Emerald Park Burger King

Comprehensive Development Proposal

January / 2023

GeoVerra Inc.

Statement of Qualifications and Limitations

The attached Comprehensive Development Proposal (CDP) has been prepared by GeoVerra, in association with Meridian Surveys Ltd., G. Griffiths + Associates Ltd., Jeffrey Elliott, Architect, WSP Canada Inc., and Ground Engineering Consultants Ltd. for the benefit of 102133212 Saskatchewan Ltd. to satisfy the subdivision application requirements in the RM of Edenwold No. 158.

The information, data, and recommendations within this CDP:

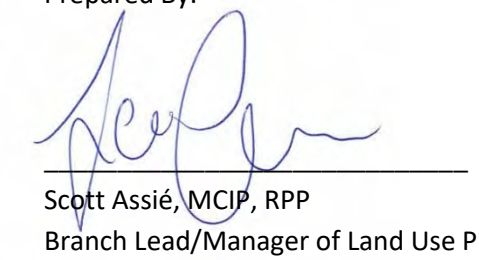
- are subject to the requirements outlined in the Official Community Plan and Zoning Bylaw;
- represent the consultant's professional judgement;
- have not been updated since the date of issuance, and their accuracy is limited to the time period and circumstances in which they were collected, processed, and interpreted; and,
- must not be read in sections, but rather as a whole.

The CDP is to be treated as confidential and may not be used by third parties, except:

- as agreed upon by the consultant and client;
- as required by law; and,
- for use by government referral agencies.

Any use of the CDP is subject to the Statements of Qualifications and Limitations. Any damages as a result of the improper use of the Plan shall be the responsibility of the party making such use.

Prepared By:



Scott Assié, MCIP, RPP
Branch Lead/Manager of Land Use Planning, GeoVerra

1. Background

1.1. Introduction

1.1.1. Purpose

The purpose of this Comprehensive Development Proposal (CDP) is to introduce a single parcel commercial subdivision, along with a proposal for a fast-food restaurant on that parcel within the RM of Edenwold No. 158 (RM). The CDP has been prepared and submitted in accordance with the RM's Official Community Plan (OCP) and Zoning Bylaw (ZB). This CDP is a compilation of information representing a framework for the development of the subject property over the short-term planning horizon.

Chapter 1.0 introduces the proposal, and subject area. Chapter 2.0 discusses the site in its current state with respect to the existing land use, as well as environmental features. The third and fourth chapter present the proposed subdivision, discussing: the concept plan and design rationale; and, offers a detailed look at the proposed land uses, connectivity and transportation, phasing, and serviceability of the project. Chapter 5.0 summarizes the public consultation plan.

1.1.2. Development Objectives

This development has the following objectives:

- To create separate title for a new commercial parcel through the subdivision process;
- To create public awareness and support for the proposed development; and,
- To develop a new restaurant in an existing commercial corridor to service the Emerald Park community.

1.1.3. Planning Context

The proposed subdivision consists of approximately 0.28 hectares (0.68 acres) of land in the northwesterly corner of Lot 1, Block 3, Plan 82R55377. An existing recycling business occupies the eastern portion of the source parcel.

1.1.4. Land Ownership

The source parcel for the proposed subdivision is Surface Parcel Number 111604700 **(Figure 1.1),** encompassing a total of 1.04 hectares (2.56 acres). The parcel is currently owned by Karl John Koschorke.

There are three interests registered on title. Interest Register Number 101208259 was registered in 1950 by Enbridge Pipelines Inc. for a Pipeline Easement. Interest Register Number 119359378 was registered in 2013 by Royal Bank of Canada for a mortgage. The third and final interest is Interest Register Number 123394338 for a lease less than 10 years, held by TruGreen Metal Recycling Inc. and TruGreen Energy Inc.

Copies of all titles and parcel pictures may be found in **Appendix A**.

Figure 1.1 – Air Photo - Lot 1, Block 3, Plan 82R55377

Source: Information Services Corporation (2022)

1.1.5. Location and Area

Located within the RM of Edenwold No. 158, the subject land is located on the west side of Emerald Park (**Figure 1.2)**. The site is bound by South Plains Road to the north, Great Plains Industrial Drive to the west, commercial land uses to the east, and industrial land uses to the south. The site is located within an existing commercial corridor with restaurants, a grocery store, pharmacy, hotel, and gas bar located immediately north, and a liquor store to the east.

Figure 1.2 – Air Photo - Surface Parcel within Emerald Park

Source: Information Services Corporation (2022)

2. Inventory and Analysis

The chapter will describe the existing natural features and built environment of the site. A full Topographic Survey is included as **Appendix B**.

2.1 Natural Environment

2.1.1 Natural Features

There are no natural features located within the proposed subdivision/development area.

2.1.2 Cultural Features

There are no known areas of cultural significance located within the proposed subdivision/development area.

2.1.3 Heritage Sensitive Areas

According to the RM's Lands with Special Designation Development Overlay Area Map in the Official Community Plan, there are no heritage sensitivity lands located within the proposed subdivision/development area.

2.1.4 Hazardous and Environmentally Sensitive Lands

According to the RM's Sensitive Environmental Areas, Potentially Flood Prone and Potentially Hazardous Areas Development Overlay Area Map in the Official Community Plan, there are no hazardous and/or Environmentally Sensitive Lands located within the proposed subdivision/development area.

2.1.5 Existing Topography

The subject land is relatively flat with an elevation of 604.00 metres to 604.50 metres above sea level throughout the site. The site has a gradual slope from north to south.

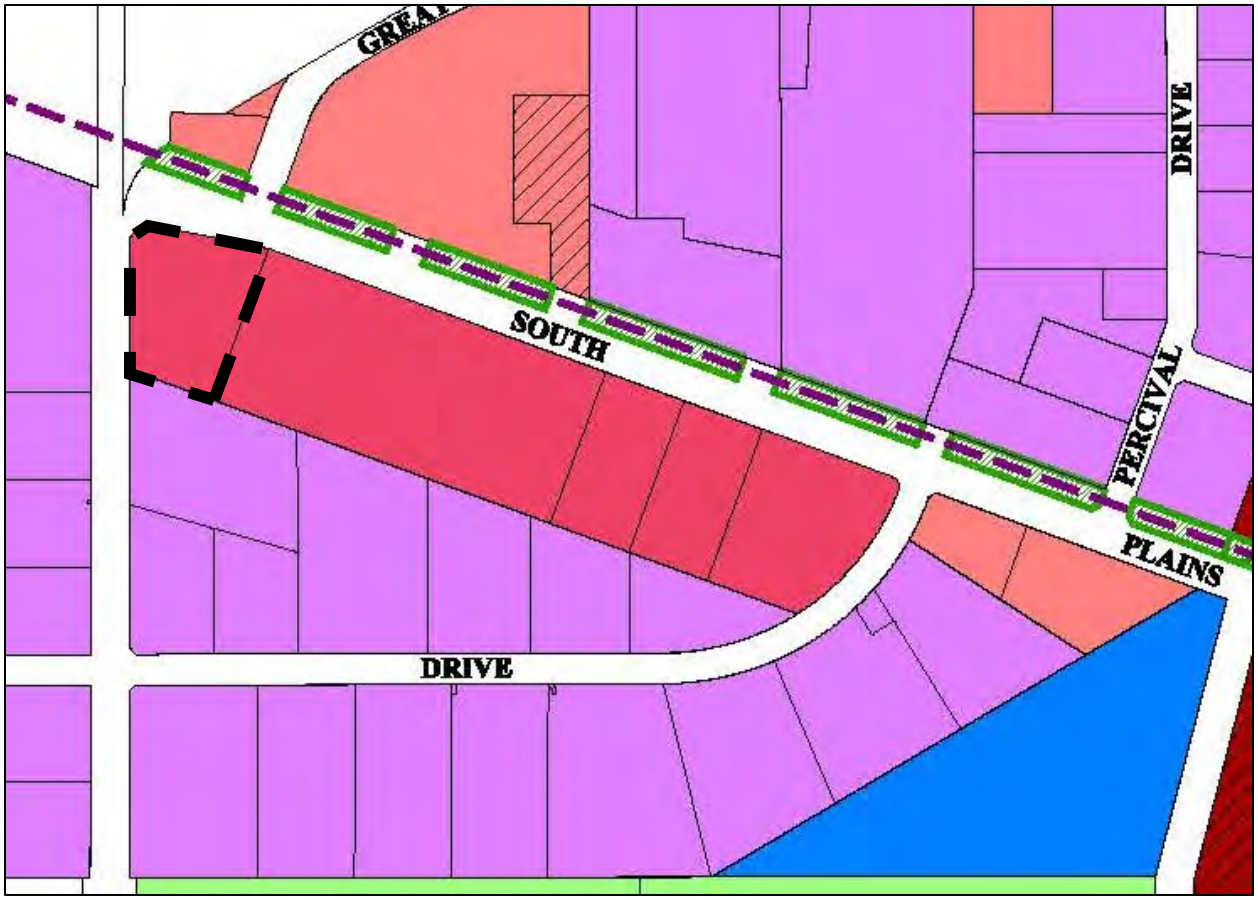
2.2 Built Environment

2.2.1 Existing and Adjacent Land Uses

The proposed new parcel currently serves as a storage site for an industrial operation (metal recycling facility) on the source parcel. There is an existing industrial building on the east side of the source parcel housing the recycling facility; however, there are no buildings located on the land to be subdivided for the proposed restaurant.

Commercial land uses in the form of a gas station, restaurants, grocery store, pharmacy, hotel, and liquor store lie immediately north and east, while industrial uses lie to the south and west of the proposed development. The subject land is currently zoned SC – Shopping Centre (**Figure 2.1**), while the RM's future land use map designates this land for future commercial development.

Figure 2.1 SC – Shopping Centre Zoning District (Dark Pink)



Source: Rural Municipality of Edenwold No. 158 (2020)

2.2.2 Connectivity and Transportation

The proposed parcel and future restaurant lie at the intersection of South Plains Road running east-west, and Great Plains Industrial Drive running north-south. The source parcel currently has direct access onto South Plains Road, which provides direct access to the residential neighbourhoods lying to the east and to the commercial and industrial areas to the north and west respectively. Moving west along South Plains Road allows travellers to access the Trans-Canada Highway interchange with direct access to the City of Regina.

Great Plains Industrial Drive provides direct access and egress for east-bound traffic on the Trans-Canada Highway with a right-in, right-out intersection. Additionally, there is a multi-purpose pathway on the north side of South Plains road, providing pedestrian access to the residential neighbourhoods of Emerald Park.

2.2.3 Existing Infrastructure

Currently, there are RM treated water supply lines immediately west and north of the proposed parcel within the road right-of-way. There is also a fire hydrant immediately west of the proposed subdivision and restaurant, on the west side of Great Plains Industrial Drive. At the time of writing this report, there

are no sewer lines present in the immediate vicinity of the proposed parcel. However, the RM has advised that sewer lines will be installed along South Plains Road in the summer of 2022.

2.3 Policy Review

2.3.1 Emerald Park Business District (EPBD) Policies

- Land Use and Intensity
  - Retail, food, accommodations, entertainment, recreation, health care, personal services and other businesses and services that cater primarily to the local population, travelers and short-term visitors shall be encouraged to locate within the EPBD High-Profile Commercial and Shopping Centre District areas as shown on the Future Land Use Map and the Emerald Park Future growth and Intensification Areas.
  - Large format retail, commercial and light industrial uses shall also be encouraged to locate within the EPBD, primarily within the Industrial District areas as shown on the Future Land Use Map.
  - Infill development shall be promoted within all areas of the EPBD, especially within the Intensification Area.
- Access
  - Pavement shall be required on all roadway surfaces in the EPBD.
  - A Pedestrian Access Plan as described in Section 4.40 of the Zoning Bylaw shall be required for all commercial developments and mixed-use developments and may be required for industrial developments in the EPBD.
- Aesthetics and Business Promotion
  - Developers shall be required to maintain attractive, well-landscaped, tidy lots within the EPBD in order to ensure the district remains a desirable and inviting business centre.
  - Local upgrading and beautification efforts such as improving landscaping or replacing and upgrading fencing in developed areas of the EPBD shall be encouraged. Landowners and developers shall be required to abide by the municipality's Yard Maintenance Policy.
- Complementary and Compatible Development
  - Compatibility with adjacent residential areas is of primary importance and developers may be required to carry out landscaping activities on site and in buffer strips as part of early on-site construction activities to limit potential negative impacts or nuisances from construction.

3.0 Future Land Use

The chapter will discuss the overall concept and design rationale; the proposed land uses; transportation systems; and, development phasing.

3.1 Concept Plan and Design Rationale

The overall concept as shown in **Appendix C – Plan of Proposed Subdivision** and **Appendix D – Site Plan** is a single-phase, single lot commercial development encompassing approximately 0.28 hectares (0.69 acres) with a principal use of restaurant with drive through.

The proposed use of restaurant is a permitted use with the SC - Shopping Centre zoning district and will not require a rezoning application or discretionary approval from council. A complete development permit application will be required as per section 3.7 of the ZB.

Dedication of municipal reserve was accounted for in the previous subdivision into Surface Parcel Number 111604700.

Overall, the concept plan has been prepared to ensure a development that is compatible and complimentary to adjacent land uses and infrastructure; meets the requirements of both provincial and municipal policies; and incorporates design features that promote a sustainable and aesthetically pleasing development.

3.2 Description of Proposed Development

3.2.1 Restaurant with Drive Through

This development consists of a single lot to be used for a restaurant with drive through. The lot provides sufficient space for a principle building that is 288.77 m² (3,141 square feet) in area and covers 10.31 percent of the proposed lot. The configuration and layout of the site proposes 28 parking spaces (1 accessible) which exceeds the required 6 spaces as per section 4.27.14 of the ZB. These parking spaces are designed in accordance with section 4.27.9 of the ZB. Additionally, the drive-through is designed to accommodate 11 vehicles.

3.2.2 Recreation and Open Space

The Planning and Development Act, 2007 (PDA) requires that new non-residential subdivisions dedicate five (5) percent of the land as municipal reserve or park space. However, the proposed subdivision is exempt from this requirement as per section 183 of the PDA due to past municipal reserve dedication.

3.2.3 Crime Prevention Through Environmental Design (CPTED)

The proposed development will incorporate the three primary CPTED principles (natural surveillance; natural access control; and, territorial reinforcement) wherever possible. For example, these three principles will be observed by orienting driveways and entrances towards the building entrance and windows; increasing visual permeability through the use of windows and landscaping; trimming back overgrown hedges; with strategic lighting; providing clear border definition of the controlled space; and, preventing the creation of any void space.

3.2.4 Street Furnishings

The proposed development will incorporate black powder coated galvanized streel street furnishings, consistent with those in the South Plains corridor and adjacent commercial areas.

3.2.5 Signage

Two potential signs are proposed for the restaurant. One in the NW corner of the parcel, and the second in the SW corner of the parcel. Both signs will be constructed in accordance with the development standards outlined in the RM's Zoning Bylaw, and will be consistent with the design of existing signage in the South Plains corridor and adjacent commercial areas.

3.3 Transportation

3.3.1 Pedestrian/Active Transportation Access Plan

The location of the proposed development lies within the commercial district of Emerald Park. Located to the northeast is a multipurpose pathway that leads from this commercial district to the greater Emerald Park and White City residential areas. The proximity to this pathway would allow pedestrians to access the restaurant by walking or with other modes of active transportation. A bicycle rack will be installed near the outdoor tables for securing bicycles.

Figure 3.1 SC – Pedestrian Access Plan

Source: Google Earth (2022)

As for pedestrian activity within the proposed development, there are sidewalks that surround the restaurant to facilitate pedestrian access from the parking spaces and other areas. There is also outdoor seating available for the restaurant patrons and other walk-up traffic.

3.3.2 Automobile

There are two proposed automobile access points for this development. An existing approach via South Plains Road to the North will be upgraded to accommodate both the proposed and residual lot. A second access approach is proposed along Great Plains Industrial Drive to the west. A private internal

road network will connect the two access points as well as provide access to parking and drive through services.

3.4 Development Phasing and Zoning

There are no phases of development proposed at this time. The entire site is intended to be completed within a single phase of construction.

The development area is located with the SC-Shopping Centre zoning district according to the RM's Zoning District Map. A permitted use within this zoning district is "Restaurant including drive thru". The proposed use of this development aligns with this permitted use and therefore will not require a bylaw amendment for zoning purposes.

3.5 Landscaping Standards and Landscaping Plan

Included as **Appendix E** is the Landscaping Plan for this development. There is no existing landscaping covering the portion of the source parcel to be redeveloped as a restaurant, and therefore there is no landscaping to protect. The Landscaping Plan proposes 26 trees and shrubs to be planted along the perimeter of the site and in the drive through and parking medians. There will be a 5.0 metre landscaped strip along South Plains Road (4.0 meters within property and 1.0 metre within road right-of-way) to be consistent with adjacent developments. There will also be a 3.0 metre landscaped strip along Great Plains Industrial Drive (1.5 metre within property and 1.5 metre within the road right-of-way). The parcel boundary directly adjacent to the intersection will have 3.0 metre landscaped strip (all within the property). The type of trees and shrubs have not yet been chosen; however, will be selected to thrive in the Saskatchewan climate. Plant species will be native to Saskatchewan and drought-tolerant. The developer will work with a local greenhouse to pick out and supply the plant species.

Any underground and above ground utility lines will be located and marked out prior to construction, for landscaping setbacks to be adhered to. Landscaping will be completed immediately following building construction (as long as weather and seasonal conditions allow).

In addition to building lighting, there will be three light standards, consistent in design in the drive through and parking areas as shown on the Landscaping Plan. The north light standard will have two LED light fixtures (one facing towards the east entrance, and the other facing north-westerly towards the drive thru lanes). The east light standard will have two LED light fixtures (one facing the north parking lot and the second facing the south-west corner). The west light standard will have one LED light fixture directed towards the drive thru land. The lighting will not be directed toward any adjacent properties, interfere with the use and enjoyment of neighbouring lands, or interfere with the effectiveness of any traffic control devices or the vision or safety of motorists.

4.0 Servicing

The chapter discusses at a broad, preliminary level the roadways, water supply, sanitary system, utilities, drainage, and geotechnical requirements for the proposed development.

4.1 Roadways

All roadway networks for the proposed development will be contained within the single lot. No road parcels are proposed. An approach construction/expansion application will be submitted to the RM for the expansion of the north access along South Plains Road and for the construction of a new access along Great Plains Industrial Drive.

4.2 Average Traffic Counts

Attached as **Appendix F** are average traffic counts from an average volume Burger King location over a 3 month period. This document shows hourly vehicle traffic counts from April 1, 2022 and June 30, 2022 (Q2 2022). The busiest time of the day is the lunch hour between 12:00 pm to 1:00 pm. In this report, there are 4191 vehicles over the lunch hour over the 91 day period. This results in an average of 46 vehicles per hour during the busiest hour, or 1 vehicle every 78 seconds. The average total time to move through the drive through (menu to pickup) is approximately 2 minutes and 9 seconds during the peak lunch hour.

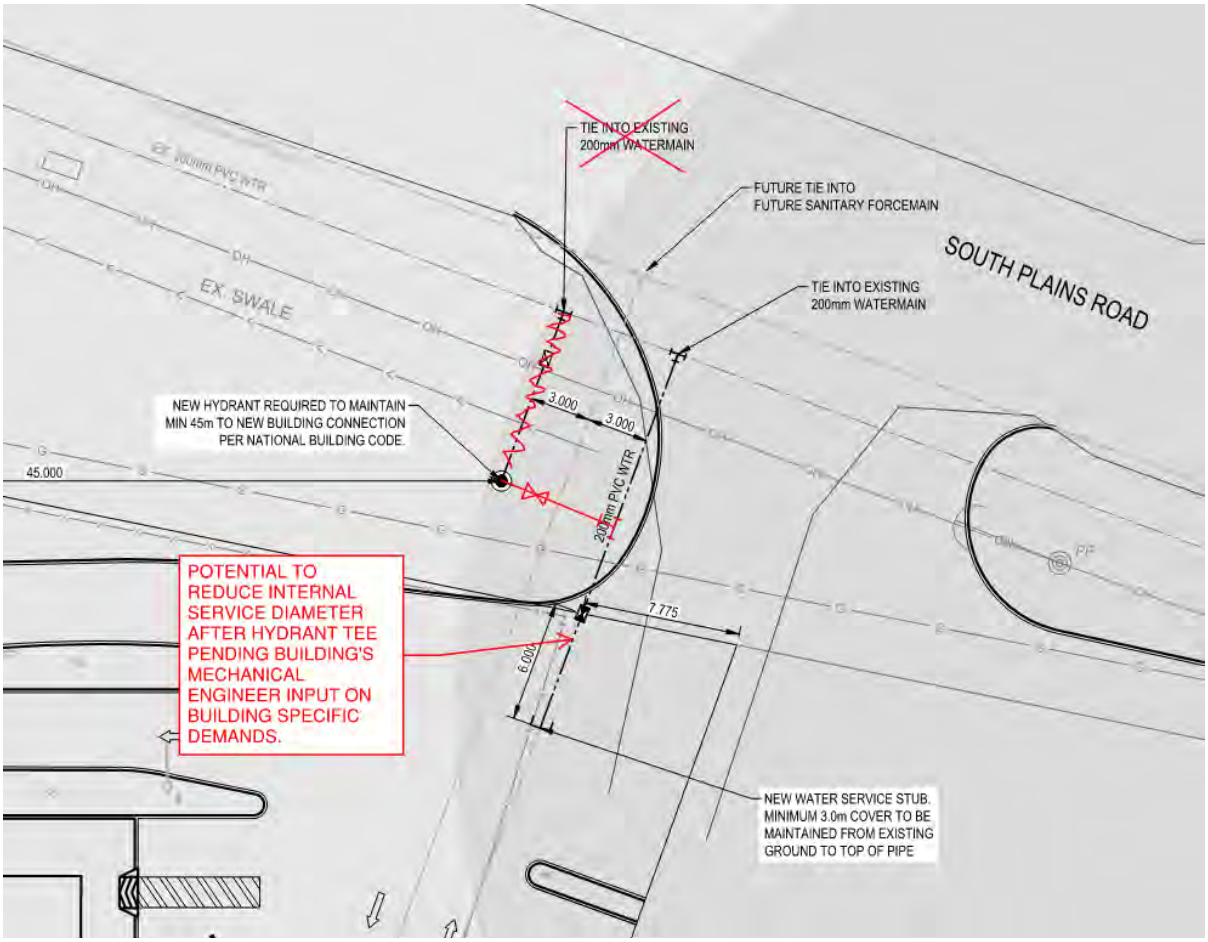
It is important to note that this data comes from a restaurant with only one drive through lane. The new location in Emerald Park is proposed to have double the drive through capacity, which will speed up ordering time and provide for a faster drive through experience. At maximum capacity, the entire drive through lanes (from west site access to the north site access) can accommodate approximately 18 vehicles at any one time within the proposed property lines. Based on an average peak volume of 46 vehicles per hour with an average processing time of 2 minutes and 9 seconds, the average vehicle overlap will only be around 2-3 vehicles.

The developer has agreed to participate in a regional Traffic Impact Assessment (TIA) led by the RM at a later date.

4.3 Water Supply

A servicing analysis was finalized by WSP Canada Inc. on May 6, 2022 for the proposed development. It identifies an existing 150 mm HDPE watermain to the west of the site running north-south along the east ditch within the Great Plains Industrial Drive right-of-way. To the north of the site, there is an existing 200 mm PVC watermain running east-west along the south ditch within the South Plains Road right-of-way. It is assumed that the existing municipal water distribution network surrounding the development has sufficient capacity to service the development. Based on domestic water demands for the parcel, a single 200 mm water service from the existing 200 mm PVC watermain within the South Plains Road right-of-way is proposed to service the subdivided lot.

Internal water service could likely be reduced, pending input from the builder's mechanical engineer on building specific demands during the building permit stage of the project.



Hydrant coverage was reviewed for the proposed subdivision. The National Building Code of Canada requires a hydrant to be within 45 metres of a building connection. Based on the location of existing hydrants surrounding the site, a new hydrant will need to be installed north of the subdivided lot within 45 metres of the building to maintain this requirement. It's location is identified within the attached report found in **Appendix G.**

4.4 Sanitary System

A servicing analysis was finalized by WSP Canada Inc. on May 6, 2022 for the proposed development. It identified that no municipal sanitary sewer network adjacent to the proposed development currently exists. The existing lot is serviced by a septic tank and pump truck.

Since the low pressure forcemain was not approved, a septic tank will be installed to service the development. The size and location of the septic tank will be designed during the detailed site design phase. Provisions could be designed to bypass the septic tank and service the development via grinder pump that ties into the RM's low pressure forcemain, should it be anticipated that the low pressure forcemain will be approved and installed after completion of this development.

Wastewater design flow calculations and engineering drawings may be found in **Appendix G.**

4.5 Drainage and Stormwater Management

The existing lot is fully developed as a shop/office building, parking field and storage yard for a recycling business. There is no existing underground storm sewer network surrounding the development. Stormwater flows for the existing lot are serviced via surface drainage to exterior ditching on the north and west sides of the property. The exterior ditch directs flow south along Great Plains Industrial Drive, away from the development. Roughly 95% of the existing ground cover within the lot is impervious, consisting of granular parking surface, buildings, and storage containers.

The stormwater servicing scheme for the proposed subdivided lot aims to maintain the existing lot's drainage scheme, directing surface drainage to exterior ditching on the north and west sides of the lot. Based on the proposed site layout, the level of impervious surface cover will be maintained between existing and redeveloped conditions within the proposed subdivided lot. As such, the total stormwater volume being directed offsite is not anticipated to increase.

Internal surface grading and culvert sizing will be designed during detailed site design for the subdivided lot. The finished floor elevation will be above the adjacent road elevation; however, this will be established during the detailed site design in conjunction with the internal grading plan. Existing drainage for the remainder of the existing lot will need to be accounted for in the subdivided lot grading design to ensure existing drainage patterns are maintained. The new road access from Great Plains Industrial Drive will require a culvert crossing to ensure drainage can continue to flow from north to south within the east ditch. The location and size of this culvert crossing will be designed during detailed site design for the subdivided lot.

