of this site as per the City and County of Wetaskiwin Intermunicipal Development Plan indicate that this site is zoned SI (Serviced Industrial) in the north end and SI and SR (Serviced Residential) in the south west and south east respectively.

A geotechnical site investigation was completed by Levelton concurrent with this report. The purpose of the investigation is to determine soil and groundwater conditions for future development of the site and provide preliminary geotechnical recommendations. The geotechnical report provided a useful reference for site specific subsurface geology and hydrogeology. The primary issue of note is the results related to the location of borehole 2 or BH-02 at or near the area where water has been observed pooling on site (as indicated in Figure 7). The BH-02 appeared to be the only borehole where clay was observed near the surface where all other boreholes advanced had topsoil at the surface. A copy of the geotechnical report is on file with Mumco and is not provided as part of this report.

A survey of the site was completed by New West Geomatics in November of 2014. A copy of the contours and point elevations are provided in Appendix B. The contour map and point elevations serves to reconcile areas of lower elevation found in the wetter locations. The year of the aerial photo used for the contours was not indicated on the figure however, Wescott Consultants indicated that they understood the photo to be from 2012.

3.0 REGULATORY MATTERS

The following is a listing of the primary Acts and Regulations at federal, provincial or municipal levels, which could be relevant to various aspects of the proposed development and possible effects on the environment or natural resources. Not all of the following legislation may be directly applicable to the development and the following is not a comprehensive list of any Act or regulation that could apply in any circumstance.

3.1 Federal Legislation

3.1.1 Canadian Environmental Assessment Act (CEAA)

The Canadian Environmental Assessment Act (CEAA) applies to a project if it is included in the designated projects regulation. It is unlikely a project at this site would be listed in the designated projects regulation or would require a federal environmental assessment as the majority of the designated projects involve resource development projects or major water withdrawals.

3.1.2 Migratory Birds Convention Act (MBCA), 1994

Under the Migratory Birds Regulation (under MBCA), no person shall hunt a migratory bird except under authority of a federal permit under this Act/Regulation. Subject to subsection 5(9), no person shall (a) disturb, destroy or take a nest, egg, nest shelter, eider duck shelter or duck box of a migratory bird, or (b) have in his possession a live migratory bird, or a carcass, skin, nest or egg of a migratory bird, except under authority of a permit licensed under this Act/Regulation. This Act and its Regulation become particularly important when removing trees or clearing open pasture to facilitate development, to landscape, or to regrade the land. The lack of tree cover on the property combined with the consistent agricultural land use appear to negate concerns related to migratory birds nesting and rearing on this property however, there is tree cover on the south end of the sewage lagoons where birds my nest and rear young.

3.1.3 Fisheries Act

If there is any proposed activity that would destroy or adversely affect fish or fish habitat, such proposed activity would require an Authorization from Fisheries and Oceans Canada (DFO) under the *Fisheries Act (FA)*. The Fisheries Act {R.S. 1985, c. F14}, applies to all Canadian fisheries waters and assigns the Department of Fisheries and Oceans Canada (DFO) the responsibility to administer and enforce the conservation and protection of fish habitat on private property and on provincial and federal lands. Section 35 of the FA states " No person shall carry on any work, undertaking or activity that results in serious harm to fish that are part of a commercial, recreational or Aboriginal fishery, or to fish that support such a fishery".

A recent change to the FA defers fisheries management to local provinces where equivalent fisheries protection measures are in place. Section 36 of the fisheries act prohibits the deposit of deleterious substances. Environment Canada is responsible for administering this subsection. There is no water body on this parcel of land to which the fisheries act would apply.

3.1.4 Navigable Waters Protection Act

If a watercourse is considered to be navigable for the purposes of the *Navigable Waters Protection Act (NWPA)*, the construction of a crossing over it would require an Authorization from Fisheries and Oceans Canada (DFO) under the NWPA. The legal scope of the term "navigation" refers to any vessel, even one as small as a canoe or kayak. There are no navigable waters on the subject site.

3.1.5 Species at Risk Act

The Species at Risk Act (SARA) was passed in 2002 as part of Canada's commitment to the international Convention on Biological Diversity. The intent of the SARA legislation is to prevent species that are listed in Schedule 1 of the Act from becoming extinct, threatened, or extirpated. Additionally, SARA strives to help in the recovery of any listed species through protecting the critical habitats of at-risk species. Under SARA, it is illegal to kill or harm any listed species, or to destroy the residences of any listed species that occur on federal lands. For listed species that that are found outside of federal lands, it is the duty of the province or territory to protect listed species through legislation. This legislation covers birds, plants, fish, mammals, insects, amphibians and reptiles.

In the present case, no rare or endangered species were expected or observed on the portion of the land in which development is proposed.

3.1.6 Federal Policy on Wetland Conservation

The Federal Policy on Wetland Conservation was passed by Cabinet in 1991, with the objective of promoting "the conservation of Canada's wetlands to sustain their ecological and socio-economic functions, now and in the future" (Government of Canada, 1991). The Federal Policy on Wetland Conservation applies to the full range of federal activities and drives management decisions regarding the protection of wetland habitat on federal lands.

The two key commitments of the Federal Policy on Wetland Conservation include:

- no net loss of wetland functions on federal lands and waters through mitigation of all impacts of development related to these wetlands; and,
- enhancement and rehabilitation of wetlands in areas where the continuing loss or degradation of wetlands has reached critical levels.

There were no wetlands observed on the subject property.

3.2 Provincial Legislation

3.2.1 Public Lands Act

The bed and shores of all watercourses and water bodies are considered public lands unless the Government of Canada owns them. As such, approvals under the Public Lands Act {R.S.A. 2000, c. P-40} are required for any activity on the bed or shore of Crown owned rivers, streams, or lakes. Any activity that alters or occupies the bed and shore of a water body may be done only after written approval.

A Licence of Occupation (LOC) would be required for in stream structures and permanent or temporary facilities on Crown Land. A Licence of Occupation (LOC) is required under the *Public Lands Act* to build any structures that could have a negative impact on the bed and shore of a water body (e.g., retaining walls, boat launching facilities, breakwater structures, and causeways).

There were no flowing creeks, streams or rivers observed on the subject property.

3.2.2 Environmental Protection and Enhancement Act, 1992

The Alberta *Environmental Protection and Enhancement Act (EPEA)* support and promote the protection, enhancement and wise use of the environment. It recognizes the impact of development, polluters paying for their actions, and other such acts.

The Act deals with the release of substances into the environment, regulating releases, and creating general prohibitions with respect to substance release, and also provide the necessary powers to regulate the handling of storm drainage and wastewater. A key part (Section 109) states that no person shall release or permit the

release into the environment of a substance in an amount, concentration, or level or at a rate of release that causes or may cause a significant adverse effect, thus covering a very broad range of anti-pollution prohibitions.

Under the Wastewater and Storm Drainage Regulation, EPEA gives powers to Alberta Environment for the regulation of storm water drainage and wastewater systems. The Wastewater and Storm Drainage Regulation and the Wastewater and Storm Drainage (Ministerial) Regulation enable the Department to regulate the operation of storm drainage and wastewater systems and establish standards for such facilities and their operators. This legislation sets out requirements for the construction and operation of municipal plants for handling of storm water drainage and wastewater.

Among other things that the Act covers are the following:

- Harmful emissions to the air (Air Emissions Regulation);
- Release of harmful/toxic substances to the environment (Substance Release Regulation);
- Reclamation of disturbed lands (Conservation and Reclamation Regulation);
- Ozone-depleting substances (Ozone-Depleting Substances Regulation);
- Handling, use and application of pesticides and herbicides (Pesticide Sales, Handling, Use and Application Regulation);
- Potable water (Potable Water Regulation); and,
- Reporting of releases to the environment (Release Reporting Regulation).

EPEA allows for anti-litter orders to be issued for the control of waste on highways, water, ice and public and municipally owned land (which is referred to as enforcement orders). Orders for the cleanup of unsightly property are referred to as environmental protection orders. The forms of both types of orders are set out in the regulations.

EPEA regulates the handling, storage and disposal of hazardous wastes under the Waste Control Regulation. Hazardous wastes are defined in the Regulation.

The Wastewater and Storm Drainage Regulation under AEPEA gives Alberta Environment the responsibility of regulating storm drainage and wastewater systems, including the establishment of standards for such facilities in their operation. This includes naturalized wetlands, other storm water management facilities, outfalls and related piping.

3.2.3 Water Act

The Alberta *Water Act*, which came into force in 1999, supports and promotes the conservation and management of water. It regulates withdrawals and diversions of water, including drilling water wells, through a licensing and authorization system. It regulates water management works and undertakings, and authorizes temporary diversions through a licensing process.

Watercourse crossings (road, bridge, pipeline, telecommunications, etc.) are authorized/regulated through the Alberta Watercourse Crossings Codes of Practice. A Notification must be submitted to Alberta Environment detailing any watercourse crossing structures, and explaining how the construction and operation of the crossing meets the requirements of the Code.

Approval would be required under the *Water Act* from Alberta Environment in respect to any watercourses or wetlands that might be affected, or whose flows may be affected, by the proposed development.

An approval is required to conduct an activity in a water body. An activity is defined generally to include placing or constructing works within a water body, removing or disturbing ground and/or vegetation that results in altering the flow, level, direction and/or location of a water body. A license is required to divert or transfer water from a water body.

Construction of an outfall would also require that the Code of Practice for Outfall Structures on Water bodies under the Water Act be followed. This Code of Practice dictates restricted activity periods on water bodies, and requires that certain design standards be followed. The Code of Practice also requires that notice be issued to the Director, Alberta Environment, prior to commencement of the work. Hydrological issues are discussed later in this report.

Approvals would be required under the *Water Act* to modify or fill any wetlands that might occur on the Property, and to construct any outfall or drainage channel into a water body.

The Act would also apply if withdrawal of water from a Lake/wetland is being proposed as part of the operation, such as for a domestic water supply or other use.

There were no wetlands observed on the property.

3.2.4 Alberta Weed Control Act

On June 16, 2010, the new Alberta Weed Control Act received Proclamation and came into force. The new Act is a comprehensive re-write of the old Act for the purposes of re-organizing, updating, and providing greater clarity to the existing provisions of the latter.

This Act aims to regulate noxious weeds, prohibited noxious weeds, and weed seeds through various control measures, such as inspection and enforcement, together with provisions for recovery of expenses in cases of non-compliance. Additionally, it mandates the licensing of seed cleaning plants and mechanisms. The Act requires that the owner or occupant of lands control noxious weeds and destroy prohibited noxious weeds on land the person owns or occupies. In 2012 the Alberta Invasive Plant Identification Guide was published to facilitate the identification of prohibited noxious and noxious plants.

Under provincial legislation, only pesticides that have been registered for use in Canada by the Pest Management Regulatory Agency under the Canada *Pest Control Products Act* can be used in Alberta. Pesticides and herbicides are regulated in Alberta under the Alberta *Environmental Protection and Enhancement Act* and supporting regulation (Pesticide Sales, Handling, Use and Application Regulation).

This legislation provides for the regulation of sales (pesticide vendors) and use (pesticide applicators) of pesticides in Alberta. In addition, there is the Environmental Code of Practice for Pesticides which provides more detailed direction for pesticide sales and use in Alberta.

In the field reconnaissance, various weedy species were observed, but for the most part the land was either plowed for cultivation or dominated by grass species. It is recommended that invasive plant species not be introduced as a result of project activities (e.g., filling and stockpiling of soil) and that where feasible existing weeds be controlled. Manual and cultural methods should be the priority, but where this is not practical, chemical weed control should follow the above regulations and standards; and in such a manner as not to affect the vegetation of any wetland areas within or near the property.

3.2.5 Wildlife Act

Alberta's Wildlife Act is the main piece of provincial legislation that deals with wildlife. Under the Act, hunting without a license or out of season is prohibited, as is the possession of wildlife and controlled animals (defined in the Act). The Act also covers diseased animals, damage or threat caused by private animals, and the closing of areas to the public to protect wildlife, where necessary. Licenses and permits are issued under the Act to regulate hunting or other activities, as outlined above.

If the Minister believes that any animal is diseased or materially infested by parasites and might present a danger to the life or health of any wildlife animal or endangered organism, or that any animal poses an ecological threat or genetic danger to wildlife or an endangered organism, he/she may order that the suspect animal be quarantined or direct a wildlife officer to seize the suspect animal and kill or otherwise dispose of it. If a wildlife officer believes that a privately owned animal is harassing wildlife, the officer can order the owner to confine it in acceptable manner. Other similar provisions apply where a privately owned animal is harassing, or posing a

threat to, the life or health of wildlife, or is damaging wildlife habitat. Additionally, where a privately owned animal is believed to pose an immediate danger to any person, or is damaging or is imminently likely to damage property, an officer may capture or destroy the animal. If a wildlife officer believes that the health or safety of the public is in jeopardy in any area owing to the presence of wildlife or a controlled animal or from any attempt to capture or kill such an animal, the officer or guardian may make a written or oral order that the area be closed to public access for a specified period.

Beaver control would also fall under the Wildlife Act, if a proponent is considering destroying or re-locating beavers, or destroying beaver works, in restoring flows in a watercourse or culvert or similar structure.

3.2.6 Historical Resources Act

Section 37 of the Historical Resources Act provides the framework for Historical Resources Impact Assessments (HRIAs) and mitigative studies. When, in the opinion of the Minister of Alberta Community Development (ACD), an activity will or will likely result in the alteration, damage or destruction of an historic resource, the person or company undertaking the activity can be required to:

- conduct an HRIA on lands that may be affected by the activity;
- submit to ACD a report discussing the results of the HRIA;
- avoid any historic resources endangered by activity; or
- mitigate potential impacts by undertaking comprehensive studies.

HRIAs and mitigative studies are paid for by the person or company undertaking or proposing to undertake the activity. ACD regulates archaeological and paleontological fieldwork through a permit system. All decision-making concerning the management of historical resources rests with ACD.

One of the requirements of an HRIA is to address compliance requirements associated with the Historical Resources Act of Alberta. As such, it becomes incumbent for the proponent to comply with any government requirements that result from a Historical Overview if one has been done. At a minimum, ACD should be contacted, to determine if they have any concerns about the Property in question, from an historical, archaeological or related perspective.

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3.2.7 Species at Risk Program

Alberta has a Species at Risk Program, which was initiated as a response to the provinces commitment to the Accord for the Protection of Species at Risk in Canada. The intent of the Accord is to prevent species in Canada from becoming extinct as a consequence of human activity. As part of the assessment procedure, all species of concern are generally assessed and are classified as one of the following categories 1) At Risk; 2) May Be at Risk; 3) Sensitive; 4) Undetermined; and 5) Secure. Any species that is designated as "At Risk" or "May Be at Risk" undergoes a detailed status assessment and is formally designated as Endangered, Threatened, Special Concern, Data Deficient, or Not At Risk. Any species that is designated as Endangered or Threatened becomes legally protected under Alberta's Wildlife Act {R.S.A 2000, c.W-10}. This legal designation prohibits the disturbance, killing or trafficking of these species, and provides immediate protection of nests and den sites. Any species that is designated as "Sensitive" after a general assessment, or as "Special Concern" after a detailed assessment becomes eligible for special management actions designed to prevent the species from becoming "At Risk". There were no species at risk noted for this property.

3.3 Standards Policies and Guidelines

3.3.1 Interim Policy for Wetland Management in the Settled Area of Alberta and Guidelines for Wetland Habitat Compensation

Developed in 1993, this interim policy provides direction on the management of wetlands in the settled areas (white zone) of Alberta (Alberta Water Resources Commission, 1993). The primary goal of the policy is to "sustain the social, economic, and environmental benefits that functioning wetlands provide, now and in the future" by conserving wetlands in a natural state, mitigating the degradation and loss of wetlands, and enhancing, restoring, or creating wetlands in areas where they have been depleted or degraded.

If the flow of surface water is altered or blocked, or if a wetland is being altered or destroyed by filling in or draining, the Alberta Policy on Wetlands and the *Alberta Water Act* would apply. The Policy, in essence, requires that there be no *net* loss in wetland habitats in Alberta. If a wetland is destroyed, then compensation must be provided by the person or persons responsible for affecting such damage. Under the policy, compensation can be through directly creating equivalent wetland habitat in another location, or by paying a recognized wetland manager (e.g., Ducks Unlimited) to accomplish this. If the compensation sites are within a certain distance from the affected one, the compensation ratio is 3 hectares of new wetland to 1 hectare of affected wetland. Beyond a certain distance between compensated wetlands and affected wetlands, the ratio becomes higher, and increases with progressive distance. This would apply if any wetland that might occur on the Property were affected by the development or related construction activities.

3.3.2 Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems

Alberta Environmental Protection has established standards and guidelines for the design and operation of municipal waterworks, wastewater and storm drainage systems (Alberta Environmental Protection, 1997). These standards and guidelines outline four types of requirements: Performance Standards, Design Standards, Design Guidelines, and Operating and Monitoring Requirements and Guidelines. These requirements are all directed towards ensuring public health and environmental protection.

3.3.3 Wastewater and Storm Drainage Regulation and Wastewater and Storm Drainage (Ministerial) Regulation

The Wastewater and Storm Drainage Regulation {AR 119/93} and the Wastewater and Storm Drainage (Ministerial) Regulation {AR 120/93} fall under Part 4, Division 1 of the Environmental Protection and Enhancement Act {R.S.A. 2000, c. E-12}. These regulations create general prohibitions with respect to substance release to the environment and provide powers to regulate the handling of wastewater and storm drainage.

3.3.4 Storm water Management Guidelines for the Province of Alberta

These guidelines were developed as a result of increased urbanization and public expectation for improved runoff control. These guidelines direct the planning, analysis, design, construction, operation, and maintenance of storm water management systems to address concerns associated with storm water runoff and its impact on urban and rural development, and aquatic resources. These guidelines include Best Management Practices for storm water management and quality control.

3.3.5 Code of Practice for Outfall Structures on Water Bodies

The Code of Practice for Outfall Structures on Water Bodies came into effect in September 2003. Activities regulated under the CoP for outfalls include the placement, construction, installation, maintenance, replacement or removal of an outfall structure, and any activities related to the placement, construction, installation,

maintenance, replacement or removal of the structure. The CoP establishes standards to ensure that any disturbance or impact to the environment that occurs as a result of the placement of an outfall structure is minimized. The Guide to Requirements for Outfall Structures on Water Bodies was published in December 2004. The guide was designed to clarify the obligations of those involved in outfall structure activities. The document outlines methodologies for biological and physical assessments, and provides a list of best management practices for the construction, operation, and monitoring of outfall structures. Appropriate mitigation measures would need to be taken if a storm water outfall is planned for the new subdivision (an Approval would also be required under AEPEA). If there is to be a discharge structure for surface water originating from the Property, this Code of Practice will need to be followed.

3.3.6 Code of Practice for Watercourse Crossings

Activities regulated under the CoP include the placement, construction, installation, maintenance, replacement or removal of a watercourse crossing, by a road, pipeline or telecommunications line; and any activities related to the placement, construction installation, maintenance, replacement, or removal of it. The Code establishes standards to ensure that any disturbance or impact to the environment that occurs as a result of the placement, maintenance, or removal of a watercourse crossing is minimized. This Code would apply, therefore, if a crossing structure were to be used for any water bodies entering or crossing the Property. Appropriate mitigation measures would need to be taken in respect to crossing any drainage course. If a project were to entail a crossing over a permanent watercourse, the appropriate mitigation would need to be incorporated into the design, and Alberta Environment would need to be notified as per the requirements of the Code.

3.4 Municipal Government

Most Municipal Government bodies in Alberta now require that a Biophysical Assessment and/or Environmental Impact Assessment or the equivalent be done prior to subdivision of land, and before the completion of an ASP or other site-specific development plan. One of the purposes of this Assessment is to provide a specific assessment process for dedication of Environmental Reserve, Municipal Reserve and Conservation Easement based on municipal, community and environmental needs. In addition, it makes recommendations as to how to avoid, minimize or control adverse effects on the existing environment resulting from the development, if it is to proceed, and how to incorporate the principles of sustainability in designing and constructing the development.

This report should address both the City and the County of Wetaskiwin requirements for a Biophysical Assessment. The investigation also compiles information that would be useful for regulatory determinations under the *Water Act,* the *Public Lands* Act and other applicable acts and policies as outlined above.

4.0 CURRENT AND HISTORICAL LAND USE

4.1 Site Visit

A site visit was completed in October, 2014 by Melinda McLauchlin of MCA Environmental Management. Observations were made from the road side on the west and south borders of the property. The site is bounded on the east by Agricultural lands, township road 463 to the south and further south agricultural land. To the west is 36 Street which is the Wetaskiwin city boundary, beyond which is serviced commercial industrial lots. To the north are the city sewage lagoons which appear to be located on County lands. All development on the west side of 36 Street is commercial industrial and fully serviced. The extent of the city limits is 36 Street.

The site currently appears to be in use as agricultural land. There were no structures or storage of materials or equipment noted on site.

4.2 Historical Aerial Photo Review

A random sample of historical aerial photos was selected for examination based on the best available scale, variation in the time of year, and level of coverage. The earliest photo on file at ASRD was 1949 and the most recent was from 2007. An aerial photo from New West Geomatics was examined from 2012 as well. The following paragraphs provide a summary of relevant site observations. A table of the aerial photo review is provided as Table 1.0.

