LETHBRIDGE COUNTY
IN THE PROVINCE OF ALBERTA

BYLAW NO. 23-002

A BYLAW OF LETHBRIDGE COUNTY BEING A BYLAW PURSUANT TO SECTION 633(1) OF THE MUNICIPAL GOVERNMENT ACT, REVISED STATUTES OF ALBERTA 2000, CHAPTER M.26

WHEREAS the landowners wish to develop lands within the 5-8-20-W4 being that portion of the southwest quarter lying to the west of the 65 metre canal right-of-way and lying north of the south halves of legal subdivisions 3 and 4, and lying to the north of the 30 metre canal right-of-way on Plan 8210212;

AND WHEREAS the County's Municipal Development Plan and the Lethbridge County and City of Lethbridge Intermunicipal Development Plan requires that developers prepare an Area Structure Plan to ensure sound development occurs within Lethbridge County;

AND WHEREAS the total area considered by the Area Structure Plan is approximately 66.8 acres (27 hectares);

AND WHEREAS the landowner/developer have prepared the "Country Crossroad Estate Area Structure Plan" which contains engineering, survey, and geotechnical information to support the above conditions.

NOW THEREFORE BE IT RESOLVED, under the Authority and subject to the provisions of the Municipal Government Act, Revised Statutes of Alberta, 2000, Chapter M-26, as amended, the Council of Lethbridge County in the Province of Alberta duly assembled does hereby enact the following:

1. The "Country Crossroad Estate Area Structure Plan" Bylaw No. 23-002, attached as "Appendix A".

GIVEN first reading this 16th day of March, 2023.

Reeve

CAO

GIVEN second reading this 1ST day of JUNE, 2023.

As Amended:

To include a 3-acre parcel minimum and that the applicant amend the ASP accordingly.

Reeve

CAO

GIVEN third reading this 1ST day of JUNE, 2023.

Reeve

CAO

1st Reading	March 16, 2023
2nd Reading	June 1, 2023 as amended
Public Hearing	Apr. 20, 2023
3rd Reading	June 1, 2023

Country Crossroads Estate

AREA STRUCTURE PLAN

$SW\frac{1}{4}$ Sec.05 - 8-20-W4M

Prepared for: Jody Nakamura
Prepared by: Martin Geomatic Consultants Ltd.

Bylaw 23-002

MARTIN GEOMATIC CONSULTANTS

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1.0 INTRODUCTION

1.1 PURPOSE OF THE PLAN

The purpose of the Country Crossroads Estate Area Structure Plan (ASP) is to provide a comprehensive planning framework for development of the land within the southwest quarter of Sec. 05-8-20-W4M. The Plan Area is located in Lethbridge County and is shown on **Figure 1 - Location Plan.** Prior to consideration of subdividing or re-subdividing a property, Lethbridge County requires preparation of an Area Structure Plan to address all planning issues related thereto. The purpose of this area structure plan is thus to provide all pertinent information to the County and its advisors that will enable development of the subject property.

The plan is submitted for approval according to provincial statutory requirements. This plan will also be used to support a land use reclassification pursuant to Lethbridge County Land Use Bylaw #1404.

The Area Structure Plan have been amended to meet the County Councils' request for revisions.

1.2 PLAN PREPARATION

Prior to commencing the preparation of the area structure plan document, Martin Geomatic Consultants Ltd. (MGCL) had discussions and met with representatives from:

- Lethbridge County
- Alberta Environment and Parks,
- Alberta Transportation,
- County of Lethbridge Rural Water Association,
- Exon Mobil,
- Fortis Alberta,
- Lethbridge County,
- Saint Mary River Irrigation District,
- Shaw Cable,
- Telus Communications,
- the landowner of the proposed plan area,
- Triple W Natural Gas Co-op Ltd.

2.0 LEGISLATIVE FRAMEWORK

2.1 THE MUNICIPAL GOVERNMENT ACT

Country Crossroads Estate Area Structure Plan has been produced in accordance with Section 633 of the Municipal Government Act. It is the intention of this plan to create a framework for the development of a portion of SW. 1/4 Sec. 5-8-20-W4M into Grouped Country Residential classified area.

2.2 THE SOUTH SASKATCHEWAN REGIONAL PLAN

The Country Crossroads Estate ASP aims to follow the Alberta Government South Saskatchewan Regional Plan (SSRP) 2014 – 2024, Amended February 2017.

Strategic Outcomes of the SSRP aligned with the Country Crossroads Estate ASP include: sustainable development wherein economic development takes into account environmental sustainability and social outcomes, conserving and maintaining the benefits of biodiversity, advancing watershed management, promoting efficient use of land, and strengthening communities.

2.3 LETHBRIDGE COUNTY MUNICIPAL DEVELOPMENT PLAN

The Country Crossroads Estate ASP aims to follow the Lethbridge County Municipal Development Plan (MDP) Bylaw No. 22-001.

The MDP outlines specific requirements necessary for residential development in Lethbridge County. Based on these requirements the Country Crossroads Estate ASP sets the stage for the proposed development.

Part 4, Sec. 4 - Land Use and Development Requirements of the MDP, outlines specific requirements in order that land in the County is properly planned and serviced based on the proposed use. County Crossroads Estates ASP and Land Use request is compatible with these detailed prerequisites for ASP's, land use re-designation, Geotechnical and soil reports.

This ASP has been designed such that the requirements outlined in Part 4 Plan Policies; Sec. 5 - Subdivision and Sec. 6 - General Residential Land Use, can be met when the development is ready for subdivision. The detailed design will be required to confirm as closely as possible to the policies in Sec. 11 - Infrastructure and Servicing and with the County's requirements in "Engineering Guidelines and Minimum Servicing Standards".

This ASP has endeavored to meet the requirements as detailed in Part 4, Sec. 8 - Grouped Country Residential. Particularly the criteria for siting, servicing roadways and fire suppression have generally been met. Notwithstanding these requirements, the source of potable water has not yet been finalized. The ASP presents three alternatives for the potable water supply and the Developer is endeavoring to obtain water through the water co-op. The water source must be finalized and approved by Lethbridge County.

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

Although the minimum lot size is 2 acres (0.8 ha) to facilitate on-site sewage disposal systems,

the area structure plan lots sizes are no less than 3 acres (1.21 ha) as required by County Council.

2.4 LETHBRIDGE COUNTY, GROUPED COUNTRY RESIDENTIAL LAND USE STRATEGY

The main purpose of the above strategy is the identification of suitable site criteria for GCR developments.

This section of the ASP addresses the siting criteria as detailed in the county's strategy.

2.4.1. SITING CRITERIA

One of the siting criteria is that GCR sites should be located on lands that are already subdivided or are fragmental areas and land where the adjacent properties are currently subdivided for grouped country residential purposes.

Country Crossroads Estates falls within land that meets the above, preferred, siting criteria. The SW ¼ of Section 28 is divided in half with Highway 4 and the railway right of way running diagonally through the quarter section. Additionally, the triangular SW half is further divided in half by the SMRID main canal. This leaves a fragmented site that is difficult to farm. Existing grouped country residential sites are adjacent to the site's north and south boundaries. In total there are about 45 residential sites within 800 meters of the Country Crossroads ASP area.

2.4.2. SERVICING

The site meets the following criteria from the GCR land use strategy:

- Potable water can be obtained
- Supply of irrigation water from SMRID
- Soils on the site can handle individual, private septic systems. (refer to **Appendix 2 - Geotechnical Evaluation.**)
- A Storm Water Management Plan has been completed and is attached as **Appendix 5 – Stormwater Management Plan**; this demonstrates that all stormwater up to the 1 in 100 year event will be stored on site and as such will not impact any adjacent or downstream landowners.
- The various shallow utility companies have been contacted and they have verified that gas, electrical and telephone services are available to the site

2.4.3. ROADS

The ASP area is accessed off of Range Roads 205 which is currently paved. All roads in the development will be paved. A T.I.A will be undertaken prior to subdivision approval and any upgrades to the existing roads that are required as a result of this the subdivision will be undertaken by the developer.

2.4.4. FIRE SUPPRESSION

The lots will be a minimum of 3 acres (1.21 ha) in size which will enable the houses to be setback a considerable distance from each other. Fire fighting water will be available on site from the wet pond. Additionally, the Coaldale fire department is the responsive fire department and the site is approximately 18 minutes from the fire station. If needed, the Lethbridge fire station is about 13 minutes from the site.

2.5 COUNTY LAND USE BYLAW

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

Although the minimum lot size is 2 acres (0.8 ha) to facilitate on-site sewage disposal systems, the area structure plan lots sizes are no less than 3 acres (1.21 ha) as required by County Council.

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

3.0 THE PLAN AREA AND SITE ANALYSIS

3.1 LOCATION AND DEFINITION OF PLAN AREA

The plan area is located in Lethbridge County within the SW. 1/4 Sec. 5-8-20-W4M, approximately 12 km driving distance southeast of the Lethbridge City limits along Highway 4. It is bordered on the north by existing group country residential; on the east by a an irrigation main canal, on the south by existing group country residential and a drainage channel, and on the west by Range Road 205 *refer to* ***Figure 2 - Land Ownership Map***. The plan area includes one land parcel: Title Number 051 470 968 in the name of Jody Nakamura. Refer to **Appendix 1 - Property Ownership Titles** and to **Figure 2 - Land Ownership Map.**

The site presently has one occupied house surrounded by irrigated crop land. The subject property is surrounded by farmsteads to the west, Ritchie Bros Auctioneers to the east (beyond the irrigation canal), and by country residential to the north and south. The site is nearly level with an average slope of 0.5% dropping from north to south. A single dwelling exists in the central part of the site. A single dugout exists east of the dwelling. A former irrigation canal has been backfilled and runs across the plan area from the northwest corner to the south boundary of the site.

3.2 SITE CHARACTERISTICS

The existing site features and contours are shown on **Figure 3.0 - Existing Site.**

- Access to the plan area is from paved Range Road 205 via Highway 508, which connects between Highway 4 and Highway 5.
- There is an existing 50 mm waterline owned by County of Lethbridge Rural Water Association, which runs parallel with Rge Rd. 205 adjacent to the site.
- There is an existing irrigation Canal along the east boundary of the plan area,
- There is an existing drainage channel along a portion of the southwest boundary of the plan area,
- There is an existing 25 mm gas line owned by Triple W Natural Gas Co-op Ltd., which runs across the site to service the existing dwelling,
- Overhead power follows the east ditch of Range. Rd. 205 and borders the west side of the plan area.
- One existing residential dwelling is located in the plan area which is currently using septic field disposal of wastewater.
- There is an existing abandoned well site along the south boundary as shown on **Figure 3 - Existing Site.**
  There is an existing Commercial septic field on the east side of the SMRID Canal.

3.3 SOILS

According to the Alberta Soils Information System, the site soils are characterized as “Orthic Dark Brown Chernozem on medium textured (L, SiL) sediments deposited by wind and water (LET). The polygon includes soils that are finer textured than the dominant or co-dominant soils (5). Undulating, low relief landform with a limiting slope of 2% (U1l).”

The “Geotechnical Evaluation, Proposed Rural Residential Subdivision, SW-5-8-20-W4, County

of Lethbridge" report prepared by Wood, May 31, 2018 (refer to the attached **Appendix 2.0 - Geotechnical Evaluation)** indicates that the soil stratigraphy was found to have topsoil underlain by clay fill, clay, silty sand, sandy clay till, and clay till deposits. This report provides more information on the soil and ground water candidates with recommendations on the excavations, site grading, dewatering, buried services and trench backfill, concrete, pavement, stormwater management, residential construction, sewage disposal, and testing and inspections.

3.4 TOPOGRAPHY

The site is relatively flat with an average slope of 0.5% dropping from north to south. The high point of the plan area is at an elevation of about 926.0 m along the east boundary. The low point is at 922.26 m in the south-west area adjacent to the drainage channel. Refer to **Figure 3.0 - Existing Site.**

3.5 WATER AND HYDROLOGY

The above noted Geotechnical Evaluation found that the depth to ground water varied between 2.3 and 3.4 meters.

- There are no natural bodies of water within the plan area,
- A S.M.R.I.D. irrigation canal exists adjacent to and along the east boundary of the plan area,
- A S.M.R.I.D. drainage channel exists adjacent to and along the south boundary of the plan area,
- A highway ditch along Range Road 205 runs parallel to and adjacent to the west boundary of the site.
- A human made dugout exists adjacent to the existing house near the center of the property.

3.6 HABITAT AND VEGETATION

The plan area consists mainly of irrigated crop land.

3.7 ENVIRONMENTAL, HISTORICAL AND ARCHAEOLOGICAL SIGNIFICANCE

The "Phase 1 Environmental Site Assessment, Nakamura Residential Subdivision, SW 05-008-20 W4M near Lethbridge, Alberta" report prepared by Amec Foster Wheeler Environment & Infrastructure, Lethbridge, Alberta, April 2018 (refer to the attached **Appendix 3 - Environmental Site Assessment**) indicates:

- The site has been used for pasture and farm land since at least 1950,
- An irrigation canal traversed the site until it was backfilled prior to 1983,
- A farm house was built on a concrete foundation in 1996,
  A former Mobil Oil C.P.R Wilson No.5-4 well was identified south of the site, drilled to a depth of 1306 meters in 1955 and abandoned in 1958,
- A Phase 2 environmental investigation has been recommended in the Environmental Assessment due to the former oil well. The Developer wishes to secure approval of this ASP prior to completing the Phase 2 ESA. The Phase 2 ESA, if required, would be done prior to subdivision.
- Recommendations pertaining to hazardous building materials should be considered.

3.8 EXISTING USE OF LAND

- The plan area is mainly used for agriculture, with approximately 66.21 acres (26.79 ha) of irrigated cropland *(refer to **Figure 3 - Existing Site**)*,
- There is a house situated near the center of the plan area. This house is intended to remain in place and is incorporated in the development layout,
- Range Road 205 passes along the west side of the site which provides access to the plan area.

4.0 SITE FEATURES

4.1 LOCATION

- The site is within the rural agricultural area of Lethbridge County thereby giving residents the rural atmosphere many people desire.
- The site is in close proximity of the City of Lethbridge where a wide variety of education, medical, commercial, recreational and community services exist.

4.2 HIGHWAY ACCESS

- The paved Range Road 205 and Highway 508 provides access between the site and the City via Highway 4 and Highway 5.

4.3 EASE OF DEVELOPMENT

Basic utilities such as potable and non potable water, storm water drainage channel, gas and electrical are located at or near the site boundary and therefore the servicing and development of the site will be generally simple, efficient and economical. Nine (9) existing residents either border or back onto the plan area.

4.4 SURROUNDING USES OF LAND

- Existing agricultural land uses will not have a detrimental effect on housing within ASP.
- The residential nature of the proposed development is not likely to affect any existing land uses surrounding the plan area.
- The Ritchie Bros Auction development immediately east of the plan area is shielded to a great extent by the high banks of the adjacent irrigation canal. Further to this, the auction type use is not an impediment to a rural residential lifestyle.
- There is an existing commercial septic field as part of the auction development to the east. The Subdivision and Development Regulations require a 300 metre separation between the septic field and any residential building. This is reflected in the ASP.
- There is no known natural resource development within the vicinity of the plan area which can either restrict or be impacted by the purposed residential subdivision.
- Existing grouped county residential sites are adjacent to the sites North and South boundaries. In total there are about 45 residential sites within 800 meters of the Country Crossroads Estates ASP areas.

4.5 LIFESTYLE

- This development will provide a type of residential land use that allows the residents to have full utility services and still live in a community offering a rural lifestyle.

5.0 PLAN GOALS, OBJECTIVES AND LAND USE

5.1 PLAN GOALS

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

The goals of this Area Structure Plan follow the planning policies outlined through the legislative framework.

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

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

- proposed land use,
- proposed lot layout,
- the road access and circulation,
- the location of public utilities,
- supply of irrigation water,
- supply of potable water,
- sanitary sewage disposal,
- drainage and stormwater management,
- other related matters.

5.2 PLAN OBJECTIVES

The Country Crossroads Estate Area Structure Plan will adhere to the following objectives:

- create lots with a minimum size of 3 acres (1.21 ha),
- institute a drainage and storm water management system for the planned development,
- review alternatives for the supply of potable water and the delivery of the water to each lot,
- consider road access and circulation for the development,
- analyze the impact on traffic in the surrounding roads,
- investigate the suitability of on-site septic systems for wastewater treatment and disposal,
- allow for a community irrigation system,
- identify electrical, gas, and communications servicing requirements.

6.0 DESIGN AND LAND USE

6.1 PROPOSED LAND USE

A total of 17 lots with a minimum size of 3 acres (1.21 ha) will be created on the proposed development which is proposed to be re-zoned as Grouped Country Residential, as shown on **Figure 4** – Land Use. This layout is preliminary and may have minor changes when the detailed design is done. Any changes to the layout or number of lot will require approval during the subdivision process.

6.2 DENSITY AND POPULATION

The housing density within the proposed development is comprised of 17 lots or 0.54 units per acre (1.37 units per ha.) of net area (*refer to* ***Figure 5 - Proposed Lot Layout*****).**

Based on an average occupancy of 3 persons per household, the population within the plan area is estimated to be approximately 51 persons.

6.3 MUNICIPAL RESERVE REQUIREMENTS

The County has indicated they do not want park land for the Municipal Reserve; rather they want cash-in-lieu for the 10% municipal reserve requirement.

6.4 ABANDONED OIL WELL SETBACK

There is an abandoned oil well near the southern site boundary with the coordinate of this shown on **Figure 5.0 – Proposed Lot Layout and Figure 7.0 – Building Setbacks.**

The minimum setback for any building or structure is 5.0 metres from the old well site.

6.5 RITCHIE BROS. COMMERCIAL SEPTIC FIELD SET BACK

The required minimum setback for any residential building to the commercial septic field is 300 meters as shown on **Figure 5.0 – Proposed Lot Layout and Figure 7.0 – Building Setbacks.**

7.0 ROADS

Access into the proposed development area will be from the paved Range Road 205 which connects to the north with Highway 4 and to the south Highway 508. A paved local road is proposed to extend east from Rge-Rd. 205 to a loop road and cul-de-sac through the site back to Rge-Rd 205 to create access for 17 residential lots (*refer to* ***Figure 5 - Proposed Lot Layout*****)**. The loop road includes two access points to the Rge-Rd. 205. The proposed loop road and cul-de-sac turn around will be paved and will be constructed according to the Lethbridge County Standards.

Alberta Transportation has stated that a detailed Transportation Impact Assessment is required for this development. They have indicated that it is not required to have the TIA at the Area Structure Plan stage. However, prior to any subdivision of the site, a TIA must be completed to meet Alberta Transportation requirements.

The Developer will be responsible for the upgrade cost of adjacent roads if the TIA determines that upgrades are required because of this development.

8.0 SERVICING

8.1 POTABLE WATER SUPPLY AND DISTRIBUTION

It is envisioned that the domestic potable water requirements for the subdivision will be met by one of the following alternatives or by a combination of these alternatives.

8.1.1 POTABLE WATER SUPPLY, ALTERNATIVE 1

The first alternative is to have the water supplied by the County of Lethbridge Rural Water Association via extensions from an existing potable water pipe running through the site. Each lot will be supplied with a trickle system to fill individual cisterns. The Water Co-op is in the process of finalizing their water supply plans for this area.

8.1.2 POTABLE WATER SUPPLY, ALTERNATIVE 2

The second alternative is the provision of ground water well(s) which will supply each lot via a trickle system to fill individual cisterns. Pre-chlorination and/or other treatment may be required prior to distribution to each lot. The feasibility of this alternative will be determined if it is required by Lethbridge County.

8.1.3 POTABLE WATER SUPPLY, ALTERNATIVE 3

The third alternative is use SMRID supplied irrigation water that will be treated as required by each individual lot owner. The feasibility of this alternative will be determined as required by Lethbridge County.

8.1.4 DETERMINATION OF FINAL POTABLE WATER SOURCES

The final method of water supply will be dependent on the Water Co-op's final plans and the costs associated with each of the alternatives. The ultimate method of supply could be by a combination of these alternatives which would be subject to Lethbridge County administrative approval.

The County may consider allowing four lots in Phase 1A to haul potable water pending the final determination of a potable water supply for the balance of the lots.

8.1.5 GOVERNMENT REQUIREMENTS

The water supply and cisterns will be installed in accordance with requirements of the Chinook Health Region, the Safety Codes Council of Alberta and Lethbridge County.

8.1.6 HOME OWNER ASSOCIATION

The potable water and irrigation systems will not be taken over by Lethbridge County. A separate entity will be created to manage these facilities. The entity and management requirements shall be approved by Lethbridge County.

8.2 SEWAGE DISPOSAL

8.2.1 GEOTECHNICAL EVALUATION FOR SEWAGE DISPOSAL

The "Geotechnical Evaluation, Proposed Rural Residential Subdivision, SW-5-8-20-W4, County of Lethbridge" report prepared by Wood, May 31, 2018 (refer to the attached **Appendix 2 - Geotechnical Evaluation**) indicates:

- Ten (10) boreholes were completed to a depth of 6.1 m, with depth to groundwater varying from 2.2 m to 3.4. Soil stratigraphy was found to have topsoil underlain by clay fill, clay, silty sand, sandy clay till, and clay till deposits.
- The groundwater depths generally satisfy the septic treatment requirements,
- The soil textures are marginally suitable for conventional septic effluent,
- The soil textures may warrant treatment mounds or secondary treatment,
- The detailed design of each septic field will determine the classification requirements.

8.2.2 ALBERTA SEWAGE SYSTEM REQUIREMENTS

Alberta Regulations AR229/97 and AR196/2015, the *Alberta Private Sewage Systems Standard of Practice 2015* (the "SOP") describes the requirements for the design of on-site wastewater treatment and disposal systems. All on- site waste water treatment and disposal systems must adhere to these regulations.

8.2.3 INDIVIDUAL LOT REQUIREMENTS

The owner or builder for each lot must use a qualified septic system designer and contractor to determine the type of septic system necessary for each lot. The type of system will be based on house design and soil conditions which vary throughout the lots.

The geotechnical study for the site indicates that a treatment mound or secondary efficient treatment may be required instead of a conventional treatment field.

8.2.4 POSSIBLE CONFLICT WITH STORM WATER DRAINAGE

No on-site septic system components shall be installed in areas designated for stormwater conveyance or detention of runoff.

8.3 STORM WATER MANAGEMENT

Stormwater within the development will be managed such that runoff will be stored and controlled on-site and then directed to the existing Tiffin Drainage channel running along the south property boundary (*refer to* ***Figure 6 – Site Drainage***). Post-development runoff will be controlled and released per the Tiffin Drain - Master Drainage Plan, Alberta Environment and Parks requirements, and the Lethbridge County Engineering Guidelines and Minimum Service Standards. Existing site topography will be utilized to minimize site grading. A brief summary of the existing and proposed drainage systems follows, and a more detailed description of the site drainage is included in the Stormwater Management Plan, which is appended to this document in **Appendix 5 - Stormwater Management Plan**;

8.3.1 EXISTING CONDITION

The land generally slopes down to the southwest at an average grade of 0.5% and drains in to

an existing drainage channel. A portion of the runoff from the site is trapped on site in a localized depression which spills in to the drainage channel. The drainage channel (R/W plan 821 0212) flows west and north through farmland and discharges to Sixmile Coulee and in to the Oldman River at the City of Lethbridge.

8.3.2 DRAINAGE CONCEPT

- The stormwater management concept is outlined in the attached Stormwater Management Plan, *Refer to* ***Appendix 5 – Storm Water Management Plan.***
- Runoff from the site will drain to a storm water detention pond to retain water on site and will then be released at the designated rate (Tiffin Drain – Master Drainage Plan, Lethbridge County) through a controlled outlet in to the existing Tiffin drainage channel, which flows down to the Oldman River,
- The proposed storm water detention pond is designed to accommodate the runoff from a storm event up to a 100 year storm,
- Runoff will be directed to the storm water detention pond through individual lot swales and a system of drainage ditches or dry ponds along the boundaries of some lots. Storm drainage will then flow through ditches located in the road right of ways to the storm pond. The conveyance concept is outlined on **Figure 6 – Site Drainage**.
- All of the designated drainage conveyance routes and storage facilities within the plan area will be protected by caveat, easements, or right-of-way as required.
- Currently we are planning that the storm water detention pond will be a wet pond with a normal water level being maintained with irrigation water. The pond design may change to a dry pond during detailed design.

8.3.3 SITE GRADING

The subdivision will be graded to be consistent with the overall Stormwater Management Plan as shown on **Figure 6 - Site Drainage**. Individual lots will be graded, by the Lot Owner, such that all surface runoff will be directed to perimeter swales and ditches, designed to carry the runoff into the stormwater detention facilities. Drainage ditches will be graded by the Developer.

Design grades with corner elevations for all lots will be provided to the County prior to subdivision. Elevations for individual lots will be provided to lot owners.

As built lot elevations must be checked and approved by the Consultant to ensure compliance with design grades.

8.4 UTILITIES

8.4.1 ELECTRICITY

Epcor is the electricity provider for Lethbridge County and the distributor is Fortis Alberta. It is planned that electrical service to individual lots will be distributed underground. Internal roadways will be serviced with street lights. All necessary applications for the detailed design and installation of electric utilities will be submitted to Fortis for their approval.

8.4.2 NATURAL GAS

Natural gas is available through ATCO Gas, who have advised that there be will no problems

supplying gas to this development.

8.4.3 TELECOMMUNICATIONS/CABLE SERVICE

Telus Communications provides telephone and cable service for the area. Cellular phone service is also available.

8.4.4 SOLID WASTE MANAGEMENT

Individual solid waste will be disposed of at local transfer stations for the development unless a municipal fee-for-service is available.

8.5 IRRIGATION SYSTEM

8.5.1 COMMUNITY IRRIGATION

A community irrigation system will provide SMRID supplied non-potable water to each lot for watering lawns and gardens or possibly as a source of grey water for each lot. This irrigation water will be supplied by SMRID either directly from the canal turn out or through an irrigation storage pond. Any irrigation water storage pond will be separate from the storm water management pond. The water will be supplied through a communal pipeline system with lateral connections supplying each lot.

8.5.2 WATER SUPPLY AND STORAGE

Water for fire protection will be supplied through either this irrigation water storage pond or the storm water management pond, which will have its level maintained with irrigation water supplied by SMRID. This irrigation water supply system will require approval for SMIRD.

8.5.3 OPERATION OF SYSTEM

A homeowner's association will be formed to own and operate the irrigation system within the development. The irrigation piping will be installed in an easement through the lots in favor of the homeowner's association. '

9.0 PROTECTIVE SERVICES

9.1 FIRE PROTECTION

The Coaldale Fire Department is the responding fire station and is located approximately 18 km from the plan area. Additional support, when needed, will be from the City of Lethbridge fire department. Fire Station #3 (2614 16 Ave. South) is approximately 13 minutes from the plan area

A dry hydrant will be installed at the irrigation water storage pond to provide an on-site water supply.

9.2 POLICE PROTECTION

Policing in the development area is provided by the R.C.M.P. which has a detachment located in the Town of Coaldale, which is approximately 20 kilometers from the plan area.

10.0 DEVELOPMENT AGREEMENT

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

- Runoff conveyance and detention as per the Stormwater Management Plan,
- Roadway construction,
- Potable water installation,
- Irrigation system,
- Shallow utilities,
- Other services or matters considered necessary by Lethbridge County.
- Roadway signage including culvert markers.

11.0 ARCHITECTURAL CONTROLS

11.1 PURPOSE OF CONTROLS

The developer of County Crossroad Estates will establish a set of architectural controls in order to achieve standards and development limitations throughout the area. These architectural controls will be administered by the Developer.

11.2 TYPICAL ITEMS INCLUDED IN CONTROLS

Typically the controls that will be in effect within County Crossroads Estate will include the following:

- Minimum dwelling unit area and site coverage (building footprint),
- Diversity in home design,
- Incorporation of energy efficiency features,
- Roof pitch & materials,
- Exterior finishing materials,
- Fencing materials,
- Minimum landscaping requirements in which xeriscaping will be considered,
- Hobby farm animals such as horses,
- Accessory building.
- Backfill requirements for the old irrigation canal
- Building and lot drainage requirements
- Sanitary Sewage Disposal

11.3 SITE SPECIFIC BUILDING RESTRICTION

11.3.1 BUILDING ON THE OLD IRRIGATION CANAL

The Architectural Controls will also contain a sketch depicting the old irrigation canal that has been backfilled and the existing dugout that will be backfilled. (Refer to **Figure 8 – Footprint of Old Canal and Dugout** by the Old Irrigation Canal)

It's not known if these areas were backfilled and compacted properly. Therefore, the Architectural Controls will have a requirement that the portion of any building or structure falling within the footprint of the old canal or dugout must have that portion excavated and back filled to 98% Standard Proctor density. This backfill must be done under the supervision of a geotechnical engineer.

11.3.2 BUILDING NEAR THE ABANDONED OIL WELL

The Architectural Controls will also depict the location of the abandon oil well which is near the south boundary. Refer to **Figure 5 - Proposed Lot Layout** and **Figure 7 – Building Setbacks.**

Provincial regulations require that there be no structures built within 5.0 metres of the abandoned well. Therefore a caveat will be filed on any lot or portion of a lot within 5 meters of the well location. The Architectural Controls will also identify this setback requirement.

11.3.3 SANITARY SEWAGE DISPOSAL

The Architectural Controls will require the lot owner to use a qualified designer to undertake a soils evaluation and design the sewage disposal system. The soil is marginally acceptable for a conventional treatment field and alternative methods of treatment may have to be employed.

12.0 IMPLEMENTATION AND DEVELOPMENT CONTROL

- This Area Structure Plan will become a Bylaw of Lethbridge County.
- The Land Use Bylaw must be amended to represent this ASP.
- All subsequent subdivision applications must adhere to provisions of this A.S.P. Bylaw and the Land Use Bylaw.
- Development applications, within the boundaries of the plan area, must comply with the requirements of the respective land use districts for which they are proposed.
- Building permits must be reviewed through a safety codes process approved by Lethbridge County.
- The developer of Country Crossroads Estate subdivision will establish a level of architectural standards and development limitations in order to achieve the desired results within the proposed subdivision. These standards and limitations are beyond the normal statutory requirements of Lethbridge County and will thus be administered by either the Developers or agents acting on their behalf and within their legal authority.
- The owners of any lot falling within the old footprint of the irrigation canal or dugout will receive notification with respect to the old irrigation canal at the time of purchase. This notification will advise that any portion of a building or structure falling within this area must be excavated and backfilled with compaction to 98% standard provided density. Further the notification will advise that this work must be undertaken under the supervision of a geotechnical engineer.
- Lethbridge County may utilize other bylaws and policies that will regulate aspects of activity within the boundaries of the Area Structure Plan.

13.0 PHASING

This development will be constructed in phases.

The first phase will be about 6 to 10 lots built along the southerly site access road. During this phase the road fronting these lots and the storm water management wet pond and the irrigation water storage pond will be constructed. Irrigation and potable water, as well as shallow utilities will also be made available to each lot.

Future phases will be developed in groups of lots as consumer demand for the lots dictates.

14.0 ADJACENT LANDOWNER CONSULTATION AND OTHER CORRESPONDENCE

14.1 NOTICE SENT TO ADJACENT OWNERS

A letter and drawings were hand delivered to residences in immediate vicinity of the ASP. (See **Appendix 6 – Adjacent Owner Consultation)**

14.2 NEIGHBORHOOD COMMENTS

One letter outlining concerns was received from John & Laura Prins.

14.3 OTHER CORRESPONDENCE

- Letter from John & Laura Prins
- Receipt for the down payment to the County of Lethbridge Rural Water Association for 27 water units
- Maps from SMRID showing irrigable land and the current irrigation turnout for the ASP site.
- Telus map
- Triple W Natural Gas Co-op map

15.0 MARKET DEMAND

The County's Group Residential strategy requires that a market demand study be included with the ASP. Consultation with land appraisers and realtors has determined that a market demand study in a rural residential development setting is difficult to undertake.

Regardless, it is possible that the lots in this ASP could take anywhere up to 10 or 15 years to be all sold. Estimating the market conditions over that period of time would be impossible. The best measure of market demand is the number of lots that are serviced at one time. Even though the ASP may contain 18 lots, the developers of Country Crossroad Estates will only service lots that they can foresee will be sold in relatively a short time period.

The ASP provides the framework for how the development is to proceed. Just because the ASP is approved it does not mean servicing all the lots at one time. With respect to this development, the owners have about 5 buyers that are interested in purchasing now. As such his plan is to service all 5 to 10 lots right away. The balance would be serviced based on market demand at that time. The owner of Phase 2 has no plans for servicing the lots. It could be 5 to 10 years before he gets started. The developers will regulate putting lots on the market only when there is purchaser interest and even then the servicing will be done in small phases.

CLOSURE

We are pleased to present to you the Crossroads Country Estates Area Structure Plan.

We trust this meets your requirements. Please contact the undersigned if you have any questions or comments.

Respectfully submitted June 19th , 2023.

PROFESSIONAL ENGINEER ED MARTIN JUNE 19 23

PROFESSIONAL ENGINEER E. MARTIN ALBERTA

2023-06-19

Prepare by
Ed Martin, P.Eng.

Reviewed by
Ray Martin, P.Eng.

PERMIT TO PRACTICE
Martin Geomatic Consultants Ltd.
Signature:
Date: 2023-06-19
PERMIT NUMBER: P 5852
The Association of Professional Engineers and Geoscientists of Alberta

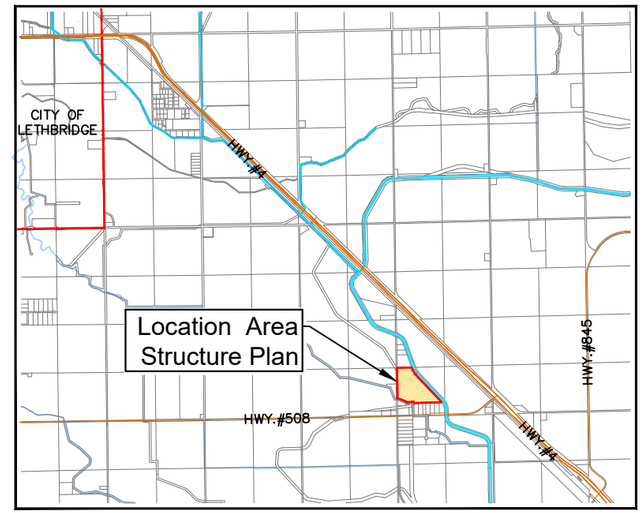
FIGURES

Area Structure Plan
Boundary encompasses
26.79 ha (66.21 ac.)

HIGHWAY 4

RANGE ROAD 20-5

HIGHWAY #508



COUNTY MAP

Country Crossroads Estate

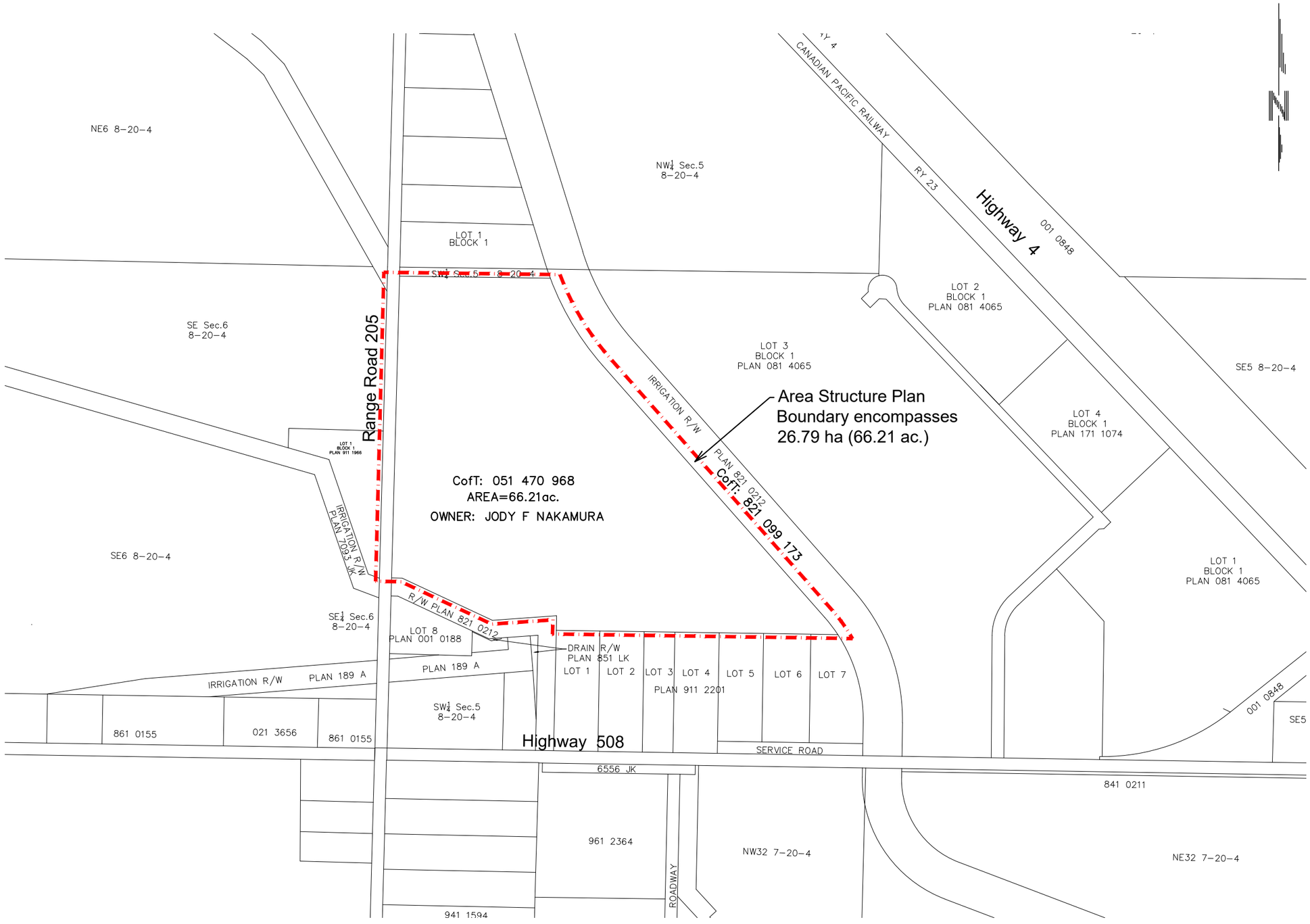
AREA STRUCTURE PLAN

REVISED - June 19, 2023

LOCATION PLAN
FIGURE 1.0

082154CE

MARTIN
GEOMATIC CONSULTANTS
Consulting Engineers, Planners, and Land Surveyors
255-31st Street North Lethbridge, Alberta T1H 3Z4
Ph: (403) 329-0050 E-mail: geomart@mgcl.ca Fax: (403) 329-6594



Country Crossroads Estate

AREA STRUCTURE PLAN

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LAND OWNERSHIP MAP

FIGURE 2.0

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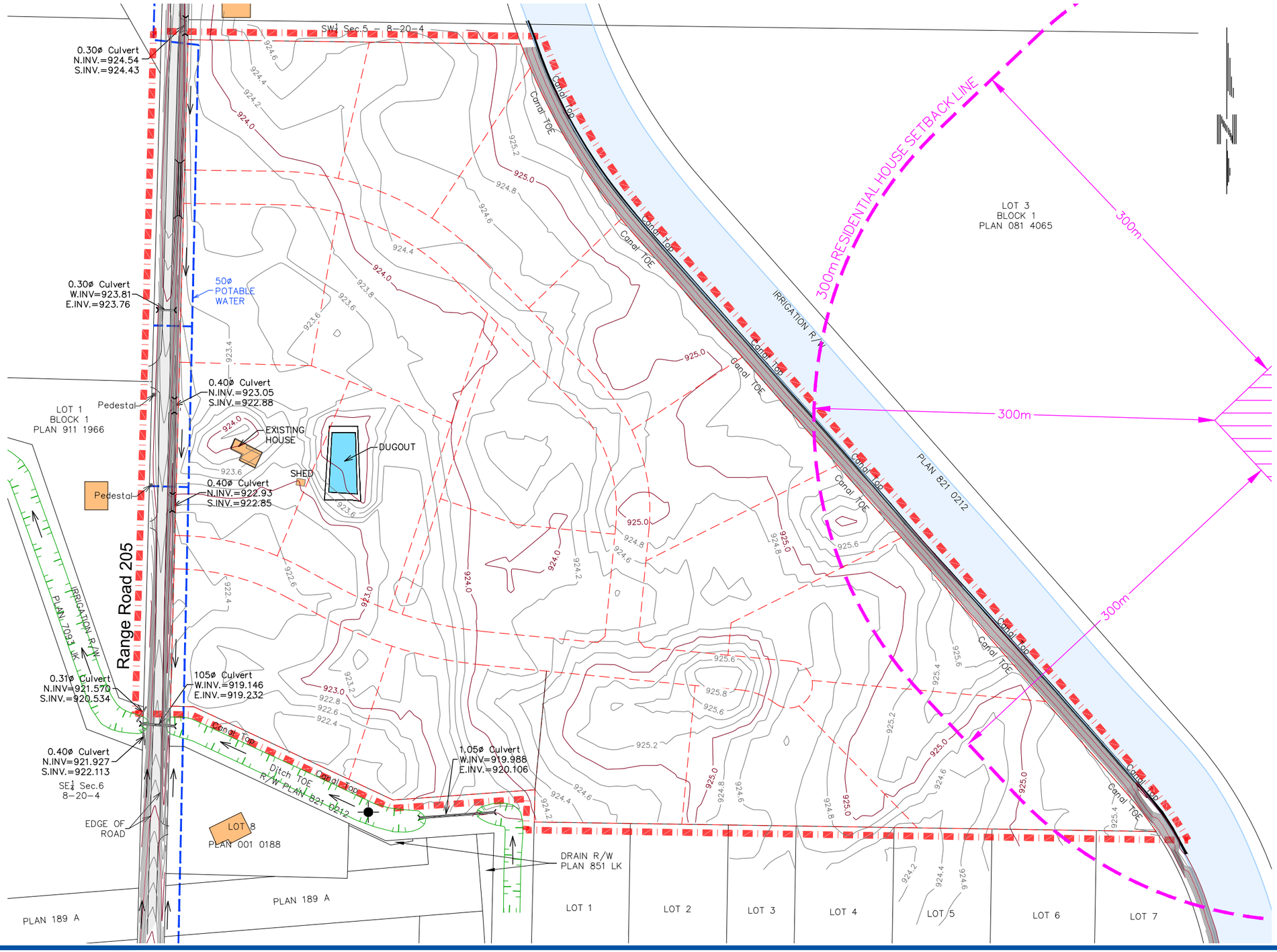

LEGEND:

- AREA STRUCTURE PLAN BOUNDARY
- LS ☼ — LIGHT STANDARD
- PP ● — POWER POLE w/ OH LINE
- ⊠ PED — TELEPHONE PEDESTALS
- EX.HOUSES/STRUCT.
- EX. C.S.P.
- GAS — EX. GAS LINE
- C — EX. TELUS LINE
- X — EX. FENCE LINE
- 911.0 — EX. MAJOR CONTOUR LINE (1.0m)
- 911.0 — EX. MINOR CONTOUR LINE (0.2m)
- EX. WATERLINE
- ABANDONED GAS WELL
- LOT BOUNDARY

Country Crossroads Estate

AREA STRUCTURE PLAN

REVISED - June 19, 2023

EXISTING SITE

FIGURE 3.0

082154CE

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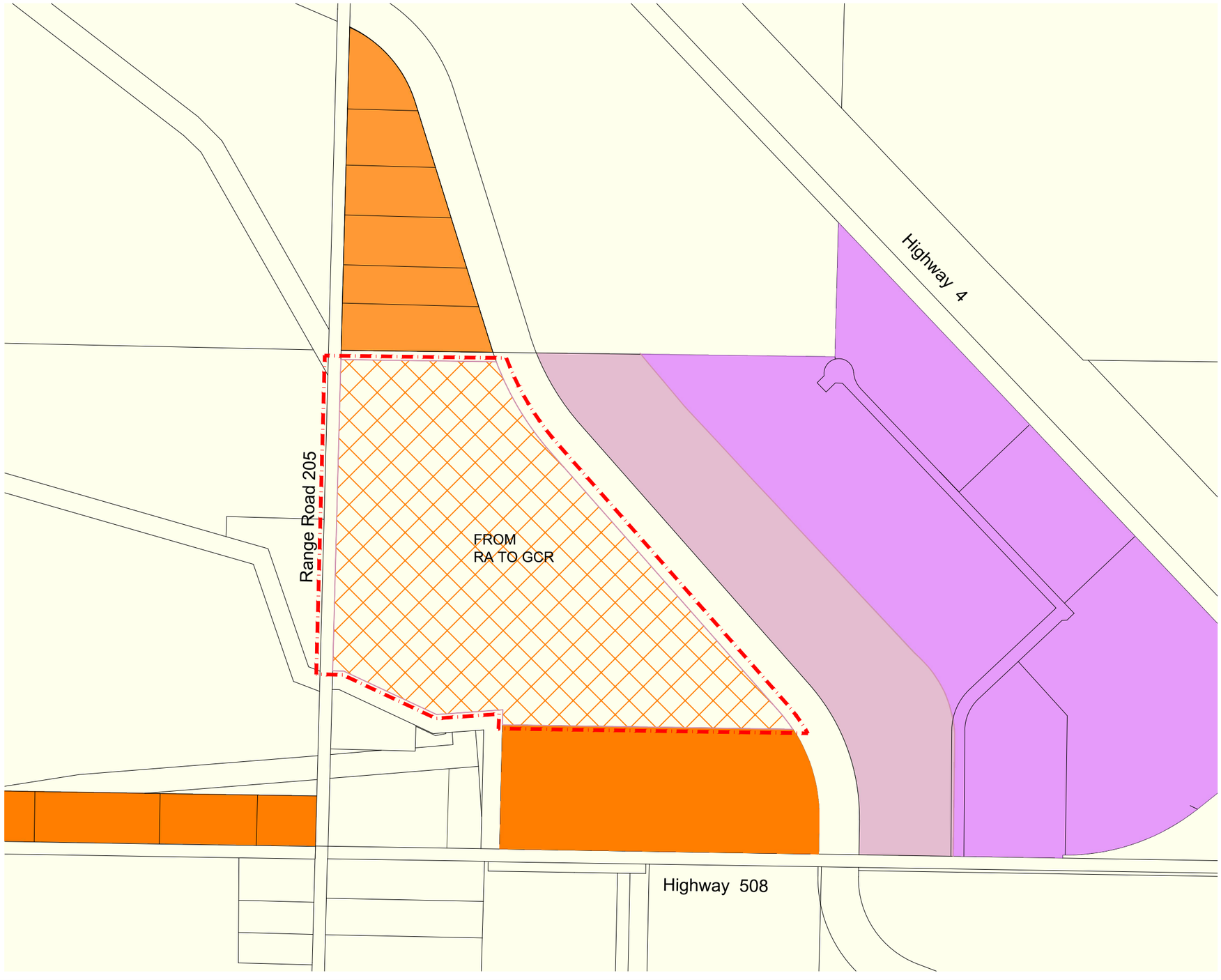
Ph: (403) 329-0050 E-mail: geomart@mgcl.ca Fax: (403) 329-6594



LEGEND:

AREA STRUCTURE PLAN BOUNDARY

EXISTING: BUSINESS LIGHT INDUSTRIAL (BLI)

EXISTING: RURAL GENERAL INDUSTRIAL (RLI)

EXISTING: GROUPED COUNTRY RESIDENTIAL (GCR)

EXISTING: RURAL AGRICULTURE (RA)

FROM: RURAL AGRICULTURE (RA)
TO: GROUPED COUNTRY RESIDENTIAL (GCR)

Country Crossroads Estate

AREA STRUCTURE PLAN
REVISED - June 19, 2023

LAND USE
FIGURE 4.0

082154CE

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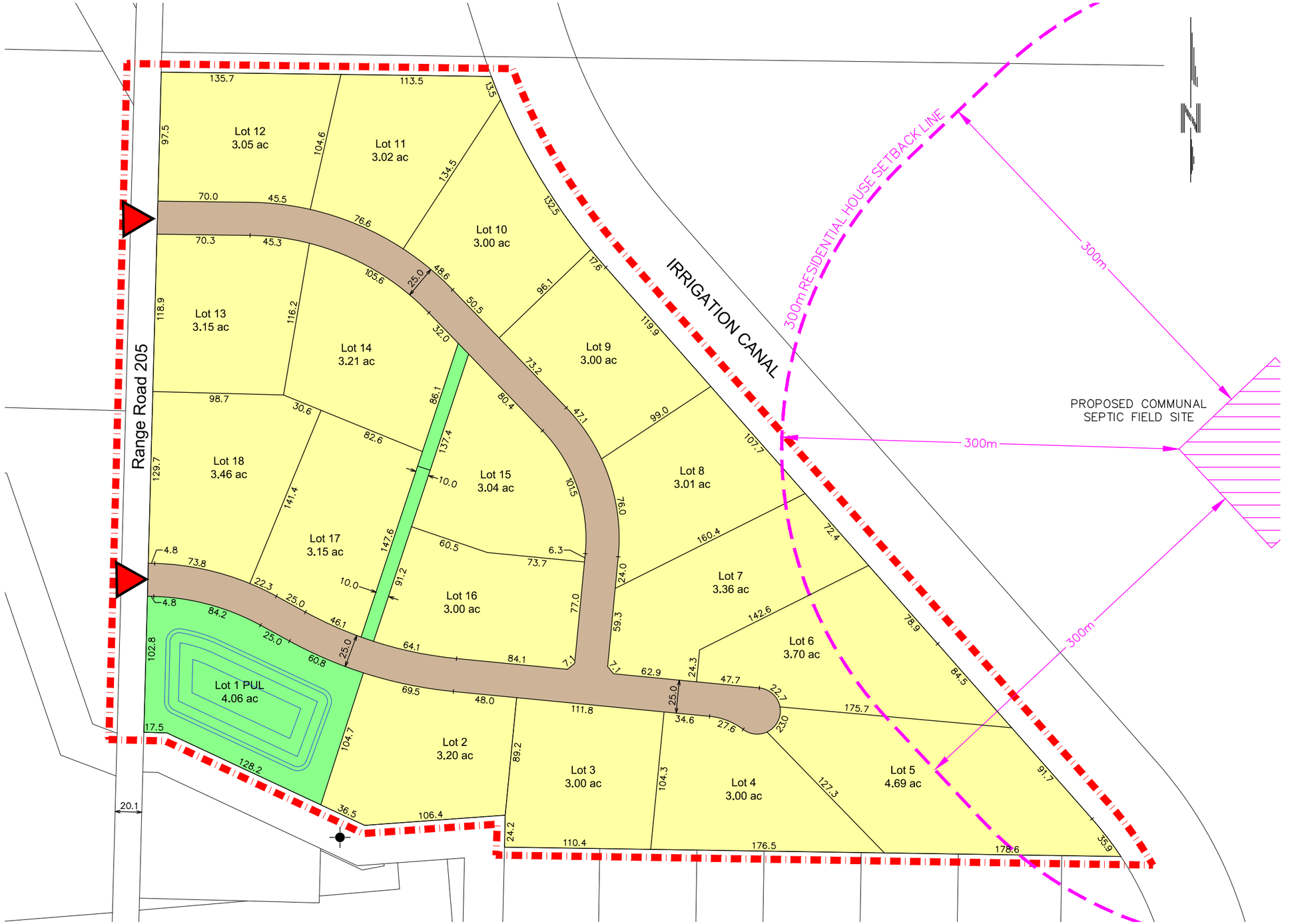

LEGEND:

- AREA STRUCTURE PLAN BOUNDARY
- SUBDIVISION ENTRANCE

NOTE:

LOT LINE ARE SHOWN FOR CONCEPTUAL PURPOSES ONLY. FINAL LOT LAYOUT WILL BE DETERMINED DURING DETAILED DESIGN.

Country Crossroads Estate

AREA STRUCTURE PLAN

REVISED - June 19, 2023

PROPOSED LOT LAYOUT

FIGURE 5.0

082154CE

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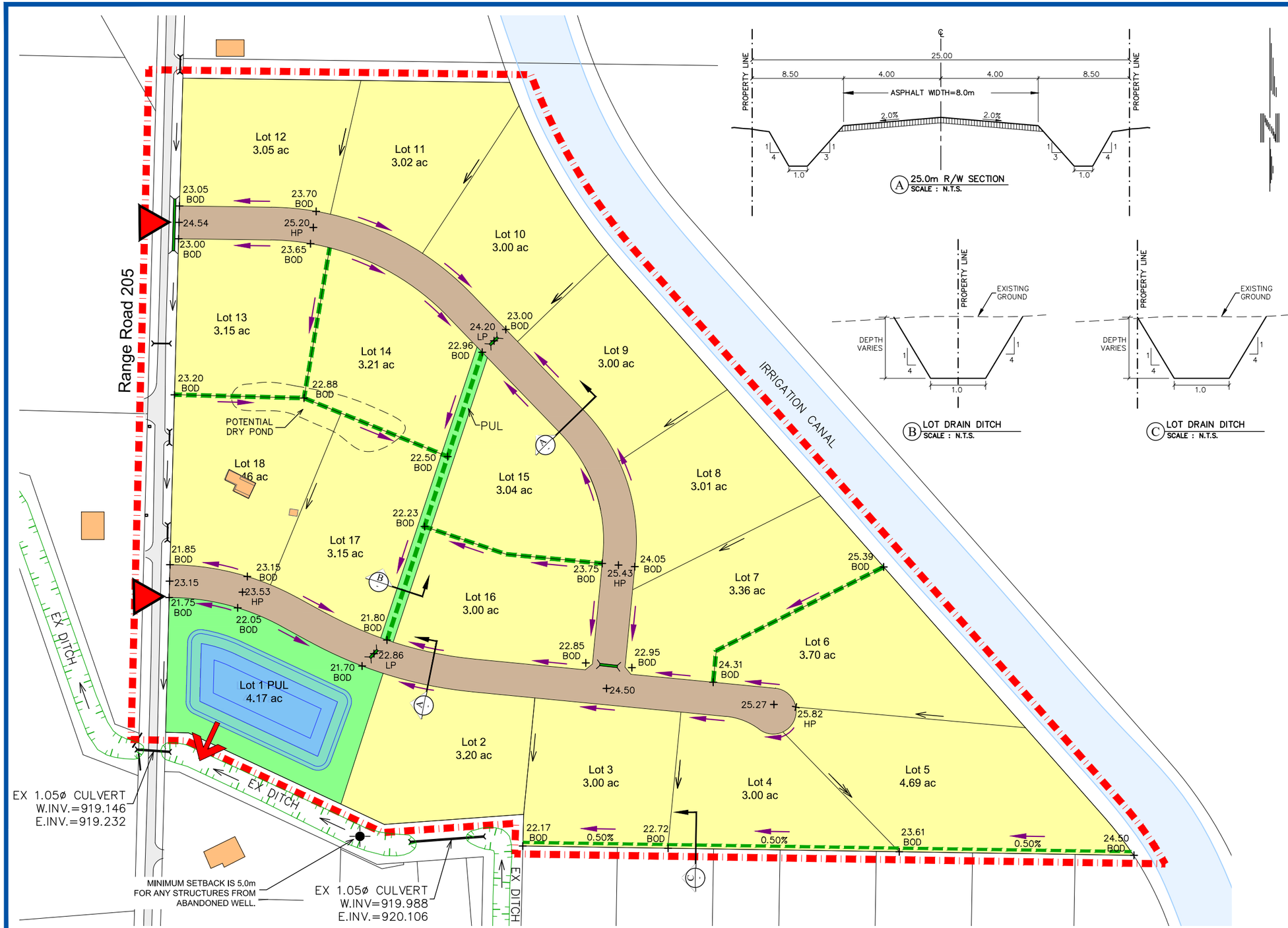

A 25.0m R/W SECTION
SCALE : N.T.S.

B LOT DRAIN DITCH
SCALE : N.T.S.

C LOT DRAIN DITCH
SCALE : N.T.S.

LEGEND:

- AREA STRUCTURE PLAN BOUNDARY
- SUBDIVISION ENTRANCE
- DRAINAGE DITCH FLOW
- LOT DRAINAGE ARROWS
- LOT DRAIN DITCH (SEE DETAIL 'B')
- PROPOSED CULVERT
- 25.39 BOD + BOTTOM OF DITCH ELEVATION
- 25.39+ CENTERLINE OF ROAD ELEVATION
- HP HIGH POINT
- LP LOW POINT
- OUTFALL

NOTE:

DRAINAGE & ELEVATIONS ARE SHOWN FOR CONCEPTUAL PURPOSES ONLY AND WILL BE DETERMINED DURING DETAILED DESIGN.

Country Crossroads Estate
AREA STRUCTURE PLAN
REVISED - June 19, 2023

SITE DRAINAGE
FIGURE 6.0

082154CE

MARTIN
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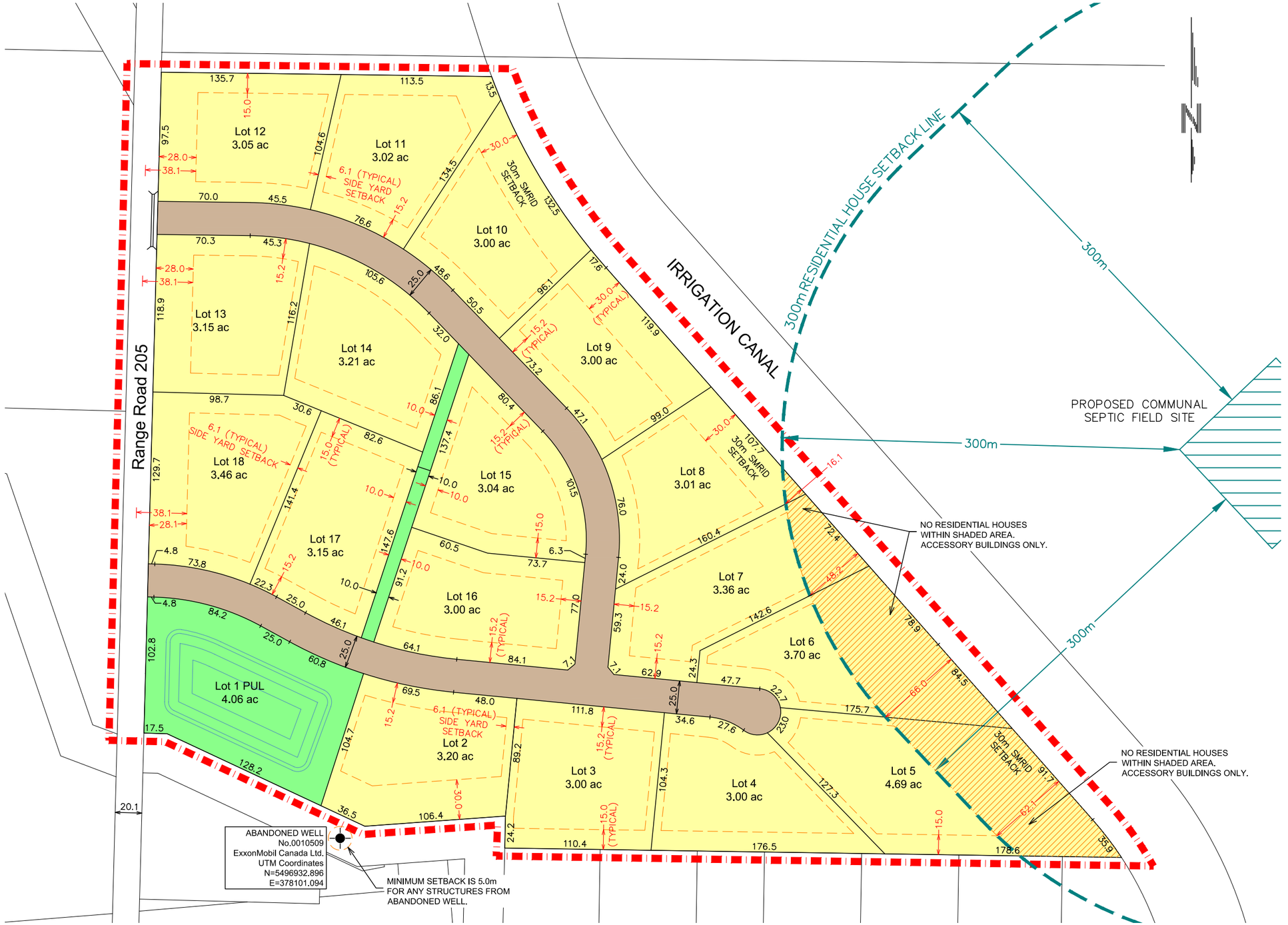

LEGEND:

- AREA STRUCTURE PLAN BOUNDARY
- ABANDONED WELL SITE. NO STRUCTURES ALLOWED WITHIN 5.0m
- BUILDING SETBACK
- NO RESIDENTIAL HOUSES WITHIN SHADED AREA. ONLY ACCESSORY BUILDING PERMITTED.

NOTE:

LOT LINES ARE SHOWN FOR CONCEPTUAL PURPOSES ONLY. FINAL LOT LAYOUT WILL BE DETERMINED DURING DETAILED DESIGN.

Country Crossroads Estate

AREA STRUCTURE PLAN
REVISED - June 19, 2023

BUILDING SETBACKS
FIGURE 7.0

082154CE

MARTIN GEOMATIC CONSULTANTS
Consulting Engineers, Planners, and Land Surveyors
255-31st Street North Lethbridge, Alberta T1H 3Z4
Ph: (403) 329-0050 E-mail: geomart@mgcl.ca Fax: (403) 329-6594

1. ALL BUILDINGS AND STRUCTURES FALLING WITHIN THE FOOTPRINT OF THE OLD IRRIGATION CANAL OR DUGOUT (AS IDENTIFIED IN THIS SKETCH) MUST HAVE THAT PORTION OF THE BUILDING OR STRUCTURE EXCAVATED TO NATURAL GROUND AND THEN BACKFILLED TO 98% STANDARD PROCTOR DENSITY .
2. ALL WORK SHALL BE DONE UNDER THE SUPERVISION OF THE GEOTECHNICAL ENGINEER.