An engineered Drainage Plan may be found in **Appendix G**.

4.6 Shallow Utilities

Overhead SaskPower as well as underground SaskEnergy utilities run north-south, and east-west within the east ditch of Great Plains Industrial Drive and south ditch of South Plains Road respectively. SaskTel lines run north-south within the east ditch of Great Plains Industrial Drive. Power, gas, and phone services are proposed to tie into these existing lines.

4.7 Geotechnical Requirements

A Geotechnical Investigation was finalized by Ground Engineering Consultants Ltd. On March 30, 2022. A summary of the report is found below; however, the detailed report may be found in **Appendix H.** A total of five test borings holes ranging in depth from 3.1 to 15.2 metres were used in the investigation. Drilling information indicates a shallow groundwater table on the site.

4.7.1 Frost Heaving

To minimize frost heaving problems, any paved areas should be sloped to suitably located catch basins or ditches. Regular maintenance of the pavement structure (crack sealing) is critical for satisfactory long-term performance. Rigid insulation is recommended beneath exterior grade support concrete slabs to minimize the depth of frost penetration and prevent frost heaving adjacent to the buildings.

Conventional excavation procedures should be applicable to the soils at the site. Dewatering will be required for excavations that extend below the water table.

4.7.2 Foundation Considerations

It is recommended that the proposed building be supported on a driven steel pipe pile and grade beam type of foundation.

4.7.3 Excavation Considerations

Building excavation at this site will be in the surficial fill and stratified drift soils. Conventional excavation procedures should therefore be applicable to the soils at this site. The silt is saturated and trench instability should be anticipated when excavating in any soils below the water table. Excavations shall comply with minimum requirements of Occupational Health and Safety. It is anticipated that in some areas the excavations will extend below the water table, therefore, dewatering will be required during construction. Water may be removed from excavations through the use of sumps.

4.7.4 Floor Slab Considerations

The surficial clay is a potentially active type soil, therefore, there is a potential for differential movement of grade supported floor slabs at this site. A structural floor system would be the more desirable alternative insofar as overcoming the potential problems associated with differential floor slab movement. Alternatively, if differential movement can be tolerated, the floor may be constructed as a grade supported slab.

4.7.5 Pavement Structure

The pavement around the building should be designed to slope in order to provide adequate drainage of water away from the perimeter of the building and from the surface of paved areas. The need for adequate drainage cannot be overstressed. To ensure fast runoff, the surface of the pavement should have a slope of at least two (2) percent, either to the outer perimeter of the paved areas, or to a suitable located catch basins leading to underground drains. The contour of the finished pavement at all points should prevent water from standing on the surface, and surface water should not be permitted to seep back under the outer edges of the pavement.

Adequate drainage away from the building should be provided and maintained to minimize infiltration of water into the subgrade. Building floors should be set as high as possible in relation to the surrounding area.

4.8 Aquifer Protection Plan

The subject property is located within the Extreme Sensitivity Aquifer zone as identified in the RM of Edenwold Official Community Plan (Map 12, Appendix A). The OCP requires that an Aquifer Protection Plan be implemented as part of the development process to limit any potential contamination of the aquifer. An Aquifer Protection Plan has been prepared by Ground Engineering and can be found in **Appendix I.**

4.8.1 Inventory of Wells

Using the Water Security Agency (WSA) GIS, all water wells within a 1 km radius of the subject property were identified. In total, there are 34 water wells within 1 km. The full inventory and individual water well reports are found in **Appendix J.**

4.8.2 Recommendations

The following recommendations and comments are provided to limit the potential impact the proposed development may have on the underlying aquifer:

1) Any fill material which is required to grade the property shall be from a pre-approved borrow source. Random fill from various sources shall not be permitted. Importing of the fill shall be monitored and the fill shall be placed in lifts which are compacted. Grading the property with controlled fill will limit the potential contamination of the underlying aquifer.

2) Building foundation options include driven steel pipe, augercast concrete piles and screw piles. Regardless of the foundation type selected, the buildings foundation will not increase the contaminant risk of the aquifer.

3) Installation of the site services (sewer/water) will require excavations which may extend below the water table in some areas. The trenches may be backfilled with the excavated soil which is placed in lifts which are compacted. Backfilling the trenches in this manner will limit the potential contamination of the underlying aquifer.

4) No fuel shall be stored onsite during and after development.

The proposed development consists of a restaurant and paved parking lot which is not considered to pose an elevated risk of contamination to the underlying aquifer. Provided the recommendations outlined in this letter are implemented, the potential for contamination of the underlying aquifer will be satisfactorily addressed.

4.9 Policing Services

In consultation with the RM of Edenwold, the local RCMP detachment, which is in the RM has capacity to offer protective services for this new development. In addition, the RM has Community Safety Officers (CSO) available to enforce municipal bylaws, as well as other provincial statutes and acts. The CSO program emerged from resident concerns regarding overweight and speeding vehicles, rural crime, and public safety.

4.10 Fire and Protective Services

The Emerald Park Fire Hall is to be completed by the end of 2022. In consultation with the RM, this fire hall will have capacity to offer fire protective services to this development.

4.11 Schools and Other Supportive Community Services

As a commercial development, the proposed land use will not have the need for schools and other supportive community services.

5.0 Public Engagement Summary

A public engagement plan was developed in consultation with the RM to reach those potentially impacted by the development. All comments were considered carefully and have been utilized to strengthen the CDP. This chapter will review the public engagement objectives, methodology, and provide a summary of the results.

5.1 Objectives

- To create an overall community awareness of the proposed development;
- To collect information and comments from the public and stakeholders; and,
- To carefully consider all comments to strengthen the CDP.

5.2 Methodology

In consultation with the RM, and in accordance with the RM's Zoning Bylaw policies, the developer has notified all land owners within 150 metres of the source parcel by letter. A copy of the letter summarizing the development and providing an opportunity for comments may be found in **Appendix K.** All landowners within 150 metres may be found in the table below:

Owner	Legal Land Description	Civic Address
Beaujot Holdings Ltd.	Parcel A, Plan 101520829	1 South Plains Road West, Emerald Park, SK S4L 1C6
Nick's Service Ltd.	Parcel B, Plan 101853301	2 South Plains Road West, Emerald Park, SK S4L 1C6
O & M Construction Ltd.	Parcel E, Plan 101853301	3 Great Plains Industrial Drive, Emerald Park, SK S4L 1C6
Tri Star Farm Services Ltd.	Parcel F, Plan 101853301	5 Great Plains Industrial Drive, Emerald Park, SK S4L 1C6
101111003 Saskatchewan Ltd.	Lot 13, Block 3, Plan 82R55377	4 Great Plains Industrial Drive, Emerald Park, SK S4L 1C6
101111003 Saskatchewan Ltd.	Lot 12, Block 3, Plan 84R60003	4 Great Plains Industrial Drive, Emerald Park, SK S4L 1C6
101111003 Saskatchewan Ltd.	Parcel E, Plan 84R60003	4 Great Plains Industrial Drive, Emerald Park, SK S4L 1C6
All-Rite Land Development Company	Lot 14, Block 3, Plan 102234158	4 South Plains Road, Emerald Park, SK S4L 1C6
K-Line Equipment Leasing (Toronto) Limited	Lot 11, Block 3, Plan 82R55377	5 Industrial Drive, Emerald Park, SK S4L 1B7
Sadiq Holdings Inc.	Parcel A2, Plan 101938787	
Garwal Properties Ltd.	Lot 2A, Block 1, Plan 102212503	20 Great Plains Road, Emerald Park, SK S4L 1A1

5.3 Summary of Engagement

As of October 12, 2022 no submissions (for or against) from the public were received.

6.0 Summary

This CDP has introduced and discussed a proposed commercial development (restaurant with drive through) along South Plains Road and Great Plains Industrial Drive in the RM's commercial district. This site is already zoned for commercial development and the development will complement existing commercial uses in the immediate vicinity.

The overall concept is a single-phase, single lot commercial development encompassing approximately 0.28 hectares (0.69 acres) with a principal use of Restaurant with drive through.

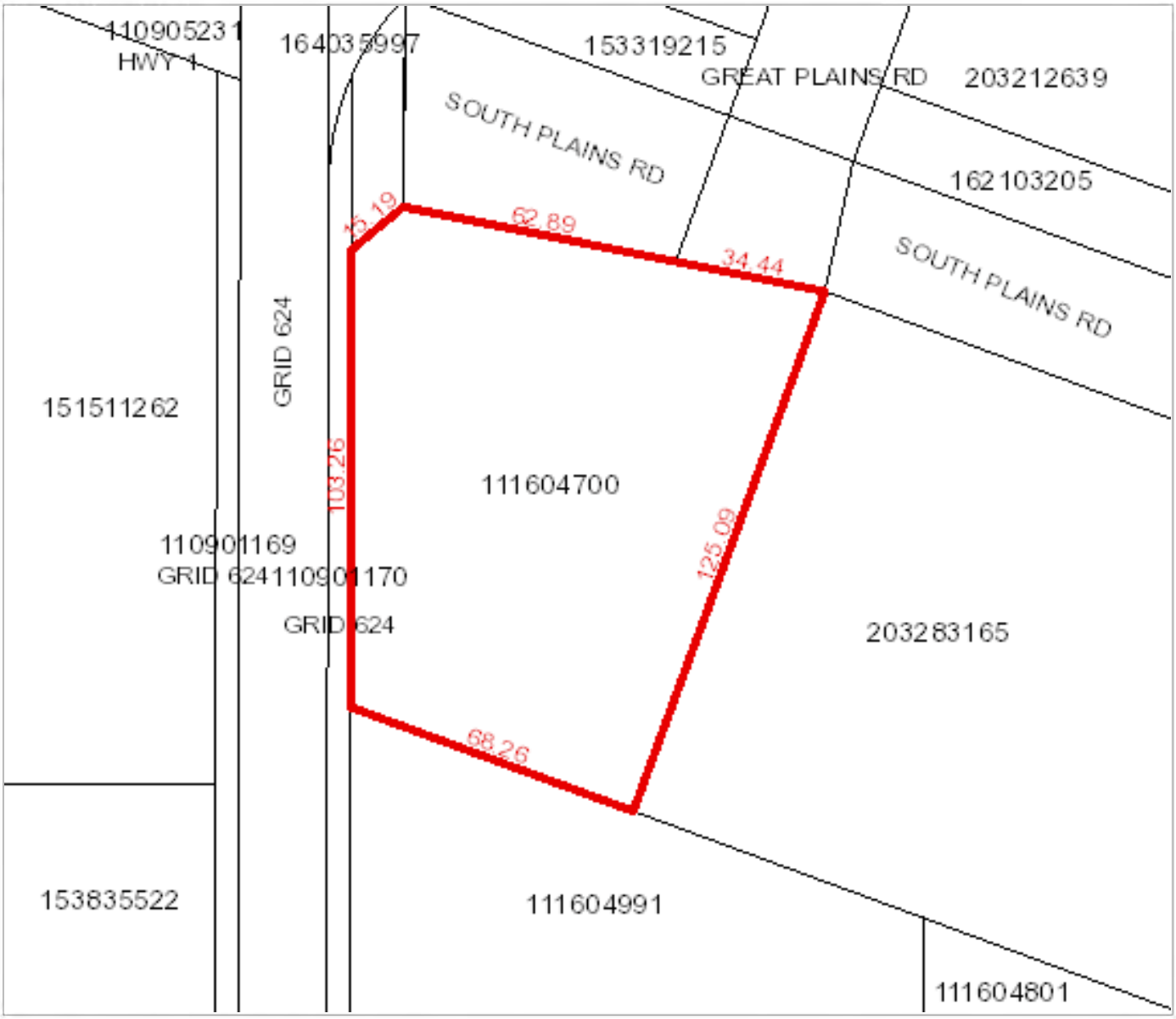
The proposed use of restaurant is a permitted use with the SC - Shopping Centre zoning district and will not require a rezoning application or discretionary approval from council. Overall, the concept plan has been prepared to ensure a development that is compatible and complimentary to adjacent land uses and infrastructure; and, meets the requirements of both provincial and municipal policies.

In closing, this CDP has been prepared and submitted in accordance with the RM's Official Community Plan (OCP) and Zoning Bylaw (ZB). This CDP is a compilation of information representing a framework for the development of the subject property over the short-term planning horizon.

Appendix A – Parcel Picture and Title

Surface Parcel Number: 111604700

REQUEST DATE: Wed Mar 30 21:55:24 GMT-06:00 2022



Owner Name(s) : KOSCHORKE, KARL JOHN

Municipality : RM OF EDENWOLD NO. 158

Area : 1.038 hectares (2.56 acres)

Title Number(s) : 129626848

Converted Title Number : 89R12172(1)C

Parcel Class : Parcel (Generic)

Ownership Share : 1:1

Land Description : Lot 1-Blk/Par 3-Plan 82R55377 Ext 0

Source Quarter Section : SW-22-17-18-2

Commodity/Unit : Not Applicable

Province of Saskatchewan
Land Titles Registry
Title

Title #: 129626848
Title Status: Active
Parcel Type: Surface
Parcel Value: $225,000.00 CAD
Title Value: *$225,000.00 CAD*
Converted Title: 89R12172(1)C
Previous Title and/or Abstract #: 104389498

As of: 30 Mar 2022 21:57:39
Last Amendment Date: 03 Apr 2019 13:18:41.783
Issued: 30 Aug 2005 14:20:23.700

Municipality: RM OF EDENWOLD NO. 158

KARL JOHN KOSCHORKE is the registered owner of Surface Parcel #111604700

Reference Land Description: Lot 1 Blk/Par 3 Plan No 82R55377 Extension 0
As described on Certificate of Title 89R12172(1)C.

This title is subject to any registered interests set out below and the exceptions, reservations and interests mentioned in section 14 of *The Land Titles Act, 2000.*

Registered Interests:

Interest #:
129438760 CNV Pipeline Easement

Value: N/A
Reg'd: 06 Jun 1950 00:49:32
Interest Register Amendment Date: 17 Dec 2015 15:17:04
Interest Assignment Date: N/A
Interest Scheduled Expiry Date: N/A
Expiry Date: N/A

Holder:
ENBRIDGE PIPELINES INC.
10130 103 ST.
EDMONTON, ALBERTA, Canada T5J 3N9
Client #: 102224214

Int. Register #: 101208259
Converted Instrument #: FA2972
Feature #: 100055506

Interest #:
163721831 Mortgage

Value: $288,750.00 CAD
Reg'd: 08 Aug 2013 11:52:08
Interest Register Amendment Date: N/A
Interest Assignment Date: N/A
Interest Scheduled Expiry Date: N/A
Expiry Date: N/A

Holder:
ROYAL BANK OF CANADA
10 YORK MILLS RD 5TH FLOOR
TORONTO, ONTARIO, Canada M2P 2A0
Client #: 100008739

Int. Register #: 119359378

Interest #:

184664111 Lease - less than 10 years

Value: N/A
Reg'd: 03 Apr 2019 13:18:42
Interest Register Amendment Date: N/A
Interest Assignment Date: N/A
Interest Scheduled Expiry Date: N/A
Expiry Date: N/A

Holders as Joint Tenants
Holder:
TRUGREEN METAL RECYCLING INC.
800 - 1801 HAMILTON STREET
REGINA, Saskatchewan, Canada S4P 4B4
Client #: 136616991

Holder:
TRUGREEN ENERGY INC.
2 GREAT PLAINS INDUSTRIAL DR
EMERALD PARK, Saskatchewan, Canada S4L 1B6
Client #: 133711321

Int. Register #: 123394338

Addresses for Service:

Name	Address
Owner: KARL JOHN KOSCHORKE Client #: 119355374	17 PALMER CRESCENT EMERALD PARK, Saskatchewan, Canada S4L 1A3

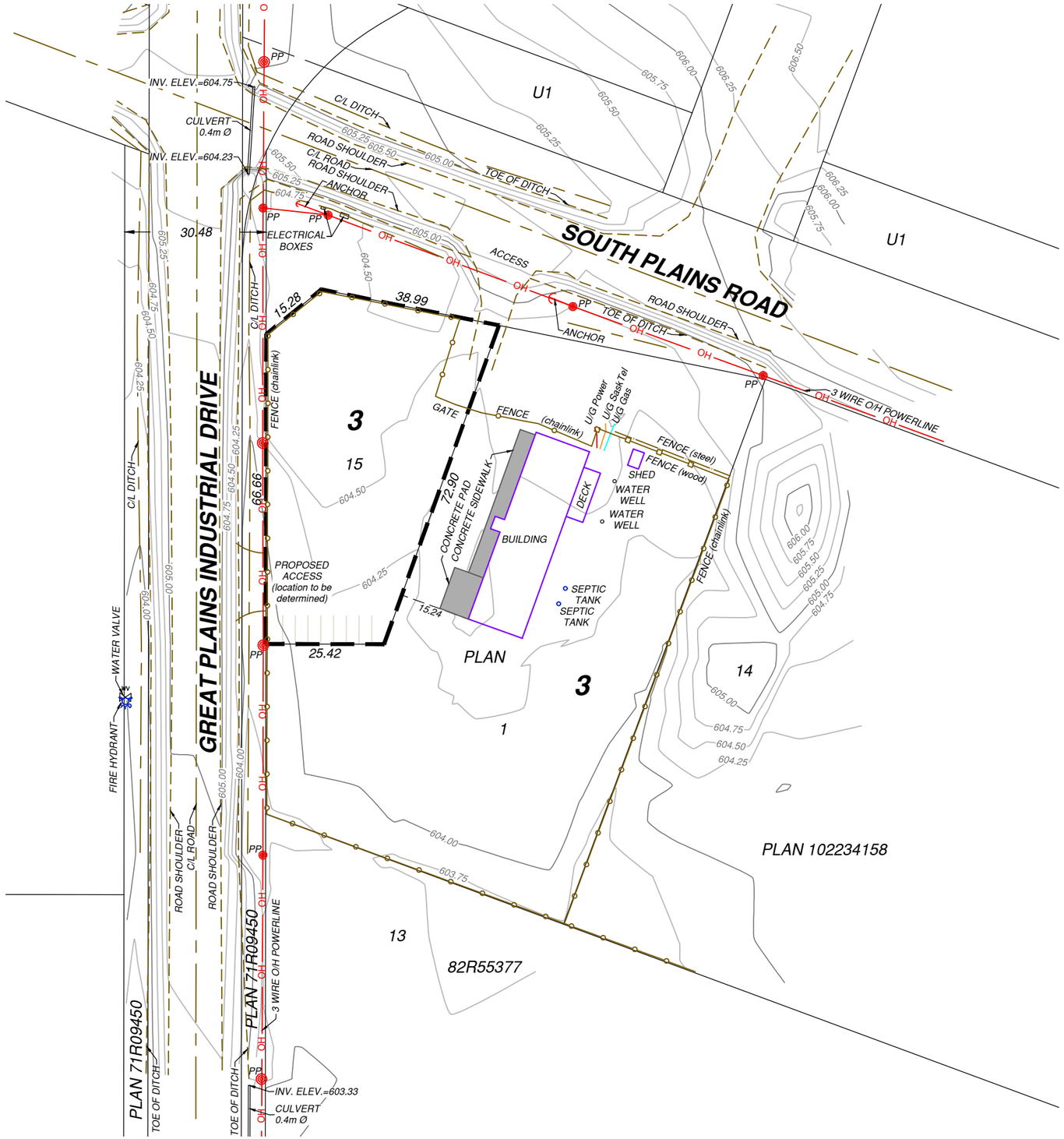
Notes:

Parcel Class Code: Parcel (Generic)

Back

Back to top

Appendix B – Topographic Survey



NOTES

- *Field Survey Completed February 17, 2022*
- *Measurements are in metres and decimals thereof.*
- *Contour intervals are 0.2m.*
- *Contour Intervals are 0.25m*
- Meridian Surveys Ltd. makes no guarantee as to the exact location of underground facilities shown on this plan. The location of underground facilities must be field verified prior to any construction activities.
- Sewer and Waterlines were not located during time of survey. Sewer and Waterline plans not available at time of survey.

LEGEND

- Property Boundary
- Buried Gas Pipeline
- Buried Power Cable
- Buried Telephone Cable
- Overhead Power Cable
- Fence
- Water Valve
- Fire Hydrant
- Light Standard
- Road Shoulder
- Road Centerline
- Building

TOPOGRAPHIC PLAN

showing surface features of
Lot 1 - Block 3 - Plan No. 82R55377 in
S.W.1/4 Sec. 22 - Twp. 17 - Rge. 18 - W.2M.

R.M of EDENWOLD, SK

Scale 1:1000

No.	Date	Revision	Rev. By	Chd. By
0	Mar. 16/22	Issued for Review	lh	dc

Dwn. By:	Chd. By:	Date:	File No.	Drawing Name:	Rev.
lh	dc	March 16, 2022	RE213841	RE213841-TOPO	0

Meridian Surveys Ltd.

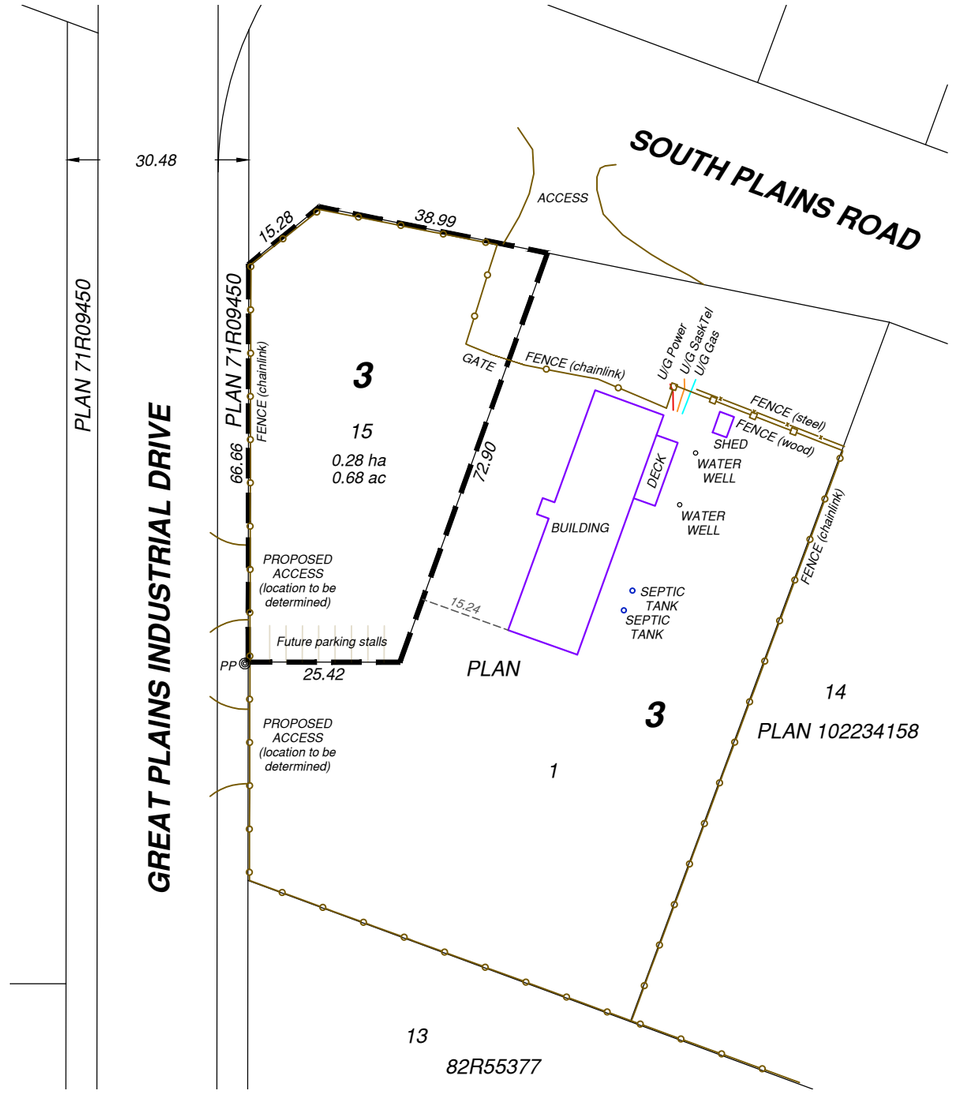
Appendix C – Plan of Proposed Subdivision

PLAN OF PROPOSED SUBDIVISION

OF PART OF

LOT 1 - BLOCK 3 - PLAN No. 82R55377
S.W.¼ SEC.22-TWP.17-RGE.18-W.2Mer.
R.M. of EDENWOLD No. 158, SK

SCALE 1:1000



NOTES

PRELIMINARY SURVEY DONE ON NOVEMBER 18, 2021.
PORTION TO BE SURVEYED IS OUTLINED IN A HEAVY DASHED LINE, AND CONTAINS ***0.28 ha. (0.68 acres).***
MEASUREMENTS ARE IN METRES AND DECIMALS THEREOF.
DISTANCES ARE APPROXIMATE AND MAY VARY BY ± 0.5 METRES.
STANDARD ROAD ALLOWANCE SHOWN ARE 20.117m IN WIDTH.