The sewage lagoons located north of the site were first observed on aerial photos in 1954. Construction had to have occurred between 1949 when the site was undeveloped and 1954, when construction appears complete and the cells appear fully functional. At that time the lagoons consisted of three small cells and two large cells as in Figure 4 below.

Figure 4: Sewage lagoons north of the site in 1954.

By 1975 north of the NW corner of the site shows the addition of four cells to the lagoon system. The central portion of the site to the north is still undeveloped. By 1983 the lagoon system has expanded to include an additional three larger cells and the first signs of a significant wet area in the north central portion of the subject

site are visible. This wet area could indicate sub surface leakage from the lagoon to the north or simply an area of low relief where surface water tends to pool as a result of drainage from the south, north and east of the property.

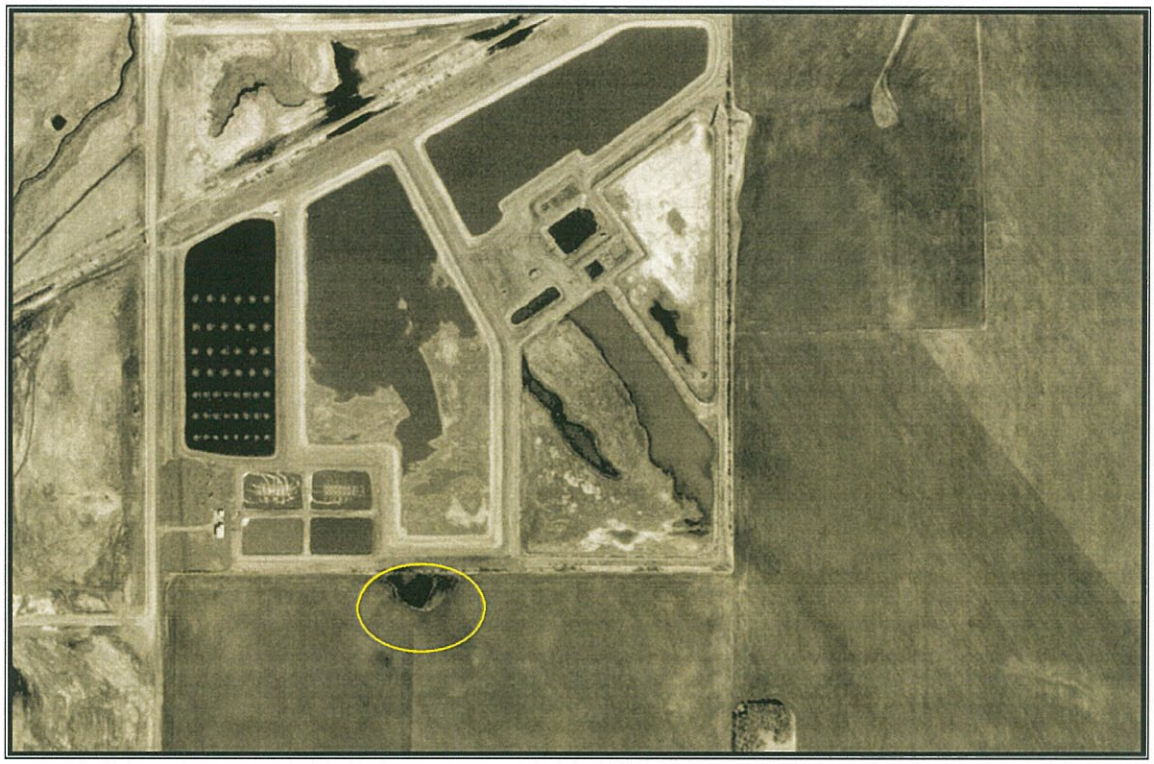

Figure 5: Poor drainage evident at the north boundary of the site in May 1983.

Subsequent aerial photos from 1989 through to 2007 fail to demonstrate a wet area in this location. As noted in section 5.1 it does not appear that there is a relationship between the poor drainage and higher than usual precipitation during any given year. The wet area is again visible in 2011 (figure 2).

Table 1: Aerial Photo Review

Year	Observations	Scale
1949	No time of year indicated but leaves are visible (Summer) Quarter appears fully cleared and cultivated with some growth. Farm located to the south east. There is an east west road fully developed on the south end of the property. Small wetland in the north east of the quarter and a small rectangle on the northwest appears to have a wet area as well. A possible low area in the north central portion of the quarter may explain why there appears to be higher vegetation in this location (Figure 3 upper). The majority of the site appears clear and well drained.	1:40,000
1954	No time of year indicated but leaves are visible (Summer) Sewage lagoon to the north has two large cells and three smaller holding ponds in the north east corner. On site the small rectangle on the northwest is still undeveloped and trees are evident. The rest of the quarter appears completely cultivated.	1:40,000

Year	Observations	Scale
1970	(June) Site is fully cultivated (seeded) but part of the north end of the site is not fully visible.	1:6,000
1975	(Sept) Further sewage lagoon cell development on the south west portion of the quarter to the north.	1:25,000
1983	(date on photo reads May 11, 1983, leaves are visible) Site is cultivated. First obvious signs of wet area in the north central portion of the site.	1:40,000
1989	(date on photo reads June 13, 1989. Leaves are visible and crop is growing) Site is still cultivated. Wet area at the north end near lagoons is still evident and appears to be un-cultivated.	1:20,000
1998	(date on photo reads Oct 22, 1998) There are rows of round bales visible. No sign of wet area in the north anymore.	1:30,000
2001	(August) Fully cultivated. No signs of wet area.	1:20,000
2007	No time of year indicated. Fully cultivated. Likely mid-summer due to vegetation on site. No signs of wet area.	1:40,000
2012	(image from New West Geomatics) Site appears fully cultivated but with no field growth visible so it is likely early spring (May). Wet area in the north end of the site is visible and appears more extensive than in 1983 aerial photo image.	1:2,000

Aerial photos reveal that the site has been cultivated since prior to 1949. The low area at the north central portion of the site is likely a natural depression with a history of intermittent poor drainage over the years. Observations also seem to indicate that the area is wetter during the spring than in the fall. It is difficult to ascertain however why the wet area appears to have expanded in more recent years.

5.0 THE EXISTING ENVIRONMENT

5.1 CLIMATE AND AIR QUALITY

The proposed development site lies in the Parkland, Central Parkland Sub-Region of Central Alberta (Alberta Environmental Protection, 2006 Natural Regions and Sub-Regions of Alberta (map).

The climate is sub-humid, continental with short, cool summers and long, cold winters. The mean May - September temperature within the Sub-Region is about 13° C and the growing period is about 80 - 90 days Annual precipitation averages about 441 mm with June and July the wettest months. Winters provide approximately 100 mm of precipitation.

Climatic data from Environment Canada was compiled for the 22 year period, 1985 to 2007, from the nearest Station called Wetaskiwin South.

Aerial photos from 1983 in May show a wet area in the north central portion of the site, there is however no historical data on file to compare higher than usual precipitation to the image. In June of 1989 the wet area is

visible still and total precipitation was recorded as 512.2 mm. Compared to the year previous (553mm) and the following year (543mm) this was not a significant amount of precipitation. A review of aerial photos from subsequent years fail to show this wet area until the most recent aerial photos 2012, as presented in Appendix B, where it is again visible and appears more extensive than in 1983.

Agricultural related industrial activities are likely the predominate source of local emissions. Higher particulate air quality levels may occur on a temporary basis as a result of agricultural and industrial (e.g., construction, road dust, fires) activity. Vehicle exhaust fumes may be another source of minor air pollution, given the proximity to populated areas and roads.

5.2 PHYSIOGRAPHY AND TOPOGRAPHY

Dominant Landforms of the Central Parkland region include level to gently undulating plains underlain by glacial till. The central parkland region is one the most productive agricultural lands in the province due to the combination of precipitation, growing days and soil type.

The land on which the Property is located presents a gently sloped property with very little variation in elevation notable across the site. The land is normally under cultivation. The land to the north of the subject site, where the sewage lagoon is located, appears to have been lower in natural elevation however, the lagoons appear to be elevated and built with a berm around them as would be expected with the design of the system. Contours on the topographic mapsheets show contours lower to the northwest, and higher to the south east end of the property. This topography indicates that natural drainage patterns on the subject property will likely flow to the north and west and would be interrupted by the presence of the berms around the lagoons.

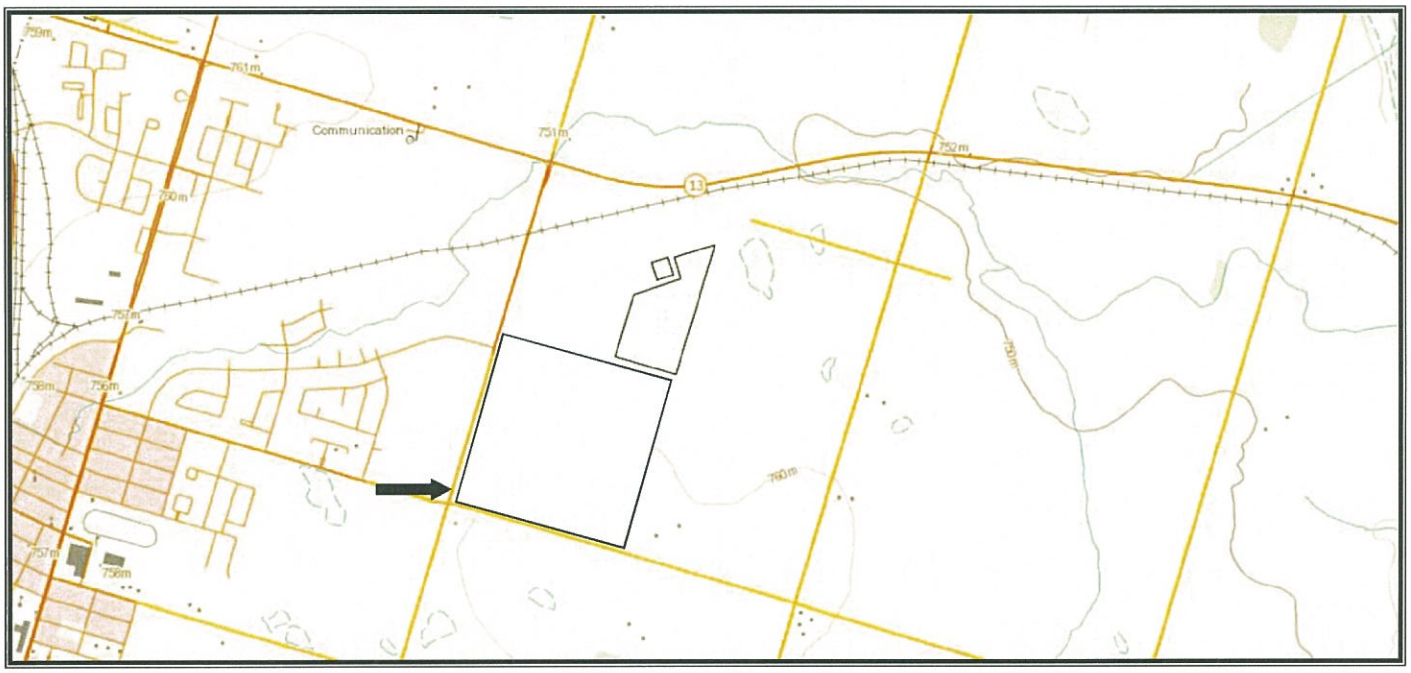

Figure 6 : *Topography of the study area (NTS Map sheet 83). Arrow shows subject site.*

On site topography was recently confirmed through a survey completed by New West Geomatics. The site surveys indicate drainage is toward the north and northwest towards areas of lower elevation on site. Water pools in the north central portion of the site where lowest elevations are recorded. A copy of the survey figures is contained in Appendix B.

5.3 GOLOGY AND SOILS

Surficial materials are dominantly medium to moderately fine textured, moderately calcareous glacial till that may be a thin (less than 2 m) blanket over bedrock in some of the low-relief plains. In the eastern part of the Natural Subregion, about 15 percent of the area is covered by glaciolacustrine and glaciofluvial sediments occurring as inclusions within the till plains.

Based on published information Native soil on site are expected to consist of eluviated black chernozem. The AGRISID database search was completed for the parcel of land. The database listed the site as polygon 14526 MMWk1/U1I. This indicates the site is undulating with low relief and limited slope. The land suitability rating is listed as 2H(8) – 2W(2) which indicates the site is 80% class 2 soils sub-class H, and 20% class 2 sub-class W. As mentioned previously the soils on site are considered productive for agricultural land.

5.4 SURFACE WATER

5.4.1 Drainage Patterns on the Property

Surface water drainage on site appears to follow topographic contours directing overland flows toward the north central portion of the site. Elevated areas on the north and east borders of the site directs surface water from these areas to the west and north end of the site. A topographic map sheet provides an overview of the contours on site prior to full build out of the sewage lagoons in Figure 4. The figure demonstrates that the majority of overland flows from the site were historically expected to flow north towards the sewage lagoon and more generally west.

In examining the contour data provided by New West Geomatics (Appendix B), the quarter section, as is the case with most undeveloped parcels of land is impacted by imperfect drainage. From the recent contour data it appears that generally the surface drainage flows in a south to north westerly direction. This flow appears to be in keeping with the direction of drainage observed on the 1:50:000 NTS topographic mapsheets. In addition, there are a series of small depressional areas throughout the quarter section which may retain surface runoff during significant rainfall events.

In reviewing historical aerial photos, from 1949 prior to construction of the waste water lagoon system, it appears that the low area on site may have been evident prior to the development of the sewage lagoon, due to the density of vegetation in this particular area (Figure 3 upper image). The construction of the berm around the sewage lagoon may have contributed somewhat to the poor drainage of the area blocking natural flow of surface runoff and potentially contributing more as a result of the elevated berm. Aerial photo interpretation over time reveals wet periods and dry spells in this area along the north boundary of the site. The wetter images appear to be from the spring and the dryer images from later in the summer.

Recent aerial photography combined with point elevations confirms the existence of this natural depression referenced above. Whether the natural drainage pattern appears to have been interrupted with the construction of the waste water lagoon system, is seasonal in nature or is being impacted by sub-surface leakage from the lagoon to the north should be evaluated.

In addition, recent and current aerial photography identify the existence of the standing water on the north boundary of the parcel with far more regularity.

This may be the result of several factors notwithstanding that:

1) The interruption of the natural drainage pattern through the quarter in which the waste water lagoon system is located is impacting the parcel;

2) An anomaly such as an increase in additional water (either surface runoff or waste water) to the area and the subsurface as a result of construction and recent repairs to the waste water lagoons.

Further investigation should be undertaken to determine the source of the water which is ponding in along north boundary of the parcel and remedial action taken to correct this anomaly.

The low area in the north central part of the site does not support good drainage to the west and appears to cause surface water to pool in this location during certain times of the year and may be influenced by precipitation (Note: a direct correlation to the past precipitation events has not been confirmed).

5.4.2 Drainage Patterns in the Vicinity of the Property

The closest mapped water body within 5 km of the site is Huard Lake, located approximately 3 km to the north. Based on a review of elevations on the topographic map sheet for the area it appears that the general regional trend of surface water drainage is to the north and east of the subject site towards Coal Lake. Highway 13 shows a definite drop in elevation as it moves east from Wetaskiwin. This tends to be reflected in the contours on the map sheet of the area as well.

5.5 Vegetation Communities

The Biophysical Assessment was conducted in part to describe and interpret vegetation communities as they existed at the time of the field reconnaissance, which took place in late October 2014. Most species of plants are visible and identifiable at that time of year but because they are not in flower some may have been missed. In some cases, while the genus of the plant was recognized, it may not have been possible to identify it to species. Where this was the case, there still remained little question of the plant's endangered, at risk, of threatened status, due to the location of the vegetation adjacent a busy road way which is not a favoured habitat of any species at risk in this region.

This section provides a description of the vegetation communities that were observed on the site in the field reconnaissance, preceded by a general description of vegetation in a regional context.

5.5.1 Regional Context

The Property being assessed is located within the Central Parkland sub-region of the Parkland Ecological Region. In this sub-region, agricultural annual crop land is successful due to warm temperatures and long growing season with adequate rainfall. Only about 5% of the Central parkland sub region remains in native vegetation due primarily to the highly productive agricultural productivity of the soil. This site in particular has been in used for crops since earliest review of aerial photos in 1949. Due to the prolonged use of the area as agricultural lands there is very little diversity in vegetation across the site.

5.5.2 Site Context

The following basic types of vegetation community were observed on the study site:

- Agriculture, hay or straw, ditches with various grasses and weeds.

A vegetation map of the site was not produced due to the lack of variation across the property.

5.5.3 Wetlands and Other Water bodies

No wetlands were observed on the Property during the site visit. There is an area of low relief in the north central portion of the site where it appears surface water periodically collects and pools. The vegetation on site did not present wetland species.

5.6 WILDLIFE

5.6.1 Regional Context

The subject Property is located in the Central Parklands sub-region of Alberta. Bird species typically inhabiting grassed flatlands in the Central Parkland area include,

The richest fauna is to be found in riparian mixed woods and scrublands associated with swamps, ponds, streams and lakes. Some species, such as Yellow Warbler, Black-And-White Warblers, American Redstart, Song Sparrow, Northern Water Thrush, Fox Sparrow and Philadelphia Vireo are mostly restricted to these sites.

Throughout the Boreal Forest Natural Region, typical, widespread mammals include beaver, muskrat, moose, varying hare, black bear, wolf, lynx, red-backed vole, various species of shrew, deer mouse, least chipmunk, red squirrel and ermine. Others, such as fisher, wolverine, river otter, and woodland caribou, are less common and locally distributed.

The animals of the Central Parkland Sub region are a mix of elements of the Northern Fescue Sub region and the boreal mixed wood Sub regions. At the southern edge of the Sub region, grassland species such as upland sandpiper, Sprague's pipit and Baird's sparrow occur but become less common further north. Along the northern boundary, boreal forest species such as broad-winged hawk and rose-breasted grosbeak are more common. Franklin's ground squirrel and piping plover range primarily in this Sub region. Species characteristic of forested uplands include Red-Eyed Vireo, Red-Tailed Hawk, Least Flycatcher, Baltimore Oriole, Yellow Warbler, white-tailed deer, American porcupine, northern pocket-gopher and snowshoe hare. Due to the proximity of the site to the city boundary combined with the ongoing agricultural use of the land there is little evidence of wildlife movement across the area.

5.7 BIODIVERSITY

5.7.1 Species Richness

The site comprises a singular block of land that provides little variation in setting. While site observations were made in October there is no reason to believe that there would be different perspective during the growing season as the entire site is dedicated to agriculture. The only variation in vegetation presents in the ditches on the south and west boundaries where it is possible for weeds and native species alike to thrive.

5.7.2 Species at Risk

No rare, threatened or endangered species of plants or animals were observed during the field surveys.

A database search for rare, endangered or listed species by the Alberta Conservation Information Management System (ACIMS) was requested for the section on which this Property is located. In its response, ACIMS stated that there were no sensitive occurrences in the study area.

No provincially protected areas (PPA's) were returned by the inquiry.

In respect to animal species, no reported occurrences were received from the ACIMS enquiry. This information indicates that the site has little potential to provide habitat for sensitive species.

5.7.3 Threats to Biodiversity

In general, disturbance to, or loss of undisturbed vegetation translates into loss of ecological habitat niches, resulting in a decline in biodiversity. The more sensitive and the less resilient the predominant vegetation community is, the greater the risk of biodiversity loss in a given area. Due to the use of the site for agricultural purposes the site offers little biodiversity and therefore clearing activities on this site are less likely to contribute threats to biodiversity.

Some of the activities that could result in a decline in biodiversity adjacent the site are the following:

- Soil erosion and instability;
- Weed infestations; and
- Changes in runoff patterns, which could affect trees and other vegetation through desiccation or flooding.

5.8 SUSTAINABILITY

In determining whether an ecosystem is likely to be sustainable over the long term, some of the important factors to consider include the size of the system (e.g., the length and width of a stand of trees), the health and sensitivity of the soil, slope angles and aspect, soil drainage and supply of moisture, the depth of the water table and supply of groundwater, and the exposure and susceptibility of the system to the extremes of weather. Due to the ongoing use of the site for agricultural purposes there is little opportunity for a sustainable ecosystem to exist.

The key concern in future development will be to design storm water management plans for the developed area such that post-development surface water flows are approximately similar in flow rates and periodicity to what was prevalent in the pre-development condition.

5.9 ECOLOGICAL LINKAGES

In the central parkland ecological region, ecological connectivity has been impacted by the extensive agricultural land uses. Linkages that do exist rely mainly on forested areas, river and creek valleys which provide visual and thermal cover for many forms of wildlife, as well as nutritional support. Moose and deer, for example, move readily along corridors of forest, because it provides them with visual cover from predators, as well as providing them with a source of food in the form of leafy vegetation. Although they venture out into the open to travel or to access other sources of food, deer prefer to stay within about 180 m of forest cover. Extensive forest areas, therefore, serve as movement corridors for these animals.

Similarly, birds use forest corridors for habitat, visual and thermal cover and the acquisition of food, and because they can fly, easily disperse among patches of forest on the landscape. Mammalian wildlife such as moose, deer, coyotes, furbearers and even amphibians, also use patches of treed areas to disperse with greater safety. These adjacent patches are referred to as "stepping stones", while long bands of forest are called "corridors". Patches of forest that is sufficiently large to support all of the life-cycle activities of animals are referred to as "core" habitats.