LEGEND:

AREA STRUCTURE PLAN BOUNDARY

APPROXIMATE LOCATION OF EXITING CANAL.
ACTUAL DISTURBED BOUNDARIES MUST BE DETERMINED IN THE FIELD DURING EXCAVATION.

NOTE:

LOT LINE ARE SHOWN FOR CONCEPTUAL PURPOSES ONLY. FINAL LOT LAYOUT WILL BE DETERMINED DURING DETAILED DESIGN.

Country Crossroads Estate

AREA STRUCTURE PLAN
REVISED - June 19, 2023

LOTS AFFECTED BY OLD IRRIGATION CANAL & DUGOUT

FIGURE 8.0

082154CE

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APPENDICES

1. Property Ownership Titles
2. Geotechnical Evaluation
3. Environmental Site Assessment
4. Correspondence
    a. Letter To Adjacent Landowners
    b. Neighborhood Comments
    c. Receipt From Water Coop For 27 Water Units
    d. Telus Map
    e. SMRID Maps
    f. Triple W Gas Co-op Map
5. Stormwater Management Plan

APPENDIX 1

PROPERTY OWNERSHIP TITLES

Certificate of Title		**Landowner**
C of T #051 470 968	-	Jody Nakamura

LAND TITLE CERTIFICATE

S

LINC	SHORT LEGAL	TITLE NUMBER
0020 144 473	4;20;8;5;SW	051 470 968

LEGAL DESCRIPTION

MERIDIAN 4 RANGE 20 TOWNSHIP 8
SECTION 5
THAT PORTION OF THE SOUTH WEST QUARTER LYING TO THE
WEST OF THE 65 METRE CANAL RIGHT OF WAY AND LYING
NORTH OF THE SOUTH HALVES OF LEGAL SUBDIVISIONS 3
AND 4, AND LYING TO THE NORTH OF THE 30 METRE CANAL
RIGHT OF WAY ON PLAN 8210212
CONTAINING 27 HECTARES (66.8 ACRES) MORE OR LESS
EXCEPTING THEREOUT:
THE NORTH 15 METRES CONTAINING 0.37 OF A HECTARE MORE OR LESS
EXCEPTING THEREOUT ALL MINES AND MINERALS

ESTATE: FEE SIMPLE

MUNICIPALITY: COUNTY OF LETHBRIDGE

REFERENCE NUMBER: 941 226 700

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
051 470 968	10/12/2005	TRANSFER OF LAND	$414,000	$414,000

OWNERS

JODY F NAKAMURA
OF 4611-50 AVE
TABER
ALBERTA T1G 1G3

(CONTINUED)

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
1485KX .	21/06/1971	IRRIGATION ORDER/NOTICE THIS PROPERTY IS INCLUDED IN THE ST. MARY RIVER IRRIGATION DISTRICT
3432U .		RESTRICTIVE COVENANT
3903EM .	24/10/1934	CAVEAT CAVEATOR - ALBERTA RAILWAY AND IRRIGATION CO..
941 261 421	07/10/1994	UTILITY RIGHT OF WAY GRANTEE - TRIPLE W NATURAL GAS CO-OP LIMITED. SEE INSTRUMENT FOR INTEREST
941 261 422	07/10/1994	UTILITY RIGHT OF WAY GRANTEE - TRIPLE W NATURAL GAS CO-OP LIMITED. SEE INSTRUMENT FOR INTEREST
051 470 969	10/12/2005	MORTGAGE MORTGAGEE - THE TORONTO DOMINION BANK. 300,10004 JASPER AVE EDMONTON ALBERTA T5J1R3 ORIGINAL PRINCIPAL AMOUNT: $250,000

TOTAL INSTRUMENTS: 006

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 14 DAY OF MAY, 2010 AT 09:51 A.M.

ORDER NUMBER:16529001

CUSTOMER FILE NUMBER: 082154

END OF CERTIFICATE

(CONTINUED)

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

APPENDIX 2

GEOTECHNICAL EVALUATION

Wood - Geotechnical Investigation dated May 31, 2018

469 – 40 Street S
Lethbridge, Alberta T1J 4M1
T: +1 403 327-7474
F: +1 403 327-7682
www.woodplc.com

May 31, 2018
Wood File: BX30531

Ed Martin, P. Eng.
Martin Geomatic Consultants Ltd.
255 31 Street North
Lethbridge, Alberta T1H 3Z4

Dear Mr. Martin:

Re: GEOTECHNICAL INVESTIGATION
Proposed Rural Residential Subdivision
SW-5-8-20-W4, County of Lethbridge

1.0 INTRODUCTION

At the request of Martin Geomatic Consultants Ltd., (Martin Geomatics), Wood Environment & Infrastructure Solutions (Wood) has carried out a geotechnical investigation for the above-captioned project.

Based on information provided to Wood, it is understood that the development of a rural residential subdivision is being proposed at the above-captioned location, complete with site servicing, paved streets, and a storm-water management pond.

This report summarizes the results of the current geotechnical investigation, and provides geotechnical discussion and recommendations to support the proposed development.

2.0 GEOTECHNICAL INVESTIGATION – METHODOLOGY AND RESULTS

2.1 Methodology

In order to assess the subsurface soil and groundwater conditions at the subject site, Wood visited the site on May 4, 2018 and monitored the drilling of a series of ten boreholes at the locations denoted on Figure 1 as BH18-01 to BH18-10, inclusive. The boreholes were generally laterally distributed across the proposed development area, with BH18-10 advanced near the proposed storm pond. In addition, boreholes BH18-01 and BH18-05 were advanced within a former irrigation canal right of way to assess depth of fill.

The boreholes were advanced using a truck-mounted drill equipped with continuous flight solid stem augers. The boreholes were terminated at depths ranging between about 5.0 m and 6.1 m below grade.

During the drilling, disturbed soil samples were collected from the auger flights. In addition, Standard Penetration Tests (SPTs) were also carried out at regular intervals to assess the soil consistency/ compactness, and to obtain representative samples for identification.

Upon completion of the drilling, 25 mm diameter hand-slotted standpipes were installed in boreholes BH18-01, BH18-03, BH18-05, BH18-07, and BH18-10. The annular space was backfilled with drill cuttings, with a bentonite cap at the surface. The remaining boreholes were backfilled with the auger cuttings.

The drilling was carried out under the supervision of a Wood representative, who collected the soil samples and logged the subsurface conditions. The recovered soil samples were transported to Wood's Lethbridge laboratory for further review by a geotechnical engineer and selected laboratory classification testing. Laboratory testing for this project consisted of routine moisture content determinations and Atterberg Limits testing, with results presented on the appended borehole logs and summarized in the following paragraphs.

Samples remaining will be stored for a period of three months following this report at which time they will be discarded unless we are requested otherwise by the Client.

2.2 Soil and Groundwater Conditions

The subsurface conditions encountered are detailed on the attached borehole logs and summarized in the following paragraphs. It must be noted that boundaries of soil indicated on the borehole logs are inferred from non-contiguous sampling and observations during drilling. These boundaries are intended to reflect transition zones for the purposes of geotechnical design, and should not be interpreted as exact planes of geological change.

The boreholes were each surfaced with a 100 mm to 150 mm thick layer of topsoil.

Underlying the topsoil, layers of clay fill were encountered in boreholes BH18-01, BH18-04, and BH18-05. The clay fill extended to depths of 1.5 m and 1.0 m below grade at BH18-01 and BH18-05, respectively. The clay fill was generally described as low to medium plastic, silty and sandy with trace fibrous organics, trace red shale, organic staining, light brown to dark brown, and moist.

The predominant natural mineral soil encountered within the boreholes was clay, becoming clay till at depth. The clay and clay till were generally described as low to medium plastic, silty and sandy with trace gravel, coal and oxide inclusions, light brown to dark brown, and soft to very stiff (based on observed drill resistance, tactile observations, and SPT N-values ranging between about 4 and 22 blows per 300 mm of sampler penetration. Based on laboratory testing, the *in situ* water content of the clay and clay till ranged between about 9 percent and 21 percent, generally indicative of damp to moist soil conditions. Fissuring of the near surface clay and clay till was also observed in several boreholes.

Layers of silty sand were encountered in boreholes BH18-02 and BH18-10. The silty sand was generally described as fine to coarse grained, trace to some clay with trace gravel, coal and oxide inclusions, brown, and damp to moist.

The results of Atterberg Limits testing carried out on three representative samples of the clay are provided on the borehole logs, and detailed in the following table. The results of the Atterberg Limits testing indicated that the clay is of low to medium plasticity.

Table 1: Atterberg Limits

Borehole / Sample No.	Liquid Limit, w_L	Plasticity Index, I_P	Moisture Content, w
BH18-01/S4	34%	17%	16.5%
BH18-05/S6	31%	16%	15.0%
BH18-10/S8	36%	17%	16.3%

No free groundwater or seepage was encountered at the borehole locations. As indicated previously, standpipes were installed in selected boreholes upon completion of the drilling; however, the standpipes had been destroyed prior to measurement of the depth to groundwater at those locations. While groundwater depths are indicated on the borehole logs, those depths are inferred from observations of the soil profile during drilling, and the results of the laboratory testing. As indicated on the borehole logs, these inferred depths ranged between depths of about 2. 2 m and 3.4 m below existing grades.

It is further noted that groundwater conditions are expected to fluctuate seasonally in response to spring thaw and periods of heavy precipitation, and may differ at the time of construction.

3.0 GEOTECHNICAL DISCUSSION AND RECOMMENDATIONS

3.1 General

As indicated in Section 1.0, it is understood that the subject site will be developed into about 23 residential building lots, complete with site servicing, paved streets, and a storm-water management pond in Lot 13.

Based on a historical records and air photo review, the site has previously been traversed by an irrigation canal, as illustrated on Figure 1. It is noted that there may be extensive fill and pockets of soft soils related to the historical canal. Boreholes BH18-01 and BH18-05 were advanced in the area of the historical canal, and the results of drilling indicated up to 1.5 m of fill soils, with marginally soft conditions below the fill. Accordingly, full subgrade reconstruction within proposed building footprints would be required where the proposed building footprint encroaches onto the former canal alignment. The affected building lots include Lots 1, 12, 13, 16, 17, 22, 24, and 25. Similarly, there is an existing dugout at Lot 16 which will also require subgrade reconstruction prior to lot development. Further discussion pertaining to subgrade reconstruction is provided in Section 3.2.

Based on our understanding of the proposed development as discussed above, in conjunction with the results of the current investigation, the following paragraphs provide geotechnical discussion and recommendations pertaining to excavations, site grading, site servicing, storm-water management pond construction, and pavement construction, with preliminary discussion and recommendations addressing residential construction and onsite sanitary sewage disposal.

3.2 Excavations, Site Grading, and Dewatering

All excavations should conform to Part 32 of the Alberta Occupational Health and Safety Code.

Prior to placement of any fill, site stripping will be required. As indicated in Section 2.2, topsoil thicknesses ranging between 100 mm to 150 mm were encountered at the borehole locations. As indicated previously, clay fill soils were encountered to depths of up to about 1.5 m in the area of the former irrigation canal. For roadway areas, this fill should also be fully excavated as part of the site stripping. It is noted that actual fill thicknesses in the area of the former canal, or in other areas of the site between boreholes, may be in excess of the 1.5 m indicated at borehole BH18-01.

It is further recommended that as part of the rough site/subdivision grading, that all fill associated with the former canal also be sub-excavated and the subgrade reconstructed. This would minimize the potential for foundation bearing problems at the time of residential lot development as a result of less than adequate construction control of the subgrade reconstruction in the area of the canal.

Prior to placement of structural fill at the site, the exposed subgrade should be reviewed by the geotechnical engineer to confirm adequacy of the site striping, and be proof-rolled. Any loose or soft zones noted during the inspection should be further assessed by the geotechnical engineer for appropriate remedial action.

The material used for structural fill that will support footings, slabs, or roadways should comprise of approved fine-grained material or imported granular material. The native clay and clay till soils are generally acceptable for use as structural fill, provided the material is free of organics and/or otherwise deleterious materials, and is inspected by a geotechnical engineer prior to placement. Structural fill that will support foundation elements should be placed in maximum 200 mm thick lifts, moisture conditioned as required and uniformly compacted to 100 percent Standard Proctor Maximum Dry Density (SPMDD) at a moisture content within about three percent of optimum. Any structural fill should also extend laterally beyond the edges of foundation elements a minimum distance equal to the thickness of fill beneath the foundation or slab. Structural fill that will support slabs or roadways should be compacted to a minimum of 98 percent of SPMDD, as a moisture content within three percent of optimum. In situ compaction testing should be carried out during the fill placement to ensure that the specified compaction is being achieved.

During rough grading, positive site grading should be maintained at all times in order to minimize the potential for water ponding at the site.

As indicated in Section 2.2, the boreholes were open and dry on completion, with the inferred groundwater table below 2 m below grade. Accordingly, excessive groundwater seepage into conventional foundation and buried utility excavations is not anticipated at this site. Minor groundwater accumulations, where encountered, can likely be removed with conventional sump pumping techniques.

3.3 Buried Services and Trench Backfill

Where spatial restrictions do not allow for the required safe trench sideslope inclinations, conventional shoring (i.e., trench boxes) can be considered. For shoring design, the following parameters can be used for the soils encountered at the site:

Table 2: Parameters for Shoring Design

Parameter	Native Clay and Clay Till
Total Unit Weight, y, kN/m^3	18.5 kN/m^3
Active Earth Pressure Coefficient, k_a	0.40

The weight of the adjacent structures must also be considered in the calculation of the lateral earth pressures where these structures fall within a line drawn up at 45° from the base of the excavations. Where trench boxes or shoring are used, adjacent structures should be inspected prior to and following construction to ensure damage has not occurred to the foundations.

For frost protection, it is recommended that a minimum of 2.1 m of soil cover be provided above watermains and sanitary sewer pipes.

Bearing problems are not anticipated for pipes founded on the natural soil deposits. It is noted that the trench bases, where left open for extended periods, will likely be susceptible to softening and loosening in the presence of weather and/or construction traffic. Accordingly, short sections should be worked at a time, and backfilling should follow relatively closely behind the pipe installation. Excavating or trenching should be done so that the slope of the walls is adequate for above mentioned soils and conforms to Part 32 of the 2009 Alberta Occupational Health and Safety Code.

The pipeline excavations should be reviewed by a qualified geotechnical engineer to confirm that the bearing soils exposed are as anticipated in design. Loose or disturbed materials should be removed from the pipeline excavation prior to placement of pipes, and hand cleaning may be required to prepare an acceptable bearing surface. Accordingly, the pipeline subgrade should be protected at all times from rain, snow, freezing temperatures and the ingress of free water.

The bedding course may be thickened if portions of the subgrade become unduly wet during excavation. The bedding aggregate should be provided around the pipe to at least 300 mm above the pipe. The bedding aggregate should be compacted to a minimum 95 percent of Standard Proctor Maximum Dry Density (SPMDD). In wet zones, the incorporation of geotextile and uniformly graded, clear, crushed stone can be considered.

The trenches above the service pipes should be backfilled with inorganic on-site soils placed in maximum 300 mm thick lifts and compacted to at least 98 percent of SPMDD. The natural on site excavated soil can be generally used as trench backfill, provided the material is conditioned to or within three percent of the optimum moisture content as determined by the Standard Proctor test. As the near surface soils were relatively dry, moisture conditioning of the soils should be anticipated.

3.4 Concrete Mix Considerations

In general, the natural mineral soil deposits and groundwater in the Lethbridge area contain high levels of water soluble sulphates, indicating severe potential for sulphate attack on concrete in contact with native mineral soil deposits (CSA Class S-2 exposure). Accordingly, sulphate resisting cement (i.e., Type HS or HSb) should be used in the manufacture of concrete in contact with soil at this site. A minimum 56 day compressive strength of 32 MPa and a maximum water/cement ratio of 0.45 should also be specified.

An air entrainment agent is recommended for concrete exposed to cyclic freeze-thaw action. In addition to the improved durability, the air entraining will provide improved workability of the plastic concrete.

3.5 Curbs and Sidewalks

The concrete for the curbs and gutters should be proportioned, mixed, placed and cured in accordance with City of Lethbridge specifications. During cold weather, the freshly placed concrete should be covered with insulating blankets, or hoarded and heated, to protect against freezing.

The subgrade for the sidewalks should comprise of undisturbed native soil or well-compacted fill. A minimum 150 mm thick layer of compacted (minimum 98 percent SPMDD) granular material meeting the City of Lethbridge gradation specification for GBC should be placed below the sidewalk slabs.

3.6 Pavement Construction

Recommendations for site preparation are provided in Section 3.2.

Subgrade preparation of all pavement areas will be required prior to placement of the pavement structure. This should include scarification to a depth of 150 mm, moisture conditioning to within three percent of optimum, and recompaction to a minimum of 98 percent of SPMDD. Any loose or soft zones noted during the inspection should be further assessed by the geotechnical engineer for appropriate remedial action.

Silty sand and sandy clay soils were noted in some areas of the site, accordingly there is a risk of subgrade dilatency and deterioration particularly under construction wheel loading, particularly during unfavourable weather conditions. The risk of subgrade deterioration can generally be reduced by minimizing heavy wheel loads on the exposed subgrade. Where subgrade deterioration by dilatant conditions occurs, the subgrade can typically be stabilized by sub-excavation and granular base thickening, as well as the incorporation of geotextiles and grid into the pavement structure. Wood can provide further support in this regard, as required.

Provided the preceding recommendations are followed, the pavement thickness design requirements given in the following table are recommended for the anticipated traffic loading and subgrade conditions.

Table 3: Recommended Pavement Structure Thicknesses for Pavement Areas

Pavement Layer	Compaction Requirements	Light Duty Residential Structure Thicknesses
Asphaltic Concrete	97% Marshall Density	90 mm Type 3[1]
Granular Base Course[1] (GBC)	100% SPMDD	200 mm
*Notes: 1) City of Lethbridge Specification 2) The subgrade must be compacted to 98% SPMDD. 3) The above recommendations are minimum requirements		

The recommended pavement structures provided in the above table are based on the natural subgrade soil properties determined from visual examination and textural classification of the soil samples. Consequently, the recommended pavement structures should be considered for preliminary design purposes only, and should be verified during construction based on actual site subgrade conditions. The subgrade for asphalt and gravel surfaced areas should be proof-rolled to check for excessive deflection, soft or loose areas prior to placing base or subbase gravel. Any deficient areas should be remediated with use of additional gravel or possibly with geogrid. Details of the remediation measures are best determined during construction when subgrade conditions are exposed and evident.

If construction is undertaken under adverse weather conditions (i.e., wet or freezing conditions) subgrade preparation and granular base requirements should be reviewed by the geotechnical engineer. As well, if only a portion of the pavement will be in place during construction, the granular base may have to be thickened, and the subgrade improved with a geotextile separator, in order to withstand the conditions imposed by construction traffic.

Samples of both the aggregates and asphaltic concrete paving materials should be checked for conformance to the City Lethbridge specifications prior to use on site, and during construction.

Good drainage provisions will optimize pavement performance. The pavement subgrade and the finished surface should be free of depressions and should be sloped (preferably at a minimum grade of two percent) to provide effective surface drainage toward catch basins. Surface water should not be allowed to pond adjacent to the outside edges of pavement areas.

A program of in situ density testing must be carried out to verify that satisfactory levels of compaction are being achieved.

For detailed pavement design, specific geotechnical investigation will be required. Further, the traffic loading requirements and desired functional design life of the pavement should also be taken into consideration for detailed design.

3.7 Storm Water Management

Based on information provided by the client, it is understood that a Storm-Water Management (SWM) Pond will also be constructed as part of the current development. The SWM Pond will generally be located within proposed Lot 13, near borehole location BH18-10.

Based on the results of the current investigation, it is anticipated that the base of the proposed pond would be set into the natural clay till stratum. It is noted that the inferred groundwater table was estimated to be about 3.4 m below existing grade at the proposed pond location.

Given the soil conditions at the proposed pond location, the base of the pond should be set no deeper than about 3.0 m below existing grades. Full lining of the SWM Pond will be required, either using compacted clay or a synthetic membrane such as high density polyethylene (HDPE).

To support the design and construction of the SWM Pond, the following discussion and recommendations are offered:

- The design and construction of the storm water detention pond should conform to the latest edition of the Alberta Environmental Protection 'Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems'.

- The interior side slopes of the pond should be sloped with a maximum gradient of 3 horizontal to 1 vertical (i.e., 3H:1V). The exterior side slopes of the pond embankments should be sloped at a maximum gradient of 4H:1V. The top of the embankment should have a minimum width of 3 m to provide suitable width for maintenance vehicles.

- The natural soils are generally considered suitable for the construction of the perimeter berms. Prior to placement of berms, the footprint of the berms should be stripped of any topsoil, organics and/or otherwise deleterious material, and the exposed subgrade should be approved by geotechnical engineer. The stripped subgrade that will support the new berms should be scarified to a depth of 150 mm, moisture conditioned and recompacted to minimum 98 percent of Standard Proctor Maximum Dry Density (SPMDD) prior to placing fill for the lagoon berms. The initial lift of fill should be worked and compacted to 'knit' the prepared subgrade and overlying fill into a relatively homogeneous mass. The berm fill material should placed in maximum 150 mm thick lifts and compacted to a minimum of 98 percent of SPMDD at a moisture content within three percent of optimum (as determined by standard Proctor testing).

- For a clay liner solution, a clay liner with a minimum thickness of 0.6 m should be provided across the pond base, and a clay liner with a minimum thickness of 0.75 m should be provided along the pond sideslopes. The material proposed for use for the clay liner should have a permeability in the order of 10^{-8} m/s, and be approved by a geotechnical engineer prior to use. The approved clay material should be placed in maximum 150 mm thick lifts and compacted to a minimum of 98 percent of SPMDD at a moisture content ranging between optimum and three percent above optimum (as determined by standard Proctor testing).

- To reduce potential for drying and shrinkage cracking of the liner, it is recommended that an additional earth cover of 0.3 m thickness be placed above the liner as a protective layer. The protective layer should be compacted to minimum 95 percent of SPMDD.

- Following construction of the liner, the side slopes of the pond above the normal water level as well as the exterior side slopes should be dressed with a 150 mm thick layer of topsoil, and seeded with deep-root grass species native to the area to minimize the potential for erosion of the pond sideslopes.

- Clay collars should be provided at inlet/outlets of pipes connected to the pond where there is less than a metre of hydraulic head across the clay plug, in order to minimize the potential for internal erosion or piping along the inlet or outlet piping. The clay collars should extend between 1 m and 2 m along the length of the piping, and extend laterally to the natural subgrade soils. The clay material should be approved by a geotechnical engineer prior to placement, and should be placed in maximum 150 mm lifts and compacted to a minimum of 95 percent of SPMDD at a moisture content ranging between optimum and three percent above optimum (as determined by standard Proctor testing). Concrete seepage cutoff collars should be provided where there is potential for more than a meter of hydraulic head to develop along the pipe.

- As an alternative to a compacted clay liner, consideration can be given to using a synthetic geomembrane, such as a High Density Polyethylene (HDPE) liner. In this regard, an HDPE liner should have a minimum thickness of 60 mil, and be placed in accordance with the manufacturer's recommendations. Inlet and outlet pipes should be fully booted and welded to the liner material to facilitate a water tight seal at the pipe protrusions. The liner should be anchored at the top of the berms into a minimum 0.6 m deep by 0.6 m wide trench. Following construction of the liner, consideration should be given to covering the liner with a 0.3 m thick compacted clay layer, or with Class 1M rip rap (Alberta Transportation – Specifications for Bridge Construction).

For a clay liner solution, full-time geotechnical supervision should be provided during construction. Compaction should be carried out using a heavy, self-propelled sheepsfoot compactor. Lift surfaces that have been allowed to dry out should be scarified, moisture conditioned and recompacted prior to placement of the subsequent lift. Where lift surfaces have degraded due to excess precipitation, etc., the material should be either removed or allowed to dry to the required moisture content and recompacted. In situ density testing should be provided to verify that the target liner density is achieved.

For synthetic liner construction, full quality control testing will be required to verify field welds. In addition, the subgrade will require geotechnical review prior to the placement of the liner material.

3.8 Residential Construction – Preliminary Comments

For preliminary design purposes, the following general discussion and recommendations are offered to support the development of single family residential and related ancillary structures within the study area. Specific, detailed geotechnical investigations are required for non-residential developments in the subdivision, and may be needed for some residential structures if there are unusual design features associated with the residence.

Conventional Strip and Spread Footing Foundations

Based on Wood's review of the soil conditions within the widely spaced boreholes at the site, the natural occurring clay and clay till encountered within the boreholes is generally considered suitable for the support of conventional strip and spread footings for proposed single family residences. For preliminary design, a Serviceability Limit States (SLS) bearing pressure of 75 kPa is recommended, with a corresponding unfactored Ultimate Limit States (ULS) bearing pressure of 225 kPa. A geotechnical resistance factor of 0.5 should be applied to the ULS bearing pressure, per current building code requirements.

As indicated above, further investigation and/or review of the bearing soils associated with any non-residential structures will be required to support detailed design of the various proposed structures.

For protection against frost action, perimeter footings in heated areas should be extended to provide at least 1.5 m of soil cover. For any unheated buildings or portions of the building, footings should have at least 2.1 m of soil cover. Alternatively, insulation can be used to reduce the thickness of soil cover required.

Basements

All below grade walls, such as for the residential basements, should be designed to resist a horizontal earth pressure 'p' at any depth 'h' below the surface as given by the following equation:

$$p = k_0 (¥h + q)$$

where: p = lateral earth pressure in kPa acting at a depth h
K_0 = lateral at-rest earth pressure coefficient (use k_0 = 0.50),
¥ = unit weight of backfill (use ¥ = 18.5 kN/m^3 for clay)
h = depth to point of interest in m (ft)
q = equivalent value of any surcharge on the ground surface.

The above expression assumes a fully drained condition along the base of the below-grade walls.

Damp-Proofing and Drainage

While only minor groundwater was encountered during the current investigation, the installation of weeping tile around residences is still recommended, regardless of groundwater elevation. The requirements for weeping tile installation are outlined in Section 9.14 of the Alberta Building Code. Weeping tiles must discharge to either a gravity outlet, or to a pumped sump, in accordance with local regulatory requirements.

In conjunction with installation of weeping tile, below grade foundation walls around basements require damp proofing, in accordance with the current Alberta Building Code.

Weeping tile flow due to surface water infiltration along foundation walls can be minimized by providing a modest amount of compaction to the exterior foundation wall backfill, thus minimizing future settlement of the backfill. The backfill within two metres of the residence foundation should be graded

away from the foundation at approximately a ten percent slope. Downspout roof leaders should discharge onto splash pads at least a metre from the foundation walls.

Construction of Grade-Supported Slabs

In general, it is anticipated that engineered fill or the natural clay till at the site will provide adequate support for grade supported basement floors, concrete garage slabs, driveways and parking slabs, provided the subgrade is adequately prepared by stripping topsoil and fill, and reconstruction to achieve design elevations by placement of thin lifts compacted to a minimum of 98 percent of Standard Proctor Maximum Dry Density (SPMDD).

Following preparation of the subgrade surface, a levelling course of 25 mm nominal size well graded crushed gravel at least 150 mm in compacted thickness is recommended directly beneath the slabs. The gravel should also be compacted to at least 98 percent of SPMDD.

As an alternative to compacted gravel, a vapour break consisting of a minimum of 200 mm thick layer of 25 mm washed gravel fill can be provided beneath basement floor slabs. If floor coverings that are sensitive to moisture penetration will be installed in basement areas, additional vapour break considerations (such as the inclusion of a polyethylene vapour barrier should also be considered.

The excavated subgrade for the slabs on grade, including basement slabs, should be protected at all times from rain, snow, freezing temperatures, excessive drying and the ingress of free water. To minimize the potential negative effects of settlement or heave in soil below the slabs, it would be preferable to allow slabs to float with no rigid connections to walls or foundation elements except at doorways.

Some relative movement between the slabs-on-grade and adjacent walls or foundations and differential movements within the slabs should be anticipated. Where recommendations outlined in this report are followed, these movements are expected to be within tolerable limits.

The water-to-cement ratio and slump of concrete utilized in the floor slabs should be strictly controlled to minimize shrinkage of the slabs. Adequate joints should be provided in the floor slab to further control cracking.

3.9 Onsite Sanitary Sewage Disposal – Preliminary Comments

It is understood that the subject lots will be serviced by private sewage systems which will be developed by the buyers of the individual lots in conjunction with the design and construction of proposed residences.

The design and construction of private onsite sanitary sewage disposal systems in Alberta is subject to the requirements of the *Alberta Private Sewage Systems Standard of Practise 2015* (hereafter referred to as the *2015 Standard*).

One of the most significant changes encompassed in the 2015 Standard compared to the prior 2009 Standard of Practice is a shift from a design based on percolation testing to a design based on soil profile and textural classification. Percolation rates can only be used to support a design based on soil profile.

In accordance with the *2015 Standard*, a site (i.e., lot) specific evaluation and report is required to support the detailed design and construction of individual private sewage systems. Detailed requirements for the Site Evaluation are provided in Part 7 of the *2015 Standard*.

Using the results of the Site Evaluation, a type of private sewage system best suited for the site is proposed. Selection of the type of system is based on various factors including soil profile, vertical separation between groundwater or impervious layer and point of effluent infiltration, design effluent volume and anticipated effluent strength.

The typical and most cost efficient private sewage system for a single family residential lot generally involves primary treatment of effluent using a septic tank with discharge to a conventional treatment field. The treatment field typically utilizes perforated piping laid in a bed of gravel in trenches, which distributes the effluent in the trenches to the natural subsurface soils.

Where there are limits imposed by proximity to water table or very low permeable soils, a treatment mound can be considered as an alternative to a conventional treatment field. A treatment mound generally refers to a system where effluent from a septic tank is distributed onto an imported sand layer that is constructed above grade. In this case, the effluent must be discharged into the treatment mound using a pressurized system. Accordingly, the costs associated with importing sand for the treatment mound and operation of a discharge pump make this style of treatment system costlier than the conventional treatment field.

As an alternative, secondary treatment of the effluent can be considered. Secondary treatment of the effluent, as outlined in Part 5 of the *2015 Standard*, can be carried out by means of a sand filter, a re-circulating gravel filter, or a Packaged Sewage Treatment Plant. Where effluent quality meets Level 2 or better (as outlined in Table 5.1.1.1 of the 2015 Standard), the options for disposal of the effluent are less restrictive, and effluent may even be used for sub-surface drip dispersal and irrigation (subject to Section 8.5 of the 2015 Standard).

For the proposed lots, the inferred groundwater table was below about 2 m depth, as discussed in the previous Section 2.2. The groundwater depths observed generally satisfy the vertical separation requirements for soil-based treatment as outlined in Paragraph 8.1.1.4 of the *2015 Standard*.

Based on the current investigation and visual review of samples recovered from boreholes at the site, the soils indicate a textural classification of about SiCL (silty clay loam). Based on the results of the textural classification, the site is considered marginally suitable for effluent discharge using a conventional treatment field, and a treatment mound or secondary treatment of the effluent may be warranted.

It is noted that the detailed design of each proposed discharge field must be based on a soil profile assessment and textural classification of test pits within the footprint of the proposed discharge fields, and that these textural classifications will vary somewhat from the classification indicated above.

3.10 Testing and Inspection

All engineering design recommendations presented in this report are based on the assumption that an adequate level of inspection and review will be provided during construction and that all construction will be carried out by a suitably qualified contractor experienced in foundation and earthworks construction. An adequate level of inspection is considered to be:

- For earthworks: full time monitoring and representative compaction testing
- For concrete construction: testing of concrete supplier mixes for conformance with prescribed and/or performance concrete specifications

4.0 CLOSURE

The recommendations given in the above sections are based upon interpreted conditions found within the ten boreholes advanced at this site. Should subsurface conditions other than those presented in this report be encountered during construction, the Client should notify our office so that these recommendations can be reviewed.

Soil conditions, by their nature, can be highly variable across a site. A contingency should be included in the construction budget to allow for the possibility of variations in soil conditions, which may result in modification of the design, and/or changes in the construction procedures.

Wood requests the opportunity to review the design drawings and the civil works during construction of the subdivision to confirm that the recommendations in this report have been correctly interpreted and implemented. If not afforded the opportunity to conduct this review, Wood cannot accept responsibility for the interpretation of this report. Wood would be pleased to provide any further information that may be needed during design and to advise on the geotechnical aspects of specifications for inclusion in contract documents.

This report has been prepared for the exclusive use of Martin Geomatic Consultants Ltd. and their designers for the specific application to the development described in this report. Any use that a third party makes of this report, or any reliance or decisions based on this report are the sole responsibility of those parties.

This report has been prepared in accordance with generally accepted soil and foundation engineering practices. No other warranty, express or implied, is made.

We trust that this report satisfies your present requirements, and we look forward to assisting you in the completion of this project. Should you have any questions, please contact the undersigned at your convenience.

Yours truly,

Wood Environment & Infrastructure Solutions
A Division of Wood Canada Limited

PROFESSIONAL ENGINEER ALBERTA JOHN LOBBEZOO

June 5, 2018

John Lobbezoo, P.Eng.
Associate Engineer, Geotechnical
Branch Manager, Lethbridge & Medicine Hat

Reviewed by:
Kevin Spencer, M.Eng., P.Eng.
Senior Associate Geotechnical Engineer

Permit to Practice No. P-04546

Attachments:
- Figure 1 Borehole Location Plan
- Borehole Logs
- Explanation of Symbols and Terms

	CLIENT LOGO	CLIENT: Martin Geomatic Consultants Ltd.	DWN BY: BJ CHK'D BY: BM DATUM: NA PROJECTION: NA SCALE: NTS	TITLE: BOREHOLE LOCATION PLAN	DATE: MAY 2018 PROJECT NO: BX30531 REV. NO.: A	
		Wood Environment & Infrastructure Solutions 469 - 40th Street South Lethbridge, Alberta CANADA T1J 4M1 Tel. (403) 327-7474 Fax (403) 327-7682	wood.	PROJECT: Geotechnical Investigation Rural Residential Subdivision - SW5-8-20-W4M County of Lethbridge, Alberta	FIGURE 1	

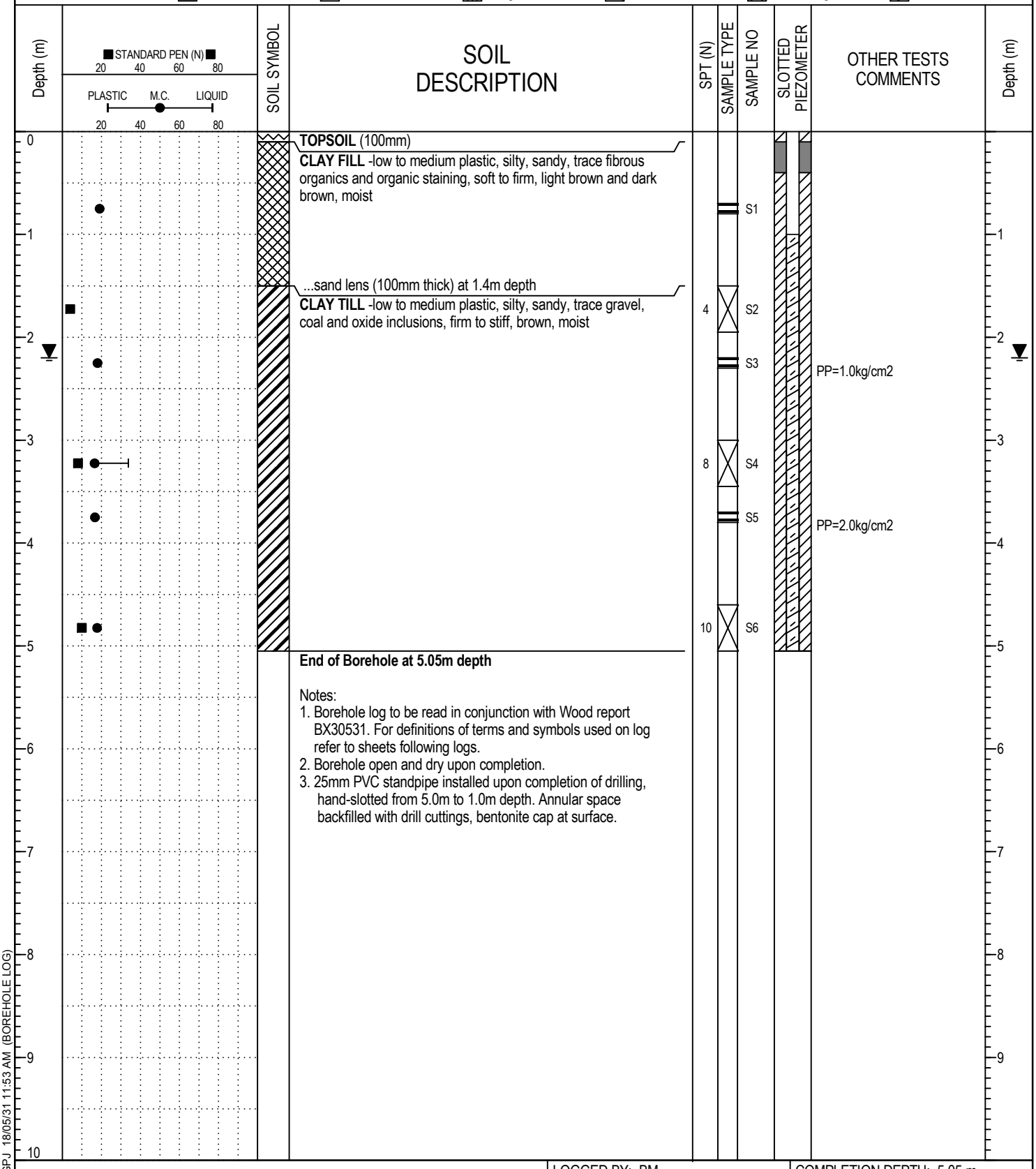
T:\Drafting\Brent\E&E PROJECTS\LETHBRIDGE\BX30531 – Residential Subdivision\BX30531.dwg – FIGURE1 – Jun. 01, 2018 3:15pm – brent.johnson

This drawing was originally produced in colour.

PROJECT NAME: Proposed Residential Subdivision	DRILLER: Chilako Drilling Services Ltd.	BOREHOLE NO: **BH18-01**
CLIENT: Martin Geomatic Consultants Ltd.	DRILL/METHOD: Truck Mounted C-1150 Drill/ SSA	PROJECT NO: BX30531
LOCATION: See Figure 1.		ELEVATION: --

SAMPLE TYPE: Shelby Tube; No Recovery; SPT Test (N); Grab Sample; Split-Pen; Core

BACKFILL TYPE: Bentonite; Pea Gravel; Slough; Grout; Drill Cuttings; Sand



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	REVIEWED BY: JL	COMPLETION DATE: 4/5/18
		Page 1 of 1

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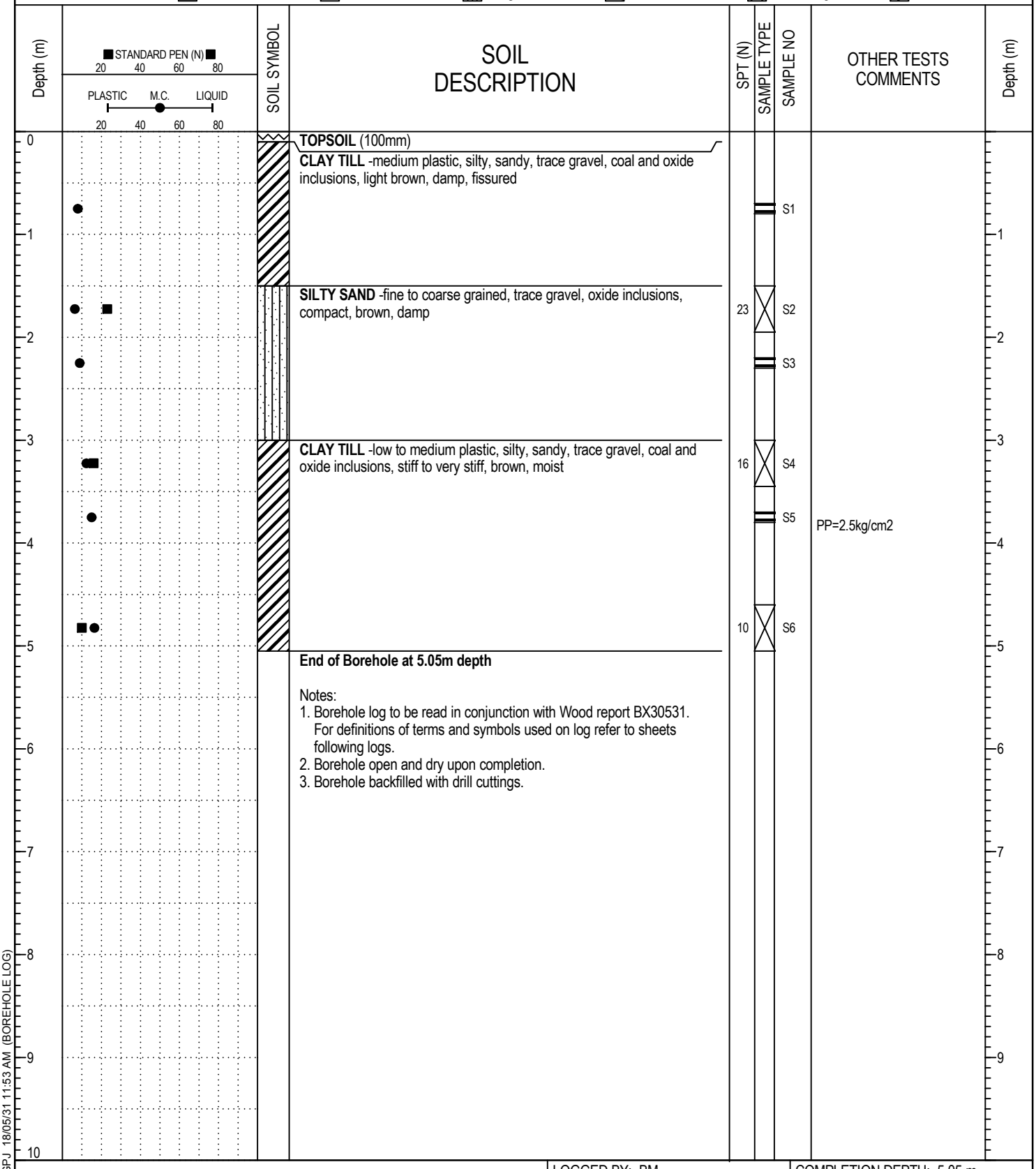
PROJECT NAME: Proposed Residential Subdivision	DRILLER: Chilako Drilling Services Ltd.	BOREHOLE NO: **BH18-02**
CLIENT: Martin Geomatic Consultants Ltd.	DRILL/METHOD: Truck Mounted C-1150 Drill/ SSA	PROJECT NO: BX30531
LOCATION: See Figure 1.		ELEVATION: --

SAMPLE TYPE: Shelby Tube; No Recovery; SPT Test (N); Grab Sample; Split-Pen; Core

BACKFILL TYPE: Bentonite; Pea Gravel; Slough; Grout; Drill Cuttings; Sand



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	REVIEWED BY: JL	COMPLETION DATE: 4/5/18
		Page 1 of 1

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PROJECT NAME: Proposed Residential Subdivision	DRILLER: Chilako Drilling Services Ltd.	BOREHOLE NO: **BH18-03**
CLIENT: Martin Geomatic Consultants Ltd.	DRILL/METHOD: Truck Mounted C-1150 Drill/ SSA	PROJECT NO: BX30531
LOCATION: See Figure 1.		ELEVATION: --

SAMPLE TYPE: Shelby Tube; No Recovery; SPT Test (N); Grab Sample; Split-Pen; Core

BACKFILL TYPE: Bentonite; Pea Gravel; Slough; Grout; Drill Cuttings; Sand

Depth (m)	SOIL DESCRIPTION	SPT (N)	SAMPLE NO	OTHER TESTS COMMENTS
0	**TOPSOIL** (150mm)			
	CLAY TILL -medium plastic, silty, sandy, trace gravel, oxide inclusions, brown, damp to moist		S1	
1	...fissured, light brown below 1.0m depth			
	SANDY CLAY TILL -low plastic, silty, trace gravel, coal and oxide inclusions, very stiff, brown, damp to moist	19	S2	
2			S3	
3	**CLAY TILL** -low to medium plastic, silty, sandy, trace gravel, coal and oxide inclusions, stiff to very stiff, brown, damp to moist	17	S4	
			S5	PP=3.0kg/cm2
4				
5		10	S6	
	End of Borehole at 5.05m depth			

Notes:
1. Borehole log to be read in conjunction with Wood report BX30531. For definitions of terms and symbols used on log refer to sheets following logs.
2. Borehole open and dry upon completion.
3. 25mm PVC standpipe installed upon completion of drilling, hand-slotted to 5.0m to 1.0m depth. Annular space backfilled with drill cuttings, bentonite cap at surface.

STANDARD PEN (N) 20 40 60 80

PLASTIC M.C. LIQUID 20 40 60 80

SOIL SYMBOL

SLOTTED PIEZOMETER

Depth (m) 0 1 2 3 4 5 6 7 8 9 10

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REVIEWED BY: JL	COMPLETION DATE: 4/5/18

PROJECT NAME: Proposed Residential Subdivision	DRILLER: Chilako Drilling Services Ltd.	BOREHOLE NO: **BH18-04**
CLIENT: Martin Geomatic Consultants Ltd.	DRILL/METHOD: Truck Mounted C-1150 Drill/ SSA	PROJECT NO: BX30531
LOCATION: See Figure 1.		ELEVATION: --

SAMPLE TYPE: Shelby Tube; No Recovery; SPT Test (N); Grab Sample; Split-Pen; Core

BACKFILL TYPE: Bentonite; Pea Gravel; Slough; Grout; Drill Cuttings; Sand

Depth (m)	STANDARD PEN (N) 20 40 60 80 / PLASTIC M.C. LIQUID 20 40 60 80	SOIL SYMBOL	SOIL DESCRIPTION	SPT (N)	SAMPLE TYPE	SAMPLE NO	OTHER TESTS COMMENTS	Depth (m)
0			**TOPSOIL** (150mm)					0
			CLAY FILL -low to medium plastic, silty, trace to some sand, organic staining, dark brown, moist					
1			**CLAY** -medium plastic, silty, sandy, brown, moist			S1	PP=4.5kg/cm2	1
2			**CLAY TILL** -low to medium plastic, silty, sandy, trace gravel, coal and oxide inclusions, stiff to very stiff, brown, damp	21		S2		2
						S3		
3			...medium plastic, moist below 3.0m depth	16		S4		3
						S5	PP=2.5kg/cm2	
4								4
5				14		S6		5
			End of Borehole at 5.05m depth					
6								6
7								7
8								8
9								9
10								

Notes:
1. Borehole log to be read in conjunction with Wood report BX30531. For definitions of terms and symbols used on log refer to sheets following logs.
2. Borehole open and dry upon completion.
3. Borehole backfilled with drill cuttings.

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REVIEWED BY: JL	COMPLETION DATE: 4/5/18
	Page 1 of 1

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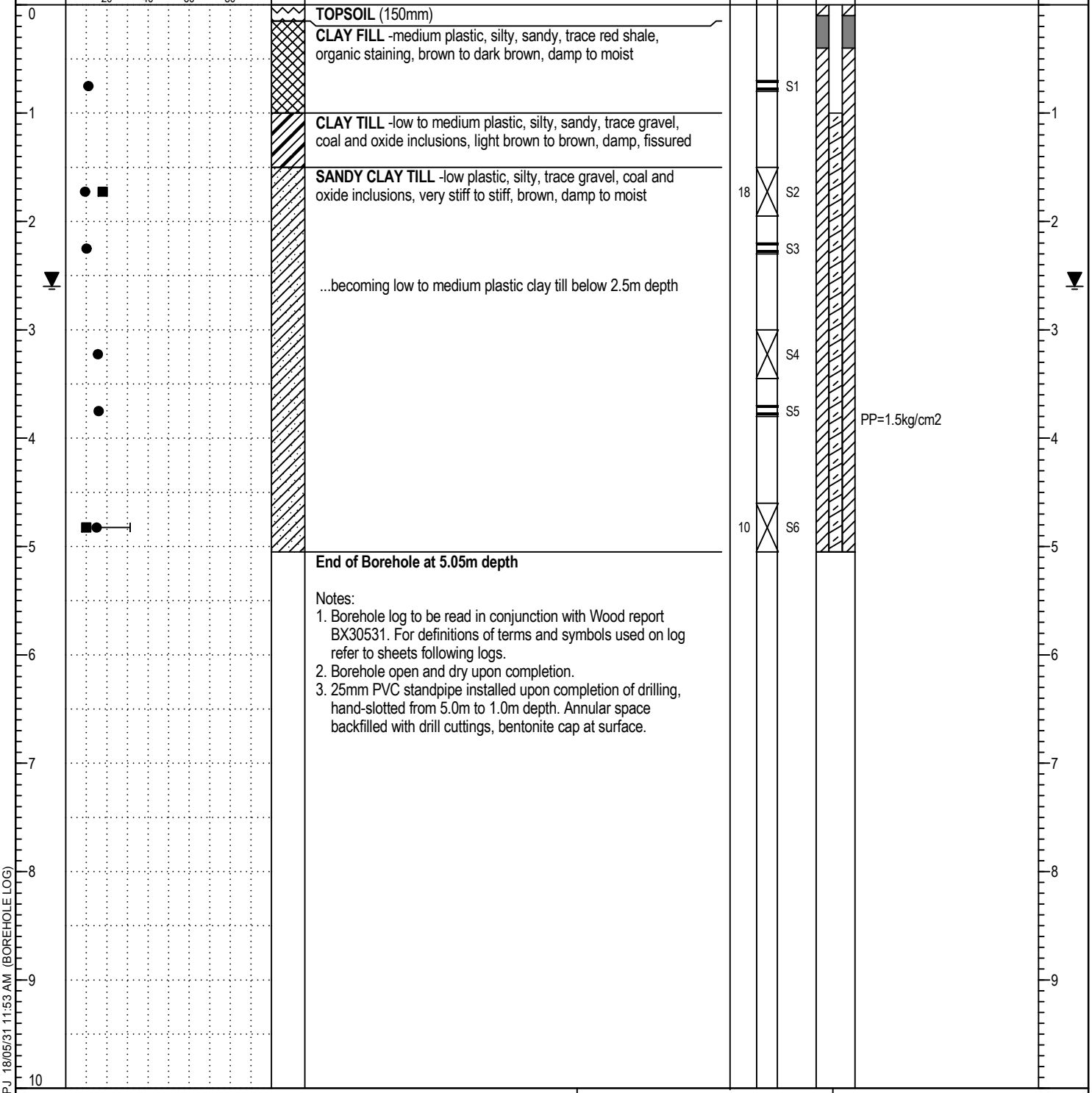
PROJECT NAME: Proposed Residential Subdivision	DRILLER: Chilako Drilling Services Ltd.	BOREHOLE NO: **BH18-05**
CLIENT: Martin Geomatic Consultants Ltd.	DRILL/METHOD: Truck Mounted C-1150 Drill/ SSA	PROJECT NO: BX30531
LOCATION: See Figure 1.		ELEVATION: --

SAMPLE TYPE: Shelby Tube; No Recovery; SPT Test (N); Grab Sample; Split-Pen; Core

BACKFILL TYPE: Bentonite; Pea Gravel; Slough; Grout; Drill Cuttings; Sand



Notes:
1. Borehole log to be read in conjunction with Wood report BX30531. For definitions of terms and symbols used on log refer to sheets following logs.
2. Borehole open and dry upon completion.
3. 25mm PVC standpipe installed upon completion of drilling, hand-slotted from 5.0m to 1.0m depth. Annular space backfilled with drill cuttings, bentonite cap at surface.

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	REVIEWED BY: JL	COMPLETION DATE: 4/5/18
		Page 1 of 1

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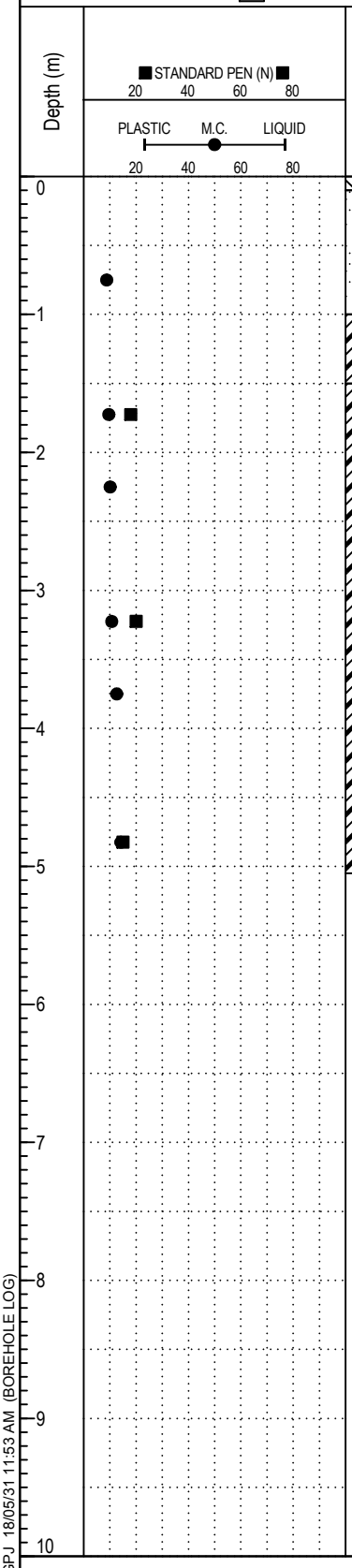
PROJECT NAME: Proposed Residential Subdivision	DRILLER: Chilako Drilling Services Ltd.	BOREHOLE NO: **BH18-06**
CLIENT: Martin Geomatic Consultants Ltd.	DRILL/METHOD: Truck Mounted C-1150 Drill/ SSA	PROJECT NO: BX30531
LOCATION: See Figure 1.		ELEVATION: --

SAMPLE TYPE: Shelby Tube; No Recovery; SPT Test (N); Grab Sample; Split-Pen; Core

BACKFILL TYPE: Bentonite; Pea Gravel; Slough; Grout; Drill Cuttings; Sand



Notes:
1. Borehole log to be read in conjunction with Wood report BX30531. For definitions of terms and symbols used on log refer to sheets following logs.
2. Borehole open and dry upon completion.
3. Borehole backfilled with drill cuttings.

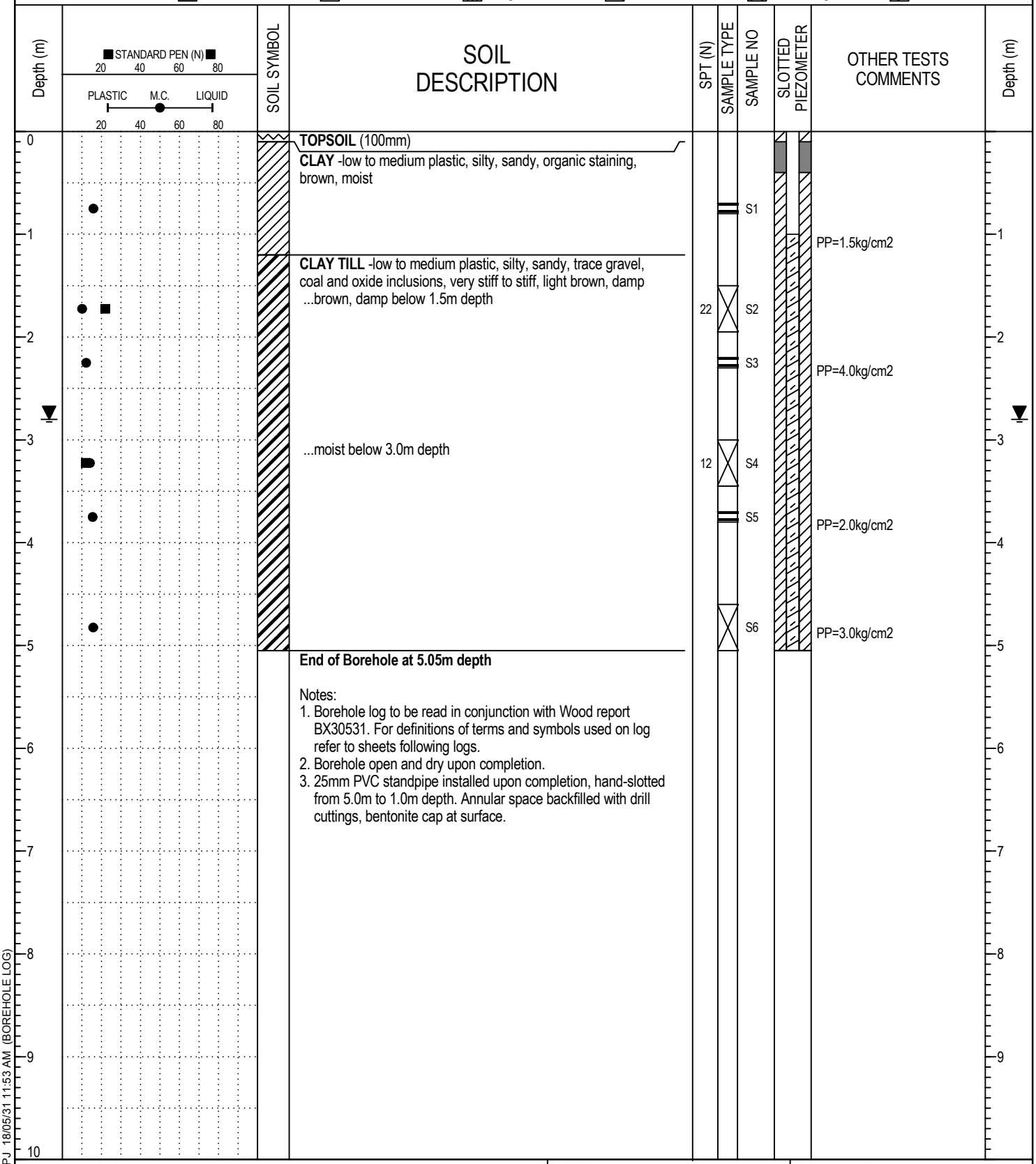
Wood Environment & Infrastructure Solutions	LOGGED BY: BM	COMPLETION DEPTH: 5.05 m
	REVIEWED BY: JL	COMPLETION DATE: 4/5/18
		Page 1 of 1

BX30531.GPJ 18/05/31 11:53 AM (BOREHOLE LOG)

PROJECT NAME: Proposed Residential Subdivision	DRILLER: Chilako Drilling Services Ltd.	BOREHOLE NO: **BH18-07**
CLIENT: Martin Geomatic Consultants Ltd.	DRILL/METHOD: Truck Mounted C-1150 Drill/ SSA	PROJECT NO: BX30531
LOCATION: See Figure 1.		ELEVATION: --

SAMPLE TYPE: Shelby Tube; No Recovery; SPT Test (N); Grab Sample; Split-Pen; Core

BACKFILL TYPE: Bentonite; Pea Gravel; Slough; Grout; Drill Cuttings; Sand



Notes:
1. Borehole log to be read in conjunction with Wood report BX30531. For definitions of terms and symbols used on log refer to sheets following logs.
2. Borehole open and dry upon completion.
3. 25mm PVC standpipe installed upon completion, hand-slotted from 5.0m to 1.0m depth. Annular space backfilled with drill cuttings, bentonite cap at surface.

BX30531.GPJ 18/05/31 11:53 AM (BOREHOLE LOG)

Wood Environment & Infrastructure Solutions

LOGGED BY: BM	COMPLETION DEPTH: 5.05 m
REVIEWED BY: JL	COMPLETION DATE: 4/5/18

PROJECT NAME: Proposed Residential Subdivision	DRILLER: Chilako Drilling Services Ltd.	BOREHOLE NO: **BH18-08**
CLIENT: Martin Geomatic Consultants Ltd.	DRILL/METHOD: Truck Mounted C-1150 Drill/ SSA	PROJECT NO: BX30531
LOCATION: See Figure 1.		ELEVATION: --

SAMPLE TYPE: Shelby Tube; No Recovery; SPT Test (N); Grab Sample; Split-Pen; Core

BACKFILL TYPE: Bentonite; Pea Gravel; Slough; Grout; Drill Cuttings; Sand

Depth (m)	STANDARD PEN (N) 20 40 60 80 / PLASTIC M.C. LIQUID 20 40 60 80	SOIL SYMBOL	SOIL DESCRIPTION	SPT (N)	SAMPLE TYPE	SAMPLE NO	OTHER TESTS COMMENTS	Depth (m)
0			**TOPSOIL** (150mm)					0
			CLAY -low to medium plastic, silty, sandy, organic staining, dark brown, moist					
			CLAY TILL -low to medium plastic, silty, sandy, trace gravel, coal and oxide inclusions, stiff, brown, moist			S1	PP=2.0kg/cm2	
1								1
			...organic staining at 1.5m depth	9		S2		
2						S3	PP=2.0kg/cm2	2
3				12		S4		3
						S5	PP=1.75kg/cm2	
4								4
5				13		S6		5
			End of Borehole at 5.05m depth					
6								6
7								7
8								8
9								9
10								

Notes:
1. Borehole log to be read in conjunction with Wood report BX30531. For definitions of terms and symbols used on log refer to sheets following logs.
2. Borehole open and dry upon completion.
3. Borehole backfilled with drill cuttings.