Planning Authority Approval

Daniel S. E. Cook
Saskatchewan Land Surveyor

KARL JOHN KOSCHORKE
Approval: Owner LOT 1 - BLOCK 3 - PLAN No. 82R55377

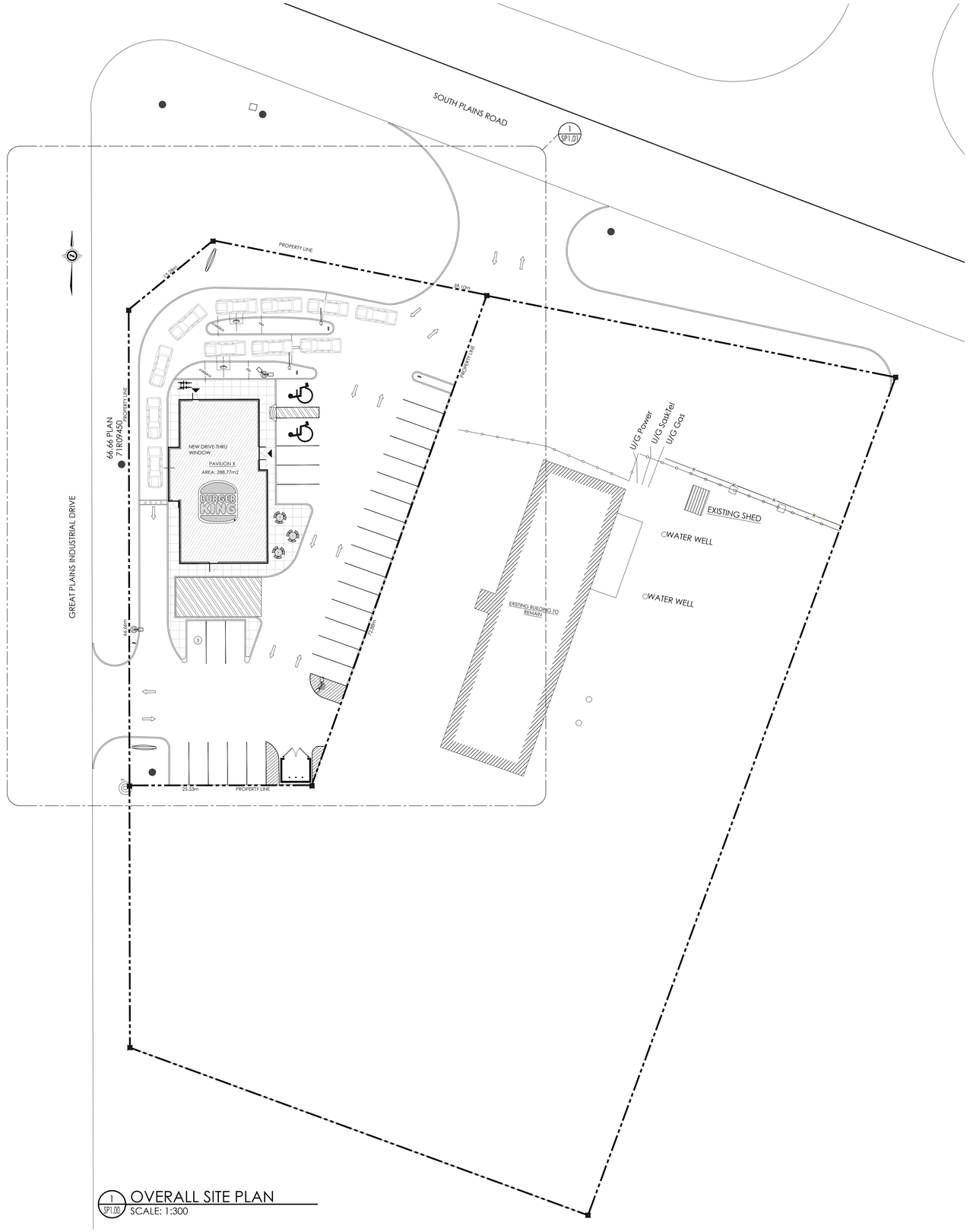
No.	REVISIONS	DATE	DR.	CH.
2	Adjusted east parcel boundary	December 7, 2021	jle	dsec
3	Add additional proposed access	February 23, 2023	kmh	dsec
	FILE: RE213841	DWG.: RE213841DEV-R3		

Meridian Surveys Ltd.

Appendix D – Site Plan

GG+A project no. 20042

GG+A + EA



1 SP1.00 OVERALL SITE PLAN
SCALE: 1:300

designer

GG+A

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development · design · management

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architect

EA

JEFFREY ELLIOTT, ARCHITECT

288 woods street . stratford . on . N5A 7TA
t 519.275.7104 e e.arch@rogers.com

seal

client

Burger King
2 great plains road, emerald park,
saskatchewan S4L 1B6

Do not scale drawings. Use only drawings marked 'Issued for Construction'. Field verify configurations and dimensions on site prior to beginning work. notify architect and/or designer immediately of any errors, omissions, or discrepancies in drawings issued.

issued for

1	client review	31.01.2022
2	preliminary review	16.01.2023

revised

0

project

Burger King Restaurant

address
2 great plains road,
emerald park,
saskatchewan S4L 1B6

issued for permit

drawing title

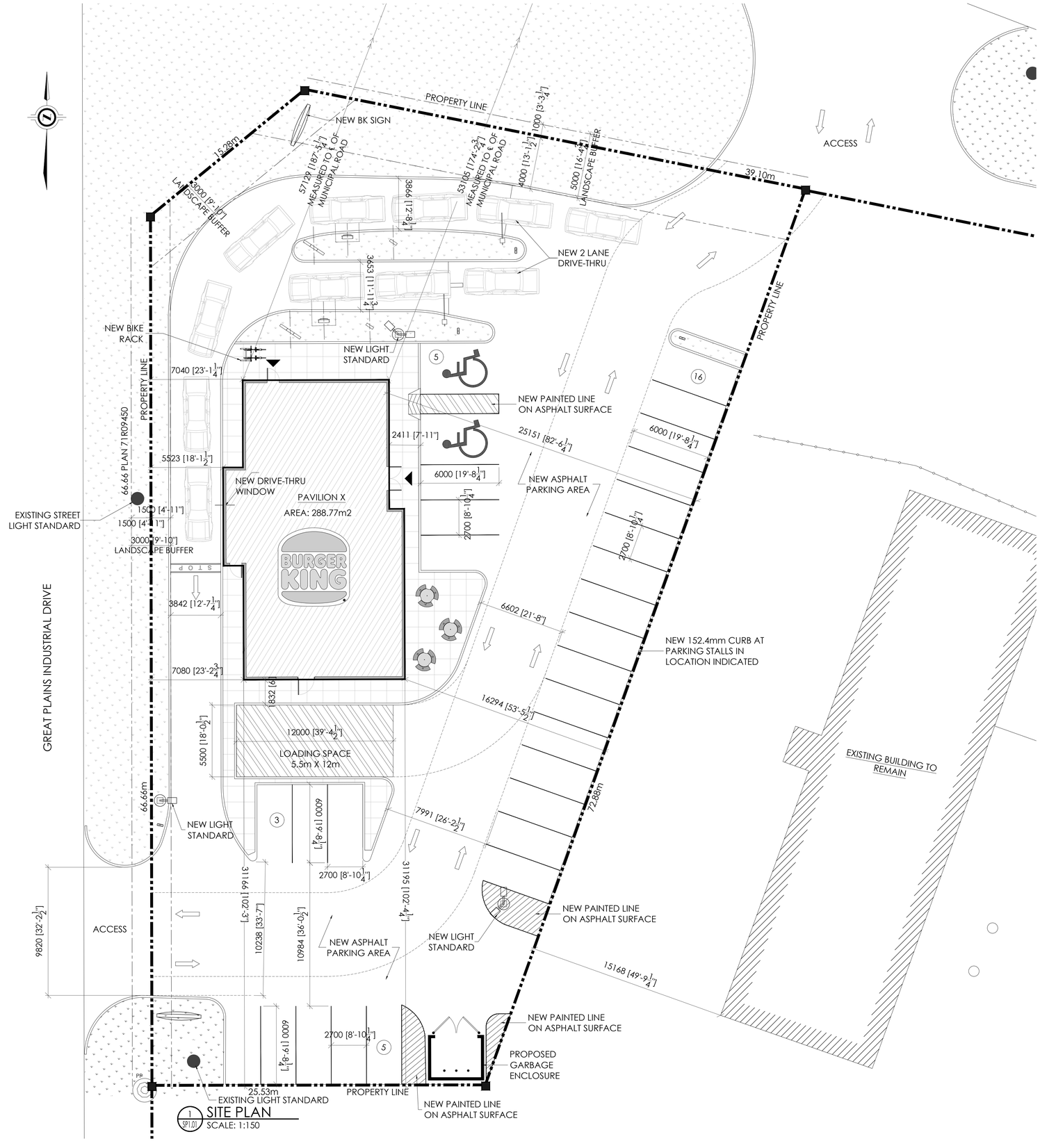
overall site plan

date drawn	28.01.2022
drawn by	aa/rb
checked by	gg
file name	GG+A-EA 24x36
project no.	21040
scale	as noted

drawing no.

SP1.00

GG+A project no. 20042



1 SP1.01 SITE PLAN
SCALE: 1:150

PROPERTY STATISTICS:

LEGAL DESCRIPTION:	PART OF LOT 1- BLOCK 3- PLAN NO. 82R55377 S.W.¼ SEC.22-TWP.17-RGE. 18-W.2Mer. R.M. OF EDENWOLD NO. 158, SK.
MUNICIPAL ADDRESS:	2 GREAT PLAINS ROAD, EMERALD PARK, SASKATCHEWAN S4L 1B6
REGISTERED OWNERS:	BURGER KING

BUILDING CODE ANALYSIS:

FLOOR AREA:	288.77 SQ.M. (3,140.59 SF) First Floor
NUMBER OF STORIES:	1 STOREY
MAJOR OCCUPANCY:	GROUP 'E'
FACING STREETS:	2 STREET
O.B.C. SECTION:	O.B.C PART 3.2.2.61.
CONSTRUCTION TYPE:	NON-COMBUSTIBLE

ZONING STATISTICS:

	PERMITTED	PROPOSED
SITE AREA:	8.9 ha. (max.) 200m² (min.)	0.28ha. 2800m²
BUILDING AREA:	-	288.77m²
BUILDING HEIGHT:	4 storeys (6m per storey)	1 storey
LOT COVERAGE:	-	10.31%
LOT FRONTAGE:	30m	39.10m
FRONT YARD SETBACKS: MUNICIPAL ROAD	45m	53.11m
SIDE YARD SETBACKS: PROPERTY LINE: PROPERTY LINE:	5m 5m	5.52m ONE SIDE 16.29m OTHER SIDE
REAR YARD SETBACKS: PROPERTY LINE:	5m	31.16m

PARKING STATISTICS:

ZONING: SHOPPING CENTRE DISTRICT-SC (ZONING BY-LAW 4.27.14 TABLE 8.)

REQUIREMENTS: 1 SPACES / 50m² - SHOPPING CENTRE DISTRICT

PROPOSED RESTAURANT: 288.77m² REQ'D: 6 SPACES PROVIDED: 29 SPACES

DRIVE-THRU LANE: 11 SPACES

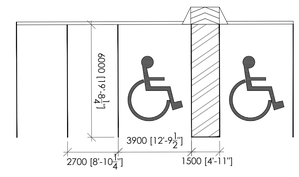
PARKING SPACE DIMENSIONS AS PER ZONING BY-LAW NO. 2019-20, 4.27.9 TABLE 4.

ACCESSIBLE PARKING SPACES: 3.9m BY 6.0m FOR ONE SPACE: OR
6.3m BY 6.0m FOR TWO SPACES SIDE BY SIDE

SMALL VEHICLE PARKING SPACES 2.43m BY 4.9m

PARKING SPACES OTHER THAN THE ABOVE 2.7m BY 6.0m

LOADING SPACE DIMENSION AS PER ZONING BY-LAW NO. 2019-20, 4.30.3 TABLE 9.
WIDTH: 5.5 METERS
LENGTH: 12 METERS
HEIGHT CLEARANCE 4.2 METERS



designer
GG+A
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architect
EA
JEFFREY ELLIOTT, ARCHITECT
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t 519.275.7104 e e.arch@rogers.com
seal
client
Burger King
2 great plains road, emerald park,
saskatchewan S4L 1B6

issued for

1	client review	31.01.2022
2	preliminary review	16.01.2023

revised

/0\

project

Burger King Restaurant

address
2 great plains road,
emerald park,
saskatchewan S4L 1B6

issued for permit

drawing title
site plan

date drawn	28.01.2022
drawn by	aa/rb
checked by	gg
file name	GG+A-EA 24x36
project no.	21040
scale	as noted

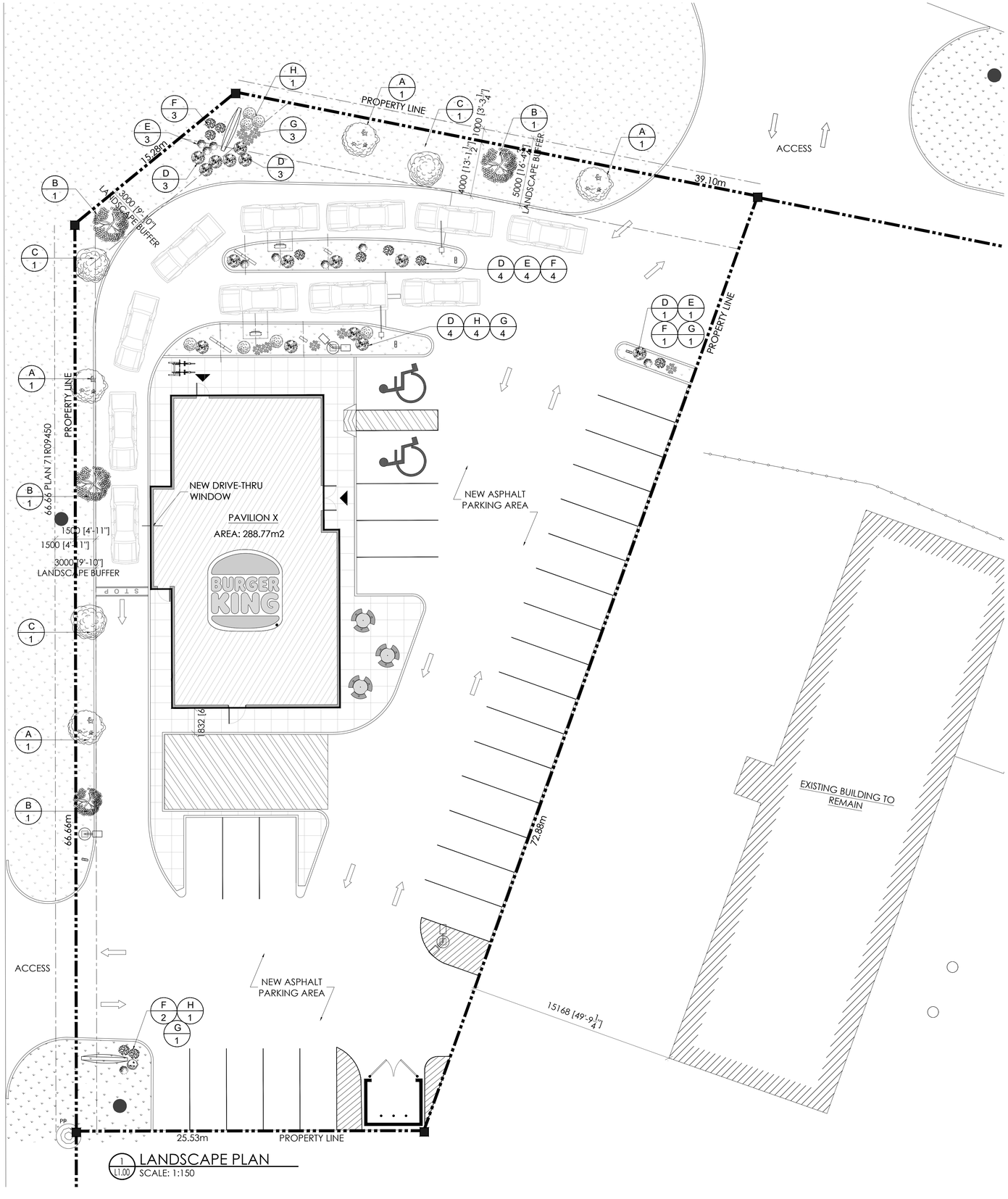
drawing no.
SP1.01

Appendix E – Landscaping Plan

GG+A project no. 20042

GG+A + EA

GREAT PLAINS INDUSTRIAL DRIVE



1 LANDSCAPE PLAN
L1.00 SCALE: 1:150

PLANT LIST- TREES			
KEY	HEIGHT	COMMON NAME	BOTANICAL NAME
A	5'-0"	BOXELDER	ACER NEGUNDO
B	5'-0"	SILVER CLOUD SILVER MAPLE	ACER SACCHARINUM 'SILVER CLOUD'
C	5'-0"	PRAIRIE HORIZON MANCHURIAN ALDER	ALNUS HIRSUTA 'HARBIN'

PLANT LIST- SHRUBS			
KEY	HEIGHT	COMMON NAME	BOTANICAL NAME
D	0'-6"	GOLDEN NUGGET JAPANESE BARBERRY	BERBERIS THUNBERGII 'GOLDEN NUGGET'
E	0'-4"	BUNCHBERRY	CORNUS CANADENSIS
F	0'-4"	CREEPING WINTERGREEN	GAULTHERIA PROCUMBENS
G	0'-4"	PRINCE OF WALES JUNIPER	JUNIPERUS HORIZONTALIS 'PRINCE OF WALES'
H	0'-4"	VANCOUVER GOLF WOADWAXEN	GENISTA PILOSA 'VANCOUVER GOLD'

designer

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development · design · management

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architect

JEFFREY ELLIOTT, ARCHITECT

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t 519.275.7104 e e.arch@rogers.com

seal

client

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project

Burger King Restaurant

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issued for permit

drawing title

landscape plan

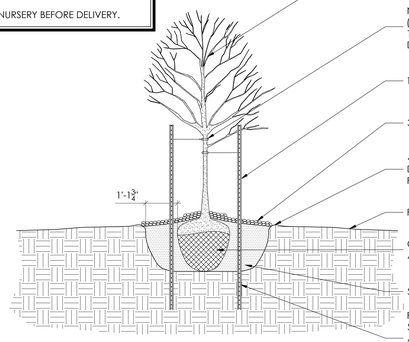
date drawn	28.01.2022
drawn by	aa/rb
checked by	gg
file name	GG+A-EA 24x36
project no.	21040
scale	as noted

drawing no.

L1.00

NOTE:

1. DO NOT DAMAGE ROOT-BALL WHEN INSTALLING STAKES.
2. WATER THOROUGHLY AFTER INSTALLATION.
3. WILTPROOF IN NURSERY BEFORE DELIVERY.



PRUNE TO REMOVE DEADWOOD, WEAK INTERFERING, DISEASED OR INJURED BRANCHES, DOUBLE LEADERS AND TIGHT V-SHAPED CROCHES WHERE APPLICABLE. WHERE ROOT DAMAGE IS ABNORMALLY SEVERE, COMPENSATION PRUNING SHOULD BE LIMITED TO REMOVAL OF NO MORE THAN 15% OF THE LEAF BEARING CROWN USING A BRANCH THINNING TECHNIQUE. BRANCH TIPS SHOULD NOT BE LEADED.

No. 12 GALVANIZED WIRE ENCLOSED IN A ¾" Ø BLACK RUBBER HOSE (AS PER DETAIL BELOW). PLASTIC HOSE IS UNACCEPTABLE. EACH TREE TIE SHOULD BE LOOSE ENOUGH TO PERMIT UNENCUMBERED CALIPER DEVELOPMENT

1½" x 1½" STEEL "T" BAR 9'-0" LONG DRIVEN 36" INTO GROUND

3" DEEP MINI BARK NUGGETS

4" HIGH SAUCER AROUND TREE. IN HEAVY CLAY OR POOR DRAINAGE SOIL CONDITIONS, TREES AND SHRUBS SHOULD BE PLANTED 4" HIGHER THAN ORIGINAL NURSERY PLANTING DEPTH

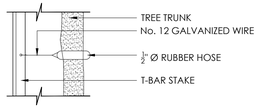
FINISHED GRADE

CUT AND REMOVE ALL WIRE, ROPE, TWINE AND BURLAP FROM AROUND THE TRUNK AND TOP THIRD OF THE ROOT BALL

SCARIFY BOTTOM AND SIDES OF PLANTING PIT

PLANTING SOIL MIX AS SPECIFIED. HOLES FOR TREES SHOULD BE LARGE ENOUGH TO PERMIT PROPER ADDITION AND TAMPING OF BACK FILL ONLY DEEP ENOUGH TO ACCOMMODATE ROOT BALL AT ITS FINAL DEPTH.

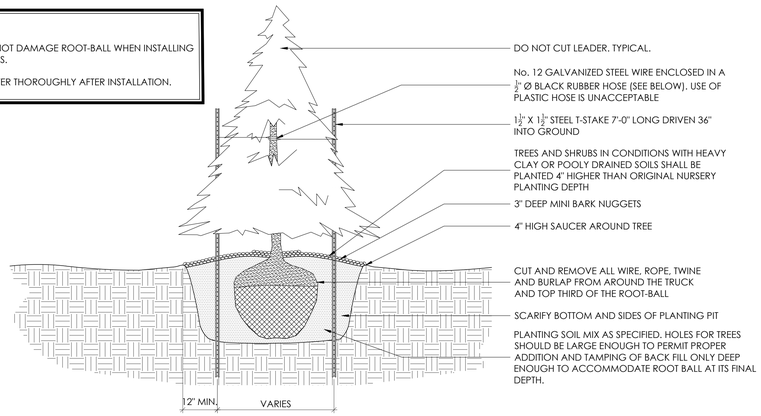
NOTE:



1 L1.01 DECIDUOUS TREE PLANTING DETAIL
SCALE: NTS

NOTE:

1. DO NOT DAMAGE ROOT-BALL WHEN INSTALLING STAKES.
2. WATER THOROUGHLY AFTER INSTALLATION.



DO NOT CUT LEADER, TYPICAL.

No. 12 GALVANIZED STEEL WIRE ENCLOSED IN A ¾" Ø BLACK RUBBER HOSE (SEE BELOW). USE OF PLASTIC HOSE IS UNACCEPTABLE

1½" X 1½" STEEL T-STAKE 7'-0" LONG DRIVEN 36" INTO GROUND

TREES AND SHRUBS IN CONDITIONS WITH HEAVY CLAY OR POOLY DRAINED SOILS SHALL BE PLANTED 4" HIGHER THAN ORIGINAL NURSERY PLANTING DEPTH

3" DEEP MINI BARK NUGGETS

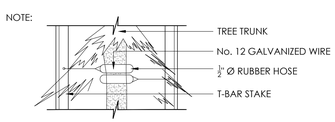
4" HIGH SAUCER AROUND TREE

CUT AND REMOVE ALL WIRE, ROPE, TWINE AND BURLAP FROM AROUND THE TRUCK AND TOP THIRD OF THE ROOT-BALL

SCARIFY BOTTOM AND SIDES OF PLANTING PIT

PLANTING SOIL MIX AS SPECIFIED. HOLES FOR TREES SHOULD BE LARGE ENOUGH TO PERMIT PROPER ADDITION AND TAMPING OF BACK FILL ONLY DEEP ENOUGH TO ACCOMMODATE ROOT BALL AT ITS FINAL DEPTH.

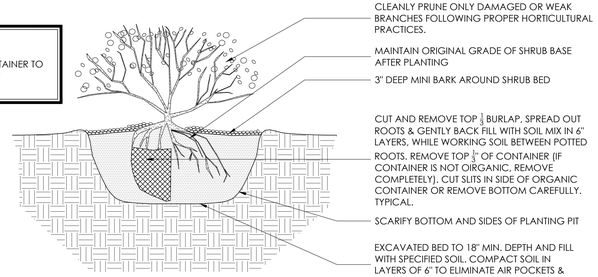
NOTE:



2 L1.01 CONIFEROUS TREE PLANTING DETAIL
SCALE: NTS

NOTE:

DO NOT ALLOW ANY PORTION OF CONTAINER TO REMAIN EXPOSED. WATER THOROUGHLY SUBSEQUENT TO INSTALLATION.



CLEANLY PRUNE ONLY DAMAGED OR WEAK BRANCHES FOLLOWING PROPER HORTICULTURAL PRACTICES.

MAINTAIN ORIGINAL GRADE OF SHRUB BASE AFTER PLANTING

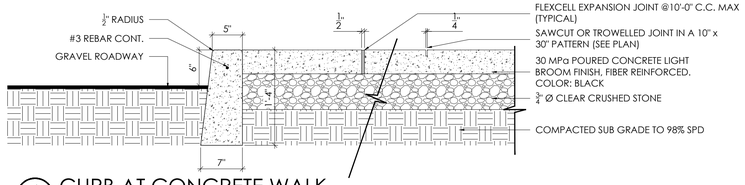
3" DEEP MINI BARK AROUND SHRUB BED

CUT AND REMOVE TOP ⅓ BURLAP, SPREAD OUT ROOTS & GENTLY BACK FILL WITH SOIL MIX IN 6" LAYERS, WHILE WORKING SOIL BETWEEN POTTED ROOTS. REMOVE TOP ⅓" OF CONTAINER (IF CONTAINER IS NOT OIRGANIC, REMOVE COMPLETELY). CUT SLITS IN SIDE OF ORGANIC CONTAINER OR REMOVE BOTTOM CAREFULLY. TYPICAL.

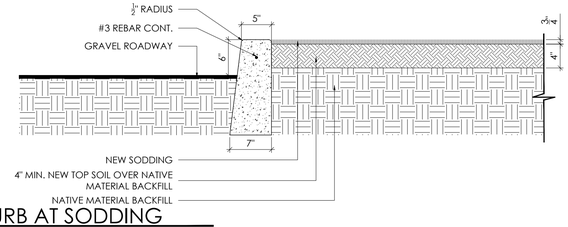
SCARIFY BOTTOM AND SIDES OF PLANTING PIT

EXCAVATED BED TO 18" MIN. DEPTH AND FILL WITH SPECIFIED SOIL. COMPACT SOIL IN LAYERS OF 6" TO ELIMINATE AIR POCKETS & TO PREVENT SOIL SETTLEMENT. TYPICAL.