Wetland habitats are also important as stepping stones to habitat with secure brood water. Generally, smaller temporary wetlands are used by waterfowl to disperse pairs into nesting habitat on the landscape, thereby maximizing breeding opportunity. However, after nests have hatched broods are often moved to more secure water until young have fledged.

Amphibians, generally, require upland sites in which to feed and over-winter, but must return to water to reproduce. The distance between wetlands or other waterbodies, and suitable undisturbed upland sites becomes critical when land developments threaten amphibian habitats of one type or another.

In the broader context, aerial photos of the property and surrounding lands as they appeared in 1949 and 2007, shown in Figure 3 respectively, indicate that the wet area identified in some of the other aerial photos is periodic in nature and has not shown the potential to offer sustainable ecological settings or linkages to adjacent areas.

5.10 Mapped and Classed Waterbodies in the Area

The Alberta Environment classification system for waterbodies in Alberta is based generally on the abundance and quality of fish habitat. Class A is the highest priority class, and class D is the lowest (except for "unmapped" watercourses which are not shown on the maps at all). Any mapped waterbody must follow the Code of Practice for Watercourse Crossings, which falls under the Alberta *Water Act*. Any classed waterbody must also observe a Restricted Activity Period specified for it, for conducting in-stream construction or related activities.

The only mapped waterbody within 5 km of the site is Huard Lake, which is 3 km north of the subject site. There is an (unmapped) tributary to Coal Lake which is as close as 1 km north of the site. The tributary is a class D with no restrictions.

6.0 RECOMMENDATIONS

The following recommendations are put forward for consideration in the possible development of industrial at the site, for design, construction and post-construction phases.

6.1 Industrial Subdivision Design

- To the extent feasible, the natural contours of the land should be considered in order to conserve the natural drainage patterns and flows, and to moderate storm water drainage patterns, thus damping out extremes of overland flow, avoiding erosion and promoting the settling of solid particulate matter.

- Gradual slopes and vegetated swales should be incorporated in the contouring and landscaping of the development in the flat areas surrounding the lagoon. By slowing down the runoff, this provides more opportunity for particulate matter to settle, and nutrients to be removed.

6.2 Opportunities for Habitat Conservation

- Due to the relative absence of habitat on site there is little requirement for the preservation of habitat. Opportunities to enhance habitat can be taken through the addition of trees as part of site restoration and landscaping efforts.

- Invasive weedy plants should be prevented upon construction completion through the use of re-vegetation strategies where applicable. The use of native grasses will reduce future management requirements if pursued immediately upon construction completion.

6.3 Surface Water and Groundwater

- A master drainage plan as per the Storm water Management Guidelines for the Province of Alberta would be beneficial as part of the overall storm water surface water management plan for any developed area on the Property. The plan should aim at maintaining overland runoff at approximately pre-development conditions, to reduce the risk of flood as a result of altered runoff patterns. Consideration of changing weather systems as a result of climate change should be incorporated into future designs. This may require anticipation of major rainfall events and impacts on surface water drainage.

- The facility should be designed to achieve effective settlement of suspended solids in accordance with the current Alberta Environment guidelines (see above). Otherwise, discharge points from the ditches should be into a vegetated or other area where energy dissipation will occur, or the equivalent, in order to prevent local erosion. Where necessary, roads and their ditches should have flow-limiting structures (e.g., ditch blocks) along sloped stretches so that water draining off or along them does not cause erosion.

- Surface paving should be minimized, other than what is necessary for transportation, parking and other infrastructure in order to maintain permeability and thus groundwater re-charge.

- Where excavated, topsoil should be conserved and stockpiled with protection from wind and water erosion, and then replaced after construction, being careful not to mix topsoil and subsoil layers.

- Where any clearing or earthworks are necessary, strict erosion control and reclamation measures should be taken. Contouring should avoid significantly increasing the angle of slopes, such as would lead to erosion ar instability.

- In order to conserve water landscaping should be completed through the use of native, drought-tolerant plants. This will help avoid the need to water plants and reduce the need to use chemical fertilizers.

6.4 Hazards, Wastes and Disturbances

- No hazards, wastes or other disturbances were observed on or around the subject property.

6.5 Environmental Sustainability and Community Participation

- The use of fixtures that reduce light pollution, especially avoiding projecting light into natural areas. Fixture design and placement should ensure that most of the light produced should be projected downwards, rather than laterally into the surrounding environment. The use of long wavelength bulbs should be encouraged, as they have less impact on wildlife.

- Industrial developments should be encouraged to install windows that are highly visible in buildings in order to reduce the risk of birds striking windows.

6.6 Ecological Linkages

No ecological linkages were evident on the site.

7.0 CONCLUSIONS

Due to the agricultural activities on site, the property presents a lack of biological diversity with poor range of habitat available for plant and animal species. There were no indications of potential species at risk on site, and the area provides little in the way of ecological linkages with adjacent properties that could be considered valuable to the property.

The pooling water near the north end of the site should be examined in detail to determine whether it is a function of surface water drainage, flow and direction on site or if there is a possible sub-surface influence from the sewage lagoon to the north.

The area has been subject to wet periods over time however, no classified wetland was observed in this area or elsewhere on site.

The subject property has been in use for agricultural purposes since at least 1949 and consists of productive agricultural land in the form of a class 2 soil. While there are no specific limitations related to the development of the land for wildlife habitat, regulators and the developer will likely recognize that development of the site will result in a decrease to local productive agricultural land. This can be considered a common consequence of city expansion to adjacent properties.

Recommendations for future studies prior to the development of the land include the following.

- Discuss the potential for sub-surface leakage from sewage lagoon to the north through inquiries with the City of Wetaskiwin.
- Master drainage plan and erosion control strategies
- Fire prevention and control strategies
- Site hazard management planning

These recommendations are not intended to be exclusive. Regulators may have additional requirements not listed here. Reference should be made to the recommendations provided in this report along with various other planning tools during future site development including the inter-municipal Development Plan.

We trust this report meets with your current requirements. Should you have any questions or concerns please contact the undersigned.

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Climate and weather, Government of Canada Weather Stations

LIMITATIONS

This report has been prepared for the exclusive use of Mumco Properties Ltd. and its consultants or client relative to the proposed project described in the report. It may not be used or relied upon in any manner whatsoever, or for any purpose whatsoever, by any other party. The Consultant makes no representation of fact or opinion of any nature whatsoever to any person or entity other than the company, organization or individual to whom this report is addressed.

MCA Environmental Management denies any liability whatsoever to other parties who may obtain access to this report for any injury, loss or damage suffered by such parties arising from their use of, or reliance upon, this report or any of its contents without the express written consent of the author and the client.

Subject to the following conditions and limitations, the investigation described in this report has been conducted in a manner consistent with a reasonable level of care and skill normally exercised by members of the environmental consulting profession currently practicing under similar conditions in the area.

The investigation described in this report has been limited to the scope of work described in the MCA Environmental Management proposal submitted August 2014 and the contract between MCA Environmental Management and Mr. Glen Mumey of the client group in October, 2014.

The investigation described in this report has been limited to the extent that the steps of doing a field reconnaissance were done at only one time of the year (October). Features such as plants and wildlife, and water flows, are different at different times of the year, and will have variations from season to season and from year to year. To determine the entire assemblage of plants and wildlife that would frequent the study site, it would be necessary to conduct field surveys during the spring, early summer and late summer months. The plant and animal species identified in this study included those that can be inferred to use the site, based on its location and vegetation communities, and based on past experience in other investigations. The drainage map in this report was developed from visual observations and a contour map. The outlines depicted in the report, of vegetation areas and other features are intended to be approximations only.

The possibility of contamination from past activities on the property, or other public safety risks, was not assessed in this investigation. This would more appropriately fit into the scope of a Phase 1 Environmental Site Assessment.

APPENDICIES

APPENDIX A: SITE PHOTOGRAPHS

APPENDIX A: Site Photos

Photo 1: Looking north from the South East.

Photo 2: Looking northwest from the South East.

Photo 3: Looking east from the northwest.

Photo 4: Looking south east from the northwest.

Photo 5: Looking north from the northwest.

Photo 6: Looking north west (36 Street) from the northwest corner of the property.

Photo 7: Looking west from the northwest corner of the property.

Photo 8: Looking south from the northwest corner of the property.

APPENDIX B: SITE SURVEYS

N

GENERAL NOTES

LEGEND:

NOTES:

1. This plan is based on:
   Vertical Datum - CGVD 28 (Canadian Geodetic Vertical Datum 1928)
   Horizontal Datum - North American Datum 1983(original)
   Projection - Universal Transverse Mercator
2. Distances shown are in metres and decimals thereof (grid).

REVISIONS

NO	DATE	DESCRIPTION
0	2014/11/26	ISSUED

PROJECT

MUMECO PROPERTIES LTD.

DRAWING

PLAN SHOWING TOPOGRAPHIC DETAILS
WITHIN THE S.W. 1/4 OF SEC. 19-46-23-4
COUNTY OF WETASKIWIN NO. 10

DESIGN	—	PROJECT NO. 14-0344	DRAWING NO 14-0344A
DRAWN	PH		
CHECKED	—	DATE NOVEMBER 26, 2014	REVISION 0
APPROVED	—	SCALE 1:2000	

NEW WEST GEOMATICS

N

GENERAL NOTES

LEGEND:

NOTES:

1. This plan is based on:
   Vertical Datum - CGVD 28 (Canadian Geodetic Vertical Datum 1928)
   Horizontal Datum - North American Datum 1983(original)
   Projection - Universal Transverse Mercator
2. Distances shown are in metres and decimals thereof (grid).

REVISIONS

NO	DATE	DESCRIPTION
0	2014/11/26	ISSUED

PROJECT

MUMECO PROPERTIES LTD.

DRAWING

PLAN SHOWING TOPOGRAPHIC DETAILS
WITHIN THE S.W. 1/4 OF SEC. 19-46-23-4
COUNTY OF WETASKIWIN NO. 10

DESIGN	—	PROJECT NO. 14-0344	DRAWING NO. 14-0344A
DRAWN	PH		
CHECKED	—	DATE: NOVEMBER 26, 2014	REVISION 0
APPROVED	—	SCALE: 1:2000	

NEW WEST GEOMATICS

"PRELIMINARY GEOTECHNICAL ASSESSMENT"

S.W. 19-46-23-4

PREPARED BY

LEVELTON CONSULTANTS LTD.

APPENDIX 'B'

December 2014

LEVELTON

Mumeco Properties Ltd., c/o Wescott Consulting Group

SW ¼ 19-46-23 W4M, County of Wetaskiwin, AB

Preliminary Geotechnical Assessment

Submitted by:
LEVELTON CONSULTANTS LTD.

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Submitted to:
MUMECO PROPERTIES LTD.,
c/o WESCOTT CONSULTING GROUP
28 Cougarstone Common SW
Calgary, AB T3H 5P5

Attention: Mr. Robert Wescott, AICP

December 22, 2014

File: R714-1823-00

TABLE OF CONTENTS

List of Tables

1 INTRODUCTION

This report presents the results of a preliminary geotechnical assessment undertaken by Levelton Consultants Ltd. (Levelton) as requested by Wescott Consulting Group (Westcott) on behalf of Mumeco Properties Ltd. (Mumeco) for the site referenced in the title block of this report located in the County of Wetaskiwin. It has been prepared on the basis of the scope of work agreed upon in the Levelton proposal P714-2401-00, dated October 15, 2014. Written authorization to proceed with the scope of work was provided to Levelton by Mumeco on October 20, 2014.

2 BACKGROUND

We understand that a preliminary geotechnical assessment is required for the project site to provide general geotechnical information on potential development and construction constraints to assist in the preparation of a comprehensive area structure plan.

We were provided with the following information at the time of the preliminary geotechnical assessment:

- Plan map (Map 3) showing the subject quarter section (no date); and
- Two topographic maps (Drawing no. 14-0344A), dated November 2014.

3 SITE AND PROJECT DESCRIPTION

The project site encompasses about 64.7 hectares (160 acres). The legal description of the site is SW ¼ 19-46-23 W4M. The site is bounded by 36 Street to the west, 56 Avenue to the south, an undeveloped quarter section to the east, and a Waste Water Treatment Facility to the north.

The site is currently undeveloped, vacant and gently undulating with no treed areas.

Based on our conversations with Westcott, we understand that the preliminary plan is to develop the site with industrial buildings. No detailed development plans for the site are available at this time.

Based on background information, we understand that considerable earth moving operations would be associated with the final design of the site and the quality of the on-site material and suitability as fill will need to be characterized for future use.

4 DESKTOP STUDY

4.1 REVIEW OF SURFICIAL GEOLOGY

The review of Alberta Geological Survey Map 601, *Surficial Geology of Alberta,* published in 2013 indicated that the site surficial geology may comprise of *glaciolacustrine* deposits:

"...sediments deposited in or along the margins of glacial lakes; includes a) offshore sediment; rhythmically laminated to massive fine sand, silt, and clay, locally containing debris released by the melting of floating ice; and b) littoral (nearshore) sediments; massive to stratified, well-sorted silty sand, pebbly sand, and minor gravel; occurs in beaches, bars, and deltas."

4.2 REVIEW OF BEDROCK GEOLOGY

The review of Alberta Geological Survey Map 600, *Bedrock Geology of Alberta,* published in 2013 indicated that the site bedrock geology may consists of *Horseshoe Canyon Formation:*

"...pale grey, fine to very fine grained, feldspathic sandstone interbedded with siltstone, bentonitic mudstone, carbonaceous mudstone, concretionary sideritic layers, and laterally continuous coal seams; includes white, pedogenically altered sandstone and mudstone interval at top (formerly assigned to the Whitemud Formation); nonmarine to locally marginal marine."

5 GEOTECHNICAL INVESTIGATION

5.1 FIELD DRILLING AND SOIL SAMPLING

Field drilling was carried out on November 06, 2014 using a truck mounted drill rig owned and operated by All Service Drilling Inc. Soil sampling and logging of the various soil strata encountered in the boreholes during field drilling was conducted by Levelton.

A total of 9 boreholes (BH14-01 to BH14-09) were drilled on the site. The boreholes were staggered relatively evenly across the site. The approximate depths of the boreholes extended to 7.2 metres below ground surface (mbgs).

The soil conditions encountered during drilling were described visually in accordance with the *Modified Unified Soil Classification System*. A Google map showing approximate borehole locations, based on GPS coordinates recorded during the field work is attached as Figure 1, in Appendix A.

Soil samples were collected from the split spoon sampler as well as from the auger flights at select depth intervals from all boreholes. In addition, Standard Penetration Testing (SPT) were conducted in all boreholes at select depths to obtain an indication of soil consistency/compactness. Pocket penetrometer (PP) readings were taken on intact cohesive soil samples to obtain an indication of soil unconfined compressive strengths. Field test results are contained in the borehole records in Appendix B.

The groundwater conditions were monitored during drilling. In addition, standpipes were installed in all of the boreholes to allow monitoring of long-term groundwater conditions.

5.2 LABORATORY TEST PROGRAMS

Laboratory testing was carried out on selected soil samples and included:

- 84 in-situ moisture contents (ASTM D2216);
- 4 Atterberg limit tests (ASTM D4318);
- 9 particle size analyses (ASTM D422); and
- 4 water soluble sulphate content tests.

The laboratory test results are included in Appendix C and are presented in the borehole records in Appendix B.

The moisture contents and Atterberg limits are also summarized in Section 6 for soil layers encountered. The results of water soluble sulphate content tests are also summarized in Section 9.

6 SUBSURFACE CONDITIONS

6.1 SUBSURFACE SOIL LAYERS

The general soil profile at the borehole locations consisted of a surficial topsoil layer over clay overlying sand which extended to the terminus depths of the all boreholes. Relevant descriptions of the soil layers are given in the following sections.

6.1.1 Topsoil

Topsoil was encountered at the ground surface in all boreholes except borehole BH14-02. The thickness of topsoil ranged from about 0.275 to 0.4 m. It was described as loose, black and moist.

6.1.2 Clay

Clay was encountered below the topsoil in all boreholes except the borehole BH14-02 where it was encountered at the surface. It extended to the depth of about 3.75 to 4.25 mbgs in boreholes BH14-01, BH14-02, BH14-03, BH14-05, BH14-06 and BH14-07 and termination depths of boreholes BH14-04, BH14-08 and BH14-09. Sand layer embedded within the clay deposits was encountered in boreholes BH14-04 and BH14-09. Clay was described as firm to hard, dark brown to grey, sandy to some sand, some silt to silty, trace fine grained gravel, trace coal specks, medium plastic and moist. Frequent sand and coal seams and coarse grained gravel were also encountered within clay deposits. Laboratory and field test results on this soil layer are summarized below in Table 1.

Table 1 Properties of Clay

Test		Range
Pocket Penetrometer (kPa)		75 to 450
Standard Penetration Test (SPT) Blow Count		7 to 44
In-situ Moisture Content (%)		13 to 35
Liquid Limit (%)		34 to 36
Plastic Limit (%)		19 to 20
Grain Size Analysis	Silt (%)	18.6 to 40.6
	Clay (%)	59.4 to 81.4

6.1.3 Sand

Sand was encountered below the clay deposit in boreholes BH14-01, BH14-02, BH14-03, BH14-05, BH14-06 and BH14-07 and extended to the termination depth of the boreholes. Sand was also encountered in boreholes BH14-04 and BH14-09 embedded within the clay deposits. It was described as compact to very dense, yellowish to reddish brown, clayey to some clay, silty to some silt, trace fine to medium course grained and moist to wet. Laboratory and field test results on this soil layer are summarized below in Table 2.

At or near the bottom depths in boreholes BH14-01, BH14-02, BH14-03 and BH14-05 the sand layer appeared to transition to severely weathered sandstone bedrock. Based upon published geological information we expect competent sandstone bedrock to be present at depth. The presence of bedrock at the site can be confirmed by completing a detailed geotechnical investigation by rock core drilling, if required, to properly classify rock weathering, rock name, strength, discontinuities, etc.

Table 2 Properties of Sand

Test		Range
Standard Penetration Test (SPT) Blow Count		21 to >50
In-situ Moisture Content (%)		15.5 to 28.2
Grain Size Analysis	Gravel (%)	3.6 to 9.2
	Sand (%)	36.7 to 78.8
	Silt (%)	19.7 to 26.5
	Clay (%)	10.2 to 39.4

6.2 Groundwater Conditions

Groundwater conditions were observed during drilling and approximately 35 days after drilling. A summary of the groundwater conditions is presented in Table 4.

Table 3 Summary of Groundwater Observations

Borehole Number	Depth of Water Seepage (mbgs)	Depth of Sloughing (mbgs)	Groundwater Level (mbgs)	
			At End of Drilling Nov. 06, 2014	December 11, 2014
BH14-01	5.55	No	Dry	5.0
BH14-02	No	No	6.3	3.9
BH14-03	5.7	No	5.8	3.8
BH14-04	No	No	Dry	Dry
BH14-05	No	No	6.75	4.5
BH14-06	6.0	No	5.9	3.1
BH14-07	No	No	6.8	4.4
BH14-08	No	No	Dry	5.9
BH14-09	No	No	Dry	7.1

It should be recognized that the groundwater levels may fluctuate and may not be representative of long-term stabilized groundwater conditions. The above groundwater levels were measured at the end of each borehole drilling. Relatively stable groundwater levels from within the installed standpipes should be measured for detailed design purposes, after an adequate period of time to allow for equilibration of groundwater levels.

7 DISCUSSIONS AND RECOMMENDATIONS

This section of the report provides preliminary geotechnical engineering information for the project, based on our interpretation of the borehole information from Levelton's site investigation, available site geological information, as well as our understanding of the project requirements. The recommendations provided are intended as preliminary guidance for planning and design. Where comments are made on construction, they are provided to highlight aspects of construction that could affect the design of the project.

During the detailed design stage for this project, we recommend that additional detailed geotechnical assessments be completed to provide specific geotechnical commentary for and recommendations to address specific building, road and other structure developments on the site.

7.1 General Comments

Based on the results of this preliminary geotechnical assessment, the existing subsurface soil and groundwater conditions encountered at the borehole locations advanced over the project site can be considered favourable to generally support the preliminary plan to develop the site with industrial buildings. Given the subsurface soil and groundwater conditions encountered it is judged that building developments will have options to utilize both shallow and deep foundation systems for support.

Shallow foundations bearing on stiff to hard clay or dense to very dense sand or properly compacted engineered fill atop approved subgrade soils can be considered for building developments.

Deep pile foundations such as cast-in-place concrete or screw piles can also be considered for building developments. Very dense sand was encountered at depth below clay deposits towards the north, west and southwest sides of the site. As discussed, severely weathered sandstone bedrock may be present at the bottom of boreholes BH14-01, BH14-02, BH14-03 and BH14-05. Very dense sand may pose construction difficulties for the installation of pile foundations, in particular for end bearing piles with enlarged belled bases. Pile foundations designed to bear on bedrock should consider being socketed into bedrock.

7.2 Site Preparation And Grading

7.2.1 Removal of Unsuitable Materials

Topsoil was encountered in all boreholes except borehole BH14-02. Generally, unsuitable materials such as topsoil should be stripped off from proposed roads, utility corridors, and building development areas of the project site. The extent requirement to remove unsuitable materials from the site will need to be determined for specific sites by conducting detailed geotechnical assessments during the detailed design stage of this project.

7.2.2 Site Preparation

After removal of unsuitable materials, the subgrade should be scarified to a depth of 300 mm, moisture conditioned as needed, and re-compacted to a minimum of 98% Standard Proctor Maximum Dry Density (SPMDD) within 2% of its Optimum Moisture Contents (OMC).