BX30531.GPJ 18/05/31 11:53 AM (BOREHOLE LOG)

Wood Environment & Infrastructure Solutions

LOGGED BY: BM	COMPLETION DEPTH: 5.05 m
REVIEWED BY: JL	COMPLETION DATE: 4/5/18

PROJECT NAME: Proposed Residential Subdivision	DRILLER: Chilako Drilling Services Ltd.	BOREHOLE NO: **BH18-09**
CLIENT: Martin Geomatic Consultants Ltd.	DRILL/METHOD: Truck Mounted C-1150 Drill/ SSA	PROJECT NO: BX30531
LOCATION: See Figure 1.		ELEVATION: --

SAMPLE TYPE: Shelby Tube; No Recovery; SPT Test (N); Grab Sample; Split-Pen; Core

BACKFILL TYPE: Bentonite; Pea Gravel; Slough; Grout; Drill Cuttings; Sand

Depth (m)	STANDARD PEN (N) 20 40 60 80 / PLASTIC M.C. LIQUID 20 40 60 80	SOIL SYMBOL	SOIL DESCRIPTION	SPT (N)	SAMPLE TYPE	SAMPLE NO	OTHER TESTS COMMENTS	Depth (m)
0			**TOPSOIL** (150mm)					0
			CLAY -low to medium plastic, silty, sandy, organic staining, dark brown, moist					
			CLAY TILL -low to medium plastic, silty, sandy, trace gravel, coal and oxide inclusions, stiff to very stiff, brown, damp, fissured to 1.5m depth			S1		
1								1
				9		S2		
2						S3	PP=3.0kg/cm2	2
3			...moist below 3.0m depth	16		S4		3
						S5	PP=2.0kg/cm2	
4								4
				12		S6		
5			**End of Borehole at 5.05m depth**					5
6								6
7								7
8								8
9								9
10								

Notes:
1. Borehole log to be read in conjunction with Wood report BX30531. For definitions of terms and symbols used on log refer to sheets following logs.
2. Borehole open and dry upon completion.
3. Borehole backfilled with drill cuttings.

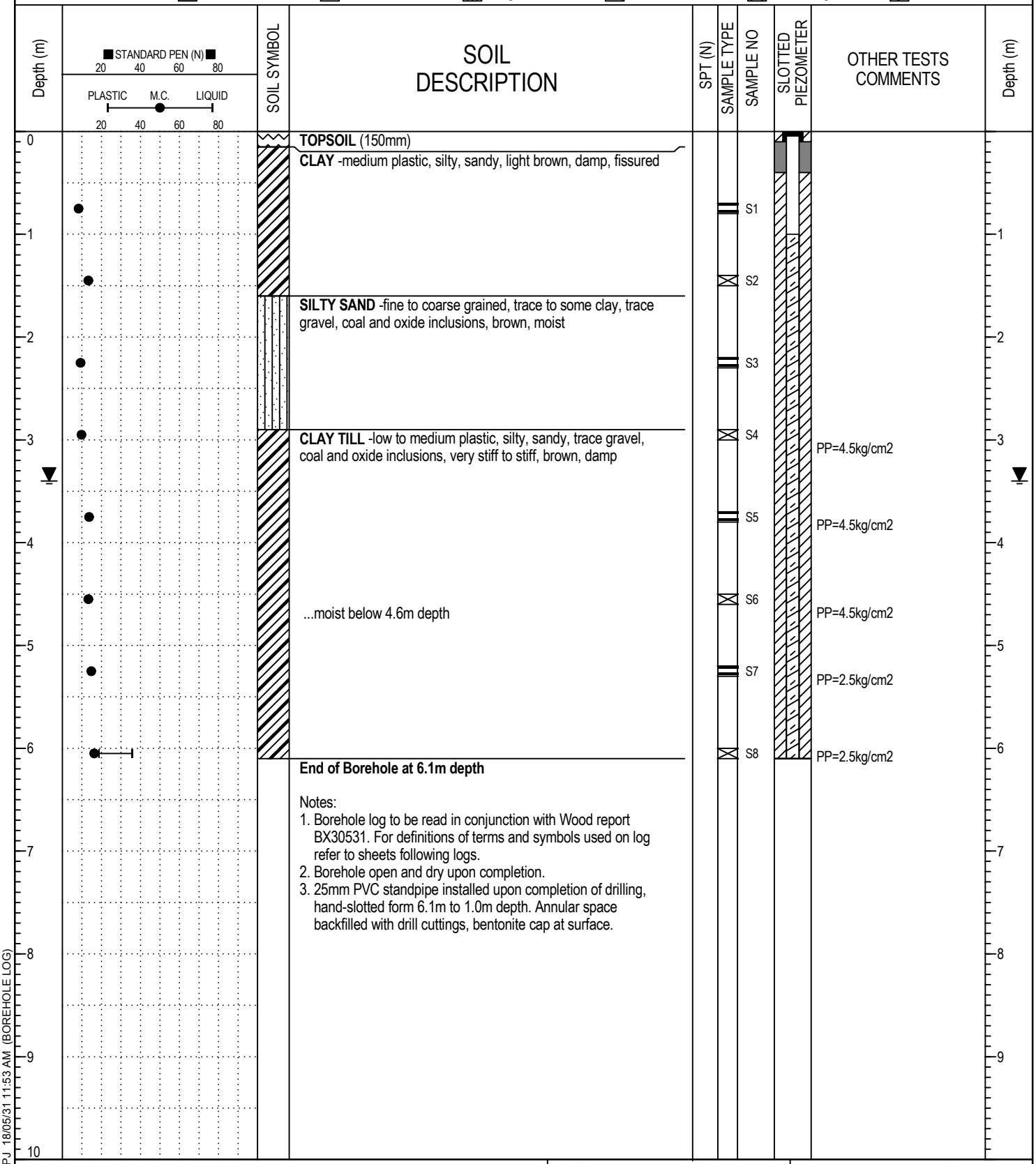
Wood Environment & Infrastructure Solutions

LOGGED BY: BM	COMPLETION DEPTH: 5.05 m
REVIEWED BY: JL	COMPLETION DATE: 4/5/18

PROJECT NAME: Proposed Residential Subdivision	DRILLER: Chilako Drilling Services Ltd.	BOREHOLE NO: **BH18-10**
CLIENT: Martin Geomatic Consultants Ltd.	DRILL/METHOD: Truck Mounted C-1150 Drill/ SSA	PROJECT NO: BX30531
LOCATION: See Figure 1.		ELEVATION: --

SAMPLE TYPE: Shelby Tube; No Recovery; SPT Test (N); Grab Sample; Split-Pen; Core

BACKFILL TYPE: Bentonite; Pea Gravel; Slough; Grout; Drill Cuttings; Sand



Notes:
1. Borehole log to be read in conjunction with Wood report BX30531. For definitions of terms and symbols used on log refer to sheets following logs.
2. Borehole open and dry upon completion.
3. 25mm PVC standpipe installed upon completion of drilling, hand-slotted form 6.1m to 1.0m depth. Annular space backfilled with drill cuttings, bentonite cap at surface.

Wood Environment & Infrastructure Solutions	LOGGED BY: BM	COMPLETION DEPTH: 6.10 m
	REVIEWED BY: JL	COMPLETION DATE: 4/5/18
		Page 1 of 1

BX30531.GPJ 18/05/31 11:53 AM (BOREHOLE LOG)

EXPLANATION OF TERMS AND SYMBOLS

The terms and symbols used on the borehole logs to summarize the results of field investigation and subsequent laboratory testing are described in these pages.

It should be noted that materials, boundaries and conditions have been established only at the borehole locations at the time of investigation and are not necessarily representative of subsurface conditions elsewhere across the site.

TEST DATA

Data obtained during the field investigation and from laboratory testing are shown at the appropriate depth interval.

Abbreviations, graphic symbols, and relevant test method designations are as follows:

*C	Consolidation test	*ST	Swelling test
D_R	Relative density	TV	Torvane shear strength
*k	Permeability coefficient	VS	Vane shear strength
*MA	Mechanical grain size analysis	w	Natural Moisture Content (ASTM D2216)
	and hydrometer test	w_l	Liquid limit (ASTM D 423)
N	Standard Penetration Test (CSA A119.1-60)	w_p	Plastic Limit (ASTM D 424)
N_d	Dynamic cone penetration test	E_f	Unit strain at failure
NP	Non plastic soil	γ	Unit weight of soil or rock
pp	Pocket penetrometer strength (kg/cm²)	γ_d	Dry unit weight of soil or rock
*q	Triaxial compression test	ρ	Density of soil or rock
q_u	Unconfined compressive strength	ρ_d	Dry Density of soil or rock
*SB	Shearbox test	C_u	Undrained shear strength
SO_4	Concentration of water-soluble sulphate	→	Seepage
		▼	Observed water level

* The results of these tests are usually reported separately

Soils are classified and described according to their engineering properties and behaviour.

The soil of each stratum is described using the Unified Soil Classification System[1] modified slightly so that an inorganic clay of “medium plasticity” is recognized.

The modifying adjectives used to define the actual or estimated percentage range by weight of minor components are consistent with the Canadian Foundation Engineering Manual[2].

Relative Density and Consistency:

Cohesionless Soils		Cohesive Soils		
Relative Density	SPT (N) Value	Consistency	Undrained Shear Strength c_u (kPa)	Approximate SPT (N) Value
Very Loose	0-4	Very Soft	0-12	0-2
Loose	4-10	Soft	12-25	2-4
Compact	10-30	Firm	25-50	4-8
Dense	30-50	Stiff	50-100	8-15
Very Dense	>50	Very Stiff	100-200	15-30
		Hard	>200	>30

Standard Penetration Resistance (“N” value)
The number of blows by a 63.6kg hammer dropped 760 mm to drive a 50 mm diameter open sampler attached to “A” drill rods for a distance of 300 mm.

1 “Unified Soil Classification System”, Technical Memorandum 36-357 prepared by Waterways Experiment Station, Vicksburg, Mississippi, Corps of Engineers, U.S. Army. Vol. 1 March 1953.

2 ”Canadian Foundation Engineering Manual”, 4th Edition, Canadian Geotechnical Society, 2006.

MODIFIED UNIFIED CLASSIFICATION SYSTEM FOR SOILS

MAJOR DIVISION			GROUP SYMBOL	GRAPH SYMBOL	COLOUR CODE	TYPICAL DESCRIPTION	LABORATORY CLASSIFICATION CRITERIA	
COARSE GRAINED SOILS (MORE THAN HALF BY WEIGHT LARGER THAN 75µm)	GRAVELS MORE THAN HALF THE COARSE FRACTION LARGER THAN 4.75mm	CLEAN GRAVELS (LITTLE OR NO FINES)	GW		RED	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	$C_U = \frac{D_{60}}{D_{10}} > 4$; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1 \text{ to } 3$	
			GP		RED	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	NOT MEETING ABOVE REQUIREMENTS	
		DIRTY GRAVELS (WITH SOME FINES)	GM		YELLOW	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES	CONTENT OF FINES EXCEEDS 12 %	ATTERBERG LIMITS BELOW "A" LINE OR P.I. LESS THAN 4
			GC		YELLOW	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES		ATTERBERG LIMITS ABOVE "A" LINE P.I. MORE THAN 7
	SANDS MORE THAN HALF THE COARSE FRACTION SMALLER THAN 4.75mm	CLEAN SANDS (LITTLE OR NO FINES)	SW		RED	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES	$C_U = \frac{D_{60}}{D_{10}} > 6$; $C_C = \frac{(D_{60})^2}{D_{10} \times D_{60}} = 1 \text{ to } 3$	
			SP		RED	POORLY GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES	NOT MEETING ABOVE REQUIREMENTS	
		DIRTY SANDS (WITH SOME FINES)	SM		YELLOW	SILTY SANDS, SAND-SILT MIXTURES	CONTENT OF FINES EXCEEDS 12 %	ATTERBERG LIMITS BELOW "A" LINE OR P.I. LESS THAN 4
			SC		YELLOW	CLAYEY SANDS, SAND-CLAY MIXTURES		ATTERBERG LIMITS ABOVE "A" LINE P.I. MORE THAN 7
FINE-GRAINED SOILS (MORE THAN HALF BY WEIGHT SMALLER THAN 75µm)	SILTS BELOW "A" LINE NEGLIGIBLE ORGANIC CONTENT	W_L< 50%	ML		GREEN	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY SANDS OF SLIGHT PLASTICITY	CLASSIFICATION IS BASED UPON PLASTICITY CHART (SEE BELOW)	
		W_L< 50%	MH		BLUE	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS, FINE SANDS OR SILTY SOILS		
	CLAYS ABOVE "A" LINE NEGLIGIBLE ORGANIC CONTENT	W_L< 30%	CL		GREEN	INORGANIC CLAYS OF LOW PLASTICITY, GRAVELLY, SANDY OR SILTY CLAYS, LEAN CLAYS		
		30% <W_L< 50%	CI		GREEN-BLUE	INORGANIC CLAYS OF MEDIUM PLASTICITY, SILTY CLAYS		
		W_L> 50%	CH		BLUE	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS		
	ORGANIC SILTS & CLAYS BELOW "A" LINE	W_L< 50%	OL		GREEN	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY	WHENEVER THE NATURE OF THE FINES CONTENT HAS NOT BEEN DETERMINED, IT IS DESIGNATED BY THE LETTER "F", E.G. SF IS A MIXTURE OF SAND WITH SILT OR CLAY	
		W_L> 50%	OH		BLUE	ORGANIC CLAYS OF HIGH PLASTICITY		
HIGHLY ORGANIC SOILS			Pt		ORANGE	PEAT AND OTHER HIGHLY ORGANIC SOILS	STRONG COLOUR OR ODOUR, AND OFTEN FIBEROUS TEXTURE	

SPECIAL SYMBOLS

LIMESTONE		OILSAND	
SANDSTONE		SHALE	
SILTSTONE		FILL (UNDIFFERENTIATED)	

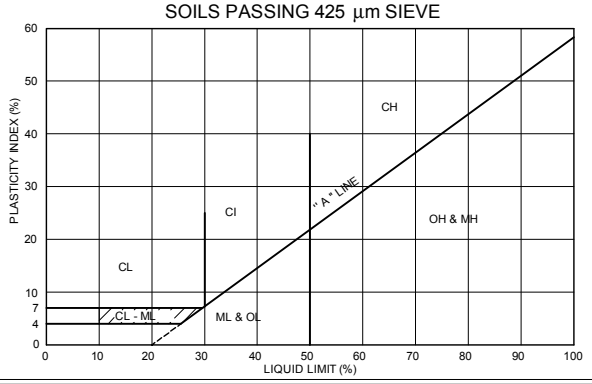
SOIL COMPONENTS

FRACTION	U.S. STANDARD SIEVE SIZE		DEFINING RANGES OF PERCENTAGE BY WEIGHT OF MINOR COMPONENTS	
GRAVEL	PASSING	RETAINED	PERCENT	DESCRIPTOR
COARSE	76mm	19mm	35-50	AND
FINE	19mm	4.75mm		
SAND			20-35	Y/EY
COARSE	4.75mm	2.00mm		
MEDIUM	2.00mm	425µm	10-20	SOME
FINE	425µm	75µm		
FINES (SILT OR CLAY BASED ON PLASTICITY)	75µm		1-10	TRACE

OVERSIZED MATERIAL

ROUNDED OR SUBROUNDED:	NOT ROUNDED:
COBBLES 76mm TO 200mm	ROCK FRAGMENTS > 76mm
BOULDERS > 200mm	ROCKS > 0.76 CUBIC METRE IN VOLUME

PLASTICITY CHART FOR SOILS PASSING 425 µm SIEVE



NOTES:

1. ALL SIEVE SIZES MENTIONED ON THIS CHART ARE U.S. STANDARD A.S.T.M. E.11
2. COARSE GRAIN SOILS WITH 5 TO 12% FINES GIVEN COMBINED GROUP SYMBOLS, E.G. GW-GC IS A WELL GRADED GRAVEL SAND MIXTURE WITH CLAY BINDER BETWEEN 5 AND 12% FINES.

amec foster wheeler

APPENDIX 3

ENVIRONMENTAL SITE ASSESSMENT

Amec Foster Wheeler- Phase 1 Environmental Site Assessment dated April 2018

PHASE I ENVIRONMENTAL SITE ASSESSMENT
Nakamura Residential Subdivision
SW 05-008-20 W4M
near Lethbridge, Alberta

CONFIDENTIAL

Submitted to:
Martin Geomatic Consultants Ltd.

Submitted by:

Amec Foster Wheeler Environment & Infrastructure
Lethbridge, Alberta

April 2018

Project No.: BX20137

13 April 2018
BX20137

Martin Geomantic Consultants Ltd.
255 – 31 Street North
Lethbridge, AB, T1H 3Z4

Re: Phase I Environmental Site Assessment
Nakamura Residential Subdivision

SW 05-008-20 W4M

Amec Foster Wheeler Environment & Infrastructure (Amec Foster Wheeler) is pleased to submit this report describing the results of the Phase I Environmental Site Assessment for the above-referenced property.

If you have any questions regarding our findings or recommendations, please contact the undersigned at 403-327-7474. Thank you for allowing Amec Foster Wheeler to be of service. We look forward to working with you again.

With appreciation,

Amec Foster Wheeler
Environment & Infrastructure,

Scott Roughead, C.E.T.
Senior Environmental Technologist
ASET Member #: 098653

469 40 Street South
Lethbridge, AB T1J 4M1
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Amec Foster Wheeler Environment & Infrastructure
Registered office: 2020 Winston Park Drive, Suite 700, Oakville, Ontario L6H 6X7
Registered in Canada; GST: 899879050 RT0008; DUNS: 25-362-6642

EXECUTIVE SUMMARY

Project:	Phase I Environmental Site Assessment
Site Civic Address:	No Site Civic Address
Short Legal Description:	4;20;8;5;SW
Alberta Township System:	SW 05-008-20 W4M
Site Size:	Approximately 27 hectares (66.6 acres)
Site Owners:	Jody F Nakamura
Site Occupant:	Jody F Nakamura (Farmer)

Martin Geomatic Consultant Ltd. retained Amec Foster Wheeler Environment & Infrastructure (Amec Foster Wheeler) to conduct a Phase I Environmental Site Assessment (ESA) of an approximate 27 hectare, zoned Rural Agricultural (RA) property with legal land description of SW 05-008-20 W4M, within the County of Lethbridge, Alberta, herein referred to as the 'Site'.

The objective of the Phase I ESA was to identify actual or potential substances or conditions of environmental concern at the Site that could be associated with previous or current land use, construction, management or operation of the Site or surrounding properties, and to determine if additional investigations are warranted. These substances or conditions are commonly referred to as either Areas of Potential Environmental Concern (APECs) or Items of Potential Environmental Concern (IPECs).

METHODOLOGY

The Phase I ESA was conducted in accordance to the 2001 Canadian Standards Association (CSA), *Phase I Environmental Site Assessment (CAN/CSA Z768-01 R2016)* guideline which is referenced by the Canadian Mortgage and Housing Corporation and the major financial institutions. The Phase I ESA methodology also adheres to the Alberta Environment and Parks (AEP) 2016 *Alberta Environmental Site Assessment Standard.*

Amec Foster Wheeler's Phase I ESA standards, procedures and policies were adhered to during the completion of this assessment.

At the time of the Site visit, the ground surfaces on the property and surrounding properties were clear.

FINDINGS AND RECOMMENDATIONS

The on-site and off-site environmental concerns are summarized as follows and include the recommendations for further work or actions to be considered to IPECs or APECs.

Methane

The aerial photograph review did identify potential wetlands that have been filled in on the southern portion of Site, as well as a backfilled irrigation canal that crossed the Site from north

to south. A methane survey would be required to determine the presence or absence and actual concentrations of methane at the Site or within Site buildings.

Radon

Shales and coal beds which may be present in the subsurface are a potential source for radon generation. There is, therefore, a potential for radon concentrations present in the subsurface to exceed the annual occupational exposure limit on-site. However, a radon survey would be required to determine the actual concentrations in the buildings on-site.

Equipment Containing Regulated Substances

Equipment potentially containing liquid and vapour mercury (thermostats and light tubes and bulbs), and small quantities of radioactive material (smoke detectors) were identified within the Site building. Amec Foster Wheeler recommends that when this equipment is serviced or removed during routine maintenance, renovation, alterations or demolition of the building, the units (>10 bulbs/tubes and/or >two smoke detectors/thermostats) are segregated, packaged to avoid breakage and disposed of in accordance with the waste management regulations.

Ozone-Depleting Substances

Amec Foster Wheeler recommends that when equipment containing refrigerants are serviced or removed during maintenance, renovation, alteration or demolition of the building, the units be inspected by qualified personnel and the presence or absence of ODS confirmed. If the units contain ODSs, they should be handled and disposed of in accordance with the ODS regulations.

Asbestos-Containing Materials

Based on the construction date of the Site building (1996), there is a possibility of non-friable asbestos-containing materials (ACMs) being present in, but not limited to, the roofing materials, vinyl flooring and mastics, caulking compounds, drywall joint compounds, floor levelling compounds, and penetration mastics. Amec Foster Wheeler recommends that if these items or other suspect materials are to be disturbed during routine maintenance, renovations, alterations or demolition, the materials should be assessed, sampled and tested by qualified environmental health practitioners in accordance with the asbestos management and waste regulations.

Lead-Containing Paint

Based on the construction date of the Site building (1996), although unlikely, there is the potential for lead-containing paints to be present within the building. Amec Foster Wheeler recommends that when potential lead-containing paints are to be disturbed during routine maintenance or renovations, alterations or demolition of the building, the painted surfaces be assessed by a qualified environmental practitioner prior to disturbance and if required, abated in accordance with the occupational health and safety and waste control regulations.

Pipelines and Oil and Gas Wells

A search of the Abacus database (AbaData) identified one well, Mobil Oil C.P.R. Wilson No. 5-4, located 10 m south of Site. The well was drilled in 1955 and abandoned in 1958. It is believed that it was an exploration well as no production report is available. The completion depth was

1306.1 m. The lease plan was available and shows that a portion of the lease covered approximately 3 acres of the southern portion of the Site.

There were no records pertaining to environmental spills in relation to the above noted well site, however environmental impacts can result from the drilling and production process, specifically in areas surrounding the well head, flare pits and sumps. Potential parameters of concerns can include elevated metals, petroleum hydrocarbons and/or salinity concentrations.

Based on the limited information available for the former well site, including specific operations, production activity, spills, remediation activities (if completed), reason for closing and planned activities for the property, along with overlapping of the lease and close proximity of the well to the Site (10 m south), the former Mobile Oil well represents an on- and off-site APEC. Further investigation (Phase II ESA) would be required to determine if this property has affected the Site.

In summary, based on Amec Foster Wheeler's review of the available information for the Site and surrounding properties as presented herein,

i) a Phase II intrusive environmental investigation is recommended.

ii) recommendations pertaining to the assessment of methane, radon and potential hazardous building materials as described in this report should also be considered.

The opinions in this report are based on the assumption that information provided to Amec Foster Wheeler, and information presented by others in reports to various agencies is accurate and complete.

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Amec Foster Wheeler Environment & Infrastructure is committed to achieving sustainability through balancing economic growth, social responsibility and environmental protection. Learn more at: http://amecfw.com/aboutus/sustainability.htm.

GLOSSARY OF ABBREVIATIONS

ACM	Asbestos-Containing Material(s)
AECB	Atomic Energy Control Board
AEP	Alberta Environment and Parks
AER	Alberta Energy Regulator
AHS	Alberta Health Services
APEC	Area of Potential Environmental Concern
AST	Above-ground Storage Tank
CCME	Canadian Council of Ministers of the Environment
CFC	Chlorofluorocarbon
CMHC	Canadian Mortgage and Housing Corporation
CSA	Canadian Standards Association
ELC	Environmental Law Centre
EPEA	(Alberta) *Environmental Protection and Enhancement Act*
ESA	Environmental Site Assessment
ESAR	Environmental Site Assessment Repository
FIP	Fire Insurance Plans
FOIP	Freedom of Information and Protection of Privacy
HCFC	Hydrochlorofluorocarbon
HPA	*Hazardous Products Act*
HWY	Highway
IPEC	Item of Potential Environmental Concern
L	Litres
LCP	Lead-Containing Paint(s)
masl	Metres Above Sea Level
mbgl	Metres Below Ground Level
mbgs	Metres Below Ground Surface
ODS	Ozone-Depleting Substances
PCB	Polychlorinated Biphenyl(s)
PHC	Petroleum Hydrocarbons
PTMAA	Petroleum Tank Management Association of Alberta
RD	Routine Disclosure
TDG	*Transportation of Dangerous Goods Act*
UFFI	Urea Formaldehyde Foam Insulation
UST	Underground Storage Tank
WHMIS	Workplace Hazardous Materials Information System
WL	Working Level

1.0 INTRODUCTION

The following provides a description of the project background, objectives of this assessment and methodology used to complete this assignment.

1.1 Project Background

Martin Geomatic Consultant Ltd. retained Amec Foster Wheeler Environment & Infrastructure (Amec Foster Wheeler) to conduct a Phase I Environmental Site Assessment (ESA) of an approximate 27 hectare, zoned Rural Agricultural (RA) property with legal land description of SW 05-008-20 W4M, within the County of Lethbridge, Alberta, herein referred to as the 'Site'.

Approval to proceed with this assessment was provided by Ed Martin on 22 March 2018. Amec Foster Wheeler understands the assessment has been undertaken for potential rezoning of the Site from Rural Agricultural to Grouped Country Residential.

1.2 Objectives

The objective of the Phase I ESA was to identify actual or potential substances or conditions of environmental concern at the Site that could be associated with previous or current land use, construction, management or operation of the Site or surrounding properties, and to determine if additional investigations are warranted. These substances or conditions are commonly referred to as either Areas of Potential Environmental Concern (APECs) or Items of Potential Environmental Concern (IPECs).

The Canadian Standards Association (CSA) notes that no environmental site assessment can wholly eliminate uncertainty regarding the potential for recognized environmental conditions about a property. Performance of a standardized environmental site assessment protocol is intended to reduce, but not to eliminate, uncertainty regarding the potential for recognized environmental conditions about the property, given reasonable limits of time and cost.

1.3 Methodology

Amec Foster Wheeler's methodology in conducting Phase I ESAs is based on the requirements of the 2001 CSA *Phase I Environmental Site Assessment (CAN/CSA Z768-01 reaffirmed 2012)* guideline, which is referenced by the Canadian Mortgage and Housing Corporation (CMHC) and major financial institutions. The guideline sets standards for the review of mandatory and optional information pertaining to a property and its surroundings, completion of checklists, property viewing procedures, interviews, and preparation of the final report. Our report methodology also complies with the requirements of the 2016 Alberta Environment and Parks (AEP) *Alberta Environmental Site Assessment Standard*. Amec Foster Wheeler's standard procedures for health and safety, site viewing and evaluation, and Amec Foster Wheeler's report writing and review policies were adhered to during the completion of this assessment.

The assessment comprised five main components:

1. identifying the background environmental setting of the Site and surrounding properties;

2. reviewing readily-available historical archives and government and public agency records for the Site and selected surrounding properties;
3. completing a viewing of the Site and perimeter-viewing of surrounding properties;
4. interviewing representatives knowledgeable about the Site and surrounding properties; and,
5. preparing a report summarizing the methodology and findings of the Phase I ESA and providing recommendations.

Background information gathered for surrounding properties was limited to information that was readily-available during this assessment. Historical records reviewed included records available for properties located within a 150 m radius of the subject Site boundaries as selected by the Client. Search radius for other parameters including historical aerial photographs, geology, topography, etc., met the AEP Phase I Guidelines. This assessment included an overview of the surrounding land uses and does not constitute a complete assessment of those properties.

The following records were reviewed and methodologies applied in the completion of this Phase I ESA:

- Topographical elevations for the Site and surrounding lands provided by Abacus Datagraphics Ltd. (AbaData) were reviewed.
- The Quaternary Geology Map of Southern Alberta provided by the Alberta Research Council (1987) was reviewed for the Site.
- The Surficial Geology Map of Southern Alberta (2013), Map 601, published by the Alberta Geological Survey was reviewed.
- A map of the bedrock geology of the Site and surrounding lands titled Bedrock Geology of Alberta, Map No. 600 published by Alberta Geological Survey in 2013 was reviewed.
- Water well drilling reports from Alberta Environment and Parks' (AEP) on-line groundwater database were reviewed on 25 March 2018.
- Historical and current land titles for the Site were reviewed to identify landowners and potential land uses. Land titles were provided by the Alberta Government Services Calgary land titles office and obtained from the on-line Spatial Information System and are included in Appendix A.
- Historical aerial photography of the Site and surrounding properties was reviewed to identify land uses and development. Photographs were obtained through the Alberta Environment and Parks (AEP) Air Photo Services (including select images archived in Amec Foster Wheeler's resource library) and from Abacus Datagraphics Ltd. (AbaData), and Google Earth Images™. Reproductions of selected photographs are included in Appendix B.
- A review of available Fire Insurance Plans (FIPs) was completed to identify historical building materials, structures and equipment on the Site and surrounding properties.

- Research of FIP collections listed in the Catalogue of Canadian Fire Insurance Plans 1875-1975 published by L. Dubreuil and C.A. Woods was completed.
- A review of available urban and rural directories was completed to identify historical occupants of the Site and surrounding properties.
- Federal, provincial and municipal government and public agencies were contacted and databases were researched to obtain readily-available environmental information for the Site and selected surrounding properties. Documents received from the agencies and databases are included in Appendix C or maintained in Amec Foster Wheeler's project file.
- Scott Roughead of Amec Foster Wheeler conducted the Site viewing on 29 March 2018. The Site and surrounding lands and improvements were viewed to identify evidence of potential impacts, including but not limited to, forms of soil disturbance, waste storage/spillage, staining of ground surfaces or discolouration of soils, and hazardous materials or chemical management issues. Viewing of surrounding properties was limited to publicly-accessible areas. Copies of selected photographs taken at the time of viewing are included in Appendix D. Completed environmental checklists are maintained in Amec Foster Wheeler's project files. Mr. Roughead's Statement of Qualifications is included in Appendix E.
- A interview was conducted with Jody Nakamura, Site owner and occupant, on 29 March 2018. This individual is hereafter referred to as the Site Representative in this report.

2.0 SITE AND PHYSICAL SETTING

The following sections provide a description of the physical setting of the Site including improvements and land topography, drainage, geology and hydrogeology.

2.1 Site Facilities and Land

The Site is located within SW 05-008-20 W4M. A map showing the location of the Site in the County of Lethbridge is provided as Figure 1. Access to the Site is from Range Road 20-5, located west of the Site. The Site is zoned by the County of Lethbridge as Rural Agricultural (RA) and has been owned by Jody F Nakamura since 2005.

It is understood that the subject parcel encompasses the triangular shaped area just north of an irrigation canal, along Range Road 20-5, west of the Saint Mary River irrigation Canal (SMRID). It is understood that the proposed parcel will be developed into 40 residential building lots, complete with full site servicing and paved streets.

The Site was originally used as pasture and farm land from at least 1950 (as evident in aerial photograph and historical land title review). The most recent Site activity was farming. One residential farm house (Alberta Rural Address of 80025 Rge Rd 20-5) and several small sheds are located on the west side of the Site (Photo #1 and #2, Appendix D). The 2000 square foot, two storey house with basement, was constructed in 1996. The house is situated on a concrete foundation, with hardy plank siding and asphaltic shingled roof. A septic field is located on the east side of the house with a 500,000-gallon dugout for water storage. Power and natural gas are supplied to the house from a utility right of way located along Range Road 20-5. The farm house is surrounded to the north, south and east by 6 acres of pasture land and 60 acres of alfalfa field.

An irrigation canal transvers the Site from prior to 1950 until its abandonment and backfill prior to 1983, as evident in aerial photograph review. The location of the former irrigation canal, can be seen on Figure 2.

A water pipeline right of way is located adjacent west of the Site and includes a 300 mm diameter irrigation water pipeline owned by the SMRID (Photo #3, Appendix D). The main SMRID canal is located along the east property line, with a smaller canal along the south property line (Photo #4, Appendix D). The smaller canal along the south property line was constructed between 1961 and 1970 as evident in aerial photography review.

A former Mobil Oil C.P.R Wilson No. 5-4 well was identified south of the Site adjacent to the small irrigation canal. The well was drilled to a depth of 1306.1 m in December of 1955 and abandoned in April of 1958. The lease access road was located south of Site, with the well lease covering approximately 3 acres of the present Site pasture (Photo #4, Appendix D and Figure 2). The well is discussed further in Section 5.6 of subject report.

2.2 Geology and Hydrogeology

The Quaternary Geology Map of Southern Alberta provided by the Alberta Research Council (2012) indicates the Site consists primarily of glacial deposits including gravel, sand, silt and clay, with some exposed local till and bedrock. These deposits can be up to 60 m thick deposited mainly in floors and terraces of river valleys and melt water channels and deltas. The area is characterized by flat to undulating topography. Surficial geology in the area is dominated by sediments including fine sand, silt and clay, and some minor gravel beds.

Bedrock Geology of Alberta, Map No. 600 published by Alberta Geological Survey in 2013 was reviewed and indicates that the bedrock geology for the Site is the Bears Paw Formation (KBp), characterized by dominantly dark grey to brown mudstone with concretionary sideritic bentonite concretionary layers; concentrations locally yield ammonites; deposition was in a marine to marginal marine environment.

The Old Man River is located approximately 10 km west of the Site at its closest distance. Regional horizontal groundwater flow direction is anticipated to be west towards Old Man River. However, a site-specific groundwater investigation would be required to determine the directions of groundwater flow beneath the Site, which is beyond the scope of a Phase I ESA. Underground utility trenches, conduits, installed drainage systems, structures, fill placement, variations in soil type and minor fluctuations in topography may influence the shallow groundwater flow. In addition, seasonal fluctuations of the groundwater elevation and flow direction can be expected.

3.0 HISTORICAL RECORDS

The following sections include the results of the review of available land titles, aerial photographs, fire insurance plans, urban and rural directories, and government and public-agency regulatory records.

3.1 Land Titles

The Alberta Land Titles records list Jody Nakamura as the current Site owner since 2005. A listing of the previous landowners of the Site from 1932 to present is provided in Table 1. Amec Foster Wheeler's summary of the findings is presented below. Copies of the current and historical land titles are included in Appendix A.

Table 1: Land Titles

Short Legal	Dates of Ownership	Name of Owner(s)
4;20;8;5;SW	2005 to present	Jody F Nakamura
4;20;8;5;SW	1982 - 2005	Robert D Wilson (Farmer)
4;20;8;5;SW	1954 - 1982	Her majesty the Queen in Right of The Province of Alberta As Represented by The Manager of The St. Mary and Milk Rivers Development
4;20;8;5;SW	1948 - 1954	His majesty the King in the right of Alberta
4;20;8;5;SW	1932 - 1948	Alberta Railway and Irrigation Company

There were no easements, orders, liens, rights-of-way, caveats of concern or IPECs/ APECs identified on the Site in the land title review.

3.2 Aerial Photographs

Aerial photographs of the Site and surrounding lands were reviewed. The aerial photographs ranged in dates from 1950 to 2009 and the scale of the images ranged from 1:20,000 to 1:40,000.

Aerial photography does not provide a continuous record of Site development and activities. It is possible that features of interest will have appeared and disappeared between the dates of coverage. In addition, photographic-quality and scale are variable and may make features difficult to identify, or their purpose difficult to establish. An interpretation of the aerial photography is presented in Table 2. Amec Foster Wheeler's summary of the findings is provided below. Reproductions of aerial photographs from the years 1950 (Figure B-1), 1961 (Figure B-2), 1970 (Figure B-3), 1983 (Figure B-4), 1999 (Figure B-5) and 2009 (Figure B-6) are included in Appendix B.

Table 2: Aerial Photographs

Photo Date and Scale	Photography Interpretation	
1950 1:40,000	Site	The east portion of the Site appears to be agricultural farm land. An area of sparse vegetation and wetland is visible on the southwest corner of Site. The historical irrigation canal is visible through the center of Site, running from northwest corner to south center. Pasture land is visible on the west side of the irrigation canal.
	Surrounding Properties	A road is visible at the present-day location of Range Road 20-5. A small farm appears to be located west of the Range Road. A second historical irrigation canal is visible south of the Site with farm land and a Township road beyond. Farm land primarily surrounds the Site in all directions with small farm structures visible to the north of the Site.
1961 1:40,000	Site	A low lying wet area (possibly marshy area, irrigation canal or dugouts) are visible along the south side of the Site between the Range Road and the irrigation canal. The remainder of the Site appears like the 1950 aerial photo.
	Surrounding Properties	The main SMRID canal is now visible along the east side of Site. The remainder of the Site appears similar to the 1950 aerial photo.
1970 1:31,680	Site	The low-lying dugout area located on the south corner of the Site is now filled in and the small irrigation canal is visible to the south of Site.
	Surrounding Properties	Further farm structures are visible north of the Site. The irrigation canal south of the site has been filled in and now appears to be only an irrigation ditch. A smaller canal has been constructed.
1983 1:31,680	Site	The historical irrigation canal that ran across the Site from north to south is now filled in. The outline (land scar) is still visible. The majority of the Site is now farm land.
	Surrounding Properties	The small irrigation canal south of the Site is well defined and a small structure is visible south of the small canal. A new barn is visible on the farm located west of Range Road 20-5.
1999 1:20,000	Site	The present farm house and 500,000-gallon fresh water storage dugout is now visible on Site. A drive way for the farm house is visible. What appears to be irrigation pipe is visible in the southeast corner of the Site. Most of the Site is farm land with a small pasture south of the farm house and dugout. Generally, the Site appears like present day.
	Surrounding Properties	Grouped Country Residential properties are now visible south and north of the Site. Increased development is visible on the farms located west of Site.
2009 1:20,000	Site	The site appears like 1999 aerial photo and present day. The outline of the former irrigation canal is still visible.
	Surrounding Properties	The surrounding properties appear similar to the 1999 air photo.

Based on the review of the historical aerial photographs it appears that the Site was used as rural agricultural farm land from 1950 until present.

It should be noted that aerial coverage from 1955 to 1958 was not available for the Site (period when Mobil Oil C.P.R. Wilson No. 5-4 may have been visible).

3.3 Fire Insurance Plans

In Canada, Fire Insurance Plans (FIPs) were first published in 1874 and were discontinued from publication in 1975. FIPs were not listed in the *Catalogue of Canadian Fire Insurance 1875-1975* plans and none were available in the collections archived at the University of Calgary Libraries and Cultural Resources, the Glenbow Museum Archives, the Galt Museum Archives or Amec Foster Wheeler's resource library.

3.4 Urban and Rural Directories

Urban and rural directories were not available for the Site.

3.5 Government and Public Agency Records

Amec Foster Wheeler contacted federal, provincial and municipal government and public agencies and researched databases to obtain current and historical publicly-available environmental information about the Site and selected surrounding properties. The responses received from the agencies and obtained from the databases are presented in Table 3. Amec Foster Wheeler's summary of the findings is presented below. Copies of the correspondence are provided in Appendix C.

Table 3: Publicly-Available Environmental Records

National Pollutant Release Inventory (NPRI) – *Inventory of pollutant releases (to air, water and land), disposals and transfers for recycling:* A search of the NPRI did not identify any pollution releases for the Site for the years searched (1994 to 2016) within a 300 m radius of the Site.
Treasury Board of Canada – *Canadian Federal Contaminated Sites:* A search of the Treasury Board of Canada's online database indicated there were no Canadian Federal Contaminated Sites on the Site or within a 2 km radius of the Site.
Canadian Nuclear Safety Commission (CNSC) – *Licensing of Nuclear Facilities:* A search of the CNSC online database did not identify the Site or the current landowner in ongoing, completed or cancelled nuclear environmental assessments.
Alberta Environment and Sustainable Resource Development (AEP) and Environment Canada's Help End Landfill Pollution (H.E.L.P.) Project Registry (1988) – *Registered Landfills or Dumps:* A search of the H.E.L.P. registry did not identify a landfill within a 300 m[(1)] radius of the Site Quarter Section (SW ¼ 05-008-20-W4M).
AEP – *Authorization and Approvals for the Site and Surrounding Properties:* A search of the AEP Authorizations and Approvals database did not identify records of active or inactive authorizations or approvals for the Site or surrounding area.

[1] The Alberta Subdivision and Development Regulation establish set back limits and development restrictions for properties within 300 m and up to 450 m from a landfill, waste site and other facilities.

AEP Water Well Drilling Reports – *Groundwater wells within the Site quarter section:* The search of the AEP groundwater records did not identify any groundwater wells on-Site. Two groundwater wells are located within the SW ¼ 05-008-20-W4M. The closest well is located approximately 10 m south of the Site. The drilling report is incomplete and does not identify purpose or yield, or owner, only a completion depth of 4284 ft. (1305.7 m). This well is suspected to be the Mobil Oil C.P.R. Wilson No. 5-4 well. The second well is located 15 m south of Site to a completion depth of 265 ft. The well is used for domestic purpose and was installed in 1983 and owned by Lionel Stokell. The static water level is 140 ft. The groundwater drilling reports are available in Appendix C. Groundwater monitoring wells were not identified on-Site. The Site representative was not aware of any water wells on-Site.
AEP Environmental Site Assessment Repository (ESAR) – *ESAR reports on the Site and neighboring properties:* A search of AEP's ESAR database did not identify reports for surrounding properties within 150 m of the Site.
AEP Routine Disclosure (RD) and Freedom of Information and Protection of Privacy (FOIP) Office – *Potential environmental issues at the Site:* The responses received from the AEP FOIP Office on 27 March 2018 stated there are no routinely available records pertaining to nature and extent of soil, ground and surface water contamination, remedial measures taken to clean-up; status, or external correspondence between submitter and the Department of Environment for the Site.
Alberta Environmental Law Centre (ELC) – *Stop orders, control orders, tickets, violations of various Environmental Acts and wellsite reclamation certificates:* The responses received from the ELC stated there had been no enforcement actions issued against the Site owner.
Alberta Energy Regulator (AER) – *Information on oil and gas wells, facilities, batteries, incident reports and pipeline township maps:* At the time of issue of the Phase I ESA, response from the AER for the well file had not yet been received, when received the findings will be updated.
Abacus Datagraphics Limited Database (AbaData)[2] – *Oil/gas wells, groundwater wells, pipelines, facilities and batteries, AER waste control location or landfill, or environmental spills:* A search of the Abacus database (AbaData) identified one well (Mobil Oil C.P.R. Wilson No. 5-4) located 10 m south of Site. The well was drilled in 1955 and abandoned in 1958. It is believed that it was an exploration well as no production report is available. The completion depth was 1306.1 m (4285.1 feet). The lease plan was available and shows that a portion of the lease covered approximately 3 acres of the southern portion of the Site. There were no records pertaining to environmental spills in relation to the above noted well site.
Petroleum Tank Management Association of Alberta (PTMAA) – *Above-ground and Underground Bulk Storage Tanks reported since 1992 or surveyed in 1992:* The response received from the PTMAA did not identify any USTs or ASTs for the Site.
County of Lethbridge – *Records of known contamination or compliance concerns, landfills, bylaw complaints or infractions or surface drainage issues:* The County of Lethbridge issued development permits for the Site in September of 1994. The County also forwarded a letter to Amec Foster Wheeler from Mobil Oil of Canada Ltd. dated August 1, 1957 that indicates an abandoned well was located on LSD. 4-5-8-20-W4M and that all equipment was removed in May and June of 1956.

[2] Abacus Datagraphics obtains their data from the AER, Alberta Energy, Alberta Environment and other sources.

4.0 HISTORICAL ENVIRONMENTAL REPORTS

Amec Foster Wheeler did not receive any previous environmental reports for the Site.

5.0 ENVIRONMENTAL ISSUES INVENTORY

The following sections describe environmental issues evaluated during the course of this assignment.

5.1 Land In-Filling

An irrigation canal was infilled on the Site between 1970 and 1983. The outline of the former canal is visible on current air photos and is presented on Figure 2.

Review of historical development and construction details or an intrusive investigation would be required to confirm the presence or absence of non-native fill materials on the Site. However, there could be no assurances that even an extensive investigation sampling and analytical program would detect impacts to the Site, if any, associated with the fill material. Therefore, no Phase II ESA is recommended to assess the fill at this time.

5.2 Dumps and Landfills

Background

The *Subdivision and Development Regulation* (*43/2002*) outlines the development restrictions and setback distances associated with construction of a school, hospital, food establishment, or residence in the vicinity of an active or inactive/closed dump or landfill. Construction, management and closure of a landfill are regulated under the *Waste Control Regulation* (*192/1996*) *(as amended)* and the *Alberta Environment Code of Practice for Landfills*. Dumps and landfills may represent potential sources of soil and groundwater contamination, or health hazards.

Site

According to the available records, no active or inactive registered landfills or dumps are known to be located on the Site or within a 300 m radius of the Site. There was no evidence of potential landfills or dumps identified on the Site in the historical review or during the Site viewing. The Site Representative was not aware of historical dumps on the Site. Based on the available information, Amec Foster Wheeler does not anticipate dumps or landfills are present on the Site.

5.3 Methane

Background

Methane is a gas derived from the breakdown of organic material or waste under anaerobic conditions (e.g., dumps and landfills). The primary concern with respect to methane is its potential to accumulate in enclosed spaces and explode upon ignition. Methane also acts as an

asphyxiant, decreasing the oxygen content of the air, which may cause health concerns, including increased breathing and pulse rates, impaired muscular coordination and fatigue. The *2010 National Building Code* includes provisions for the construction of new buildings which address soil gas ingress into buildings.

Site

The Site is not located within 500 m of a registered active or inactive landfill or a dump, as discussed in Section 5.2. No evidence of potential landfills or dumps or other sources of potentially buried organics were identified on the Site during the Site viewing or in the historical review. A Groundwater Well Drilling Report lithology was reviewed for a groundwater well located in NW¼ 05-008-20 W4M. The report did not indicate any organic shales within the upper 130 m from ground surface.

The aerial photograph review did identify potential wetlands that have been filled-in on the southern portion of Site, as well as the backfilled irrigation canal.

Based on this available information, there is potential for methane gas to be a potential environmental concern at the Site, however testing would be required to determine the presence or absence and concentration (if present), of methane on Site.

5.4 Radon and NORM

Background

Radon is a colourless, odourless gas that occurs naturally from the breakdown of uranium. Radon can be found in high concentrations where there are soils and rocks containing high levels of uranium, granite, shale, sandstones or phosphate. In open air or in areas with high air circulation, radon is not considered a health hazard. However, in confined spaces (such as basements), radon can concentrate and become a health hazard. According to Health Canada's 2011 *Canadian Guidelines for the Management of Naturally Occurring Radioactive Materials (NORM)*, radon released from soil beneath a building gives rise to an average indoor background concentration of about 45 Bq/m^3 (Becquerel's per cubic metre), but much higher values are possible in some areas. The *2010 National Building Code* (R2012), includes provisions for the construction of new buildings which address soil gas ingress into buildings. In addition, the 2014 Alberta Building Code incorporated these provisions, which require all buildings to include a "rough-in" for a subslab depressurization system for protection against potential radon ingress. Municipalities across the province have been incorporating the enforcement of these protective measures as part of building development permit applications at varying timelines.

Health Canada and Canadian Mortgage and Housing Corporation (CMHC) have issued a guide and other papers, which address radon concerns (CMHC 2007). Health Canada recommends that the level of radon in the air in a home in a normal living area be no more than 200 Bq/m^3 per year and recommends that action be taken to reduce the radon level to a value as low as reasonably achievable, if values are above this level. If the annual radon concentration reaches or exceeds 600 Bq/m^3, action should be taken sooner and within one year to reduce the value.

Health Canada (2011) also recommends that all workplaces be assessed for potential elevated levels of radon. Derived Working Limits (DWLs) have been determined and provide an estimate of dose from the quantities that may be directly measured in the workplace. The investigative DWL for radon in the workplace is 200 Bq/m^3. Where the annual average concentration of radon gas is expected to be above 200 Bq/m^3, measurements should be made to estimate the average annual radon gas concentration. Radon is also governed by the *Occupational Health and Safety Regulation, Alta. Reg. 62/2003*.

A 2011 Radon Potential Map of Canada, published by Radon Environmental Management Corporation, identified three zones of the relative radon hazard across Canada based on geologic conditions (i.e., geology, geophysics and geochemistry). The regions depicted in the map reflect conditions where higher radon readings might be found in Zone 1 (High) versus Zone 2 (Elevated) and Zone 3 (Guarded), respectively. A radon survey of private Canadian residences was published in 2012 by Health Canada in connection with Health Canada's National Radon Program. The survey included the evaluation of a select number of private homes from regional health units across Canada. The study estimated that of the 121 health regions, 92.6% had homes with radon concentrations above the Canadian Radon Guideline of 200 Bq/m^3. In Alberta, employers are required to develop and implement safe work practices and procedures for all workers who deal with, or come into contact with a radiation source under the OHS regulations.

Naturally-occurring radioactive material (NORM) is material that contains radioactive elements derived from a natural source. NORM primarily contains uranium and thorium which release radium, radon and potassium as they decay. NORM may be found in its natural state in rocks or sand, but can also be associated with oil and gas production residue as a mineral scale in pipes, as a sludge or on contaminated equipment. According to the Canadian Nuclear Safety Commission, NORM can also be present in consumer products such as bricks and cement blocks, granite counter tops, phosphate fertilizers, tobacco products, etc. (see: http://nuclearsafety.gc.ca/eng/resources/fact-sheets/naturally-occurring-radioactive-material.cfm). The federal government, through Health Canada, issued the document "*Canadian Guidelines for the Management of Naturally Occurring Radioactive Materials* (revised 2011)" which was last published in 2014.

In Alberta, employers are required to develop and implement safe work practices and procedures for all workers who deal with, or come into contact with a radiation source under the OHS regulations.

Site

The Site falls into Zone 1 (High) radon potential within the Chinook Health Region (Alberta Health Services Southern Region), however a radon survey of private Canadian residences was published in 2012 by Health Canada in connection with Health Canada's National Radon Program for the Chinook Health Region, which indicated that 91% of the respondents were below the Canadian Radon Guideline of 200 Bq/m^3.

Bedrock Geology of Alberta, Map No. 600 published by Alberta Geological Survey in 2013 was reviewed and indicates that the bedrock geology for the Site is the Bears Paw Formation (KBp),

characterized by dominantly dark grey to brown mudstone with concretionary sideritic bentonite concretionary layers; concentrations locally yield ammonites; marine to marginal marine in origin. Based on the bedrock information, and the anticipated thickness of overlying fine-grained sediments, and results from the 2012 Radon survey for the Chinook Health Region, naturally-occurring radon is not expected to be a concern at Site. A radon survey would be required to definitively determine the presence or absence of radon and the concentrations if present, however based on available information, NORM are not considered a concern on Site.

5.5 Water and Groundwater Wells

Background

The *Water Act* outlines the regulatory requirements for obtaining water from natural water systems in Alberta. A water well license, permit or approval must be obtained for groundwater wells. Unused groundwater wells must be properly decommissioned in accordance with the *Water (Ministerial) Regulation 205/1998* (as amended up to and including Alberta Regulation 185/2015). Groundwater wells in themselves do not typically represent a contaminant source of environmental concern; however, they can act as a conduit for liquid-phase contamination.

Site

The search of the AEP groundwater records did not identify any groundwater wells on-Site. Two groundwater wells are located within the SW ¼ 05-008-20-W4M. The closest well is located approximately 10 m south of the Site (Well ID: 118269). The drilling report is incomplete and does not identify purpose or yield, or owner, only a completion depth of 4284 ft. This well is suspected to be the Mobil Oil C.P.R. Wilson No. 5-4 well.

The second well is located 15 m south of Site to a completion depth of 265 ft. (Well ID: 118268). The well is used for domestic purpose and was installed in 1983 and owned by Lionel Stokell. The static water level is 140 ft. The groundwater drilling reports are available in Appendix C.

Groundwater monitoring wells were not identified on-Site. The Site representative was not aware of any water wells on-Site.

5.6 Pipelines and Oil and Gas Wells

Background

Oil and gas wells can represent an environmental concern from a number of related sources including drilling mud, sumps/earthen pits, flare pits/stacks, produced fluids, storage tanks, pipelines, chemicals and waste, etc.

Ground disturbance in the right-of-way of a pipeline is defined by and regulated under the *Pipeline Act RSA 2000* (revised 2014) and the *Pipeline Regulation Alta. Reg. 91/2005 (as amended)*. Ground disturbance must be completed in accordance with the applicable Alberta AER regulations and must meet the requirements of the licensee. Ground disturbance may not be undertaken within the right-of-way for a pipeline without the approval of the licensee of the pipeline. If approval cannot reasonably be obtained from the licensee, approval must be obtained from the AER prior to the commencement of any ground disturbance. Reclamation of

pipelines in Alberta is regulated under the *Environmental Protection and Enhancement Act* the *Public Lands Act*, the *Water Act* and the 1994 *Environmental Protection Guidelines for Pipelines*.

Pipeline leaks may be caused by a single catastrophic event or by a combination of events including excavation damage, corrosion, material/weld defects, or vandalism. Indicators of a possible pipeline failure or leak in the environment can include: dead or discoloured vegetation, sunken or depressed soils along the right-of-way, pools of hydrocarbon liquid at the surface of the right-of-way, odours, surface gas bubbles or clouds of vapour.

Site

A search of the Abacus database (AbaData) identified one well, Mobil Oil C.P.R. Wilson No. 5-4, located 10 m south of Site (Photo #4 Appendix D and Figure 2). The well was drilled in 1955 and abandoned in 1958. It is believed that it was an exploration well as no production report is available. The completion depth was 1306.1 m. The lease plan was available and shows that a portion of the lease covered approximately 3 acres of the southern portion of the Site.

The AbaData records are available in Appendix C. There were no records pertaining to environmental spills in relation to the above noted well site, however environmental impacts can result from the drilling and production process, specifically in areas surrounding the well head, flare pits and sumps.

Potential impacts can include metals, petroleum hydrocarbons and/or salinity parameters criteria exceedances.

Based on the limited information available for the former well site, including specific operations, production activity, spills, remediation activities (if completed), reason for closing and planned activities for the property, along with overlapping of the lease and close proximity of the well to the Site (10 m south), the former Mobile Oil well represents an on and off-site APEC. Further investigation (Phase II ESA) would be required to determine if this property has affected the Site.

5.7 Chemical Inventory, Storage and Handling

Background

In Alberta, the storage, handling and transportation of hazardous chemicals is regulated by the Occupational Health and Safety Regulation, Alta Reg. 62/2003, the 2014 Alberta Fire Code (as amended), Workplace Hazardous Materials Information System (WHMIS-2015) and the *Transportation of Dangerous Goods Act* (TDG). WHMIS 2015 incorporates the Globally Harmonized System of Classification and Labelling for chemicals (GHS). The historical and current chemical handling and storage practices as well as incidents or accidents are factors which will contribute to the likelihood of chemical impacts to a property. The effect of chemical drips, leaks, spills or releases will depend on a number of influencing factors. The type and volume of chemical, duration of the discharge, type and condition of the affected substance, ambient and ground temperatures, and precipitation are a few of these factors.

Site

No chemical storage or handing was identified on-Site. Fertilizers and pesticides are used in farming applications however at the time of the Site visit the farm fields were leased out and no fertiliser or pesticide was stored on-Site.

5.8 Storage Tanks

Background

Fuel storage at industrial facilities in Alberta is regulated by the following regulations and codes and agencies: the *2010 National Fire Code of Canada*; the 2014 *Alberta Fire Code*; the *Waste Control Regulation*, *Alta Reg. 192/1996 (as amended)*, the 2003 *Environmental Code of Practice for Above-ground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products,* the PTMAA and the local Fire Departments. In general, the codes and regulations apply to storage tanks associated with flammable and combustible liquids, and chemicals and include petroleum products as well as some thinners, solvents and inks. The Alberta Fire Code provides construction requirements of storage tanks and associated connections. Under the authority of Alberta Labour, which has delegated this authority to the PTMAA, all underground storage tanks and above-ground storage tanks with a capacity of 2,500 L or greater, excluding agricultural properties, unrefined petroleum products, and upstream oil and gas facilities require registration with the PTMAA. Both of the PTMAA databases (active tank sites and inventory of abandoned tank sites) are not complete.

The main limitation of these databases is that they only include information reported through registration or a survey of abandoned sites completed in 1992 and should not be considered as a comprehensive inventory of all past or present storage tank sites. Registration with PTMAA was not required for agricultural tanks and PTMAA only maintains records for flammable refined petroleum hydrocarbons and waste oil. Upstream or midstream oil and gas industry tanks are regulated through AER Directive 055: *Storage Requirements for the Upstream Petroleum Industry*. The PTMAA cannot guarantee that tanks do not or have not existed at this location. Information in the databases is based on information supplied by the owner and the PTMAA cannot guarantee its accuracy.

Site

A search of the PTMAA did not identify any active or abandoned tanks for the Site. Storage tanks and pipelines were not identified during the Site visit. There were no ASTs observed during the Site visit.

The detailed response received from the PTMAA is located in Appendix C of the subject report.

5.9 Pesticides

Background

In Alberta, storage, handling and use of pesticides (herbicides, insecticides, fungicides and rodenticides) are regulated under the Alberta *Environmental Protection and Enhancement Act*, the *Pesticide (Ministerial) Regulation 43/97 (1997a)*, the *Pesticide Sales Handling, Use and*

Application Regulation 24/97 (1997c) and the Environmental Code of Practice for Pesticides. The human health concerns associated with pesticides are varied, depending on the specific pesticide. They can range from non-carcinogenic effects such as hepatotoxicity to carcinogenic effects.

Site

There was no evidence of pesticide storage or use noted during the Site inspection. The farm fields are leased out yearly. No fertilizer of pesticide was stored on Site.

5.10 Non-Hazardous and Hazardous Waste

Background

The *Waste Control Regulation (192/1996) (as amended)* of the EPEA and the *TDG Act* outline the specific regulatory requirements of waste (non-hazardous, hazardous and hazardous recyclables) generation, handling, transporting and disposal in Alberta. Section 179 of the EPEA requires that a Personal Identification Number be obtained from AEP if the facility generates, transports, stores or disposes of hazardous waste beyond the small quantities exemption listed in the *Waste Control Regulation*. The *TDG Act* requires that anyone transporting hazardous wastes and recyclables, which are considered dangerous goods, must carry a current certificate of TDG training.

Site

There were no areas of potential environmental concern associated with waste handling or disposal, or evidence of unauthorized dumping observed or reported during the Site reconnaissance

5.11 Air Emissions

Background

Requirements for an Air Emissions Approval in Alberta are outlined in the *Environmental Protection and Enhancement Act* (EPEA), specifically within the *Activities Designation Regulation (276/2003*). The Substance Release Division of the Activities Designation Regulation specifically identifies substance release activities that require air emissions approvals. The operation of fuel burning equipment for comfort heating in a building does not require an approval under the EPEA.

Site

There are no known historical or current activities which generate emissions from the Site, which would require an air emissions approval. Amec Foster Wheeler has not identified a source of air emission, exempt from an approval, which represents a potential source of environmental concern to the Site.

5.12 Storm, Sanitary and Process Wastewater

Background

The *Water Resources Act* outlines the regulatory requirements for discharging wastewater to natural water systems in Alberta. The requirements for approval, with respect to wastewater and stormwater drainage in Alberta, are outlined in the EPEA, specifically within the *Activities Designation Regulation (276/2003)*. The Substance Release Division of the Activities Designation Regulation specifically identifies substance release activities, which require wastewater and stormwater drainage approvals. Regulatory control of wastewater and stormwater discharges is regulated by the *Alberta Wastewater and Storm Drainage Regulation (119/1993) (as amended)* and the *Wastewater and Storm Drainage (Ministerial) Regulation (120/1993)*. The release of normal domestic sewage and normal stormwater to the municipal sanitary and storm sewerage systems does not require an approval under EPEA. Control of discharges to the municipal sewerage system is the responsibility of the municipality or municipal (city) government.

Site

Water is supplied to Site by pumping it form the SMRID irrigation canal and storing it in the 500,000 gallon dugout. A septic field is located on the east side of the house. All stormwater is directed to the county ditch located along the west side of the Site.

Amec Foster Wheeler did not identify areas of potential environmental concern associated with Site drainage.

5.13 Spills, Surface Staining and Stressed Vegetation

Background

The *Transportation of Dangerous Goods Act*, 1992, S.C. 1992, c. 34, and the Transportation of Dangerous Goods (TDG) Regulations (SOR/2001 – 286) identify the nine classes of regulated substances. The regulation outlines under what conditions a release or ‘spill’ of a substance into the environment must be reported to the appropriate local authorities and if applicable, to AEP.

The properties of a substance, in combination with the physical condition and properties of the material which are stained, will affect the nature, degree and extent of impact caused by a release. Surface discolouration or staining of the ground surface as well as surface films, odour, or textural anomalies may be representative of either a one-time spill or release event or the result of long-term spills, drips or leaks which may have occurred during storage, decanting or filling. Localized or widespread stressed vegetation, evident by foliage discolouration, changes in vegetation cover, areas of predominant chemical tolerant plant species, or areas devoid of vegetation may also be evidence of subsurface impacts associated with historical spills or releases. The application of new gravel or surface materials or the relocation of the filling/ decanting stations or storage facilities can make evidence of a potential subsurface issue difficult to identify.

Site

There was no evidence of spills, surface staining or stressed vegetation during the Site reconnaissance.

The Site Representative was not aware of reportable spills or leaks occurring on the Site.

5.14 Mould

Background

Many different mould species can cause health concerns, especially in indoor environments. Moulds can produce allergens that can trigger allergic reactions or even asthma attacks in people allergic to mould. They can cause potentially life-threatening infections in people with compromised immune systems. Some mould species such as *Aspergillus versicolor* and *Stachybotrysatra* produce toxins that can have both acute and chronic health effects.

Different species can grow on a variety of substrates such as wood, paper, carpet, foods, and insulation. Moulds can grow on just about any organic substrate as long as moisture and oxygen are present. Controlling moisture can control mould growth but spores already present will not be eliminated. Mould can often be hidden from immediate view and can grow on the undersides of carpet, ceiling tiles or drywall. In damp areas or places where water leaks are known to have occurred, mould growth should be suspected. Qualified Occupational Health and Safety personnel can confirm this by inspection.

Care must be taken in the removal or clean-up of mould affected building materials. The minimum personal protective equipment recommended is eye-goggles, gloves, and an N-95 respirator. It is particularly important not to raise dust during the removal, as this will spread the spores. Amec Foster Wheeler recommends that only qualified people be involved in the removal of mould-affected materials.