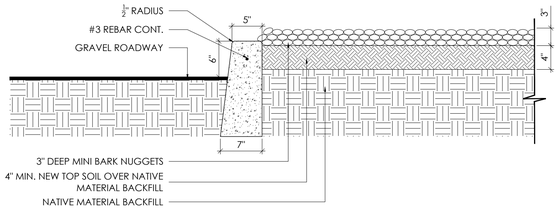
3 L1.01 SHRUB PLANTING DETAIL
SCALE: 3/8"=1'-0"



4 L1.01 CURB AT CONCRETE WALK
SCALE: 1"=1'-0"



5 L1.01 CURB AT SODDING
SCALE: 1"=1'-0"



6 L1.01 CURB AT PLANTING BED
SCALE: 1"=1'-0"

designer

G.GRIFFITHS + ASSOCIATES LTD.
development · design · management

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t 905.631.0155 e gord@ggriffiths.net

architect

JEFFREY ELLIOTT, ARCHITECT

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seal

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Burger King
2 great plains road, emerald park,
saskatchewan S4L 1B6

issued for

1	client review	31.01.2022
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revised

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project

Burger King Restaurant

address
2 great plains road,
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issued for permit

drawing title

landscape details

date drawn	28.01.2022
drawn by	aa/rb
checked by	gg
file name	GG+A-EA 24x36
project no.	21040
scale	as noted

drawing no.

L1.01

Appendix F – Average Traffic Counts

DMB lll
PORTAL

Drive Thru Timing Report : By Hour
[BK# 13208]
From: 04/01/2022 to 06/30/2022
Printed On Wed Sep 21, 2022 03:36 PM

	Car	>=	02:45	Fastest	Slowest	Average			
Time	Count	Count	%%%%%%	Car	Car	Menu Time	+ Line Time	+ Pickup Time	= Total Time
06:30	3	0	0.0	01:38	02:43	01:15	00:06	00:52	02:12
07:30	95	52	54.7	00:41	04:32	00:34	00:09	01:50	02:33
08:00	216	96	44.4	00:31	05:13	00:31	00:11	01:43	02:25
09:00	360	119	33.0	00:23	06:20	00:35	00:11	01:24	02:10
10:00	661	98	14.8	00:35	05:36	00:34	00:14	01:09	01:57
11:00	2273	309	13.5	00:32	07:55	00:33	00:30	00:56	01:59
12:00	4191	792	18.8	00:31	05:57	00:34	00:48	00:47	02:09
13:00	2241	325	14.5	00:29	05:10	00:34	00:29	00:58	02:00
14:00	1616	216	13.3	00:37	05:10	00:34	00:21	01:02	01:57
15:00	1573	227	14.4	00:29	06:45	00:36	00:20	01:02	01:58
16:00	1888	327	17.3	00:22	07:47	00:38	00:25	01:00	02:03
17:00	2641	624	23.6	00:28	07:04	00:41	00:35	00:58	02:15
18:00	2334	558	23.9	00:30	07:56	00:41	00:33	01:01	02:16
19:00	1553	359	23.1	00:28	06:14	00:44	00:24	01:05	02:13
20:00	1049	228	21.7	00:27	07:54	00:45	00:18	01:06	02:09
21:00	697	148	21.2	00:36	06:34	00:45	00:16	01:07	02:08
Total	23391	4478	19.1	00:22	07:56	00:37	00:30	00:59	02:07

This is a report of an average volume Burger King location. It shows an hourly vehicle traffic from 01 April 2022 to 30 June 2022. The most busiest time is lunch between 12:00pm to 01:00pm for any restaurant.

In this report, there are 4191 vehicles have passed through the period of 91 days during lunch time which means about 46 vehicles per day per busiest hour. So on average, one vehicle waits about 1 minute and 17 seconds.

This is from a restaurant which has only one drive thru lane for ordering. The new location at Emerald Park will have double drive thru lanes which will speed up the ordering time and overall faster drive thru operation.

The proposed subdivided property (within the property line) can have about 18 to 20 vehicles waiting in the line at the same time. So the property will have more than enough capacity to face busy days.

Having the drive thru exit by the south west access, most vehicles will exit through that side.

I have attached week and month average report for your review.

Appendix G – Water, Wastewater and Stormwater Servicing

MEMO

TO: RM of Edenwold

FROM: WSP Canada Inc.

SUBJECT: **Parcel 1 Subdivision Water, Wastewater and Stormwater Servicing**

DATE: **May 6, 2022**

The following technical memo is presented to the RM of Edenwold to support the Servicing Agreement Application for the subdivision of Lot 1 – Block 3 – Plan No. 82R55377. The following sections summarize the proposed servicing scheme for water, wastewater and stormwater demands for the subdivided lot.

BACKGROUND

Lot 1 is located on the southeast corner of South Plains Road and Great Plains Industrial Drive. It is approximately 1.04 Ha and is currently fully developed as a shop/office building, parking field and storage yard for a recycling business.

The intent is to subdivide 0.27 Ha of the northwest corner of the lot to be redeveloped into a restaurant with a drive-thru and parking field. The proposed subdivision is illustrated in Figure 1.

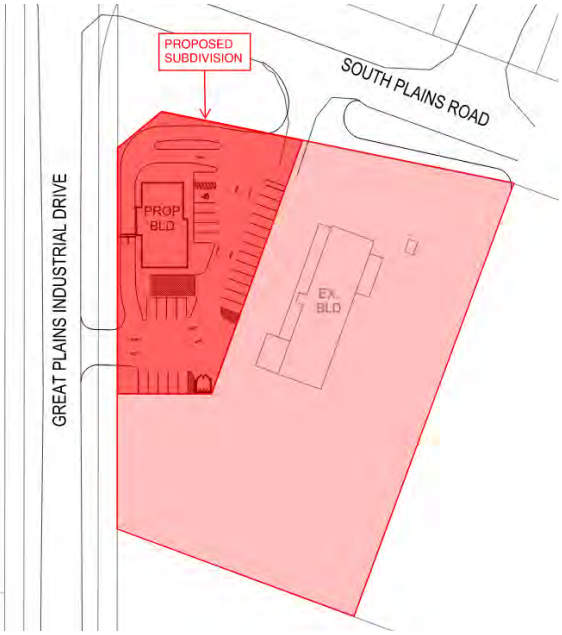

Figure 1: Proposed Subdivision

395 Maxwell Crescent
Regina, SK
Canada S4N 5X9

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WATER SERVICING

To the west of the site, there is an existing 150mm HDPE watermain running north-south along the east ditch within the Great Plains Industrial Drive right-of-way. To the north of the site, there is an existing 200mm PVC watermain running east-west along the south ditch within the South Plains Road right-of-way.

Design domestic water servicing demands for the development were calculated using City of Regina Water Design Standards (January 2021). Refer to Table 1 for the estimated additional demands the proposed development will add to the existing system under average day demand, peak day demand and peak hour demand scenarios.

Table 1: Domestic Water Demand Calculations

Area	Building	Land Use	Density	Area (Ha)	Population (Persons)	Average Daily Demand (ADD) (L/s) = 390Lpcd* Persons/ 86400	Peak Day Demand (PDD) (L/s) = 1.8*ADD	Peak Hour Demand (PHD) (L/s) = 2.9*ADD
			Persons/Ha (CoR Water Design Standard - January 2021)					
Subdivided Lot 1	Restaurant	Commercial	65	0.2771	18	**0.081**	**0.146**	**0.236**

Hydrant coverage was reviewed for the proposed subdivision. The National Building Code of Canada requires a hydrant to be within 45 metres of a building connection. Based on the location of existing hydrants surrounding the site, a new hydrant will need be installed north of the subdivided lot within 45m of the building to maintain this requirement. The proposed location of this hydrant is detailed in the accompanying Issued for Approval drawing set, dated May 6, 2022.

Note that a detailed hydraulic analysis has not been completed under the scope summarized in this memo. It is assumed that the existing municipal water distribution network surrounding the development has sufficient capacity to service the development. Based on domestic water demands for the parcel, a single 200mm water service from the existing 200mm PVC watermain within the South Plains Road right-of-way is proposed to service the subdivided lot. Refer to drawing C01 in the accompanying Issued for Approval drawing set for further details on the proposed water servicing for the development.

WASTEWATER SERVICING

Currently there is no existing municipal sanitary sewer network adjacent to the property. The existing lot is serviced by a septic tank and pump truck.

It is understood that the RM of Edenwold is currently proposing a low pressure sanitary forcemain to be installed in the south ditch within the South Plains Road right-of-way, directly north of the subdivided lot. It is understood that this low pressure sanitary forcemain is being proposed by the RM of Edenwold as a local improvement and is pending approval from council and the Saskatchewan Municipal Board.

Should this low pressure sanitary forcemain be approved and installed prior to the development of the proposed subdivided lot, the development will be serviced via grinder pump and an onsite sanitary forcemain that ties into the RM's low pressure forcemain.

If the low pressure forcemain is not approved and installed prior to the development of the proposed subdivision, a septic tank will need to be installed to service the development. The size and location of the septic tank will be designed during the detailed site design phase. Provisions could be designed to bypass the septic tank and service the development via grinder pump and internal forcemain that ties into the RM's low pressure forcemain, should it be anticipated that the low pressure forcemain will be approved and installed after completion of this development.

Design Wastewater flows for the development were calculated based on the City of Regina Wastewater Design Standards (January 2021). Refer to Table 2 for the estimate peak wastewater flow generation for the development.

Table 2: Wastewater Design Flow Calculations

Sewer Location		Catchment Area				Flows					
Section	Land Use	Catchment Gross Area (ha)	A=Cumulative Catchment Area (ha)	P=Cumulative Population of Catchment *	D=Cumulative Gross Density (P/A)	F=Cumulative Weighted Ave Daily per Capita Consumption (L/p/day)	M=Cumulative Peaking Factor=1+14/(4+√(P/1000))	Catchment Infiltration Rate = I/I (L/ha/d)	Catchment Infiltration = I/I * Catchment Gross Area (L/s)	I=Cumulative Infiltration (L/s)	Q=Cumulative Peak Wet Weather Flow =FDMA/86,400+I (L/s)
Subdivided Lot 1	Comm	0.2771	0.2771	18	65.0	454	4.386	21000	0.067	0.067	**0.48**
* Commercial (65 Persons/Ha) - CoR Wastewater Design Standards (January 2021)											

STORMWATER SERVICING

The existing lot is fully developed as a shop/office building, parking field and storage yard for a recycling business. There is no existing underground storm sewer network surrounding the development. Stormwater flows for the existing lot are serviced via surface drainage to exterior ditching on the north and west sides of the property. The exterior ditch directs flow south along Great Plains Industrial Drive, away from the development. Roughly 95% of the existing ground cover within the lot is impervious, consisting of granular parking surface, buildings, and storage containers.

The stormwater servicing scheme for the proposed subdivided lot aims to maintain the existing lot's drainage scheme, directing surface drainage to exterior ditching on the north and west sides of the lot. Based on the proposed site layout, the level of impervious surface cover will be maintained between existing and redeveloped conditions within the proposed subdivided lot. As such, the total stormwater volume being directed offsite is not anticipated to increase.

Internal surface grading will be designed during detailed site design for the subdivided lot. Existing drainage for the remainder of the existing lot will need to be accounted for in the subdivided lot grading design to ensure existing drainage patterns are maintained.

A new access from Great Plains Industrial Drive to the west side of the subdivided lot is being proposed as part of the redevelopment. A culvert crossing will need to be installed under this access to ensure drainage can continue to flow from north to south within the east ditch of Great

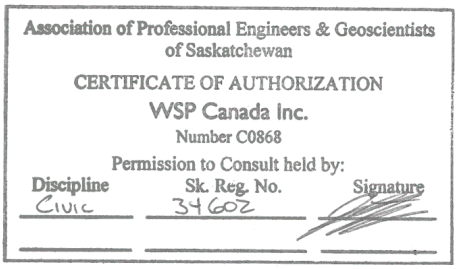
Plains Industrial Drive. The location and size of this culvert crossing will be designed during detailed site design for the subdivided lot.

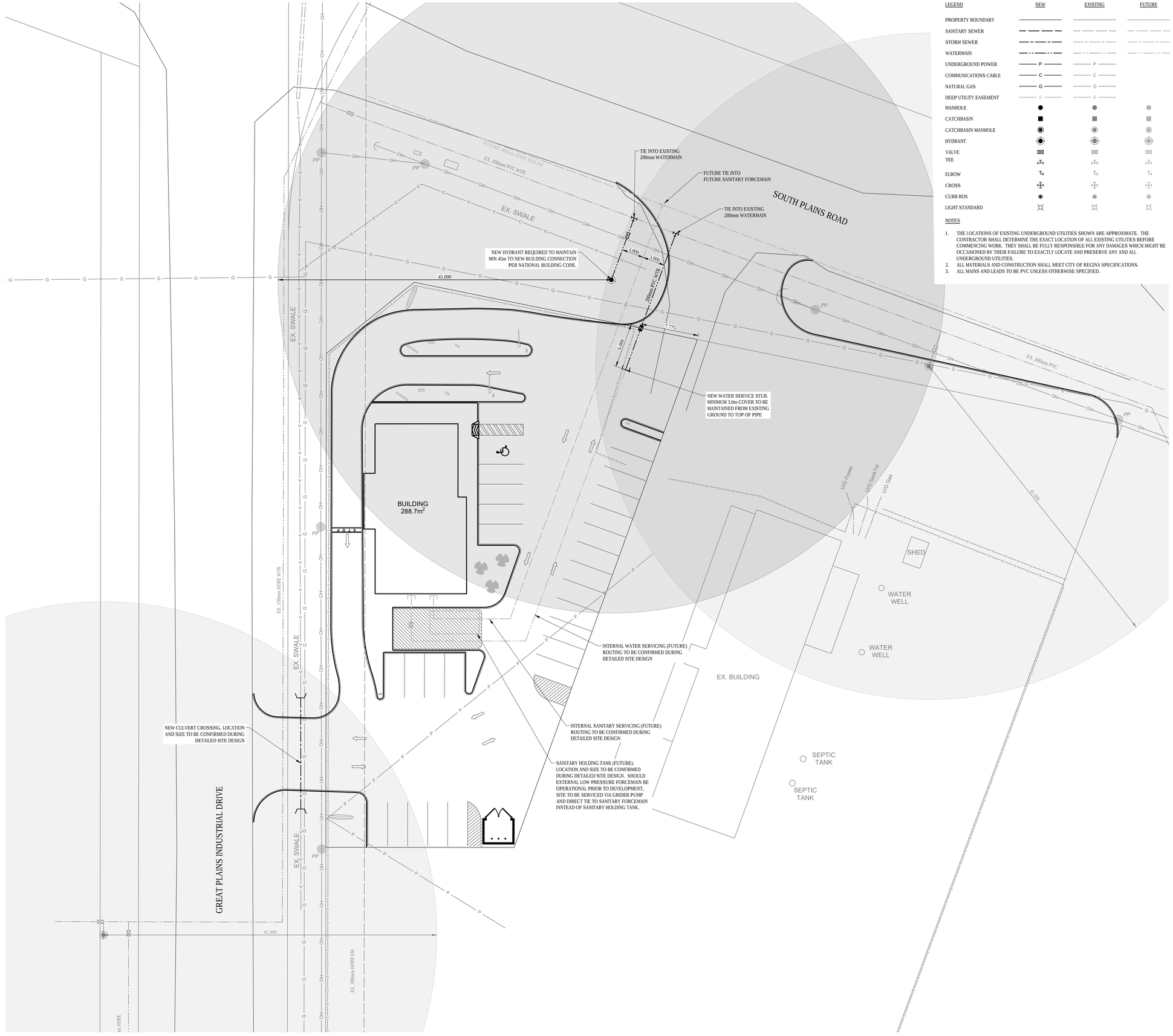
CONCLUSION

This memo has been presented to the RM of Edenwold in conjunction with the Issued for Approval drawing set to support the Servicing Agreement Application for the subdivision of Lot 1 – Block 3 – Plan No. 82R55377. Proposed water, wastewater and stormwater servicing schemes for the subdivided lot have been summarized to provide a basis for how the subdivided lot will be serviced.

If you have any questions regarding the contents of this memo, please don't hesitate to contact the undersigned.

Jordan Stepan, P.Eng., PMP
Engineer, Infrastructure





LEGEND	NEW	EXISTING	FUTURE
PROPERTY BOUNDARY			
SANITARY SEWER			
STORM SEWER			
WATERMAIN			
UNDERGROUND POWER	P	P	
COMMUNICATIONS CABLE	C	C	
NATURAL GAS	G	G	
DEEP UTILITY EASEMENT	S	S	
MANHOLE	●	●	●
CATCHBASIN	■	■	■
CATCHBASIN MANHOLE	◉	◉	◉
HYDRANT	✱	✱	✱
VALVE	⋈	⋈	⋈
TEE	┬	┬	┬
ELBOW	└	└	└
CROSS	┼	┼	┼
CURB BOX	◉	◉	◉
LIGHT STANDARD	⌑	⌑	⌑

NOTES

1. THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES SHOWN ARE APPROXIMATE. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK. THEY SHALL BE FULLY RESPONSIBLE FOR ANY DAMAGES WHICH MIGHT BE OCCASIONED BY THEIR FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES.
2. ALL MATERIALS AND CONSTRUCTION SHALL MEET CITY OF REGINA SPECIFICATIONS.
3. ALL MAINS AND LEADS TO BE PVC UNLESS OTHERWISE SPECIFIED.

REVISION:

REV	DATE	DESCRIPTION	BY
1	2022-05-06	ISSUED FOR APPROVAL	JP
0	2022-04-14	ISSUED FOR REVIEW	JP

SEAL:

PROFESSIONAL ENGINEER SASKATCHEWAN
JAMES PAUL STEPAN MEMBER 34002
2022-05-06
YYYY-MM-DD

Association of Professional Engineers & Geoscientists of Saskatchewan
CERTIFICATE OF AUTHORIZATION
WSP Canada Inc.
Number C0868
Permission to Consult held by:
Discipline: Civil | Sk. Reg. No.: 34002 | Signature

ORIGINAL SCALE: 1:250
DATE: 2022-04-14
APPROVED BY: JLS
CHECKED BY: JLS
DRAWN BY: JBP
IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.
25mm

DISCIPLINE: INFRASTRUCTURE

WSP Canada Inc.
395 Maxwell Crescent, Regina, Saskatchewan S4N 5X9
T 306-585-1990 | www.wsp.com

PROJECT NUMBER: 221-03656-00

CLIENT: 102133212 SASKATCHEWAN LTD.

CLIENT REF. #: --

PROJECT: EMERALD PARK BURGER KING

TITLE: WATER AND WASTEWATER SUBDIVISION SERVICING

DRAWING NUMBER: C01

REV.: 1

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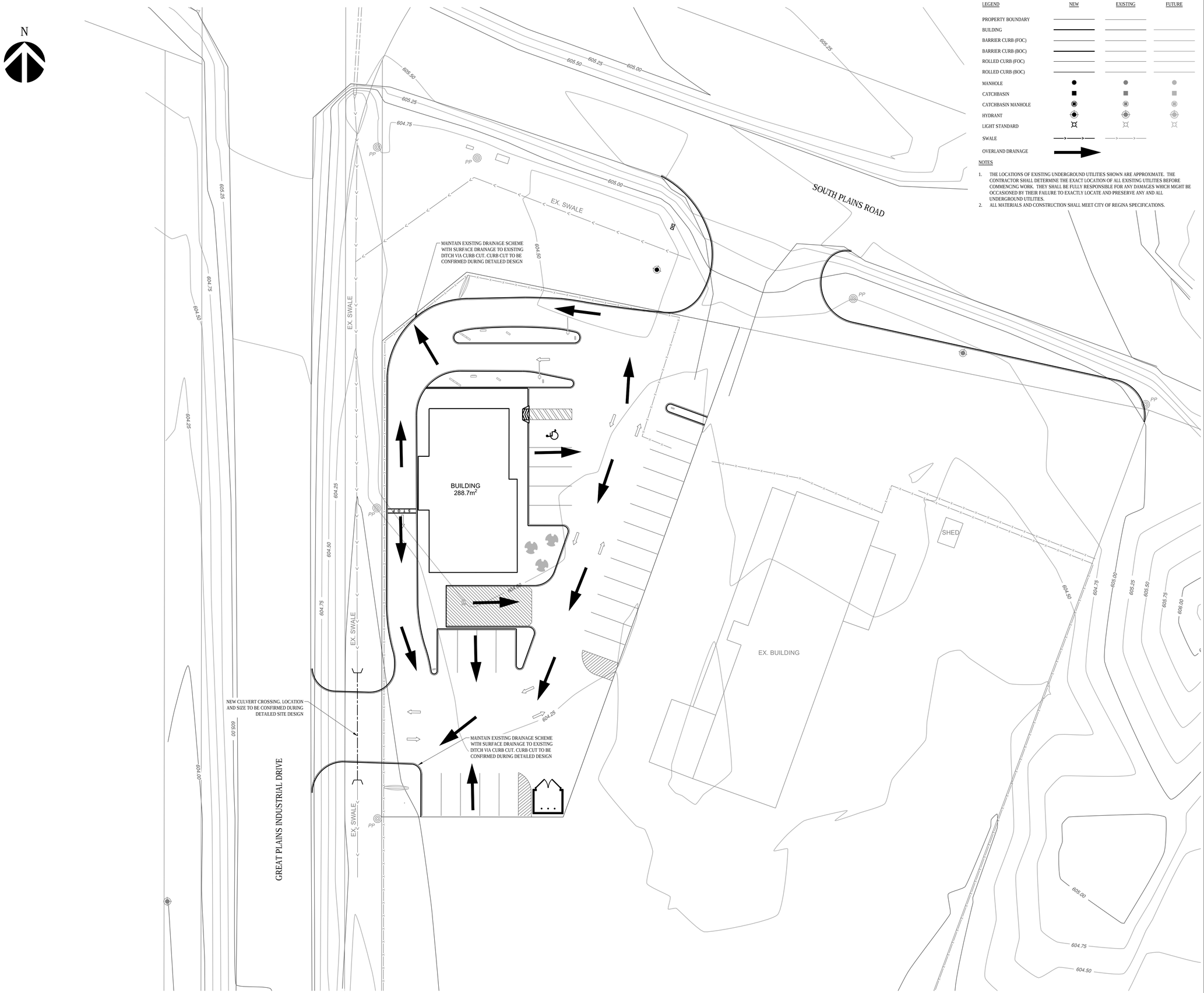

REVISION:

REV	DATE	DESCRIPTION	BY
1	2022-05-06	ISSUED FOR APPROVAL	JP
0	2022-04-14	ISSUED FOR REVIEW	JP

SEAL:

PROFESSIONAL ENGINEER SASKATCHEWAN
J.L. LETPAN MEMBER 34002
2022-05-06
YR. MH. DAY

Association of Professional Engineers & Geoscientists of Saskatchewan
CERTIFICATE OF AUTHORIZATION
WSP Canada Inc.
Number C0868
Permission to Consult held by:
Discipline: Civil
Sk. Reg. No.: 34002
Signature

ORIGINAL SCALE: 1:250
APPROVED BY: JLS
CHECKED BY: JLS
DRAWN BY: JBP
DATE: 2022-04-14
IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.
25mm

DISCIPLINE: INFRASTRUCTURE

WSP Canada Inc.
395 Maxwell Crescent, Regina, Saskatchewan S4N 5X9
T 306-585-1990 | www.wsp.com

PROJECT NUMBER: 221-03656-00

CLIENT: 102133212 SASKATCHEWAN LTD.

CLIENT REF. #: --

PROJECT: EMERALD PARK BURGER KING

TITLE: DRAINAGE PLAN

DRAWING NUMBER: C02
REV. 1

CTB: jgpy_standard.ctb
PLOTTED: 2022-05-06 - 8:55 AM
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Appendix H – Geotechnical Report

TITLE: GEOTECHNICAL INVESTIGATION
PROPOSED BURGER KING RESTAURANT
2 SOUTH PLAINS ROAD
PART OF LOT 1, BLOCK 3, PLAN No. 82R55377, EXT. 0
R.M. OF EDENWOLD No. 158, SASKATCHEWAN

CLIENT: 102133212 SASKATCHEWAN LTD.

FILE No: GE-2217 DATE: MARCH 30, 2022

TABLE OF CONTENTS

DRAWINGS

APPENDICES

GROUND ENGINEERING CONSULTANTS LTD.

CIVIL & GEOENVIRONMENTAL ENGINEERS

415 – 7TH AVENUE · REGINA · SASKATCHEWAN · S4N 4P1
Tel: (306) 569-9075 FAX: (306) 565-3677 Email: groundeng@myaccess.ca

FILE: GE-2217 March 30, 2022

102133212 Saskatchewan Ltd.
1615 North Service Road East
Swift Current, Saskatchewan
S9H 3X6

ATTENTION: MR. YOGIN SONI

Dear Sir:

SUBJECT: GEOTECHNICAL INVESTIGATION
PROPOSED BURGER KING RESTAURANT
2 SOUTH PLAINS ROAD
PART OF LOT 1, BLOCK 3, PLAN No. 82R55377, EXT. 0
R.M. OF EDENWOLD No. 158, SASKATCHEWAN

1.0 INTRODUCTION

This report presents the results of a site specific subsurface soils investigation and geotechnical analysis carried out at the site of the above captioned building project located in R.M. of Edenwold No. 158, Saskatchewan. It is understood that the project includes construction of a Burger King Restaurant covering an area of 3,108 square feet, with a paved parking lot and drive-through.

The objectives of this investigation were to provide the following information:

.1 To define the subsurface soil stratigraphy and engineering properties of the foundation soils including the groundwater regime at the site;

.2 To provide design recommendations for the most suitable and economical foundation system to support the proposed building;

.3 To comment on possible excavation and construction problems related to foundation construction with particular reference to groundwater conditions;

.4 To provide recommendations for floor slab design and construction;

.5 To provide pavement design recommendations for roadways and parking lots;

.6 To provide recommendations with respect to the type of cement to use for concrete in contact with native soils;

.7 To provide recommendations on pertinent geotechnical issues identified during the subsurface investigation.