7.2.3 Engineered Fill

For site grading, engineered fill can consist of the clay or the sand that were encountered in the boreholes advanced at the site. Generally, medium plastic clay or silty sand can be considered as engineered fill for site grading. Engineered fill should not be placed and compacted over frozen soil.

During the detailed design stage of this project we recommend that the suitability of any engineered fill be reviewed and approved prior to site use. We further recommend that full time review of fill placement and compaction testing be performed as part of site preparation during site grading for each specific site being developed. Site specific recommendations on engineered fill should be developed for areas where site filling exceeds 2.0 m as deeper fill regions may warrant special considerations for detailed design.

7.2.1 Excavations

Excavations should be properly designed and constructed by experienced contractors. The effects of construction equipment and stockpiling of excavated soils at the crest of excavations should be considered during the design of excavations.

As a minimum requirement, Part 32 and other applicable sections of the *Alberta Occupational Health and Safety Regulations (AOHSR)* shall be followed.

Care should be taken during excavations to avoid any exposed subgrades from becoming frozen, dried or softened. Water should not be allowed to pond directly on exposed subgrade soils as it can potentially soften the soil and reduce its bearing capacity. Site specific recommendations on excavation stability and protecting of any exposed excavation subgrades from softening or freezing can be provided by Levelton at the time of detailed design stage.

7.3 Preliminary Foundation Recommendations

Information provided in this section (Section 7.3 Preliminary Foundation Recommendations) are based on the soil and groundwater conditions that were encountered over the limited geotechnical boreholes that were advanced for this preliminary geotechnical assessment. Information provided below should be considered as preliminary. Lot and building specific detailed geotechnical assessments are recommended during the detailed design stage in order to provide detailed foundation recommendations.

7.3.1 Shallow Foundations

7.3.1.1 Square and Strip Footings

The use of strip and square footings placed on native clay and sand soils or properly compacted engineered fill atop approved subgrade can be considered for support of buildings. Based on borehole findings, un-factored ultimate bearing resistance of the clay soils for the design of footings would be in the range of 250 to 500 kPa for strip footings and 300 to 600 kPa for square footings.

Detailed recommendations on site specific bearing capacities for footings will need to be determined by conducting site and building specific, detailed geotechnical assessments during the detailed design stage of this project.

7.3.2 Deep Foundations

7.3.2.1 Cast-In-Place Concrete Piles

A foundation system of bored cast-in-place concrete piles placed into native clay and underlying sand soils can be considered for building developments. Based on borehole findings, un-factored ultimate resistance of the clay/ sand soils for the design of piles can be in the range of 36 to 52 kPa for skin friction and 650 to 1000 for end bearing.

Detailed recommendations on bearing capacities for cast-in-place concrete piles will need to be determined by conducting site and building specific, detailed geotechnical assessments during the detailed design stage of this project.

7.3.2.2 Screw/Helical Piles

Screw/helical piles placed into native clay and underlying sand soils can be considered for building developments. Based on borehole findings un-factored ultimate resistance of the clay/sand soils for the design of piles can be in the range of can be in the range of 36 to 52 kPa for skin friction and 550 to 1,000 kPa for end bearing.

Detailed recommendations on bearing capacities for screw/helical piles will need to be determined by conducting site and building specific, detailed geotechnical assessments during the detailed design stage of this project.

7.4 Frost Penetration Depth and Frost Protection

The empirical estimate of the expected maximum depth of frost penetration for clay at the subject site is about 2.5 m. The penetration depth is determined based on a freezing index for a 30-year return period of 1,450 degree-days Celsius. The depth of frost penetration assumes a uniform soil type with snow cover.

Unheated foundations should have minimum frost protection equivalent to a soil cover of at least 2.5 m. Rigid insulation may be used to reduce embedment depths of foundations.

7.5 Subgrade Preparation For Flexible Pavement

Generally, at this preliminary stage, the subgrade for placement of pavement structure should also be prepared based on Section 7.2.

After the removal of unsuitable materials, the exposed subgrade condition should be visually reviewed and proof rolled. Weak subgrade areas should be sub-excavated and replaced with engineered fill. The exposed subgrade should then be bladed and compacted for placement of flexible pavement structure.

We anticipate that the native clay deposit encountered below the topsoil layer will provide an adequate subgrade for pavement structure installation. Depending on the consistency of the clay deposit at the time of construction, the use of geogrid reinforcement and/or non-woven, geotextile may need to be considered to strengthen the subgrade prior to the installation of pavement structure.

7.6 Utility Trench Backfill

The native clay, or silty clayey sand soil can be used for trench backfill for underground utility corridors. The trench backfill will be placed above granular pipe surround material. Generally, trench backfill should consist of low to medium plastic clay or well-graded granular engineered fill material. The placing of trench backfill should consider specifications from the County of Wetaskiwin - *Design Guidelines and Construction Standards* for utility installation.

The excavated soils intended for re-use as trench backfill should be reviewed at the time of excavation to assess their suitability for re-use.

8 SEISMIC SITE CLASSIFICATION

Based on the results of the site investigation and our knowledge of soils at the general site vicinity, it is judged that the site classification for seismic site response for the above project can be taken as "D" according to National Building Code of Canada (Table 4.1.8.4.A). Corresponding acceleration and velocity based site coefficients are found on Table 4.1.8.4.B and 4.1.8.4.C of the Code.

9 SULPHATE EXPOSURE CLASSIFICATION

The results of water soluble sulphate tests completed on selected soil samples yielded concentration of 0.004% to 0.12% sulphate by dry unit weight of soil.

The results of water soluble sulphate concentration tests on selected soil samples indicated a "negligible" to "moderate" potential for sulphate attack on concrete in contact with native soils at this site. At the detailed design stage, we recommend that site and project specific water soluble sulphate tests be completed on selected soil samples at appropriate depths within the building footprints. Any imported soils should be tested to determine water soluble sulphate concentration and associated sulphate exposure classification.

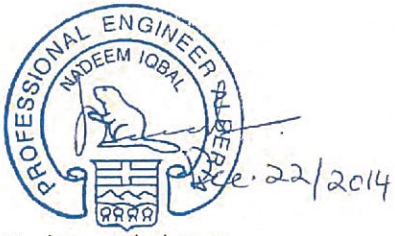
10 ADDITIONAL COMMENTS

As mentioned, during the detailed design stage for this project, we recommend that detailed geotechnical assessments be completed to provide specific geotechnical commentary for and recommendations to address specific building, road and other structure developments on the site.

11 CLOSURE

This preliminary geotechnical report has been prepared by Levelton Consultants Ltd. exclusively for Mumeco Properties Ltd., c/o Wescott Consulting Group and their appointed agents. The report reflects our judgment in light of the information provided to us at the time that it was prepared. Any use of the report by third parties, or any reliance on or decisions made based on it, are the responsibility of such third parties. Levelton Consultants Ltd. does not accept responsibility for damages suffered, if any, by a third party as a result of their use of this report. The attached *Terms of Reference* are an integral part of this preliminary geotechnical report.

Levelton Consultants Ltd.



Per: Nadeem Iqbal, P. Eng.
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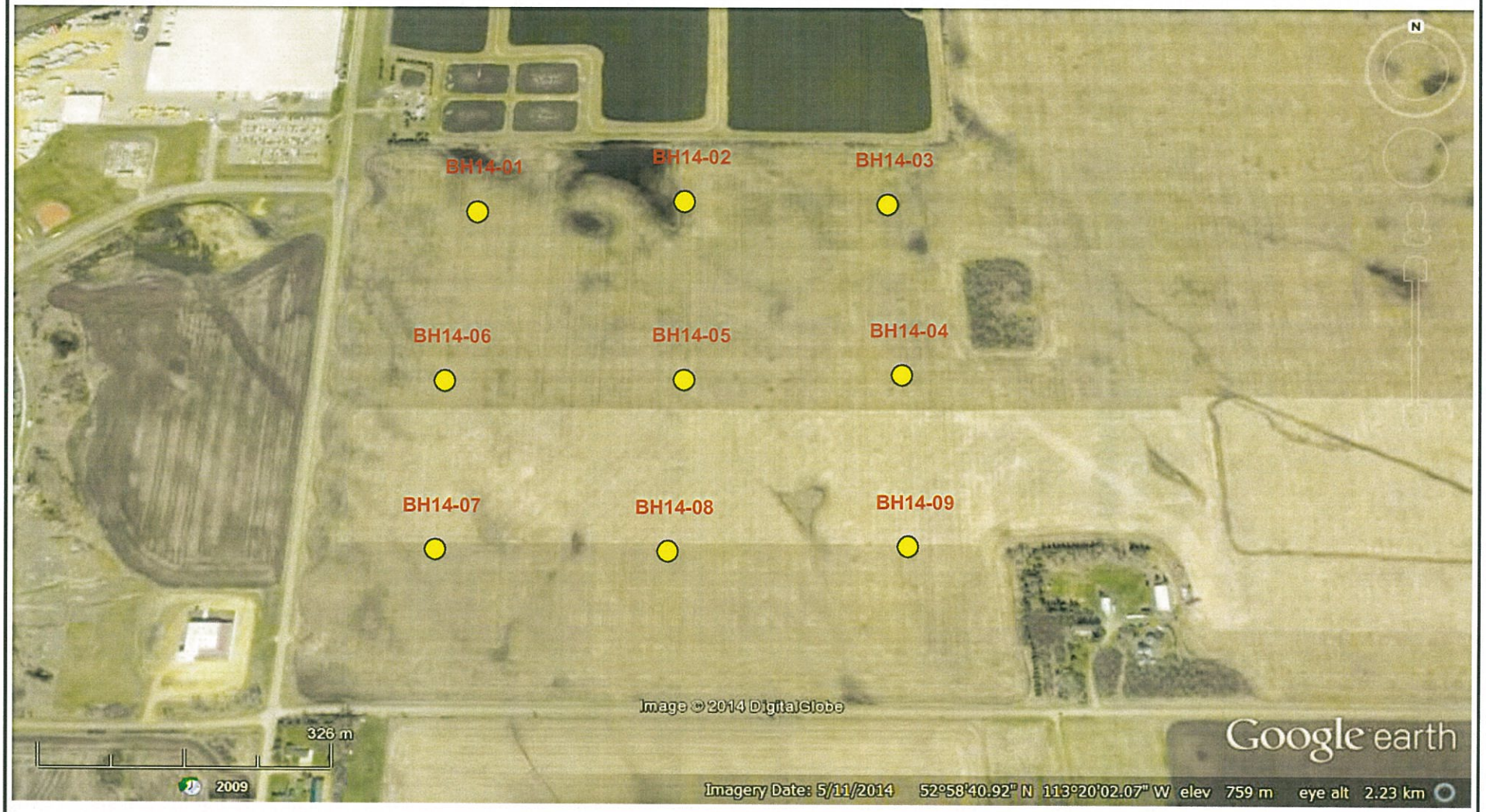
Principal, Division Manager
aabello@levelton.com

Reviewed by: David Field, MSCE, P. Eng.
Senior Geotechnical Engineer

PERMIT TO PRACTICE
LEVELTON CONSULTANTS LTD.
Signature
Date 2014 - 12 - 22
APEGA PERMIT NUMBER: P8696

APPENDIX A
VICINITY MAP SHOWING BOREHOLE LOCATIONS BASED ON GPS COORDINATES (FIGURE 1)



Borehole location based on GPS coordinate

Borehole No.	Coordinate
BH14-01	N52°58'50.1", W113°20'20.8"
BH14-02	N52°58'50.8", W113°20'06.1"
BH14-03	N52°58'50.6", W113°19'51.4"
BH14-04	N52°58'42.1", W113°20'51.2"
BH14-05	N52°58'42.1", W113°20'06.1"
BH14-06	N52°58'41.9", W113°20'21.9"
BH14-07	N52°58'34.3", W113°20'21.5"
BH14-08	N52°58'34.3", W113°20'06.7"
BH14-09	N52°58'34.5", W113°20'51.4"

SCALE	NTS	CLIENT	Mumeco Properties c/o Westcott Consulting Group.
LEVELTON	Levelton Consultants Ltd. 8884 48 Avenue NW Edmonton, AB T6E 5L1 P: (780) 438-0844 F: (780) 435-1812	PROJECT NAME	**SW Sec 19 Twp 46 Rge 23 W4M** **County of Wetaskiwin, Alberta**
		DRAWING TITLE	Borehole Location Plan
		Date: 12/11/2014	File: R714-1823-00 / Figure No: 1

APPENDIX B
BOREHOLE RECORDS

LEVELTON
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SW Sec 19 Twp 46 Rge 23 W4M
County of Wetaskiwin, Alberta
Geotechnical Assessment

BH14-01

Project No: R714-1823-00

Depth (m)	Depth (ft)	Description	Piezo 1	C	N	Type	Water Level
		Loose, black, **TOPSOIL**, moist					
	2	Stiff, brown, **CLAY**, some sand to sandy, trace fine grained gravel, medium plastic, moist					
		- at 0.75 m, about 44% recovered			10	SPT	
	4						
		- at 1.5 m, sandy, medium coarse grained, coal specks				G	
2	6						
		- at 2.25 m, coarse grained sand lenses, trace medium grained gravel, rust pockets			14	SPT	
	8						
		- at 3.0 m, salts, SO_4 = 0.120%				G	
	10						
	12				14	SPT	
4	14	Very dense, yellowish brown to greyish brown, fine grained, **SAND**, some silt, some clay, trace fine grained gravel, moist				G	
	16						Dec 11 2014
		- at 5.25m, SAND = 60.4%, SILT = 19.7%, CLAY = 19.9%			55	SPT	
	18	- at 5.55 m, slight water seepage					
6	20					G	
		- Sandstone fragments inclusions					
	22						
		- at 6.75 m, blue to white, 50 blows for 100 mm penetration, ground up material and fragments recovered			>50	SPT	
	24	End of hole at 7.2 meters. Dry upon completion.					
8	26						
	28						
	30						
	32						

PP = 175 kPa
PP = 200 kPa
PP = 200 kPa
PP = 150 kPa
PP = 225 kPa

10 20 30 40 50 60 70 80 90

C: Condition of Sample
Good
Disturbed
No Recovery

Type: Type of Sampler
SPT : 2 in. standard
ST : Shelby
FP : Fixed Piston
G : Grab
CORE

N: Number of Blows
WH : Weight of Hammer
WR : Weight of Rod
Standard Penetration Test : ASTM D1586
Hammer Type: Trip Hammer

- Moisture Content %
- Plastic Limit %
- Liquid Limit %
- Ground Water Level
- Shear strength in kPa (Torvane or Penetrometer)
- Shear strength in kPa (Unconfined)
- Shear strength in kPa (field vane)
- Remolded strength in kPa
- Percent Passing # 200 sieve

Bentonite/Grout Plug
Solid Pipe
Cuttings
Slotted Pipe
Sand/Pea-Gravel

Drill Method: Solid Stem Auger
Date Drilled: 06/11/2014
By: NG

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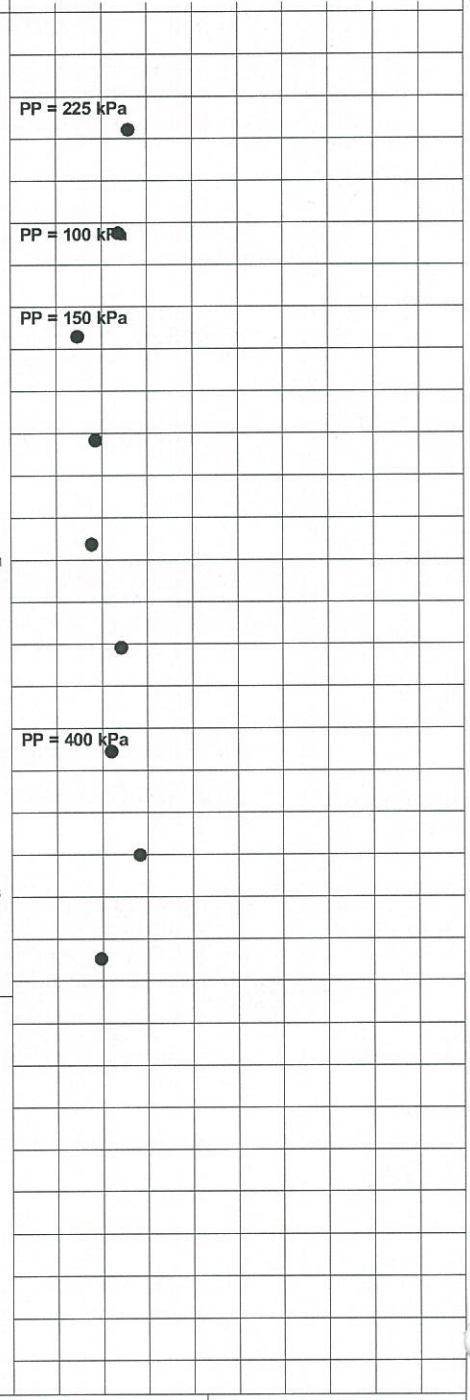
SW Sec 19 Twp 46 Rge 23 W4M
County of Wetaskiwin, Alberta
Geotechnical Assessment

BH14-02

Pg 1 of 1

Project No: R714-1823-00

Depth (m)	Depth (ft)	Description	Piezo 1	C	N	Type	Water Level
		Stiff, brown, **CLAY**, some sand, trace fine grained gravel, grey mottling, trace coal specks, rusting, medium plastic, moist					
	2						
		- at 0.75 m, dark brown to grey, white chalky inclusions			9	SPT	
	4						
		- at 1.65 m, coarse grained sand and gravel lenses,				G	
2	6						
					8	SPT	
	8	- at 2.7 m, sandy, moist to wet					
	10					G	
	12	- at 3.75 m, water seepage, clay till and coarse grained sand recovered			10	SPT	Dec 11 2014
4		Ver dense, light yellowish brown, medium grained, **SAND**, silty, some clay, moist					
	14						
		- at 4.6 m, sandstone fragments				G	
	16						
	18	- at 5.25 m, fragments, saturated, water seepage, 50 blows for 125 penetration			>50	SPT	
6							
	20					G	Nov 6 2014
	22	- at 6.75 m, silty clay pocket, 50 blows for 225 mm penetration, SAND = 36.7%, SILT = 23.9%, CLAY = 39.4%			>50	SPT	
	24	End of hole at 7.2 meters					
8	26						
	28						
	30						
	32						



C: Condition of Sample
Good
Disturbed
No Recovery

Type: Type of Sampler
SPT : 2 in. standard
ST : Shelby
FP : Fixed Piston
G : Grab
CORE

N: Number of Blows
WH : Weight of Hammer
WR : Weight of Rod
Standard Penetration Test : ASTM D1586
Hammer Type: Trip Hammer

- Moisture Content %
- Plastic Limit %
- Liquid Limit %
- Ground Water Level
- Shear strength in kPa (Torvane or Penetrometer)
- Shear strength in kPa (Unconfined)
- Shear strength in kPa (field vane)
- Remolded strength in kPa
- Percent Passing # 200 sieve

Bentonite/Grout Plug
Solid Pipe
Cuttings
Slotted Pipe
Sand/Pea-Gravel

Drill Method: Solid Stem Auger
Date Drilled: 06/11/2014
By: NG

1 LOG PER PAGE R714-1823-00 BOREHOLE LOGS.GPJ LEVELTON.GDT 17/12/14

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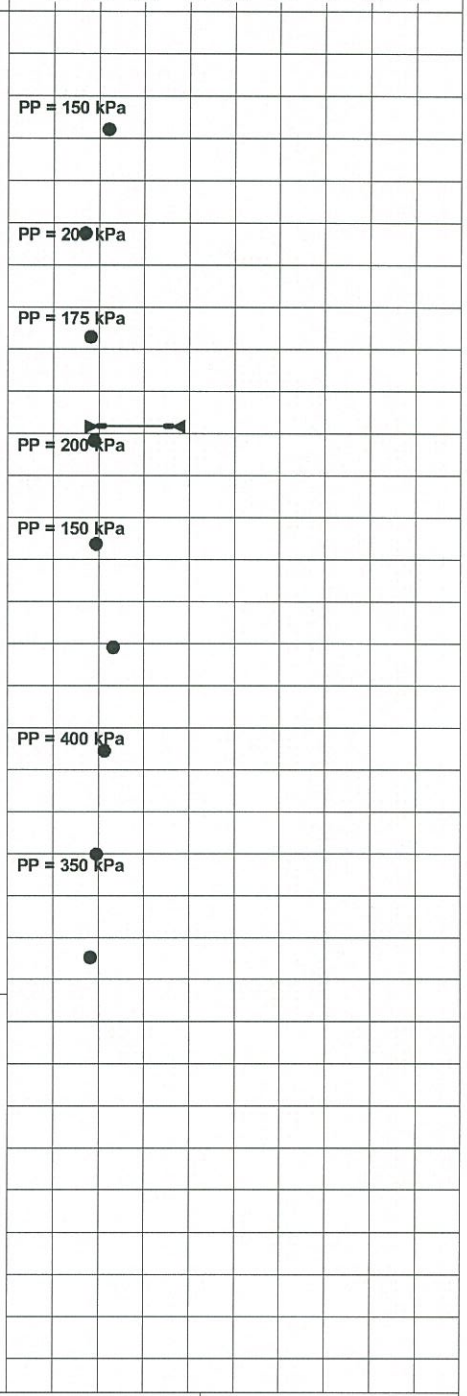
SW Sec 19 Twp 46 Rge 23 W4M
County of Wetaskiwin, Alberta
Geotechnical Assessment