Suspected mould growth on building materials is identified by visual growth or evidence of water intrusion/damage. Microbial growth may occur within enclosed spaces and may not be evident during a walk through building assessment. Removal of materials containing mould should be done in accordance with *Occupational Health and Safety Regulation, Alta Reg. 62/2003* (with amendments up to and including *Alta. Reg. 182/2013*) and the *Occupational Health and Safety Code* 2009.

Site

Mould or conditions conducive to mould growth were not observed during the Site viewing; the Site Representative was not aware of mould or locations of potential mould growth on the Site.

5.15 Equipment Containing Regulated Substances

Background

Hydraulic fluids include a large group of liquids the most common of which include mineral oils, organophosphate ester, and polyalphaolefin. Some fluids have an odour, some do not, and some are combustible and some are not. Hydraulic fluids are either petroleum hydrocarbon

derivatives or man-made. The health and environmental effects of hydraulic fluids is also variable; however, their carcinogenicity has not been evaluated. In the environment, hydraulic fluids tend to degrade rapidly but may be persistent for more than a year. The toxic effects of hydraulic fluids on humans and other organisms are poorly understood.

Building operating equipment such as hydraulic lift equipment, in-ground vehicle hoists, hydraulic piston-style elevators, some escalators, and hydraulic dock levellers operate with hydraulic fluids and possibly lubricants within their system and in reservoirs. The construction of a building and installation of these types of equipment typically include in-ground hydraulic cylinders and/or below floor pits or vaults which are either lined with concrete or open to the soils or aggregate material beneath a building floor. The equipment requires regular inspection and maintenance. In the event of manufacturing defects, damage or as the equipment deteriorates over time, seals and valves may fail and fluids can be released.

Mercury has historically been employed in the construction of thermostats, switches and lamps. Commercial switches and thermostats reportedly may contain 2 to 18 mg of mercury with industrial switches and equipment containing 5 kg or more. Older mercury-containing lamps can contain up to 80 mg of mercury per lamp. Fluorescent lamps manufactured since 2000 have in the order of 4 to 12 mg of mercury per lamp. Other types of lamps, such as metal-halide and high-pressure sodium vapour, can also contain mercury in the order of 20 to 250 mg/lamp. Mercury was also commonly added to leaded paints as a fungal retardant (biocide); however, it is not commonly tested for as the proper handling and disposal of lead-containing paints would typically minimize any safety or disposal issues for mercury. The Surface Coating Materials Regulations (April 2005 as amended in 2010) restricted the maximum total mercury content of paints and other liquid coating materials to 10 mg/kg in or around premises attended by children or pregnant women.

Ionization smoke detectors use a small radioactive source in detecting smoke particles. The radionuclide used is an oxide of Americium-241, which is bonded to a metallic foil and sealed in an ionization chamber. Americium-241 emits alpha particles and low-energy gamma rays. The smoke detector alarm is activated when the flow of alpha particles is interrupted by smoke particles. When smoke detectors are used in accordance with manufacturer requirements and are not opened, they do not pose a radiation human health risk. The Atomic Energy Control Board (AECB) achieves regulatory control of nuclear materials and nuclear facilities through a comprehensive licensing system, which is administered through the cooperation of federal and provincial government departments such as health, environment, transportation and labour.

The handling and disposal of mercury wastes are regulated by *the Waste Control Regulation 192/1996 (as amended)* and the *Canadian Environmental Protection Act*. Disposal of small quantities of radioactive/liquid mercury waste (one to two smoke detectors or thermostats), and mercury vapour waste (10 or less lamps), into non-hazardous waste receptacles is generally acceptable. Larger quantities are regulated for disposal as Special Wastes.

Site

Equipment potentially containing liquid and vapour mercury (thermostats and light tubes and bulbs), and small quantities of radioactive material (smoke detectors) were identified within the

Site building. Amec Foster Wheeler recommends that when this equipment is serviced or removed during routine maintenance, renovation, alterations or demolition of the building, the units (>10 bulbs/tubes and/or >two smoke detectors/thermostats) are segregated, packaged to avoid breakage and disposed of in accordance with the waste management regulations.

5.16 Equipment Containing Ozone-Depleting Substances

Background

An ozone-depleting substance (ODS) refers to any substance containing chlorofluorocarbon (CFC), hydrochlorofluorocarbon (HCFC), Halon or any other material capable of destroying ozone in the atmosphere. ODSs have been used in rigid polyurethane foam and insulation, packaging, laminates, aerosols, air conditioning and refrigerants, propellants, fire extinguishers, cleaning solvents, and in the sterilization of medical equipment. Federal regulations introduced in 1995 required the elimination of production and import of CFCs by 01 January 1996 (subject to certain essential uses), a suspension on the production and import of HCFC-22 by 01 January 1996, and the complete elimination of HCFC-22 by the year 2020. The HPA does not require the licensing, approval, or registration of property at which ODSs have been identified. However, Alberta regulations require the licensing of contractors who handle ODSs through equipment servicing.

Site

Amec Foster Wheeler recommends that when equipment containing refrigerants are serviced or removed during maintenance, renovation, alteration or demolition of the building, the units be inspected by qualified personnel and the presence or absence of ODS confirmed. If the units contain ODSs, they should be handled and disposed of in accordance with the ODS regulations.

5.17 Equipment Containing Polychlorinated Biphenyl Fluids

Background

Polychlorinated biphenyl (PCB) containing products were manufactured for use in applications where stable, fire-resistant, and heat-transfer properties were demanded up to approximately 1980. Most PCBs were sold for use as dielectric fluids (insulating liquids) in electric transformers and capacitors. Other uses included dye carriers in carbonless copy paper, heat transfer fluid, hydraulic fluid, some electrical and communication components, plasticizers, paints, coatings and sealants, plastics, rubbers, lubricants, wax extenders, adhesives/mastic, caulking and grout, roofing and siding materials, insulation materials and other materials that required durability and resistance to thermal and photo-reactive processes and weathering for industrial applications.

In 1977, the Government of Canada banned the importation, manufacture and sale for reuse of PCBs. Since 1977, the government has adopted various regulations and taken measures to manage PCB manufacture, processing, use, import, export, sale, storage, transportation, destruction and releases into the environment. PCBs are currently regulated under the *PCB Regulations (SOR/2008-273 as amended)* of the 1999 *Canadian Environmental Protection Act.* The *PCB Regulations* set deadlines for ending the use of PCBs, eliminating all PCBs and

equipment containing PCBs currently in storage, and limiting the period of time PCBs can be stored before being destroyed. These deadlines apply based on the liquid or solid state of the PCB, the concentration of the PCB or the type of equipment or materials the PCB is contained in. In Alberta, waste (liquid, solid, substance or equipment) containing PCBs at a concentration equal to or greater than 50 mg/kg is hazardous waste and is regulated under the *Waste Control Regulation (Alberta Regulation 192/1996)*.

Human health concerns associated with PCBs include carcinogens, if they are ingested, and toxic by-products including furans and dioxins, if they are burned.

Site

Transformers were not identified on-Site during the Site assessment. It is unlikely that PCBs are present on Site.

5.18 Asbestos-Containing Materials

Background

Asbestos-containing materials (ACMs) were generally discontinued from use in Canada in the late 1970s to early 1980s, although non-friable asbestos is still found in many more recent buildings. ACMs are fibrous hydrated silicates, and can be found in building materials as either ‘friable’ or ‘non-friable’ asbestos products. Friable asbestos (material containing 0.1% or greater asbestos fibres), refers to materials that can be readily crumbled using hand pressure, separating asbestos fibres from the binding materials with which they are associated. Non-friable material (material containing 1.0% or greater asbestos fibres) refers to asbestos that is associated with a binding agent (such as tar or concrete), preventing ready release of airborne fibres. Friable asbestos is commonly found in boiler and pipe insulation. Non-friable or bound asbestos is typically found in roofing tars, floor tiles, and precast asbestos concrete products commonly referred to as ‘transite’. The only method of confirming whether materials are asbestos-containing is to sample and analyze the suspect materials. Any potential ACM must be treated as an ACM unless laboratory analysis indicates otherwise. Alberta Labour and the Alberta Asbestos Abatement Manual state that asbestos/asbestos fibres are not permitted in or to enter into building air plenums. Employees present in buildings with known or suspect ACMs must be informed and all ACMs must be identified. Materials that are identified as containing asbestos which are in poor condition should immediately be managed, either by proper encapsulation or removal. ACMs will also become an issue during renovation, alteration, maintenance or demolition activities during which these materials would be disturbed. Removal of materials containing asbestos should be done in accordance with *Alberta Human Resources & Employment Health and Safety, Alberta Asbestos Abatement Manual current edition, Occupational Health and Safety Regulation, Alta Reg. 62/2003* and the *Occupational Health and Safety Code* 2009.

Site

Based on the construction date of the Site building (1996), there is a possibility of non-friable asbestos-containing materials (ACMs) being present in, but not limited to, the roofing materials, vinyl flooring and mastics, caulking compounds, drywall joint compounds, floor levelling

compounds, and penetration mastics. Amec Foster Wheeler recommends that if these items or other suspect materials are to be disturbed during routine maintenance, renovations, alterations or demolition, the materials should be assessed, sampled and tested by qualified environmental health practitioners in accordance with the asbestos management and waste regulations.

5.19 Lead Containing Paint

Background

Lead was used extensively for pigmentation, sealing, and as a drying agent in oil based paints up until the early 1950s. Exterior paints typically contained up to 60% lead by dry weight. Beginning in the 1960s, a decrease in the content of lead employed in paints was initiated. In 1976, the federal government passed the *Liquid Coating Materials Regulations* under the Canadian *Hazardous Products Act* limiting the amount of lead for interior paints to 0.5% by weight of the dried paint film. Exterior and commercial paints could still contain lead and these lead paints were routinely used in buildings until the early 1980s. In 2005, under the *Hazardous Products Act*, the federal government issued the *Surface Coating Materials Regulations SOR/2010-224*, which limited the amount of lead permissible in paints and other surface coating materials to 0.009% lead by dry weight (90 mg/kg). This reduction does not generally apply to surface coating applied to buildings or other structures used for agricultural or industrial purposes as an anti-weathering or anti-corrosive coating.

The presence of lead-containing paints (LCPs) in buildings represents the most significant hazard where persons, notably small children, may ingest peeling or flaking LCPs. The generation of airborne lead-containing dust created during renovation, demolition, or construction activities (i.e., during sanding and grinding), or like actions on deteriorated painted surfaces (peeling/flaking) also comprises a potential health concern. The Alberta Occupational Health and Safety Regulation occupational exposure limits for an eight-hour period for lead in air is 0.05 mg/m^3. The Canadian Council of Ministers of the Environment has also established allowable concentrations of lead in soil, sediment and water.

The presence of LCPs can only be verified through sampling and analysis of suspect paint samples. If present LCPs may be addressed through the implementation of appropriate management or abatement plans to protect the health of persons working at the property, as required under the *Occupational Health and Safety Act*. Appropriate management and disposal plans are also required where maintenance, alteration, renovation, or demolition activities undertaken at a property may disturb these lead-containing materials and generate waste materials as required under the *Occupational Health and Safety Code 2009*.

Site

Based on the construction date of the Site building (1996), although unlikely, there is the potential for lead-containing paints to be present within the building. Amec Foster Wheeler recommends that when potential lead-containing paints are to be disturbed during routine maintenance or renovations, alterations or demolition of the building, the painted surfaces be assessed by a qualified environmental practitioner prior to disturbance and if required, abated in accordance with the occupational health and safety and waste control regulations.

5.20 Urea Formaldehyde Foam Insulation

Background

Urea Formaldehyde Foam Insulation (UFFI) was widely used as an insulating material in the 1970s and up until December 1980, when a ban on the use of UFFI was enacted under the HPA. UFFI is low-density foam that is formed by the polymerization of urea and formaldehyde liquids. Some buildings were constructed with UFFI. In addition, UFFI was commonly injected through walls by drilling injection holes, typically in roof structures, ceilings and overhangs. The HPA does not require the licensing, approval or registration of a property where UFFI has been identified except for residential properties. The human health concerns associated with UFFI are the release of gases as the UFFI cures, ages and degrade. Sampling and analysis is required to confirm the presence of UFFI in suspect materials.

Site

The Site building was constructed in 1996. No exposed wall cavities, insulation or evidence of potential UFFI applications were identified on the Site. Based on the available information, UFFI is not expected to be present.

5.21 Surrounding Land Uses

Amec Foster Wheeler visually-inspected the surrounding land uses on 07 November 2016 via car and on foot to identify current surrounding land uses and to identify off-site issues of potential environmental concern to the subject Site. Surrounding lands were viewed from the boundaries of the subject Site and from publicly-accessible areas and Amec Foster Wheeler did not enter any of the observed off-site buildings.

As discussed in Section 2.2, the regional groundwater in the area of the Site is anticipated to flow towards the west. However, a groundwater study of the Site has not been completed to date to confirm this assumption. The Site and surrounding lands are illustrated on Figure 2. A summary of observations regarding surrounding land use is provided below.

North

A farm house, with agricultural land, borders the Site to the North (Photo #8, Appendix D).

Amec Foster Wheeler did not identify off-site issues on the north-surrounding properties with the potential to pose an off-site APEC/IPEC to the Site.

East

The SMRID canal borders the Site to the east (Photo #9, Appendix D).

Amec Foster Wheeler did not identify off-site issues on the east-surrounding properties with the potential to pose an off-site APEC/IPEC to the Site.

South

Land to the south of the Site includes the small irrigation canal followed by the grouped country residential subdivision. (Photo #3, #10 and #11, Appendix D).

The Mobil Oil C.P.R. Wilson No 5-4 well was located south of the Site from 1955 to 1958. The lease extended on-Site and covered approximately 3 acres of the southern portion (Figure 2). There were no records pertaining to environmental spills in relation to the above noted well site, however environmental impacts can result from the drilling and production process, specifically in areas surrounding the well head, flare pits and sumps. Potential impacts can include metals, petroleum hydrocarbons and/or salinity parameters. criteria exceedances

Based on the limited information available for the former well site, including specific operations, production activity, spills, remediation activities (if completed), reason for closing and planned activities for the property, along with overlapping of the lease and close proximity of the well to the Site (10 m south), the former Mobile Oil well represents an on and off-site APEC. Further investigation (Phase II ESA) would be required to determine if this property has affected the Site.

West

The Site is bordered to the west by Range Road 20-5 followed by Rural Agricultural land (Photo #12, Appendix D).

Amec Foster Wheeler did not identify off-site issues on the west-surrounding properties with the potential to pose an off-site APEC/IPEC to the Site.

Assumptions

These opinions as described above are based on the assumption that information provided to Amec Foster Wheeler, and information presented by others in reports to various agencies, is accurate and complete.

6.0 CONCLUSIONS AND RECOMMENDATIONS

The on-site and off-site environmental concerns are summarized as follows and include the recommendations for further work or actions to be considered to address IPECs or APECs which are summarized as follows.

Methane

The aerial photograph review did identify potential wetlands that have been filled in on the southern portion of Site, as well as a backfilled irrigation canal that crossed the Site from north to south. A methane survey would be required to determine the presence or absence and actual concentrations of methane at the Site or within Site buildings.

Radon

Shales and coal beds which may be present in the subsurface are a potential source for radon generation. There is, therefore, a potential for radon concentrations present in the subsurface to exceed the annual occupational exposure limit on-site. However, a radon survey would be required to determine the actual concentrations in the buildings on-site.

Equipment Containing Regulated Substances

Equipment potentially containing liquid and vapour mercury (thermostats and light tubes and bulbs), and small quantities of radioactive material (smoke detectors) were identified within the Site building. Amec Foster Wheeler recommends that when this equipment is serviced or removed during routine maintenance, renovation, alterations or demolition of the building, the units (>10 bulbs/tubes and/or >two smoke detectors/thermostats) are segregated, packaged to avoid breakage and disposed of in accordance with the waste management regulations.

Ozone-Depleting Substances

Amec Foster Wheeler recommends that when equipment containing refrigerants are serviced or removed during maintenance, renovation, alteration or demolition of the building, the units be inspected by qualified personnel and the presence or absence of ODS confirmed. If the units contain ODSs, they should be handled and disposed of in accordance with the ODS regulations.

Asbestos-Containing Materials

Based on the construction date of the Site building (1996), there is a possibility of non-friable asbestos-containing materials (ACMs) being present in, but not limited to, the roofing materials, vinyl flooring and mastics, caulking compounds, drywall joint compounds, floor levelling compounds, and penetration mastics. Amec Foster Wheeler recommends that if these items or other suspect materials are to be disturbed during routine maintenance, renovations, alterations or demolition, the materials should be assessed, sampled and tested by qualified environmental health practitioners in accordance with the asbestos management and waste regulations.

Lead-Containing Paint

Based on the construction date of the Site building (1996), although unlikely, there is the potential for lead-containing paints to be present within the building. Amec Foster Wheeler recommends that when potential lead-containing paints are to be disturbed during routine maintenance or renovations, alterations or demolition of the building, the painted surfaces be assessed by a qualified environmental practitioner prior to disturbance and if required, abated in accordance with the occupational health and safety and waste control regulations.

Pipelines and Oil and Gas Wells

A search of the Abacus database (AbaData) identified one well, Mobil Oil C.P.R. Wilson No. 5-4, located 10 m south of Site. The well was drilled in 1955 and abandoned in 1958. It is believed that it was an exploration well as no production report is available. The completion depth was 1306.1 m. The lease plan was available and shows that a portion of the lease covered approximately 3 acres of the southern portion of the Site.

There were no records pertaining to environmental spills in relation to the above noted well site, however environmental impacts can result from the drilling and production process, specifically in areas surrounding the well head, flare pits and sumps. Potential concerns can include elevated metals, petroleum hydrocarbons and/or salinity concentrations.

Based on the limited information available for the former well site, including specific operations, production activity, spills, remediation activities (if completed), reason for closing and planned activities for the property, along with overlapping of the lease and close proximity of the well to the Site (10 m south), the former Mobile Oil well represents an on- and off-site APEC. Further investigation (Phase II ESA) would be required to determine if this property has affected the Site.

In summary, based on Amec Foster Wheeler's review of the available information for the Site and surrounding properties as presented herein,

i) a Phase II intrusive environmental investigation is recommended.

ii) recommendations pertaining to the assessment of methane, radon and potential hazardous building materials as described in this report should also be considered.

The opinions in this report are based on the assumption that information provided to Amec Foster Wheeler, and information presented by others in reports to various agencies is accurate and complete.

7.0 CLOSURE

This report was prepared for the exclusive use of Martin Geomatic Consultants Ltd. and is intended to provide an environmental assessment of the property described by short legal 4;20;8;5;SW located near Lethbridge, Alberta, at the time of the Site visit. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of the third party. Should additional parties require reliance on this report, written authorization from Amec Foster Wheeler will be required. With respect to third parties, Amec Foster Wheeler has no liability or responsibility for losses of any kind whatsoever, including direct or consequential financial effects on transactions or property values, or requirements for follow-up actions and costs.

The report is based on data and information collected during the Phase I ESA of the property conducted by Amec Foster Wheeler. It is based solely on the conditions of the Site encountered at the time of the Site visit on 29 March 2018, supplemented by a review of historical information and data obtained by Amec Foster Wheeler as described in this report, and discussion with a representative of the owner/occupant, as reported herein. Except as otherwise maybe specified, Amec Foster Wheeler disclaims any obligation to update this report for events taking place, or with respect to information that becomes available to Amec Foster Wheeler after the time during which Amec Foster Wheeler conducted the Phase I ESA.

In evaluating the property, Amec Foster Wheeler has relied in good faith on information provided by other individuals noted in this report. Amec Foster Wheeler has assumed that the information provided is factual and accurate. In addition, the findings in this report are based, to a large degree, upon information provided by the current owner/occupant. Amec Foster Wheeler accepts no responsibility for any deficiency, misstatement or inaccuracy contained in this report as a result of omissions, misinterpretations or fraudulent acts of persons interviewed or contacted.

Amec Foster Wheeler makes no other representations whatsoever, including those concerning the legal significance of its findings, or as to other legal matters touched on in this report, including, but not limited to, ownership of any property, or the application of any law to the facts set forth herein. With respect to regulatory compliance issues, regulatory statutes are subject to interpretation and change. Such interpretations and regulatory changes should be reviewed with legal counsel.

This Report is also subject to the further Standard Limitations contained in Appendix F.

We trust that the information presented in this report meets your current requirements. Should you have any questions, or concerns, please do not hesitate to contact the undersigned.

With appreciation,

Amec Foster Wheeler Environment & Infrastructure
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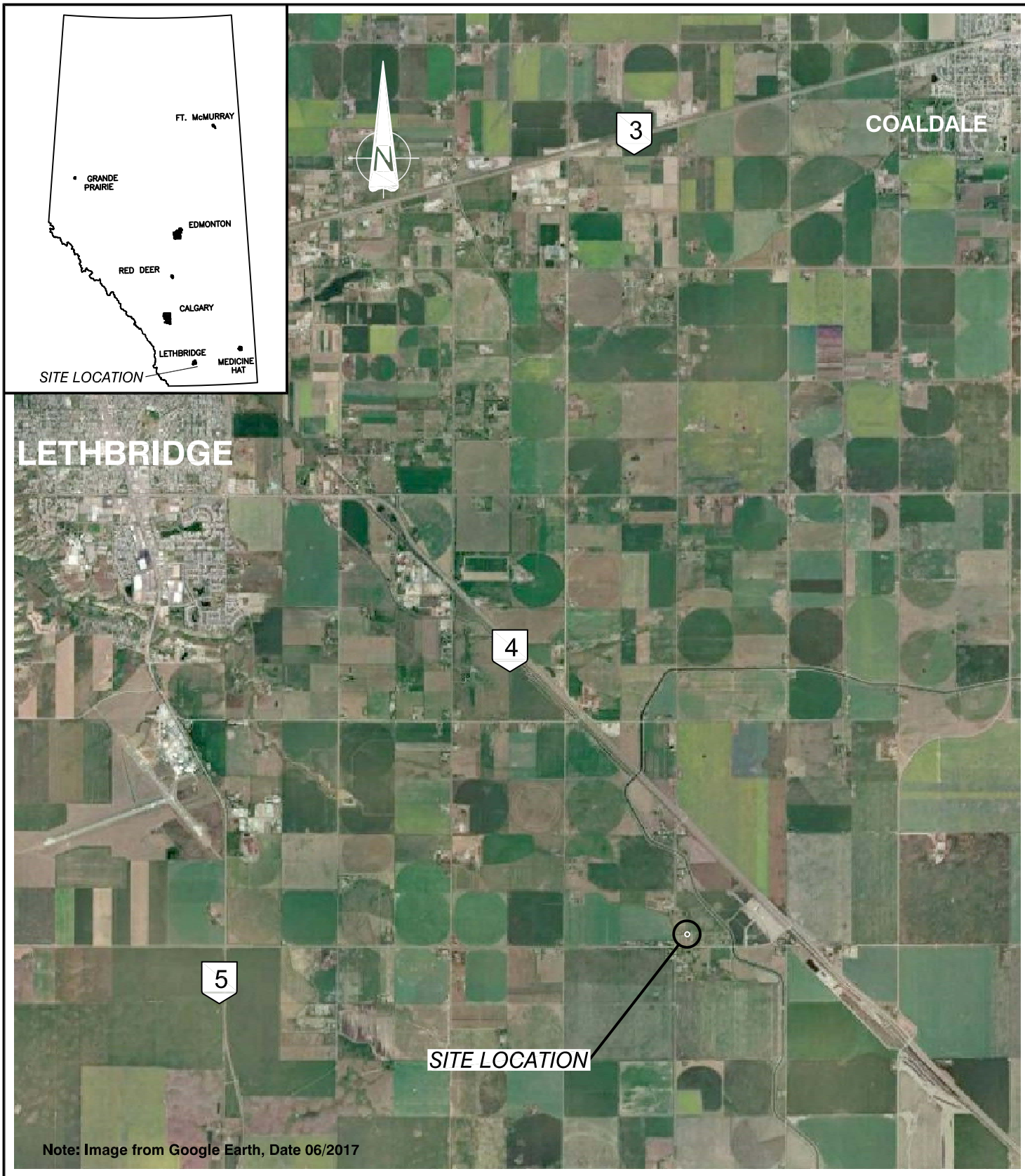
Figures



Amec Foster Wheeler Environment & Infrastructure
469 - 40th Street South
Lethbridge, Alberta CANADA T1J 4M1
Tel. (403) 327-7474
Fax (403) 327-7682

amec foster wheeler

Martin Geomatic Consultants Ltd.

TITLE: LOCATION PLAN	DWN BY: BJ	DATUM: NA	DATE: APRIL 2018	
PROJECT: Phase I Environmental Site Assessment Nakamura Residential Subdivision - SW5-8-20-W4M near Lethbridge, Alberta	CHK'D BY: SR	PROJECT NO: BX20137	FIGURE 1	
	SCALE: NTS			

Amec Foster Wheeler Environment & Infrastructure
469 - 40th Street South
Lethbridge, Alberta CANADA T1J 4M1
Tel. (403) 327-7474
Fax (403) 327-7682

amec foster wheeler

Martin Geomatic Consultants Ltd.

TITLE: SITE PLAN		DWN BY: BJ	DATUM: NA	DATE: APRIL 2018
PROJECT: Phase I Environmental Site Assessment Nakamura Residential Subdivision - SW5-8-20-W4M near Lethbridge, Alberta		CHK'D BY: SR	PROJECT NO: BX20137	FIGURE 2
		SCALE: NTS		

Appendix A

Land Titles

LAND TITLE CERTIFICATE

S

LINC	SHORT LEGAL	TITLE NUMBER
0020 144 473	4;20;8;5;SW	051 470 968

LEGAL DESCRIPTION

MERIDIAN 4 RANGE 20 TOWNSHIP 8
SECTION 5
THAT PORTION OF THE SOUTH WEST QUARTER LYING TO THE
WEST OF THE 65 METRE CANAL RIGHT OF WAY AND LYING
NORTH OF THE SOUTH HALVES OF LEGAL SUBDIVISIONS 3
AND 4, AND LYING TO THE NORTH OF THE 30 METRE CANAL
RIGHT OF WAY ON PLAN 8210212
CONTAINING 27 HECTARES (66.8 ACRES) MORE OR LESS
EXCEPTING THEREOUT:
THE NORTH 15 METRES CONTAINING 0.37 OF A HECTARE MORE OR LESS
EXCEPTING THEREOUT ALL MINES AND MINERALS

ESTATE: FEE SIMPLE

MUNICIPALITY: COUNTY OF LETHBRIDGE

REFERENCE NUMBER: 941 226 700

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
051 470 968	10/12/2005	TRANSFER OF LAND	$414,000	$414,000

OWNERS

JODY F NAKAMURA
OF 4611-50 AVE
TABER
ALBERTA T1G 1G3

(CONTINUED)

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
1485KX .	21/06/1971	IRRIGATION ORDER/NOTICE THIS PROPERTY IS INCLUDED IN THE ST. MARY RIVER IRRIGATION DISTRICT
3432U .		RESTRICTIVE COVENANT
3903EM .	24/10/1934	CAVEAT CAVEATOR - ALBERTA RAILWAY AND IRRIGATION CO..
941 261 421	07/10/1994	UTILITY RIGHT OF WAY GRANTEE - TRIPLE W NATURAL GAS CO-OP LIMITED. SEE INSTRUMENT FOR INTEREST
941 261 422	07/10/1994	UTILITY RIGHT OF WAY GRANTEE - TRIPLE W NATURAL GAS CO-OP LIMITED. SEE INSTRUMENT FOR INTEREST
051 470 969	10/12/2005	MORTGAGE MORTGAGEE - THE TORONTO DOMINION BANK. 300,10004 JASPER AVE EDMONTON ALBERTA T5J1R3 ORIGINAL PRINCIPAL AMOUNT: $250,000

TOTAL INSTRUMENTS: 006

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 14 DAY OF MAY, 2010 AT 09:51 A.M.

ORDER NUMBER:16529001

CUSTOMER FILE NUMBER: 082154

REGISTRAR OF LAND TITLES

END OF CERTIFICATE

(CONTINUED)

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

LAND TITLE CERTIFICATE

S

LINC	SHORT LEGAL	TITLE NUMBER
0020 144 473	4;20;8;5;SW	051 470 968

LEGAL DESCRIPTION

MERIDIAN 4 RANGE 20 TOWNSHIP 8
SECTION 5
THAT PORTION OF THE SOUTH WEST QUARTER LYING TO THE WEST OF THE 65 METRE CANAL RIGHT OF WAY AND LYING NORTH OF THE SOUTH HALVES OF LEGAL SUBDIVISIONS 3 AND 4, AND LYING TO THE NORTH OF THE 30 METRE CANAL RIGHT OF WAY ON PLAN 8210212
CONTAINING 27 HECTARES (66.8 ACRES) MORE OR LESS
EXCEPTING THEREOUT:
THE NORTH 15 METRES CONTAINING 0.37 OF A HECTARE MORE OR LESS
EXCEPTING THEREOUT ALL MINES AND MINERALS

ESTATE: FEE SIMPLE

MUNICIPALITY: COUNTY OF LETHBRIDGE

REFERENCE NUMBER: 941 226 700

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
051 470 968	10/12/2005	TRANSFER OF LAND	$414,000	$414,000

OWNERS

JODY F NAKAMURA
OF 4611-50 AVE
TABER
ALBERTA T1G 1G3

8211 3681 7B

(CONTINUED)

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
1485KX .	21/06/1971	IRRIGATION ORDER/NOTICE THIS PROPERTY IS INCLUDED IN THE ST. MARY RIVER IRRIGATION DISTRICT
3432U .		RESTRICTIVE COVENANT
3903EM .	24/10/1934	CAVEAT CAVEATOR - ALBERTA RAILWAY AND IRRIGATION CO..
941 261 421	07/10/1994	UTILITY RIGHT OF WAY GRANTEE - TRIPLE W NATURAL GAS CO-OP LIMITED. SEE INSTRUMENT FOR INTEREST
941 261 422	07/10/1994	UTILITY RIGHT OF WAY GRANTEE - TRIPLE W NATURAL GAS CO-OP LIMITED. SEE INSTRUMENT FOR INTEREST
051 470 969	10/12/2005	MORTGAGE MORTGAGEE - THE TORONTO DOMINION BANK. 300,10004 JASPER AVE EDMONTON ALBERTA T5J1R3 ORIGINAL PRINCIPAL AMOUNT: $250,000

TOTAL INSTRUMENTS: 006

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 14 DAY OF MAY, 2010 AT 09:51 A.M.

ORDER NUMBER:16529001

CUSTOMER FILE NUMBER: 082154

REGISTRAR OF LAND TITLES

END OF CERTIFICATE

(CONTINUED)

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

Certificate of Title

Canada

NO	8	2	1	1	3	6	8	1	7	B
	8	1	1	2	3	9	4	4	0	A
REF	8	1	1	2	3	9	4	4	0	B
VALUE $		1	1	2	2	6	8	5	0	0

RK

	MRG	TWP	SEC	Q	PT
1	4	10	8	5 SW	-

	PLAN	BLK	LOT	PT
2				

GOVERNMENT OF THE PROVINCE OF ALBERTA

South Alberta Land Registration District

THIS IS TO CERTIFY that ROBERT D. WILSON OF THE CITY OF LETHBRIDGE, IN THE PROVINCE OF ALBERTA (FARMER)

IS now the owner of an estate in fee simple

of and in

THAT PORTION OF THE SOUTH WEST QUARTER OF SECTION FIVE (5) IN TOWNSHIP EIGHT (8) RANGE TWENTY (20) WEST OF THE FOURTH MERIDIAN, LYING TO THE WEST OF THE 65 METRE CANAL RIGHT OF WAY AND LYING NORTH OF THE SOUTH HALVES OF LEGAL SUBDIVISIONS THREE (3) AND FOUR (4) AND LYING TO THE NORTH OF THE 30 METRE CANAL RIGHT OF WAY ON PLAN ~~8210213~~, CONTAINING 27 HECTARES (66.8 ACRES) MORE OR LESS

8210212 - CORRECTED 08/08/84

EXCEPTING THE NORTH 15 METRES CONTAINING 0.37 HECTARES MORE OR LESS

EXCEPTING THEREOUT ALL MINES AND MINERALS

CONVERTED AND CANCELLED

OCT 16 1991

SUBJECT TO THE ENCUMBRANCES, LIENS, ESTATES OR INTERESTS NOTIFIED BY MEMORANDUM UNDERWRITTEN OR ENDORSED HEREON, OR WHICH MAY HEREAFTER BE MADE IN THE REGISTER.

IN WITNESS WHEREOF I have hereunto subscribed my name and affixed my official seal

this 6 day of AUGUST A.D. 19 82

Post Office Address 1615 - 21 STREET SOUTH
LETHBRIDGE, ALBERTA
T1K 2H6

SOUTH ALBERTA LAND REGISTRATION DISTRICT LAND TITLES OFFICE

Registrar
South Alberta Land Registration District

A.G. 1818 V 1232
Rev 3/73

ABBREVIATIONS

E – Easement
C – Caveat
Tr – Transmission
Tfr – Transfer
Mtge – Mortgage
URW – Utility Right of Way
BL – Builders Lien
TN – Tax Notification
WE – Writ of Execution
CC – Covenants and Conditions
ENCUM – Encumbrance

Certificate of Title

NAME ROBERT D. WILSON

LAND 4 20 8 5 PTN SW¼

Show Other Abbreviations Here

TITLE NO 8211135681 7 B

CHARGES, LIENS AND INTERESTS.

Nature of Instrument	Registration Number	Date of Registration DY	MO	YR	Amount	PARTICULARS	Signature of Registrar	Discharges and Withdrawals: Registration Number	Date of Registration DY	MO	YR	Signature of Registrar
	1485 KX					THIS PROPERTY IS INCLUDED IN THE ST. MARY RIVER IRRIGATION DISTRICT						
CC	5432 U					SUBJECT TO THE RIGHTS AND RESERVATIONS CONTAINED IN TRANSFER						
C	3903 EM	24	10	34		SW¼ TO ALBERTA RAILWAY AND IRRIGATION COMPANY						
IRRIGABLE UNIT	811183569	29	09	81		IRRIGABLE UNIT UNDER SECTION 58 OF THE IRRIGABLE ACT (ST. MARY RIVER IRRIGATION DISTRICT)						
C	841183525	8	11	84		THE BOARD OF DIRECTORS OF THE ST. MARY RIVER IRRIGATION DISTRICT (RE: EASEMENT AGREEMENT) BOX 278 LETHBRIDGE, ALBERTA, T1J 3Y7 AGENT – F. J. BRENIAS		841205476	19	12	84	

Certificate of Title

NO	8 1 1 2 3 9 4 4 0 B
REF	8 1 1 0 7 1 3 1 9 A
VALUE $	1 9 4 5 0 0 0 0

Canada

	MER	RGE	TWP	SEC	QS	PT
VL	1	4	20	8	5	SW

	PLAN	BLK	LOT	PT
2				

South Alberta Land Registration District

THIS IS TO CERTIFY that ROBERT D. WILSON OF THE CITY OF LETHBRIDGE IN THE PROVINCE OF ALBERTA (FARMER)

IS now the owner of an estate in fee simple

of and in ::

OF SECTION FIVE (5)

THAT PORTION OF THE SOUTH WEST QUARTER /~~LYING~~ TO THE WEST OF THE WESTERLY LIMIT OF THE CANAL RIGHT OF WAY SHOWN ON PLAN IRR 1442 EXCEPTING THEREOUT THE SOUTH HALF OF LEGAL SUBDIVISION THREE (3) AND THE SOUTH HALF OF LEGAL SUBDIVISION FOUR (4) /OF THE SAID SECTION FIVE(5) CONTAINING 28.3 HECTARES (70) ACRES) MORE OR LESS

/CORRECTED 15/1/82

CORRECTED 15/1/82

:: IN TOWNSHIP EIGHT (8), RANGE TWENTY (20), WEST OF THE FOURTH MERIDIAN WHICH LIES

EXCEPTING THEREOUT ALL MINES AND MINERALS

THIS C... IN FULL - ON RENEWAL

... ABOVE OWNER

AND ... 811239440

ISSUED ... 15 JANUARY 82

SUBJECT TO THE ENCUMBRANCES, LIENS, ESTATES OR INTERESTS NOTIFIED BY MEMORANDUM UNDERWRITTEN OR ENDORSED HEREON, OR WHICH MAY HEREAFTER BE MADE IN THE REGISTER

IN WITNESS WHEREOF I have hereunto subscribed my name and affixed my official seal

this 29 day of DECEMBER A D 1981

Post Office Address 1615 - 21 STREET SOUTH

LETHBRIDGE, ALBERTA

Registrar

South Alberta Land Registration District

A.G. 1818 - 1232
Rev. 9 73

ABBREVIATIONS

E – Easement
C – Caveat
Tr – Transmission
Tfr – Transfer
Mtge – Mortgage
URW – Utility Right of Way
BL – Builders Lien
TN – Tax Notification
WE – Writ of Execution
CC – Covenants and Conditions
ENCUM – Encumbrance

Certificate of Title

Show Other Abbreviations Here

NAME ROBERT D. KILSON

LAND 4 - 20 - 8 - 5 - SW PTN

TITLE NO 81112391410B

CHARGES, LIENS AND INTERESTS.

Nature of Instrument	Registration Number	Date of Registration DY	MO	YR	Amount	PARTICULARS	Signature of Registrar	Discharges and Withdrawals: Registration Number	Date of Registration DY	MO	YR	Signature of Registrar
	1485 KX					THIS PROPERTY IS INCLUDED IN THE ST. MARY RIVER IRRIGATION DISTRICT	—					
CC	3432 U					SUBJECT TO THE RIGHTS AND RESERVATIONS CONTAINED IN TRANSFER	—					
C	3903 EM	24	10	34		SW¼ THE ALBERTA RAILWAY AND IRRIGATION COMPANY	—					
C	3373 KX	5	9	72		PTN DESCRIBED IN INSTRUMENT THE BOARD OF DIRECTORS OF THE ST. MARY RIVER IRRIGATION DISTRICT	—					
URW	7410452 3B	14	5	74		16.5 FT. TRIP TO ALBERTA GOVERNMENT TELEPHONES	—					
IRRIGABLE UNIT	81115356A	29	9	81		IRRIGABLE UNIT UNDER SECTION 58 OF THE IRRIGATION ACT (ST. MARY RIVER IRRIGATION DISTRICT)						

ENTERED 20/1/82

RENEWAL 15/1/82

REF. 811239439A
Canada 811239439B

Certificate of Title

NO	8 1 1 2 3 9 4 4 0 B
	8 1 1 0 7 1 3 1 9
REF	8 1 1 1 0 7 1 3 1 9 A
VALUE $	1 9 4 5 0 0 0 0

VL 1 4 20 8 5 SW

PLAN 2

THIS CERT. IS CANCELLED AS TO PORTION OF THE NORTHLY 15 METRES
IN ACCORDANCE WITH THE TRANSFER TO
THE BOARD OF DIRECTORS OF THE ST. MARY RIVER IRRIGATION DISTRICT
AND A NEW CERT. OF TITLE NO. 821099172
ISSUED THIS 4 DAY JUNE 1982
H Watson AD REG

GOVERNMENT OF THE PROVINCE OF ALBERTA

South Alberta Land Registration District

THIS IS TO CERTIFY that ROBERT D. WILSON OF THE CITY OF LETHBRIDGE IN THE PROVINCE OF ALBERTA (FARMER)

IS now the owner of an estate in fee simple

of and in

THAT PORTION OF THE SOUTH WEST QUARTER OF SECTION FIVE (5), IN TOWNSHIP EIGHT (8) RANGE TWENTY (20) WEST OF THE FOURTH MERIDIAN WHICH LIES TO THE WEST OF THE WESTERLY LIMIT OF CANAL RIGHT OF WAY SHOWN ON PLAN IRR. 1442

EXCEPTING THEREOUT THE SOUTH HALF OF LEGAL SUBDIVISION THREE (3) AND THE SOUTH HALF OF LEGAL SUBDIVISION FOUR (4) OF THE SAID SECTION FIVE (5) CONTAINING 28.3 HECTARES (70 ACRES) MORE OR LESS

CANCELLED

EXCEPTING THEREOUT ALL MINES AND MINERALS

THIS CERT. IS CANCELLED AS TO PORTIONS OF THE CANAL RIGHT OF WAY ON PLAN 8210212
IN ACCORDANCE WITH THE TRANSFER TO
THE BOARD OF DIRECTORS OF THE ST. MARY RIVER IRRIGATION DISTRICT
AND A NEW CERT. OF TITLE NO. 821099172
ISSUED THIS 4 DAY JUNE 19 82
H Watson AD. REG.

THIS CERT. IS CANCELLED IN FULL ON RENEWAL
IN ACCORDANCE WITH THE
ABOVE OWNER
AND A NEW CERT. OF TITLE NO. 811239440 B
ISSUED THIS 4 DAY JUNE 19 82
H Watson AD. REG.

SUBJECT TO THE ENCUMBRANCES, LIENS, ESTATES OR INTERESTS NOTIFIED BY MEMORANDUM UNDERWRITTEN OR ENDORSED HEREON, OR WHICH MAY HEREAFTER BE MADE IN THE REGISTER.

IN WITNESS WHEREOF I have hereunto subscribed my name and affixed my official seal

this 29 day of DECEMBER A.D. 19 81

Post Office Address 1615 - 21 STREET SOUTH
LETHBRIDGE, ALBERTA

SOUTH ALBERTA LAND REGISTRATION DISTRICT LAND TITLES OFFICE

Registrar

South Alberta Land Registration District

A.G. 1818 V 1232
Rev. 9/73

ABBREVIATIONS

E Easement — URW – Utility Right of Way
C Caveat — BL – Builders Lien
Tr Transmission — TN – Tax Notification
Tfr Transfer — WE – Writ of Execution
Mtge Mortgage — C C & Covenants and Conditions
ENCUM – Encumbrance

Certificate of Title

Show Other Abbreviations Here

NAME ROBERT D. WILSON

LAND 4 - 20 - 8 - 5 - SW PTN

TITLE NO 811123948 B

CHARGES, LIENS AND INTERESTS.

Nature of Instrument	Registration Number	Date of Registration DY MO YR	Amount	PARTICULARS	Signature of Registrar	Discharges and Withdrawals: Registration Number	Date of Registration DY MO YR	Signature of Registrar
	1485 KX			THIS PROPERTY IS INCLUDED IN THE ST. MARY RIVER IRRIGATION DISTRICT				
CC	3432 U			SUBJECT TO THE RIGHTS AND RESERVATIONS CONTAINED IN TRANSFER				
C	3903 EM	14 10 74		SW¼ THE ALBERTA RAILWAY AND IRRIGATION COMPANY				
C	3573 KX	5 9 72		PTN DESCRIBED IN INSTRUMENT THE BOARD OF DIRECTORS OF THE ST. MARY RIVER IRRIGATION DISTRICT		821099171	4 6 82	
URW	741045238	14 5 74		(16.5 FT. STRIP) TO ALBERTA GOVERNMENT TELEPHONES				
IRRIGABLE UNIT	811183564	29 9 81		IRRIGABLE UNIT UNDER SECTION 58 OF THE IRRIGABLE ACT (ST. MARY RIVER IRRIGATION DISTRICT)				

M

CANCELLED

Certificate of Title

NO 8 1 1 2 3 9 4 4 0 B

8 1 1 0 7 1 3 1 9

REF 8 1 1 1 0 7 1 1 3 1 1 9 A

VALUE $ 1 9 4 5 0 0 0 0

MD 1 | MRG | TWP | SEC | Q | PT — 9 2 0 | 8 | 5 | SW

2 | PLAN | BLK | LOT | PT

RENEWAL: 4/6/82

Canada

REFERENCES:

811239439A
811239439B

GOVERNMENT OF THE PROVINCE OF ALBERTA

South Alberta Land Registration District

THIS IS TO CERTIFY that ROBERT D. WILSON OF THE CITY OF LETHBRIDGE IN THE PROVINCE OF ALBERTA (FARMER)

IS now the owner of an estate in fee simple

of and in

THAT PORTION OF THE SOUTH WEST QUARTER OF SECTION FIVE (5)
IN TOWNSHIP EIGHT (8)
RANGE TWENTY (20)
WEST OF THE FOURTH MERIDIAN WHICH LIES TO THE NORTH OF THE
SOUTH HALVES OF LEGAL SUBDIVISION THREE (3) AND FOUR (4)
AND WHICH LIES TO THE WEST OF THE 65 METRE CANAL RIGHT OF WAY
ON PLAN 8210212
CONTAINING 28.1 HECTARES (69.5 ACRES) MORE OR LESS

EXCEPTING: FIRSTLY THE 30 METRE CANAL RIGHT OF WAY ON PLAN 8210212 CONTAINING 0.718 HECTARES (1.77 ACRES) MORE OR LESS

SECONDLY THAT PORTION OF THE NORTH 15 METRES OF THE SAID QUARTER SECTION WHICH LIES WEST OF THE 65 METRE CANAL RIGHT OF WAY ON PLAN 8210212 CONTAINING 0.37 HECTARES (0.91 ACRES) MORE OR LESS

CANCELLED

THIS CERT IS CANCELLED IN FULL
ON SEPARATION
IN ACCORDANCE WITH THE TRANSFER TO
ROBERT D. WILSON
AND A NEW CERT OF TITLE No 8 2 1 1 3 6 8 1 7
ISSUED THIS 6 DAY AUGUST 19 82
AD. REG.

EXCEPTING THEREOUT ALL MINES AND MINERALS

SUBJECT TO THE ENCUMBRANCES, LIENS, ESTATES OR INTERESTS NOTIFIED BY MEMORANDUM UNDERWRITTEN OR ENDORSED HEREON, OR WHICH MAY HEREAFTER BE MADE IN THE REGISTER

IN WITNESS WHEREOF I have hereunto subscribed my name and affixed my official seal

this 29 day of DECEMBER A.D. 19 81

Post Office Address 1615 - 21 STREET SOUTH
LETHBRIDGE, ALBERTA

Registrar

South Alberta Land Registration District

A G 1818 V 1232
Rev 5 73

ABBREVIATIONS

E – Easement
C – Caveat
Tr – Transmission
Tfr – Transfer
Mtge – Mortgage
URW – Utility Right of Way
BL – Builders Lien
TN – Tax Notification
WE – Writ of Execution
CC – Covenants and Conditions
ENCUM – Encumbrance

Certificate of Title

Show Other Abbreviations Here

NAME ROBERT D. WILSON

LAND 4 - 20 - 8 - 5 - PTN SW¼

TITLE NO 811123944 0 B

CHARGES, LIENS AND INTERESTS.

Nature of Instrument	Registration Number	Date of Registration DY	MO	YR	Amount	PARTICULARS	Signature of Registrar	Discharges and Withdrawals: Registration Number	Date of Registration DY	MO	YR	Signature of Registrar
	1485 KX					THIS PROPERTY IS INCLUDED IN THE ST. MARY RIVER IRRIGATION DISTRICT						
CC	3452 U					SUBJECT TO THE RIGHTS AND RESERVATIONS CONTAINED IN TRANSFER						
C	5903 EM	24	10	34		SW¼ TO ALBERTA RAILWAY AND IRRIGATION COMPANY						
IRRIGABLE UNIT	811183564	29	9	81		IRRIGABLE UNIT UNDER SECTION 58 OF THE IRR ACT (ST. MARY RIVER IRRIGATION DISTRICT)	GABLE					

CANCELLED

ENTERED 20/1/82
AND CONSOLIDATION WITH 811239439

Certificate of Title

NO 8 1 1 0 7 1 3 1 9

REF 8 1 1 0 1 2 4 3 4 A

VALUE $ 1 8 5 4 7 0 0 0

LM

	AREA	TWP	RGE	SEC	Q	PT
1	4	20	8	5	SW	4

	PLAN	BLK	LOT	PT
2				

THIS CERT. IS CANCELLED IN FULL
ON SEPARATION
IN ACCORDANCE W...
ABOVE OWNER
AND A NEW CERT. ... 8 1 1 2 ...
ISSUED THIS 29 DAY DECEMBER
... D. REG.

GOVERNMENT OF THE PROVINCE OF ALBERTA

South Alberta Land Registration District

THIS IS TO CERTIFY that ROBERT D. WILSON, OF THE CITY OF LETHBRIDGE, IN THE PROVINCE OF ALBERTA (FARMER)

IS now the owner of an estate in fee simple

of and in

FIRST... THE SOUTH WEST QUARTER AND THE WEST HALF OF THE SOUTH EAST QUARTER OF LEGAL SUBDIVISION THREE (3) IN THE SOUTH WEST QUARTER OF SECTION FIVE (5) IN TOWNSHIP EIGHT (8) RANGE TWENTY (20) WEST OF THE FOURTH MERIDIAN, CONTAINING 6.07 HECTARES (15 ACRES) MORE OR LESS

EXCEPTING THEREOUT ALL MINES AND MINERALS.

SECONDLY... THAT PORTION OF THE SOUTH HALF OF LEGAL SUBDIVISION FOUR (4) OF THE SAID SOUTH WEST QUARTER OF SECTION FIVE (5) LYING SOUTH AND EAST OF THE IRRIGATION RIGHT OF WAY ON PLAN IRR. 46, CONTAINING 6.151 HECTARES (15.2 ACRES) MORE OR LESS

EXCEPTING THE CANAL RIGHT OF WAY ON PLAN IRR. 1307, CONTAINING .692 OF A HECTARES (1.71 ACRES) MORE OR LESS

EXCEPTING OUT OF THE SECONDLY DESCRIBED ALL MINES AND MINERALS.

CANC...

SUBJECT TO THE ENCUMBRANCES, LIENS, ESTATES OR INTERESTS NOTIFIED BY MEMORANDUM UNDERWRITTEN OR ENDORSED HEREON, OR WHICH MAY HEREAFTER BE MADE IN THE REGISTER

IN WITNESS WHEREOF I have hereunto subscribed my name and affixed my official seal

this 23 day of APRIL A.D. 19 81

Post Office Address 1615 - 21 STREET S.
LETHBRIDGE, ALBERTA

Registrar
South Alberta Land Registration District

A.G. 1818 ...
Rev. 8-73

ABBREVIATIONS

E - Easement
C - Caveat
Tr - Transmission
Tfr - Transfer
Mtge - Mortgage
UtRW - Utility Right of Way
BL - Builders Lien
TN - Tax Notification
WE - Writ of Execution
CC - Covenants and Conditions
ENCUM - Encumbrance

Certificate of Title

Show Other Abbreviations Here

NAME ROBERT D WILSON

LAND 4 - 20 - 8 - 5 - SWL PTN

TITLE NO S 1 1 0 7 1 3 1 9

CHARGES, LIENS AND INTERESTS.

Nature of Instrument	Registration Number	Date of Registration DY	MO	YR	Amount	PARTICULARS	Signature of Registrar	Discharges and Withdrawals: Registration Number	Date of Registration DY	MO	YR	Signature of Registrar
	1485 KX					THIS PROPERTY IS INCLUDED IN THE ST. MARY RIVER IRRIGATION DISTRICT						
C	3903 EM	24	10	34		THE ALBERTA RAILWAY AND IRRIGATION COMPANY						
C	1494 LB	29	6	71		7 KUIPERS HOLDINGS LTD.		811071320	23	4	81	
C	3373 KX	5	9	72		AS TO PTN OF SE¼ CONT. 3.72 AC THE BOARD OF DIRECTORS OF THE ST. MARY RIVER IRRIGATION DISTRICT						
IRRIGABLE UNIT	811183564	29	9	81		IRRIGABLE UNIT UNDER SECTION 58 OF THE IRRIGATION ACT (ST. MARY RIVER IRRIGATION DISTRICT)						

Certificate of Title

NO	8	1	1	1	0	7	1	1	3	1	1	9				
REF	8	1	1	1	0	1	1	2	1	4	1	3	1	4	A	
VALUE $			1	8	5	1	4	1	7	1	0		0	1	0	

	MER	TWP	RGE	Q	PT
LH 1	4	2	0		

	PLAN	BLK	LOT	PT
2				

THIS CERT IS CANCELLED IN FULL
ON SEPARATION

IN ACCORDANCE WITH TRANSFER BY
ABOVE OWNER

AND A NEW CERT
ISSUED THIS 2nd DAY OF DECEMBER 8 1 1 2

GOVERNMENT OF THE PROVINCE OF ALBERTA

South Alberta Land Registration District

THIS IS TO CERTIFY that ROBERT D. WILSON, OF THE CITY OF LETHBRIDGE, IN THE PROVINCE OF ALBERTA (FARMER)

IS now the owner of an estate in fee simple

of and in

FIRST... THE SOUTH WEST QUARTER AND THE WEST HALF OF THE SOUTH EAST QUARTER OF LEGAL SUBDIVISION THREE (3) IN THE SOUTH WEST QUARTER OF SECTION FIVE (5) IN TOWNSHIP EIGHT (8) RANGE TWENTY (20) WEST OF THE FOURTH MERIDIAN, CONTAINING 6.07 HECTARES (15 ACRES) MORE OR LESS

EXCEPTING THEREOUT ALL MINES AND MINERALS.

SECONDLY... THAT PORTION OF THE SOUTH HALF OF LEGAL SUBDIVISION FOUR (4) OF THE SAID SOUTH WEST QUARTER OF SECTION FIVE (5) LYING SOUTH AND EAST OF THE IRRIGATION RIGHT OF WAY ON PLAN IRR. 46, CONTAINING 6.151 HECTARES (15.2 ACRES) MORE OR LESS

EXCEPTING THE CANAL RIGHT OF WAY ON PLAN IRR. 1307, CONTAINING .692 OF A HECTARES (1.71 ACRES) MORE OR LESS

EXCEPTING OUT OF THE SECONDLY DESCRIBED ALL MINES AND MINERALS.

SUBJECT TO THE ENCUMBRANCES, LIENS, ESTATES OR INTERESTS NOTIFIED BY MEMORANDUM UNDERWRITTEN OR ENDORSED HEREON, OR WHICH MAY HEREAFTER BE MADE IN THE REGISTER

IN WITNESS WHEREOF I have hereunto subscribed my name and affixed my official seal

this 23 day of APRIL A.D. 19 81

Post Office Address

1615 - 21 STREET S.

LETHBRIDGE, ALBERTA

Registrar

South Alberta Land Registration District

A.S. 1818 V 1232
Rev. 9-73

Tr – Transmission
Tfr – Transfer
Mtge – Mortgage

BL – Builders Lien
TN – Tax Notification
WE – Writ of Execution
CC – Covenants and Conditions
ENCUM – Encumbrance

Certificate of Title

NAME ROBERT D WILSON

LAND 4 - 20 - 8 - 5 - SW¼ PTN

Show Other Abbreviations Here

TITLE NO. 811107131 9

CHARGES, LIENS AND INTERESTS.

Nature of Instrument	Registration Number	Date of Registration DY	MO	YR	Amount	Particulars	Signature of Registrar	Discharges and Withdrawals: Registration Number	Date of Registration DY	MO	YR	Signature of Registrar
	1485 KX					THIS PROPERTY IS INCLUDED IN THE ST. MARY RIVER IRRIGATION DISTRICT						
C	3903 EH	24	10	34		THE ALBERTA RAILWAY AND IRRIGATION COMPANY						
C	1494 LB	29	6	71		7 KUIPERS HOLDINGS LTD.						
C	3373 KX	5	9	72		AS TO PTN OF SE¼ CONT. 3.72 AC THE BOARD OF DIRECTORS OF THE ST. MARY RIVER IRRIGATION DISTRICT		811071320	23	4	81	
IRRIGABLE UNIT	811183564	29	9	81		IRRIGABLE UNIT UNDER SECTION 58 OF THE IRRIGATION ACT (ST. MARY RIVER IRRIGATION DISTRICT)						

Certificate of Title

Canada

NO 8 1 1 2 3 9 4 3 9 A

REF 9 6 R 1 0 9 A

VALUE $ 1 5 8 1 1

	MRD	RGE	TWP	SEC	Q	PT
VL 1	4	20	8	5	SW	-

	PLAN	BLK	LOT	PT
2				

GOVERNMENT OF THE PROVINCE OF ALBERTA

South Alberta Land Registration District

THIS IS TO CERTIFY that ROBERT D. WILSON OF THE CITY OF LETHBRIDGE IN THE PROVINCE OF ALBERTA

IS now the owner of an estate in fee simple

of land in

THAT PORTION OF THE SOUTH WEST QUARTER OF SECTION FIVE (5)
IN TOWNSHIP EIGHT (8)
RANGE TWENTY (20)
WEST OF THE FOURTH MERIDIAN CONSISTING OF A THIRTY TWO (32) FOOT STRIP IN PERPENDICULAR WIDTH ADJACENT TO THE NORTHERN, WESTERN AND SOUTH WESTERN LIMITS OF THE CANAL RIGHT OF WAY ON PLAN IRR. 46 CONTAINING .761 HECTARES (1.88 ACRES) MORE OR LESS

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

ENTERED 20/1/32

CANCELLED 29 DECEMBER 1981
BY CERT. 811071319
AND 811071319A
811235440A & B
INST. A.D. 19

CANCELLED

SUBJECT TO THE ENCUMBRANCES, LIENS, ESTATES OR INTERESTS NOTIFIED BY MEMORANDUM UNDERWRITTEN OR ENDORSED HEREON, OR WHICH MAY HEREAFTER BE MADE IN THE REGISTER

IN WITNESS WHEREOF I have hereunto subscribed my name and affixed my official seal

this 29 day of DECEMBER A.D. 1981

Post Office Address 1615 - 21 STREET SOUTH
LETHBRIDGE, ALBERTA

SOUTH ALBERTA LAND REGISTRATION DISTRICT LAND TITLES

Registrar
South Alberta Land Registration District

A.G. 1814 V 1232
Rev. 9-73

ABBREVIATIONS

E – Easement
C – Caveat
Tr – Transmission
Tfr – Transfer
Mtge – Mortgage
URW – Utility Right of Way
BL – Builders Lien
TN – Tax Notification
WE – Writ of Execution
C C – Covenants and Conditions
ENCUM – Encumbrance

Certificate of Title

NAME ROBERT D. WILSON

LAND 4 - 20 - 8 - 5 - SW PTN

Show Other Abbreviations Here

TITLE NO 8 1 1 2 3 9 4 3 9 A

CHARGES, LIENS AND INTERESTS.

Nature of Instrument	Registration Number	Date of Registration DY / MO / YR	Amount	PARTICULARS	Signature of Registrar	Discharges and Withdrawals: Registration Number	Discharges and Withdrawals: Date of Registration DY / MO / YR	Discharges and Withdrawals: Signature of Registrar

RENEWAL
6441 G.X.

Certificate of Title

NO	96 K 109	A
REF	65 Z 209	
VALUE $	NOT EST AB	

Canada

	MRD	TWP	RG	S	Q	PT
1	4	20	8	5	SW	

	PLAN	BLK	LOT	PT
2				

South Alberta Land Registration District

THIS IS TO CERTIFY that HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF ALBERTA AS REPRESENTED BY THE MANAGER OF THE ST. MARY AND MILK RIVERS DEVELOPMENT

IS now the owner of an estate in fee simple

of and in THAT PORTION OF THE SOUTH WEST QUARTER OF SECTION FIVE (5) IN TOWNSHIP EIGHT (8) RANGE TWENTY (20) WEST OF THE FOURTH MERIDIAN CONSISTING OF A THIRTY TWO (32) FOOT STRIP IN PERPENDICULAR WIDTH ADJACENT TO THE NORTHERN, WESTERN AND SOUTH WESTERN LIMITS OF THE CANAL RIGHT OF WAY ON PLAN IRR. 46 CONTAINING ONE AND EIGHTY EIGHT HUNDREDTHS (1.88) ACRES MORE OR LESS

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

IN FULL

ROBERT D. WILSON
AND A 811 239 439
ISSUED THIS 29 DECEMBER 81.

SUBJECT TO THE ENCUMBRANCES, LIENS, ESTATES OR INTERESTS NOTIFIED BY MEMORANDUM UNDERWRITTEN OR ENDORSED HEREON, OR WHICH MAY HEREAFTER BE MADE IN THE REGISTER

IN WITNESS WHEREOF I have hereunto subscribed my name and affixed my official seal

this 9 day of MARCH A.D. 19 54

Post Office Address LETHBRIDGE, ALBERTA.

Registrar
South Alberta Land Registration District

ABBREVIATIONS

E — Easement	URW — Utility Right of Way
C — Caveat	BL — Builders Lien
Te — Transmission	TN — Tax Notification
Tfr — Transfer	WE — Writ of Execution
Mtge — Mortgage	CC — Covenants and Condition
	UNCUM — Encumbrance

Certificate of Title

TITLE 96 R 109 A

NAME THE MANAGER OF THE ST. MARY AND MILK RIVERS DEVELOPMENT

LAND 4 20 8 5 SW PTN.

Show Other Abbreviations Here

CHARGES, LIENS AND INTERESTS.

Nature of Instrument	Registration Number	Date of Registration D M Y	Amount	Particulars	Signature of Registrar	Discharges and Withdrawals: Registration Number	Date of Registration D M Y	Signature of Registrar

652209.

LAND TITLES ACT, Sec. 61.—The land mentioned in any certificate of title granted under this Act shall by implication and without any special mention therein, unless the contrary is expressly declared, be subject to—
(a) Any subsisting reservations or exceptions contained in the original grant of the land from the Crown;
(b) All unpaid taxes, including irrigation and drainage district rates;
(c) Any public highway or right-of-way or other public easement, howsoever created upon, over or in respect of the land;
(d) Any subsisting lease or agreement for a lease for a period not exceeding three years, where there is actual occupation of the land under the same;
(e) Any decrees, orders or executions against or affecting the interest of the owner of the land which have been registered and maintained in force against the owner;
(f) Any right of expropriation which may by statute be vested in any person, body corporate, or His Majesty;
(g) Any right-of-way or other easement granted or acquired under the provisions of any Act or law in force in the Province.

GOVERNMENT OF THE PROVINCE OF ALBERTA

209

Issued on instrument registered at 3.47 o'clock p.m. on the 3 day of May A.D. 1946
Number 5H77 Book EX Folio 144
Registrar S.A.L.R.D.