Authorization to proceed with this work was received in your e-mail dated March 4, 2022.

2.0 DESCRIPTION OF THE SITE

The subject property shown in Figure 1 is located at 2 South Plains Road in the R.M. of Edenwold No. 158, Saskatchewan. The legal description of the property is a Part of Lot 1, Block 3, Plan No. 82R55377, Ext. 0. The study area consists of an irregular-shaped tract of land which covers an area of approximately 1.056 ha (2.61 acres). Fill materials have been placed in the past to achieve the existing grades and the topography of the site is now relatively flat. Ground surface elevations vary up to 0.40 metres between the test hole locations.

3.0 FIELD AND LABORATORY INVESTIGATION

The subsurface conditions were investigated by drilling five (5) test borings at the locations shown on Drawing No. GE-2217-1. The test holes were drilled on March 14, 2022, using a truck-mounted, Diedrich D-120 drilling rig equipped with a 150 mm diameter continuous flight auger. The test holes were terminated at depths of 3.1 to 15.2 metres below existing ground surface.

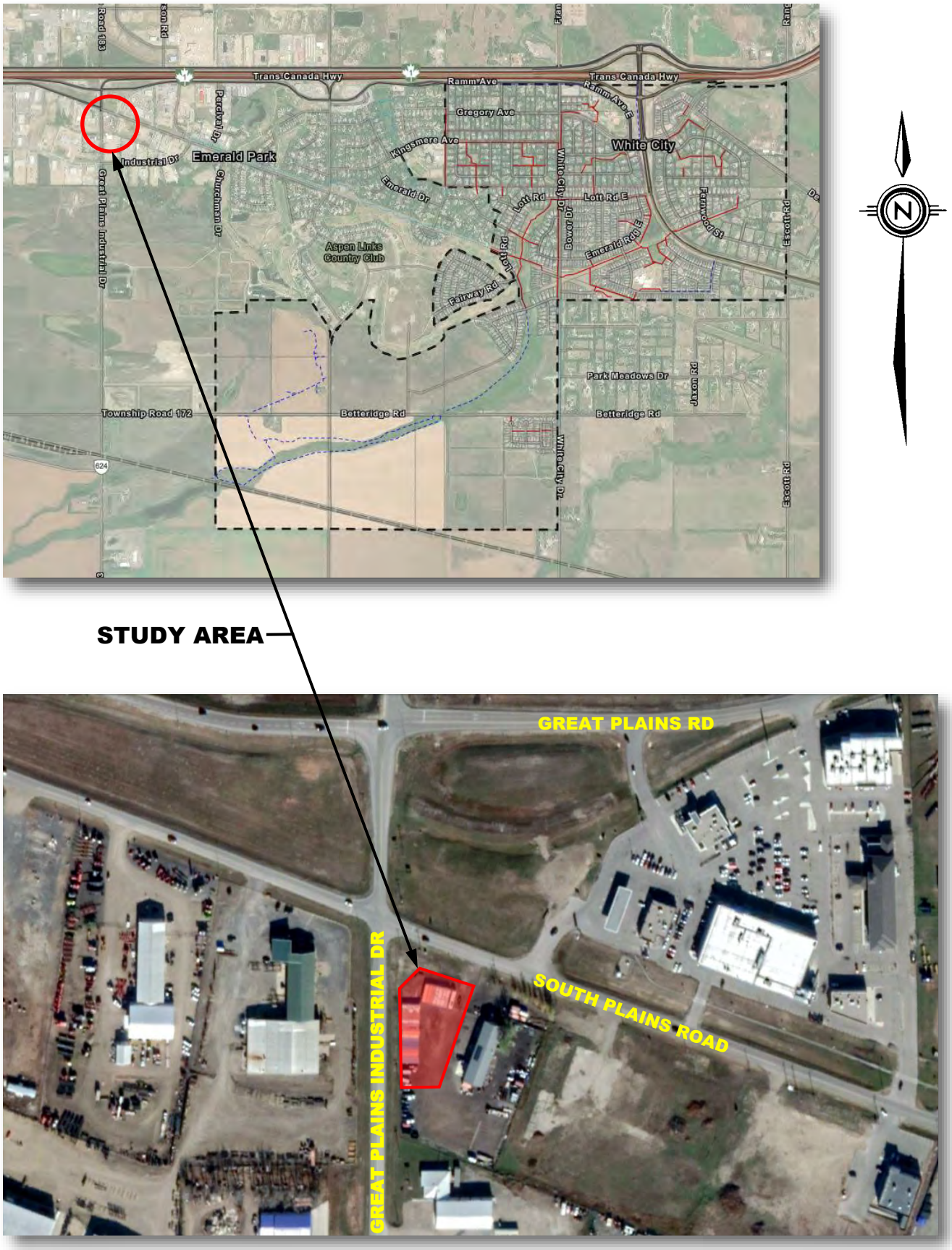

FIGURE 1

LOCATION OF STUDY AREA

Representative disturbed auger soil samples, split-spoon soil samples and undisturbed Shelby tube soil samples were recovered from the test borings and taken to our laboratory for analysis. Standard Penetration tests were conducted in Test Holes 101 and 102 at selected depths and intervals as shown on the bore hole logs. Each soil sample was visually examined to determine its textural classification and a natural moisture content test was performed on each sample. An estimate of the undrained shear strength of the undisturbed soil was made using both a pocket penetrometer and a laboratory vane shear apparatus. In addition, Atterberg Limits, dry density, unconfined compressive strength and sulphate content tests were performed on selected representative soil samples. Details of the soil profile, samples taken, laboratory test results and stratigraphic interpretations of the subsoils are appended to this report on Drawing Nos. GE-2217-5 to -10, inclusive.

The ground surface elevations at the test hole locations were established by representatives of Ground Engineering Consultants Ltd. and are referenced to an assumed datum of 100.00 metres described as the top of the floor slab at the west overhead bay door of the existing building on the adjacent property to the east, as shown on the Drawing No. GE-2217-1.

4.0 GEOTECHNICAL ANALYSIS

4.1 Stratigraphy

The drilling information indicates that the proposed building site is overlain by fill materials which extend to depths ranging from 0.3 of 0.9 metres. The fill consists predominantly of clayey silt and/or highly plastic clay with trace quantities of sand, gravel and organics.

The surficial fill materials are underlain by a stratified drift unit which extends to the maximum depth penetrated in the test holes (15.2 metres). The stratified drift unit consists predominantly of a surficial layer of highly plastic silty clay which extends to a depth of 1.8 metres below existing grade and is underlain by clayey silt and sandy silt. The silt unit contains interbedded highly plastic clay and fine grained sand layers.

4.2 Groundwater

The drilling information indicates that there is a shallow groundwater table at this site. The saturated silt is dilatent and subject to sloughing in an open test hole. Test Hole 102 was left open for 1.5 hours, after which, the water level was measured at a depth of 2.4 metres below grade.

5.0 DISCUSSION

5.1 Fill Materials

The majority of fill materials were placed prior to 1995. It is not known if the fill was compacted during placement. Atterberg Limits test results indicate that the fill has a Liquid Limit in the order of 70 percent and a Plasticity Index in the order of 47 percent.

5.2 Stratified Drift Unit

The stratified drift unit varies in lithology from highly plastic silty clay to clayey silt. These soils are normally consolidated except for the surficial clay which is highly plastic and over consolidated from desiccation. The clay layers are generally firm to stiff in consistency. Atterberg Limit tests indicate that the clay is highly plastic with a Liquid Limit ranging from 57 to 64 percent and a Plasticity Index ranging from 37 to 39 percent. The dry density of the clay is in the order of 1.44 tonnes per cubic metre.

The silt layers have a Liquid Limit in the order of 24 percent and a Plasticity Index in the order of 5 percent. Standard Penetration test "N" values range from a low of 5 blows per foot to a high of 55 blows per foot. The saturated silts are dilatent and subject to sloughing in an open test hole.

5.3 Frost Heaving

In fine-grained soils such as silts and clays, moisture is continuously drawn to the freezing plane where it forms ice lenses. These lenses physically lift the soil above them, thus causing heave at ground surface. The soils at this site have a high susceptibility to frost heaving due to the fine-grained soils and shallow groundwater table. The maximum anticipated depth of frost penetration at this site is in the order of 1.8 to 2.2 metres depending on the depth of snow cover.

To minimize frost heaving problems, any paved areas should be sloped to suitably located catch basins or ditches. Regular maintenance of the pavement structure (crack sealing) is critical for satisfactory long-term performance. Rigid insulation is recommended beneath exterior grade supported concrete slabs to minimize the depth of frost penetration and prevent frost heaving adjacent to the buildings.

6.0 FOUNDATION CONSIDERATIONS

We recommend that the proposed building be supported on a driven steel pipe pile and grade beam type of foundation system. Augercast (CFA) bored concrete piles or helical steel screw piles would be a suitable alternative. Our specific design recommendations for each type of foundation system are presented as follows:

6.1 Driven Steel Pipe Piles

Steel pipe piles are commonly used for:

i) variable lengths, since cuts and splices are made easily;

ii) diameters up to 900 mm, and;

iii) loads up to 6500 kN.

Our specific design recommendations for installing steel pipe piles at this site are provided below:

.1 The structural design of steel pipe piles must conform to the requirements of Subsection 4.3.4 of the National Building Code of Canada (2015). The steel pipe piles may be designed as open ended. The soil plug that forms inside the pile may be left in place. The piles should be filled with concrete after driving has been completed.

.2 A minimum embedment length of 7.0 metres is recommended, with a minimum pipe diameter of 273 mm.

.3 The load carrying capacity of a single steel pipe pile is a combination of point resistance and side friction developed between the pile and the surrounding soil. For design purposes, the end bearing component should generally be disregarded. The relationship can be expressed as follows:

$$R = \phi A_p f$$

Where: R = pile capacity;
ϕ = geotechnical resistance factor;
A_p = effective skin friction area;
f = ultimate skin friction

.4 The upper 2.0 metres of pile length or the maximum depth of fill whichever is greater should be discounted when calculating the frictional component. Friction piles should be designed

using the ultimate skin friction values and applicable geotechnical resistance factors for Limits State Design provided in Table 1, below.

TABLE 1

RECOMMENDED LSD CRITERIA FOR FRICTION TYPE DRIVEN STEEL PIPE PILES IN COMPRESSION

ASSUMED ELEVATION (metres)	SOIL TYPE	ULTIMATE SKIN FRICTION (kPa)	GEOTECHNICAL RESISTANCE FACTOR (compression)	GEOTECHNICAL RESISTANCE FACTOR (tension)
Above 97.8	Fill / Clay / Silt	0	0.4	0.3
97.8 to 88.0	Silt	60		
Below 88.0	Silt	75		

* Ground Surface Elevation is 99.8 to 100.04 metres, Assumed, approximately.

.5 Practical refusal can be calculated in the field on the basis of the allowable pile capacity, pile specifications, pile penetration and the driving energy. Dynamic pile driving formulas should generally not be used for pile design, however, driving beyond the refusal criteria may cause structural damage to the piles which should not be permitted. Practical refusal for steel piles should be defined as a pile penetration of 50 mm for the last 10 blows of a hammer operating at a specified energy (depending on pile size). The pile cross section, required energy and allowable capacity for piles driven to refusal are provided in Table 2. Piles driven to refusal should be re-driven after 24 hours to ensure proper set.

TABLE 2

REQUIRED DRIVING ENERGY & ALLOWABLE CAPACITY FOR STEEL PIPE PILES DRIVEN TO REFUSAL

PILE DIAMETER*	DRIVING ENERGY (kJ)	ALLOWABLE CAPACITY (kN)
273	45	500
325	52	600
355	59	675
406	65	750
508	85	975
559	90	1050
610	100	1150

*Section thickness as required for structural integrity and corrosion protection (not less than 10.0 mm).

.6 The materials to be used for steel piles must conform to the requirements of the National Building Code of Canada (2015) and ASTM A252-82.

.7 Experience indicates that corrosion is not a practical problem for steel piles driven into natural soil. However, in fill at/or above the groundwater table, moderate corrosion may occur. Where these conditions exist, steps should be taken to protect the piles. Among these are the application of coatings such as coal tar epoxy before driving, encasement by cast-in-place concrete jackets, Cathodic protection, inclusion of copper content in the steel, or combinations of these including increasing the wall thickness to provide a margin for corrosion, see National Bureau of Standard Monograph 127 (1972) and BJERRUM (1967).

.8 The pile driving procedures should be inspected by competent geotechnical personnel and driving records documented for each pile.

.9 A minimum centre to centre spacing of 2.5 times the pile diameter should be maintained between piles.

.10 Additional technical information on structural design and installation of steel pipe piles is included in Appendix A.

6.2 Augercast Bored Concrete Piles

.1 The column loads for the proposed building structure may be supported by augercast (CFA) straight shaft piles designed to develop load carrying capacity on the basis of side friction only. Friction piles should be designed according to the design criteria provided in Table 3, below.

TABLE 3

RECOMMENDED LSD CRITERIA FOR FRICTION TYPE BORED CONCRETE PILES

ASSUMED ELEVATION (metres)	SOIL TYPE	ULTIMATE SKIN FRICTION (kPa)	GEOTECHNICAL RESISTANCE FACTOR (compression)	GEOTECHNICAL RESISTANCE FACTOR (tension)
Above 97.8	Fill / Clay / Silt	0	0.4	0.3
97.8 to 88.0	Silt	65		
Below 88.0	Silt	75		

* Ground Surface Elevation is 99.8 to 100.04 metres, Assumed, approximately.

.2 The upper 2.0 metres of pile length should be discounted insofar as side friction carrying capacity is concerned. It is recommended that the minimum pile shaft diameter be 400 mm. A minimum pile length of 6.0 metres is also recommended.

.3 The minimum centre to centre pile spacing for CFA piles should be (0.02D + 2.5b) where D is the average depth of the piles and b is the pile diameter.

.4 Pile shafts carrying little or no bending moment should be reinforced with nominal vertical reinforcement in the form of intermediate grade deformed bars, composing about one-half (½) of one (1) percent of the cross-sectional area. The steel reinforcing cage should be projected or dowels set into the top of the caisson to tie into the foundation walls and/or columns.

.5 A minimum of 75 mm of rigid insulation should be placed on the inside of all perimeter grade beams to reduce the heat losses and to prevent drying of the soils.

6.3 Helical Steel Screw Piles

Relatively light column loads may be supported on helical steel screw piles. The following geotechnical parameters may be used to design the screw pile foundations:

The approximate ultimate vertical capacity Q_u, for a single helix pile installed in cohesive soils may be determined by the following equation:

$$Q_u = (N_c C_u + \gamma' H) \frac{\pi (D^2 - d^2)}{4}$$

Where: C_u = Ultimate undrained shear strength at the depth of the helix
For the clayey silt soils, C_u = 50 kPa

N_c = bearing capacity factor
For deep embedment, H/D >4, Nc = 9
For shallow embedment H/D<4
N_c varies linearly between 5.6 at H/D = 0, to 9 at H/D = 4

γ' = soil unit weight of soil above the water table or effective (buoyant) soil unit weight if below water table (use $\gamma' = 19.6$ kN/m^3 for drift soils)

H = height of soil above the helix plate
(Measured from the bottom of upper helix to the top of lower helix in the case of multiple helix piles)

D = diameter of the helix

d = diameter of the shaft

In the case of a screw pile with multiple helixes, the ultimate vertical compressive load capacity may be determined by:

$$Q_u = \sum_{I=1}^{n} R_{ui}\ Q_{ui}$$

Where: i = helix number, numbered 1 to n, increasing downward

Q_{ui} = ultimate capacity of helix plate "i", from the above equation using the applicable helix diameter and embedment depth

R_{ui} = interaction factor given in Table 4, to account for the effect of helix spacing.

TABLE 4

INTERACTION FACTOR FOR MULTIPLE HELIX SCREW PILES

Ratio (S/D) of Average Helix Spacings (S) to Average Helix Diameter (D)	Interaction Factor R_u
1	0.3
2	0.5
2.5	0.65
3	0.75
3.5	0.85
4	0.95
5	1.0
Note: For cohesive soils: R_{u1} and R_{un} = 1, for both tension and compressive loads.	

The recommended geotechnical resistance factors (Φ) for Limit States Design purposes are 0.4 for piles in compression, 0.3 for piles in tension and 1.0 for adfreezing. Assume an adfreeze depth of 2.0 metres. With a center-to-center spacing of 3 helix diameters or more, the group capacity may be taken as the sum of the capacities of individual piles. At pile spacing between 2 and 3 helix diameters, the sum of the vertical capacities of a group should be reduced by 20 percent. The center-to-center pile spacing should not be less than 2 helix diameters.

A minimum pile embedment depth of 7.5 metres below existing grade or 5 times the helix diameter plus 1.5 metres, whichever is greater, is recommended.

Historically, torque measurements have been utilized to predict the vertical capacities of helical piles. However, various researchers have indicated that torque correlations with vertical capacities are unreliable and show significant deviations between the predicted and actual capacities from load tests. Therefore, the use of torque measurements alone as a design tool is not recommended.

7.0 EXCAVATION CONSIDERATIONS

Building excavations at this site will be in the surficial fill and stratified drift soils. Conventional excavation procedures should therefore be applicable to the soils at this site. The silt is saturated and trench instability should be anticipated when excavating in any soils below the water table. Excavations shall comply with minimum requirements of Occupational Health and Safety Regulations.

Occupational Health and Safety Regulations require that any trench or excavation in which people must work must be cut back according to the soil "type" or a temporary shoring system must be used to support the sides of the excavation. The surficial clay and silt soils above the water table would be classified as a "Type 3 Soil". According to current Occupational Health and Safety Regulations, the walls of excavations shall be sloped from the bottom of the excavation with a slope at an angle not steeper than one (1) horizontal to one (1) vertical. The saturated silt soils below the water table would be classified as "Type 4 Soils". In the case of a "Type 4 Soil", the walls of excavations which penetrate into the saturated silt soils shall be sloped from the bottom of the excavation at an angle not steeper than three (3) horizontal to one (1) vertical.

Stockpiles and/or surcharge loads should not be placed on the edge of the excavations.

Shoring systems shall protect the worker and prevent instability. All shoring systems shall be designed by a qualified professional engineer.

It is anticipated that in some areas the excavations will extend below the water table, therefore, dewatering will be required during construction. Water may be removed from excavations through the use of sumps. The following points are recommended for dewatering of deep excavations:

.1 The dewatering method must insure the stability of the sides and bottom of the excavation. Extra width of excavation to accommodate ditches and/or sumps may be required;

.2 The lowered water table must be kept under full control to avoid fluctuations which may cause instability in the excavation;

.3 Adequate pumping capacity as well as standby pumping and power capacity should be provided;

.4 Pumped water should be discharged in a manner that will not interfere with the excavation or deposit deleterious materials in waterways;

.5 Loss of ground from around the sump should be prevented;

.6 Observation and maintenance of the excavation should be carried out on a regular basis.

Should changed soil and/or groundwater conditions be encountered as the excavation proceeds, they should be reported immediately to our office in order that we can review our recommendations. Side slopes of deep excavations should be monitored on a daily basis to detect any signs of potential stability problems. It is assumed that all open cut excavations will not remain open for more than two weeks.

8.0 FLOOR SLAB CONSIDERATIONS

The surficial clay is a potentially active type soil, therefore, there is a potential for differential movement of grade supported floor slabs at this site. A structural floor system would be the more desirable alternative insofar as overcoming the potential problems associated with differential floor slab movement. Alternatively, if differential movement can be tolerated, the floor may be constructed as a grade supported slab. The following recommendations are provided for both types of floor systems.

8.1 Structurally Supported Floor Systems

A structural floor system would be the most positive way to ensure satisfactory long term performance of the floor. We recommend the following items of work for construction of the structural slab.

.1 A minimum 150 mm cardboard void form should be placed beneath the floor slab.

.2 The void form should be covered with a minimum 6 mil polyethylene vapour barrier to deter moisture migration through the floor.

.3 The backfill against the perimeter grade beams should consist of the native clay or clay fill soils. The soil should be placed in thin lifts (200 mm) and compacted to 95 percent Standard Proctor density to minimize infiltration of surface water into the void space beneath the floor.

8.2 Grade Supported Floor Slabs

In most commercial buildings, a grade supported floor slab is placed because of the relatively high cost of a structural floor slab. In opting for a grade supported slab, the Owner must accept the risk of differential movement. At this site, the risk is present because of the highly plastic clay subgrade.

The following recommendations are given in an attempt to minimize differential movement of the grade supported floor slabs:

.1 The subgrade under a grade supported slab should be as uniform as possible. The exposed clay subgrade should be proof-rolled by at least 10 passes with a heavy sheepsfoot or vibratory padfoot roller. Any soft or spongy areas should be excavated and filled with compacted granular material. A well graded pit run sand (Type 8) compacted to 95% Standard Proctor density is suitable for this purpose. Excessive compaction of the clay subgrade is not recommended because this will increase the swell potential of the clay. The clay subgrade should be at or preferably 1% to 2% above its optimum moisture content. In order to achieve this moisture content, moisture conditioning may be required. A minimum of 900 mm of granular fill is recommended below all grade supported floor slabs comprised of 700 mm of Type 8 subbase overlain by 200 mm of Type 33 base course, each compacted to 100% Standard Proctor density. Specifications for granular fill materials are included in Appendix B.

.2 It is assumed that the floor slab will possess sufficient rigidity to distribute the loading across the floor slab. The floor slab must be stiff enough to distribute the contact stresses and yet strong enough to resist resulting moments. A generous amount of reinforcing running both ways on the top and bottom of the slab is desirable. Control joints (sawn or premolded) are recommended at a maximum spacing of about 4.5 metres.

.3 A layer of robust polyethylene sheeting should be placed between the granular base and the concrete slab to deter the migration of moisture through the floor.

9.0 PAVEMENT STRUCTURE

It is understood that roadway and parking areas will be surfaced with an asphaltic concrete pavement structure. Our pavement design recommendations are as follows;

9.1 Determination of Subgrade Strength

Subgrade soaked CBRs were estimated on the basis of the calculated Group Index values according to the protocol given in Saskatchewan Ministry of Highway and Infrastructure Surfacing Manual[1]. The equivalent soaked CBR of the subgrade soils are in the order of 2.5. We recommend a soaked CBR value of 2.5 for design purposes. The group index and CBR values are summarized in Table 5, below.

TABLE 5

SUMMARY OF GROUP INDEX AND DESIGN CBR VALUES

TEST HOLE	GI VALUE	ESTIMATED CBR	DESIGN CBR	MATERIAL DESCRIPTION
103	20	2.5	2.5	Clay
105	20	2.5		Fill – Clay

9.2 Traffic Analysis

A traffic analysis was completed to estimate the traffic loading anticipated over a proposed 15 year design life (2022 to 2037). A design 15 year traffic loading of $2.1x10^5$ ESALs was estimated. Projected traffic volumes were estimated based on the procedure outlined in the ITE Trip Generation

[1] Surfacing Manual – Ministry of Highways and Infrastructure, 2016

Manual[2]. A daily vehicle trip generation rate of 716 trips/KSF (Land Usage Codes No. 933) was applied for the Fast Food with Drive Through land usage.

9.3 Asphaltic Concrete Pavement Structure

Our pavement design recommendations are as follows:

.1 The pavement around the building should be designed to slope in order to provide adequate drainage of water away from the perimeter of the building and from the surface of paved areas. The need for adequate drainage cannot be overstressed. To ensure fast runoff, the surface of the pavement should have a slope of at least two (2) percent, either to the outer perimeter of the paved areas, or to suitable located catch basins leading to underground drains. The contour of the finished pavement at all points should prevent water from standing on the surface, and surface water should not be permitted to seep back under the outer edges of the pavement. Subsurface drains should be installed in locations where subsurface water may accumulate within the pavement structure or where its necessary to intercept water that would tend to make its way into the pavement structure.

.2 Our recommended pavement structure thicknesses for heavy truck loading and light duty parking areas are shown in Table 6, below.

TABLE 6

RECOMMENDED PAVEMENT STRUCTURES

	ASPHALT CONCRETE SURFACE COURSE (mm)	TYPE 33 BASE COURSE THICKNESS (mm)	TYPE 8 SUBBASE THICKNESS (mm)	NON-WOVEN GEOTEXTILE
Heavy Structure	100	150	350	Geotex 1201
Light Structure	50	150	150	-

.3 The subgrade in the parking and roadway areas should be compacted to a minimum of 95% Standard Proctor density with a heavy sheepsfoot or vibratory padfoot type compactor. Any soft or spongy areas should be replaced with granular material before placing the base or subbase. If isolated soft wet areas are encountered in any of the roadways areas during

[2] Trip Generation 9th Edition – ITE International, 2012

construction, a non-woven geotextile (Geotex 1201 or equivalent) is recommended on top of the finished clay subgrade.

.4 Suggested specifications for asphaltic concrete and granular fill materials are included in Appendix B.

10.0 OTHER

.1 Adequate drainage away from the building should be provided and maintained to minimize infiltration of water into the subgrade. Building floors should be set as high as possible in relation to the surrounding area.

.2 Test results on selected samples indicate that the soluble sulphate contents in the soil range from 0.13 to 0.16 percent by dry soil weight. Exposure Class S-3 is considered appropriate for design of concrete in contact with the native soil, as specified in CSA Standard CAN3-A23.1. Minimum requirements for Exposure Class S-3 are as follows:

i) Cement Type: MS, MSB, LH, HS or HSb
ii) Maximum water to cementing materials ratio: 0.50
iii) Air Content: as per CSA CAN-A23.1 Tables 2 and 4
iv) Minimum specified Compressive Strength: 30 MPa at 56 days

.3 In the event that changes are made in the design, location or nature of the project, the conclusions and recommendations included in this report would not be deemed valid unless the changes in the project were reviewed by our firm. Modification to this report would then be made if necessary. Furthermore, it is recommended that this firm be allowed an opportunity for a general review of the final design plans and specifications in order to ensure that the recommendations made in this report are properly interpreted and implemented. If this firm is not allowed the opportunity for this review, we assume no responsibility for the misinterpretation of any of the recommendations.