BH14-03

Project No: R714-1823-00

Depth (m)	Depth (ft)	Description	Piezo 1	C	N	Type	Water Level
		Loose, black, **TOPSOIL**, moist					
	2	Firm to very stiff, brown, **CLAY**, some sand, trace fine grained gravel, oxides, trace coal specks, some grey mottling, medium plastic, moist			7	SPT	
	4						
	6					G	
2							
	8	- at 2.25 m, orange sand lenses			21	SPT	
	10	- at 3.0 m, coarse grained sand lenses, orange to grey mottling, SO_4 = 0.004%				G	
	12						
4		Compact to very dense, reddish brown to yellowish brown, coarse grained, **SAND**, silty, some clay till, moist			12	SPT	Dec 11 2014
	14						
	16	- at 4.5 m, SAND = 61.0%, SILT = 26.5%, CLAY = 12.5%				G	
	18	- at 5.25 m, slight water seepage			75	SPT	
6		- at 5.7 m, hard drilling, free flowing water					Nov 6 2014
	20					G	
	22	- at 6.75 m, 50 blows for 100 mm penetration, sandstone fragments,			>50	SPT	
	24	End of hole at 7.2 meters					
8	26						
	28						
	30						
	32						



C: Condition of Sample
Good
Disturbed
No Recovery

Type: Type of Sampler
SPT : 2 in. standard
ST : Shelby
FP : Fixed Piston
G : Grab
CORE

N: Number of Blows
WH : Weight of Hammer
WR : Weight of Rod
Standard Penetration Test : ASTM D1586
Hammer Type: Trip Hammer

- ● Moisture Content %
- ▶ Plastic Limit %
- ◀ Liquid Limit %
- ▼ Ground Water Level
- (X) Shear strength in kPa (Torvane or Penetrometer)
- X Shear strength in kPa (Unconfined)
- ⊗ Shear strength in kPa (field vane)
- ⊠ Remolded strength in kPa
- ■ Percent Passing # 200 sieve

Bentonite/Grout Plug
Solid Pipe
Cuttings
Slotted Pipe
Sand/Pea-Gravel

Drill Method: Solid Stem Auger
Date Drilled: 06/11/2014
By: NG

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SW Sec 19 Twp 46 Rge 23 W4M
County of Wetaskiwin, Alberta
Geotechnical Assessment

BH14-04

Project No: R714-1823-00

Depth (m)	Depth (ft)	Description	Piezo 1	C	N	Type	Water Level	Shear strength (kPa)
		Loose, black, **TOPSOIL**, moist						
	2	Very stiff, dark brown, **CLAY**, some sand, trace fine grained gravel, salts, medium plastic, moist			16	SPT		PP = 300 kPa
	4					G		PP = 450 kPa
2	6	Reddish brown, coarse grained, **SAND**, silty, trace clay, dry						PP = 175 kPa
	8	- at 2.25 m, GRAVEL = 3.6%, SAND = 60.8%, SILT = 25.4%, CLAY = 10.2%			15	SPT		
	10	Stiff to very stiff, dark brown, **CLAY**, silty, some sand, trace fine grained gravel, trace coal specks, oxids, medium plastic, moist				G		PP = 275 kPa
	12				12	SPT		PP = 225 kPa
4	14					G		PP = 300 kPa
	16							
	18	- at 5.25 m, coal pocket			25	SPT		PP = 275 kPa
6	20					G		PP = 250 kPa
	22				22	SPT		PP = 300 kPa
	24	End of hole at 7.2 meters. Dry upon completion.						
8	26							
	28							
	30							
	32							

C: Condition of Sample
Good
Disturbed
No Recovery

Type: Type of Sampler
SPT : 2 in. standard
ST : Shelby
FP : Fixed Piston
G : Grab
CORE

N: Number of Blows
WH : Weight of Hammer
WR : Weight of Rod
Standard Penetration Test : ASTM D1586
Hammer Type: Trip Hammer

- Moisture Content %
- Plastic Limit %
- Liquid Limit %
- Ground Water Level
- Shear strength in kPa (Torvane or Penetrometer)
- Shear strength in kPa (Unconfined)
- Shear strength in kPa (field vane)
- Remolded strength in kPa
- Percent Passing # 200 sieve

Bentonite/Grout Plug
Solid Pipe
Cuttings
Slotted Pipe
Sand/Pea-Gravel

Drill Method:
Solid Stem Auger
Date Drilled: 06/11/2014
By: NG

1 LOG PER PAGE R714-1823-00 BOREHOLE LOGS.GPJ LEVELTON.GDT 17/12/14

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County of Wetaskiwin, Alberta
Geotechnical Assessment

BH14-05

Project No: R714-1823-00

Depth (m)	Depth (ft)	Description	Piezo 1	C	N	Type	Water Level	PP (kPa)
		Loose, black, **TOPSOIL**, moist						
	2	Stiff, brown, **CLAY**, silty, some sand, trace fine grained gravel, medium plastic, moist			13	SPT		PP = 350 kPa
	4							
	6	- at 1.5 m, light brown, trace coal specks				G		PP = 200 kPa
2								
	8	- at 2.25 m, coarse grained sand lenses			15	SPT		PP = 175 kPa
	10	- at 3.0 m, orange to grey mottling, rusting				G		PP = 150 kPa
	12				12	SPT		PP = 150 kPa
4								
	14	Very dense, pale yellowish brown, fine grained, **SAND**, clayey, some silt, sandstone fragment, moist				G	Dec 11 2014	PP = 200 kPa
	16							
	18	- at 5.25 m, hard drilling			76	SPT		
6								
	20	- at 6.0 m silty clay till pocket, SILT = 40.6%, CLAY = 59.4%				G		PP = 300 kPa
	22	- at 6.75 m, blue, water seepage, 50 blows for 100 mm penetration, some fragments recovered			>50	SPT	Nov 6 2014	PP = 300 kPa
		End of hole at 7.2 meters						
	24							
8								
	26							
	28							
	30							
	32							

PP (kPa) scale: 10 20 30 40 50 60 70 80 90

C: Condition of Sample
Good
Disturbed
No Recovery

Type: Type of Sampler
SPT : 2 in. standard
ST : Shelby
FP : Fixed Piston
G : Grab
CORE

N: Number of Blows
WH : Weight of Hammer
WR : Weight of Rod
Standard Penetration Test : ASTM D1586
Hammer Type: Trip Hammer

- Moisture Content %
- Plastic Limit %
- Liquid Limit %
- Ground Water Level
- Shear strength in kPa (Torvane or Penetrometer)
- X Shear strength in kPa (Unconfined)
- ⊗ Shear strength in kPa (field vane)
- ⊠ Remolded strength in kPa
- ■ Percent Passing # 200 sieve

Bentonite/Grout Plug
Solid Pipe
Cuttings
Slotted Pipe
Sand/Pea-Gravel

Drill Method: Solid Stem Auger
Date Drilled: 06/11/2014
By: NG

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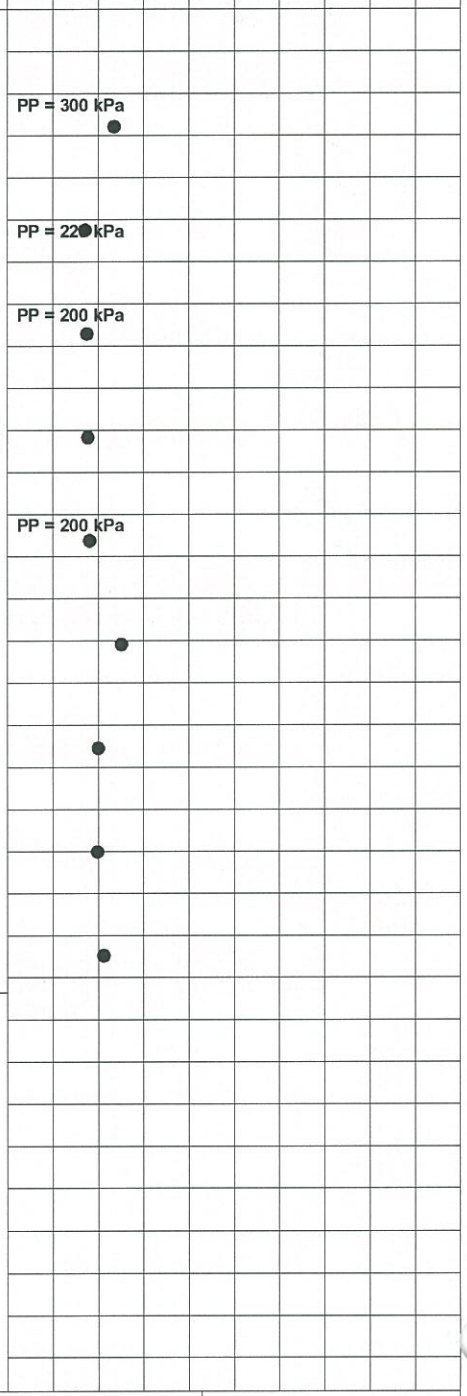
County of Wetaskiwin, Alberta
Geotechnical Assessment

BH14-06

Project No: R714-1823-00

Depth (m)	Depth (ft)	Description	Piezo 1	C	N	Type	Water Level
		Loose, black, **TOPSOIL**, moist					
	2	Stiff, brown, **CLAY**, some sand, trace fine to medium grained gravel, trace coal specks, medium plastic, moist			13	SPT	
	4						
	6					G	
2							
	8	- at 2.25 m, sandy			15	SPT	
	10	- at 3.0 m, orange sand lenses				G	Dec 11 2014
	12						
4		Very dense, pale orange brown, **SAND**, meidum grained sand, trace silt, trace clay, moist			26	SPT	
	14						
	16					G	
	18	- at 5.25 m, 50 blows for 150 mm penetration, SAND = 78.8%, SILT/CLAY = 21.2%			>50	SPT	
6							Nov 6 2014
	20	- at 6.0 m, water seepage				G	
	22						
		- at 6.75 m, 50 blows for zero penetration, no recovery for SPT			>50	SPT	
	24	End of hole at 7.2 meters					
8	26						
	28						
	30						
	32						



C: Condition of Sample
Good
Disturbed
No Recovery

Type: Type of Sampler
SPT : 2 in. standard
ST : Shelby
FP : Fixed Piston
G : Grab
CORE

N: Number of Blows
WH : Weight of Hammer
WR : Weight of Rod
Standard Penetration Test : ASTM D1586
Hammer Type: Trip Hammer

- Moisture Content %
- Plastic Limit %
- Liquid Limit %
- Ground Water Level
- Shear strength in kPa (Torvane or Penetrometer)
- Shear strength in kPa (Unconfined)
- Shear strength in kPa (field vane)
- Remolded strength in kPa
- Percent Passing # 200 sieve

Bentonite/Grout Plug
Solid Pipe
Cuttings
Slotted Pipe
Sand/Pea-Gravel

Drill Method: Solid Stem Auger
Date Drilled: 06/11/2014
By: NG

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County of Wetaskiwin, Alberta
Geotechnical Assessment

BH14-07

Project No: R714-1823-00

Depth (m)	Depth (ft)	Description	Piezo 1	C	N	Type	Water Level
		Loose, black, **TOPSOIL**, moist					
	2	Stiff, dark brown, **CLAY**, some sand, trace fine grained gravel, white chalky inclusions, medium plastic, moist			8	SPT	
	4	- at 1.5 m, moist to wet				G	
2	6	- at 2.25 m, sandy, coal pockets, rock in sampler			11	SPT	
	8	- at 3.0 m, orange mottling, SO_4 = 0.052%				G	
	10				15	SPT	
	12	Dense to very dense, pale yellowish brown, fine to medium grained, **SAND**, clayey, silty, moist				G	Dec 11 2014
4	14				44	SPT	
	16					G	
	18	- at 6.75 m, SAND = 40.3%, SILT = 24.5%, CLAY = 35.2%			>50	SPT	Nov 6 2014
	20	End of hole at 7.2 meters					
6	22						
	24						
	26						
8	28						
	30						
	32						

PP = 200 kPa
PP = 75 kPa
PP = 100 kPa
PP = 175 kPa
PP = 200 kPa
PP = 325 kPa

10 20 30 40 50 60 70 80 90

C: Condition of Sample
Good
Disturbed
No Recovery

Type: Type of Sampler
SPT : 2 in. standard
ST : Shelby
FP : Fixed Piston
G : Grab
CORE

N: Number of Blows
WH : Weight of Hammer
WR : Weight of Rod
Standard Penetration Test : ASTM D1586
Hammer Type: Trip Hammer

- Moisture Content %
- Plastic Limit %
- Liquid Limit %
- Ground Water Level
- Shear strength in kPa (Torvane or Penetrometer)
- X Shear strength in kPa (Unconfined)
- ⊗ Shear strength in kPa (field vane)
- ⊠ Remolded strength in kPa
- ■ Percent Passing # 200 sieve

Bentonite/Grout Plug
Solid Pipe
Cuttings
Slotted Pipe
Sand/Pea-Gravel

Drill Method: Solid Stem Auger
Date Drilled: 06/11/2014
By: NG

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SW Sec 19 Twp 46 Rge 23 W4M
County of Wetaskiwin, Alberta
Geotechnical Assessment

BH14-08

Project No: R714-1823-00

Depth (m)	Depth (ft)	Description	Piezo 1	C	N	Type	Water Level	10 20 30 40 50 60 70 80 90
		Loose, black, **TOPSOIL**, moist						
	2	Stiff to very stiff, dark brown, **CLAY**, some silt, trace sand, trace fine grained gravel, medium plastic, moist			11	SPT		PP = 200 kPa
	4							
	6	- at 1.5 m, coal pockets, SILT = 18.6%, CLAY = 81.4%				G		PP = 300 kPa
2	8				22	SPT		PP = 325 kPa
	10	- at 3.0 m, orange mottling, sand lenses				G		PP = 200 kPa
	12				20	SPT		PP = 200 kPa
4	14	- at 4.2 m, a 150 mm coarse grained sand and clay till layer, easily crumbled				G		PP = 325 kPa
	16							
	18				22	SPT		PP = 300 kPa
6	20	- at 6.0 m, grey mottling				G	Dec 11 2014	PP = 150 kPa
	22				22	SPT		PP = 250 kPa
	24	End of hole at 7.2 meters. Dry upon completion.						
8	26							
	28							
	30							
	32							

C: Condition of Sample
Good
Disturbed
No Recovery

Type: Type of Sampler
SPT : 2 in. standard
ST : Shelby
FP : Fixed Piston
G : Grab
CORE

N: Number of Blows
WH : Weight of Hammer
WR : Weight of Rod
Standard Penetration Test : ASTM D1586
Hammer Type: Trip Hammer

- Moisture Content %
- Plastic Limit %
- Liquid Limit %
- Ground Water Level
- Shear strength in kPa (Torvane or Penetrometer)
- X Shear strength in kPa (Unconfined)
- ⊗ Shear strength in kPa (field vane)
- ⊠ Remolded strength in kPa
- ■ Percent Passing # 200 sieve

Bentonite/Grout Plug
Solid Pipe
Cuttings
Slotted Pipe
Sand/Pea-Gravel

Drill Method: Solid Stem Auger
Date Drilled: 06/11/2014
By: NG

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County of Wetaskiwin, Alberta
Geotechnical Assessment

BH14-09

Project No: R714-1823-00

Depth (m)	Depth (ft)	Description	Piezo 1	C	N	Type	Water Level
		Loose, black, **TOPSOIL**, moist					
	2	Stiff, brown, **CLAY**, silty, some sand, trace fine grained gravel, medium plastic, moist			10	SPT	
	4						
	6	- at 1.5 m, coal specks, white chalky inclusions				G	
2	8	Compact, greyish brown, medium to coarse grained, **SAND**, some silt, trace clay, trace gravel, moist - at 2.25 m, GRAVEL = 9.2%, SAND = 74.4%, SILT/CLAY = 16.4%			21	SPT	
	10	- at 3.0 m, SO_4 = 0.014%				G	
	12				22	SPT	
4	14						
	16	- at 4.45 m, very stiff clay till interbedded within coarse grained sand				G	
	18	Very stiff to hard, brown, **CLAY**, silty, some sand, trace medium grained gravel, medium plastic, moist - at 5.7 m, dark brown to grey			27	SPT	
6	20					G	
	22	- at 6.75 m, hard			44	SPT	
	24	End of hole at 7.2 meters. Dry upon completion.					Dec 11 2014
8	26						
	28						
	30						
	32						

PP = 200 kPa
PP = 150 kPa
PP = 300 kPa
PP = 350 kPa
PP = 200 kPa
PP = 225 kPa

10 20 30 40 50 60 70 80 90

C: Condition of Sample
Good
Disturbed
No Recovery

Type: Type of Sampler
SPT : 2 in. standard
ST : Shelby
FP : Fixed Piston
G : Grab
CORE

N: Number of Blows
WH : Weight of Hammer
WR : Weight of Rod
Standard Penetration Test : ASTM D1586
Hammer Type: Trip Hammer

- Moisture Content %
- Plastic Limit %
- Liquid Limit %
- Ground Water Level
- Shear strength in kPa (Torvane or Penetrometer)
- Shear strength in kPa (Unconfined)
- Shear strength in kPa (field vane)
- Remolded strength in kPa
- Percent Passing # 200 sieve

Bentonite/Grout Plug
Solid Pipe
Cuttings
Slotted Pipe
Sand/Pea-Gravel

Drill Method:
Solid Stem Auger
Date Drilled: 06/11/2014
By: NG

APPENDIX C
LABORATORY TEST RESULTS

TRN: 1699

LEVELTON CONSULTANTS LTD.

Moisture Content

Client:	Mumeco Properties Ltd.	Sampled By:	NG
Project:	Mumeco Properties - County of Wetaskiwin, AB	Tested By:	HJ
Job No.:	R714-1823-00	Sample Date:	Nov. 06, 2014
Report Date:	Nov. 12, 2014	Test Date:	Nov. 10, 2014

TH No.		BH1	BH1	BH1	BH1	BH1	BH1	BH1	BH1
Depth	in meters	0.75	1.50	2.25	3.00	3.75	4.50	5.25	6.00
Tare No.									
Wt. Tare, g		19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0
Wt. Wet Soil + Tare, g		484.6	631.1	496.8	517.4	595.5	575.6	581.5	687.6
Wt. Dry Soil + Tare, g		389.3	552.3	427.9	438.0	505.5	478.2	486.4	587.7
Wt. Water, g		95.3	78.8	68.9	79.4	90.0	97.4	95.1	99.9
Wt. Dry Soil, g		370.3	533.3	408.9	419.0	486.5	459.2	467.4	568.7
Moisture Content (%)		**25.7**	**14.8**	**16.9**	**18.9**	**18.5**	**21.2**	**20.3**	**17.6**
TH No.		BH1	BH2	BH2	BH2	BH2	BH2	BH2	BH2
Depth	in meters	6.75	0.75	1.50	2.25	3.00	3.75	4.50	5.25
Tare No.									
Wt. Tare, g		19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0
Wt. Wet Soil + Tare, g		391.6	614.7	487.9	600.3	494.7	567.6	391.4	551.0
Wt. Dry Soil + Tare, g		341.5	492.1	398.0	525.8	420.0	485.1	318.8	455.1
Wt. Water, g		50.1	122.6	89.9	74.5	74.7	82.5	72.6	95.9
Wt. Dry Soil, g		322.5	473.1	379.0	506.8	401.0	466.1	299.8	436.1
Moisture Content (%)		**15.5**	**25.9**	**23.7**	**14.7**	**18.6**	**17.7**	**24.2**	**22.0**
TH No.		BH2	BH2	BH3	BH3	BH3	BH3	BH3	BH3
Depth	in meters	6.00	6.75	0.75	1.50	2.25	3.00	3.75	4.50
Tare No.									
Wt. Tare, g		19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0
Wt. Wet Soil + Tare, g		537.0	355.7	536.7	641.3	622.9	620.9	585.1	577.5
Wt. Dry Soil + Tare, g		423.1	300.5	443.1	551.0	529.9	524.8	493.2	472.5
Wt. Water, g		113.9	55.2	93.6	90.3	93.0	96.1	91.9	105.0
Wt. Dry Soil, g		404.1	281.5	424.1	532.0	510.9	505.8	474.2	453.5
Moisture Content (%)		**28.2**	**19.6**	**22.1**	**17.0**	**18.2**	**19.0**	**19.4**	**23.2**
TH No.		BH3	BH3	BH3					
Depth	in meters	5.25	6.00	6.75					
Tare No.									
Wt. Tare, g		19.0	19.0	19.0					
Wt. Wet Soil + Tare, g		543.0	706.4	427.9					
Wt. Dry Soil + Tare, g		450.9	593.7	364.9					
Wt. Water, g		92.1	112.7	63.0					
Wt. Dry Soil, g		431.9	574.7	345.9					
Moisture Content (%)		**21.3**	**19.6**	**18.2**					

Per: _____

TRN: 1699

LEVELTON CONSULTANTS LTD.