Certificate of Title

Assoc. Fund Value ______
Unearned Inc. Value ______

Refer Cert. No. 45N.232

South Alberta Land Registration District.

This is to Certify that His Majesty The King in the right of the Province of Alberta

is now the owner of an estate in fee simple

of and in Firstly that portion of the South East quarter of Section Six (6) in Township Eight (8) Range Twenty (20) West of the Fourth Meridian in the Province of Alberta which lies to the North of the Northerly limit of the Canal Right-of-way shown on a plan filed in the Land Titles Office for the South Alberta Land Registration District as Irr 46. and South of a line drawn parallel with and Thirty two (32) feet perpendicularly distant Northerly from said Northerly limit of said Right-of-way containing One and Ninety two hundredths (1.92) aues more or less and Secondly. that portion of the South West quarter of Section Five (5) in said Township consisting of a strip of land Thirty two (32) feet in perpendicular width adjacent to the Northern, Western and South Western limits of said Canal Right-of-way shown on said plan Irr 46 containing One and Eighty eight hundredths (1.88) aues more or less Excepting thereout all Mines and Minerals and the right to work the same and

subject to the encumbrances, liens and interests notified by memorandum underwritten or endorsed hereon, or which may hereafter be made in the register.

In Witness Whereof I have hereunto subscribed my name and affixed my official seal this Third day of May A.D. 1946

Registrar.
South Alberta Land Registration District

P.O. Address ______

OVER

This Certificate is cancelled

and a new Certificate 96 R 109 issued to

St. Mary and Milk River Development

under Transfer to (by O.C.) from the

above named registered owner. Dated 21 July 1953

and Registered at 10[41] o'clock A.M, this 9 day of

March A.D., 1954 as No. 6441 G.X.

W. [signature] KD

Registrar

LAND TITLES ACT, Sec. 37.—The land mentioned in any certificate of title granted under this Act shall by implication and without any special mention therein, unless the contrary is expressly declared, be subject to—
(a) Any subsisting reservations or exceptions contained in the original grant of the land from the Crown;
(b) All unpaid taxes, including irrigation or drainage district rates;
(c) Any public highway or right-of-way or other public easement, howsoever created upon, over or in respect of the land;
(d) Any subsisting lease or agreement for a lease for a period not exceeding three years, where there is actual occupation of the land under the same;
(e) Any decrees, orders or executions against or affecting the interest of the owner of the land which have been registered and maintained in force against the owner;
(f) Any right of expropriation which may by statute or ordinance be vested in any person, body corporate, or His Majesty;
(g) Any right-of-way or other easement granted or acquired under the provisions of any Act or law in force in the Province.

45 N 232

CANADA

232

Issued on instrument registered at 10:47 o'clock A.M. on the 26 day of APRIL A.D. 19 32.
Number 8137 Book E.J. Folio 197
[illegible signature]
Registrar S.A.L.R.D.

Certificate of Title.

Assce. Fund Value $100:00

Unearned In. Value $100:00

CANCELLED

Refer Cert. No. 14 J.224

South Alberta Land Registration District.

This is to Certify that ALBERTA RAILWAY AND IRRIGATION COMPANY

is now the owner of an estate in fee simple

of and in FIRSTLY .. THAT PORTION OF THE SOUTH EAST QUARTER OF SECTION SIX (6) IN TOWNSHIP EIGHT (8) RANGE TWENTY (20) WEST OF THE FOURTH MERIDIAN IN THE PROVINCE OF ALBERTA WHICH LIES NORTH OF THE NORTHERN LIMIT OF THE IRRIGATION RIGHT OF WAY AS THE SAID RIGHT OF WAY IS SHOWN ON A PLAN FILED IN THE LAND TITLES OFFICE FOR THE SOUTH ALBERTA LAND REGISTRATION DISTRICT AS IRR. 46 AND SOUTH OF A LINE RUNNING PARALLEL WITH THE SAID NORTHERN LIMIT AND DISTANT THIRTY TWO (32) FEET PERPENDICULARLY NORTHERLY THEREFROM, CONTAINING ONE AND NINETY TWO ONE HUNDREDTHS (1.92) ACRES MORE OR LESS, AND

SECONDLY .. THAT PORTION OF THE SOUTH WEST QUARTER OF SECTION FIVE (5) IN THE SAID TOWNSHIP CONSISTING OF A STRIP OF LAND THIRTY TWO (32) FEET IN PERPENDICULAR WIDTH ADJACENT TO THE NORTHERN, WESTERN AND SOUTH WESTERN LIMITS OF SAID IRRIGATION RIGHT OF WAY AS SHOWN ON SAID PLAN IRR. 46, CONTAINING ONE AND EIGHTY EIGHT ONE HUNDREDTHS (1.88) ACRES MORE OR LESS.

NO ENDORSEMENTS ON BACK OF TITLE

RESERVING OUT OF ALL THE ABOVE LAND UNTO HIS MAJESTY ALL COAL AND UNTO THE ALBERTA RAILWAY AND IRRIGATION COMPANY ALL OTHER MINERALS, AND

subject to the encumbrances, liens and interests notified by memorandum underwritten or endorsed hereon, or which may hereafter be made in the register.

In Witness Whereof I have hereunto subscribed my name and affixed my official seal, this TWENTY SIXTH day of APRIL A.D. 1932.

P.O. Address

[illegible signature]

CANCELLED

Registrar
South Alberta Land Registration District.

This Certificate is cancelled and a new Certificate 452209 issued to Crown Prov. of Alberta under Transfer to [illegible] from the above named registered [illegible] and Registered at 3.07 [illegible] P [illegible] 3 day of May A.D. 1946. 5477EX.

[illegible signature]

AD [illegible]

234

14. J. 234.

Certificate of Title.

CANADA

Issued on instrument registered at 2^{45} o'clock p. m. on the 5th day of February A.D. 1917 Number 448 Folio 15

R. J. Slavin
AD Registrar A.L.R.D.

LAND TITLES ACT, SEC. 43.—The land mentioned in any certificate of title granted under this Act shall by implication and without any special mention therein, unless the contrary is expressly declared, be subject to—
Any subsisting reservations or exceptions contained in the original grant of the land from the Crown;
Any unpaid taxes;
Any public highway or right-of-way or other public easement, howsoever created upon, over or in respect of the land;
Any subsisting lease or agreement for a lease for a period not exceeding three years, where there is actual occupation of the land under the same;
Any decrees, orders or executions against or affecting the interest of the owner of the land which have been registered and maintained in force against the owner;
Any right of expropriation which may by statute or ordinance be vested in any person, body corporate, or His Majesty;
Any right-of-way or other easement granted or acquired under the provisions of any Act or law in force in the Province.

Assess. Fixed Value $10,000.00

Unearned Inc. Value $6700.00

Land Registration District

Refer Cert. No. 4 J. 37

CANCELLED

This is to Certify that Walter Porter, of the City of Lethbridge, in the Province of Alberta

Farmer

is now the owner of an estate in fee simple

of and in those portions of land situate in Township Eight (8) Range Twenty (20) West of the Fourth Meridian
in the Province of Alberta, and being Firstly:- Those portions of the South West quarter of Section Four (4)
and of the South East quarter of Section Five (5) which lie to the West of a line drawn parallel
with and fifty (50) feet perpendicularly distant West from the centre line of the Railway Right of Way
of the Alberta Railway and Irrigation Company as shown on a plan of said Right of Way, filed in the
Land Titles Office, for the South Alberta Land Registration District as Ry 25, containing in the said South
West quarter Four and three tenths (4.3) acres more or less and in the said South East quarter One
hundred and nineteen (119) acres, more or less. Secondly:- The North half and the East half of the South
East quarter of Legal Subdivision Three (3) and the whole of Legal Subdivision Six (6) all of said Section Five (5)
containing together sixty five (65) acres, more or less. Thirdly:- Those portions of Legal Subdivision
Five (5) and of the North half of Legal Subdivision Four (4) of said Section Five (5) which lie to the East of the
Canal Right of Way of the Alberta Railway and Irrigation Company, as shown on a plan of said Right of Way
filed in said Land Titles Office, as "Irr 46", containing together thirty seven and five tenths (37.5) acres, more or less. Fourthly
Those portions of said Legal Subdivisions Four (4) and Five (5) which lie to the West of said Canal Right of Way, containing
together nineteen (19) acres more or less and Fifthly:- Those portions of Legal Subdivisions One (1) and Two (2) of
Section Six (6) which lie to the North of said Canal Right of Way, the whole of Legal Subdivision Eight (8) of said
Section (6), which lie to the West of said Canal Right of Way containing together One hundred and forty one (141) acres
more or less, all as shown on said plan "Irr 46". The lands herein comprised containing together three
hundred and eighty five, and eight tenths (385.8) acres, more or less. Subject to the right (to be exercised
within ten (10) years from 25th August 1908) of expropriation of certain portions thereof, and to such
other rights and conditions, as are reserved and contained in Transfer registered as "3432 U" and
Reserving unto His Majesty all coal, and unto the Alberta Railway and Irrigation Company

all other minerals and

subject to the encumbrances, liens and interests notified by memorandum underwritten or endorsed hereon, or which may hereafter be made in the register.

In Witness Whereof *I have hereunto subscribed my name and affixed my official seal this* Fifth *day of* February *A.D.* 1917

R. J. Slavin *Registrar,*
AD
Land Registration District.

P.O. Address Lethbridge Alberta

E 24 rods of S 20 rods of SE¼ Sec 5. Mechanics Lien $1250.00 (see over)

The title of the above owner is subject to a mortgage made by him to Harvey F. Fisk to secure $8000.00 with interest at 5% per annum payable as therein mentioned dated 1 June 1917 and Registered at 2.20 p. 10 Apr 1917 as 2379 B.S.
S H Gamham
Registrar

Mortgage 2379 B.S. Discharge
from Harvey F. Fisk
dated the 7 day of January 1918
registered at 10.22 a.m. the 23 day of January 1918 as 532 C.A.
S H Gamham
Registrar

S 4 Lien SE 1/4 Sec 5 - John Henry Sosnoski to Min of Agric 450.00 Dat. 7% 31 Mar 1919 Regd 10.32 am 5 June 1919 1067 C.J.

E 24 rods of S. 20 rods of SE 1/4 Sec 5 - Mechanics Lien $1250.00 - The Stacey Lumber Co Ltd. 22 Dec 1919. 11.50 AM. 23 Dec 1919. 789 C.M.

Withdrawal of S.S. Lien 1067 C.J. 15 Oct 1920. 2.30 pm 22 Oct 1920 - 5520 C.J.

5 SE 1/4 Ex part of S 20 rods (3 ac) Wilson Sch. Dist 3736, 25 K 189. 24 Nov 1920 2.37 pm 3 Mch 1921 - 6737 C.M.

Mortgage. Owner to Credit Foncier Franco Canadien 3000.00 @ 8% 20 Oct 1930. 10.52 24 Oct 1930. 3213 E.G.

6 - S. E 1/4 - 1.92 ac. } as described
5 - S. W 1/4 - 1.88 ac. } in Instrument } Discharge of mortgage 3213 E.G. 12 April 1932 - 10.45 am 26 April 1932 - 8155 E.G.

6 - S. E 1/4 - 1.92 acres } as described
5 - S. W 1/4 - 1.88 acres } in Instrument } Alberta Railway & Irr. Co. 45 N 232 - 10.47 am. 26 April 1932 - 8157 E.G.

5 SW 1/4 Caveat: The Alberta Railway and Irrigation Co. 5 Oct 1934 - 10.33 AM - 24 Oct 1934 3903 E.M.
6 SE 1/4.

NOTIFICATION (Tax Recovery Act 1929)
by Dept. Mun. Affs.
Dated 30/3/35 Reg'd 10.31 AM.
1 Apl 1935 as No. 8361 D.P.

[illegible] Tax Notification No. 8361 D.P. Dated
Registered at 10.15 Am. 22 June 1935 as No. 8465 D.P.

SW 1/4 - 4.
4.3 acres as described in Inst } Discharge of Mortgage 3213 E.G. - 2 Oct 1936 - 3.00 pm - 22 Jan 1937 - 7001 E.P.
SW 1/4 - 4.
4.3 acres as described in Inst } John S Henderson 31 I 205 - 19 Sept 1936 - 3.03 pm - 22 Jan 1937 - 7002 E.P.

6 - SE portion fully described } Eva Mabel Porter 52 T 186. 27 April 1938. 10.25 am. 29 April 1938 - 5285 E.R.G.

This certificate is cancelled 57 I 65
and a new certificate issued to Eva M. Porter
under transfer to her from the above named registered owner dated 28 Aug/25
and Registered at 2.7 o'clock P., this 14th day of May A.D., 1941 as 5267 F.B.
[illegible]
Registrar

THIS CERT. IS CANCELLED IN FULL
Cause: ON SEPARATION
ABOVE ORDER
8 1 1 2 3 5 4
ISSUED THIS 29 DECEMBER 81
AD

Certificate of Title

NO	8 1 1 0 7 1 3 1 9 A
REF	8 1 1 0 1 2 4 3 4
VALUE $	3 0 1 5 3 0 . 0 0

LM

	MRD	TWP	RG	S	Q	PT
1	4 20	8	5	SE		

	PLAN	BLK	LOT	PT
2				

South Alberta Land Registration District

THIS IS TO CERTIFY that ROBERT D. WILSON, OF THE CITY OF LETHBRIDGE, IN THE PROVINCE OF ALBERTA (FARMER)

IS now the owner of an estate in fee simple

of and in ALL THOSE PORTIONS OF SECTION FIVE (5) IN TOWNSHIP EIGHT (8) RANGE TWENTY (20) WEST OF THE FOURTH MERIDIAN AND BEING.....

FIRST...THAT PORTION OF THE SOUTH EAST QUARTER WHICH LIES TO THE SOUTH AND WEST OF THE SOUTH WESTERLY LIMIT OF THE RAILWAY RIGHT OF WAY OF THE ALBERTA RAILWAY AND IRRIGATION COMPANY AS SAID RIGHT OF WAY IS SHOWN ON PLAN R.Y. 23 CONTAINING 48.2 HECTARES (119 ACRES) MORE OR LESS, EXCEPTING THEREOUT "A" 1.21 HECTARES (3 ACRES) MORE OR LESS, BEING THE SOUTHERLY TWENTY (20) RODS OF THE EASTERLY TWENTY FOUR (24) RODS OF SAID QUARTER SECTION....

"B" PLAN......	NO......	HECTARES		ACRES
CANAL RIGHT OF WAY	IRR. 1442	.918	MORE OR LESS	2.27

EXCEPTING THEREOUT ALL MINES AND MINERALS.

SECONDLY... THE NORTH HALF AND THE EAST HALF OF THE SOUTH EAST QUARTER OF LEGAL SUBDIVISION THREE (3) AND THE WHOLE OF LEGAL SUBDIVISION SIX (6) CONTAINING TOGETHER 26.3 HECTARES (65 ACRES) MORE OR LESS, EXCEPTING THEREOUT.....

PLAN...	NO.....	HECTARES		ACRES
CANAL RIGHT OF WAY	IRR 1442	1.319	MORE OR LESS	3.27

THIRDLY.... THOSE PORTIONS OF LEGAL SUBDIVISION FIVE (5) AND OF THE NORTH HALF OF LEGAL SUBDIVISION FOUR (4) WHICH LIE TO THE EAST OF THE CANAL RIGHT OF WAY SHOWN ON PLAN IRR 46 CONTAINING 15.02 HECTARES (37.5 ACRES) MORE OR LESS, EXCEPTING THEREOUT.....

PLAN...	NO...	HECTARES		ACRES
CANAL RIGHT OF WAY	IRR 1442	3.487	MORE OR LESS	8.61

EXCEPTING THEREOUT ALL MINES AND MINERALS.

FOURTHLY... THOSE PORTIONS OF SAID LEGAL SUBDIVISIONS FOUR (4) AND FIVE (5) WHICH LIE TO THE WEST OF SAID CANAL RIGHT OF WAY CONTAINING 7.69 HECTARES (19 ACRES) MORE OR LESS EXCEPTING THEREOUT.. .761 OF A HECTARES (1.88 ACRES) MORE OR LESS BEING A STRIP OF LAND THIRTY TWO (32) FEET IN PERPENDICULAR WIDTH ADJACENT TO THE NORTHERN, WESTERN AND SOUTHWESTERN LIMITS OF IRRIGATION RIGHT OF WAY AS SHOWN ON PLAN IRR 46

EXCEPTING THEREOUT ALL MINES AND MINERALS.

SUBJECT TO THE ENCUMBRANCES, LIENS, ESTATES OR INTERESTS NOTIFIED BY MEMORANDUM UNDERWRITTEN OR ENDORSED HEREON, OR WHICH MAY HEREAFTER BE MADE IN THE REGISTER

IN WITNESS WHEREOF I have hereunto subscribed my name and affixed my official seal

this 23 day of APRIL A D 19 81

Post Office Address 1615 - 21 STREET S.
LETHBRIDGE, ALBERTA

Registrar
South Alberta Land Registration District

A G 1414 - 1232
Rev 2 73

ABBREVIATIONS

URW - Utility Right of Way
BL - Builders Lien
TN - Tax Notification
WE - Writ of Execution
CC - Covenants and Condition
ENCUM - Encumbrance

Certificate of Title

NAME RALPH P. KUIPERS ET UX

LAND 4-20-8-5-5½ PTN

Show Other Abbreviations Here

21 1 10 1 21 4 5 5

CHARGES, LIENS AND INTERESTS.

Registration Number	Date of Registration DY	MO	YR	Amount	PARTICULARS	Signature of Registrar	Discharges and Withdrawals: Registration Number	Date of Registration DY	MO	YR	Signature of Registrar
1435 K.K.					THIS PROPERTY IS INCLUDED IN THE ST. M RIVER IRRIGATION DISTRICT						
5432 U					SUBJECT TO THE RIGHTS AND RESERVATIONS CONTAINED IN TRANSFER						
3905 EH	24	10	34		THE ALBERTA RAILWAY AND IRRIGATION COMPANY (SWÉ)						
1494 LB	29	6	71		7 KUIPERS HOLDING LTD.						
3573 KK	5	9	72		CAS TO SWÉ-CONT. 3.72 ACS) THE BOARD OF DIRECTORS OF THE ST. MARY RIVER IRRIGATION DISTRICT						
7410KS233	14	5	74		16.5 FT. STRIP IN N½ AND SE¼ OF 5 TO ALBERTA GOVERNMENT TELEPHONES						

CANCELLED

Certificate of Title

Canada

NO. 3 1 1 0 1 2 4 3 5 / 1 0 0 / R / 1 5 4
REF. 3 0 Q 1 38
VALUE $ 1 9 2 0 0 0 0 0

THIS CERT IS CANCELLED
IN FULL
IN ACCORDANCE WITH THE TRANSFER TO
ROBERT D. WILSON
AND A NEW CERT OF TITLE No. 811071319
ISSUED THIS 23 DAY APRIL 1981
AD. REG.

GOVERNMENT OF THE PROVINCE OF ALBERTA

South Alberta Land Registration District

THIS IS TO CERTIFY that RALPH P. KUIPERS OF THE CITY OF LETHBRIDGE IN THE PROVINCE OF ALBERTA (FARMER) AND SUSAN DEE KUIPERS OF THE SAME PLACE (HIS WIFE)

ARE now the owner S of an estate in fee simple AS JOINT TENANTS

of and in ALL THOSE PORTIONS OF SECTION FIVE (5) IN TOWNSHIP EIGHT (8) RANGE TWENTY (20) WEST OF THE FOURTH MERIDIAN AND BEING...

FIRST: THAT PORTION OF THE SOUTH EAST QUARTER WHICH LIES TO THE SOUTH AND WEST OF THE SOUTH WESTERLY LIMIT OF THE RAILWAY RIGHT OF WAY OF THE ALBERTA RAILWAY AND IRRIGATION COMPANY AS SAID RIGHT OF WAY IS SHOWN ON PLAN R.Y. 23 CONTAINING 48.2 HECTARES (119 ACRES) MORE OR LESS,
EXCEPTING THEREOUT "A": 1.21 HECTARES (3 ACRES) MORE OR LESS, BEING THE SOUTHERLY TWENTY (20) RODS OF THE EASTERLY TWENTY FOUR (24) RODS OF SAID QUARTER SECTION:

"B" PLAN	NO.	HECTARES MORE OR LESS	ACRES MORE OR LESS
CANAL RIGHT OF WAY	IRR. 1442	.918	2.27

EXCEPTING THEREOUT ALL MINES AND MINERALS

SECONDLY: THE NORTH HALF AND THE EAST HALF OF THE SOUTH EAST QUARTER OF LEGAL SUBDIVISION THREE (3) AND THE WHOLE OF LEGAL SUBDIVISION SIX (6) CONTAINING TOGETHER 26.3 HECTARES (65 ACRES) MORE OR LESS,
EXCEPTING THEREOUT:

PLAN	NO.	HECTARES MORE OR LESS	ACRES MORE OR LESS
CANAL RIGHT OF WAY	IRR 1442	1.319	3.27

THIRDLY: THOSE PORTIONS OF LEGAL SUBDIVISION FIVE (5) AND OF THE NORTH HALF OF LEGAL SUBDIVISION FOUR (4) WHICH LIE TO THE EAST OF THE CANAL RIGHT OF WAY SHOWN ON PLAN IRR 5 CONTAINING 15.02 HECTARES (37.5 ACRES) MORE OR LESS
EXCEPTING THEREOUT:

PLAN	NO.	HECTARES MORE OR LESS	ACRES MORE OR LESS
CANAL RIGHT OF WAY	IRR 1442	3.487	8.61

EXCEPTING THEREOUT ALL MINES AND MINERALS

FOURTHLY: THOSE PORTIONS OF SAID LEGAL SUBDIVISIONS FOUR (4) AND FIVE (5) WHICH LIE TO THE WEST OF SAID CANAL RIGHT OF WAY CONTAINING 7.69 HECTARES (19 ACRES) MORE OR LESS
EXCEPTING THEREOUT: .761 OF A HECTARE (1.88 ACRES) MORE OR LESS BEING A STRIP OF LAND THIRTY TWO (32) FEET IN PERPENDICULAR WIDTH ADJACENT TO THE NORTHERN, WESTERN AND SOUTHWESTERN LIMITS OF IRRIGATION RIGHT OF WAY AS SHOWN ON PLAN IRR 46

EXCEPTING THEREOUT ALL MINES AND MINERALS

CANCELLED

SUBJECT TO THE ENCUMBRANCES, LIENS, ESTATES OR INTERESTS NOTIFIED BY MEMORANDUM UNDERWRITTEN OR ENDORSED HEREON OR WHICH MAY HEREAFTER BE MADE IN THE REGISTER.

IN WITNESS WHEREOF ...

CORRECTED 27-01-81

this 22 day of JANUARY A.D. 19 80

Post Office Address S.S. 1-3-11

LETHBRIDGE, ALBERTA

Registrar

South Alberta Land Registration District

ABBREVIATIONS

E Easement	UROW Utility Right of Way
C Caveat	BL Builders Lien
Tr Transmission	TN Tax Notification
Tfr Transfer	WE Writ of Execution
Mtge Mortgage	CC Covenants and Condition
	ENCUM Encumbrance

Certificate of Title

NAME RALPH P. KUIPERS ET UX

LAND 4-20-8-5-SE PTN

Show Other Abbreviations Here

TITLE NO 8 1 1 0 1 2 4 5 5

CHARGES, LIENS AND INTERESTS.

Nature of Instrument	Registration Number	Date of Registration Dy	MO	Yr	Amount	Particulars	Signature of Registrar	Discharges and Withdrawals: Registration Number	Date of Registration Dy	MO	Yr	Signature of Registrar
	1435 K.A.					THIS PROPERTY IS INCLUDED IN THE ST. M RIVER IRRIGATION DISTRICT						
C	3432 U					SUBJECT TO THE RIGHTS AND RESERVATIONS CONTAINED IN T ANSFER						
C	3903 EM	24	10	36		THE ALBERTA RAILWAY AND IRRIGATION COMPANY (SWE)						
C	1496 LB	29	6	71		7 KUIPERS HOLDING LTD.						
C	3373 KK	5	9	72		CAS TO SWE-CONT. 3.72 ACS) THE BOARD OF DIRECTORS OF THE ST. MARY RIVER IRRIGATION DISTRICT						
UROW	7410-5235	14	5	76		16.5 FT. STRIP IN N½ AND SE¼ OF 5 TO ALBERTA GOVERNMENT TELEPHONES						

RENEWAL

53 L.F.

Certificate of Title

NO	166 N 134
REF	164 P 75
VALUE $	2845 00

Canada

THIS CERT IS CANCELLED ...... IN FULL ......

IN ACCORDANCE WITH THE TRANSFER TO ......
RALPH P. KUIPERS ET UX

AND A NEW CERT. OF TITLE No 811 110 124 3

ISSUED THIS ... 22 DAY ... JAN ... 1981.

.... AD. REG.

GOVERNMENT OF THE PROVINCE OF ALBERTA

	MRD	TWP	RG	Q	PT
KD	1	8	20	5	H

	PLAN	BLK	LOT	PT
2				

CANCELLED

South Alberta Land Registration District

THIS IS TO CERTIFY that ANN PORTER (WIDOW) OF LAFAYETTE IN THE STATE OF OREGON AND DONALD D. PORTER OF LONGVIEW IN THE STATE OF WASHINGTON BOTH OF THE UNITED STATES OF AMERICA THE SAID ANN PORTER AS TO AN UNDIVIDED FOURTENTHS (4/10) INTEREST, AND THE SAID DONALD D. PORTER AS TO AN UNDIVIDED ONE TENTH (1/10) INTEREST

ARE now the owner S of an estate in fee simple

of and in ALL THOSE PORTIONS OF SECTION FIVE (5) IN TOWNSHIP EIGHT (8) RANGE TWENTY (20) WEST OF THE FOURTH MERIDIAN, AND BEING . . .

FIRST: THAT PORTION OF THE SOUTH EAST QUARTER WHICH LIES TO THE SOUTH AND WEST OF THE RAILWAY ON PLAN R.Y. 23, CONTAINING ONE HUNDRED AND NINETEEN (119) ACRES MORE OR LESS,

SECONDLY: THE NORTH HALF AND THE EAST HALF OF THE SOUTH EAST QUARTER OF LEGAL SUBDIVISION THREE (3) AND ALL OF LEGAL SUBDIVISION SIX (6) IN THE SOUTH WEST QUARTER CONTAINING TOGETHER SIXTY FIVE (65) ACRES MORE OR LESS,

THIRDLY: THOSE PORTIONS OF LEGAL SUBDIVISION FIVE (5) AND THE NORTH HALF OF LEGAL SUBDIVISION FOUR (4) WHICH LIE TO THE EAST OF THE CANAL RIGHT OF WAY ON PLAN IRR.46, CONTAINING THIRTY SEVEN AND FIVE TENTHS (37.5) ACRES MORE OR LESS,

FOURTHLY: THOSE PORTIONS OF SAID LEGAL SUBDIVISONS FOUR (4) AND FIVE (5) WHICH LIE TO THE WEST OF THE SAID CANAL RIGHT OF WAY, CONTAINING NINETEEN (19) ACRES MORE OR LESS,
EXCEPTING:
(A) OUT OF THE FIRSTLY DESCRIBED PORTION THE SOUTHERLY THREE HUNDRED AND THIRTY (330) FEET OF THE EASTERLY THREE HUNDRED AND NINETY SIX (396) FEET OF THE SAID QUARTER SECTION CONTAINING THREE (3.) ACRES MORE OR LESS,
(B) OUT OF THE FOURTHLY DESCRIBED PORTION, A STRIP OF LAND THIRTY TWO (32) FEET WIDE LYING TO THE WEST AND ADJACENT TO THE WESTERN LIMIT OF THE SAID CANAL RIGHT OF WAY ON PLAN IRR.45, CONTAINING ONE AND EIGHTY EIGHT HUNDREDTHS (1.88) ACRES MORE OR LESS,
(C) OUT OF THE FIRSTLY, SECONDLY, AND THIRDLY DESCRIBED, THE CANAL RIGHT OF WAY ON PLAN IRR. 1442, CONTAINING IN:

QUARTER SECTION	ACRES MORE OR LESS
SE¼	2.27
SW¼	11.88

EXCEPTING OUT OF ALL THE ABOVE LAND ALL MINES AND MINERALS.

SUBJECT TO THE ENCUMBRANCES, LIENS, ESTATES OR INTERESTS NOTIFIED BY MEMORANDUM UNDERWRITTEN OR ENDORSED HEREON, OR WHICH MAY HEREAFTER BE MADE IN THE REGISTER

IN WITNESS WHEREOF I have hereunto subscribed my name and affixed my official seal

this 14 day of JULY A.D. 19 71

Post Office Address HWY. 99W. LAFAYETTE, OREGON U.S.A.
1704 SUSAN AVENUE
LONGVIEW, WASHINGTON U.S.A.
(RESPECTIVELY)

Registrar

South Alberta Land Registration District

A.G. 1818 2 1232
Rev 5 73

ABBREVIATIONS

E – Easement
C – Caveat
Tr – Transmission
Tfr – Transfer
Mtge – Mortgage
URW – Utility Right of Way
BL – Builders Lien
TN – Tax Notification
WE – Writ of Execution
CC – Covenants and Conditions
ENCUM – Encumbrance

Certificate of Title

Show Other Abbreviations Here

NAME ANN PORTER ET AL (PART INTEREST)

LAND 4 20 8 5 (PTN)

TITLE NO. 166 NI 118 4

CHARGES, LIENS AND INTERESTS.

Nature of Instrument	Registration Number	Date of Registration DY	MO	YR	Amount	Particulars	Signature of Registrar	Discharges and Withdrawals: Registration Number	Date of Registration DY	MO	YR	Signature of Registrar
C.C.	3432 U.					SUBJECT TO THE RIGHTS AND RESERVATIONS CONTAINED IN TRANSFER						
C.	3903 E.M.	24	10	34		SW¼ THE ALBERTA RAILWAY AND IRRIGATION COMPANY						
C.	5995 K.V.	8	4	71		RALPH PETER KUIPERS AND SUSANDEE KUIPERS		811012433	22	1	81	
C.	1494 L.B.	29	6	71		J KUIPERS HOLDING LTD.						
C.	3373 K.X.	5	9	72		THE BOARD OF DIRECTORS OF THE ST. MARY RIVER IRRIGATION DISTRICT/SW¼ 3.72 ACRES						
URW	7410452 38	14	5	74		16.5 FT. STRIP IN N½ AND SE¼ OF 5 TO ALBERTA GOVERNMENT TELEPHONES						
	1485 K.X.					THIS PROPERTY IS INCLUDED IN THE ST. MARY RIVER IRRIGATION DISTRICT						

CANCELLED

LAND TITLES ACT, Sec. 64 — The land mentioned in any certificate of title granted under this Act shall by implication and without any special mention therein, be subject to—
(a) Any subsisting reservations or exceptions including royalties contained in the original grant of the land from the Crown;
(b) All unpaid taxes, including irrigation and drainage district rates;
(c) Any public highway or right-of-way or other public easement, howsoever created upon, over or in respect of the land;
(d) Any subsisting lease or agreement for a lease for a period not exceeding three years, where there is actual occupation of the land under the same;
(e) Any decrees, orders or executions against or affecting the interest of the owner of the land which have been registered and maintained in force against the owner;
(f) Any right of expropriation which may by statute be vested in any person, body corporate, or Her Majesty;
(g) Any right-of-way or other easement granted or acquired under the provisions of any Act or law in force in the Province.

164 P 75

GOVERNMENT OF THE PROVINCE OF ALBERTA

OEA

Issued on instrument registered at ..... 2.1 o'clock
P. m. on the 2 day of MARCH
A.D. 19 71
Number 8161 Book K.T. 237 Folio
H. E. MC COMBS,
Registrar, S.A.L.R.D.

Certificate of Title

Assce. Fund Value $2,845.00

Refer Cert. No. 80 Q 138

South Alberta Land Registration District.

This is to Certify that FREDERICK MILTON PRITCHARD OF THE CITY OF LETHBRIDGE IN THE PROVINCE OF ALBERTA (BARRISTER) ADMINISTRATOR OF THE ESTATE OF LAURANCE FISK PORTER (DECEASED)

is now the owner of an estate in fee simple IN AN UNDIVIDED ONE HALF (1/2) INTEREST

of and in ALL THOSE PORTIONS OF SECTION FIVE (5) IN TOWNSHIP EIGHT (8) RANGE TWENTY (20) WEST OF THE FOURTH MERIDIAN IN THE PROVINCE OF ALBERTA AND BEING.....

FIRST, THAT PORTION OF THE SOUTH EAST QUARTER WHICH LIES TO THE SOUTH AND WEST OF THE RAILWAY ON PLAN R.Y. 23, CONTAINING ONE HUNDRED AND NINETEEN (119) ACRES MORE OR LESS,

SECONDLY, THE NORTH HALF AND THE EAST HALF OF THE SOUTH EAST QUARTER OF LEGAL SUBDIVISION THREE (3) AND ALL OF LEGAL SUBDIVISION SIX (6) IN THE SOUTH WEST QUARTER CONTAINING TOGETHER SIXTY FIVE (65) ACRES MORE OR LESS,

THIRDLY, THOSE PORTIONS OF LEGAL SUBDIVISION FIVE (5) AND OF THE NORTH HALF OF LEGAL SUBDIVISION FOUR (4) WHICH LIE TO THE EAST OF THE CANAL RIGHT-OF-WAY ON PLAN IRR. 46 CONTAINING THIRTY SEVEN AND FIVE TENTHS (37.5) ACRES MORE OR LESS,

FOURTHLY, THOSE PORTIONS OF SAID LEGAL SUBDIVISIONS FOUR (4) AND FIVE (5) WHICH LIE TO THE WEST OF THE SAID CANAL RIGHT-OF-WAY CONTAINING NINETEEN (19) ACRES MORE OR LESS,

EXCEPTING THEREOUT.....

(A) OUT OF THE FIRSTLY DESCRIBED PORTION, THE SOUTHERLY THREE HUNDRED AND THIRTY (330) FEET OF THE EASTERLY THREE HUNDRED AND NINETY SIX (396) FEET OF THE SAID QUARTER SECTION CONTAINING THREE (3) ACRES MORE OR LESS,

(B) OUT OF THE FOURTHLY DESCRIBED PORTION, A STRIP OF LAND THIRTY TWO (32) FEET WIDE LYING TO THE WEST AND ADJACENT TO THE WESTERN LIMIT OF THE SAID CANAL RIGHT-OF-WAY ON PLAN IRR. 46 CONTAINING ONE AND EIGHTY EIGHT HUNDREDTHS (1.88) ACRES MORE OR LESS,

(C) OUT OF THE FIRSTLY, SECONDLY AND THIRDLY DESCRIBED, THE CANAL RIGHT-OF-WAY ON PLAN IRR 1442 CONTAINING IN THE

QUARTER SECTION	ACRES MORE OR LESS
SE	2.27
SW	11.88

CANCELLED

EXCEPTING OUT OF ALL THE ABOVE LAND ALL MINES AND MINERALS.

subject to the encumbrances, liens and interests notified by memorandum underwritten or endorsed hereon, or which may hereafter be made in the register.

In Witness Whereof I have hereunto subscribed my name and affixed my official seal this SECOND day of MARCH A.D. 19 71

B. Jones A/ Registrar

South Alberta Land Registration District

202 PROFESSIONAL BUILDING,
740-4TH AVENUE SOUTH,
P.O. Address LETHBRIDGE, ALBERTA.

SUBJECT TO THE RIGHTS AND RESERVATIONS CONTAINED IN TRANSFER.....3432 U.

B Jones AO REG.

OVER

SW¼

CAVEAT--THE ALBERTA RAILWAY AND IRRIGATION COMPANY, 5 OCT. 1934, 10.33 AM., 24 OCT. 1934....3903 E.H. T.B. Jones AD REG.

THIS PROPERTY FORMS PART OF THE ST. MARY AND MILK RIVERS DEVELOPMENT....4950 G.U. T.B. Jones AD REG.

CAVEAT--THE MANAGER OF THE ST. MARY & MILK RIVERS DEVELOPMENT, 23 OCT. 1967, 4.02 PM., T.B. Jones AD REG.
2 NOV. 1967.....3712 J.X.

Caveat - Ralph Peter Kuipers & Susan Dee Kuipers - 7 April 1971
11:45 Am. - 8 April 1971 — 5995 K.V.
E Haddon Asst.

Caveat - T Kuipers Holding Ltd. - 22 June 1971 - 11:14 Am - 29 June 1971 -
— 1494 L.B.
E Haddon Asst.

THIS CERT. OF TITLE IS CANCELLED in full
in accordance with the transfer, subject to any exceptions and/or reservations therein and a new Certificate of Title No. 166 N 184
issued this 14 day of July 19 71 to Ann Porter et al
D.R. 53 L.F. A.D. Reg

RENEWAL.
1461 G.C.

Certificate of Title

No. 8 0 1 Q 1 1 3 1 8
7 9 U 1 1 1 5 1 1
M 5 3 4 3 5 1 0

THIS CERT. IS CANCELLED IN FULL
IN ... WITH ... TO
RALPH P. KUIPERS ET UX
AND A ... CERT. OF TITLE No. 8 1 1 0 1 2
ISSUED THIS 22 DAY ... 19 84
AD. REG.

CS 1 920 18 59

PLAN 2

South Alberta Land Registration District

THIS IS TO CERTIFY THAT ... PORTER OF SALEM (CLERK) IN THE STATE OF OREGON ONE OF THE UNITED STATES OF AMERICA

CANCELLED

IS now the owner of an estate in fee simple IN AN UNDIVIDED ONE HALF (1/2) SHARE

of and in ALL THOSE PORTIONS OF SECTION FIVE (5) IN TOWNSHIP EIGHT (8) RANGE TWENTY (20) WEST OF THE FOURTH MERIDIAN AND BEING........

FIRST...THAT PORTION OF THE SOUTH EAST QUARTER WHICH LIES TO THE SOUTH AND WEST OF THE SOUTH WESTERLY LIMIT OF THE RAILWAY RIGHT OF WAY OF THE ALBERTA RAILWAY AND IRRIGATION COMPANY AS SAID RIGHT OF WAY IS SHOWN ON PLAN R.Y. 23 CONTAINING ONE HUNDRED AND NINETEEN (119) ACRES MORE OR LESS
EXCEPTING THEREOUT "A": THREE (3) ACRES MORE OR LESS BEING THE SOUTHERLY TWENTY (20) RODS OF THE EASTERLY TWENTY FOUR (24) RODS OF SAID QUARTER SECTION
"B":

PLAN	NO.	ACRES MORE OR LESS
CANAL RIGHT OF WAY	IRR 1442	2.27

EXCEPTING THEREOUT ALL MINES AND MINERALS

SECONDLY...THE NORTH HALF AND THE EAST HALF OF THE SOUTH EAST QUARTER OF LEGAL SUBDIVISION THREE (3) AND THE WHOLE OF LEGAL SUBDIVISION SIX (6) CONTAINING TOGETHER SIXTY FIVE (65) ACRES MORE OR LESS
EXCEPTING THEREOUT:

PLAN	NO.	ACRES MORE OR LESS
CANAL RIGHT OF WAY	IRR 1442	3.27

EXCEPTING THEREOUT ALL MINES AND MINERALS

THIRDLY...THOSE PORTIONS OF LEGAL SUBDIVISION FIVE (5) AND OF THE NORTH HALF OF LEGAL SUBDIVISION FOUR (4) WHICH LIE TO THE EAST OF THE CANAL RIGHT OF WAY SHOWN ON PLAN IRR 46 CONTAINING THIRTY SEVEN AND FIVE TENTHS (37.5) ACRES MORE OR LESS
EXCEPTING THEREOUT:

PLAN	NO.	ACRES MORE OR LESS
CANAL RIGHT OF WAY	IRR 1442	8.61

EXCEPTING THEREOUT ALL MINES AND MINERALS

FOURTHLY...THOSE PORTIONS OF SAID LEGAL SUBDIVISIONS FOUR (4) AND FIVE (5) WHICH LIE TO THE WEST OF SAID CANAL RIGHT OF WAY CONTAINING NINETEEN (19) ACRES MORE OR LESS
EXCEPTING THEREOUT: ONE AND EIGHTY EIGHT HUNDREDTHS (1.88) ACRES MORE OR LESS BEING A STRIP OF LAND THIRTY TWO (32) FEET IN PERPENDICULAR WIDTH ADJACENT TO THE NORTHERN, WESTERN AND SOUTHWESTERN LIMITS OF IRRIGATION RIGHT OF WAY AS SHOWN ON PLAN IRR 46
EXCEPTING THEREOUT ALL MINES AND MINERALS

SUBJECT TO THE ENCUMBRANCES, LIENS, ESTATES OR INTERESTS NOTIFIED BY MEMORANDUM UNDERWRITTEN OR ENDORSED HEREON, OR WHICH MAY HEREAFTER BE MADE IN THE REGISTER

IN WITNESS WHEREOF I have hereunto subscribed my name and affixed my official seal

this 24 day of AUGUST A.D. 1949

Post Office Address

Registrar
South Alberta Land Registration District

ABBREVIATIONS

E – Easement
C – Caveat
Tr – Transmission
Tfr – Transfer
Mtge – Mortgage
URW – Utility Right of Way
BL – Builders Lien
TN – Tax Notification
WE – Writ of Execution
CC – Covenants and Conditions
ENCUM – Encumbrance

Certificate of Title

Show Other Abbreviations Here

NAME DAVID WALTER PORTER (PART INT.)

LAND 4-20-8-5-SW PTN

TITLE NO 810 | 0 | 1 | 3 | 8

CHARGES, LIENS AND INTERESTS.

	Nature of Instrument	Registration Number	Date of Registration Dy / Mo / Yr	Amount	Particulars	Signature of Registrar	Discharges and Cancellations: Registration Number	Date of Registration Dy / Mo / Yr	Signature of Registrar
(1)		1485 K.X.			THIS PROPERTY IS INCLUDED IN THE ST. MARY RIVER IRRIGATION DISTRICT				
(2)	C	3903 E.M.	24 / 10 / 34		(SW¼) THE ALBERTA RAILWAY AND IRRIGATION COMPANY				
(4)	C	5995 K.Y.	8 / 4 / 71		RALPH PETER KUIPERS & SUSAN DEE KUIPERS		81101243 3	22 / 1 / 81	
(5)	C	1494 L.B.	29 / 6 / 71		7 KUIPERS HOLDING LTD.				
(6)	C	3373 K.X.	5 / 9 / 72		(AS TO THE SW¼ CONT. 3.72 ACS) THE BOARD OF DIRECTORS OF THE ST. MARY RIVER IRRIGATION DISTRICT				
M	CC	3432 U.			SUBJECT TO THE RIGHTS AND RESERVATIONS CONTAINED IN TRANSFER				

79 U 151

151

LAND TITLES ACT, Sec. 81.—The land mentioned in any certificate of title granted under this Act shall be held by implication and without any special mention therein, unless the contrary is expressly declared, be subject to—

(a) Any subsisting reservations or exceptions contained in the original grant of the land from the Crown;
(b) All unpaid taxes, including irrigation and drainage district rates;
(c) Any public highway or right-of-way or other public easement, howsoever created upon, over or in respect of the land;
(d) Any subsisting lease or agreement for a lease for a period not exceeding three years, where there is actual occupation of the land under the terms;
(e) Any decrees, orders or executions against or affecting the interest of the owner of the land which have been registered and maintained in force against the owner;
(f) Any right of expropriation which may by statute be vested in any person, body corporate, or His Majesty;
(g) Any right-of-way or other easement granted or acquired under the provisions of any Act or law in force in the Province.

GOVERNMENT OF THE PROVINCE OF ALBERTA

EH

Issued on instrument registered at 2.17 o'clock P. m. on the 13 day of JULY A.D. 1949 Number 597 Book G.C. Folio 17
W. FORBES
Registrar, S.A.L.R.D.

Certificate of Title

Assce. Fund Value $7900.00
Unearned Inc. Value $4150.00

Refer Cert. No. 57.I.65

South Alberta Land Registration District

This is to Certify that DAVID WALTER PORTER OF SALEM IN THE STATE OF OREGON ONE OF THE UNITED STATES OF AMERICA (CLERK) AND JOHN A. LIVINGSTONE OF THE CITY OF LETHBRIDGE IN THE PROVINCE OF ALBERTA (BARRISTER AT LAW) EXECUTORS OF THE WILL OF EVA MABEL PORTER (DECEASED)

ARE ~~now the owners of an estate in fee simple~~ AS SUCH EXECUTORS

of and in ALL THOSE PORTIONS OF SECTION FIVE (5) IN TOWNSHIP EIGHT (8) RANGE TWENTY (20) WEST OF THE FOURTH MERIDIAN IN THE PROVINCE OF ALBERTA AND BEING .....

FIRSTLY, THAT PORTION OF THE SOUTH EAST QUARTER WHICH LIES TO THE SOUTH AND WEST OF THE SOUTH WESTERLY LIMIT OF THE RAILWAY RIGHT OF WAY OF THE ALBERTA RAILWAY AND IRRIGATION COMPANY AS SAID RIGHT OF WAY IS SHOWN ON A PLAN FILED IN THE LAND TITLES OFFICE FOR THE SOUTH ALBERTA LAND REGISTRATION DISTRICT AS R.Y. 23 CONTAINING ONE HUNDRED AND NINETEEN (119) ACRES MORE OR LESS.

EXCEPTING THEREOUT THREE (3) ACRES MORE OR LESS BEING THE SOUTHERLY TWENTY (20) RODS OF THE EASTERLY TWENTY FOUR (24) RODS OF SAID QUARTER SECTION.

SECONDLY, THE NORTH HALF AND THE EAST HALF OF THE SOUTH EAST QUARTER OF LEGAL SUBDIVISION THREE (3) AND THE WHOLE OF LEGAL SUBDIVISION SIX (6) CONTAINING TOGETHER SIXTY FIVE (65) ACRES MORE OR LESS.

THIRDLY, THOSE PORTIONS OF LEGAL SUBDIVISION FIVE (5) AND OF THE NORTH HALF OF LEGAL SUBDIVISION FOUR (4) WHICH LIE TO THE EAST OF THE CANAL RIGHT OF WAY SHOWN ON A PLAN FILED IN THE SAID LAND TITLES OFFICE AS IRR. 46 CONTAINING THIRTY SEVEN AND FIVE TENTHS (37.5) ACRES MORE OR LESS, AND

FOURTHLY, THOSE PORTIONS OF SAID LEGAL SUBDIVISIONS FOUR (4) AND FIVE (5) WHICH LIE TO THE WEST OF SAID CANAL RIGHT OF WAY CONTAINING NINETEEN (19) ACRES MORE OR LESS.

EXCEPTING THEREOUT ONE AND EIGHTY EIGHT HUNDREDTHS (1.88) ACRES MORE OR LESS AS DESCRIBED IN TRANSFER REGISTERED AS 8137 E.J.

SUBJECT TO (AS TO ALL THE ABOVE LAND) THE RIGHT OF EXPROPRIATION OF CERTAIN PORTIONS THEREOF AND TO SUCH OTHER RIGHTS AND CONDITIONS AS ARE SET FORTH IN TRANSFER REGISTERED AS 3432 U. AND

RESERVING UNTO HIS MAJESTY ALL COAL AND UNTO THE ALBERTA RAILWAY AND IRRIGATION COMPANY ALL OTHER MINERALS, AND

subject to the encumbrances, liens and interests notified by memorandum underwritten or endorsed hereon, or which may hereafter be made in the register

In Witness Whereof I have hereunto subscribed my name and affixed my official seal this THIRTEENTH day of JULY A.D. 19 49

J. J. Moore
Registrar
South Alberta Land Registration District

P.O. Address

SW 1/4 CAVEAT, THE ALBERTA RAILWAY AND IRRIGATION COMPANY 5 OCT. 1934, 10.33 AM., 24 OCT. 1934..... 3903 E.W.P.

This Certificate is cancelled 138/83

and a new Certificate 80 [illegible]

David Wallis Porter et al

[illegible] from the

under Transfer [illegible] 10 Aug 1949

above named [illegible] day of

and Registered at 10 31 o'clock A. M. this 24 day of

Aug A.D. 1949 as No. 1481 [illegible]

[illegible]

Registrar

57 I 65

65

LAND TITLES ACT, Sec. 51.—The land mentioned in any certificate of title granted under this Act shall be held subject to and without any special mention therein, unless the contrary is expressly declared, but subject to—
(a) Any subsisting reservations or exceptions contained in the original grant of the land from the Crown;
(b) All unpaid taxes, including irrigation or drainage district rates;
(c) Any public highway or right-of-way or other public easement, howsoever created upon, over or in respect of the land;
(d) Any subsisting lease or agreement for a lease for a period not exceeding three years, where there is actual occupation of the land under the same;
(e) Any decrees, orders or executions against or affecting the interest of the owner of the land which have been registered and maintained in force against the owner;
(f) Any right of expropriation which may by statute or ordinance be vested in any person, body corporate, or His Majesty;
(g) Any right-of-way or other easement granted or acquired under the provisions of any Act or law in force in the Province.

GOVERNMENT OF THE PROVINCE OF ALBERTA

SSM

Issued on instrument registered at 2.17 o'clock P.M. on the 14 day of MAY A.D. 19 41 Number 5217 Book F.B. Folio 149 W. FORBES Registrar S.A.L.R.D.

Certificate of Title.

Assd. Fund Value $6200.00

Unearned Ins. Value $4150.00

Refer Certs. No. 14 J 234

South Alberta Land Registration District.

This is to (1) EVA MABEL PORTER OF THE CITY OF LETHBRIDGE (WOMAN)

is now the owner of

of and in ALL THAT PORTION OF TOWNSHIP EIGHT (8) RANGE TWENTY (20) WEST OF THE PROVINCE OF ALBERTA AND BEING

FIRSTLY, THE EAST QUARTER WHICH LIES TO THE SOUTH AND WEST OF THE SOUTH OF THE RAILWAY RIGHT OF WAY OF THE ALBERTA RAILWAY AND IRRIGATION COMPANY SAID RIGHT OF WAY IS SHOWN ON A PLAN FILED IN THE LAND TITLES OFFICE FOR THE SOUTH ALBERTA LAND REGISTRATION DISTRICT AS R.Y.23 CONTAINING ONE HUNDRED AND NINETEEN (119) ACRES MORE OR LESS.
EXCEPTING THEREOUT THREE (3) ACRES MORE OR LESS BEING THE SOUTHERLY TWENTY (20) RODS OF THE EASTERLY TWENTY FOUR (24) RODS OF SAID QUARTER SECTION.
SECONDLY, THE NORTH HALF, AND THE EAST HALF OF THE SOUTH EAST QUARTER OF LEGAL SUBDIVISION THREE (3) AND THE WHOLE OF LEGAL SUBDIVISION SIX (6) CONTAINING TOGETHER SIXTY FIVE (65) ACRES MORE OR LESS,
THIROLY, THOSE PORTIONS OF LEGAL SUBDIVISION FIVE (5) AND OF THE NORTH HALF OF LEGAL SUBDIVISION FOUR (4) WHICH LIE TO THE EAST OF THE CANAL RIGHT OF WAY SHOWN ON A PLAN FILED IN THE SAID LAND TITLES OFFICE AS IRR.46 CONTAINING THIRTY SEVEN AND FIVE TENTHS (37.5) ACRES MORE OR LESS, AND
FOURTHLY, THOSE PORTIONS OF SAID LEGAL SUBDIVISIONS FOUR (4) AND FIVE (5) WHICH LIE TO THE WEST OF SAID CANAL RIGHT OF WAY CONTAINING NINETEEN (19) ACRES MORE OR LESS.
EXCEPTING THEREOUT ONE AND EIGHTY EIGHT HUNDREOTHS (1.88) ACRES MORE OR LESS AS DESCRIBED IN TRANSFER REGISTEREO AS 8137 E.J.
SUBJECT AS TO ALL THE ABOVE LANDS TO THE RIGHT OF EXPROPRIATION OF CERTAIN PORTIONS THEREOF AND TO SUCH OTHER RIGHTS AND CONDITIONS AS ARE SET FORTH IN TRANSFER REGISTERED AS 3432 U. AND
RESERVING UNTO HIS MAJESTY ALL COAL AND UNTO THE ALBERTA RAILWAY AND IRRIGATION COMPANY ALL OTHER MINERALS, AND

CANCELLED

Ref Parked previously

CANCELLED

subject to the encumbrances, liens and interests notified by memorandum underwritten or endorsed hereon, or which may hereafter be made in the register.

In Witness Whereof I have hereunto subscribed my name and affixed my official seal this FOURTEENTH day of MAY A.D. 19 41

Registrar

South Alberta Land Registration District.

P.O. Address LETHBRIDGE, ALBERTA

MORTGAGE. WALTER PORTER TO CREDIT FONCIER FRANCO CANAOIEN $3000.00 INT 8 PC. 20 OCT. 1930, 10.53 AM. 24 OCT. 1930.. 3213 E.G.

SW 1/4. CAVEAT. THE ALBERTA RAILWAY AND IRRIGATION COMPANY, 5 OCT. 1934, 10.33 AM., 24 OCT. 1934..3903 E.G.

Discharge of mortgage 3213 E.G. - 2 Mch 1942 - 2 58 pm - 10 Mch 1942 - 3738 F.C.

This Certificate is cancelled _____

and a new certificate 2941/5 issued to David W Porter et al (ex executors)

under Transfer to By Transmission from the

above named registered owner dated 12 July 1949.

and registered at 2 17 o'clock PM, this 13 day of

July A.D., 1949 as No. 597 G.C.

W.J. Cobb Registrar

Certificate of Title

RENEWAL: 4/6/82

Canada

REFERENCES:

811239439
811239439A
811239439B

NO	8	1	1	2	3	9	4	5	1	0	A
PT	1	1	0	7	1	3	1	9			
RET	8	1	1	0	7	1	3	1	1	9	A
VALUE	1	9	6	7	5	.	0	0			

		MD	RGE	TWP	SEC	Q	PT
1			2	0	1	8	

		PLAN	BLK	LOT	PT
2					

South Alberta Land Registration District

THIS IS TO CERTIFY that ROBERT D. WILSON OF THE CITY OF LETHBRIDGE IN THE PROVINCE OF ALBERTA (FARMER)

IS now the owner of an estate in fee simple

of and in

THAT PORTION OF THE SOUTH HALF OF LEGAL SUBDIVISION THREE (3) AND THE SOUTH HALF OF LEGAL SUBDIVISION FOUR (4) IN THE SOUTH HALF OF SECTION FIVE (5) IN TOWNSHIP EIGHT (8) RANGE TWENTY (20) WEST OF THE FOURTH MERIDIAN WHICH LIES TO THE WEST OF THE 6.5 METRE CANAL RIGHT OF WAY ON PLAN 8210212 CONTAINING 15.3 HECTARES (37.7 ACRES) MORE OR LESS EXCEPTING OUT OF LEGAL SUBDIVISION FOUR (4) THE 30 METRE CANAL RIGHT OF WAY ON PLAN 8210212 CONTAINING 0.725 HECTARES (1.79 ACRES) MORE OR LESS

EXCEPTING THEREOUT ALL MINES AND MINERALS

THIS CERT IS CANCELLED IN FULL ON SEPARATION

IN ACCORDANCE WITH TRANSFER TO ABOVE OWNER

AND A NEW CERT OF TITLE IS 821136817 ISSUED THIS 6 DAY AUGUST 19 82

AD. REG.

CANCELLED

SUBJECT TO THE ENCUMBRANCES, LIENS, ESTATES OR INTERESTS NOTIFIED BY MEMORANDUM UNDERWRITTEN OR ENDORSED HEREON OR WHICH MAY HEREAFTER BE MADE IN THE REGISTER

IN WITNESS WHEREOF I have hereunto subscribed my name and affixed my official seal

DATED 29 DAY OF DECEMBER AD 19 81

Post Office Address 1615 - 21 STREET SOUTH
LETHBRIDGE, ALBERTA

Registrar

South Alberta Land Registration District

ABBREVIATIONS

E Easement
C Caveat
Tr Transmission
Tfr Transfer
Mtge Mortgage
URW Utility Right of Way
BL Builders Lien
TN Tax Notification
WE Writ of Execution
CC Covenants and Condition
ENCUM - Encumbrance

Certificate of Title

Show Other Abbreviations Here

TITLE NO 811123940A

NAME ROBERT D. WILSON

LAND S - 20 - 3 - 5 - PTN SW

CHARGES, LIENS AND INTERESTS.

Nature of Instrument	Registration Number	Date of Registration DY MO YR	Amount	PARTICULARS	Signature of Registrar	Discharges and Settlements: Registration Number	Date of Registration DY MO YR	Signature of Registrar
	[illegible]			THIS PROPERTY IS INCLUDED IN THE ST. MARY RIVER IRRIGATION DISTRICT.				
	3432 U			SUBJECT TO THE RIGHTS AND RESERVATIONS CONTAINED IN TRANSFER				
C	3903 EM	24 10 34		SWL TO ALBERTA RAILWAY AND IRRIGATION COMPANY				
IRRIGABLE UNIT	811153568	29 9 81		IRRIGABLE UNIT UNDER SECTION 58 OF THE IRRIGABLE ACT (ST. MARY RIVER IRRIGATION DISTRICT)				

CANCELLED

RENEWAL

15/1/82
ENTERED 20/1/82
REF. 811239439
Cancels 811239439A
8112394398

Certificate of Title

NO 811239440 A
811071319
REF 811071319 A
VALUE $ 96750.00

VL 1 4 20 8 5 9

PLAN 2

South Alberta Land Registration District

THIS IS TO CERTIFY that ROBERT D. WILSON OF THE CITY OF LETHBRIDGE IN THE PROVINCE OF ALBERTA (FARMER)

IS now the owner of an estate in fee simple

of and in

THAT PORTION OF THE SOUTH HALF OF LEGAL SUBDIVSION THREE (3) AND THE SOUTH HALF OF LEGAL SUBDIVISION FOUR (4) IN THE SOUTH HALF OF SECTION FIVE (5), IN TOWNSHIP EIGHT (8), RANGE TWENTY (20) WEST OF THE FOURTH MERIDIAN WHICH LIES TO THE WEST OF THE WESTERLY LIMIT OF THE CANAL RIGHT OF WAY AS SHOWN ON PLAN IRR. 1442

CONTAINING 15.2 HECTARES (38 ACRES) MORE OR LESS

CANCELLED

EXCEPTING THEREOUT ALL MINES AND MINERALS

THIS CERT. IS CANCELLED AS TO PORTIONS OF CANAL RIGHT OF WAY ON PLAN 8210212
IN ACCORDANCE WITH THE TRANSFER TO THE BOARD OF DIRECTORS OF THE ST. MARY RIVER IRRIGATION DISTRICT
AND A NEW CERT. OF TITLE No 821099172
ISSUED THIS 4 DAY JUNE 19 82
A.D. REG.

THIS CERT. IS CANCELLED IN FULL ON RENEWAL
IN ACCORDANCE WITH THE TRANSFER TO ABOVE OWNER
AND A NEW CERT. OF TITLE No 811239440 A
ISSUED THIS 4 DAY JUNE 19 82
A.D. REG.

SUBJECT TO THE ENCUMBRANCES, LIENS, ESTATES OR INTERESTS NOTIFIED BY MEMORANDUM UNDERWRITTEN OR ENDORSED HEREON, OR WHICH MAY HEREAFTER BE MADE IN THE REGISTER

IN WITNESS WHEREOF I have hereunto subscribed my name and affixed my official seal

this 29 day of DECEMBER A.D. 1981

Post Office Address 1615 - 21 STREET SOUTH
LETHBRIDGE, ALBERTA

SOUTH ALBERTA LAND REGISTRATION DISTRICT LAND TITLES OFFICE

Registrar
South Alberta Land Registration District

A.G. 1818
Rev.

ABBREVIATIONS

E – Easement
C – Caveat
Tr – Transmission
Tfr – Transfer
Mtge – Mortgage
URW – Utility Right of Way
BL – Builders Lien
TN – Tax Notification
WE – Writ of Execution
CC – Covenants and Condition
ENCUM – Encumbrance

Certificate of Title

Show Other Abbreviations Here

NAME ROBERT D. WILSON
4 - 20 - 8 - 5 - 53 PTN
LAND

TITLE NO 8 1 1 1 2 3 9 1 4 0 A

CHARGES, LIENS AND INTERESTS.