.4 It is recommended that Ground Engineering Consultants Ltd. be retained to provide inspection services during construction of the foundations for this project. This is to observe compliance with the design concepts, specifications or recommendations and to allow design changes in the event that the subsurface conditions differ from what was anticipated.

.5 This report has been prepared for 102133212 Saskatchewan Ltd. and is intended for the specific application to the design and construction of the Proposed Burger King Restaurant to be constructed at 2 South Plains Road located in R.M. of Edenwold No. 158, Saskatchewan. The analysis and recommendations are based in part on the data obtained from the test hole logs. The boundaries between soil strata have been established at the bore hole locations. Between the bore holes, the boundaries are assumed from geological evidence and may be subject to considerable error. Contractors bidding on the project works are particularly advised against reviewing the report without realizing the limitations of the subsurface information.

.6 It is recommended that the geotechnical workscope include the following services in addition to subsurface exploration and development of foundation design recommendations. These two services are:

i) geotechnical review of other design professionals' plans relative to their interpretation of geotechnical findings and recommendations, and

ii) construction monitoring to observe construction activities in light of plans and specifications, and to help assure that unforeseen conditions are detected quickly to permit prompt corrective action and thus prevent minor problems from growing to major proportion.

.7 The samples from this site will be retained in our laboratory for 90 days following the date of this report. Should no instructions be received to the contrary, these samples will then be discarded.

11.0 CLOSURE

We trust that this report is satisfactory for your purposes. If you have any questions or require additional information, please contact our office.

Yours very truly
Ground Engineering Consultants Ltd.

PROFESSIONAL ENGINEER
M.S. WURM
MEMBER 13573
22 03 30
YR. MO. DAY
SASKATCHEWAN

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MW:cf
Distribution: 102133212 Saskatchewan Ltd. (1 copy, 1 PDF copy)
mw1321 Office (1 copy)

Association of Professional Engineers & Geoscientists of Saskatchewan
CERTIFICATE OF AUTHORIZATION
Ground Engineering Consultants Ltd.
Number C0008
Permission to Consult held by:

Discipline	Sk. Reg. No.	Signature
GEOTECHNICAL	6307	

GROUND ENGINEERING CONSULTANTS LTD.

STATEMENT OF GENERAL CONDITIONS

1. STANDARD OF CARE

This study and report have been prepared in accordance with generally accepted geotechnical and environmental consulting practices in this area. No other warranty, expressed or implied, is made.

2. BASIS OF REPORT

This report has been prepared for the specific site, development, design objectives and purpose that were described to Ground Engineering Consultants Ltd. (**GEC**) by the Client. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the document are only valid to the extent that there has been no material alternation or variation from any of the said descriptions provided to **GEC**, unless **GEC** is specifically requested by the Client to review and revise the Report in light of such alteration or variation.

3. USE OF THE REPORT

The information and opinions expressed in this document are for the sole benefit of the Client. No other party may use or rely upon the report or any portion thereof without **GEC**'s expressed written consent. **GEC** will consent to any reasonable request by the Client to approve the use of this report by other parties as approved users. The contents of the report remain the copyright property of **GEC**, who authorizes only the Client and "Approved Users" to make copies of the report only in such quantities as are reasonably necessary for the use of the report by those parties. The Client and Approved Users may not give, lend, sell or otherwise make available this document or the report or any portion thereof, or any copy of the report or portion thereof, to any party without the expressed written permission of **GEC**.

4. COMPLETE REPORT

The report is of a summary nature and is not intended to stand alone without reference to the instructions given to **GEC** by the Client, communications between **GEC** and the client, and to any other reports, writings or documents prepared by **GEC** for the Client relative to the specific site described herein, all of which constitute the report. Wherever the word "report" is used herein, it shall refer to any and all of the documents referred to herein

IN ORDER TO PROPERLY UNDERSTAND THE SUGGESTIONS, RECOMMENDATIONS AND OPINIONS EXPRESSED HEREIN, REFERENCE MUST BE MADE TO THE WHOLE OF THE REPORT. **GEC** CANNOT BE RESPONSIBLE FOR USE BY ANY PARTY OR PORTIONS OF THE REPORT WITHOUT REFERENCE TO THE WHOLE REPORT.

5. INTERPRETATION OF THE REPORT

Nature and Exactness of Soil and Contaminant Description. Classification and identification of soils, rocks, geological units, contaminant materials and contaminant quantities have been based on commonly accepted geotechnical and environmental consulting practices in this area. Classification and identification of these factors are judgmental in nature and even comprehensive sampling and testing programs implemented with appropriate equipment by experienced personnel, may fail to locate some hidden conditions. All reasonable problems will involve an inherent risk that some conditions will not be detected and all reports summarizing such investigations will be based on assumptions of what exists between the actual points sampled. Actual conditions may vary significantly between the points investigated and all persons making use of such reports should be aware of and accept this risk. Some conditions are subject to change over time and those making use of the report should be aware of this possibility and understand that the report only presents the conditions at the sampled points at the time of sampling.

DRAWINGS

SCALE: 1:500

GROUND ENGINEERING CONSULTANTS LTD.
CIVIL & GEOENVIRONMENTAL ENGINEERS
415-7th AVENUE
REGINA, SASKATCHEWAN, CANADA

SITE PLAN SHOWING LOCATION OF TEST HOLES
PROPOSED BURGER KING RESTAURANT
2 SOUTH PLAINS ROAD
PART OF LOT 1, BLOCK 3, PLAN 82R55377 Ext 0
R.M. OF EDENWOLD No. 158, SASKATCHEWAN

CLIENT:	APPROVED:	DATE:	DWG. No.:
102133212 SASKATCHEWAN LTD.	M. WURM	MARCH 30, 2022	GE-2217-1

Z:\ PROJECT DIRECTORY \ ENG-FILES \ 2022 FILES \ 2217 GI&PH1 SASK LTD_2 GREAT PLAINS RD_EMERALD PARK \ GI \ DRAWINGS \ 2217 SITE_BURGER KING_EMERALD PARK.DWG

CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES

ASTM Designation: D 2487 - 69 AND D 2488 - 69

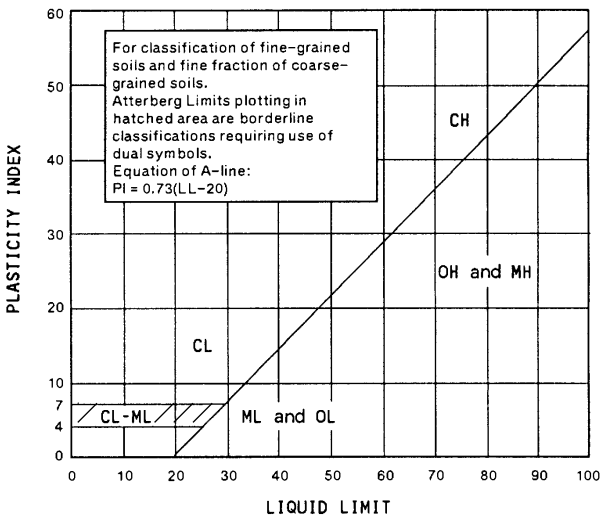
(Unified Soil Classification System)

Major Divisions			Group Symbols	Typical Names	Classification Criteria
Coarse-grained soils More than 50% retained on No. 200 sieve *	Gravels 50% or more of coarse fraction retained on No. 4 sieve	Clean gravels	GW	Well-graded gravels and gravel-sand mixtures, little or no fines	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4: $C_z = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines	Not meeting both criteria for GW
		Gravels with fines	GM	Silty gravels, gravel-sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4
			GC	Clayey gravels, gravel-sand-clay mixtures	Atterberg limits above "A" line with P.I. greater than 7
	Sands More than 50% of coarse fraction passes No. 4 sieve	Clean sands	SW	Well-graded sands and gravelly sands, little or no fines	$C_u = \frac{D_{60}}{D_{10}}$ greater than 6: $C_z = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3
			SP	Poorly graded sands and gravelly sands, little or no fines	Not meeting both criteria for SW
		Sands with fines	SM	Silty sands, sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4
			SC	Clayey sands, sand-clay mixtures	Atterberg limits above "A" line with P.I. greater than 7
Fine-grained soils 50% or more passes No. 200 sieve *	Silts and clays Liquid limit 50% or less		ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands	
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	
			OL	Organic silts and organic silty clays of low plasticity	
	Silts and clays Liquid limit greater than 50%		MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts	
			CH	Inorganic clays of high plasticity, fat clays	
			OH	Organic clays of medium to high plasticity	
	Highly organic soils		Pt	Peat, muck and other highly organic soils	

Classification on basis of percentage of fines
Less than 5% pass No. 200 sieve ..... GW, GP, SW, SP
More than 12% pass No. 200 sieve ..... GM, GC, SM, SC
5 to 12% pass No. 200 sieve ..... Borderline classifications requiring use of dual symbols

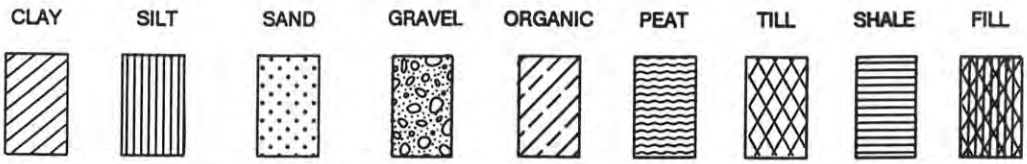
Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols

PLASTICITY CHART



*Based on the material passing the 75mm (3in) sieve.

SYMBOLS AND TERMS USED IN THE REPORT



The symbols may be combined to denote various soil combinations, the predominate soil being heavier.

RELATIVE PROPORTIONS

TERM	RANGE
Trace	0 – 5%
A Little	5 – 15%
Some	15 – 30%
With	30 – 50%

ASTM CLASSIFICATION BY PARTICLE SIZE

Boulder		> 300 mm
Cobble		300 mm – 75 mm
Gravel		75 mm – 4.75 mm
Sand		
	coarse	4.75 mm – 2 mm
	medium	2 mm – 425 um
	fine	425 um – 75 um
Silt		75 um – 5 um
Clay		< 5 um

DENSITY OF SANDS AND GRAVELS

DESCRIPTIVE TERM	RELATIVE DENSITY [1]	N VALUE STANDARD PENETRATION TEST [2]
Very loose	0 – 15%	0 – 4 Blows per 300mm
Loose	15 – 35%	4 – 10 Blows per 300mm
Medium Dense	35 – 65%	10 – 30 Blows per 300mm
Dense	65 – 85%	30 – 50 Blows per 300mm
Very Dense	85 – 100%	> 50 Blows per 300mm

CONSISTENCY OF CLAYS AND SILTS

DESCRIPTIVE TERM	UNDRAINED SHEAR STRENGTH (kPa) (CFEM, 2nd Edt., 1985)	N VALUE STANDARD PENETRATION TEST [2]	FIELD IDENTIFICATION (ASTM D 2488–84)
Very Soft	<12	< 2 Blows per 300mm	Thumb will penetrate soil more than 25 mm
Soft	12 – 25	2 – 4 Blows per 300mm	Thumb will penetrate soil about 25 mm
Firm	25 – 50	4 – 8 Blows per 300mm	Thumb will indent soil about 6 mm
Stiff	50 – 100	8 – 15 Blows per 300mm	Thumb will indent, but only with great effort (CFEM)
Very Stiff	100 – 200	15 – 30 Blows per 300mm	Readily indented by thumbnail (CFEM)
Hard	>200	> 30 Blows per 300mm	Thumb will not indent soil but readily indented with thumbnail

NOTES: 1. Relative Density determined by standard laboratory tests.
2. N Value – Blows/300mm of a 620N hammer falling 762mm on a 50mm O.D. Split Spoon.

SYMBOLS AND TERMS USED IN THE REPORT (continued)

GROUNDWATER

▼ Water level measured in the borings at the time and under the conditions indicated. In sand, the indicated levels can be considered reliable groundwater levels. In clay soil, it is not possible to determine the groundwater level within the normal scope of a test boring investigation, except where lenses or layers of more pervious waterbearing soil are present and then a long period of time may be necessary to reach equilibrium. Therefore, the position of the water level symbol for cohesive or mixed texture soils may not indicate the true level of the groundwater table. The available water level information is given at the bottom of the log sheet.

▽ Water level determined by piezometer installation – In all soils the levels can be considered reliable groundwater levels.

DESCRIPTIVE SOIL TERMS

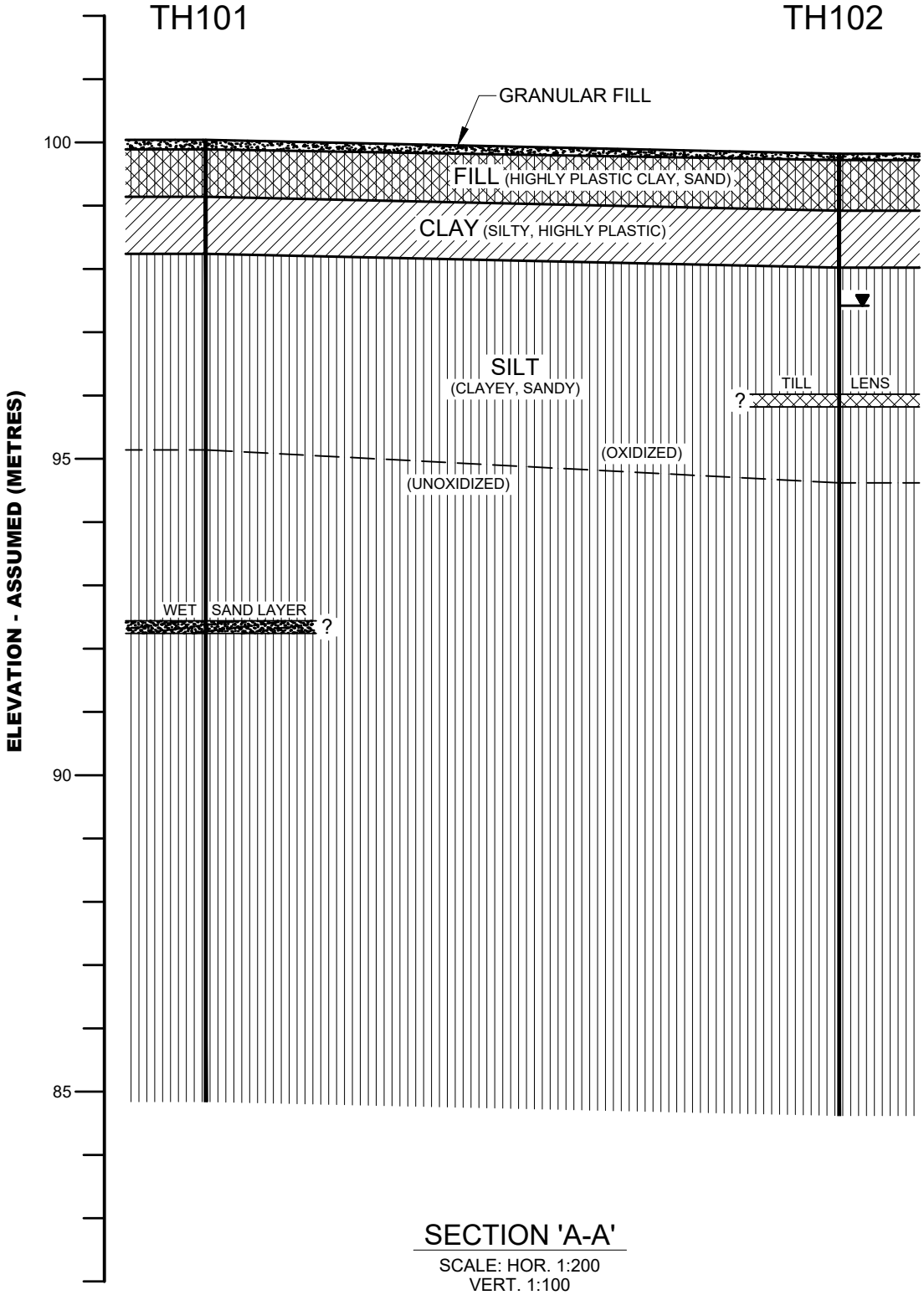
WELL GRADED	Having wide range of grain sizes and substantial amounts of all intermediate sizes.
POORLY GRADED	Predominantly of one grain size.
SLICKENSIDES	Refers to a clay that has planes that are slick and glossy in appearance; slickensides are caused by shear movements.
SENSITIVE	Exhibiting loss of strength on remolding.
FISSURED	Containing cracks, usually attributable to shrinkage. Fissured clays are sometimes described as having a nuggetty structure.
STRATIFIED	Containing layers of different soil types.
ORGANIC	Containing organic matter; may be decomposed or fibrous.
PEAT	A fibrous mass of organic matter in various stages of decomposition. Generally dark brown to black in color and of spongy consistency.
BEDROCK	Preglacial material.
DRIFT	Material deposited directly by glaciers or glacial melt-water.
ALLUVIAL	Soils that have been deposited from suspension from moving water.
LACUSTRINE	Soils that have been deposited from suspension in fresh water lakes.

DRILLING AND SAMPLING TERMS

SYMBOL	DEFINITION
C.S.	Continuous Sampling
Sy	75mm Thin Wall Tube Sample
Sy (2)	50mm Thin Wall Tube Sample
SPT (SS)	50mm O.D. Split Spoon Sample
BLOWS / 300mm	"N" Value – Standard Penetration Test
Bag	Disturbed Bag Sample
No.	Sample Identification Number
——→	Piezometer Tip
S.I.	Slope Indicator
SPG —→	Observed Seepage

LABORATORY TEST SYMBOLS

SYMBOL	DEFINITION
●	Moisture Content – Percent of Dry Weight
⊢→	Plastic and Liquid Limit determined in accordance with ASTM D-423 and D-424
◆	Dry Density – t/m^3
■	Shear Strength – As determined by Unconfined Compression Test
▲	Shear Strength – As determined by Field Vane
▲	Shear Strength – As determined by Pocket Penetrometer Test
$\%SO_4$	Water Soluable Sulphates – Percent of Dry Weight
M.A.	Grain Size Analysis



SECTION 'A-A'

SCALE: HOR. 1:200
VERT. 1:100

The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes, the boundaries are interpolated and may be subject to considerable error.

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REGINA, SASKATCHEWAN, CANADA

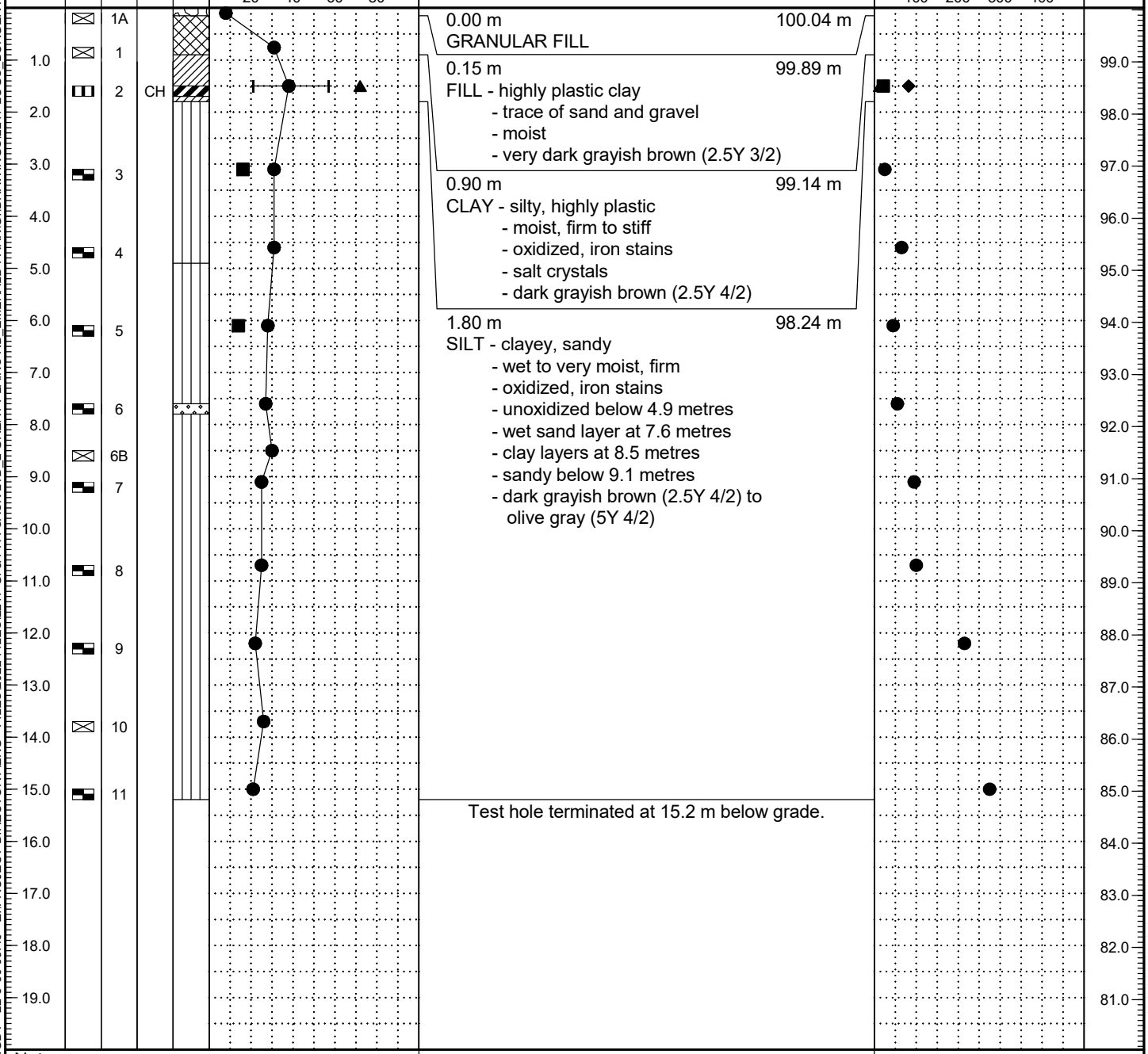
STRATIGRAPHIC CROSS SECTION 'A-A'
PROPOSED BURGER KING RESTAURANT
2 SOUTH PLAINS ROAD
PART OF LOT 1, BLOCK 3, PLAN 82R55377 Ext 0
R.M. OF EDENWOLD No. 158, SASKATCHEWAN

CLIENT:	APPROVED:	DATE:	DWG. No.:
102133212 SASKATCHEWAN LTD.	M. WURM	MARCH 30, 2022	GE-2217-5

Z:\ PROJECT DIRECTORY \ ENG-FILES \ 2022 FILES \ 2217 GI&PH1 SASK LTD_2 GREAT PLAINS RD_EMERALD PARK \ GI \ DRAWINGS \ 2217 SITE_BURGER KING_EMERALD PARK.DWG

Project: Proposed Burger King Restaurant	Location: 2 South Plains Road, Emerald Park	Test Hole No.: TH101
Project No.: GE-2217	Coordinate: 5588277 N; 541796 E (NAD83)	Drill Rig: Diedrich D-120
Client: 102133212 Saskatchewan Ltd.	Elevation: 100.04 m (Assumed)	Date Drilled: 2022-03-14

Sample Type: Shelby Tube | Disturbed | SPT Sample | Pail Sample | No Recovery | Jar Sample



Soil Description

0.00 m — 100.04 m
GRANULAR FILL

0.15 m — 99.89 m
FILL - highly plastic clay
- trace of sand and gravel
- moist
- very dark grayish brown (2.5Y 3/2)

0.90 m — 99.14 m
CLAY - silty, highly plastic
- moist, firm to stiff
- oxidized, iron stains
- salt crystals
- dark grayish brown (2.5Y 4/2)

1.80 m — 98.24 m
SILT - clayey, sandy
- wet to very moist, firm
- oxidized, iron stains
- unoxidized below 4.9 metres
- wet sand layer at 7.6 metres
- clay layers at 8.5 metres
- sandy below 9.1 metres
- dark grayish brown (2.5Y 4/2) to olive gray (5Y 4/2)

Test hole terminated at 15.2 m below grade.