Moisture Content

Client:	Mumeco Properties Ltd.	Sampled By:	NG
Project:	Mumeco Properties - County of Wetaskiwin, AB	Tested By:	HJ
Job No.:	R714-1823-00	Sample Date:	Nov. 06, 2014
Report Date:	Nov. 12, 2014	Test Date:	Nov. 10, 2014

TH No.	BH4	BH4	BH4	BH4	BH4	BH4	BH4	BH4
Depth in meters	0.75	1.50	2.25	3.00	3.75	4.50	5.25	6.00
Tare No.								
Wt. Tare, g	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0
Wt. Wet Soil + Tare, g	507.7	575.1	540.8	727.6	569.3	527.6	540.1	505.7
Wt. Dry Soil + Tare, g	431.5	484.3	480.9	630.7	490.8	454.1	405.1	432.4
Wt. Water, g	76.2	90.8	59.9	96.9	78.5	73.5	135.0	73.3
Wt. Dry Soil, g	412.5	465.3	461.9	611.7	471.8	435.1	386.1	413.4
Moisture Content (%)	**18.5**	**19.5**	**13.0**	**15.8**	**16.6**	**16.9**	**35.0**	**17.7**
TH No.	**BH4**	**BH5**	**BH5**	**BH5**	**BH5**	**BH5**	**BH5**	**BH5**
Depth in meters	6.75	0.75	1.50	2.25	3.00	3.75	4.50	5.25
Tare No.								
Wt. Tare, g	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0
Wt. Wet Soil + Tare, g	568.7	495.2	620.9	490.8	788.8	512.4	524.1	479.7
Wt. Dry Soil + Tare, g	485.5	390.3	496.7	422.6	673.0	433.5	435.5	409.9
Wt. Water, g	83.2	104.9	124.2	68.2	115.8	78.9	88.6	69.8
Wt. Dry Soil, g	466.5	371.3	477.7	403.6	654.0	414.5	416.5	390.9
Moisture Content (%)	**17.8**	**28.3**	**26.0**	**16.9**	**17.7**	**19.0**	**21.3**	**17.9**
TH No.	**BH5**	**BH5**	**BH6**	**BH6**	**BH6**	**BH6**	**BH6**	**BH6**
Depth in meters	6.00	6.75	0.75	1.50	2.25	3.00	3.75	4.50
Tare No.								
Wt. Tare, g	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0
Wt. Wet Soil + Tare, g	530.3	296.2	482.8	521.7	511.1	615.6	692.5	549.2
Wt. Dry Soil + Tare, g	368.7	252.1	394.5	448.3	437.7	525.7	589.4	442.9
Wt. Water, g	161.6	44.1	88.3	73.4	73.4	89.9	103.1	106.3
Wt. Dry Soil, g	349.7	233.1	375.5	429.3	418.7	506.7	570.4	423.9
Moisture Content (%)	**46.2**	**18.9**	**23.5**	**17.1**	**17.5**	**17.7**	**18.1**	**25.1**
TH No.	**BH6**	**BH6**	**BH6**					
Depth in meters	5.25	6.00	6.75					
Tare No.								
Wt. Tare, g	19.0	19.0	19.0					
Wt. Wet Soil + Tare, g	463.9	527.1	384.5					
Wt. Dry Soil + Tare, g	389.6	443.0	320.5					
Wt. Water, g	74.3	84.1	64.0					
Wt. Dry Soil, g	370.6	424.0	301.5					
Moisture Content (%)	**20.0**	**19.8**	**21.2**					

Per: _____

TRN: 1699

LEVELTON CONSULTANTS LTD.

Moisture Content

Client:	Mumeco Properties Ltd.	Sampled By:	NG
Project:	Mumeco Properties - County of Wetaskiwin, AB	Tested By:	HJ
Job No.:	R714-1823-00	Sample Date:	Nov. 06, 2014
Report Date:	Nov. 12, 2014	Test Date:	Nov. 10, 2014

TH No.		BH7	BH7	BH7	BH7	BH7	BH7	BH7	BH7
Depth	in meters	0.75	1.50	2.25	3.00	3.75	4.50	5.25	6.00
Tare No.									
Wt. Tare, g		19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0
Wt. Wet Soil + Tare, g		758.4	677.4	540.0	617.1	444.8	614.7	441.8	597.9
Wt. Dry Soil + Tare, g		598.6	569.6	457.5	524.8	371.8	514.1	367.7	501.4
Wt. Water, g		159.8	107.8	82.5	92.3	73.0	100.6	74.1	96.5
Wt. Dry Soil, g		579.6	550.6	438.5	505.8	352.8	495.1	348.7	482.4
Moisture Content (%)		**27.6**	**19.6**	**18.8**	**18.2**	**20.7**	**20.3**	**21.3**	**20.0**
TH No.		**BH7**	**BH8**	**BH8**	**BH8**	**BH8**	**BH8**	**BH8**	**BH8**
Depth	in meters	6.75	0.75	1.50	2.25	3.00	3.75	4.50	5.25
Tare No.									
Wt. Tare, g		19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0
Wt. Wet Soil + Tare, g		549.3	609.7	607.9	585.4	706.5	551.7	683.3	515.3
Wt. Dry Soil + Tare, g		459.7	531.1	518.8	509.0	607.0	472.3	588.1	439.3
Wt. Water, g		89.6	78.6	89.1	76.4	99.5	79.4	95.2	76.0
Wt. Dry Soil, g		440.7	512.1	499.8	490.0	588.0	453.3	569.1	420.3
Moisture Content (%)		**20.3**	**15.3**	**17.8**	**15.6**	**16.9**	**17.5**	**16.7**	**18.1**
TH No.		**BH8**	**BH8**	**BH9**	**BH9**	**BH9**	**BH9**	**BH9**	**BH9**
Depth	in meters	6.00	6.75	0.75	1.50	2.25	3.00	3.75	4.50
Tare No.									
Wt. Tare, g		19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0
Wt. Wet Soil + Tare, g		611.0	494.2	500.7	586.6	663.9	517.4	562.7	547.7
Wt. Dry Soil + Tare, g		519.3	422.2	428.1	498.6	622.8	451.8	542.9	487.0
Wt. Water, g		91.7	72.0	72.6	88.0	41.1	65.6	19.8	60.7
Wt. Dry Soil, g		500.3	403.2	409.1	479.6	603.8	432.8	523.9	468.0
Moisture Content (%)		**18.3**	**17.9**	**17.7**	**18.3**	**6.8**	**15.2**	**3.8**	**13.0**
TH No.		**BH9**	**BH9**	**BH9**					
Depth	in meters	5.25	6.00	6.75					
Tare No.									
Wt. Tare, g		19.0	19.0	19.0					
Wt. Wet Soil + Tare, g		423.7	664.0	570.8					
Wt. Dry Soil + Tare, g		373.5	567.9	485.5					
Wt. Water, g		50.2	96.1	85.3					
Wt. Dry Soil, g		354.5	548.9	466.5					
Moisture Content (%)		**14.2**	**17.5**	**18.3**					

Per: _____

TRN: 1699

LEVELTON CONSULTANTS LTD.
Sulphate Content

Client:	Mumeco Properties Ltd.	Sampled By:	NG
Project:	Mumeco Properties - County of Wetaskiwin, AB	Tested By:	RS
Job No.:	R714-1823-00	Sample Date:	Nov. 06, 2014
Report Date:	Nov. 18, 2014	Test Date:	Nov. 17, 2014

TH No.	BH1	BH3	BH7	BH9				
Depth m	3.00	3.00	3.00	3.00				
Tare No.	# 113.0	# 505.0	# 178.0	# 109.0				
Actual Reading	60	2	26	7				
Correction Factor	1	1	1	1				
Corrected Reading	60	2	26	7				
SO4 Content (%)	**0.120**	**0.004**	**0.052**	**0.014**				
TH No.								
Depth m								
Tare No.								
Actual Reading								
Correction Factor								
Corrected Reading								
SO4 Content (%)								
TH No.								
Depth m								
Tare No.								
Actual Reading								
Correction Factor								
Corrected Reading								
SO4 Content (%)								
TH No.								
Depth m								
Tare No.								
Actual Reading								
Correction Factor								
Corrected Reading								
SO4 Content (%)								
TH No.								
Depth m								
Tare No.								
Actual Reading								
Correction Factor								
Corrected Reading								
SO4 Content (%)								

10 is to 200

Moderate 0.10 - 0.20 Severe 0.20 - 2.00 Very Severe >2.00

Per: ____________

TRN: 1699

LEVELTON CONSULTANTS LTD.

Atterberg Limits

Client:	Mumeco Properties Ltd.	Sampled By:	NG
Project:	Mumeco Properties - County of Wetaskiwin, AB	Tested By:	RS
Job No.:	R714-1823-00	Sample Date:	Nov. 06, 2014
Report Date:	Nov. 18, 2014	Test Date:	Nov. 17, 2014

Test Hole: **BH1** Depth: **3.0m**

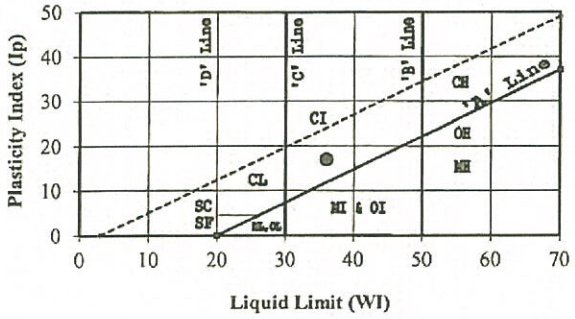
Liquid Limit Test

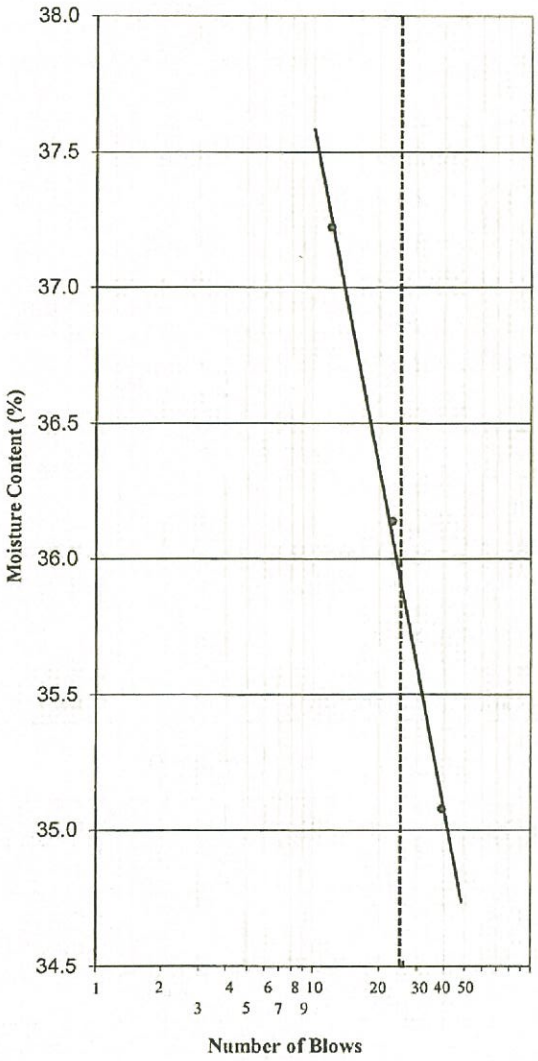
Trial	A	B	C
No. of Blows	39	23	12
Tare Number	B6	J1	C3
Wt. of Tare, g	1.40	1.50	1.60
Wt. Wet Soil + Tare, g	27.20	29.00	26.30
Wt. Dry Soil + Tare, g	20.50	21.70	19.60
Wt. of Water, g	6.70	7.30	6.70
Wt. of Dry Soil, g	19.10	20.20	18.00
Moisture Content (%)	35.1	36.1	37.2

Plastic Limit Test

Trial	A	B	C
Tare Number	H1	D4	
Wt. of Tare, g	1.50	1.40	
Wt. Wet Soil + Tare, g	11.10	12.00	
Wt. Dry Soil + Tare, g	9.60	10.30	
Wt. of Water, g	1.50	1.70	
Wt. of Dry Soil, g	8.10	8.90	
Moisture Content (%)	18.5	19.1	

Plasticity Chart





USCS Symbol	CI	Soil Description:	Medium Plasticity
Liquid Limit (%)	36		
Plastic Limit (%)	19		
Plasticity Index (%)	17	Per:	

TRN: 1699

LEVELTON CONSULTANTS LTD.

Atterberg Limits

Client:	Mumeco Properties Ltd.	Sampled By:	NG
Project:	Mumeco Properties - County of Wetaskiwin, AB	Tested By:	RS
Job No.:	R714-1823-00	Sample Date:	Nov. 06, 2014
Report Date:	Nov. 18, 2014	Test Date:	Nov. 17, 2014

Test Hole: **BH3** Depth: **3.0m**

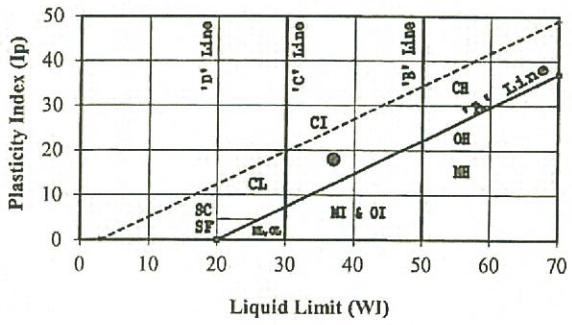
Liquid Limit Test

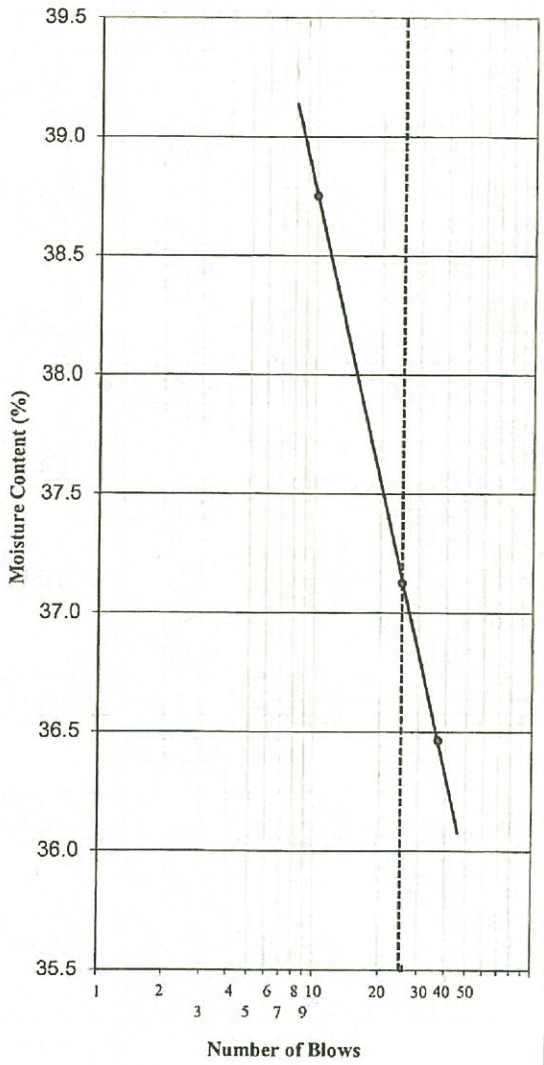
Trial	A	B	C
No. of Blows	37	25	10
Tare Number	E2	C1	G5
Wt. of Tare, g	1.40	1.50	1.50
Wt. Wet Soil + Tare, g	26.10	24.40	23.70
Wt. Dry Soil + Tare, g	19.50	18.20	17.50
Wt. of Water, g	6.60	6.20	6.20
Wt. of Dry Soil, g	18.10	16.70	16.00
Moisture Content (%)	36.5	37.1	38.8

Plastic Limit Test

Trial	A	B	C
Tare Number	F3	A6	
Wt. of Tare, g	1.50	1.60	
Wt. Wet Soil + Tare, g	10.80	11.30	
Wt. Dry Soil + Tare, g	9.30	9.80	
Wt. of Water, g	1.50	1.50	
Wt. of Dry Soil, g	7.80	8.20	
Moisture Content (%)	19.2	18.3	

Plasticity Chart





USCS Symbol CI

Soil Description: Medium Plasticity

Liquid Limit (%) 37

Plastic Limit (%) 19

Plasticity Index (%) 18

Per:

TRN: 1699

LEVELTON CONSULTANTS LTD.

Atterberg Limits

Client:	Mumeco Properties Ltd.	Sampled By:	NG
Project:	Mumeco Properties - County of Wetaskiwin, AB	Tested By:	RS
Job No.:	R714-1823-00	Sample Date:	Nov. 06, 2014
Report Date:	Nov. 18, 2014	Test Date:	Nov. 17, 2014

Test Hole: **BH7** Depth: **3.0m**

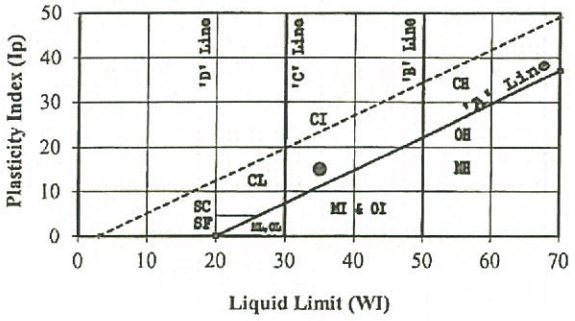
Liquid Limit Test

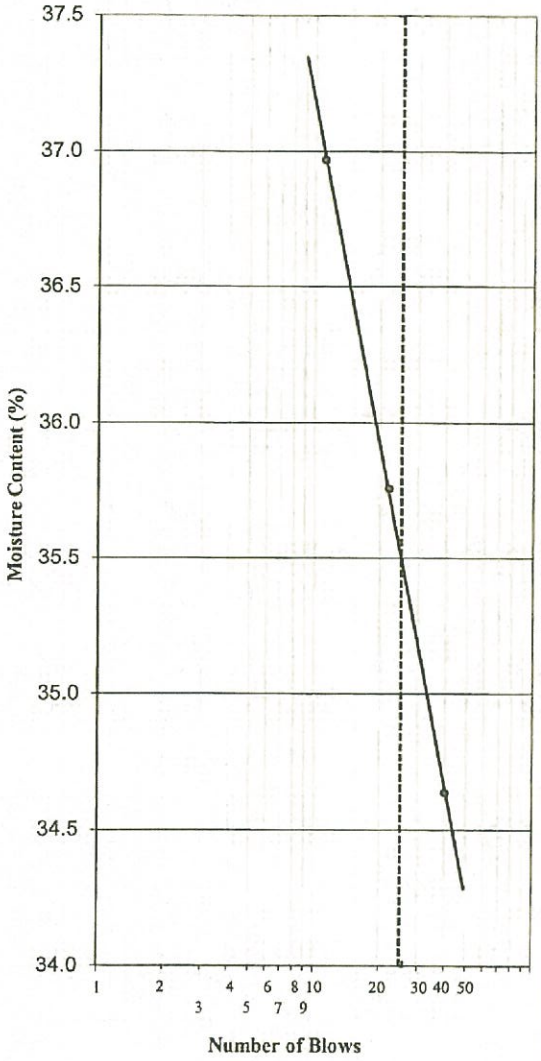
Trial	A	B	C
No. of Blows	40	22	11
Tare Number	A4	C4	D1
Wt. of Tare, g	1.40	1.50	1.50
Wt. Wet Soil + Tare, g	25.50	23.90	24.10
Wt. Dry Soil + Tare, g	19.30	18.00	18.00
Wt. of Water, g	6.20	5.90	6.10
Wt. of Dry Soil, g	17.90	16.50	16.50
Moisture Content (%)	34.6	35.8	37.0

Plastic Limit Test

Trial	A	B	C
Tare Number	G3	A2	
Wt. of Tare, g	1.50	1.60	
Wt. Wet Soil + Tare, g	11.50	11.00	
Wt. Dry Soil + Tare, g	9.80	9.40	
Wt. of Water, g	1.70	1.60	
Wt. of Dry Soil, g	8.30	7.80	
Moisture Content (%)	20.5	20.5	

Plasticity Chart





USCS Symbol: CI

Soil Description: Medium Plasticity

Liquid Limit (%): 35

Plastic Limit (%): 20

Plasticity Index (%): 15

Per:

TRN: 1699

LEVELTON CONSULTANTS LTD.