Nature of Instrument	Registration Number	Date of Registration DY	MO	YR	Amount	Particulars	Signature of Registrar	Discharges and Withdrawals: Registration Number	Date of Registration DY	MO	YR	Signature of Registrar
	1485 KX					THIS PROPERTY IS INCLUDED IN THE ST. MARY RIVER IRRIGATION DISTRICT						
	3432 U					SUBJECT TO THE RIGHTS AND RESERVATIONS CONTAINED IN TRANSFER						
C	3903 EM	24	10	34		SW¼ THE ALBERTA RAILWAY AND IRRIGATION COMPANY						
C	3373 KX	5	9	72		PTN DESCRIBED IN INSTRUMENT THE BOARD OF DIRECTORS OF THE ST. MARY RIVER IRRIGATION DISTRICT		821099171	4	6	82	
URW	7410465238	14	5	74		(16.5 FT. STRIP) TO ALBERTA GOVERNMENT TELEPHONES						
IRRIGABLE UNIT	8111183564	29	9	81		IRRIGABLE UNIT UNDER SECTION 58 OF THE IRRIGABLE ACT (ST. MARY RIVER IRRIGATION DISTRICT)						

CANCELLED

Canada

Certificate of Title

NO	8 1 1 2 3 0 4 4 0 A
	8 1 1 0 7 1 5 1 9
REF	8 1 1 0 7 1 3 1 9 A
VALUE $	9 6 7 5 0 0 0

	MER	TWP	SEC	QS	PT
VL 1	4 20	8	5	S	—

	PLAN	BLK	LOT	PT
2				

South Alberta Land Registration District

THIS IS TO CERTIFY that ROBERT D. WILSON OF THE CITY OF LETHBRIDGE IN THE PROVINCE OF ALBERTA (FARMER)

IS now the owner of an estate in fee simple

of and in

THAT PORTION OF THE SOUTH HALF OF LEGAL SUBDIVISION THREE (3) AND THE SOUTH HALF OF LEGAL SUBDIVISION FOUR (4)* LYING TO THE WEST OF THE WESTERLY LIMIT OF THE CANAL RIGHT OF WAY AS SHOWN ON PLAN IRR 1942 CONTAINING 15.3 HECTARES (38 ACRES) MORE OR LESS

/CORRECTED 15/1/81

*IN THE SOUTH HALF OF SECTION FIVE (5), IN TOWNSHIP EIGHT (8) RANGE TWENTY (20) WEST OF THE FOURTH MERIDIAN WHICH LIES

EXCEPTING THEREOUT ALL MINES AND MINERALS

THIS CERT. IS CANCELLED IN FULL

ON RENEWAL

ABOVE OWNER

8 1 1 2 3 9 4 4 0

15 JANUARY 82

SUBJECT TO THE ENCUMBRANCES, LIENS, ESTATES OR INTERESTS NOTIFIED BY MEMORANDUM UNDERWRITTEN OR ENDORSED HEREON, OR WHICH MAY HEREAFTER BE MADE IN THE REGISTER

IN WITNESS WHEREOF I have hereunto subscribed my name and affixed my official seal

this 29 day of DECEMBER A.D. 19 81

Post Office Address 1615 - 21 STREET SOUTH

LETHBRIDGE, ALBERTA

Registrar

South Alberta Land Registration District

ABBREVIATIONS

E Easement
C Caveat
Tr Transmission
Tfr Transfer
Mtge Mortgage
URW Utility Right of Way
BL Builders Lien
TN Tax Notification
WE Writ of Execution
CC Community Land Condition
ENCUM Encumbrance

Certificate of Title

Show Other Abbreviations Here

NAME ROBERT D. WILSON

LAND 4 - 20 - 8 - 5 - SS PTN

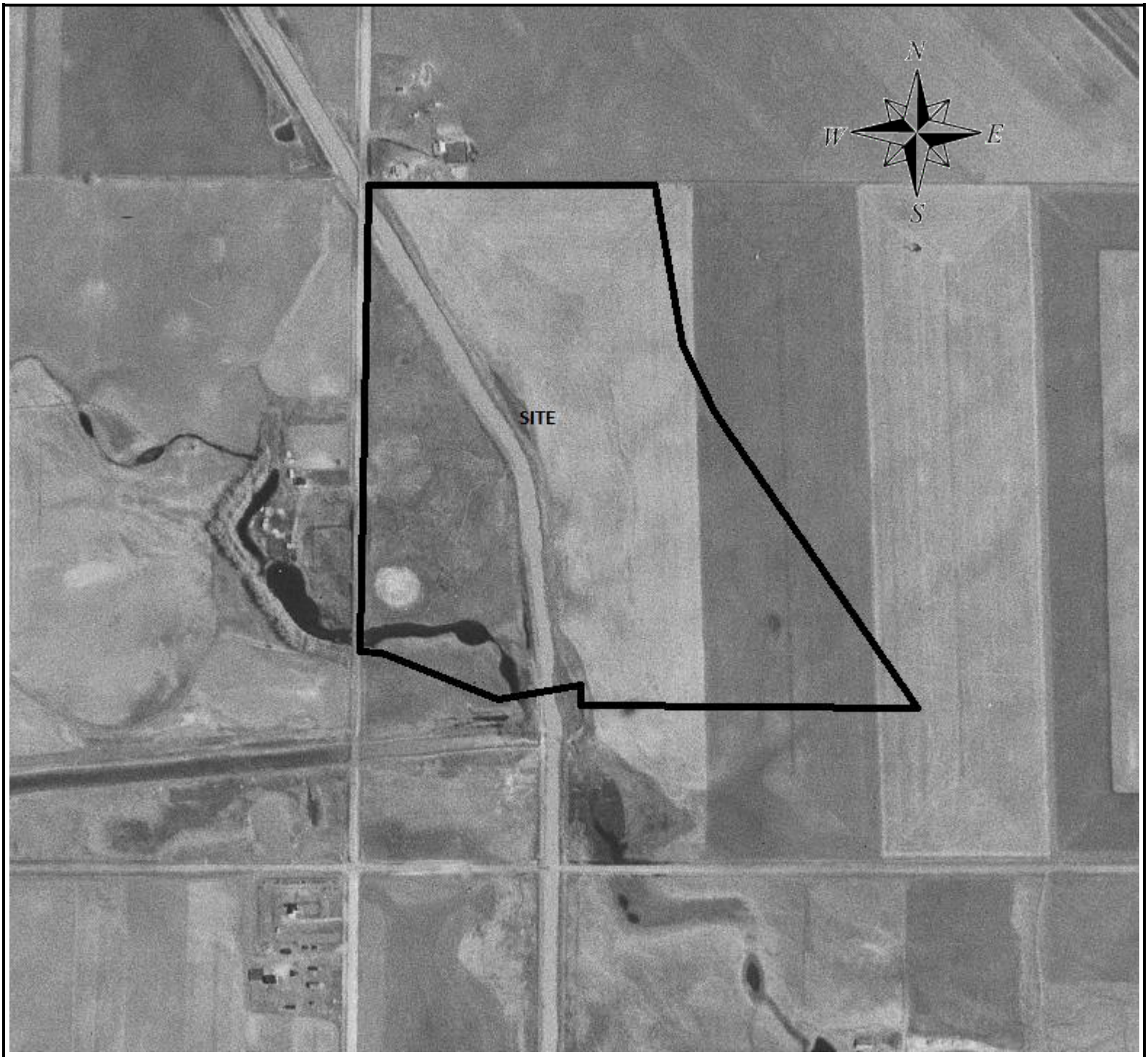
TITLE NO 811123056A

CHARGES, LIENS AND INTERESTS.

Nature of Instrument	Registration Number	Date of Registration (DY / MO / YR)	Amount	PARTICULARS	Signature of Registrar	Discharges and Withdrawals: Registration Number	Date of Registration (DY / MO / YR)	Signature of Registrar
	1485 KS			THIS PROPERTY IS INCLUDED IN THE ST. MARY RIVER IRRIGATION DISTRICT	—			
	3432 U			SUBJECT TO THE RIGHTS AND RESERVATIONS CONTAINED IN TRANSFER	—			
C	3903 EM	24 / 10 / 34		SW¼ THE ALBERTA RAILWAY AND IRRIGATION COMPANY	—			
C	3373 KS	5 / 9 / 72		AS TO PORTIONS DESCRIBED IN THE INSTRUMENT THE BOARD OF DIRECTORS OF THE ST. MARY RIVER IRRIGATION DISTRICT	—			
URW	7910452 36	14 / 5 / 79		16.5 FT. STRIP TO ALBERTA GOVERNMENT TELEPHONES	—			
IRRIGABLE UNIT	811183564	29 / 9 / 81		IRRIGABLE UNIT UNDER SECTION 58 OF THE IRRIGABLE ACT (ST. MARY RIVER IRRIGATION DISTRICT)				

Appendix B

Aerial Photographs



amec foster wheeler

Project:

Phase I ESA
Nakamura Residential Subdivision
SW 05-008-20 W4M, near Lethbridge, Alberta

Air Photo 1950

CLIENT:	DATE:	JOB No.:	SCALE:	APPENDIX	REV.
Martin Geomatic Consultants Ltd.	April 2018	BX20137	N.T.S	B-1	1

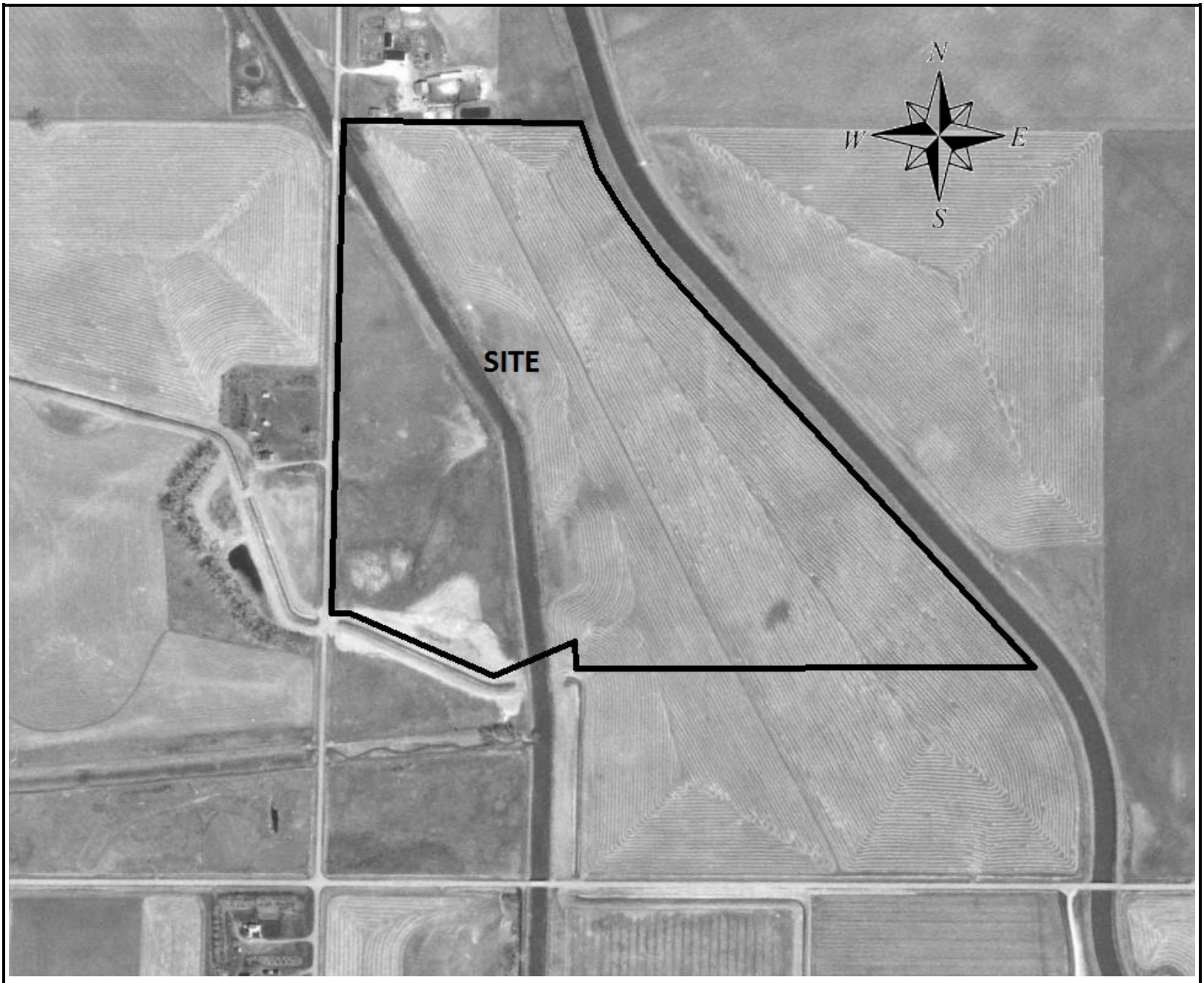
amec foster wheeler

Project:

Phase I ESA
Nakamura Residential Subdivision
SW 05-008-20 W4M, near Lethbridge, Alberta

Air Photo 1961

CLIENT:	DATE:	JOB No.:	SCALE:	APPENDIX	REV.
Martin Geomatic Consultants Ltd.	April 2018	BX20137	N.T.S	B-2	1



amec foster wheeler

Project:

Phase I ESA
Nakamura Residential Subdivision
SW 05-008-20 W4M, near Lethbridge, Alberta

Air Photo 1970

CLIENT:	DATE:	JOB No.:	SCALE:	APPENDIX	REV.
Martin Geomatic Consultants Ltd.	April 2018	BX20137	N.T.S	B-3	1

amec foster wheeler

Project:

Phase I ESA
Nakamura Residential Subdivision
SW 05-008-20 W4M, near Lethbridge, Alberta

Air Photo 1983

CLIENT:	DATE:	JOB No.:	SCALE:	APPENDIX	REV.
Martin Geomatic Consultants Ltd.	April 2018	BX20137	N.T.S	B-4	1

amec foster wheeler

Project:

Phase I ESA
Nakamura Residential Subdivision
SW 05-008-20 W4M, near Lethbridge, Alberta

Air Photo 1999

CLIENT:	DATE:	JOB No.:	SCALE:	APPENDIX	REV.
Martin Geomatic Consultants Ltd.	April 2018	BX20137	N.T.S	B-5	1

amec foster wheeler

Project:

Phase I ESA
Nakamura Residential Subdivision
SW 05-008-20 W4M, near Lethbridge, Alberta

Air Photo 2009

CLIENT:	DATE:	JOB No.:	SCALE:	APPENDIX	REV.
Martin Geomatic Consultants Ltd.	April 2018	BX20137	N.T.S	B-6	1

Appendix C

Documentation

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

April 5, 2018

Scott Roughead
AMEC Foster Wheeler
469 - 40 Street South
Lethbridge, AB
T1J 4M1

Dear Scott Roughead:

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

SW 5-8-20-W4, Lethbridge

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

Yours truly,

Connie Jacobsen
PTMAA

LETHBRIDGE COUNTY

#100, 905 - 4th Avenue South, Lethbridge, Alberta T1J 4E4

Amec Foster Wheeler Environment and Infrastructure
Attn: Scott Roughead
469 – 40 Street South
Lethbridge, AB T1J 4M1

March 28, 2018

Re: Environmental information regarding SW-05-08-20-W4M, 80025 Range Road 20-5, Lethbridge County

The following information is the County's response to your inquiry regarding the above mentioned property.

1. Environmental concerns and property information.
    a. A letter in the property file refers to there being an abandoned well on the site. It states the well was abandoned in 1956 with all equipment being removed from the property in May and June of 1956.
    b. The property is classified as Rural Agriculture (R.A.) pursuant to the Lethbridge County Land Use By-Law 1404.
    c. A Development Permit (94-89) was issued for a residence on the property in 1994. A copy of this permit has been included with this letter.

If you have any other questions regarding this please contact Sarah Mitchell, Development Officer at 403-328-5525.

Regards,

Sarah Mitchell
Development Officer

Tel: (403) 328-5525 E-Mail: mailbox@lethcounty.ca Fax: (403) 328-5602

COUNTY OF LETHBRIDGE NO. 26
DEVELOPMENT PERMIT

SCHEDULE 4 **LAND USE BY-LAW NO.** 806

FORM B **DEVELOPMENT APPLICATION NO.** 94-89

DEVELOPMENT PERMIT NO. 94-89

This development permit is hereby issued to:

NAME: Harriet Douwes & Bourke Reaney

ADDRESS: Box 3000 Main, Lethbridge, Alberta T1J 4B1

In respect of works consisting of: new residence.

On land located at: S.W. 5-8-20-W4 (65 acres)

and as described on plans submitted by the applicant.

This permit refers only to works outlined in Development Application No. 94-89

and is subject to the conditions contained herein:

1) The residence is to be located a minimum distance of 125' from the centerline of the County road.

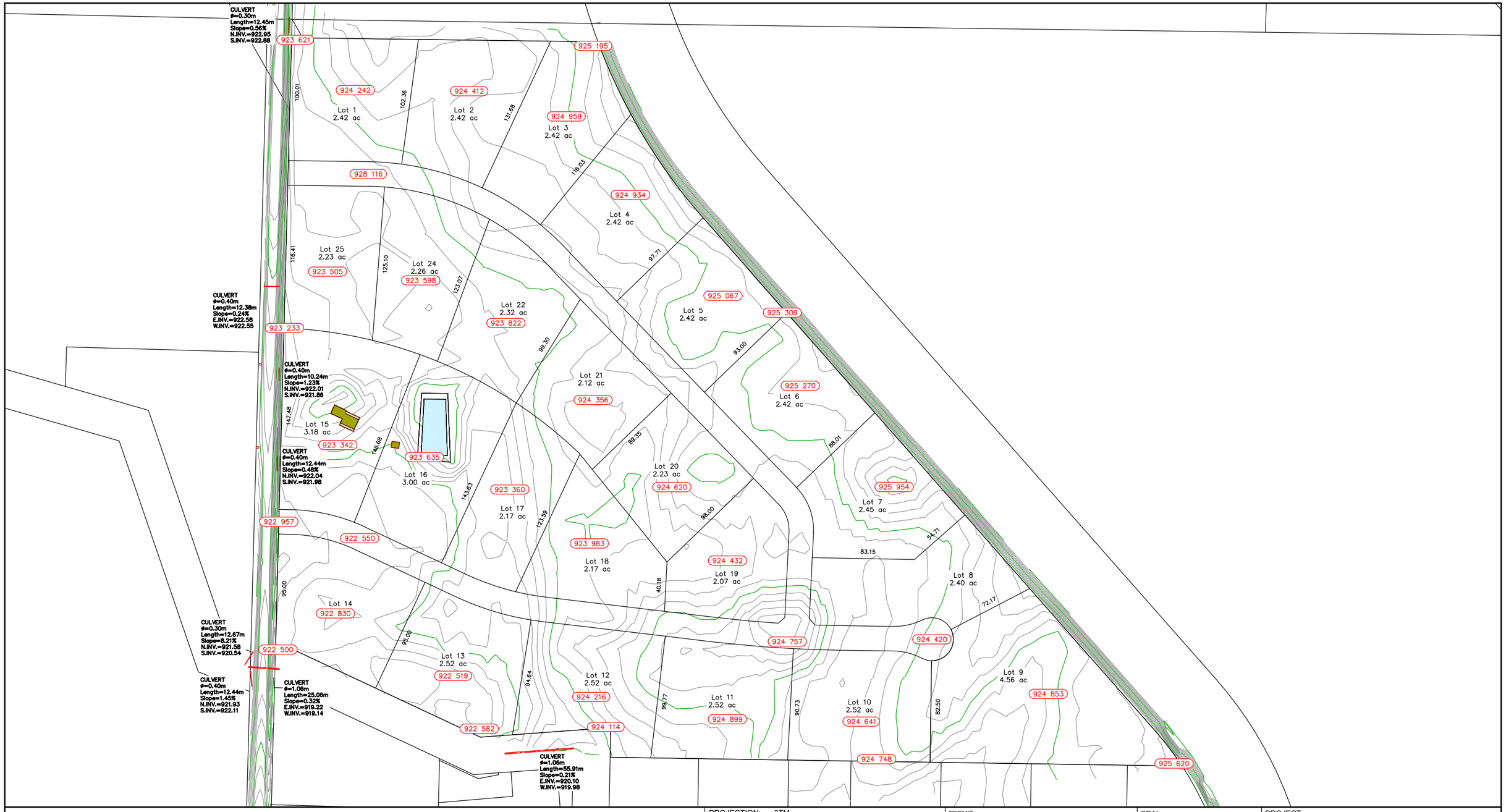
2) All construction is to comply with the Alberta Building Code. The applicant is to contact Alberta Labour, Client Services Division @ 381-5423.

This permit becomes effective the 6th day of September, 1994 unless an appeal pursuant to Section 83 of The Planning Act is lodged within fourteen (14) days of the following date.

DATE: August 23, 1994 SIGNED: _____
Development Officer

THIS IS NOT A BUILDING PERMIT

IMPORTANT: See over.



PROJECTION:	3TM
MERIDIAN:	114
ZONE:	-
SCALE FACTOR:	0.999000
DATUM:	NAD83

REVISIONS	BY	Y	M	D

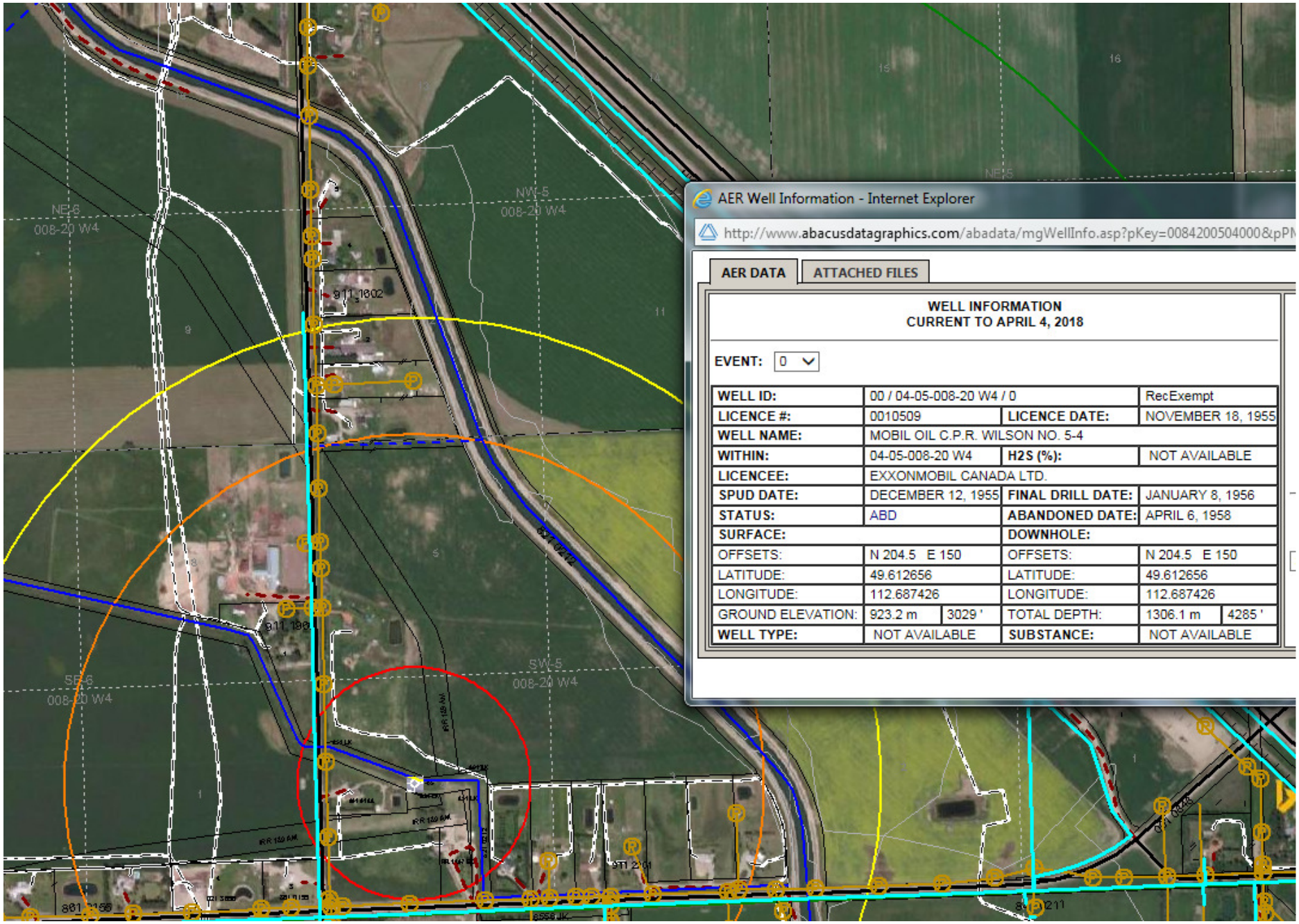
PERMIT

PERMIT TO PRACTICE
Martin Geomatic Consultants Ltd.
PERMIT NUMBER: **P 5852**
The Association of Professional Engineers and Geoscientists of Alberta

MARTIN GEOMATIC CONSULTANTS LTD
Consulting Engineers, Planners, and Land Surveyors
205–31st Street North Lethbridge, Alberta T1H 3Z4
Ph: (403) 329-0050 E-mail: geomart@mgcl.net Fax: (403) 329-6584

SEAL

PROJECT	RESIDENTIAL SUBDIVISION
TITLE	PROPOSED LOT LAYOUT
OWNER	JODY NAKAMURA
SCALE	
DRAWN: DV	APPROVED: --
DESIGN: --	DATE: 03/02/2017
PROJECT NUMBER	082154CE
DRAWING NUMBER	C4.7


AER Well Information - Internet Explorer
http://www.abacusdatagraphics.com/abadata/mgWellInfo.asp?pKey=0084200504000&pPM
AER DATA
ATTACHED FILES
WELL INFORMATION
CURRENT TO APRIL 4, 2018
EVENT: 0
WELL ID: 00 / 04-05-008-20 W4 / 0 RecExempt
LICENCE #: 0010509 LICENCE DATE: NOVEMBER 18, 1955
WELL NAME: MOBIL OIL C.P.R. WILSON NO. 5-4
WITHIN: 04-05-008-20 W4 H2S (%): NOT AVAILABLE
LICENCEE: EXXONMOBIL CANADA LTD.
SPUD DATE: DECEMBER 12, 1955 FINAL DRILL DATE: JANUARY 8, 1956
STATUS: ABD ABANDONED DATE: APRIL 6, 1958
SURFACE: DOWNHOLE:
OFFSETS: N 204.5 E 150 OFFSETS: N 204.5 E 150
LATITUDE: 49.612656 LATITUDE: 49.612656
LONGITUDE: 112.687426 LONGITUDE: 112.687426
GROUND ELEVATION: 923.2 m 3029 ' TOTAL DEPTH: 1306.1 m 4285 '
WELL TYPE: NOT AVAILABLE SUBSTANCE: NOT AVAILABLE

MOBIL OIL OF CANADA, LTD.

MOBIL OIL BUILDING

Calgary, Alberta

COMPTROLLER'S DEPARTMENT
B.E. TAYLOR, COMPTROLLER
~~W.P. ROLLICH, ASSISTANT COMPTROLLER~~
H.W. SKIRTEN, CHIEF ACCOUNTANT

August 1, 1957

Secretary Treasurer,
M. D. of Lethbridge #25,
Barons, Alberta.

Dear Sir:

We refer to your 1957 Tax Notice based on an assessment of $5,440.00 covering personal property on LSD. 4-5-8-20-W4M. We wish to draw to your attention that this well was abandoned in 1956 and all the equipment was removed during May and June, 1956.

The only 1957 Assessment Slip we have on file is for the personal property on our well situated on LSD. 12-32-7-20-W4M in the amount of $2,000.00. Incidentally, this well went off production during April, 1957, and all the equipment was moved from the well-site approximately two months ago. As we did not receive an Assessment Slip for personal property on LSD. 4-5-8-20-W4M, it was assumed that your Assessor was aware of the abandonment of this well during 1956.

Please advise if an error has been made on this Tax Notice which should have been calculated on an assessment of $2,000.00 instead of $5,440.00.

Very truly yours,

B E Taylor DEP

B. E. Taylor

AEEhnis:bam

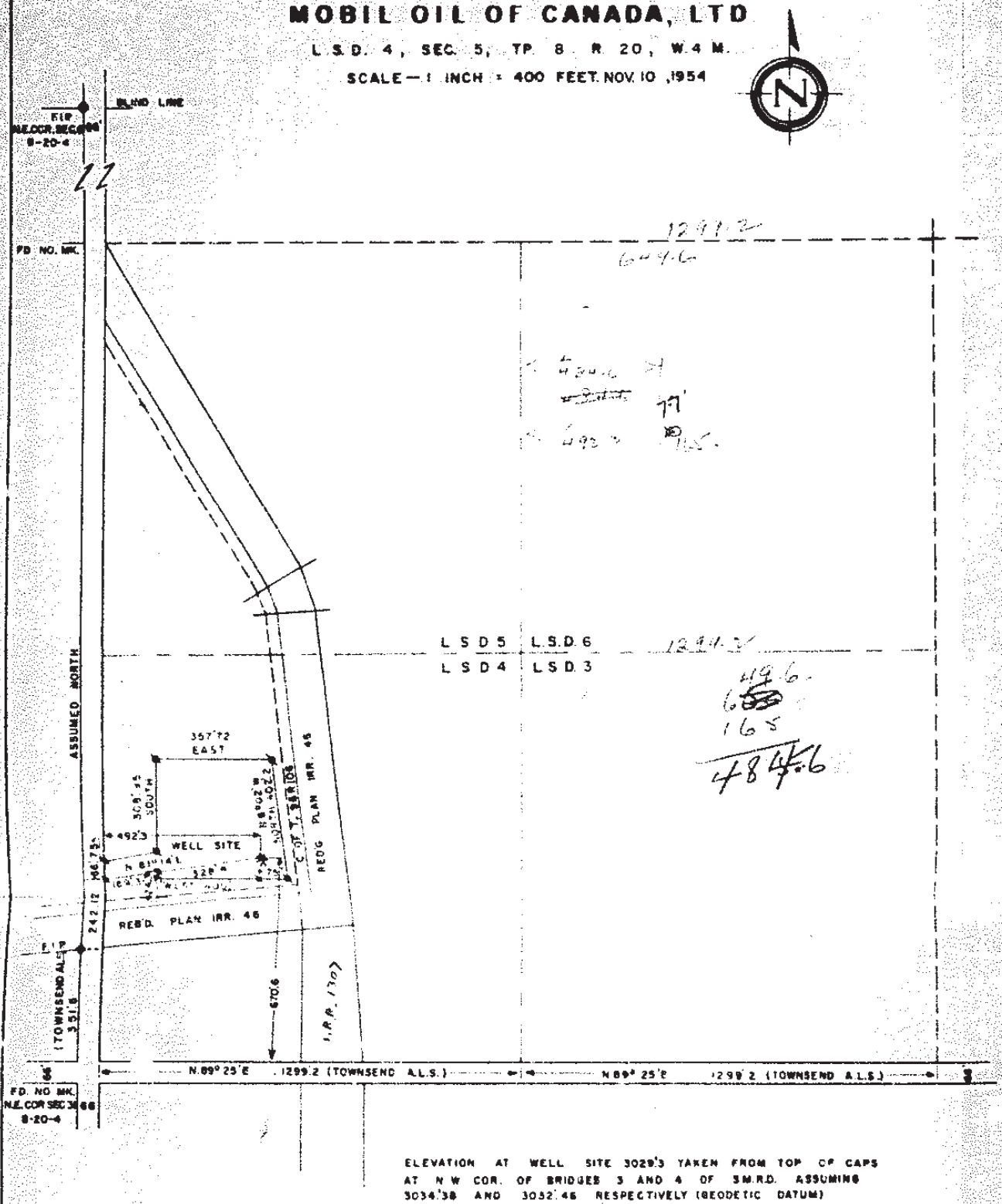
PLAN OF

MOBIL OIL C.P.R. WILSON 5-4

MOBIL OIL OF CANADA, LTD

L.S.D. 4, SEC. 5, TP. 8 R. 20, W.4 M.

SCALE — 1 INCH = 400 FEET. NOV. 10, 1954



ELEVATION AT WELL SITE 3029'3 TAKEN FROM TOP OF CAPS AT N.W. COR. OF BRIDGES 3 AND 4 OF 3M.R.D. ASSUMING 3034'38 AND 3052'46 RESPECTIVELY (GEODETIC DATUM)

MINERAL RIGHTS SURFACE RIGHTS				
CO-ORDINATES	ELEVATION		AREA	
N. 870'6 E. 492.3	GROUND	K.B.	TRACT	ROAD
	3029.3		3.48	0.26
TOTAL ACREAGE			3.74	
FLOWLINE ACREAGE				

● 6"x6" WOODEN STAKE
/ LATH
COMBINATION OF ABOVE
I 1½" DIAM. ROUND PIPE & 2 LATHS
RAIL
STANDARD IRON POST FOUND

MOBIL OIL OF CANADA, LTD

A.E. Barrell — R.P.E.

B. Foster — WITNESS

I HEREBY CERTIFY THIS TO BE A TRUE AND CORRECT SURVEY

D.L.S. — SURVEYOR

Irma Borges — WITNESS

Water Well Drilling Report

View in Metric | Export to Excel

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GIC Well ID 118269
GoA Well Tag No.
Drilling Company Well ID
Date Report Received

GOWN ID

Well Identification and Location

Measurement in Imperial

Owner Name	Address	Town	Province	Country	Postal Code

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	4	5	8	20	4				

Measured from Boundary of
ft from
ft from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 49.612674 Longitude -112.686998
How Location Obtained
Field

Elevation 3039.00 ft
How Elevation Obtained
Estimated

Drilling Information

Method of Drilling
Drilled

Proposed Well Use
Industrial

Type of Work
Structure Test Hole

Formation Log

Measurement in Imperial

Depth from ground level (ft)	Water Bearing	Lithology Description

Yield Test Summary

Measurement in Imperial

Recommended Pump Rate igpm

Test Date	Water Removal Rate (igpm)	Static Water Level (ft)

Well Completion

Measurement in Imperial

Total Depth Drilled	Finished Well Depth	Start Date	End Date
4284.00 ft			1956/01/08

Borehole

Diameter (in)	From (ft)	To (ft)
0.00	0.00	4284.00

Surface Casing (if applicable)

Size OD : 0.00 in
Wall Thickness : 0.000 in
Bottom at : 0.00 ft

Well Casing/Liner

Size OD : 0.00 in
Wall Thickness : 0.000 in
Top at : 0.00 ft
Bottom at : 0.00 ft

Perforations

From (ft)	To (ft)	Diameter or Slot Width(in)	Slot Length (in)	Hole or Slot Interval(in)

Perforated by

Annular Seal

Placed from 0.00 ft to 0.00 ft
Amount

Other Seals

Type	At (ft)

Screen Type

Size OD : 0.00 in

From (ft)	To (ft)	Slot Size (in)

Attachment
Top Fittings
Bottom Fittings

Pack

Type
Grain Size
Amount

Contractor Certification

Name of Journeyman responsible for drilling/construction of well
UNKNOWN NA DRILLER

Certification No
1

Company Name
UNKNOWN DRILLER

Copy of Well report provided to owner

Date approval holder signed

Water Well Drilling Report

View in Metric | Export to Excel

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GIC Well ID 118269
GoA Well Tag No.
Drilling Company Well ID
Date Report Received

GOWN ID

Well Identification and Location

Measurement in Imperial

Owner Name	Address	Town	Province	Country	Postal Code

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	4	5	8	20	4				

Measured from Boundary of
ft from
ft from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 49.612674 Longitude -112.686998
How Location Obtained
Field

Elevation 3039.00 ft
How Elevation Obtained
Estimated

Additional Information

Measurement in Imperial

Distance From Top of Casing to Ground Level in
Is Artesian Flow
Rate igpm
Is Flow Control Installed
Describe

Recommended Pump Rate igpm
Recommended Pump Intake Depth (From TOC) ft
Pump Installed
Depth ft
Type
Make
H.P.
Model (Output Rating)

Did you Encounter Saline Water (>4000 ppm TDS)
Depth ft
Well Disinfected Upon Completion
Gas
Depth ft
Geophysical Log Taken Electric
Submitted to ESRD Electric

Sample Collected for Potability
Submitted to ESRD

Additional Comments on Well

Yield Test

Taken From Ground Level
Measurement in Imperial

Test Date	Start Time	Static Water Level
		ft

Method of Water Removal

Type
Removal Rate igpm
Depth Withdrawn From ft

If water removal period was < 2 hours, explain why

Water Diverted for Drilling

Water Source	Amount Taken	Diversion Date & Time
	ig	

Contractor Certification

Name of Journeyman responsible for drilling/construction of well
UNKNOWN NA DRILLER

Certification No
1

Company Name
UNKNOWN DRILLER

Copy of Well report provided to owner
Date approval holder signed

Water Well Drilling Report

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

View in Metric | Export to Excel

GIC Well ID 118268
GoA Well Tag No.
Drilling Company Well ID
Date Report Received 1983/12/15

GOWN ID

Well Identification and Location

Measurement in Imperial

Owner Name	Address	Town	Province	Country	Postal Code
STOKELL, LIONEL	WILSON				

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	4	5	8	20	4				

Measured from Boundary of
ft from
ft from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 49.612674 Longitude -112.686998
How Location Obtained
Map

Elevation ft
How Elevation Obtained
Not Obtained

Drilling Information

Method of Drilling
Rotary

Proposed Well Use
Domestic

Type of Work
New Well

Formation Log

Measurement in Imperial

Depth from ground level (ft)	Water Bearing	Lithology Description
24.00		Glacial Till
28.00		Sand & Gravel
48.00		Glacial Till
58.00		Clay & Coal
75.00		Gray Clay
100.00		Gray Sticky Clay
120.00		Coal
180.00		Sandy Clay
240.00		Clay & Gravel
260.00		Sand
265.00		Hard Clay

Yield Test Summary

Measurement in Imperial

Recommended Pump Rate 0.00 igpm

Test Date	Water Removal Rate (igpm)	Static Water Level (ft)
1983/03/11	7.50	140.00

Well Completion

Measurement in Imperial

Total Depth Drilled	Finished Well Depth	Start Date	End Date
265.00 ft		1983/03/07	1983/03/11

Borehole

Diameter (in)	From (ft)	To (ft)
0.00	0.00	265.00

Surface Casing (if applicable)
Steel
Size OD : 6.00 in
Wall Thickness : 0.225 in
Bottom at : 200.00 ft

Well Casing/Liner
Steel
Size OD : 4.50 in
Wall Thickness : 0.000 in
Top at : 0.00 ft
Bottom at : 265.00 ft

Perforations

From (ft)	To (ft)	Diameter or Slot Width(in)	Slot Length (in)	Hole or Slot Interval(in)
200.00	265.00	2.000		0.13

Perforated by Machine

Annular Seal Cement/Grout
Placed from 0.00 ft to 100.00 ft
Amount

Other Seals

Type	At (ft)

Screen Type
Size OD : 0.00 in

From (ft)	To (ft)	Slot Size (in)

Attachment
Top Fittings
Bottom Fittings

Pack
Type Unknown
Grain Size .375
Amount 1.00 Yards

Contractor Certification

Name of Journeyman responsible for drilling/construction of well
UNKNOWN NA DRILLER

Certification No
1

Company Name
SOUTH COUNTRY DRILLING LTD.

Copy of Well report provided to owner

Date approval holder signed

Water Well Drilling Report

View in Metric | Export to Excel

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GIC Well ID 118268
GoA Well Tag No.
Drilling Company Well ID
Date Report Received 1983/12/15

GOWN ID

Well Identification and Location

Measurement in Imperial

Owner Name	Address	Town	Province	Country	Postal Code
STOKELL, LIONEL	WILSON				

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	4	5	8	20	4				

Measured from Boundary of
ft from
ft from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 49.612674 Longitude -112.686998
How Location Obtained
Map

Elevation ft
How Elevation Obtained
Not Obtained

Additional Information

Measurement in Imperial

Distance From Top of Casing to Ground Level in
Is Artesian Flow
Rate igpm
Is Flow Control Installed
Describe

Recommended Pump Rate 0.00 igpm
Recommended Pump Intake Depth (From TOC) 0.00 ft
Pump Installed
Type
Depth ft
Make
H.P.
Model (Output Rating)

Did you Encounter Saline Water (>4000 ppm TDS)
Depth ft
Gas
Depth ft
Well Disinfected Upon Completion
Geophysical Log Taken
Submitted to ESRD
Sample Collected for Potability
Submitted to ESRD Yes

Additional Comments on Well
DRILLER REPORTS SOFT WATER

Yield Test

Taken From Ground Level
Measurement in Imperial

Test Date	Start Time	Static Water Level
1983/03/11	12:00 AM	140.00 ft

Depth to water level

Drawdown (ft)	Elapsed Time Minutes:Sec	Recovery (ft)

Method of Water Removal
Type Pump
Removal Rate 7.50 igpm
Depth Withdrawn From 200.00 ft

If water removal period was < 2 hours, explain why

Water Diverted for Drilling

Water Source	Amount Taken	Diversion Date & Time
	ig	

Contractor Certification

Name of Journeyman responsible for drilling/construction of well
UNKNOWN NA DRILLER

Certification No
1

Company Name
SOUTH COUNTRY DRILLING LTD.

Copy of Well report provided to owner
Date approval holder signed

CULVERT
ϕ=0.30m
Length=12.45m
Slope=0.56%
N.INV.=922.95
S.INV.=922.88

CULVERT
ϕ=0.40m
Length=12.38m
Slope=0.24%
E.INV.=922.58
W.INV.=922.55

CULVERT
ϕ=0.40m
Length=10.24m
Slope=1.23%
N.INV.=922.01
S.INV.=921.86

CULVERT
ϕ=0.40m
Length=12.44m
Slope=0.48%
N.INV.=922.04
S.INV.=921.98

CULVERT
ϕ=0.30m
Length=12.67m
Slope=8.21%
N.INV.=921.58
S.INV.=920.54

CULVERT
ϕ=1.06m
Length=25.06m
Slope=0.32%
E.INV.=919.22
W.INV.=919.14

CULVERT
ϕ=0.40m
Length=12.44m
Slope=1.45%
N.INV.=921.93
S.INV.=922.11

CULVERT
ϕ=1.06m
Length=55.91m
Slope=0.21%
E.INV.=920.10
W.INV.=919.98

Well Location

Appendix D

Site Photographs

Photo 1:
Viewing southeast at residence.

Direction:
Southeast.

Photo 2.
Viewing east at drive way to residence ~~with~~ located at 80025 Rge. Rd 20-05.

Direction:
East.

Photo 3:
Rural water line running parallel to west property line along Range Road 20-5.

Direction:
East.

Photo 4:
Viewing East at approximate location of Mobil Oil C.P.R. Wilson No. 5-4 located south of fence adjacent to south property line, near the irrigation canal.

Direction:
East.

	**Photo 5:** Pasture located south of the residence and north of the former Mobil Oil well.
	Direction: East.

	**Photo 6:** Agricultural land located over the east half of the Site.
	Direction: East.

Photo 7:
Natural gas line located in south half of Site with residence visible in center of photo.

Direction:
Northwest.

Photo 8:
Farm located north of the Site.

Direction:
West.

	**Photo 9:** The Site is bordered to the east by Saint Marry River Irrigation District (SMRID) Canal located on left edge of photo. Canal berm and access road visible in center of photo, with Site adjacent right.
	Direction: East.

	**Photo 10:** Country residential property and dugout located south of the Site. Small irrigation canal located in ditch behind dugout.
	Direction: South.

Photo 11:
Rural agricultural residential property and small irrigation canal located south of Site.

Direction:
East.

Photo 12:
Rural agricultural residential property located west of the Site adjacent to Rge Road 20-5.

Direction:
East.

Appendix E

Statement of Qualifications

Scott Roughead, C.E.T.

Senior Environmental Technologist

Core Skills

- Technical Field Background for all aspects of Environmental Site Assessments
- Project Management and Reporting for contaminated site assessment and remediation
- Reliable Client liaison

Professional summary

Mr. Scott Roughead has been working as a senior environmental technologist with Amec Foster Wheeler Environment and Infrastructure for over fourteen years. Mr. Roughead has had a diverse range of duties, working on a wide arrangement of Environmental Assessment and Remediation projects. His current duties include management on Environmental projects including Phase I Environmental Site Assessments (ESAs), Phase II Environmental Site Assessments, open water and groundwater monitoring and sampling programs and supervision and management on Phase III remediation projects as well as risk management. Geotechnical duties include project management, geotechnical drilling, soil classification, and borehole log data entry. Mr Roughead's Project Management responsibilities include being a reliable and accountable liaison to clients from all identified disciplinary backgrounds.

Employment history

Amec Foster Wheeler, Environmental Technologist, Lethbridge, AB, 2005 to present.
Amec Foster Wheeler, Environmental Technologist, Calgary, AB, 2003 field season.

Certifications and Training

- Ongoing Standard First Aid, 2005 to present.
- Ground Disturbance Level II, 2010 to present.
- ENFORM H_2S Alive, 2005 to present.
- Alberta Construction Safety Association Safety Training System, 2011.
- Sprouse Fire and Safety Training, 2003.
- Transportation of Dangerous Goods Course, 2014.
- Introduction to Contaminated Hydrogeology Workshop, 2010
- Project Management Training (in-house), 2007
- Tier 1 and Tier 2 Remediation Guideline Workshop, Alberta Environment, 2008.

Years with Amec Foster Wheeler: 14

Years' Experience: 14

Education

Environmental Science, Diploma, Renewable Resource Management, Lethbridge College, AB, Canada, 2003

Certificate of Specialization, Environmental Science, Fish and Wildlife Technology, Lethbridge College, Lethbridge, AB, Canada, 2004

Professional qualifications

Certified Engineering Technologist with the Association of Science and Engineering Technology Professionals of Alberta (ASET), Area of Practice Environmental Science.

ASET Member: 98653

Languages

English

Appendix F

Limitations

LIMITATIONS

1. The work performed in the preparation of this report and the conclusions presented are subject to the following:
   a. The Standard Terms and Conditions which form a part of our Professional Services Contract;
   b. The Scope of Services;
   c. Time and Budgetary limitations as described in our Contract; and
   d. The Limitations stated herein.
2. No other warranties or representations, either expressed or implied, are made as to the professional services provided under the terms of our Contract, or the conclusions presented.
3. The conclusions presented in this report were based, in part, on visual observations of the Site and attendant structures. Our conclusions cannot and are not extended to include those portions of the Site or structures, which are not reasonably available, in Amec Foster Wheeler's opinion, for direct observation.
4. The environmental conditions at the Site were assessed, within the limitations set out above, having due regard for applicable environmental regulations as of the date of the inspection. A review of compliance by past owners or occupants of the Site with any applicable local, provincial or federal by-laws, orders-in-council, legislative enactments and regulations was not performed.
5. The Site history research included obtaining information from third parties and employees or agents of the owner. No attempt has been made to verify the accuracy of any information provided, unless specifically noted in our report.
6. Where testing was performed, it was carried out in accordance with the terms of our contract providing for testing. Other substances, or different quantities of substances testing for, may be present on-site and may be revealed by different or other testing not provided for in our contract.
7. Because of the limitations referred to above, different environmental conditions from those stated in our report may exist. Should such different conditions be encountered, Amec Foster Wheeler must be notified in order that it may determine if modifications to the conclusions in the report are necessary.
8. The utilization of Amec Foster Wheeler's services during the implementation of any remedial measures will allow Amec Foster Wheeler to observe compliance with the conclusions and recommendations contained in the report. Amec Foster Wheeler's involvement will also allow for changes to be made as necessary to suit field conditions as they are encountered.
9. This report is for the sole use of the party to whom it is addressed unless expressly stated otherwise in the report or contract. Any use which any third party makes of the report, in whole or the part, or any reliance thereon or decisions made based on any information or conclusions in the report is the sole responsibility of such third party. Amec Foster Wheeler accepts no responsibility whatsoever for damages or loss of any nature or kind suffered by any such third party as a result of actions taken or not taken or decisions made in reliance on the report or anything set out therein.
10. This report is not to be given over to any third party for any purpose whatsoever without the written permission of Amec Foster Wheeler.
11. Provided that the report is still reliable, and less than 12 months old, Amec Foster Wheeler will issue a third-party reliance letter to parties that the client identifies in writing, upon payment of the then current fee for such letters. All third parties relying on Amec Foster Wheeler's report, by such reliance agree to be bound by our proposal and Amec Foster Wheeler's standard reliance letter. Amec Foster Wheeler's standard reliance letter indicates that in no event shall Amec Foster Wheeler be liable for any damages, howsoever arising, relating to third-party reliance on Amec Foster Wheeler's report. No reliance by any party is permitted without such agreement.

APPENDIX 4

CORRESPONDENCE

a. Letter To Adjacent Landowner
b. Neighborhood Comments
c. Receipt From Water Coop For 27 Water Units
d. Telus Map
e. SMRID Maps
f. Triple W Gas Co-Op Map

Letter To Adjacent Landowner

CONSULTING ENGINEERS, PLANNERS & LAND SURVEYORS
255 – 31st Street North, Lethbridge, Alberta, T1H 3Z4
PH: (403) 329-0050 FAX: (403) 329-6594
Email: geomart@mgcl.ca

December 13th, 2021 File: 082154CE

Dear Neighbor:

Re: Country Crossroads Estate
Proposed Area Structure Plan
Lethbridge County, Alberta
SW 5-8-20-W4M (Jody Nakamura)

We are pleased to provide this notification and to seek feedback regarding a new country residential development being planned in your community. We are preparing an Area Structure Plan report in support of the twenty-five lot subdivision located at the Nakamura property along Range Road 205. The development would follow the Lethbridge County Land Use Bylaw for Group Country Residential zoning. The attached concept drawings are provided for your reference.

A brief description of the planned development follows:

The 25 lot country residential subdivision is located along Range Road 20-5, approximately 300 meters north of Highway 508. Existing rural residential properties border the development area to the south and north, and the SMRID canal borders the property to the east. Each of the 25 lots would be a minimum of 2 acres in area. There would be a paved public roadway looping through the property with two connections to RR-205. In order to manage runoff, a stormwater pond would be built adjacent to the RR-205 at the south end of the site. Surrounding the pond would be a landscaped area to function as a public green space. Potable water servicing is anticipated to be provided by the County of Lethbridge Rural Water Association or a private well system. Private septic systems will be used to provide on-site wastewater treatment and disposal for each individual lot. Utility servicing would be provided to each lot, including electricity, natural gas, and telecommunications. A community irrigation system is planned to supply untreated irrigation water to each lot for lawn and garden use. Architectural controls are intended to help ensure a high quality development. A phased development plan would allow for construction of approximately 6-10 lots in the initial phase. The demands of the housing market would influence the timing and size of each future phase.

If you have any comments about the proposed development, please contact the owner or MGCL as follows:

<u>Owner:</u>

Jody Nakamura
RR 8-10-8, Lethbridge, Alberta, T1J 4P4
(403) 795-2341
jnakamura@hotmail.com

Consultant:

Martin Geomatic Consultants Ltd. (MGCL)
Attention: Matt Redgrave, P.Eng.
255 – 31st Street North, Lethbridge, Alberta, T1H 3Z4
(403) 329-0050
Mattr@mgcl.ca

Please provide any comments or questions by January 10th, 2022, and we will work to address any comments received.

If you do not have any concerns with the proposed development, please read and sign the box below:

I, _____(print names),

of _____(address),

have received the letter and concept drawings from MGCL, dated December 13th, 2021 outlining the planned 25 lot rural residential development (Jody Nakamura) in SW-5-8-20 W4M, Lethbridge County.
I have reviewed the letter and concept plans and have no concerns with the proposed development at this time, based on the information received.

Regards,

_____(sign names)

_____(date)

Thank you.

Neighborhood Comments

February 20, 2022

Martin Geomatic Consultants Ltd. (MGCL)
Attention: Matt Redgrave, P.Eng.
255 – 31 Street North
Lethbridge, AB T1H 3Z4

RECEIVED
FEB 28 2022

Dear Sirs:

We have received the letter and concept drawings from MGCL, dated December 13, 2021 outlining the planned 25 lot rural residential development (Jody Nakamura) in SW-5-8-20 W4th, Lethbridge County. We have reviewed the letter and concept plans and we DO have concerns with the proposed development, based on the information received.

We are opposed to the proposal at the present time for the following reasons:

1. The property is in excess of 60 acres (66 acres).
2. While the property may be small for agriculture purposes, it has produced an alfalfa crop annually – sometimes two cuts. Although a pivot is not possible, the owners have irrigation rights with SMRID and wheel-move equipment is on site.
3. A previous proposal was made in 2010 for 27 lots and has since been amended to 25 lots, which is still too many. With 25 houses there would be 50 to 75 residents and likely 50 vehicles, all accessing Range Road 20-5, not to mention access for service vehicles. Traffic is an issue.
4. Who will maintain the road – the County?
5. Is the County Rural Water Association able to accommodate 25 more residences? Maybe not, neither do 25 private wells make any sense.
6. Wastewater management (25 septic fields) is a sewage drainage issue. The stormwater pond would not and should not contain wastewater drainage.
7. Natural drainage for excess rainwater flows south and impacts the acreages already established along Highway 508 and has been known to overflow ditches along Range Road 20-5. Yes, we have had excessive run-off in rainy years.
8. The landscaped pond sounds nice but will it then drain into 6 Mile Coulee?
9. Community irrigation water from SMRID is currently sporadic for the existing acreages. Would they approve of this? Are they even aware of it?

There are just too many unanswered questions.
A copy of this letter is being sent to Lethbridge County and the property owner.

Yours truly,

John & Laura Prins 204062 HWY 508
Lethbridge County AB T1K 8G8

Receipt From Water Coop For 27 Water Units

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

Jody Nakamura
RR 8, Site 10, Comp. 8
Lethbridge, Alberta
T1J 4P4

This is your receipt for a down payment on twenty-seven (27) water units @ $250.00 each for a total of $6,750.00.

Sincerely

Kirk Williamson

County of Lethbridge Rural Water Association Ltd.
Box 15 Lethbridge, Alberta T1J 3Y3

INVOICE # 0686

DATE: MAR. 5/10

Received from: SODY NAKAMURA

		Price	Amount
Payment for:	DOWN PAYMENT FOR (27)		
	WATER UNITS @ 250.00 EA X 27 =	6,750.00	
PAID	BY MONEY ORDER #52657082		
	GST # 866702798 GST	#	
	Total	6,750.00	

Telus Map

TELUS
the future is friendly®

OneCall Ticket no: 20192703220

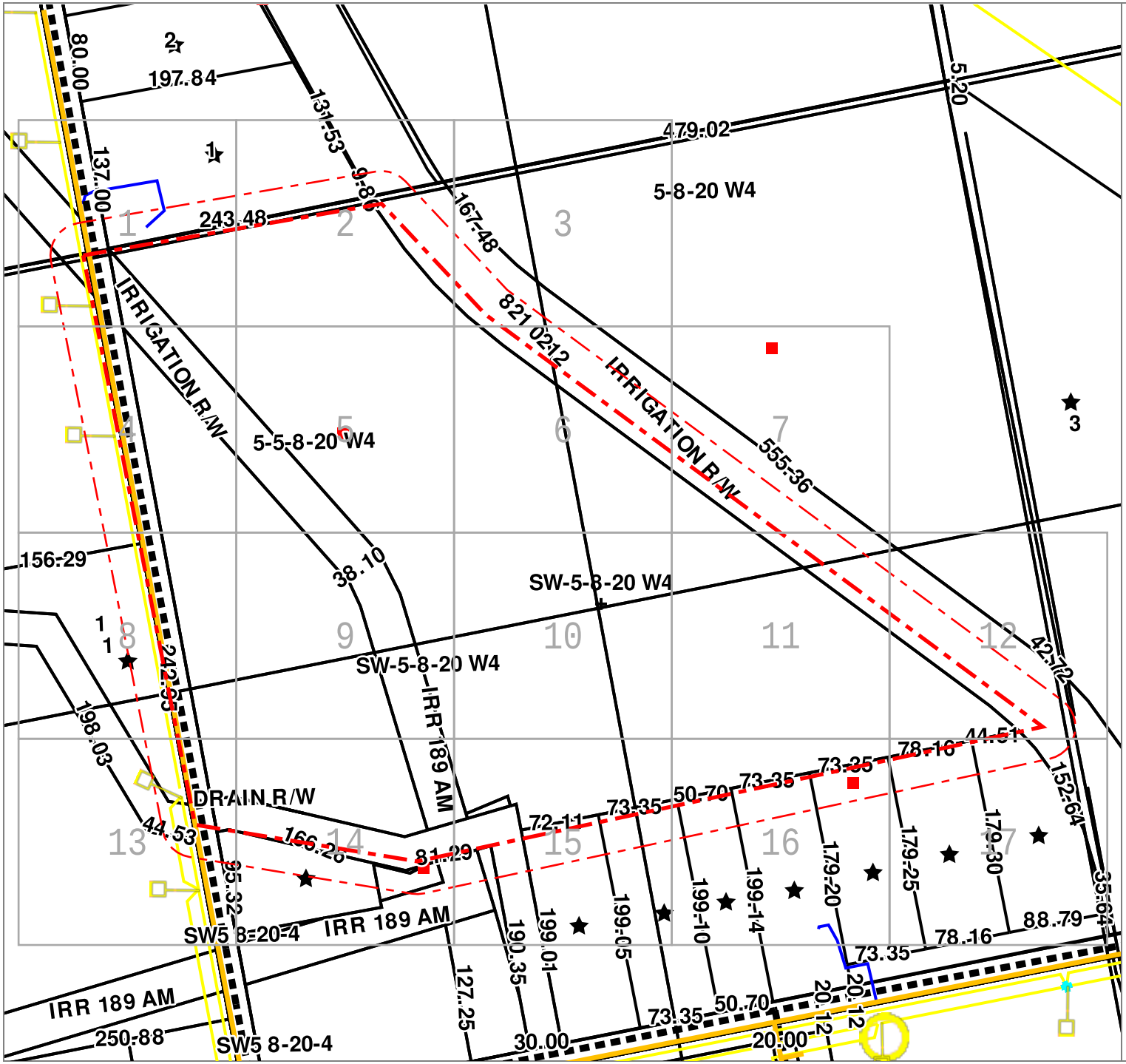
Ticket Location: Range road 205, Lethbridge County, AB

Overview

One Call Center – Dig Area

TELUS Buffer

CAUTION



LEGEND

Scale: 1:5125

- Underground COPPER
- Underground FIBRE
- Direct Buried COPPER
- Direct Buried FIBRE
- Underground DUCT / TRENCH
- Proposed Direct Buried COPPER
- Proposed Underground FIBRE
- Abandoned
- Temporary
- Critical Cable (Soft Red Glow)
- Vault
- Manhole
- Copper Load Coil
- Copper Repeater
- FIBRE Distribution Hub
- Pedestal
- Copper Cross Connect
- MUX Cabinet
- FIBRE Cabinet
- Underground Facility Color
- Direct Buried Facility Color
- Premises Facility Color
- Purposed Facility Color
- Road
- Property Line
- FIBRE Splice

N

These plans must be read in conjunction with the other documents attached to this email

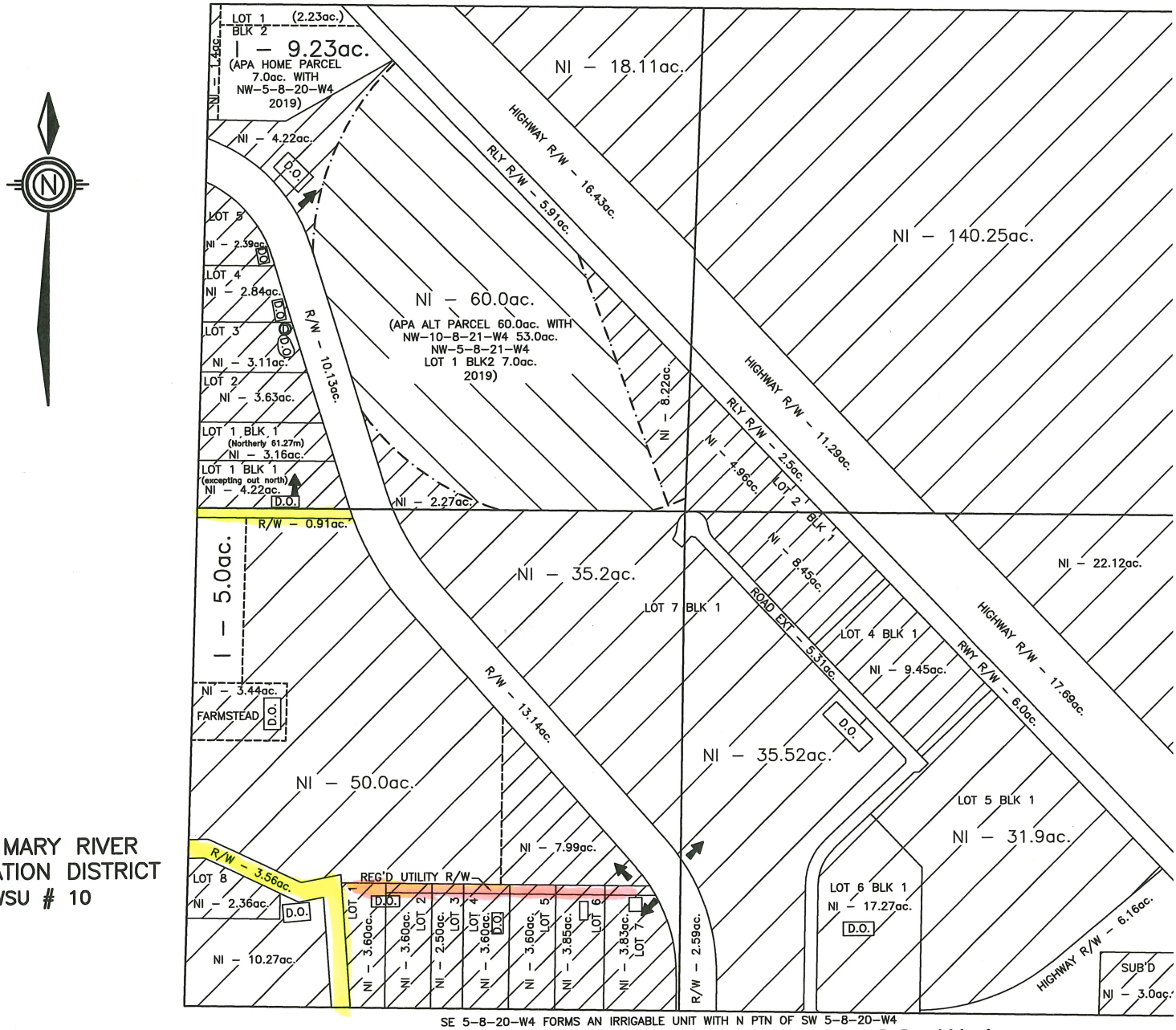
TELUS FACILITY MAPS: The maps supplied by TELUS show a general location of the buried TELUS facilities. These are NOT 'as-built' plans and only represent an approximate alignment. The depth of buried facilities is NOT provided.

If you have any questions or concerns regarding this response, please contact the Cable Locate Support Centre on **locatesupport@telus.com**

DISCLAIMER: While reasonable measures have been taken to ensure the accuracy of the information contained in this plan response, neither TELUS or PelicanCorp shall have any liability whatsoever in relation to any loss, damage, cost or expense arising from the use of this plan response or the information contained in it or the completeness or accuracy of such information. Use of such information is subject to and constitutes acceptance of these terms.

This document has been prepared for reference purposes and may contain commercially sensitive information and is to be treated accordingly. No such information is to be shared with or passed onto other parties without written consent from TELUS Communications Inc.