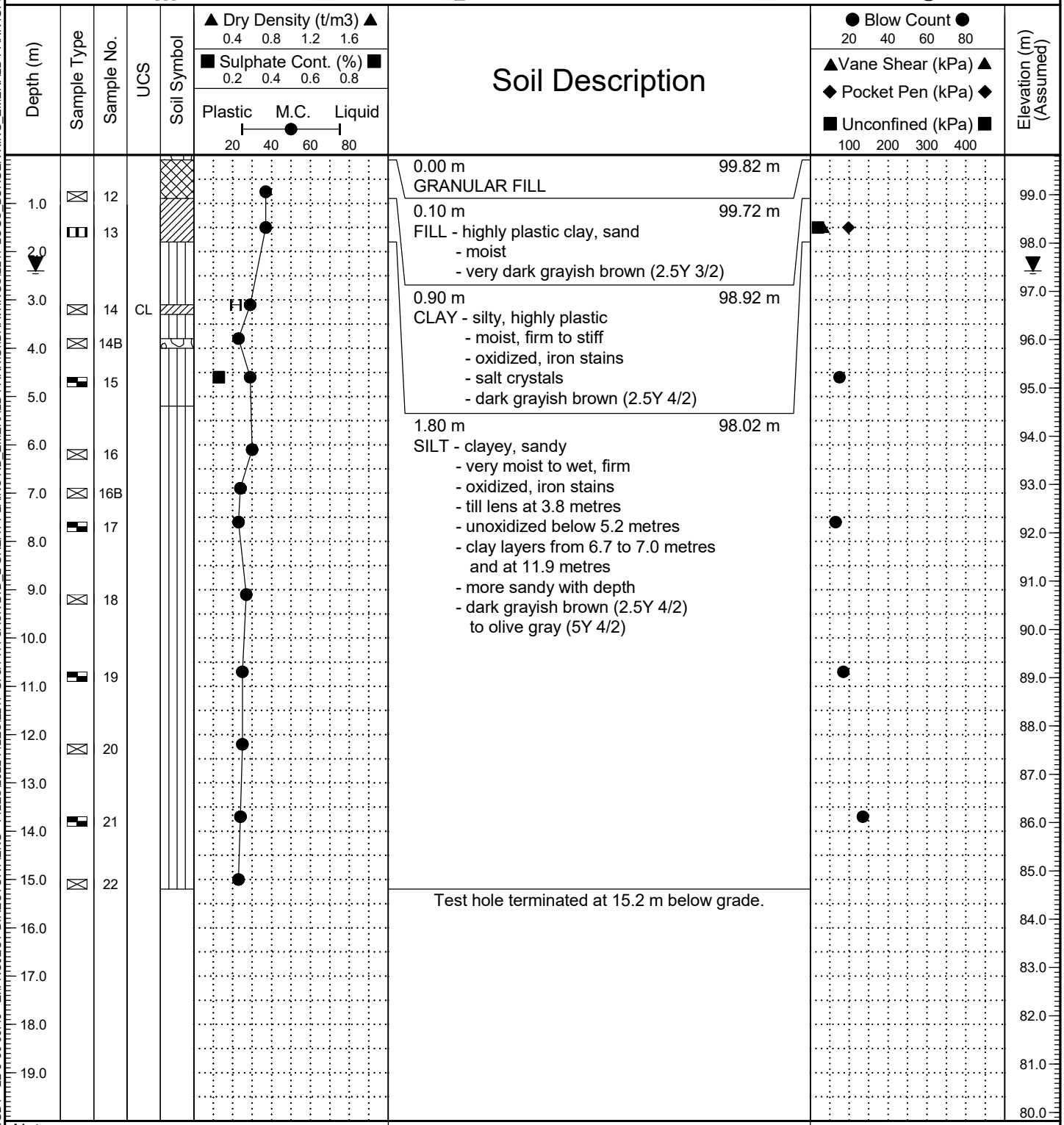
Notes:
1. Test hole was excavated using a 150 mm dia. continuous flight auger.
2. Test hole sloughed to 3.4 metres immediately after completion of drilling.
3. Test hole was backfilled to surface with drill cuttings immediately after completion of drilling.

GROUND ENGINEERING CONSULTANTS LTD.
CIVIL & GEOENVIRONMENTAL ENGINEERS
415 - 7th AVENUE, REGINA, SASKATCHEWAN, S4N 4P1

Logged By:	J. Stepp	Page	1 of 5
Drawn By:	M. Creary	Date Plotted:	2022-03-30
Reviewed By:	M. Wurm	Figure No.:	GE-2217-6

Project: Proposed Burger King Restaurant	Location: 2 South Plains Road, Emerald Park	Test Hole No.: TH102
Project No.: GE-2217	Coordinate: 5588257 N; 541797 E (NAD83)	Drill Rig: Diedrich D-120
Client: 102133212 Saskatchewan Ltd.	Elevation: 99.82 m (Assumed)	Date Drilled: 2022-03-14

Sample Type: Shelby Tube | Disturbed | SPT Sample | Pail Sample | No Recovery | Jar Sample



Notes:

1. Test hole was excavated using a 150 mm dia. continuous flight auger.
2. Test hole sloughed to 2.6 metres immediately after completion of drilling.
3. Water level was measured at 2.4 metres, 1.5 hours after completion of drilling. Test hole had sloughed to 2.5 metres.
4. Test hole was backfilled to surface with drill cuttings.

GROUND ENGINEERING CONSULTANTS LTD.

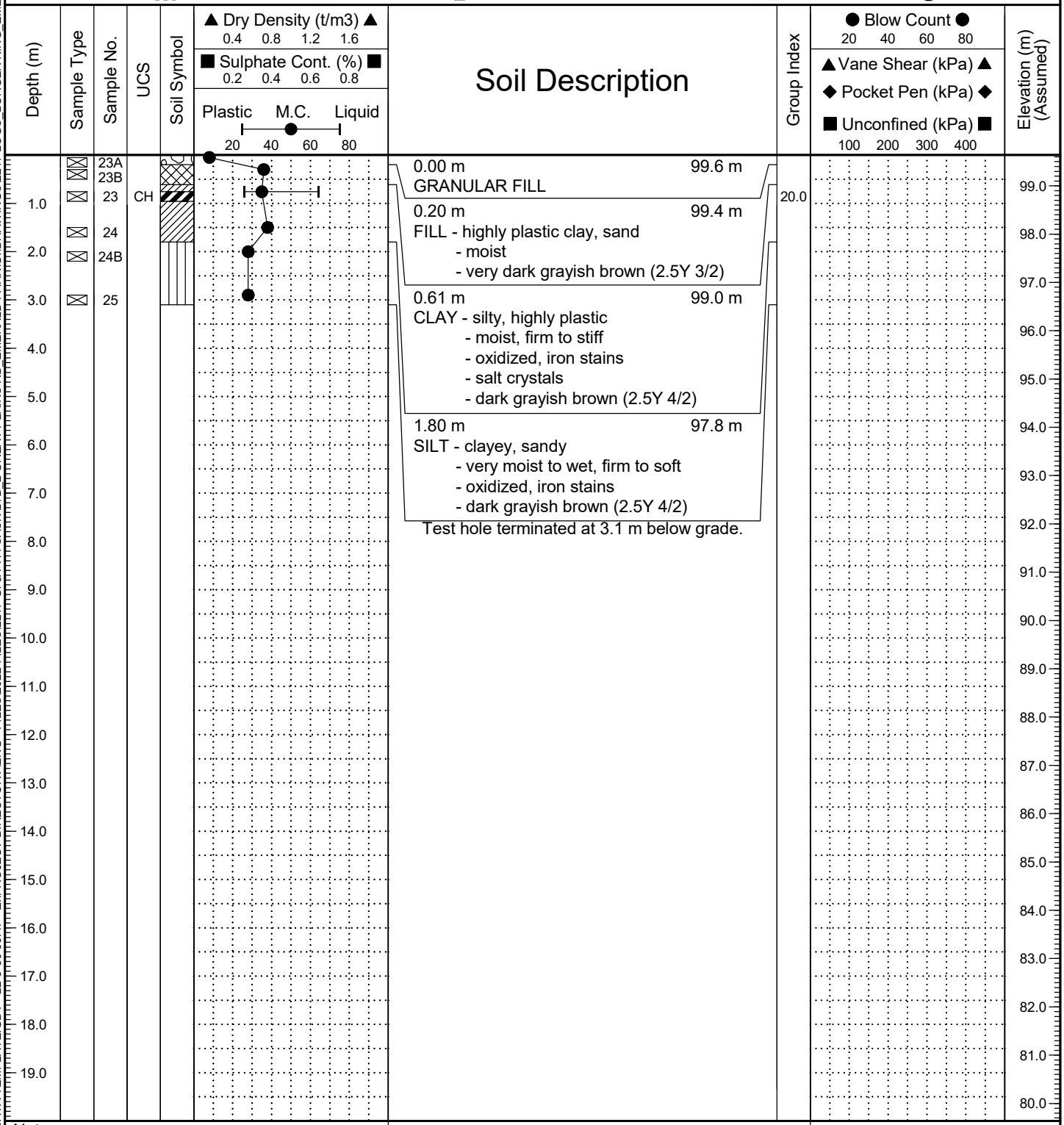
CIVIL & GEOENVIRONMENTAL ENGINEERS

415 - 7th AVENUE, REGINA, SASKATCHEWAN, S4N 4P1

Logged By:	J. Stepp	Page	2 of 5
Drawn By:	M. Creary	Date Plotted:	2022-03-30
Reviewed By:	M. Wurm	Figure No.:	GE-2217-7

Project: Proposed Burger King Restaurant	Location: 2 South Plains Road, Emerald Park	Test Hole No.:TH103
Project No.: GE-2217	Coordinate: 5588234 N; 541794 E (NAD83)	Drill Rig: Diedrich D-120
Client: 102133212 Saskatchewan Ltd.	Elevation: 99.64 m (Assumed)	Date Drilled: 2022-03-14

Sample Type: Shelby Tube | Disturbed | SPT Sample | Pail Sample | No Recovery | Jar Sample



Notes:
1. Test hole was excavated using a 150 mm dia. continuous flight auger.
2. No sloughing was noted immediately after completion of drilling.
3. Test hole was backfilled to surface with drill cuttings immediately after completion of drilling.

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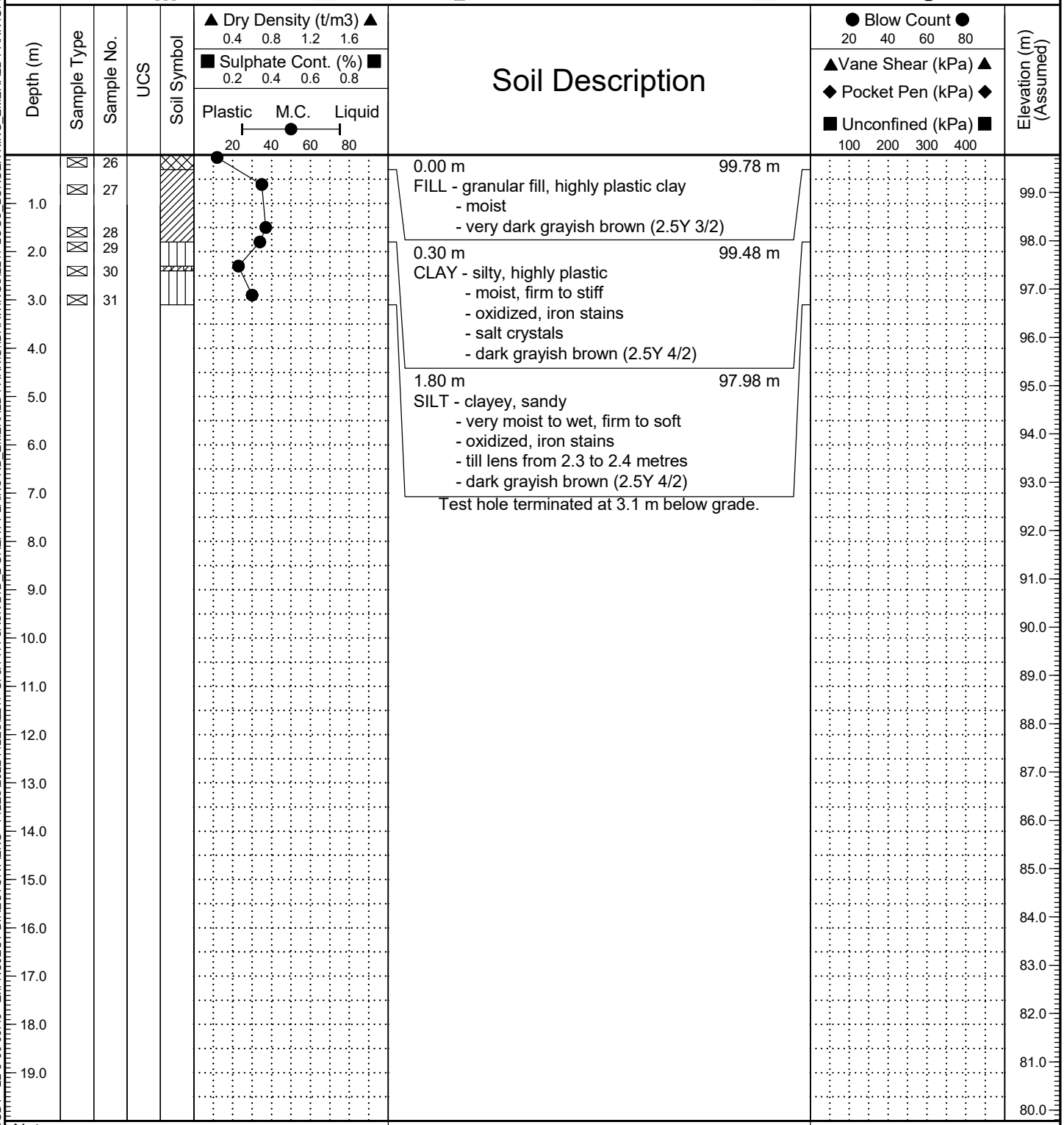
Logged By: J. Stepp		Page: 3 of 5
Drawn By: M. Creary		Date Plotted: 2022-03-30
Reviewed By: M. Wurm		Figure No.: GE-2217-8

Project: Proposed Burger King Restaurant	Location: 2 South Plains Road, Emerald Park	Test Hole No.: TH104
Project No.: GE-2217	Coordinate: 5588257 N; 541813 E (NAD83)	Drill Rig: Diedrich D-120
Client: 102133212 Saskatchewan Ltd.	Elevation: 99.78 m (Assumed)	Date Drilled: 2022-03-14

Sample Type: Shelby Tube | Disturbed | SPT Sample | Pail Sample | No Recovery | Jar Sample



0.00 m — **99.78 m**
FILL - granular fill, highly plastic clay
- moist
- very dark grayish brown (2.5Y 3/2)

0.30 m — **99.48 m**
CLAY - silty, highly plastic
- moist, firm to stiff
- oxidized, iron stains
- salt crystals
- dark grayish brown (2.5Y 4/2)

1.80 m — **97.98 m**
SILT - clayey, sandy
- very moist to wet, firm to soft
- oxidized, iron stains
- till lens from 2.3 to 2.4 metres
- dark grayish brown (2.5Y 4/2)

Test hole terminated at 3.1 m below grade.

Notes:
1. Test hole was excavated using a 150 mm dia. continuous flight auger.
2. Test hole sloughed to 2.8 metres immediately after completion of drilling.
3. Test hole was backfilled to surface with drill cuttings immediately after completion of drilling.

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Logged By:	J. Stepp	Page	4 of 5
Drawn By:	M. Creary	Date Plotted:	2022-03-30
Reviewed By:	M. Wurm	Figure No.:	GE-2217-9

Project: Proposed Burger King Restaurant	Location: 2 South Plains Road, Emerald Park	Test Hole No.:TH105
Project No.: GE-2217	Coordinate: 5588290 N; 541825 E (NAD83)	Drill Rig: Diedrich D-120
Client: 102133212 Saskatchewan Ltd.	Elevation: 99.95 m (Assumed)	Date Drilled: 2022-03-14

Sample Type: Shelby Tube | Disturbed | SPT Sample | Pail Sample | No Recovery | Jar Sample

Depth (m)	Sample Type	Sample No.	UCS	Soil Symbol	Soil Description	Group Index	Elevation (m) (Assumed)
		32			0.00 m — 100.0 m GRANULAR FILL		
1.0		33	CH		0.20 m — 99.8 m FILL - highly plastic clay, sand - moist - very dark grayish brown (2.5Y 3/2)	20.0	99.0
2.0		34					98.0
		35					
3.0		36			0.76 m — 99.2 m CLAY - silty, highly plastic, sandy - moist, firm to stiff - oxidized, iron stains - salt crystals - dark grayish brown (2.5Y 4/2)		97.0
4.0							96.0
5.0							95.0
6.0					1.80 m — 98.2 m SILT - clayey, sandy - moist to very moist, stiff to soft - oxidized, iron stains - dark grayish brown (2.5Y 4/2)		94.0
7.0							93.0
8.0					Test hole terminated at 3.1 m below grade.		92.0
9.0							91.0
10.0							90.0
11.0							89.0
12.0							88.0
13.0							87.0
14.0							86.0
15.0							85.0
16.0							84.0
17.0							83.0
18.0							82.0
19.0							81.0

Dry Density (t/m3): 0.4 0.8 1.2 1.6
Sulphate Cont. (%): 0.2 0.4 0.6 0.8
Plastic M.C. Liquid: 20 40 60 80
Blow Count: 20 40 60 80
Vane Shear (kPa)
Pocket Pen (kPa)
Unconfined (kPa): 100 200 300 400

Notes:
1. Test hole was excavated using a 150 mm dia. continuous flight auger.
2. Test hole sloughed to 2.7 metres immediately after completion of drilling.
3. Test hole was backfilled to surface with drill cuttings immediately after completion of drilling.

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Logged By: J. Stepp	Page: 5 of 5
Drawn By: M. Creary	Date Plotted: 2022-03-30
Reviewed By: M. Wurm	Figure No.: GE-2217-10

APPENDIX A

Advantages of concrete filled steel pipe piles

The Steel Pipe Pile represents one of the finest means of providing piled foundations. The individual pipe can be selected in a number of wall thicknesses and diameters to tailor the capacity of the pile to each design load, to the supporting soil capacity and to the ease or difficulty of the driving conditions.

After completion of driving to the required bearing capacity and prior to filling with concrete, each pile can be checked visually for damage in driving, for plumb and for sweep or radius of curvature. In this respect, steel pipe piling is unique. It is subject to full visual observation.

Inspection can be accomplished in very long piles by lowering a safety light on a long drop cord into the steel shaft to inspect for any driving damage. An alternative is the use of a light and mirror to illuminate the interior for inspection. Such inspection methods are not possible with solid piles of steel, concrete, wood or any other structural material. From the time these solid units are driven below the ground surface, nothing is known for certainty of the plumb, curvature or possible damage due to driving or due to obstructions.

After completion of inspection, the steel pipe pile has an added flexibility in its column carrying capacity since the concrete strength can be varied to meet greater or less stringent load demands.

The concrete is placed under controlled conditions to attain the desired results. It is introduced into a thoroughly inspected form which is free of water or any other deleterious substance. This insures a structural integrity which is not possible with any other foundation except a controlled concrete pour in a reinforced pier or caisson.

Other advantages are: high loading capacities; low cost per ton of supported load; ease of driving due to stiffness of the pipe; ease of joining by welding; speed in driving long unspliced lengths, ability of steel to absorb hard driving, reuse of any sections above cut-off elevation, ready availability of pipe; great stability against buckling due to hard driving, high or unusual earth pressures or high loading.

Availability

Stelco Steel Piling Pipe is readily available in many wall thicknesses and diameters. Representative sizes are listed in Table II.

Driving

Steel pipe piling can be driven with or without a plate on the bottom end. Open end piling requires a more expensive cleanout procedure, but does eliminate ground heave in conditions where, in the designer's opinion, ground heave may present a problem.

The closed bottom-end pipe can be driven either with an internal mandrel or by top driving. When driving thin-walled pipe (1/8" to about 3/16" wall), the use of a mandrel ensures damage-free pipe. Mandrel driving requires the driving leads to be approximately double the pile length. Beyond a depth of about 40 feet this method is seldom economic.

Heavier walled pipe can be top driven. This method is particularly applicable when either long piles or hard driving is encountered. The required thickness of the wall is dependent upon the energy of the driving hammer, the ease of driving, the length of pile to be placed, and the imposed design loads.

For any given weight of steel, the pipe pile presents the stiffest shape possible. The radius of gyration of the pipe is the same in all directions. The pile drives straighter than other shapes and keeps drift, out of plumb and sweep to a minimum.

Placing concrete

The requirements of placing concrete in the bottom of a closed bottom-end pipe can be costly if too restrictive. By common practice, in pipes up to 18" in diameter, the pipe is considered to be the chute or spout acting to prevent segregation. If the designer wishes to increase protection against segregation in these smaller diameter pipes (and in any event for diameters of 20 inches or greater) it is recommended that about two feet of strong dry grout be first placed in the bottom of the pile. This grout is placed by free fall regardless of the pile length. The remainder of the pile is filled with a stiff concrete (1 1/2" to 2" slump).

Once again, this concrete is placed without the use of an "elephant trunk" or other special device. It should be noted that some of the larger aggregate in the concrete will penetrate the bottom grout layer to give a pile of uniform high strength.

Piles 12 3/4 x 0.281 wall filled in the above manner have been load tested to greater than 300 tons with no damage to the shaft, and 10 3/4 x 0.250 wall piles have been tested to over 400 tons before failure.

Field splices

Stelco steel piling pipe can be manufactured in any length up to 80'. If pile lengths longer than 80' are required, or if transportation problems dictate shorter pipe lengths than required, field welding is employed. Stelco piling pipe is supplied with bevelled ends to facilitate splicing.

In a bearing pile, it is not essential to have full penetration welds or expensive chill rings and back-up plates. The ends of two adjoining piles are placed in flush contact and then joined with a circumferential fillet weld. In this way, longitudinal compression due to driving and loading is transferred directly across the splice by the end of one pipe bearing on the other. Tensile forces and bending moments induced during driving are easily resisted by the fillet weld.

For any carrying capacity, the splicing of steel piling pipe requires less time and materials than that required for structural shapes. Also, unlike concrete or wood piles, there is little wastage with steel piling pipe since sections cut-off above elevation can be reused.

Load capacity

Soil

The ultimate load capacity of any pile regardless of its column capacity depends upon the surrounding soil in which it is placed. The 1965 National Building Code Section 4.2.2.16 (1), Properties of Soils and Capacities of Foundations is one specification which provides the designer with a number of means for determining the maximum design capacity of a pile. These are: load tests, local experience, or properties of the soil by an appropriate soils investigation.

It is imperative for the designer to remember that the structural column capacity of the pile must be tailored to equal the imposed load which in turn must not exceed the supporting capacity of the soil.

The supporting soil capacity of a friction pile may be taken as the frictional resistance between its surface and the ground with which it is in permanent contact.

Pipe column

The concrete filled steel pipe pile has a very wide range of capacities. The pipe is readily obtained in a number of diameters (5 9/16" to 36"), and wall thicknesses (1/8" to 5/8"). The cast-in-place concrete can be easily varied in strength (3^{KSI} to 5^{KSI} concrete is readily available from most pre-mix plants). The cost of the pile per ton of bearing capacity can be kept to a minimum by adjusting the pipe diameter, the pipe wall thickness, and the concrete strength to suit the driving conditions and bearing capacity of the soil. In this way, the least total cost of the piled foundation is obtained.

From past experience, most concrete filled steel pipe piles in Canada have been driven in the small diameters, i.e., 10 3/4 and 12 3/4", with wall thicknesses from 0.219 to 0.281 inches. 3^{KSI} concrete has been used in most cases, although there is presently a trend to higher strength concrete. The larger diameters and thicker walls have generally been used for special conditions.

Lateral support

The 1965 National Building Code presently permits any pile driven into soils other than peat or soft clay to be designed as a short column. Research reported in "Norwegian Experiences with Steel Piles to Rock" by Dr. Lawrence Bjerrum confirms that pipe piling will not undergo column (Euler) buckling provided that

$\frac{I}{A^2} \geq \frac{f^2}{4CE}$ where:

I = Moment of inertia of the transformed cross-section of the concrete filled steel pipe pile,
A = Transformed cross-section area,
f = Yield stress of steel,
E = Young's Modulus of elasticity for steel,
C = Modulus of horizontal compressibility of surrounding soil.

If the yield stress of the pipe (f) is less than or equal to 52,000 psi and "C" is at least 75 psi (a soft clay), the above reduces to:

$\frac{I}{A^2} \geq 0.3$.

In the majority of cases, I/A^2 exceeds 0.3 and the concrete-filled steel pipe pile can be considered as a short column for design purposes. In concrete design, a short column is one in which the unsupported length (h) divided by the outside diameter (d) is 10 or less.

Corrosion of steel pipe piles

The 1965 National Building Code states that steel piles shall have a thickness 1/16" greater than that needed for design requirements unless evidence indicates that corrosion is not a problem. On steel H-piles or sheet steel piles, corrosion can take place on all faces of the member (i.e. two faces of a thickness). On a steel pipe pile, corrosion can take place only on the exterior surface. Hence when making a corrosion allowance in design, the outside diameter is assumed to be reduced by 1/16".

In 1962, the U. S. Department of Commerce released a study on "Corrosion of Steel Piling in Soils", by Melvin Romanoff. This extensive field survey of steel piles located in all types of soil for up to 40 years concluded that:

1. No appreciable corrosion occurs when piles are located in undisturbed soils or below the water table (regardless of the soil types or properties encountered).

2. Above the water table and in fill soils, corrosion is not serious. The areas of pitting in the worst cases are localized and small in area.

3. With the exception of piling exposed to sand erosion, salt water, or tides with high oxygen content in the splash area, *corrosion did not reduce the structural capacity of any pile examined.*

External pressure

The empty steel pipe pile should be strong enough to resist the active earth pressure and the ground water pressure to which it is subjected. The collapse resistance of an empty steel pipe is generally great enough to handle all external earth and any fluid pressures.

For conservative design, particularly in clays, the external earth pressure can be taken as: $p = wh$
where p = External pressure
w = unit weight of soil
h = height of soil at point of calculation

This external pressure should be kept less than the collapse pressure tabulated below.

Table I
External Uniform Collapse Pressure
(33,000 psi minimum yield strength)

Ratio Diameter / Wall Thickness	External Collapse Pressure
10	5300
15	3933
20	2950
25	2360
30	1967
35	1551
40	1012
45	744
50	513
55	389
60	300
65	236
70	189
75	154
80	126
85	105
90	89
95	75
100	65
105	56
110	49
115	43
120	37
125	33

Load tests

The 1965 National Building Code permits a pile to be load tested as a means of verifying its design load capacity (see Section 4.2.2.17 (2)). According to the NBC, the allowable pile load is one-half of the maximum test load applied to the pile. A further stipulation is that the allowable load cannot exceed the load which causes a ½" permanent settlement. As explained in the section "Pipe Column", the above allowable load based on tests need not be reduced when applied to piles which are inspected before the concrete has been poured. When applying test results to uninspected piles, a 25% reduction must be applied to the allowable load determined as above.

Extensive load testing has been carried out on concrete-filled steel pipe piles, both end bearing and friction type. One load test was carried out on two piles at the Steel Company of Canada's Swansea Works in Toronto. The piles were 12.75 O.D. x 0.281 steel tubes filled with 4000 psi high-early strength concrete.

Test pile #1 had a 1" steel plate (13 ½" in diameter) welded across the bottom end to act as a point. The pile was driven 47'8" by a #0 Vulcan Hammer to the surface of a shale layer. Fifteen blows were required for the last inch of penetration.