Atterberg Limits

Client:	Mumeco Properties Ltd.	Sampled By:	NG
Project:	Mumeco Properties - County of Wetaskiwin, AB	Tested By:	RS
Job No.:	R714-1823-00	Sample Date:	Nov. 06, 2014
Report Date:	Nov. 18, 2014	Test Date:	Nov. 17, 2014

Test Hole: **BH9** Depth: **3.0m**

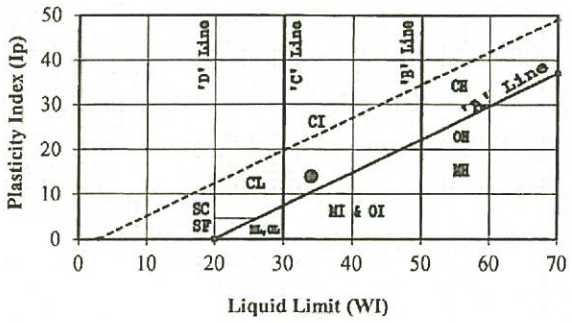
Liquid Limit Test

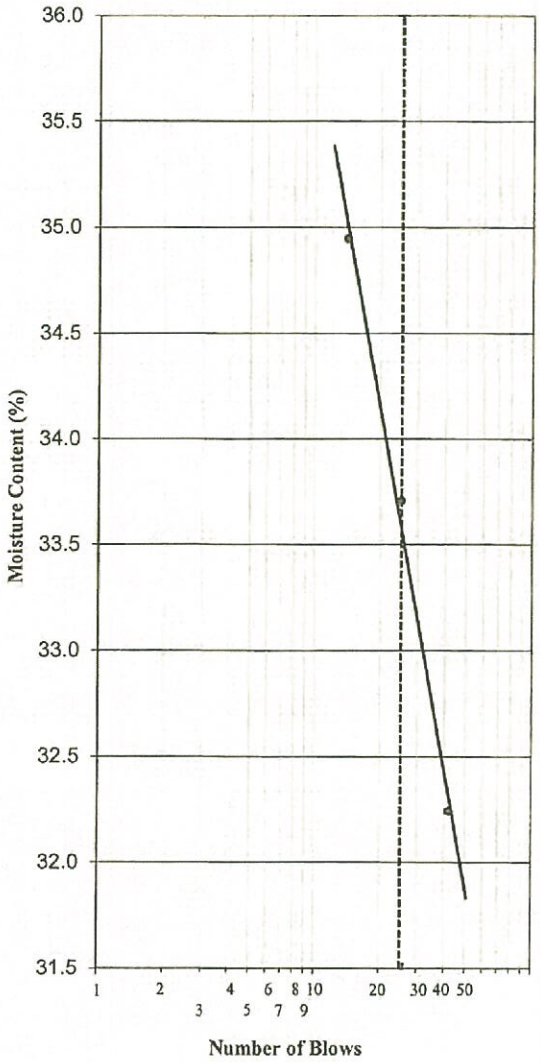
Trial	A	B	C
No. of Blows	42	25	14
Tare Number	A4	C4	D1
Wt. of Tare, g	1.50	1.60	1.50
Wt. Wet Soil + Tare, g	25.70	25.40	26.60
Wt. Dry Soil + Tare, g	19.80	19.40	20.10
Wt. of Water, g	5.90	6.00	6.50
Wt. of Dry Soil, g	18.30	17.80	18.60
Moisture Content (%)	32.2	33.7	34.9

Plastic Limit Test

Trial	A	B	C
Tare Number	G3	A2	
Wt. of Tare, g	1.60	1.50	
Wt. Wet Soil + Tare, g	10.30	12.30	
Wt. Dry Soil + Tare, g	8.90	10.50	
Wt. of Water, g	1.40	1.80	
Wt. of Dry Soil, g	7.30	9.00	
Moisture Content (%)	19.2	20.0	

Plasticity Chart





USCS Symbol: CI

Soil Description: Medium Plasticity

Liquid Limit (%): 34

Plastic Limit (%): 20

Plasticity Index (%): 14

Per:

LEVELTON CONSULTANTS LTD.
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8884 - 48 Avenue
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edmonton@levelton.com
www.levelton.com

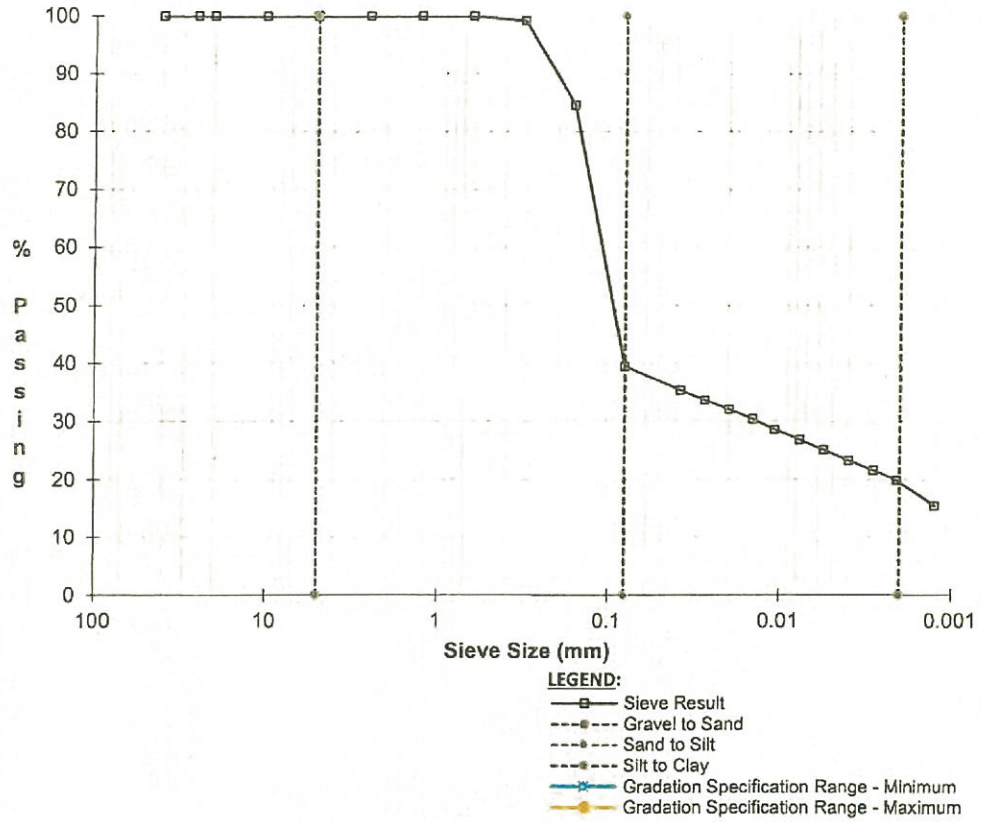
SIEVE ANALYSIS

Report Date: Nov. 25, 2014
Project Number: R714-1823-00
Report Number: 1699

To: Mumeco Properties Ltd.
Project: Mumeco Properties - County of Wetaskiwin, AB

Sample ID: BH1 - 5.25m
Source: N/A
Sampled By: NG
Tested By: RS

Sample Date: Nov 6, 2014 | Date Tested: Nov 24, 2014 | Date Received: Nov 6, 2014



Sieve Size (mm)	Percent Passing
40.000	100.0
25.000	100.0
20.000	100.0
10.000	100.0
5.000	100.0
2.500	100.0
1.250	100.0
0.630	100.0
0.315	99.2
0.160	84.6
0.080	39.6
0.038	35.4
0.027	33.7
0.020	32.1
0.014	30.4
0.011	28.7
0.008	26.9
0.006	25.1
0.004	23.4
0.003	21.7
0.002	19.9
0.001	15.5

Sand = 60.4 %
Silt = 19.7 %
Clay = 19.9 %

Sample Description:
Remarks:

Per: _____

LEVELTON CONSULTANTS LTD.
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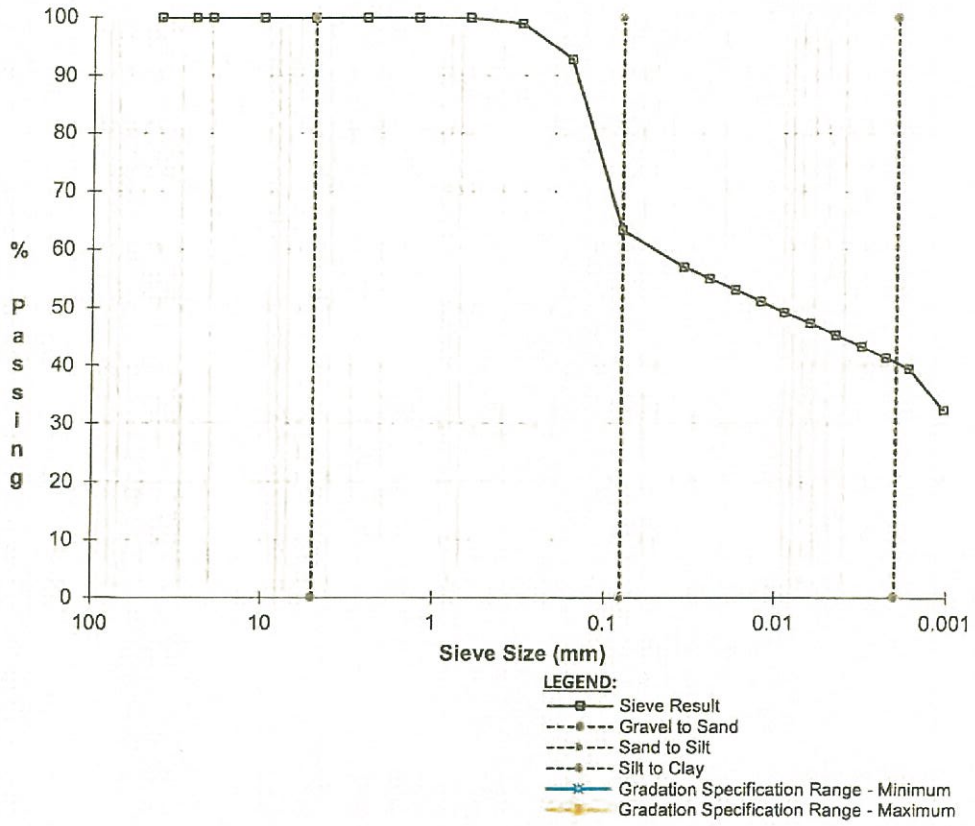
SIEVE ANALYSIS

Report Date: Nov. 25, 2014
Project Number: R714-1823-00
Report Number: 1699

To: Mumeco Properties Ltd.
Project: Mumeco Properties - County of Wetaskiwin, AB

Sample ID: BH2 - 6.75m
Source: N/A
Sampled By: NG
Tested By: RS

Sample Date: Nov 6, 2014 | Date Tested: Nov 24, 2014 | Date Received: Nov 6, 2014



Sieve Size (mm)	Percent Passing
40.000	100.0
25.000	100.0
20.000	100.0
10.000	100.0
5.000	100.0
2.500	100.0
1.250	100.0
0.630	100.0
0.315	99.0
0.160	92.8
0.080	63.3
0.035	56.9
0.025	54.9
0.017	53.0
0.012	51.1
0.009	49.2
0.006	47.3
0.004	45.2
0.003	43.2
0.002	41.3
0.002	39.4
0.001	32.4

Sand = 36.7 %
Silt = 23.9 %
Clay = 39.4 %

Sample Description:
Remarks:

Per:

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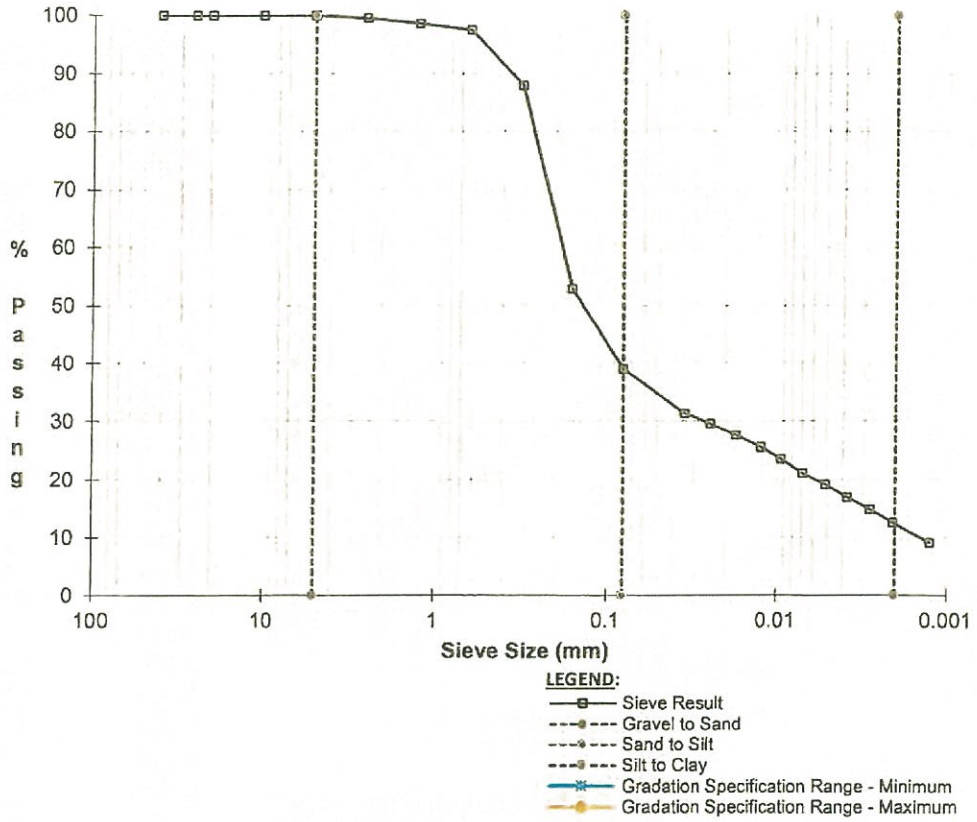
SIEVE ANALYSIS

Report Date: Nov. 25, 2014
Project Number: R714-1823-00
Report Number: 1699

To: Mumeco Properties Ltd.
Project: Mumeco Properties - County of Wetaskiwin, AB

Sample ID: BH3 - 4.5m
Source: N/A
Sampled By: NG
Tested By: RS

Sample Date: Nov 6, 2014 | Date Tested: Nov 24, 2014 | Date Received: Nov 6, 2014



Sieve Size (mm)	Percent Passing
40.000	100.0
25.000	100.0
20.000	100.0
10.000	100.0
5.000	100.0
2.500	99.5
1.250	98.6
0.630	97.5
0.315	88.0
0.160	52.9
0.080	39.0
0.035	31.3
0.025	29.5
0.017	27.6
0.012	25.6
0.009	23.6
0.007	21.1
0.005	19.2
0.004	16.9
0.003	14.9
0.002	12.5
0.001	9.1

Sand = 61.0 %
Silt = 26.5 %
Clay = 12.5 %

Sample Description:
Remarks:

Per: _____

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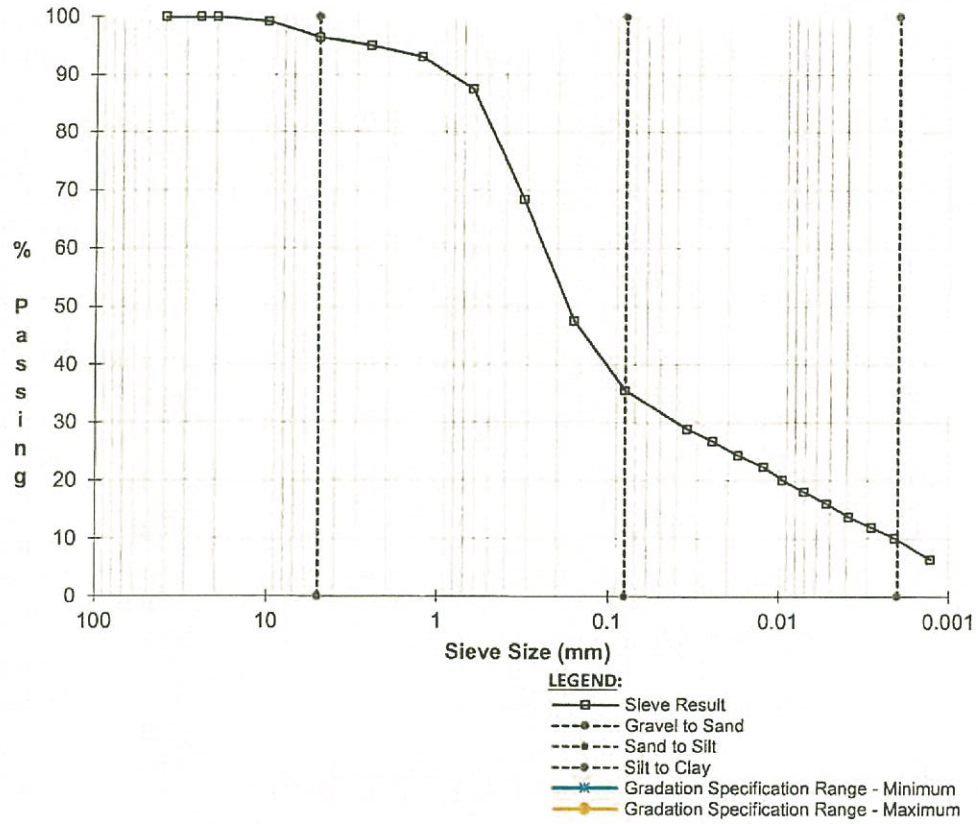
SIEVE ANALYSIS

Report Date: Nov. 25, 2014
Project Number: R714-1823-00
Report Number: 1699

To: Mumeco Properties Ltd.
Project: Mumeco Properties - County of Wetaskiwin, AB

Sample ID: BH4 - 2.25m
Source: N/A
Sampled By: NG
Tested By: RS

Sample Date: Nov 6, 2014 Date Tested: Nov 24, 2014 Date Received: Nov 6, 2014



Sieve Size (mm)	Percent Passing
40.000	100.0
25.000	100.0
20.000	100.0
10.000	99.2
5.000	96.4
2.500	94.9
1.250	93.1
0.630	87.5
0.315	68.4
0.160	47.6
0.080	35.6
0.035	28.9
0.025	26.9
0.017	24.4
0.012	22.4
0.010	20.1
0.007	18.1
0.005	16.1
0.004	13.8
0.003	12.0
0.002	10.2
0.001	6.5

Gravel = 3.6 %
Sand = 60.8 %
Silt = 25.4 %
Clay = 10.2 %

Sample Description:
Remarks:

Per:

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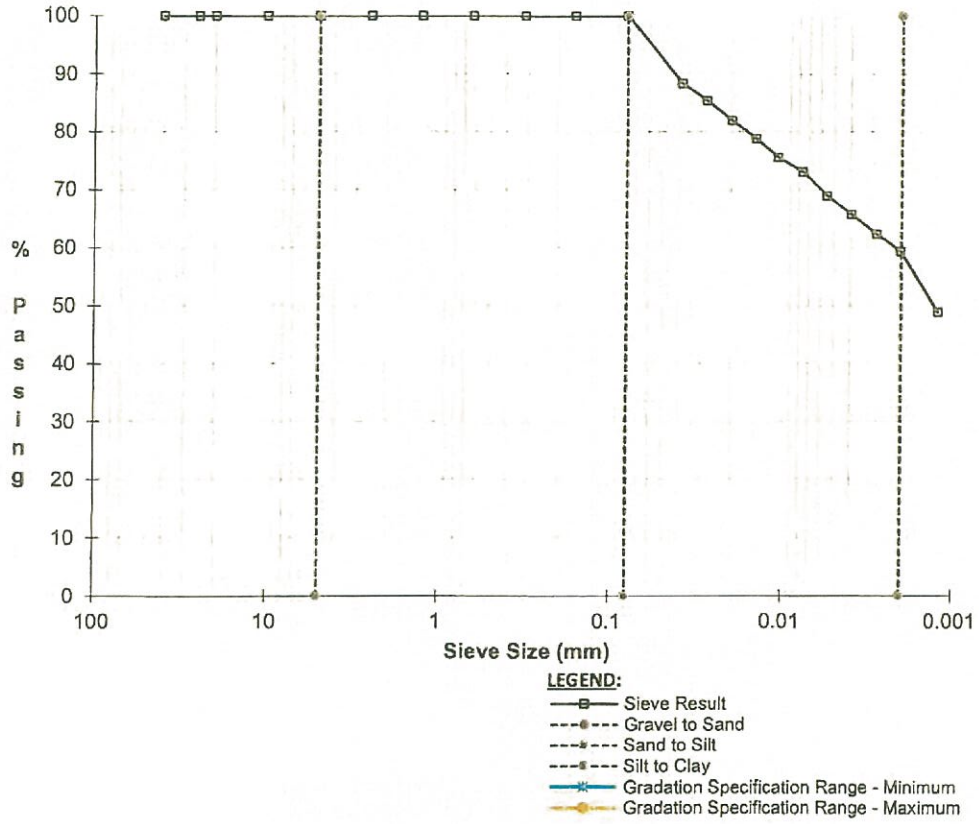
SIEVE ANALYSIS

Report Date: Nov. 25, 2014
Project Number: R714-1823-00
Report Number: 1699

To: Mumeco Properties Ltd.
Project: Mumeco Properties - County of Wetaskiwin, AB

Sample ID: BH5 - 6.0m
Source: N/A
Sampled By: NG
Tested By: RS

Sample Date: Nov 6, 2014 | Date Tested: Nov 24, 2014 | Date Received: Nov 6, 2014



Sieve Size (mm)	Percent Passing
40.000	100.0
25.000	100.0
20.000	100.0
10.000	100.0
5.000	100.0
2.500	100.0
1.250	100.0
0.630	100.0
0.315	100.0
0.160	100.0
0.080	100.0
0.039	88.4
0.028	85.4
0.020	82.0
0.014	78.8
0.011	75.6
0.008	73.0
0.005	69.0
0.004	65.8
0.003	62.4
0.002	59.4
0.001	49.0

Silt = 40.6 %
Clay = 59.4 %

Sample Description:
Remarks:

Per: _____

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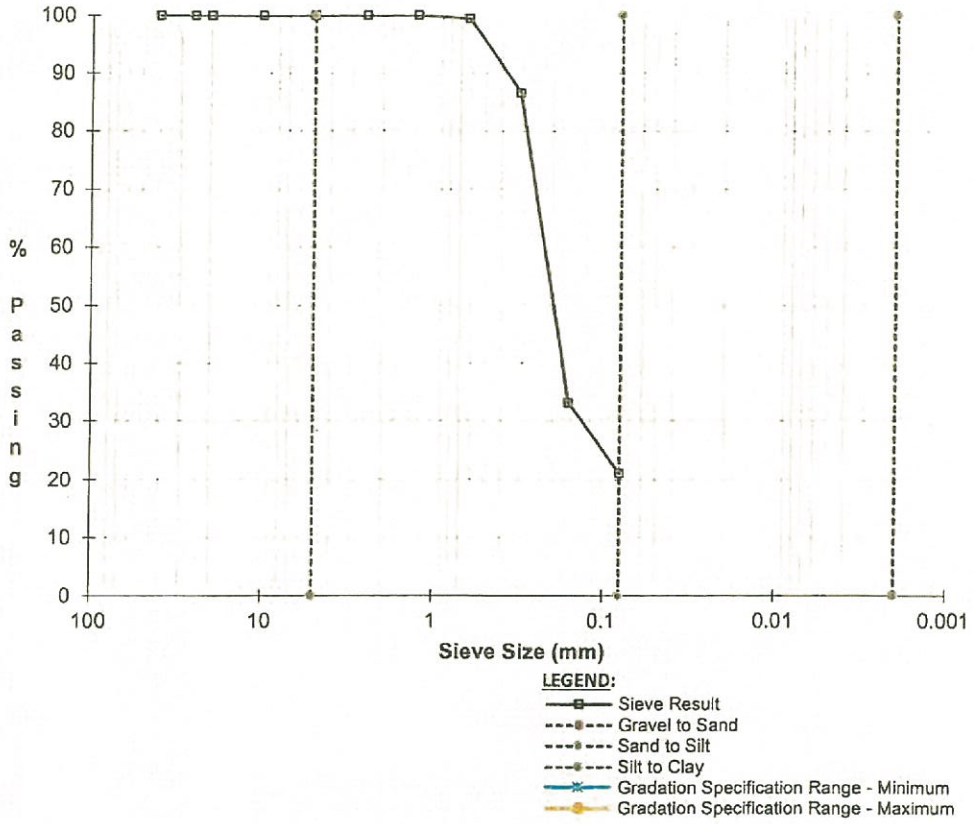
SIEVE ANALYSIS

Report Date: Nov. 25, 2014
Project Number: R714-1823-00
Report Number: 1699

To: Mumeco Properties Ltd.
Project: Mumeco Properties - County of Wetaskiwin, AB

Sample ID: BH6 - 5.25m
Source: N/A
Sampled By: NG
Tested By: RS

Sample Date: Nov 6, 2014 | Date Tested: Nov 24, 2014 | Date Received: Nov 6, 2014



Sieve Size (mm)	Percent Passing
40.000	100.0
25.000	100.0
20.000	100.0
10.000	100.0
5.000	100.0
2.500	100.0
1.250	100.0
0.630	99.4
0.315	86.6
0.160	33.2
0.080	21.2

Sand = 78.8 %
Silt/Clay = 21.2 %

Sample Description:
Remarks:

Per: _____

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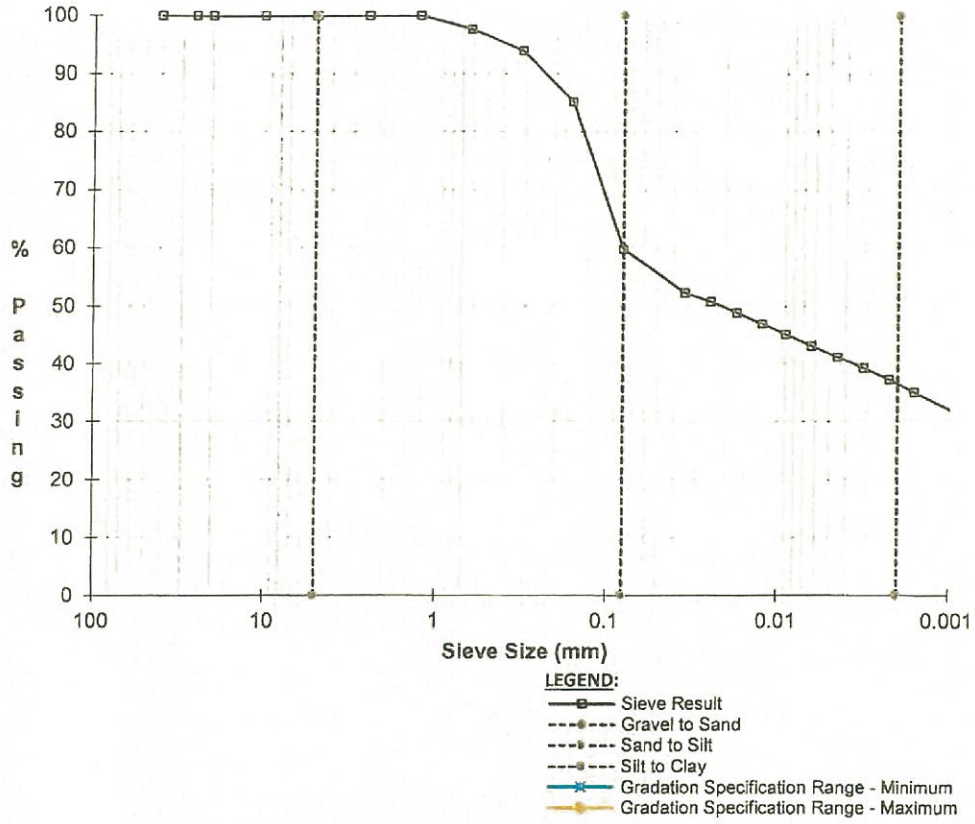
SIEVE ANALYSIS

Report Date: Nov. 25, 2014
Project Number: R714-1823-00
Report Number: 1699

To: Mumeco Properties Ltd.
Project: Mumeco Properties - County of Wetaskiwin, AB

Sample ID: BH7 - 6.75m
Source: N/A
Sampled By: NG
Tested By: RS

Sample Date: Nov 6, 2014 | Date Tested: Nov 24, 2014 | Date Received: Nov 6, 2014



Sieve Size (mm)	Percent Passing
40.000	100.0
25.000	100.0
20.000	100.0
10.000	100.0
5.000	100.0
2.500	100.0
1.250	100.0
0.630	97.7
0.315	94.0
0.160	85.2
0.080	59.7
0.035	52.2
0.025	50.8
0.017	48.9
0.012	47.0
0.009	45.0
0.006	43.1
0.004	41.2
0.003	39.3
0.002	37.4
0.002	35.2
0.001	31.6

Sand = 40.3 %
Silt = 24.5 %
Clay = 35.2 %

Sample Description:
Remarks:

Per: _____

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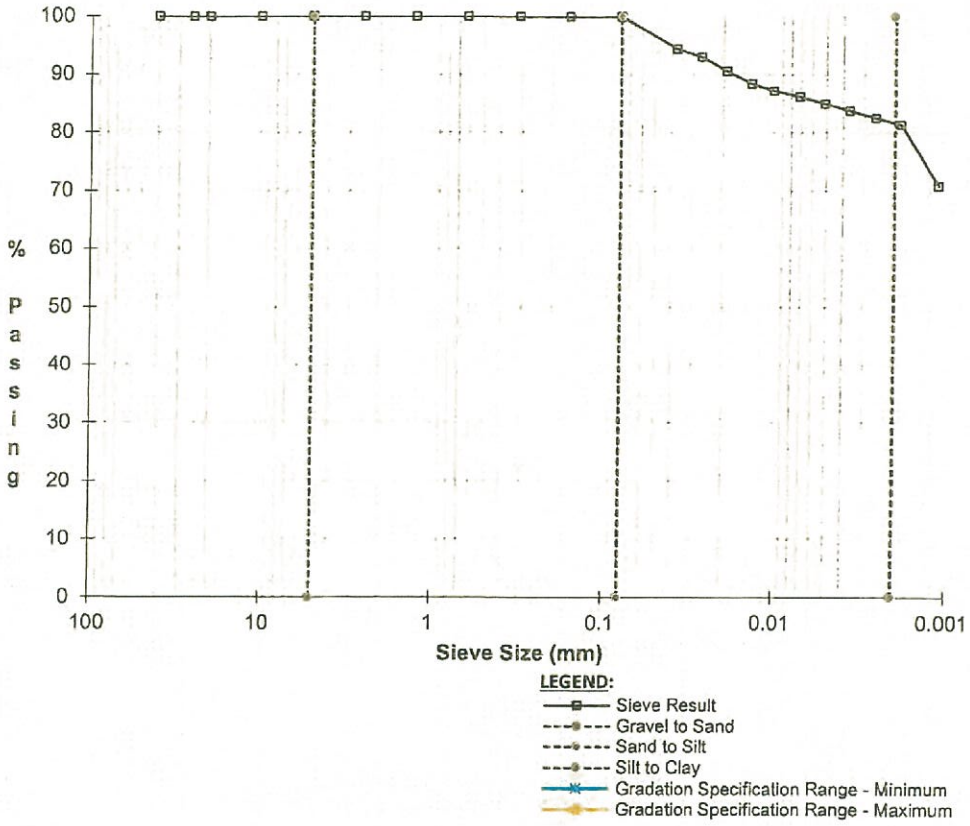
SIEVE ANALYSIS

Report Date: Nov. 25, 2014
Project Number: R714-1823-00
Report Number: 1699

To: Mumeco Properties Ltd.
Project: Mumeco Properties - County of Wetaskiwin, AB

Sample ID: BH8 - 1.5m
Source: N/A
Sampled By: NG
Tested By: RS

Sample Date: Nov 6, 2014 | Date Tested: Nov 24, 2014 | Date Received: Nov 6, 2014



Sieve Size (mm)	Percent Passing
40.000	100.0
25.000	100.0
20.000	100.0
10.000	100.0
5.000	100.0
2.500	100.0
1.250	100.0
0.630	100.0
0.315	100.0
0.160	100.0
0.080	100.0
0.038	94.4
0.027	93.0
0.019	90.6
0.014	88.4
0.010	87.2
0.007	86.2
0.005	85.0
0.004	83.8
0.003	82.6
0.002	81.4
0.001	71.0

Silt = 18.6 %
Clay = 81.4 %

Sample Description:
Remarks:

Per: _____

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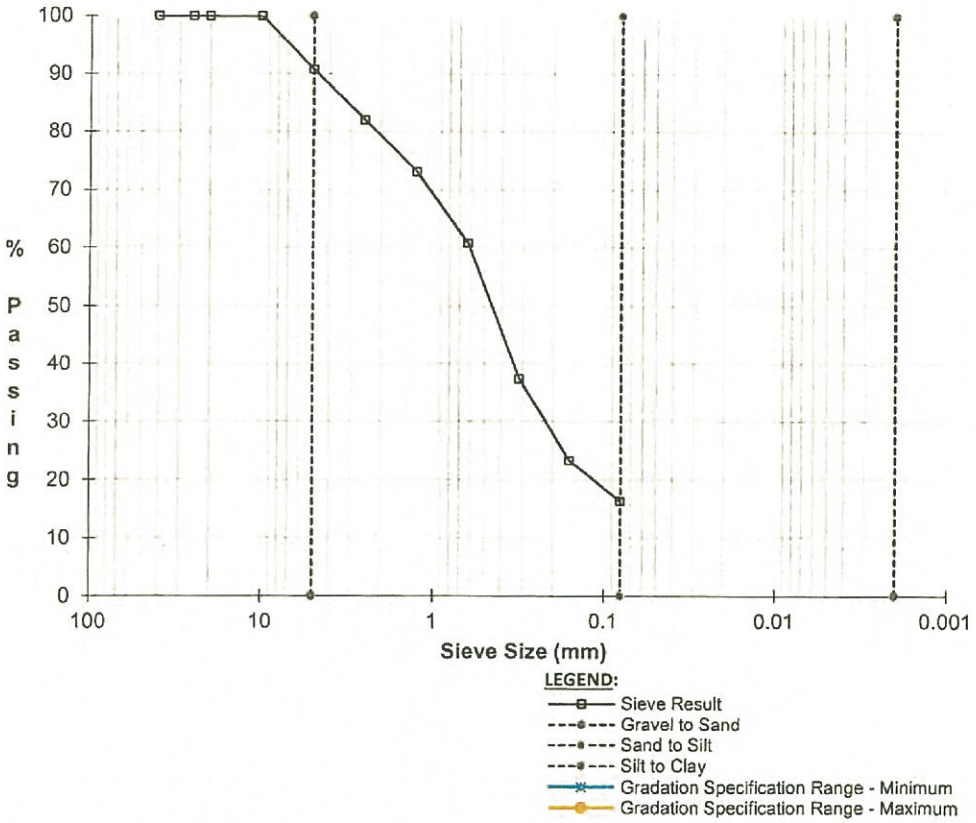
SIEVE ANALYSIS

Report Date: Nov. 25, 2014
Project Number: R714-1823-00
Report Number: 1699

To: Mumeco Properties Ltd.
Project: Mumeco Properties - County of Wetaskiwin, AB

Sample ID: BH9 - 2.25m
Source: N/A
Sampled By: NG
Tested By: RS

Sample Date: Nov 6, 2014 Date Tested: Nov 24, 2014 Date Received: Nov 6, 2014



Sieve Size (mm)	Percent Passing
40.000	100.0
25.000	100.0
20.000	100.0
10.000	100.0
5.000	90.8
2.500	82.0
1.250	73.1
0.630	60.8
0.315	37.5
0.160	23.4
0.080	16.4

Gravel = 9.2 %
Sand = 74.4 %
Silt/Clay = 16.4 %

Sample Description:
Remarks:

Per:

APPENDIX D
TERMS OF REFERENCE

TERMS OF REFERENCE FOR GEOTECHNICAL REPORTS ISSUED BY LEVELTON CONSULTANTS LTD.

LEVELTON

1. STANDARD OF CARE

Levelton Consultants Ltd. ("Levelton") prepared and issued this geotechnical report (the "Report") for its client (the "Client") in accordance with generally-accepted engineering consulting practices for the geotechnical discipline. No other warranty, expressed or implied, is made. Unless specifically stated in the Report, the Report does not address environmental issues.

The terms of reference for geotechnical reports issued by Levelton (the "Terms of Reference") contained in the present document provide additional information and caution related to standard of care and the use of the Report. The Client should read and familiarize itself with these Terms of Reference.

2. COMPLETENESS OF THE REPORT

All documents, records, drawings, correspondence, data, files and deliverables, whether hard copy, electronic or otherwise, generated as part of the services for the Client are inherent components of the Report and, collectively, form the instruments of professional services (the "Instruments of Professional Services"). The Report is of a summary nature and is not intended to stand alone without reference to the instructions given to Levelton by the Client, the communications between Levelton and the Client, and to any other reports, writings, proposals or documents prepared by Levelton for the Client relative to the specific site described in the Report, all of which constitute the Report.

TO PROPERLY UNDERSTAND THE INFORMATION, OBSERVATIONS, FINDINGS, SUGGESTIONS, RECOMMENDATIONS AND OPINIONS CONTAINED IN THE REPORT, REFERENCE MUST BE MADE TO THE WHOLE OF THE REPORT. LEVELTON CANNOT BE RESPONSIBLE FOR USE BY ANY PARTY OF PORTIONS OF THE REPORT WITHOUT REFERENCE TO THE WHOLE REPORT AND ITS VARIOUS COMPONENTS.

3. BASIS OF THE REPORT

Levelton prepared the Report for the Client for the specific site, development, building, design or building assessment objectives and purpose that the Client described to Levelton. The applicability and reliability of any of the information, observations, findings, suggestions, recommendations and opinions contained in the Report are only valid to the extent that there was no material alteration to or variation from any of the said descriptions provided by the Client to Levelton unless the Client specifically requested Levelton to review and revise the Report in light of such alteration or variation.

4. USE OF THE REPORT

The information, observations, findings, suggestions, recommendations and opinions contained in the Report, or any component forming the Report, are for the sole use and benefit of the Client and the team of consultants selected by the Client for the specific project that the Report was provided. NO OTHER PARTY MAY USE OR RELY UPON THE REPORT OR ANY PORTION OR COMPONENT WITHOUT THE WRITTEN CONSENT OF LEVELTON. Levelton will consent to any reasonable request by the Client to approve the use of this Report by other parties designated by the Client as the "Approved Users". As a condition for the consent of Levelton to approve the use of the Report by an Approved User, the Client must provide a copy of these Terms of Reference to that Approved User and the Client must obtain written confirmation from that Approved User that the Approved User will comply with these Terms of Reference, such written confirmation to be provided separately by each Approved User prior to beginning use of the Report. The Client will provide Levelton with a copy of the written confirmation from an Approved User when it becomes available to the Client, and in any case, within two weeks of the Client receiving such written confirmation.

The Report and all its components remain the copyright property of Levelton and Levelton authorises only the Client and the Approved Users to make copies of the Report, but only in such quantities as are reasonably necessary for the use of the Report by the Client and the Approved Users. The Client and the Approved Users may not give, lend, sell or otherwise disseminate or make the Report, or any portion thereof, available to any party without the written permission of Levelton. Any use which a third party makes of the Report, or any portion of the Report, is the sole responsibility of such third parties. Levelton accepts no responsibility for damages suffered by any third party resulting from the use of the Report. The Client and the Approved Users acknowledge and agree to indemnify and hold harmless Levelton, its officers, directors, employees, agents, representatives or sub-consultants, or any or all of them, against any claim of any nature whatsoever brought against Levelton by any third parties, whether in contract or in tort, arising or related to the use of contents of the Report.

LEVELTON

TERMS OF REFERENCE FOR GEOTECHNICAL REPORTS ISSUED BY LEVELTON CONSULTANTS LTD. (continued)

5. INTERPRETATION OF THE REPORT

a. **Nature and Exactness of Descriptions**: The classification and identification of soils, rocks and geological units, as well as engineering assessments and estimates have been based on investigations performed in accordance with the standards set out in Paragraph 1 above. The classification and identification of these items are judgmental in nature and even comprehensive sampling and testing programs, implemented with the appropriate equipment by experienced personnel, may fail to locate some conditions. All investigations or assessments utilizing the standards of Paragraph 1 involve an inherent risk that some conditions will not be detected and all documents or records summarizing such investigations will be based on assumptions of what exists between the actual points sampled. Actual conditions may vary significantly between the points investigated and all persons making use of such documents or records should be aware of, and accept, this risk. Some conditions are subject to changes over time and the parties making use of the Report should be aware of this possibility and understand that the Report only presents the conditions at the sampled points at the time of sampling. Where special concerns exist, or when the Client has special considerations or requirements, the Client must disclose them to Levelton so that additional or special investigations may be undertaken, which would not otherwise be within the scope of investigations made by Levelton or the purposes of the Report.

b. **Reliance on information**: The evaluation and conclusions contained in the Report have been prepared on the basis of conditions in evidence at the time of site investigation and field review and on the basis of information provided to Levelton. Levelton has relied in good faith upon representations, information and instructions provided by the Client and others concerning the site. Accordingly, Levelton cannot accept responsibility for any deficiency, misstatement or inaccuracy contained in the report as a result of misstatements, omissions, misrepresentations or fraudulent acts of persons providing information.

c. **Additional Involvement by Levelton**: To avoid misunderstandings, Levelton should be retained to assist other professionals to explain relevant engineering findings and to review the geotechnical aspects of the plans, drawings and specifications of other professionals relative to the engineering issues pertaining to the geotechnical consulting services provided by Levelton. To ensure compliance and consistency with the applicable building codes, legislation, regulations, guidelines and generally-accepted practices, Levelton should also be retained to provide field review services during the performance of any related work. Where applicable, it is understood that such field review services must meet or exceed the minimum necessary requirements to ascertain that the work being carried out is in general conformity with the recommendations made by Levelton. Any reduction from the level of services recommended by Levelton will result in Levelton providing qualified opinions regarding adequacy of the work.

6. ALTERNATE REPORT FORMAT

When Levelton submits both electronic and hard copy versions of the Instruments of Professional Services, the Client agrees that only the signed and sealed hard copy versions shall be considered final and legally binding upon Levelton. The hard copy versions submitted by Levelton shall be the original documents for record and working purposes, and, in the event of a dispute or discrepancy, the hard copy versions shall govern over the electronic versions; furthermore, the Client agrees and waives all future right of dispute that the original hard copy signed and sealed versions of the Instruments of Professional Services maintained or retained, or both, by Levelton shall be deemed to be the overall originals for the Project.

The Client agrees that the electronic file and hard copy versions of Instruments of Professional Services shall not, under any circumstances, no matter who owns or uses them, be altered by any party except Levelton. The Client warrants that the Instruments of Professional Services will be used only and exactly as submitted by Levelton.

The Client recognizes and agrees that Levelton prepared and submitted electronic files using specific software or hardware systems, or both. Levelton makes no representation about the compatibility of these files with the current or future software and hardware systems of the Client, the Approved Users or any other party. The Client further agrees that Levelton is under no obligation, unless otherwise expressly specified, to provide the Client, the Approved Users and any other party, or any or all of them, with specific software and hardware systems that are compatible with any electronic submitted by Levelton. The Client further agrees that should the Client, an Approved User or a third party require Levelton to provide specific software or hardware systems, or both, compatible with the electronic files prepared and submitted by Levelton, for any reason whatsoever included but not restricted to an order from a court, then the Client will pay Levelton for all reasonable costs related to the provision of the specific software or hardware systems, or both. The Client further agrees to indemnify and hold harmless Levelton, its officers, directors, employees, agents, representative or sub-consultant, or any or all of them, against any claim or any nature whatsoever brought against Levelton, whether in contract or in tort, arising or related to the provision or use or any specific software or hardware provided by Levelton.