SMRID Maps



ST. MARY RIVER IRRIGATION DISTRICT
WSU # 10

SE 5-8-20-W4 FORMS AN IRRIGABLE UNIT WITH N PTN OF SW 5-8-20-W4

IRRIGATED ACRES MAP OF SEC. 5 TP. 8 RG. 20 W.4

LEGEND

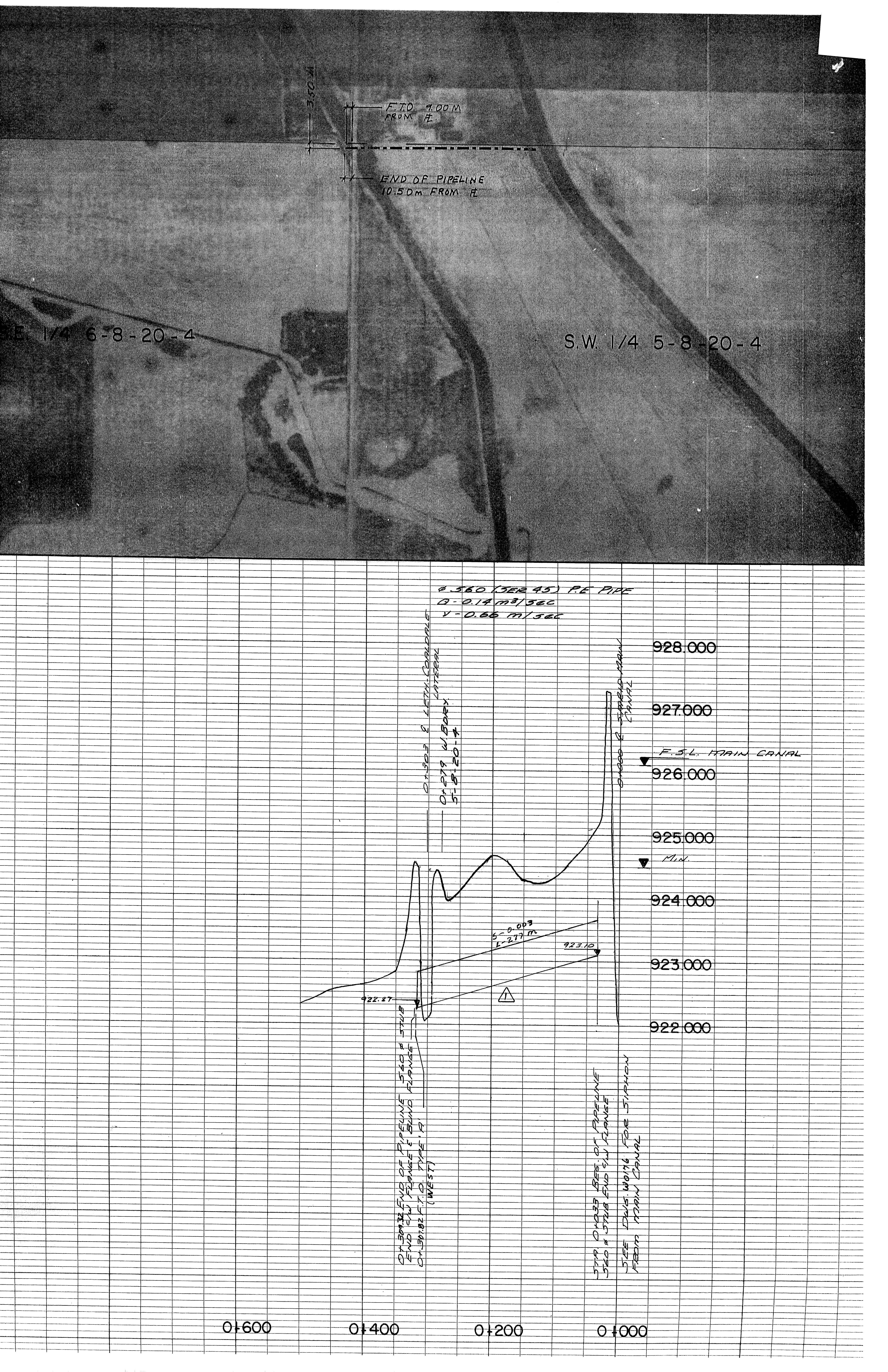
- 0.0ac. — IRRIG. AREAS (CLEAR)
- 0.0ac. — NOT IRRIGATED
- APA — ALTERNATE PARCEL AGREEMENT
- POINT OF DELIVERY
- D — DOMESTIC TURNOUT
- PUMP SITE
- FARM IRRIGATION DITCH
- F.S. — FARMSTEAD
- D.O. — DUGOUT
- DRAINAGE CHANNEL
- FIELD BOUNDARY
- BURIED PIPE
- BP EAS — BURIED PIPELINE EAS
- BOUNDARY OF SPRINKLED AREA

	S.E. SOUTH OF RLY	S.W.	N. 1/2 SOUTH OF RAILWAY
IRR.		5.0	9.23
N.I.	105.44	133.92	94.06
R/W	2.59	17.61	10.13
HWY	6.16		
TOTAL	114.19	156.53	113.42

REPLACING IRRIGATED ACRES MAP DATED MAR, 2019.

APRIL 1, 2019.
DATE

S.3.5-8-20-4



F.T.O. 9.00M FROM ℄
3.50M
END OF PIPELINE 10.50m FROM ℄
S.E. 1/4 6-8-20-4
S.W. 1/4 5-8-20-4
ø 560 (SER 45) P.E PIPE
Q - 0.14 m³/SEC
V - 0.66 m/SEC
928.000
927.000
F.S.L. MAIN CANAL
926.000
925.000
M.N.
924.000
923.000
922.000
0+303 ℄ LETH.-COALDALE LATERAL
0+279 W.BDRY. 5-8-20-4
0+000 ℄ SARLID MAIN CANAL
S-0.003
L-277 m
923.10
922.27
0+309.32 END OF PIPELINE 560 ø STUB END c/w FLANGE & BLIND FLANGE
0+301.82 F.T.O. TYPE 'A' (WEST)
STA 0+033 BEG. OF PIPELINE 560 ø STUB END c/w FLANGE
SEE DWG. W0176 FOR SIPHON FROM MAIN CANAL
0+600
0+400
0+200
0+000

Triple W Gas Co-op Map

TRIPLE W NATURAL GAS CO-OP LTD
P.O. Box 69, Warner, AB T0K 2L0
Phone: 403-642-3991 Lethbridge: 403-328-6959
Fax: 403-642-3627 E-mail: triplew@telusplanet.net
After Hours Emergency: 403-642-3991

CUSTOMER SERVICE REQUEST FORM

No. 4946

Distributor: TRIPLE W NATURAL GAS CO-OP LTD. Date: July 2/19

Customer Name: Martin Geomatic

Address or Legal Description: SE 6-8-20 + SW 5-8-20

Customer's Request: planning + design subdivision

Time Office received call: 2:25 Call Taken by: e-mail

Time Operations received call: Time Responded:

Time Operations reached site: AB One Call #: 20192703220

TYPE OF REQUEST:

Leak on Meter Set	☐	Appliance Problem	☐	Line Location	☑
Leak in Premises	☐	Pilot Light Out	☐	CO Problem	☐
Leak on Reg Station	☐	Venting Problem	☐	Furnace Check	☐
Underground Leak	☐	House Reg Problem	☐	Meter Read	☐
Hit Gas Line	☐	Reg Station Problem	☐	Other	☐

Leak Detection Equipment Reading: Inside: Outside:

Operation's Remarks & Recommendations:

Sent map of area for planning + design

Completion Time: 5:15

Date: 07/04/19

Serviceman: JM

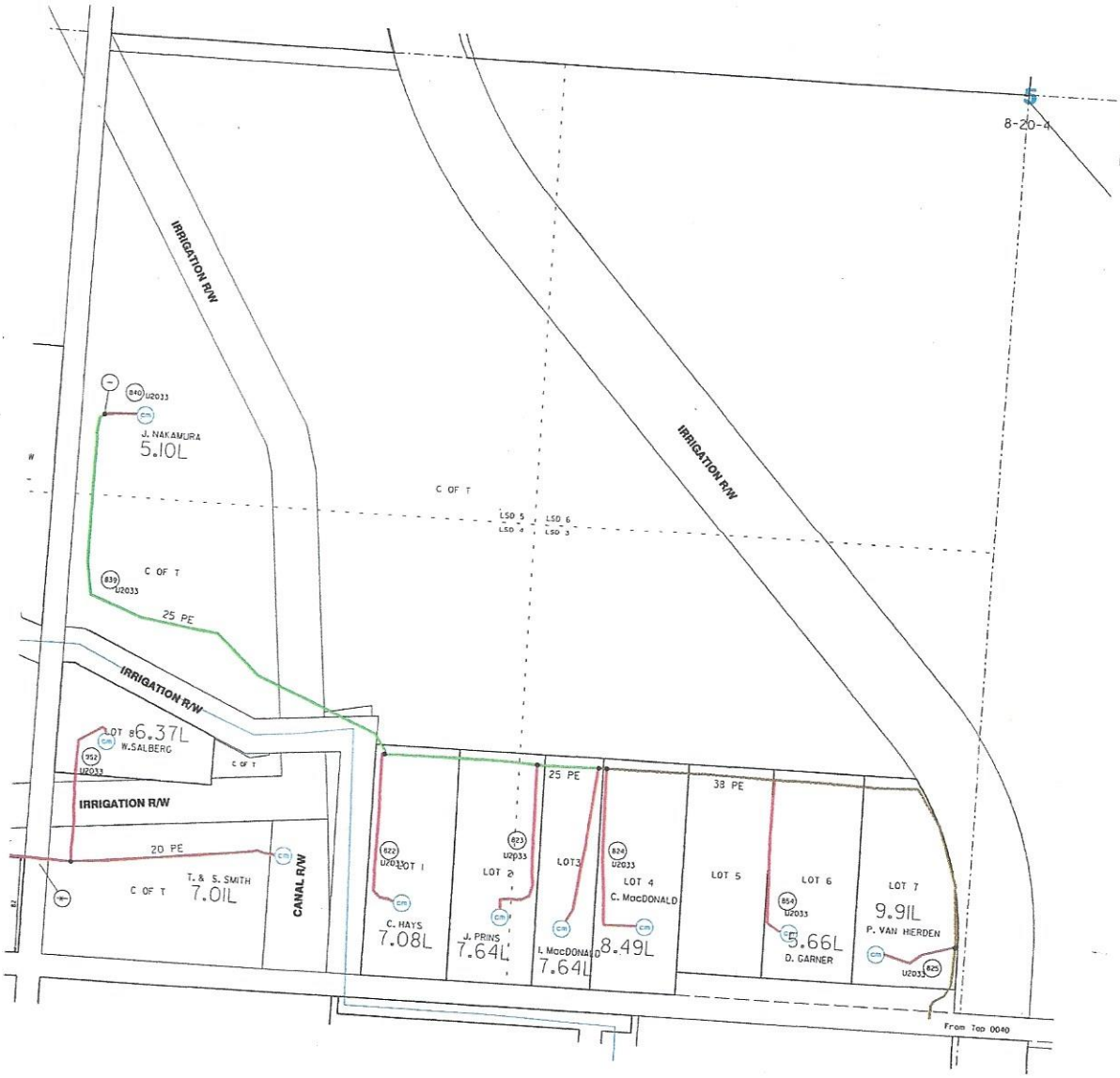
MAP

I have read and acknowledge receipt of the Foregoing:

Tenant ☐ Owner ☐ Acting Manager ☐

Customer's Signature:

Top Copy - Customer Second Copy - Operations and Maintenance Third Copy - Office



NO.	
10	2017
9	2015
8	2007
7	2003
6	2000
5	1995
4	ADDED
3	1994
2	1993
1	NEW S

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2. All singl

B-20, W4M

APPENDIX 5

STORMWATER MANAGEMENT PLAN

STORMWATER MANAGEMENT PLAN
COUNTRY CROSSROADS ESTATE SUBDIVISION
SW5-8-20-W4M
Lethbridge County, Alberta

Prepared for: **Ms. Jody Nakamura**

File Number: **082154CE**

Dated: **February 1, 2023**

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APPENDIX

I. PROJECT BACKGROUND AND DRAINAGE FEATURES

The Country Crossroads Estate Subdivision is a proposed group country residential subdivision located approximately 300 meters north of Highway 508 along Range Road 20-5 in Lethbridge County. The legal property description is Southwest Quarter of Section 5, Township 8, Range 20 West of the 4th Meridian. The property is bound by a grouped country residential community to the north, a Saint Mary River Irrigation District (S.M.R.I.D.) canal to the east, a grouped country residential community and a drainage channel (S.M.R.I.D.) to the south, and Range Road 20-5 to the west. Refer to *Figure 1 – Location Plan* for an illustrative map. The purpose of this report is to provide stormwater management strategies to guide the future development of the Country Crossroads Estate Subdivision, in support of The Country Crossroads Estate Area Structure Plan (ASP) for consideration by the Lethbridge County. The ASP plan area is 70.50 acres (26.79 ha) and the proposed lot layout is shown on *Figure 2* – Layout.

A. Existing Features

The subject parcel is presently used as farmland with a single dwelling and a dugout. The property is supplied with irrigation water from a S.M.R.I.D. lateral pipeline turnout. The land generally drains to the southwest at an average grade of 0.5% and drains in to a S.M.R.I.D. drainage channel (Tiffin drain). The site is characterized by three sub-catchment areas. The East catchment (6.15ha) drains to the west along the southern property boundary. The West catchment (16.25ha) drains to a localized depression to the south and spills in to the Tiffin drain. The RR-205A catchment (6.13ha) drains into the east ditch of RR 20-5, which flows into the Tiffin drain. The Tiffin drain(R/W plan 821 0212) flows west and north through farmland and discharges to Sixmile Coulee and the Oldman River in the City of Lethbridge. A topographical site survey has been completed[a] and an existing surface terrain model has been created to define drainage boundaries, storage depressions and flow conveyance routes as shown in *Figure 3* – .

B. Proposed Development

The proposed development will subdivide the parcel into 25 legal lots with each lot being approximately 2 to 4.29 acres, as well as road allowances for access and traffic circulation, and a public park with a stormwater pond. Drainage conditions will be affected as a result of this development, as the runoff flow rates and volumes will change due to the increase in the impervious areas within the plan area with the addition of hard surfaces including paved roads, building roofs and driveways. To mitigate the effect of runoff from the development, a stormwater storage pond is proposed on site with a controlled release which is designed to not exceed the allowable release rate. The proposed stormwater retention pond (storage pond) is located in the southwest corner of the site at a natural low area, to collect runoff from the development and store the water on-site. The paved roadways and grass swales will provide overland drainage routes throughout the development to convey runoff to the storage pond. The pond will drain the active storage volume in to the existing Tiffin drain, bordering the property to the south. The Tiffin drain ultimately drains to the Oldman River via Six Mile Coulee in the City of Lethbridge. *Figure 4 –Stormwater* shows the location of the proposed retention pond. The storage pond will include a permanent pool of water to promote the settlement of runoff pollutants.

[a] GPS topographical survey, MGCL, June 01, 2016.

C. Soil Conditions

Existing soil descriptions for the area include Orthic Dark Brown Chernozem on medium textured loam, silt loam sediments deposited by wind on medium textured loam, silty clay loam, clay loam, clay, clay till and clay fill[b]. Ten boreholes have been completed for the geotechnical investigations[c]. The boreholes were drilled to a depth of 6.1m and generally found 100mm to 150mm topsoil above clay and clay till, with groundwater depths ranging from 2.2m to 3.4m. Soil reports are included in Appendix A – Soil Information.

II. METHODOLOGY

Drainage analysis of the existing site and proposed development (pre-development and post-development scenarios) has been completed to simulate the site drainage during a 100 year storm event. The stormwater will be managed on-site such that the post-development release rate will be equal to or less than 1.28 L/s/ha, per the Tiffin Drain – Master Drainage Plan[d]. The increased runoff resulting from the construction of impervious areas will be mitigated by capturing and controlling the runoff in a retention pond and discharging at the allowable release rate.

A. Hydraulic Model

The existing pre-development and future post-development site models[e] have been developed to simulate the site drainage during a 100 year storm event. The following table presents sub catchment parameters assumed in the post-development model:

1. Synthetic Design Storm – Chicago Method: 24-hour duration, 100-year return period, (IDF Parameters A = 1019.20, B = 0, C = 0.731)[f]
2. Rainfall time step = 5 minutes
3. Simulation duration = 240 hrs
4. Routing Method: Dynamic Wave
5. No effect of Evaporation and Groundwater
6. Catchment area = 26.83 ha
7. Infiltration Method: Green Ampt
8. Manning's N Impervious = 0.015
9. Manning's N Pervious = 0.15
10. Depression Storage Pervious = 5 mm
11. Depression Storage Impervious = 1 mm

B. Sub-Catchments

An existing site (pre-development) model and a proposed site model (post-development) have been developed to simulate drainage patterns in response to a 100 year synthetic design storm. The following tables present the sub-catchment parameters used in the pre-development and post-development scenarios:

---

[b] Alberta Soil Information Viewer, Alberta Agriculture and Forestry, http://www4.agric.gov.ab.ca/agrasidviewer

[c] Geotechnical Investigation, Proposed Rural Residential Subdivision, SW-5-20-W4, County of Lethbridge report prepared by Wood, May 31, 2018.

[d] Lethbridge County, DRAFT Tiffin Drain – Master Drainage Plan, MPE Engineering Ltd., March 2021.

[e] EPA Storm Water Management Model – Version 5.0 (Build 5.0.22).

[f] Design Standards, City of Lethbridge, 2016.

Table 1 – Pre Development Sub-Catchment Parameters								
Name	Area (ha)	Flow Length (m)	Slope (%)	Texture	Imperv. (%)	Suction Head (mm)	Conduct -ivity (mm/hr)	Initial Deficit (frac.)
East	6.15	350	1.05	SiC	0	292.2	0.5	0.25
West	16.25	463	1.11	SiC	0	292.2	0.5	0.25
RR_20-5	6.13	521	0.45	SiC	0	292.2	0.5	0.25

Table 2 – Post Development Sub-Catchment Parameters								
Name	Area (ha)	Flow Length (m)	Slope (%)	Texture	Imperv. (%)	Suction Head (mm)	Conduct -ivity (mm/hr)	Initial Deficit (frac.)
S1	26.83	508	1.0	SiC	10	292.2	0.5	0.25

The source information for the above tables includes:

Area (ha) & Flow Path (m): measured.

Slope (%): Estimated from field survey and design plans.

Texture: Alberta Soil Viewer[g] & boreholes[h].

Impervious (%): Estimated from field survey and design plans.

Hydraulic Conductivity (mm/hr) & Suction Head (mm): Typical soil characteristics[i].

Initial Moisture Deficit: Typical soil characteristics[j].

III. RESULTS

The pre and post development model results are presented in the following tables. Details of the rainfall runoff modeling are included in Appendix B – SWMM Model Results.

A. Pre-Development

The pre-development runoff, storage and release rates are shown in the following tables resulting from a 100 year / 24 hour storm.

[g] Alberta Soil Information Viewer, Alberta Agriculture and Forestry, http://www4.agric.gov.ab.ca/agrasidviewer
[h] Geotechnical Investigation, Proposed Rural Residential Subdivision, SW-5-8-20-W4.
[i] Rawls, W.J. et al., (1983). J. Hyd. Engr., 109:1316
[j] XP SWMM Solutions, http://help.xpsolutions.com/display/xps2015/Infiltration

Table 3 – Pre-Development Runoff						
Name	Area (ha)	Precipitation (mm)	Infiltration (mm)	Runoff Depth (mm)	Runoff Volume (ML)	Peak Runoff (m^3/s)
East	6.15	120.15	52.96	67.31	4.14	0.47
West	16.24	120.15	53.66	66.58	10.82	1.04
RR_20-5	6.12	120.15	56.01	64.19	3.93	0.25

Table 4 – Pre-Development Storage						
Name	Invert Elev. (m)	Rim Elev. (m)	Max. Depth (m)	Max. HGL (m)	Total inflow (ML)	Max. Volume (1,000 m^3)
ponding	922.20	924.20	0.57	922.77	10.82	1.96

Table 5 – Pre-Development Discharge		
Name	Max. Flow (m^3/s)	Total Flow (ML)
S.M.R.I.D._Channel	1.38	17.93

B. Post-Development

The prost-development runoff, storage and release rates are shown in the following tables resulting from a 100 year storm.

Table 6 – Post-Development Runoff						
Name	Area (ha)	Precipitation (mm)	Infiltration (mm)	Runoff Depth (mm)	Runoff Volume (ML)	Peak Runoff (m^3/s)
S1	26.83	120.15	49.37	70.87	19.02	1.84

Table 7 – Post-Development Storage

Name	Invert Elev. (m)	Rim Elev. (m)	Max. Depth (m)	Max. HGL (m)	Total inflow (ML)	Max. Volume (1,000 m³)
wet_pond	918.90	923.00	3.54	922.44	33.17	30.37

Table 8 – Stage Storage Chart – Wet Pond

Description	Elevation (m)	Depth (m)	Area (m^2)	Increment Volume (m^3)	Total Volume (m^3)
Bottom	918.90	0.00	5,700	0	0
-	919.90	1.00	6,900	6,300	6,300
NWL	920.90	2.00	8,800	7,900	14,100
-	921.90	3.00	10,900	9,900	23,900
HWL	922.40	3.50	12,400	5,900	29,800
TOB	923.00	4.10	13,900	7,900	37,600

The definitions pertaining to the above table include:

NWL = Normal Water Level

HWL = High Water Level (100 yr / 24 hr storm)

TOB = Top of Bank

Table 9 – Wet Pond Characteristics

Type	Stormwater Wet Pond	Catchment	26.83 ha
Land Use	Rural Residential	% Impervious	10 %
Permanent Pool Volume	14,100 m³	Permanent Pool Depth	2.0 m
Active Storage Volume	15,700 m³	Active Storage Depth	1.5 m
Volume at Spill Elevation	37,600 m³	Freeboard	0.6 m
Unit Release Rate	1.28 L/s/ha	Peak Release Rate	34 L/s

Table 10 – Post-Development Discharge		
Name	Max. Flow (L/s)	Total Flow (ML)
Tiffin Drain	34.3	18.89

C. Allowable and Post Development Release Rates

The allowable and post development discharge rates to be released from the development during the 100 year / 24 hour storm event are shown below.

Table 11 – Release Rates			
Outlet Description	Allowable Release Rate* (L/s)	Post –Development Peak Release Rate (L/s)	Net Change (L/s)
Tiffin Drain	34	34	0

*Allowable Release Rate[k] = 1.28 L/s/ha x 26.8 ha = 34.3 L/s

The stormwater analysis for the Country Crossroads Estate development indicates that the proposed outfall in to Tiffin drain located at the southwest development boundary will receive a post-development peak flow rate not exceeding the continuous allowable release rate of 1.28 L/s/ha. The construction of a wet pond will retain runoff on site and discharge to the downstream environment with a controlled release. Preliminary stormwater modeling indicates that a gravity drain pipe with a 1.0 m elevation drop from the Wet Pond to Tiffin Drain would require a circular orifice outlet, 0.14 m in diameter.

IV. RECOMMENDATIONS

It is recommended that the detailed design of the Country Crossroads Estate Development provides a stormwater wet pond with an active storage volume 15,700 m^3 on-site, to retain the runoff from a 1 in 100 year 24 hour storm, and discharge at or below the allowable release rates as outlined in this report. The retention pond shall be designed and constructed to Lethbridge County and Alberta Environment and Parks standards and guidelines. A forebay berm is intended in the wet pond to trap sediments, and a make-up water supply should be provided to maintain the permanent pool water level, accounting for evaporation. The wet pond may serve as a water source for a community irrigation system which would provide water to irrigate lawns and gardens. The establishment of vegetative zones around the wet pond is recommended to enhance the pond's capability of pollutant removal. For future houses adjacent to the pond, basement footings should be below the pond's high water level. Approval drawings

[k] Lethbridge County, DRAFT Tiffin Drain – Master Drainage Plan, MPE Engineering Ltd., March 2021.

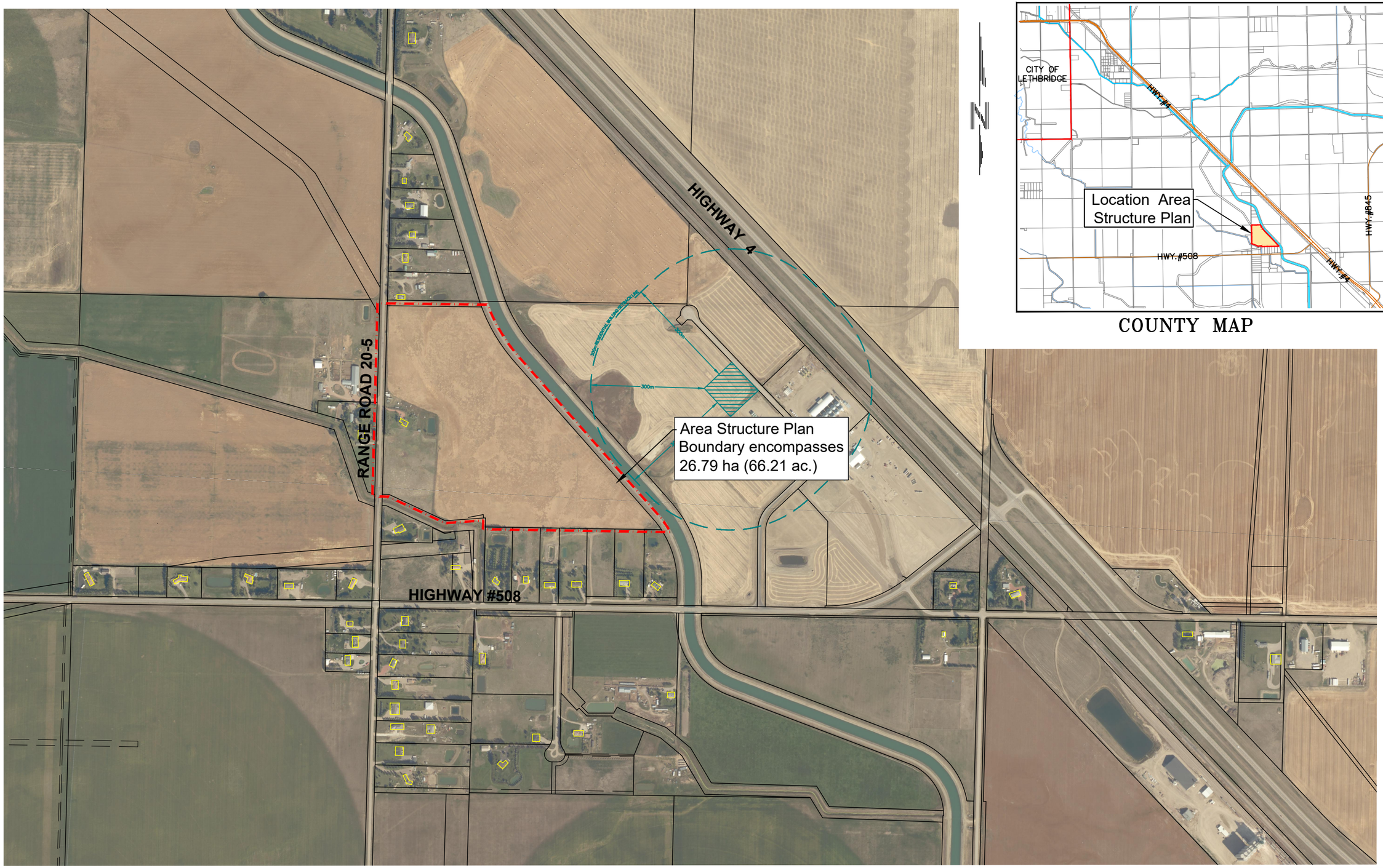
including the detailed designs of retention ponds, outlets, swales and grading plans are recommended prior to construction, and it is intended that such detailed designs would generally follow the stormwater concepts outlined in this report.

V. CLOSING

We trust that this report meets the requirements of the Area Structure Plan. Should you require any further information, please contact the undersigned.

Raymond Martin, P.Eng.
Civil Engineer, Project Manager

MARTIN GEOMATIC CONSULTANTS LTD.
Association of Professional Engineers and Geoscientists of Alberta Permit to Practice P05852



COUNTY MAP

Country Crossroads Estate

STORMWATER MANAGEMENT PLAN

Feb 06, 2023

LOCATION PLAN

FIGURE 1.0

082154CE

MARTIN
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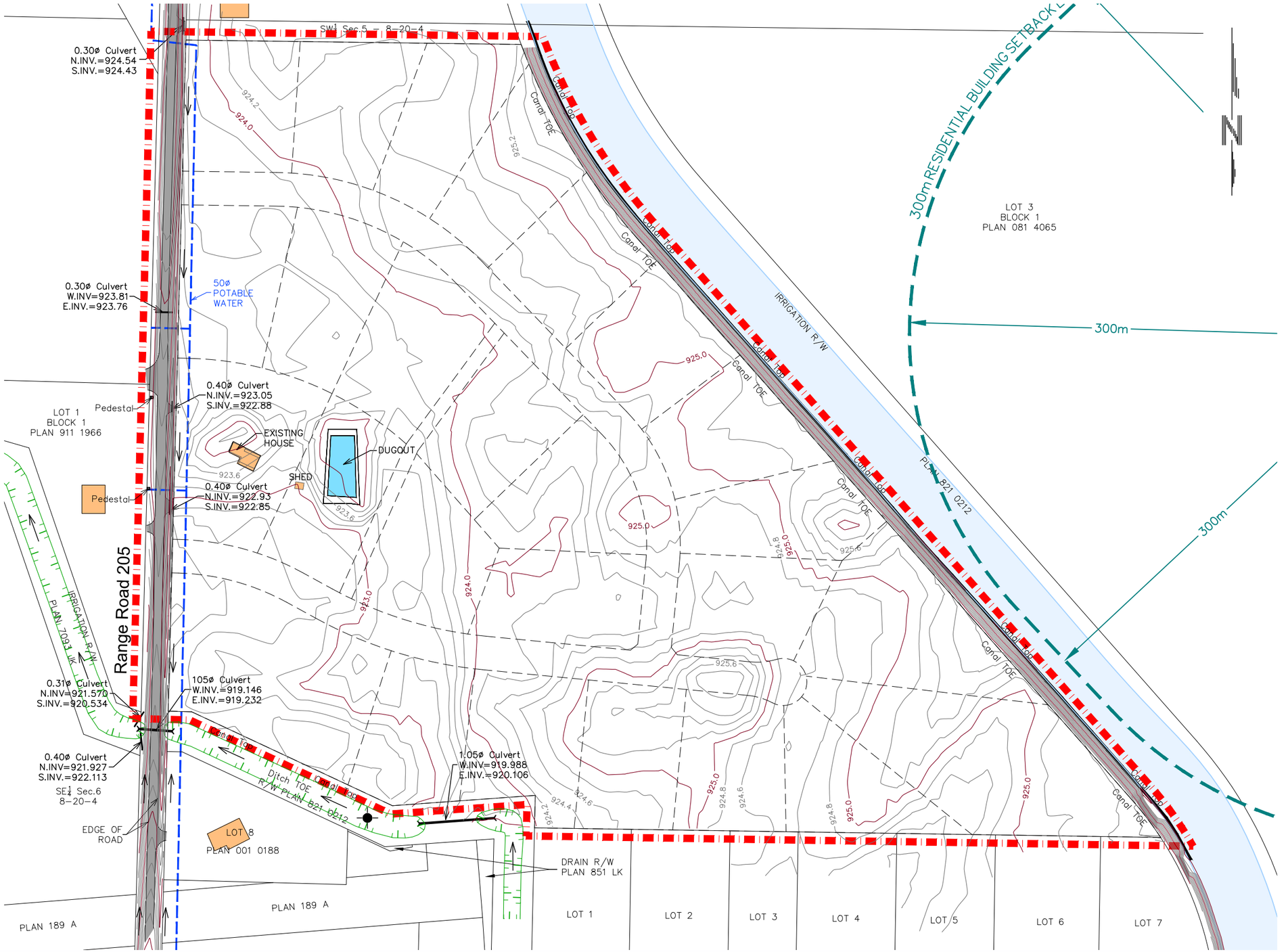
Consulting Engineers, Planners, and Land Surveyors
255-31st Street North Lethbridge, Alberta T1H 3Z4
Ph: (403) 329-0050 E-mail: geomart@mgcl.ca Fax: (403) 329-6594



LEGEND:

- AREA STRUCTURE PLAN BOUNDARY
- LS ☼ — LIGHT STANDARD
- PP ● — POWER POLE w/ OH LINE
- ⊠ PED — TELEPHONE PEDESTALS
- EX.HOUSES/STRUCT.
- EX. C.S.P.
- GAS — EX. GAS LINE
- C — EX. TELUS LINE
- X — EX. FENCE LINE
- 911.0 — EX. MAJOR CONTOUR LINE (1.0m)
- 911.0 — EX. MINOR CONTOUR LINE (0.2m)
- EX. WATERLINE
- ABANDONED GAS WELL
- LOT BOUNDARY

Country Crossroads Estate

STORMWATER MANAGEMENT PLAN

Feb 06, 2023

EXISTING SITE
FIGURE 2.0

082154CE

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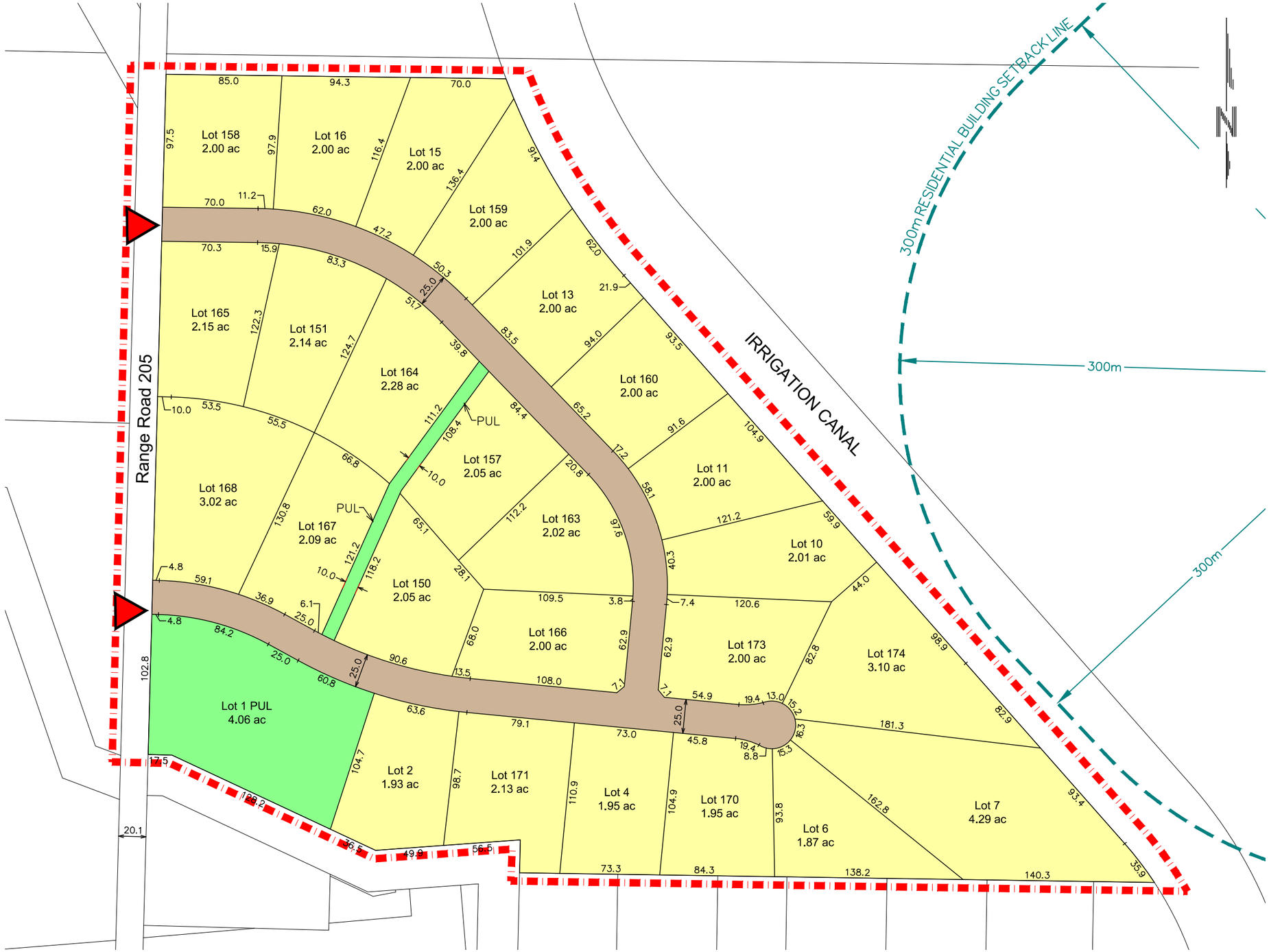

LEGEND:

- AREA STRUCTURE PLAN BOUNDARY
- SUBDIVISION ENTRANCE

NOTE:

LOT LINE ARE SHOWN FOR CONCEPTUAL PURPOSES ONLY. FINAL LOT LAYOUT WILL BE DETERMINED DURING DETAILED DESIGN.

Country Crossroads Estate

STORMWATER MANAGEMENT PLAN

Feb 06, 2023

PROPOSED LOT LAYOUT

FIGURE 3.0

SCALE: 1:3000

082154CE

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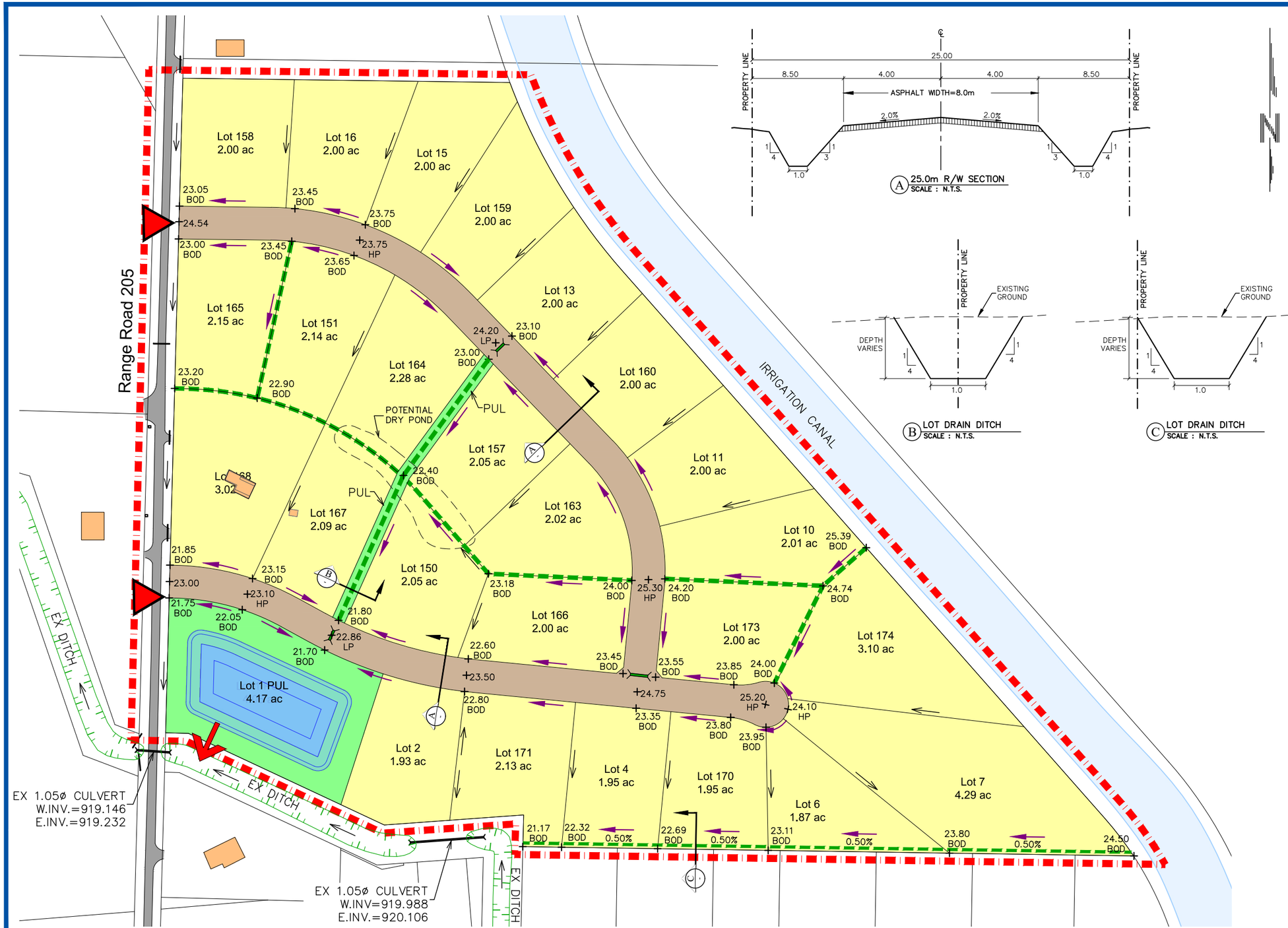

A 25.0m R/W SECTION
SCALE : N.T.S.

B LOT DRAIN DITCH
SCALE : N.T.S.

C LOT DRAIN DITCH
SCALE : N.T.S.

LEGEND:

- AREA STRUCTURE PLAN BOUNDARY
- SUBDIVISION ENTRANCE
- DRAINAGE DITCH FLOW
- LOT DRAINAGE ARROWS
- LOT DRAIN DITCH (SEE DETAIL 'B')
- PROPOSED CULVERT
- 25.39 BOD + BOTTOM OF DITCH ELEVATION
- 25.39+ CENTERLINE OF ROAD ELEVATION
- HP HIGH POINT
- LP LOW POINT
- OUTFALL

NOTE:

DRAINAGE & ELEVATIONS ARE SHOWN FOR CONCEPTUAL PURPOSES ONLY AND WILL BE DETERMINED DURING DETAILED DESIGN.

Country Crossroads Estate

STORMWATER MANAGEMENT PLAN

Feb 06, 2023

STORMWATER MANAGEMENT
FIGURE 4.0

082154CE

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APPENDIX ‘A’ – SOILS

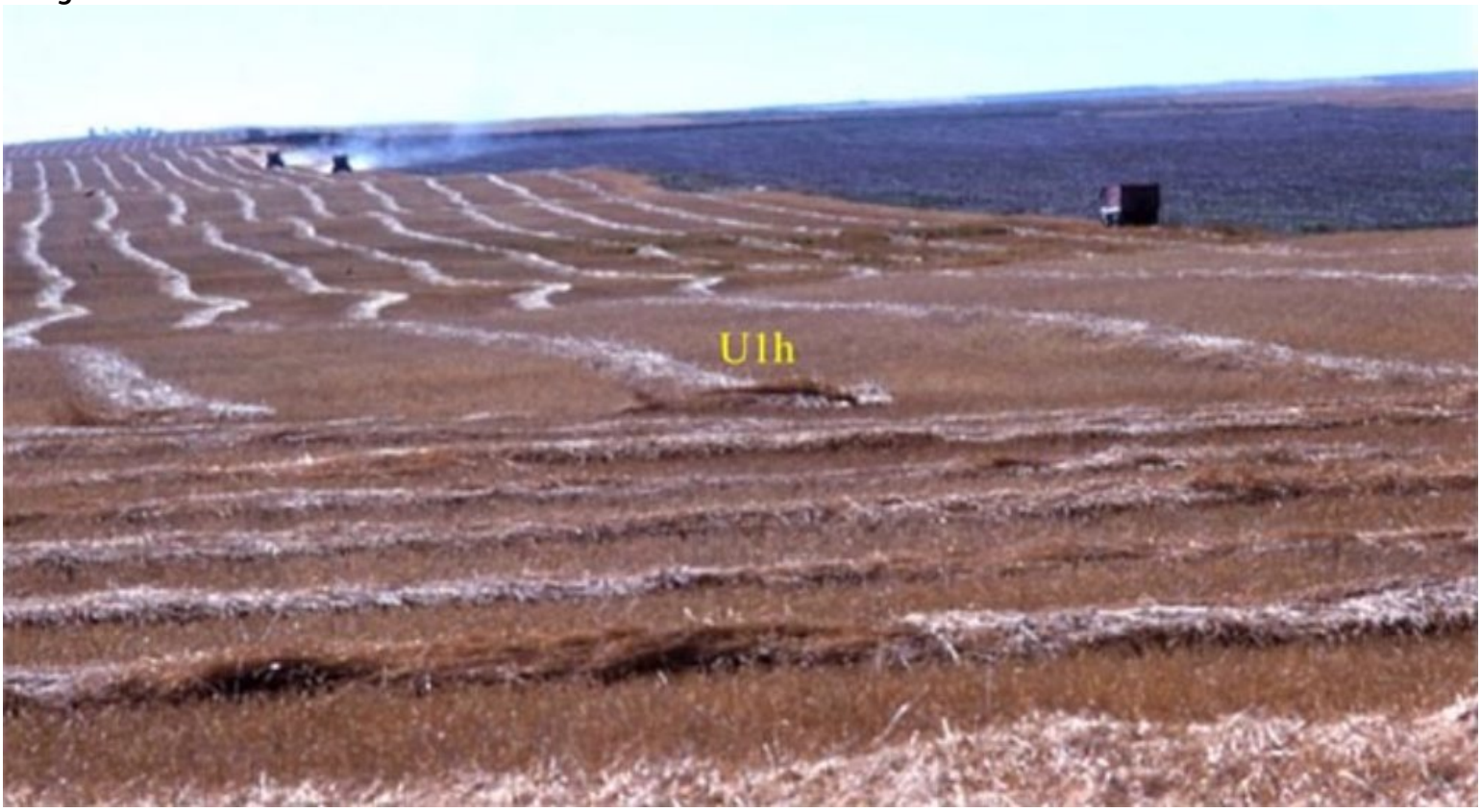
STORMWATER MANAGEMENT PLAN
COUNTRY CROSSROADS ESTATE SUBDIVISION
SW5-8-20-W4M
Lethbridge County, Alberta

Report on Soil Polygon: 5815

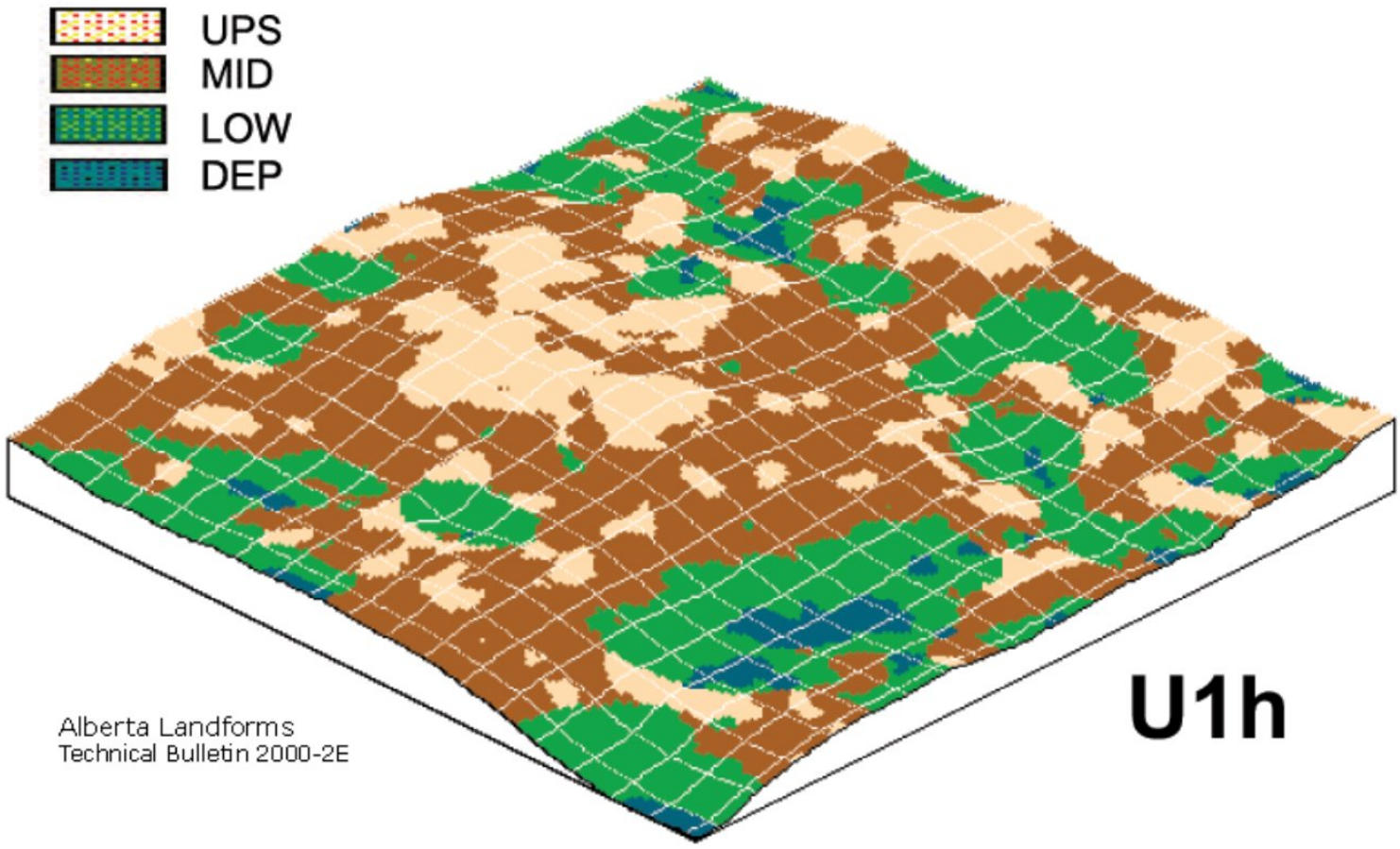
Variable	Value
POLY_ID	5815
Map Unit Name	LEWN1/U1h
Landform	U1h - undulating - high relief
LSRS Rating (Spring Grains)	4M(10)

Landscape Model Descriptions:
Orthic Dark Brown Chernozem on medium textured (L, SiL) sediments deposited by wind and water (LET).
Orthic Dark Brown Chernozem on medium textured (L, SiCL, CL) materials over medium (L, CL) or fine (C) textured till (WNY).
The polygon may include soils that are not strongly contrasting from the dominant or co-dominant soils (1).
Undulating, high relief landform with a limiting slope of 4% (U1h).

Image:



Landform Model:



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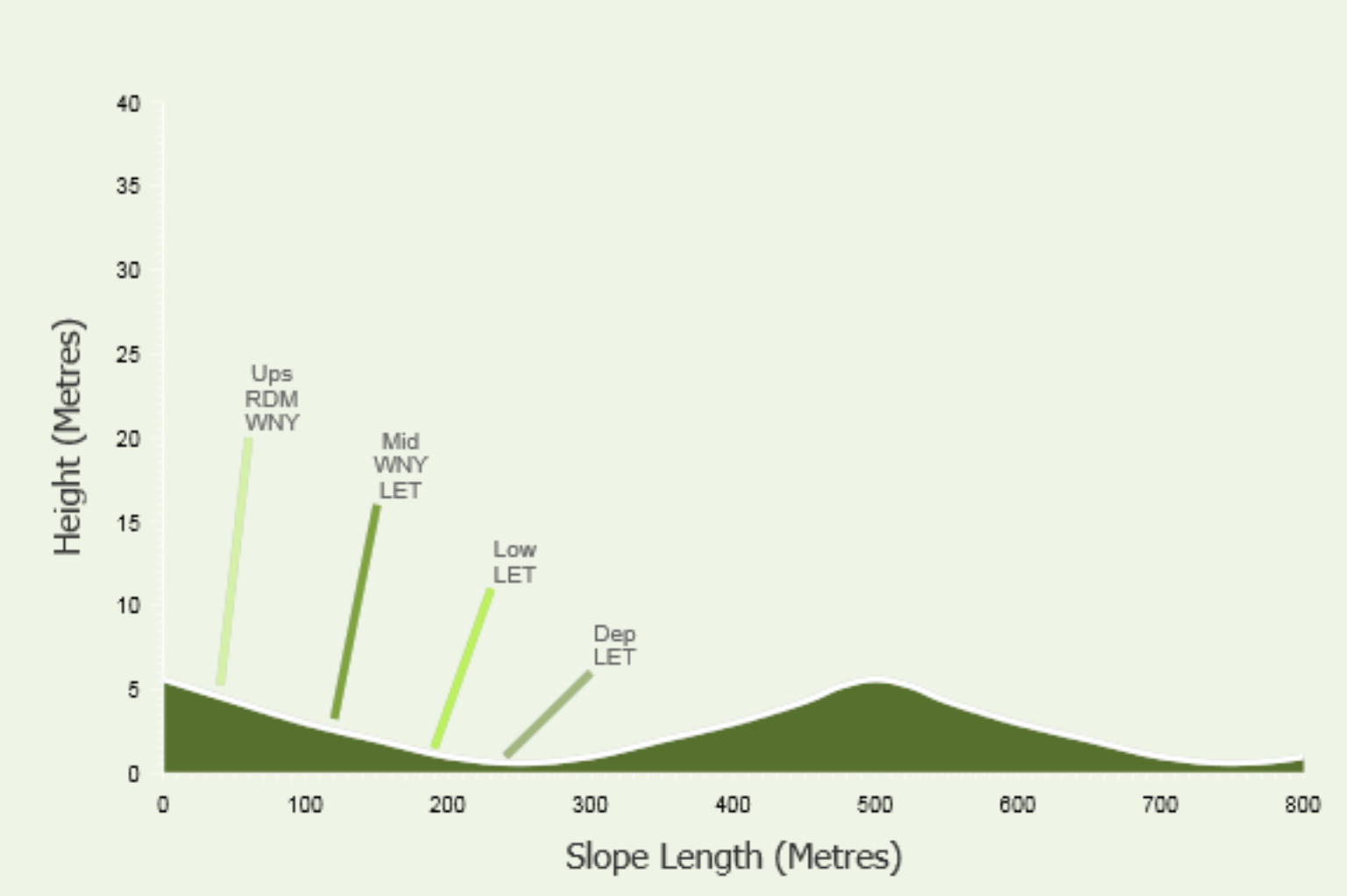
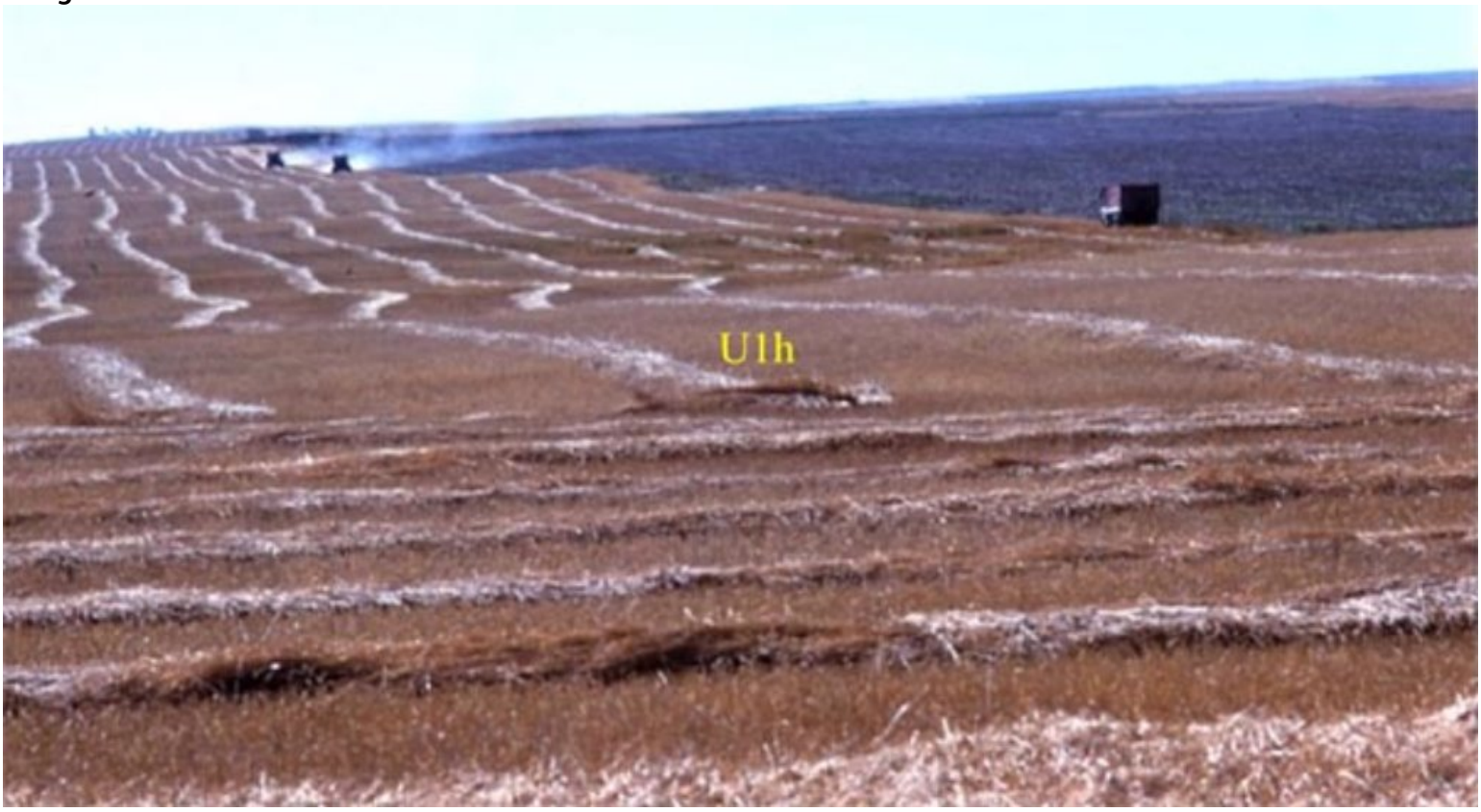


Report on Soil Polygon: 5839

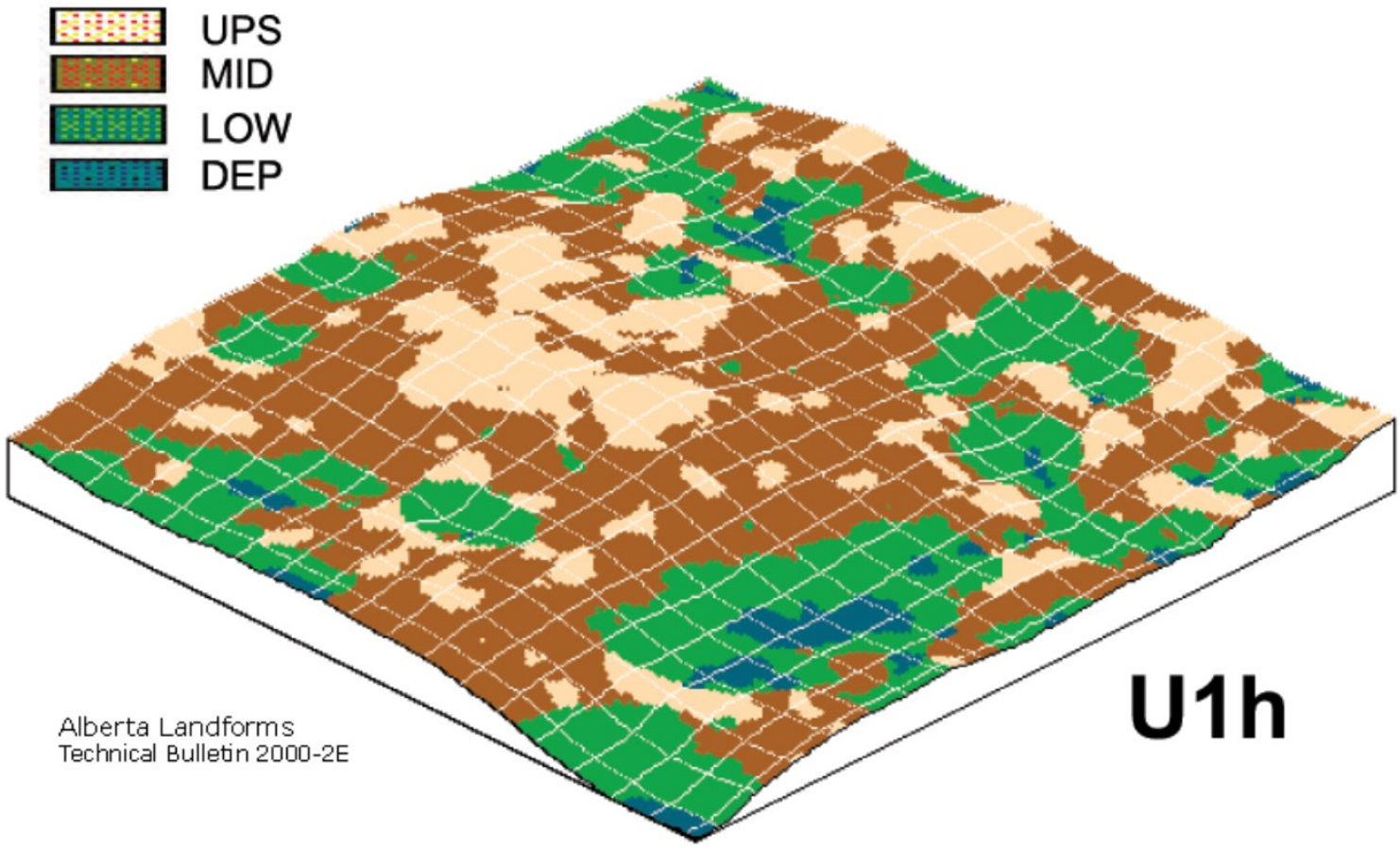
Variable	Value
POLY_ID	5839
Map Unit Name	RDWN1/U1h
Landform	U1h - undulating - high relief
LSRS Rating (Spring Grains)	3MT(10)

Landscape Model Descriptions:
Orthic Dark Brown Chernozem on medium textured (L, CL) till (RDM).
Orthic Dark Brown Chernozem on medium textured (L, SiCL, CL) materials over medium (L, CL) or fine (C) textured till (WNY).
The polygon may include soils that are not strongly contrasting from the dominant or co-dominant soils (1).
Undulating, high relief landform with a limiting slope of 4% (U1h).

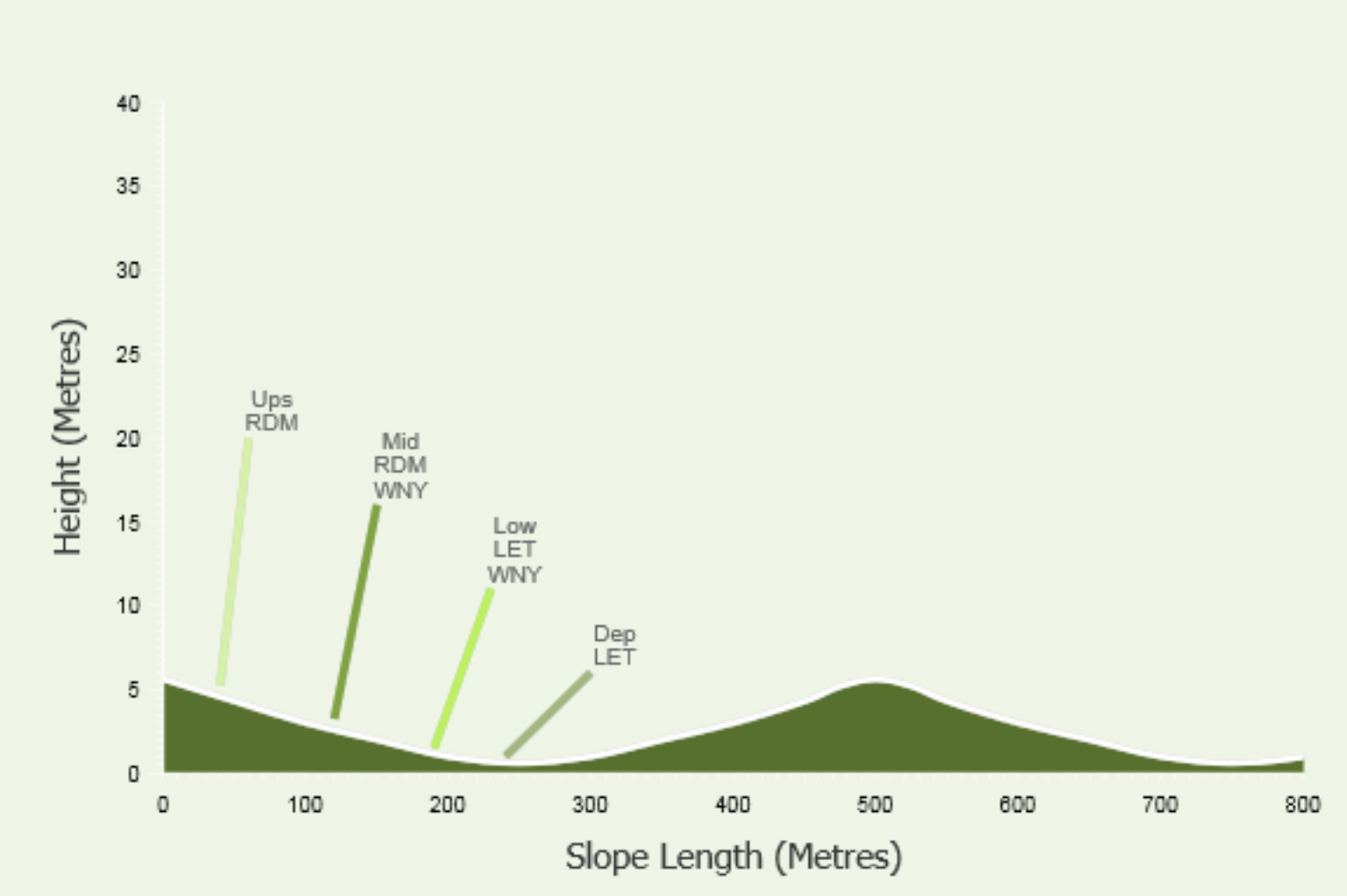
Image:



Landform Model:



Landform Profile:



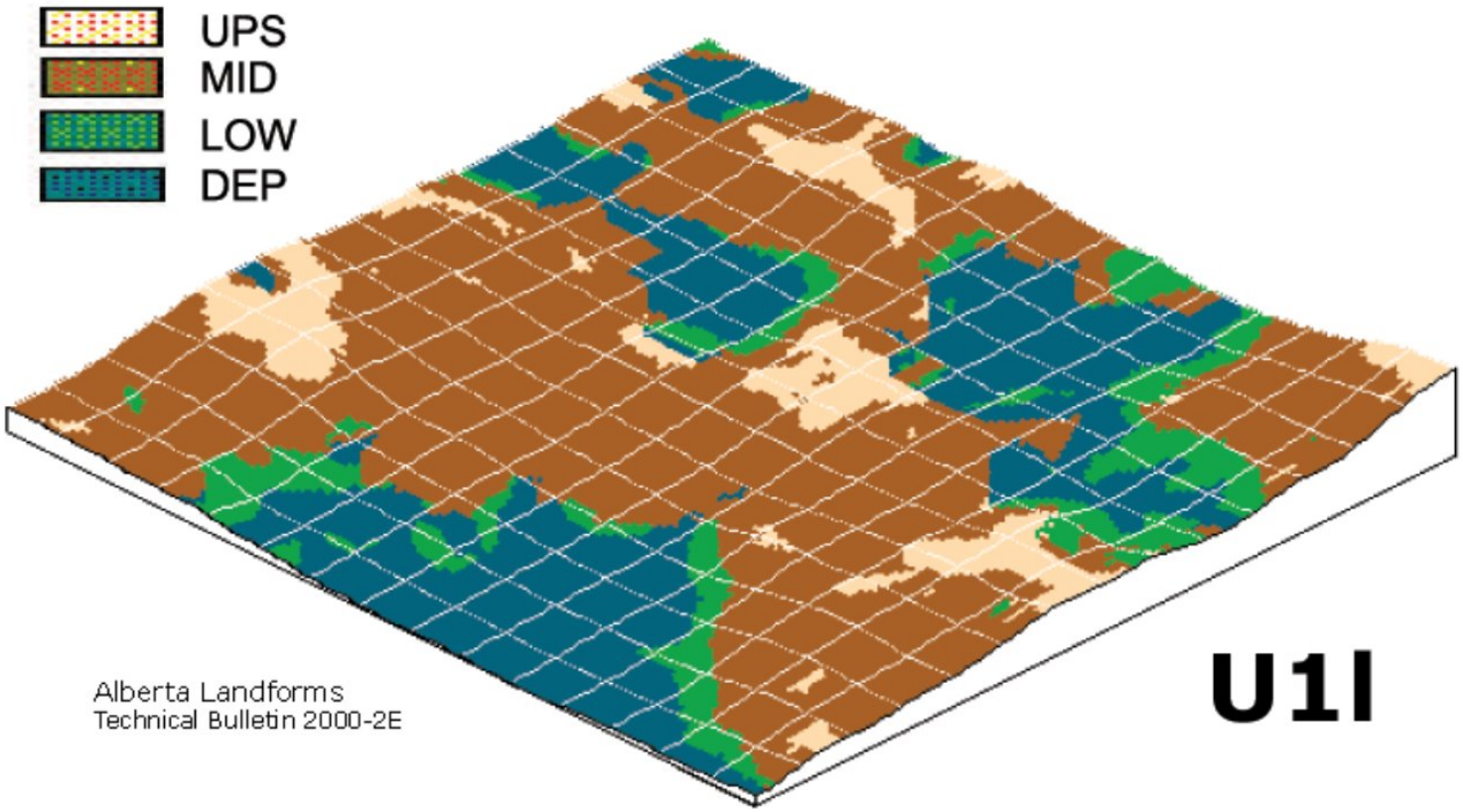
Report on Soil Polygon: 5863

Variable	Value
POLY_ID	5863
Map Unit Name	LET5/U1l
Landform	U1l - undulating - low relief
LSRS Rating (Spring Grains)	3M(10)

Landscape Model Descriptions:
Orthic Dark Brown Chernozem on medium textured (L, SiL) sediments deposited by wind and water (LET).
The polygon includes soils that are finer textured than the dominant or co-dominant soils (5).
Undulating, low relief landform with a limiting slope of 2% (U1l).

Image:

Landform Model:



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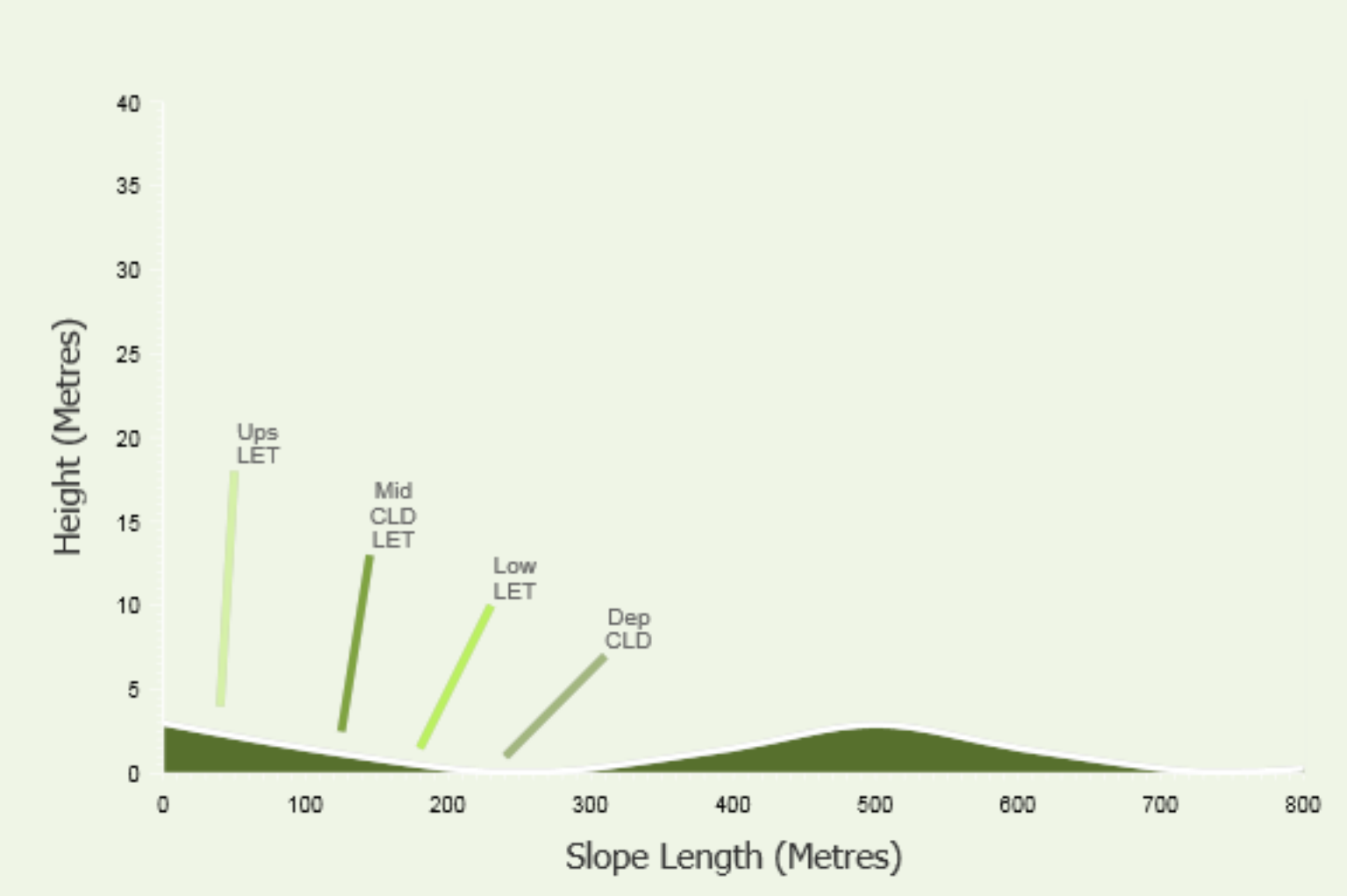
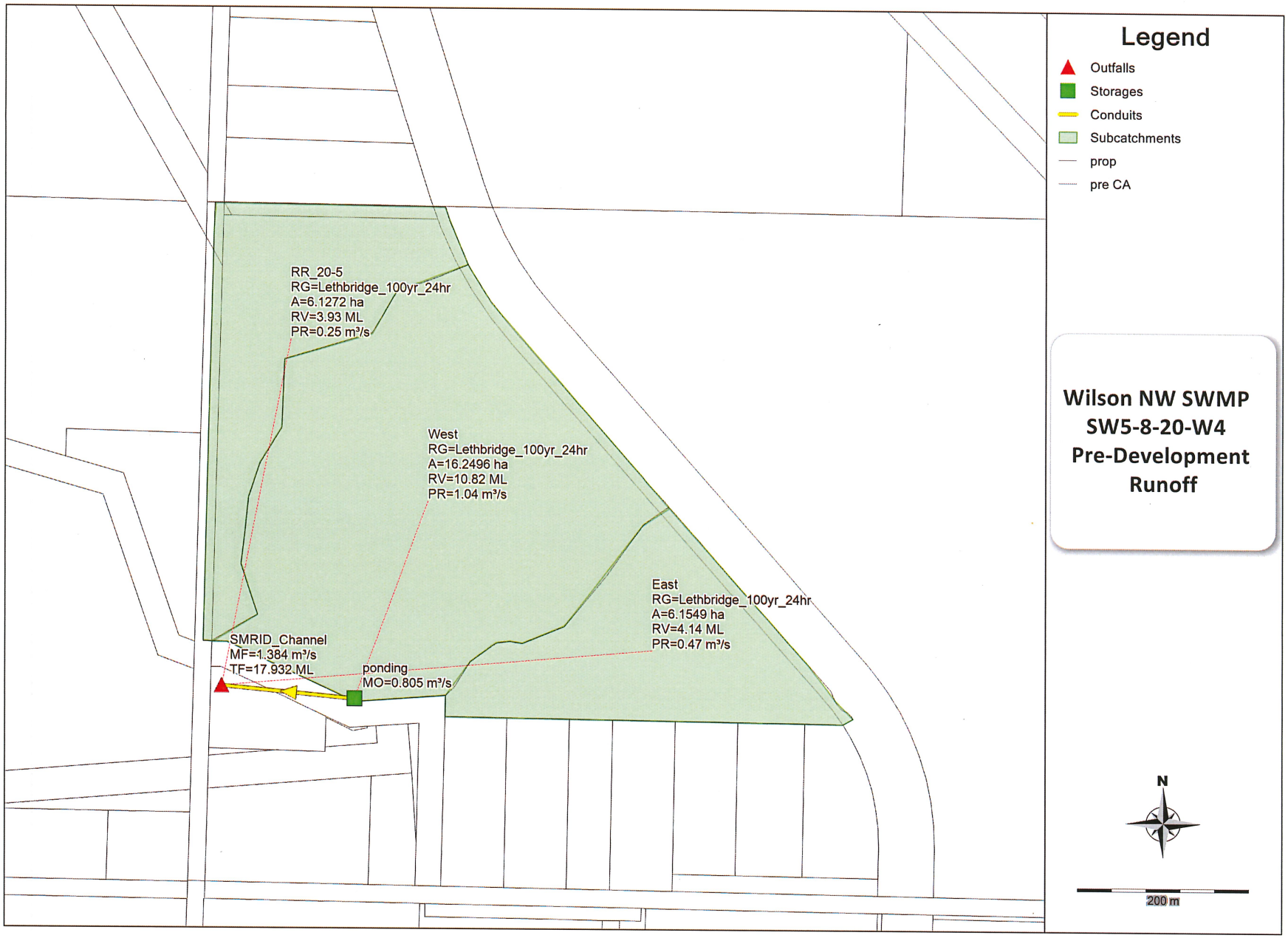


APPENDIX ‘B’ – SWMM

STORMWATER MANAGEMENT PLAN
COUNTRY CROSSROADS ESTATE SUBDIVISION
SW5-8-20-W4M
Lethbridge County, Alberta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RV=3.93 ML
PR=0.25 m³/s
West
RG=Lethbridge_100yr_24hr
A=16.2496 ha
RV=10.82 ML
PR=1.04 m³/s
East
RG=Lethbridge_100yr_24hr
A=6.1549 ha
RV=4.14 ML
PR=0.47 m³/s
SMRID_Channel
MF=1.384 m³/s
TF=17.932 ML
ponding
MO=0.805 m³/s
Legend
Outfalls
Storages
Conduits
Subcatchments
prop
pre CA
Wilson NW SWMP
SW5-8-20-W4
Pre-Development
Runoff
N
200 m

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[TITLE]
Wilson NW
Pre Development
24hr_100yr


[OPTIONS]
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;;------------------- ------------
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INFILTRATION         GREEN_AMPT
FLOW_ROUTING         DYNWAVE
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START_TIME           00:00:00
REPORT_START_DATE    05/27/2015
REPORT_START_TIME    00:00:00
END_DATE             06/10/2015
END_TIME             00:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          0:01:00
WET_STEP             0:05:00
DRY_STEP             0:05:00
ROUTING_STEP         5
ALLOW_PONDING        NO
INERTIAL_DAMPING     PARTIAL
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         0
NORMAL_FLOW_LIMITED  BOTH
SKIP_STEADY_STATE    NO
FORCE_MAIN_EQUATION  H-W
LINK_OFFSETS         DEPTH
MIN_SLOPE            0

[EVAPORATION]
;;Type          Parameters
;;------------- ----------
CONSTANT     0.0
DRY_ONLY     NO

[RAINGAGES]
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;;Name               Type      Intrvl  Catch   Source
;;------------------ --------- ------ ------ ----------
Lethbridge_100yr_24hr INTENSITY 0:05   1.0    TIMESERIES Chicago_24hr

[SUBCATCHMENTS]
;;                                                Total     Pcnt.             Pcnt.     Curb      Snow
;;Name           Raingage         Outlet           Area      Imperv   Width    Slope     Length    Pack
;;-------------- ---------------- ---------------- --------- -------- -------- --------- --------- ---------
East             Lethbridge_100yr_24hr SMRID_Channel 6.1549 0        175.854  1.05      0
```

```
RR_20-5          Lethbridge_100yr_24hr SMRID_Channel 6.1272 0        117.605  0.45     0
West             Lethbridge_100yr_24hr ponding     16.2496  0        350.963  1.11     0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
East             0.015      0.15       1          5          0          PERVIOUS   100
RR_20-5          0.015      0.15       1          5          0          PERVIOUS   100
West             0.015      0.15       1          5          0          PERVIOUS   100

[INFILTRATION]
;;Subcatchment   Suction    HydCon     IMDmax
;;-------------- ---------- ---------- ----------
East             292.2      0.5        0.25
RR_20-5          292.2      0.5        0.25
West             292.2      0.5        0.25

[OUTFALLS]
;;               Invert     Outfall      Stage/Table      Tide
;;Name           Elev.      Type         Time Series      Gate
;;-------------- ---------- ------------ ---------------- ----
SMRID_Channel    919.4      FREE                          NO

[STORAGE]
;;               Invert   Max.     Init.    Storage    Curve                      Ponded   Evap.
;;Name           Elev.    Depth    Depth    Curve      Params                     Area     Frac.    Infiltration parameters
;;-------------- -------- -------- -------- ---------- -------- -------- -------- -------- -------- ----------------------
ponding          922.2    2        0        TABULAR    Curve1                     0        0        292      0.5      0.26

[CONDUITS]
;;               Inlet            Outlet                      Manning    Inlet      Outlet     Init.      Max.
;;Name           Node             Node             Length     N          Offset     Offset     Flow       Flow
;;-------------- ---------------- ---------------- ---------- ---------- ---------- ---------- ---------- ----------
C1               ponding          SMRID_Channel    10         0.15       0.4        2          0          0

[XSECTIONS]
;;Link           Shape        Geom1            Geom2      Geom3      Geom4      Barrels
;;-------------- ------------ ---------------- ---------- ---------- ---------- ----------
C1               TRAPEZOIDAL  1                10         5          5          1

[LOSSES]
;;Link           Inlet      Outlet     Average    Flap Gate
;;-------------- ---------- ---------- ---------- ----------

[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
Curve1           Storage    0          600
Curve1                      0.2        1500
Curve1                      .4         5242
Curve1                      .6         8000

[TIMESERIES]
```

```
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
;Chicago design storm, a = 1019.2, b = 0, c = 0.731, Duration = 1440 minutes, r = 0.35, rain units = mm/hr.
Chicago_24hr                0:00       1.352
Chicago_24hr                0:05       1.361
Chicago_24hr                0:10       1.372
Chicago_24hr                0:15       1.382
Chicago_24hr                0:20       1.392
Chicago_24hr                0:25       1.403
Chicago_24hr                0:30       1.414
Chicago_24hr                0:35       1.425
Chicago_24hr                0:40       1.436
Chicago_24hr                0:45       1.448
Chicago_24hr                0:50       1.459
Chicago_24hr                0:55       1.471
Chicago_24hr                1:00       1.483
Chicago_24hr                1:05       1.496
Chicago_24hr                1:10       1.509
Chicago_24hr                1:15       1.521
Chicago_24hr                1:20       1.535
Chicago_24hr                1:25       1.548
Chicago_24hr                1:30       1.562
Chicago_24hr                1:35       1.576
Chicago_24hr                1:40       1.59
Chicago_24hr                1:45       1.605
Chicago_24hr                1:50       1.62
Chicago_24hr                1:55       1.635
Chicago_24hr                2:00       1.651
Chicago_24hr                2:05       1.667
Chicago_24hr                2:10       1.683
Chicago_24hr                2:15       1.7
Chicago_24hr                2:20       1.717
Chicago_24hr                2:25       1.735
Chicago_24hr                2:30       1.753
Chicago_24hr                2:35       1.771
Chicago_24hr                2:40       1.79
Chicago_24hr                2:45       1.809
Chicago_24hr                2:50       1.829
Chicago_24hr                2:55       1.85
Chicago_24hr                3:00       1.871
Chicago_24hr                3:05       1.892
Chicago_24hr                3:10       1.914
Chicago_24hr                3:15       1.937
Chicago_24hr                3:20       1.961
Chicago_24hr                3:25       1.985
Chicago_24hr                3:30       2.009
Chicago_24hr                3:35       2.035
Chicago_24hr                3:40       2.061
Chicago_24hr                3:45       2.089
Chicago_24hr                3:50       2.117
Chicago_24hr                3:55       2.146
Chicago_24hr                4:00       2.176
Chicago_24hr                4:05       2.206
```

Chicago_24hr	4:10	2.238
Chicago_24hr	4:15	2.272
Chicago_24hr	4:20	2.306
Chicago_24hr	4:25	2.341
Chicago_24hr	4:30	2.378
Chicago_24hr	4:35	2.416
Chicago_24hr	4:40	2.456
Chicago_24hr	4:45	2.498
Chicago_24hr	4:50	2.541
Chicago_24hr	4:55	2.585
Chicago_24hr	5:00	2.632
Chicago_24hr	5:05	2.681
Chicago_24hr	5:10	2.732
Chicago_24hr	5:15	2.785
Chicago_24hr	5:20	2.841
Chicago_24hr	5:25	2.9
Chicago_24hr	5:30	2.961
Chicago_24hr	5:35	3.026
Chicago_24hr	5:40	3.094
Chicago_24hr	5:45	3.166
Chicago_24hr	5:50	3.242
Chicago_24hr	5:55	3.323
Chicago_24hr	6:00	3.408
Chicago_24hr	6:05	3.499
Chicago_24hr	6:10	3.596
Chicago_24hr	6:15	3.699
Chicago_24hr	6:20	3.81
Chicago_24hr	6:25	3.929
Chicago_24hr	6:30	4.057
Chicago_24hr	6:35	4.195
Chicago_24hr	6:40	4.346
Chicago_24hr	6:45	4.509
Chicago_24hr	6:50	4.688
Chicago_24hr	6:55	4.885
Chicago_24hr	7:00	5.102
Chicago_24hr	7:05	5.344
Chicago_24hr	7:10	5.615
Chicago_24hr	7:15	5.921
Chicago_24hr	7:20	6.269
Chicago_24hr	7:25	6.67
Chicago_24hr	7:30	7.139
Chicago_24hr	7:35	7.693
Chicago_24hr	7:40	8.361
Chicago_24hr	7:45	9.186
Chicago_24hr	7:50	10.234
Chicago_24hr	7:55	11.619
Chicago_24hr	8:00	13.551
Chicago_24hr	8:05	16.477
Chicago_24hr	8:10	21.566
Chicago_24hr	8:15	33.491
Chicago_24hr	8:20	286.165
Chicago_24hr	8:25	92.134
Chicago_24hr	8:30	42.664

Chicago_24hr	8:35	30.072
Chicago_24hr	8:40	23.803
Chicago_24hr	8:45	19.955
Chicago_24hr	8:50	17.317
Chicago_24hr	8:55	15.38
Chicago_24hr	9:00	13.889
Chicago_24hr	9:05	12.7
Chicago_24hr	9:10	11.728
Chicago_24hr	9:15	10.915
Chicago_24hr	9:20	10.224
Chicago_24hr	9:25	9.629
Chicago_24hr	9:30	9.109
Chicago_24hr	9:35	8.652
Chicago_24hr	9:40	8.245
Chicago_24hr	9:45	7.881
Chicago_24hr	9:50	7.553
Chicago_24hr	9:55	7.255
Chicago_24hr	10:00	6.984
Chicago_24hr	10:05	6.736
Chicago_24hr	10:10	6.507
Chicago_24hr	10:15	6.296
Chicago_24hr	10:20	6.101
Chicago_24hr	10:25	5.919
Chicago_24hr	10:30	5.75
Chicago_24hr	10:35	5.592
Chicago_24hr	10:40	5.444
Chicago_24hr	10:45	5.304
Chicago_24hr	10:50	5.173
Chicago_24hr	10:55	5.049
Chicago_24hr	11:00	4.932
Chicago_24hr	11:05	4.822
Chicago_24hr	11:10	4.717
Chicago_24hr	11:15	4.617
Chicago_24hr	11:20	4.522
Chicago_24hr	11:25	4.431
Chicago_24hr	11:30	4.345
Chicago_24hr	11:35	4.263
Chicago_24hr	11:40	4.184
Chicago_24hr	11:45	4.109
Chicago_24hr	11:50	4.036
Chicago_24hr	11:55	3.967
Chicago_24hr	12:00	3.901
Chicago_24hr	12:05	3.837
Chicago_24hr	12:10	3.775
Chicago_24hr	12:15	3.716
Chicago_24hr	12:20	3.659
Chicago_24hr	12:25	3.604
Chicago_24hr	12:30	3.55
Chicago_24hr	12:35	3.499
Chicago_24hr	12:40	3.449
Chicago_24hr	12:45	3.401
Chicago_24hr	12:50	3.355
Chicago_24hr	12:55	3.31

Chicago_24hr	13:00	3.267
Chicago_24hr	13:05	3.224
Chicago_24hr	13:10	3.183
Chicago_24hr	13:15	3.144
Chicago_24hr	13:20	3.105
Chicago_24hr	13:25	3.068
Chicago_24hr	13:30	3.031
Chicago_24hr	13:35	2.996
Chicago_24hr	13:40	2.961
Chicago_24hr	13:45	2.928
Chicago_24hr	13:50	2.895
Chicago_24hr	13:55	2.863
Chicago_24hr	14:00	2.832
Chicago_24hr	14:05	2.802
Chicago_24hr	14:10	2.773
Chicago_24hr	14:15	2.744
Chicago_24hr	14:20	2.716
Chicago_24hr	14:25	2.689
Chicago_24hr	14:30	2.662
Chicago_24hr	14:35	2.636
Chicago_24hr	14:40	2.61
Chicago_24hr	14:45	2.585
Chicago_24hr	14:50	2.561
Chicago_24hr	14:55	2.537
Chicago_24hr	15:00	2.514
Chicago_24hr	15:05	2.491
Chicago_24hr	15:10	2.469
Chicago_24hr	15:15	2.447
Chicago_24hr	15:20	2.425
Chicago_24hr	15:25	2.404
Chicago_24hr	15:30	2.384
Chicago_24hr	15:35	2.364
Chicago_24hr	15:40	2.344
Chicago_24hr	15:45	2.325
Chicago_24hr	15:50	2.306
Chicago_24hr	15:55	2.287
Chicago_24hr	16:00	2.269
Chicago_24hr	16:05	2.251
Chicago_24hr	16:10	2.233
Chicago_24hr	16:15	2.216
Chicago_24hr	16:20	2.199
Chicago_24hr	16:25	2.183
Chicago_24hr	16:30	2.166
Chicago_24hr	16:35	2.15
Chicago_24hr	16:40	2.134
Chicago_24hr	16:45	2.119
Chicago_24hr	16:50	2.104
Chicago_24hr	16:55	2.089
Chicago_24hr	17:00	2.074
Chicago_24hr	17:05	2.059
Chicago_24hr	17:10	2.045
Chicago_24hr	17:15	2.031
Chicago_24hr	17:20	2.017

Chicago_24hr	17:25	2.004
Chicago_24hr	17:30	1.99
Chicago_24hr	17:35	1.977
Chicago_24hr	17:40	1.964
Chicago_24hr	17:45	1.951
Chicago_24hr	17:50	1.939
Chicago_24hr	17:55	1.926
Chicago_24hr	18:00	1.914
Chicago_24hr	18:05	1.902
Chicago_24hr	18:10	1.89
Chicago_24hr	18:15	1.879
Chicago_24hr	18:20	1.867
Chicago_24hr	18:25	1.856
Chicago_24hr	18:30	1.845
Chicago_24hr	18:35	1.834
Chicago_24hr	18:40	1.823
Chicago_24hr	18:45	1.812
Chicago_24hr	18:50	1.802
Chicago_24hr	18:55	1.791
Chicago_24hr	19:00	1.781
Chicago_24hr	19:05	1.771
Chicago_24hr	19:10	1.761
Chicago_24hr	19:15	1.751
Chicago_24hr	19:20	1.741
Chicago_24hr	19:25	1.732
Chicago_24hr	19:30	1.722
Chicago_24hr	19:35	1.713
Chicago_24hr	19:40	1.704
Chicago_24hr	19:45	1.695
Chicago_24hr	19:50	1.686
Chicago_24hr	19:55	1.677
Chicago_24hr	20:00	1.668
Chicago_24hr	20:05	1.659
Chicago_24hr	20:10	1.651
Chicago_24hr	20:15	1.642
Chicago_24hr	20:20	1.634
Chicago_24hr	20:25	1.626
Chicago_24hr	20:30	1.617
Chicago_24hr	20:35	1.609
Chicago_24hr	20:40	1.601
Chicago_24hr	20:45	1.593
Chicago_24hr	20:50	1.586
Chicago_24hr	20:55	1.578
Chicago_24hr	21:00	1.57
Chicago_24hr	21:05	1.563
Chicago_24hr	21:10	1.555
Chicago_24hr	21:15	1.548
Chicago_24hr	21:20	1.541
Chicago_24hr	21:25	1.534
Chicago_24hr	21:30	1.526
Chicago_24hr	21:35	1.519
Chicago_24hr	21:40	1.512
Chicago_24hr	21:45	1.506

```
Chicago_24hr               21:50      1.499
Chicago_24hr               21:55      1.492
Chicago_24hr               22:00      1.485
Chicago_24hr               22:05      1.479
Chicago_24hr               22:10      1.472
Chicago_24hr               22:15      1.466
Chicago_24hr               22:20      1.459
Chicago_24hr               22:25      1.453
Chicago_24hr               22:30      1.447
Chicago_24hr               22:35      1.441
Chicago_24hr               22:40      1.434
Chicago_24hr               22:45      1.428
Chicago_24hr               22:50      1.422
Chicago_24hr               22:55      1.416
Chicago_24hr               23:00      1.411
Chicago_24hr               23:05      1.405
Chicago_24hr               23:10      1.399
Chicago_24hr               23:15      1.393
Chicago_24hr               23:20      1.387
Chicago_24hr               23:25      1.382
Chicago_24hr               23:30      1.376
Chicago_24hr               23:35      1.371
Chicago_24hr               23:40      1.365
Chicago_24hr               23:45      1.36
Chicago_24hr               23:50      1.355
Chicago_24hr               23:55      1.349
Chicago_24hr               24:00      0

[REPORT]
INPUT      YES
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS       377904.216833746 5496889.70168789 378739.664103158 5497557.43227258
UNITS            Meters

[COORDINATES]
;;Node           X-Coord          Y-Coord
;;-------------- ---------------- ----------------
SMRID_Channel    377963.916       5496961.816
ponding          378118.806       5496947.119

[VERTICES]
;;Link           X-Coord          Y-Coord
;;-------------- ---------------- ----------------

[POLYGONS]
;;Subcatchment   X-Coord          Y-Coord
```

;;--------------	----------------	----------------
East	378647.629	5496990.979
East	378680.915	5496947.538
East	378701.689	5496926.631
East	378690.051	5496920.053
East	378224.399	5496926.503
East	378225.097	5496951.351
East	378253.272	5496991.199
East	378283.862	5497013.739
East	378300.364	5497015.349
East	378314.452	5497013.336
East	378363.959	5497033.461
East	378455.327	5497151.796
East	378486.776	5497171.774
East	378647.629	5496990.979
RR_20-5	377953.069	5497013.256
RR_20-5	377942.192	5497015.069
RR_20-5	377954.256	5497496.649
RR_20-5	377956.131	5497527.081
RR_20-5	378223.649	5497523.406
RR_20-5	378228.794	5497509.442
RR_20-5	378250.393	5497457.066
RR_20-5	378166.998	5497425.158
RR_20-5	378138.716	5497375.121
RR_20-5	378036.828	5497344.663
RR_20-5	378033.202	5497264.168
RR_20-5	378007.821	5497222.833
RR_20-5	377994.405	5497182.223
RR_20-5	377989.203	5497129.584
RR_20-5	377986.065	5497104.266
RR_20-5	378005.645	5497045.164
RR_20-5	377953.069	5497013.256
West	378145.362	5497387.565
West	378166.998	5497425.158
West	378250.393	5497457.066
West	378277.588	5497412.105
West	378486.776	5497171.774
West	378455.327	5497151.796
West	378363.959	5497033.461
West	378314.452	5497013.336
West	378300.364	5497015.349
West	378283.862	5497013.739
West	378253.272	5496991.199
West	378225.097	5496951.351
West	378118.773	5496944.001
West	377970.111	5497013.256
West	377953.069	5497013.256
West	378005.645	5497045.164
West	377986.065	5497104.266
West	377994.405	5497182.223
West	378007.821	5497222.833
West	378033.202	5497264.168
West	378036.828	5497344.663

```
West              378138.716        5497375.121
West              378145.362        5497387.565

[SYMBOLS]
;;Gage            X-Coord           Y-Coord
;;--------------- ----------------- -----------------
```

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.022)

Wilson NW
Pre Development
24hr_100yr

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CMS
Process Models:
  Rainfall/Runoff ..... YES
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Infiltration Method ..... GREEN_AMPT
Flow Routing Method ..... DYNWAVE
Starting Date MAY-27-2015 00:00:00
Ending Date JUN-10-2015 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Wet Time Step 00:05:00
Dry Time Step 00:05:00
Routing Time Step ..... 5.00 sec

****
Element Count
****
Number of rain gages 1
Number of subcatchments ... 3
Number of nodes 2
Number of links 1
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval

Lethbridge_100yr_24hrChicago_24hr INTENSITY 5 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
East	6.15	175.85	0.00	1.0500	Lethbridge_100yr_24hr	SMRID_Channel
RR_20-5	6.13	117.61	0.00	0.4500	Lethbridge_100yr_24hr	SMRID_Channel
West	16.25	350.96	0.00	1.1100	Lethbridge_100yr_24hr	ponding

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
SMRID_Channel	OUTFALL	919.40	3.00	0.0	
ponding	STORAGE	922.20	2.00	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
C1	ponding	SMRID_Channel	CONDUIT	10.0	12.0873	0.1500

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C1	TRAPEZOIDAL	1.00	15.00	0.74	20.00	1	28.52

********** Runoff Quantity Continuity **********	Volume hectare-m	Depth mm
Total Precipitation	3.428	120.145
Evaporation Loss	0.000	0.000
Infiltration Loss	1.541	54.016
Surface Runoff	1.889	66.224
Final Surface Storage	0.000	0.000
Continuity Error (%)	-0.079	

**********	Volume	Volume

Flow Routing Continuity	hectare-m	10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	1.889	18.895
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	1.793	17.932
Internal Outflow	0.000	0.000
Storage Losses	0.066	0.656
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.031	0.307
Continuity Error (%)	0.001	

****
Time-Step Critical Elements
****
None

****
Highest Flow Instability Indexes
****
All links are stable.

****
Routing Time Step Summary
****

Minimum Time Step	:	5.00 sec
Average Time Step	:	5.00 sec
Maximum Time Step	:	5.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	2.00

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
East	120.15	0.00	0.00	52.96	67.31	4.14	0.47	0.560
RR_20-5	120.15	0.00	0.00	56.01	64.19	3.93	0.25	0.534
West	120.15	0.00	0.00	53.66	66.58	10.82	1.04	0.554

****
Node Depth Summary

****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min
SMRID_Channel	OUTFALL	0.00	0.00	919.40	0 00:00
ponding	STORAGE	0.33	0.57	922.77	0 09:20

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr
SMRID_Channel	OUTFALL	0.720	1.384	0 09:13	8.076	17.932
ponding	STORAGE	1.039	1.039	0 08:40	10.819	10.819

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	E&I Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
ponding	0.590	2	6	1.961	7	0 09:20	0.805

****
Outfall Loading Summary

****

Outfall Node	Flow Freq. Pcnt.	Avg. Flow CMS	Max. Flow CMS	Total Volume 10^6 ltr
SMRID_Channel	7.81	0.190	1.384	17.932
System	7.81	0.190	1.384	17.932

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	0.805	0 09:20	0.60	0.03	0.13

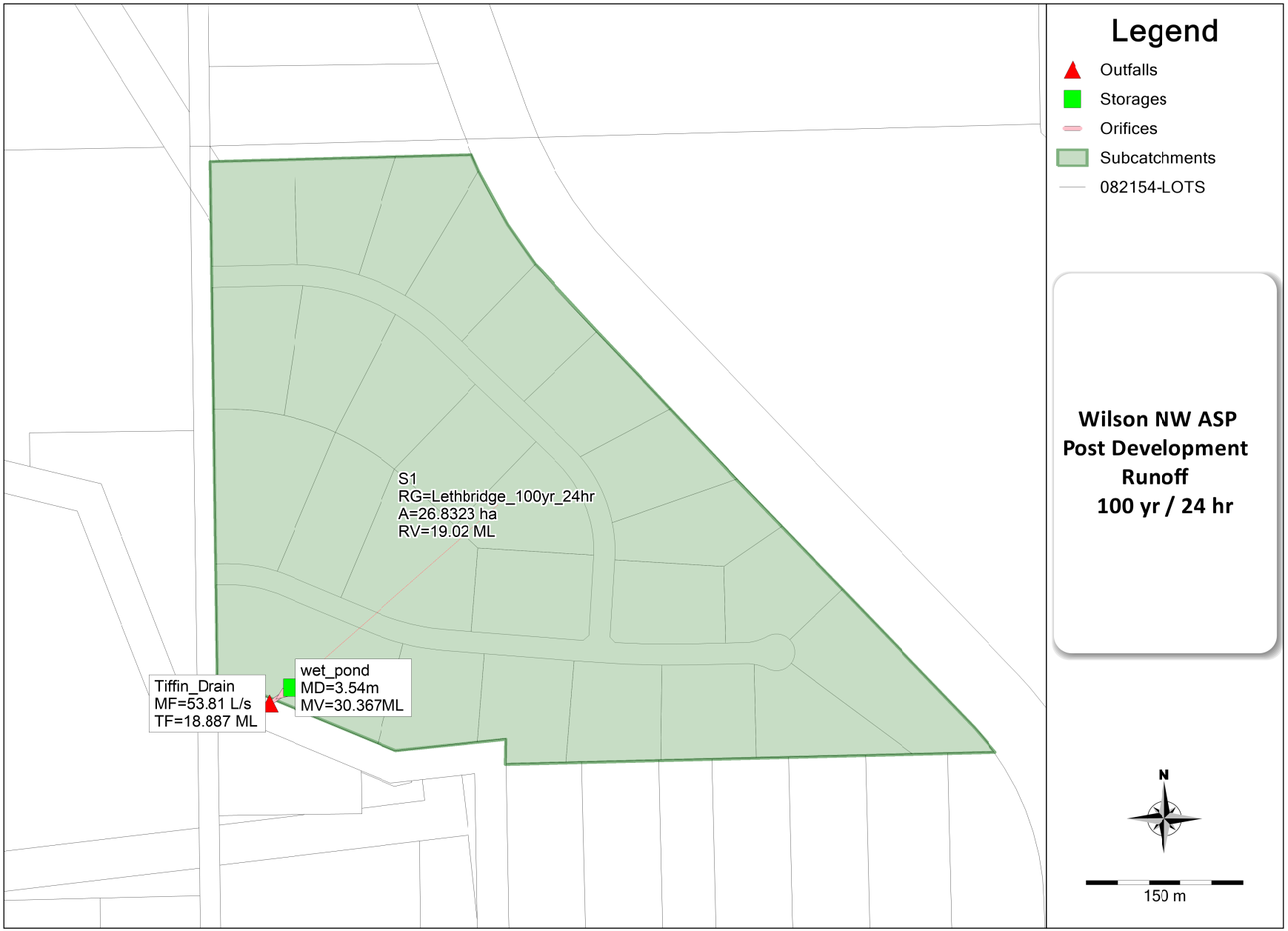
****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	--- Fraction of Time in Flow Class ---- Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Avg. Froude Number	Avg. Flow Change
C1	1.00	0.92	0.00	0.00	0.00	0.00	0.00	0.08	0.03	0.0000

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Tue Apr 16 11:34:37 2019
Analysis ended on: Tue Apr 16 11:34:38 2019
Total elapsed time: 00:00:01


S1
RG=Lethbridge_100yr_24hr
A=26.8323 ha
RV=19.02 ML
wet_pond
MD=3.54m
MV=30.367ML
Tiffin_Drain
MF=53.81 L/s
TF=18.887 ML
Legend
Outfalls
Storages
Orifices
Subcatchments
082154-LOTS
Wilson NW ASP
Post Development
Runoff
100 yr / 24 hr
N
150 m

```
[TITLE]
Wilson NW
Post Development
24hr_100yr

[OPTIONS]
;;Options             Value
;;------------------- ------------
FLOW_UNITS           LPS
INFILTRATION         GREEN_AMPT
FLOW_ROUTING         DYNWAVE
LINK_OFFSETS         DEPTH
MIN_SLOPE            0
ALLOW_PONDING        NO
SKIP_STEADY_STATE    NO

START_DATE           06/01/2020
START_TIME           00:00:00
REPORT_START_DATE    06/01/2020
REPORT_START_TIME    00:00:00
END_DATE             06/12/2020
END_TIME             06:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          00:01:00
WET_STEP             00:05:00
DRY_STEP             00:05:00
ROUTING_STEP         5

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         0

[EVAPORATION]
;;Type          Parameters
;;------------- ----------
CONSTANT         0.0
```

```
DRY_ONLY         NO

[RAINGAGES]
;;                   Rain      Time     Snow     Data
;;Name              Type      Intrvl   Catch    Source
;;------------------ --------- -------- -------- ----------
Lethbridge_100yr_24hr INTENSITY 0:05     1.0      TIMESERIES Chicago_24hr

[SUBCATCHMENTS]
;;                                          Total    Pcnt.             Pcnt.    Curb     Snow
;;Name           Raingage         Outlet     Area     Imperv   Width    Slope    Length   Pack
;;-------------- ---------------- ---------- -------- -------- -------- -------- -------- --------
S1               Lethbridge_100yr_24hr wet_pond    26.8323  10       528.29   1        0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
S1               0.015      0.15       1          5          0          PERVIOUS   100

[INFILTRATION]
;;Subcatchment   Suction    HydCon     IMDmax
;;-------------- ---------- ---------- ----------
S1               292.2      0.5        0.25

[OUTFALLS]
;;               Invert     Outfall    Stage/Table      Tide
;;Name           Elev.      Type       Time Series      Gate
;;-------------- ---------- ---------- ---------------- --------
Tiffin_Drain     919.4      FREE                        NO

[STORAGE]
;;               Invert   Max.       Init.      Storage    Curve                                Evap.
;;Name           Elev.    Depth      Depth      Curve      Params                               Frac.
Infiltration parameters
;;-------------- -------- ---------- ---------- ---------- --------- --------- -------- -------- -------- ---------
--------------
wet_pond         918.9    4.1        2          TABULAR    wet_pond                  0        0

[ORIFICES]
;;               Inlet            Outlet           Orifice      Crest      Disch.     Flap Open/Close
;;Name           Node             Node             Type         Height     Coeff.     Gate Time
;;-------------- ---------------- ---------------- ------------ ---------- ---------- ---- ----------
```

```
C1               wet_pond         Tiffin_Drain     SIDE         2          0.65       NO       0

[XSECTIONS]
;;Link           Shape        Geom1            Geom2      Geom3      Geom4      Barrels
;;-------------- ------------ ---------------- ---------- ---------- ---------- ----------
C1               CIRCULAR     0.14             0          0          0

[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
Curve1           Storage    0          600
Curve1                      0.2        1500
Curve1                      0.4        5242
Curve1                      0.6        8000

wet_pond         Storage    0          5700
wet_pond                    1          6900
wet_pond                    2          8800
wet_pond                    3          10900
wet_pond                    3.5        12400
wet_pond                    4.1        13900

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
;Chicago design storm, a = 1019.2, b = 0, c = 0.731, Duration = 1440 minutes, r = 0.35, rain units = mm/hr.
Chicago_24hr                0:00       1.352
Chicago_24hr                0:05       1.361
Chicago_24hr                0:10       1.372
Chicago_24hr                0:15       1.382
Chicago_24hr                0:20       1.392
Chicago_24hr                0:25       1.403
Chicago_24hr                0:30       1.414
Chicago_24hr                0:35       1.425
Chicago_24hr                0:40       1.436
Chicago_24hr                0:45       1.448
Chicago_24hr                0:50       1.459
Chicago_24hr                0:55       1.471
Chicago_24hr                1:00       1.483
Chicago_24hr                1:05       1.496
Chicago_24hr                1:10       1.509
```

Chicago_24hr	1:15	1.521
Chicago_24hr	1:20	1.535
Chicago_24hr	1:25	1.548
Chicago_24hr	1:30	1.562
Chicago_24hr	1:35	1.576
Chicago_24hr	1:40	1.59
Chicago_24hr	1:45	1.605
Chicago_24hr	1:50	1.62
Chicago_24hr	1:55	1.635
Chicago_24hr	2:00	1.651
Chicago_24hr	2:05	1.667
Chicago_24hr	2:10	1.683
Chicago_24hr	2:15	1.7
Chicago_24hr	2:20	1.717
Chicago_24hr	2:25	1.735
Chicago_24hr	2:30	1.753
Chicago_24hr	2:35	1.771
Chicago_24hr	2:40	1.79
Chicago_24hr	2:45	1.809
Chicago_24hr	2:50	1.829
Chicago_24hr	2:55	1.85
Chicago_24hr	3:00	1.871
Chicago_24hr	3:05	1.892
Chicago_24hr	3:10	1.914
Chicago_24hr	3:15	1.937
Chicago_24hr	3:20	1.961
Chicago_24hr	3:25	1.985
Chicago_24hr	3:30	2.009
Chicago_24hr	3:35	2.035
Chicago_24hr	3:40	2.061
Chicago_24hr	3:45	2.089
Chicago_24hr	3:50	2.117
Chicago_24hr	3:55	2.146
Chicago_24hr	4:00	2.176
Chicago_24hr	4:05	2.206
Chicago_24hr	4:10	2.238
Chicago_24hr	4:15	2.272
Chicago_24hr	4:20	2.306
Chicago_24hr	4:25	2.341
Chicago_24hr	4:30	2.378
Chicago_24hr	4:35	2.416

Chicago_24hr	4:40	2.456
Chicago_24hr	4:45	2.498
Chicago_24hr	4:50	2.541
Chicago_24hr	4:55	2.585
Chicago_24hr	5:00	2.632
Chicago_24hr	5:05	2.681
Chicago_24hr	5:10	2.732
Chicago_24hr	5:15	2.785
Chicago_24hr	5:20	2.841
Chicago_24hr	5:25	2.9
Chicago_24hr	5:30	2.961
Chicago_24hr	5:35	3.026
Chicago_24hr	5:40	3.094
Chicago_24hr	5:45	3.166
Chicago_24hr	5:50	3.242
Chicago_24hr	5:55	3.323
Chicago_24hr	6:00	3.408
Chicago_24hr	6:05	3.499
Chicago_24hr	6:10	3.596
Chicago_24hr	6:15	3.699
Chicago_24hr	6:20	3.81
Chicago_24hr	6:25	3.929
Chicago_24hr	6:30	4.057
Chicago_24hr	6:35	4.195
Chicago_24hr	6:40	4.346
Chicago_24hr	6:45	4.509
Chicago_24hr	6:50	4.688
Chicago_24hr	6:55	4.885
Chicago_24hr	7:00	5.102
Chicago_24hr	7:05	5.344
Chicago_24hr	7:10	5.615
Chicago_24hr	7:15	5.921
Chicago_24hr	7:20	6.269
Chicago_24hr	7:25	6.67
Chicago_24hr	7:30	7.139
Chicago_24hr	7:35	7.693
Chicago_24hr	7:40	8.361
Chicago_24hr	7:45	9.186
Chicago_24hr	7:50	10.234
Chicago_24hr	7:55	11.619
Chicago_24hr	8:00	13.551

Chicago_24hr	8:05	16.477
Chicago_24hr	8:10	21.566
Chicago_24hr	8:15	33.491
Chicago_24hr	8:20	286.165
Chicago_24hr	8:25	92.134
Chicago_24hr	8:30	42.664
Chicago_24hr	8:35	30.072
Chicago_24hr	8:40	23.803
Chicago_24hr	8:45	19.955
Chicago_24hr	8:50	17.317
Chicago_24hr	8:55	15.38
Chicago_24hr	9:00	13.889
Chicago_24hr	9:05	12.7
Chicago_24hr	9:10	11.728
Chicago_24hr	9:15	10.915
Chicago_24hr	9:20	10.224
Chicago_24hr	9:25	9.629
Chicago_24hr	9:30	9.109
Chicago_24hr	9:35	8.652
Chicago_24hr	9:40	8.245
Chicago_24hr	9:45	7.881
Chicago_24hr	9:50	7.553
Chicago_24hr	9:55	7.255
Chicago_24hr	10:00	6.984
Chicago_24hr	10:05	6.736
Chicago_24hr	10:10	6.507
Chicago_24hr	10:15	6.296
Chicago_24hr	10:20	6.101
Chicago_24hr	10:25	5.919
Chicago_24hr	10:30	5.75
Chicago_24hr	10:35	5.592
Chicago_24hr	10:40	5.444
Chicago_24hr	10:45	5.304
Chicago_24hr	10:50	5.173
Chicago_24hr	10:55	5.049
Chicago_24hr	11:00	4.932
Chicago_24hr	11:05	4.822
Chicago_24hr	11:10	4.717
Chicago_24hr	11:15	4.617
Chicago_24hr	11:20	4.522
Chicago_24hr	11:25	4.431

Chicago_24hr	11:30	4.345
Chicago_24hr	11:35	4.263
Chicago_24hr	11:40	4.184
Chicago_24hr	11:45	4.109
Chicago_24hr	11:50	4.036
Chicago_24hr	11:55	3.967
Chicago_24hr	12:00	3.901
Chicago_24hr	12:05	3.837
Chicago_24hr	12:10	3.775
Chicago_24hr	12:15	3.716
Chicago_24hr	12:20	3.659
Chicago_24hr	12:25	3.604
Chicago_24hr	12:30	3.55
Chicago_24hr	12:35	3.499
Chicago_24hr	12:40	3.449
Chicago_24hr	12:45	3.401
Chicago_24hr	12:50	3.355
Chicago_24hr	12:55	3.31
Chicago_24hr	13:00	3.267
Chicago_24hr	13:05	3.224
Chicago_24hr	13:10	3.183
Chicago_24hr	13:15	3.144
Chicago_24hr	13:20	3.105
Chicago_24hr	13:25	3.068
Chicago_24hr	13:30	3.031
Chicago_24hr	13:35	2.996
Chicago_24hr	13:40	2.961
Chicago_24hr	13:45	2.928
Chicago_24hr	13:50	2.895
Chicago_24hr	13:55	2.863
Chicago_24hr	14:00	2.832
Chicago_24hr	14:05	2.802
Chicago_24hr	14:10	2.773
Chicago_24hr	14:15	2.744
Chicago_24hr	14:20	2.716
Chicago_24hr	14:25	2.689
Chicago_24hr	14:30	2.662
Chicago_24hr	14:35	2.636
Chicago_24hr	14:40	2.61
Chicago_24hr	14:45	2.585
Chicago_24hr	14:50	2.561

Chicago_24hr	14:55	2.537
Chicago_24hr	15:00	2.514
Chicago_24hr	15:05	2.491
Chicago_24hr	15:10	2.469
Chicago_24hr	15:15	2.447
Chicago_24hr	15:20	2.425
Chicago_24hr	15:25	2.404
Chicago_24hr	15:30	2.384
Chicago_24hr	15:35	2.364
Chicago_24hr	15:40	2.344
Chicago_24hr	15:45	2.325
Chicago_24hr	15:50	2.306
Chicago_24hr	15:55	2.287
Chicago_24hr	16:00	2.269
Chicago_24hr	16:05	2.251
Chicago_24hr	16:10	2.233
Chicago_24hr	16:15	2.216
Chicago_24hr	16:20	2.199
Chicago_24hr	16:25	2.183
Chicago_24hr	16:30	2.166
Chicago_24hr	16:35	2.15
Chicago_24hr	16:40	2.134
Chicago_24hr	16:45	2.119
Chicago_24hr	16:50	2.104
Chicago_24hr	16:55	2.089
Chicago_24hr	17:00	2.074
Chicago_24hr	17:05	2.059
Chicago_24hr	17:10	2.045
Chicago_24hr	17:15	2.031
Chicago_24hr	17:20	2.017
Chicago_24hr	17:25	2.004
Chicago_24hr	17:30	1.99
Chicago_24hr	17:35	1.977
Chicago_24hr	17:40	1.964
Chicago_24hr	17:45	1.951
Chicago_24hr	17:50	1.939
Chicago_24hr	17:55	1.926
Chicago_24hr	18:00	1.914
Chicago_24hr	18:05	1.902
Chicago_24hr	18:10	1.89
Chicago_24hr	18:15	1.879

Chicago_24hr	18:20	1.867
Chicago_24hr	18:25	1.856
Chicago_24hr	18:30	1.845
Chicago_24hr	18:35	1.834
Chicago_24hr	18:40	1.823
Chicago_24hr	18:45	1.812
Chicago_24hr	18:50	1.802
Chicago_24hr	18:55	1.791
Chicago_24hr	19:00	1.781
Chicago_24hr	19:05	1.771
Chicago_24hr	19:10	1.761
Chicago_24hr	19:15	1.751
Chicago_24hr	19:20	1.741
Chicago_24hr	19:25	1.732
Chicago_24hr	19:30	1.722
Chicago_24hr	19:35	1.713
Chicago_24hr	19:40	1.704
Chicago_24hr	19:45	1.695
Chicago_24hr	19:50	1.686
Chicago_24hr	19:55	1.677
Chicago_24hr	20:00	1.668
Chicago_24hr	20:05	1.659
Chicago_24hr	20:10	1.651
Chicago_24hr	20:15	1.642
Chicago_24hr	20:20	1.634
Chicago_24hr	20:25	1.626
Chicago_24hr	20:30	1.617
Chicago_24hr	20:35	1.609
Chicago_24hr	20:40	1.601
Chicago_24hr	20:45	1.593
Chicago_24hr	20:50	1.586
Chicago_24hr	20:55	1.578
Chicago_24hr	21:00	1.57
Chicago_24hr	21:05	1.563
Chicago_24hr	21:10	1.555
Chicago_24hr	21:15	1.548
Chicago_24hr	21:20	1.541
Chicago_24hr	21:25	1.534
Chicago_24hr	21:30	1.526
Chicago_24hr	21:35	1.519
Chicago_24hr	21:40	1.512

```
Chicago_24hr                21:45      1.506
Chicago_24hr                21:50      1.499
Chicago_24hr                21:55      1.492
Chicago_24hr                22:00      1.485
Chicago_24hr                22:05      1.479
Chicago_24hr                22:10      1.472
Chicago_24hr                22:15      1.466
Chicago_24hr                22:20      1.459
Chicago_24hr                22:25      1.453
Chicago_24hr                22:30      1.447
Chicago_24hr                22:35      1.441
Chicago_24hr                22:40      1.434
Chicago_24hr                22:45      1.428
Chicago_24hr                22:50      1.422
Chicago_24hr                22:55      1.416
Chicago_24hr                23:00      1.411
Chicago_24hr                23:05      1.405
Chicago_24hr                23:10      1.399
Chicago_24hr                23:15      1.393
Chicago_24hr                23:20      1.387
Chicago_24hr                23:25      1.382
Chicago_24hr                23:30      1.376
Chicago_24hr                23:35      1.371
Chicago_24hr                23:40      1.365
Chicago_24hr                23:45      1.36
Chicago_24hr                23:50      1.355
Chicago_24hr                23:55      1.349
Chicago_24hr                24:00      0

[REPORT]
;;Reporting Options
INPUT      YES
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS       94653.76445      5497995.49985    95477.67655      5498635.57115
```

```
UNITS            Meters

[COORDINATES]
;;Node           X-Coord          Y-Coord
;;-------------- ---------------- ----------------
Tiffin_Drain     94747.273        5498082.681
wet_pond         94768.7          5498097.743

[VERTICES]
;;Link           X-Coord          Y-Coord
;;-------------- ---------------- ----------------

[POLYGONS]
;;Subcatchment   X-Coord          Y-Coord
;;-------------- ---------------- ----------------
S1               94716.833        5498100.957
S1               94698.022        5498100.957
S1               94691.215        5498599.823
S1               94940.465        5498606.477
S1               94947.42         5498590.709
S1               94974.97         5498540.016
S1               95001.229        5498501.997
S1               95007.726        5498495.258
S1               95060.195        5498438.194
S1               95193.199        5498296.564
S1               95294.91         5498191.079
S1               95420.202        5498059.493
S1               95440.226        5498036.037
S1               94972.811        5498024.594
S1               94973.384        5498048.623
S1               94868.115        5498037.753
S1               94716.833        5498100.957

[SYMBOLS]
;;Gage           X-Coord          Y-Coord
;;-------------- ---------------- ----------------
```

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.022)

Wilson NW
Post Development
24hr_100yr

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... LPS
Process Models:
  Rainfall/Runoff ..... YES
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Infiltration Method ..... GREEN_AMPT
Flow Routing Method ..... DYNWAVE
Starting Date JUN-01-2020 00:00:00
Ending Date JUN-12-2020 06:00:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Wet Time Step 00:05:00
Dry Time Step 00:05:00
Routing Time Step ..... 5.00 sec

****
Element Count
****
Number of rain gages 1
Number of subcatchments ... 1

Number of nodes 2
Number of links 1
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
Lethbridge_100yr_24hr	Chicago_24hr	INTENSITY	5 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
S1	26.83	528.29	10.00	1.0000	Lethbridge_100yr_24hr	wet_pond

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
Tiffin_Drain	OUTFALL	919.40	2.14	0.0	
wet_pond	STORAGE	918.90	4.10	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
C1	wet_pond	Tiffin_Drain	ORIFICE			

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	3.224	120.145
Evaporation Loss	0.000	0.000
Infiltration Loss	1.325	49.373
Surface Runoff	1.902	70.870
Final Surface Storage	0.003	0.100
Continuity Error (%)	-0.165	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	1.902	19.016
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	1.889	18.887
Internal Outflow	0.000	0.000
Storage Losses	0.000	0.000
Initial Stored Volume	1.415	14.149
Final Stored Volume	1.428	14.278
Continuity Error (%)	0.000	

****
Time-Step Critical Elements
****
None

****
Highest Flow Instability Indexes
****
All links are stable.

****
Routing Time Step Summary
****
Minimum Time Step : 5.00 sec
Average Time Step : 5.00 sec
Maximum Time Step : 5.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 2.00

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
S1	120.15	0.00	0.00	49.37	70.87	19.02	1841.08	0.590

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min
Tiffin_Drain	OUTFALL	0.00	0.00	919.40	0 00:00
wet_pond	STORAGE	2.43	3.54	922.44	0 21:25

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr
Tiffin_Drain	OUTFALL	0.00	53.81	0 21:25	0.000	18.887
wet_pond	STORAGE	1841.06	1841.06	0 08:40	19.016	33.165

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
wet_pond	STORAGE	138.33	1.404	0.556

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

	Average	Avg	E&I	Maximum	Max	Time of Max	Maximum

Storage Unit	Volume 1000 m3	Pcnt Full	Pcnt Loss	Volume 1000 m3	Pcnt Full	Occurrence days hr:min	Outflow LPS
wet_pond	18.409	49	0	30.367	81	0 21:25	53.81

****
Outfall Loading Summary
****

Outfall Node	Flow Freq. Pcnt.	Avg. Flow LPS	Max. Flow LPS	Total Volume 10^6 ltr
Tiffin_Drain	96.96	20.04	53.81	18.887
System	96.96	20.04	53.81	18.887

****
Link Flow Summary
****

Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	ORIFICE	53.81	0 21:25			1.00

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Avg. Froude Number	Avg. Flow Change

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Tue Sep 14 13:24:12 2021
Analysis ended on: Tue Sep 14 13:24:12 2021
Total elapsed time: < 1 sec