Testing began two days after driving was completed by applying 20 ton load increments up to a maximum load of 160 tons. The pile was not tested to destruction. The maximum load remained in place for 28 hours and was then removed in 20 ton increments. After unloading was complete, the permanent settlement was 0.474".

Test pile #2 at Swansea was equipped with a 24" x 24" x 1" steel plate point. This pile was driven by the same hammer to the shale layer and refusal was reached at a depth of 35'5". It was also noted that the pile went out of plumb by approximately ½"/foot in driving. Loading of the pile started 9 days after driving was complete and followed the same procedure as pile test #1. After the 160 ton load was removed the pile rebounded to its original elevation for zero permanent settlement. Loading increased the total out of plumbness by ¼".

The Michigan State Highway Department carried out an extensive pile testing program between 1962 and 1965. A twelve inch closed bottom-end pile with a 0.179" wall was top end driven to a depth of 67 feet and loaded to 390 tons. Load test capacity was not available for subjecting the pile to greater loads. At 390 tons, there was failure due to settlement of the pile as a unit into the end supporting glacial till, but no damage to the column shaft capacity was evident.

Western Foundation Corporation (N.Y.) reported that a 10¾ x 0.250 wall pile with 3,000 psi concrete was load tested to over 400 tons in a soil formation prior to failure. This load is equivalent to full tri-axial stressing in accordance with the Richart formula (see section on "Column Strength").

Load tables

Table II lists the section properties of Stelco steel piling pipe and the enclosed concrete core while Table III gives the allowable column strength of concrete filled steel pipe piles.

The tabulated load capacity of a concrete filled steel pipe pile is based upon the 1965 National Building Code, Section 4.5.4A.25 (1) for a "short" column. As explained under "Pipe Column", a short column is one having $h/d \leqq 10$. For this condition, the allowable steel stress is 16.6^{KSI} for steels with a yield of 33^{KSI} or greater and the allowable concrete stress is $0.24\ f'_c$. Three concrete strengths are tabulated—3, 4 and 5^{KSI}. For other strengths, the designer can compute the column capacity of the piles using the above listed stresses.

In some instances, a corrosion allowance may be deemed necessary (see section on "Corrosion"). The corrosion reduction factor in the last column of Table III is based on an assumed loss of 1/16" on the outside pipe diameter. The allowable loads tabulated would be reduced by the corrosion reduction factor.

Table II Properties of Stelco steel pipe and concrete core

Pipe			Area		Moment of inertia		Radius of gyration		Section modulus
outside diameter (in.)	wall (in.)	weight (lbs./ft.)	steel ($in.^2$)	concrete ($in.^2$)	steel ($in.^4$)	concrete ($in.^4$)	steel (in.)	concrete (in.)	steel ($in.^3$)
8.625	0.125	11.35	3.34	55.09	30.15	241.50	3.006	2.094	6.99
8.625	0.134	12.15	3.57	54.85	32.22	239.43	3.002	2.089	7.47
8.625	0.141	12.78	3.76	54.67	33.82	237.83	3.000	2.086	7.84
8.625	0.156	14.11	4.15	54.28	37.22	234.42	2.995	2.078	8.63
8.625	0.164	14.82	4.36	54.07	39.02	232.62	2.992	2.074	9.05
8.625	0.188	16.94	4.98	53.44	44.36	227.29	2.984	2.062	10.29
8.625	0.203	18.26	5.37	53.06	47.65	224.00	2.978	2.055	11.05
8.625	0.219	19.66	5.78	52.64	51.12	220.53	2.973	2.047	11.85
8.625	0.250	22.36	6.58	51.85	57.72	213.93	2.962	2.031	13.38
8.625	0.277	24.70	7.26	51.16	63.35	208.30	2.953	2.018	14.69
8.625	0.312	27.70	8.15	50.28	70.48	201.16	2.941	2.000	16.34
8.625	0.322	28.55	8.40	50.03	72.49	199.16	2.938	1.995	16.81
8.625	0.344	30.42	8.95	49.48	76.84	194.80	2.930	1.984	17.82
8.625	0.406	35.64	10.48	47.94	88.74	182.91	2.909	1.953	20.58
8.625	0.438	38.30	11.27	47.16	94.66	176.99	2.899	1.937	21.95
10.750	0.125	14.18	4.17	86.59	58.89	596.66	3.757	2.625	10.96
10.750	0.134	15.19	4.47	86.29	62.97	592.58	3.754	2.620	11.71
10.750	0.141	15.98	4.70	86.06	66.13	589.42	3.751	2.617	12.30
10.750	0.156	17.65	5.19	85.57	72.85	582.69	3.746	2.609	13.55
10.750	0.164	18.54	5.45	85.31	76.42	579.13	3.743	2.605	14.22
10.750	0.188	21.21	6.24	84.52	87.01	568.53	3.735	2.593	16.19
10.750	0.203	22.87	6.73	84.04	93.56	561.99	3.730	2.586	17.41
10.750	0.219	24.63	7.25	83.52	100.48	555.06	3.724	2.578	18.69
10.750	0.250	28.04	8.25	82.52	113.71	541.83	3.713	2.562	21.16
10.750	0.279	31.20	9.18	81.58	125.87	529.67	3.703	2.548	23.42
10.750	0.307	34.24	10.07	80.69	137.42	518.13	3.694	2.534	25.57
10.750	0.344	38.23	11.25	79.52	152.38	503.16	3.681	2.515	28.35
10.750	0.365	40.48	11.91	78.85	160.73	494.81	3.674	2.505	29.90
10.750	0.438	48.24	14.19	76.57	188.95	466.60	3.649	2.468	35.15
10.750	0.500	54.74	16.10	74.66	211.95	443.60	3.628	2.437	39.43
12.750	0.125	16.85	4.96	122.72	98.79	1198.42	4.464	3.125	15.50
12.750	0.134	18.06	5.31	122.37	105.68	1191.54	4.461	3.120	16.58
12.750	0.141	18.99	5.59	122.09	111.01	1186.20	4.458	3.117	17.41
12.750	0.156	20.98	6.17	121.50	122.39	1174.82	4.453	3.109	19.20
12.750	0.164	22.05	6.48	121.19	128.42	1168.79	4.450	3.105	20.14
12.750	0.188	25.22	7.42	120.26	146.38	1150.83	4.442	3.093	22.96
12.750	0.203	27.20	8.00	119.67	157.50	1139.71	4.437	3.086	24.71
12.750	0.219	29.31	8.62	119.06	169.27	1127.94	4.431	3.078	26.55
12.750	0.250	33.38	9.82	117.86	191.82	1105.39	4.420	3.062	30.09
12.750	0.281	37.42	11.01	116.67	214.03	1083.18	4.410	3.047	33.57
12.750	0.312	41.45	12.19	115.49	235.90	1061.31	4.399	3.031	37.00
12.750	0.330	43.77	12.88	114.80	248.45	1048.76	4.393	3.022	38.97
12.750	0.344	45.58	13.41	114.27	258.13	1039.08	4.388	3.015	40.49
12.750	0.375	49.56	14.58	113.10	279.33	1017.88	4.377	3.000	43.82
12.750	0.406	53.53	15.74	111.93	300.21	997.00	4.367	2.984	47.09
12.750	0.438	57.59	16.94	110.74	321.42	975.80	4.356	2.968	50.42
12.750	0.500	65.42	19.24	108.43	361.54	935.67	4.335	2.937	56.71
14.000	0.188	27.73	8.16	145.78	194.57	1691.18	4.884	3.406	27.80
14.000	0.210	30.93	9.10	144.84	216.31	1669.44	4.876	3.395	30.90
14.000	0.219	32.23	9.48	144.46	225.14	1660.60	4.873	3.390	32.16
14.000	0.250	36.71	10.80	143.14	255.30	1630.44	4.862	3.375	36.47
14.000	0.281	41.17	12.11	141.83	285.04	1600.70	4.851	3.359	40.72
14.000	0.312	45.61	13.42	140.52	314.38	1571.36	4.841	3.344	44.91
14.000	0.344	50.17	14.76	139.18	344.24	1541.50	4.830	3.328	49.18
14.000	0.375	54.57	16.05	137.89	372.76	1512.98	4.819	3.312	53.25
14.000	0.438	63.44	18.66	135.28	429.49	1456.25	4.797	3.281	61.36
14.000	0.500	72.09	21.21	132.73	483.75	1401.99	4.776	3.250	69.11
16.000	0.188	31.75	9.34	191.72	291.90	2925.09	5.591	3.906	36.49
16.000	0.219	36.91	10.86	190.20	338.06	2878.94	5.580	3.890	42.26
16.000	0.250	42.05	12.37	188.69	383.66	2833.33	5.569	3.875	47.96
16.000	0.281	47.17	13.88	187.19	428.72	2788.27	5.558	3.859	53.59
16.000	0.312	52.28	15.38	185.69	473.24	2743.75	5.548	3.844	59.16
16.000	0.344	57.52	16.92	184.14	518.64	2698.35	5.537	3.828	64.83
16.000	0.375	62.58	18.41	182.65	562.08	2654.91	5.526	3.812	70.26
16.000	0.438	72.80	21.41	179.65	648.74	2568.25	5.504	3.781	81.09
16.000	0.500	82.77	24.35	176.71	731.94	2485.05	5.483	3.750	91.49
20.000	0.250	52.73	15.51	298.65	756.43	7097.55	6.983	4.875	75.64
20.000	0.281	59.18	17.41	296.75	846.29	7007.70	6.972	4.859	84.63
20.000	0.312	65.61	19.30	294.86	935.26	6918.73	6.962	4.844	93.53
20.000	0.344	72.22	21.24	292.92	1026.21	6827.77	6.950	4.828	102.62
20.000	0.375	78.60	23.12	291.04	1113.46	6740.52	6.940	4.812	111.35
20.000	0.406	84.96	24.99	289.17	1199.90	6654.08	6.929	4.797	119.99
20.000	0.438	91.51	26.92	287.24	1288.23	6565.76	6.918	4.781	128.82
20.000	0.469	97.83	28.78	285.38	1372.95	6481.03	6.907	4.765	137.30
20.000	0.500	104.13	30.63	283.53	1456.85	6397.12	6.897	4.750	145.69
20.000	0.562	116.67	34.32	279.84	1622.24	6231.74	6.875	4.719	162.22
20.000	0.625	129.33	38.04	276.12	1786.95	6067.02	6.854	4.687	178.70

Table II continued Properties of Stelco steel pipe and concrete core

Pipe			Area		Moment of Inertia		Radius of gyration		Section modulus
outside diameter (in.)	wall (in.)	weight (lbs./ft.)	steel ($in.^2$)	concrete ($in.^2$)	steel ($in.^4$)	concrete ($in.^4$)	steel (in.)	concrete (in.)	steel ($in.^3$)
22.000	0.250	58.07	17.08	363.05	1010.26	10488.76	7.690	5.375	91.84
22.000	0.281	65.18	19.17	360.96	1130.75	10368.27	7.679	5.359	102.80
22.000	0.312	72.27	21.26	358.87	1250.17	10248.86	7.669	5.344	113.65
22.000	0.344	79.56	23.40	356.73	1372.34	10126.67	7.657	5.328	124.76
22.000	0.375	86.61	25.48	354.66	1489.66	10009.36	7.647	5.312	135.42
22.000	0.406	93.64	27.54	352.59	1605.99	9893.03	7.636	5.297	146.00
22.000	0.438	100.87	29.67	350.46	1724.97	9774.05	7.625	5.281	156.82
22.000	0.469	107.85	31.72	348.41	1839.21	9659.81	7.614	5.265	167.20
22.000	0.500	114.81	33.77	346.36	1952.44	9546.57	7.603	5.250	177.49
22.000	0.562	128.68	37.85	342.28	2175.95	9323.07	7.582	5.219	197.81
22.000	0.625	142.68	41.97	338.16	2398.98	9100.03	7.560	5.187	218.09
24.000	0.250	63.41	18.65	433.74	1315.33	14970.69	8.397	5.875	109.61
24.000	0.281	71.19	20.94	431.45	1472.73	14813.30	8.386	5.859	122.73
24.000	0.312	78.94	23.22	429.17	1628.84	14657.19	8.376	5.844	135.74
24.000	0.344	86.91	25.57	426.82	1788.69	14497.34	8.364	5.828	149.06
24.000	0.375	94.62	27.83	424.56	1942.28	14343.74	8.354	5.812	161.86
24.000	0.406	102.31	30.09	422.30	2094.71	14191.31	8.343	5.797	174.56
24.000	0.438	110.22	32.42	419.97	2250.72	14035.30	8.332	5.781	187.56
24.000	0.469	117.87	34.67	417.72	2400.63	13885.39	8.321	5.765	200.05
24.000	0.500	125.49	36.91	415.48	2549.33	13736.68	8.310	5.750	212.44
24.000	0.562	140.68	41.38	411.01	2843.21	13442.81	8.289	5.719	236.93
24.000	0.625	156.03	45.90	406.49	3136.91	13149.11	8.267	5.687	261.41
26.000	0.250	68.75	20.22	510.71	1676.37	20755.41	9.104	6.375	128.95
26.000	0.281	77.19	22.71	508.23	1877.53	20554.25	9.094	6.359	144.43
26.000	0.312	85.60	25.18	505.75	2077.17	20354.61	9.083	6.344	159.78
26.000	0.344	94.26	27.73	503.20	2281.72	20150.05	9.072	6.328	175.52
26.000	0.375	102.63	30.19	500.74	2478.41	19953.36	9.061	6.312	190.65
26.000	0.406	110.98	32.65	498.28	2673.71	19758.06	9.050	6.297	205.67
26.000	0.438	119.58	35.17	495.76	2873.74	19558.03	9.039	6.281	221.06
26.000	0.469	127.89	37.62	493.31	3066.07	19365.70	9.028	6.265	235.85
26.000	0.500	136.17	40.06	490.87	3256.97	19174.79	9.017	6.250	250.54
26.000	0.562	152.69	44.91	486.02	3634.60	18797.16	8.996	6.219	279.58
26.000	0.625	169.38	49.82	481.11	4012.53	18419.23	8.974	6.187	308.66
30.000	0.250	79.43	23.37	683.49	2585.16	37175.67	10.519	7.375	172.34
30.000	0.281	89.19	26.24	680.62	2896.77	36864.06	10.508	7.359	193.12
30.000	0.312	98.93	29.10	677.76	3206.33	36554.50	10.497	7.344	213.76
30.000	0.344	108.96	32.05	674.81	3523.82	36237.00	10.486	7.328	234.92
30.000	0.375	118.65	34.90	671.96	3829.41	35931.40	10.475	7.312	255.29
30.000	0.406	128.33	37.75	669.11	4133.16	35627.66	10.464	7.297	275.54
30.000	0.438	138.29	40.68	666.18	4444.59	35316.22	10.453	7.281	296.31
30.000	0.469	147.92	43.51	663.35	4744.33	35016.48	10.442	7.265	316.29
30.000	0.500	157.53	46.34	660.52	5042.16	34718.64	10.431	7.250	336.14
30.000	0.562	176.70	51.98	654.88	5632.22	34128.59	10.410	7.219	375.48
30.000	0.625	196.08	57.68	649.18	6223.96	33536.83	10.388	7.187	414.93
32.000	0.250	84.77	24.94	779.31	3142.35	48329.57	11.226	7.875	196.40
32.000	0.281	95.20	28.00	776.25	3521.81	47950.12	11.215	7.859	220.11
32.000	0.312	105.59	31.06	773.19	3898.93	47573.00	11.204	7.844	243.68
32.000	0.344	116.30	34.21	770.04	4285.86	47186.06	11.193	7.828	267.87
32.000	0.375	126.66	37.26	766.99	4658.44	46813.47	11.182	7.812	291.15
32.000	0.406	137.00	40.30	763.95	5028.93	46442.98	11.171	7.797	314.31
32.000	0.438	147.65	43.43	760.82	5408.93	46062.98	11.160	7.781	338.06
32.000	0.469	157.94	46.46	757.79	5774.85	45697.05	11.149	7.765	360.93
32.000	0.500	168.21	49.48	754.77	6138.57	45333.33	11.138	7.750	383.66
32.000	0.562	188.70	55.51	748.74	6859.62	44612.28	11.117	7.719	428.73
32.000	0.625	209.43	61.60	742.64	7583.33	43888.54	11.095	7.687	473.96
34.000	0.250	90.11	26.51	881.41	3774.35	61822.96	11.933	8.375	222.02
34.000	0.281	101.20	29.77	878.15	4230.86	61366.50	11.922	8.359	248.87
34.000	0.312	112.26	33.02	874.90	4684.71	60912.64	11.911	8.344	275.57
34.000	0.344	123.65	36.37	871.55	5150.55	60446.81	11.900	8.328	302.97
34.000	0.375	134.67	39.61	868.31	5599.25	59998.05	11.889	8.312	329.37
34.000	0.406	145.67	42.85	865.07	6045.60	59551.74	11.878	8.297	355.62
34.000	0.438	157.00	46.18	861.74	6503.58	59093.73	11.867	8.281	382.56
34.000	0.469	167.96	49.41	858.52	6944.78	58652.57	11.856	8.265	408.52
34.000	0.500	178.89	52.62	855.30	7383.42	58213.84	11.845	8.250	434.32
34.000	0.562	200.71	59.04	848.88	8253.54	57343.76	11.824	8.219	485.50
34.000	0.625	222.78	65.53	842.39	9127.53	56469.73	11.802	8.187	536.91
36.000	0.250	95.45	28.08	989.80	4485.86	77962.12	12.640	8.875	249.21
36.000	0.281	107.20	31.53	986.34	5029.21	77418.88	12.629	8.859	279.40
36.000	0.312	118.92	34.98	982.90	5569.55	76878.50	12.618	8.844	309.42
36.000	0.344	131.00	38.53	979.34	6124.34	76323.75	12.607	8.828	340.24
36.000	0.375	142.68	41.97	975.91	6658.89	75789.12	12.596	8.812	369.94
36.000	0.406	154.34	45.40	972.48	7190.80	75257.25	12.585	8.797	399.49
36.000	0.438	166.36	48.93	968.94	7736.80	74711.25	12.574	8.781	429.82
36.000	0.469	177.98	52.35	965.53	8262.86	74185.12	12.563	8.765	459.05
36.000	0.500	189.57	55.76	962.11	8786.13	73661.81	12.552	8.750	488.12
36.000	0.562	212.71	62.57	955.31	9824.57	72623.37	12.531	8.719	545.81
36.000	0.625	236.13	69.46	948.42	10868.30	71579.69	12.509	8.687	603.79

Table III Allowable column strength of Stelco concrete filled steel pipe piling

Pipe		Area		Allowable column strength (kips)				Corrosion reduction factor (kips)
outside diameter (in.)	wall (in.)	steel ($in.^2$)	concrete ($in.^2$)	steel only	concrete filled steel pipe piling concrete strength $f'_c = 3ksi$	$f'_c = 4ksi$	$f'_c = 5ksi$	
8.625	0.125	3.34	55.09	55.4	95.0	108.2	121.4	14.1
8.625	0.134	3.57	54.85	59.3	98.7	111.9	125.0	14.1
8.625	0.141	3.76	54.67	62.4	101.6	114.7	127.8	14.1
8.625	0.156	4.15	54.28	68.9	107.8	120.8	133.8	14.1
8.625	0.164	4.36	54.07	72.4	111.1	124.1	137.0	14.1
8.625	0.188	4.98	53.44	82.7	121.0	133.8	146.6	14.1
8.625	0.203	5.37	53.06	89.1	127.2	139.8	152.5	14.1
8.625	0.219	5.78	52.64	96.0	133.7	146.3	158.8	14.0
8.625	0.250	6.58	51.85	109.1	146.3	158.6	171.0	14.0
8.625	0.277	7.26	51.16	120.5	157.1	169.3	181.5	14.0
8.625	0.312	8.15	50.28	135.1	171.1	183.1	195.0	14.0
8.625	0.322	8.40	50.03	139.3	175.0	187.0	198.9	14.0
8.625	0.344	8.95	49.48	148.4	183.7	195.5	207.3	14.0
8.625	0.406	10.48	47.94	173.7	208.0	219.4	230.8	14.0
8.625	0.438	11.27	47.16	186.7	220.3	231.5	242.7	14.0
10.750	0.125	4.17	86.59	69.3	131.5	152.2	173.0	17.5
10.750	0.134	4.47	86.29	74.2	136.2	156.9	177.5	17.5
10.750	0.141	4.70	86.06	78.0	139.8	160.5	181.1	17.5
10.750	0.156	5.19	85.57	86.2	147.6	168.1	188.6	17.5
10.750	0.164	5.45	85.31	90.5	151.8	172.2	192.6	17.5
10.750	0.188	6.24	84.52	103.5	164.2	184.4	204.7	17.5
10.750	0.203	6.73	84.04	111.6	171.9	192.0	212.1	17.5
10.750	0.219	7.25	83.52	120.2	180.2	200.1	220.1	17.5
10.750	0.250	8.25	82.52	136.8	196.0	215.7	235.4	17.5
10.750	0.279	9.18	81.58	152.3	210.7	230.2	249.7	17.5
10.750	0.307	10.07	80.69	167.1	224.9	244.1	263.4	17.5
10.750	0.344	11.25	79.52	186.5	243.4	262.4	281.4	17.5
10.750	0.365	11.91	78.85	197.5	253.9	272.7	291.5	17.5
10.750	0.438	14.19	76.57	235.2	290.0	308.2	326.4	17.5
10.750	0.500	16.16	74.66	266.9	320.1	337.9	355.6	17.5
12.750	0.125	4.96	122.72	82.3*	170.5	199.9	229.3	20.8
12.750	0.134	5.31	122.37	88.2	176.1	205.4	234.8	20.8
12.750	0.141	5.59	122.09	92.7	180.5	209.7	239.0	20.8
12.750	0.156	6.17	121.50	102.5	189.8	218.9	248.0	20.8
12.750	0.164	6.48	121.19	107.7	194.7	223.7	252.8	20.8
12.750	0.188	7.42	120.26	123.2	209.5	238.3	267.1	20.8
12.750	0.203	8.00	119.67	132.8	218.8	247.4	276.0	20.8
12.750	0.219	8.62	119.06	143.1	228.6	257.1	285.5	20.8
12.750	0.250	9.82	117.86	162.9	247.5	275.7	303.9	20.8
12.750	0.281	11.01	116.67	182.7	266.3	294.2	322.1	20.8
12.750	0.312	12.19	115.49	202.3	285.1	312.7	340.3	20.8
12.750	0.330	12.88	114.80	213.6	295.9	323.3	350.8	20.8
12.750	0.344	13.41	114.27	222.4	304.3	331.6	358.9	20.8
12.750	0.375	14.58	113.10	241.8	322.8	349.8	376.8	20.8
12.750	0.406	15.74	111.93	261.1	341.3	368.0	394.7	20.8
12.750	0.438	16.94	110.74	281.0	360.2	386.6	413.0	20.8
12.750	0.500	19.24	108.43	319.0	396.5	422.4	448.2	20.8
14.000	0.188	8.16	145.78	135.4	240.1	275.1	310.0	22.8
14.000	0.210	9.10	144.84	151.0	255.0	289.7	324.4	22.8
14.000	0.219	9.48	144.46	157.4	261.1	295.7	330.3	22.8
14.000	0.250	10.80	143.14	179.2	282.0	316.2	350.5	22.8
14.000	0.281	12.11	141.83	201.0	302.7	336.7	370.6	22.8
14.000	0.312	13.42	140.52	222.6	323.4	357.0	390.6	22.8
14.000	0.344	14.76	139.18	244.9	344.6	377.9	411.2	22.8
14.000	0.375	16.05	137.89	266.3	365.1	398.0	431.0	22.8
14.000	0.438	18.66	135.28	309.5	406.4	438.7	470.9	22.8
14.000	0.500	21.21	132.73	351.7	446.6	478.2	509.9	22.8
16.000	0.188	9.34	191.72	155.1	292.8	338.7	384.7	26.1
16.000	0.219	10.86	190.20	180.2	316.9	362.4	408.0	26.1
16.000	0.250	12.37	188.69	205.3	340.8	386.0	431.2	26.1
16.000	0.281	13.88	187.19	230.3	364.7	409.5	454.3	26.1
16.000	0.312	15.38	185.69	255.2	388.4	432.8	477.3	26.1
16.000	0.344	16.92	184.14	280.8	412.9	456.9	500.9	26.1
16.000	0.375	18.41	182.65	305.4	436.4	480.1	523.7	26.1
16.000	0.438	21.41	179.65	355.3	484.0	526.9	569.8	26.1
16.000	0.500	24.35	176.71	403.8	530.4	572.5	614.7	26.1
20.000	0.250	15.51	298.65	257.5	472.1	543.6	615.1	32.6
20.000	0.281	17.41	296.75	289.0	502.1	573.2	644.2	32.6
20.000	0.312	19.30	294.86	320.3	532.1	602.6	673.2	32.6
20.000	0.344	21.24	292.92	352.6	562.9	632.9	703.0	32.6
20.000	0.375	23.12	291.04	383.7	592.6	662.2	731.8	32.6
20.000	0.406	24.99	289.17	414.8	622.2	691.4	760.5	32.6
20.000	0.438	26.92	287.24	446.7	652.7	721.4	790.0	32.6
20.000	0.469	28.78	285.38	477.5	682.1	750.3	818.5	32.6
20.000	0.500	30.63	283.53	508.2	711.4	779.2	846.9	32.6
20.000	0.562	34.32	279.84	569.3	769.8	836.6	903.4	32.6
20.000	0.625	38.04	276.12	631.0	828.7	894.6	960.5	32.6

Table III continued Allowable column strength of Stelco concrete filled steel pipe piling

Pipe		Area		Allowable column strength (kips)				Corrosion reduction factor (kips)
outside diameter (in.)	wall (in.)	steel ($in.^2$)	concrete ($in.^2$)	steel only	concrete filled steel pipe piling concrete strength f'_c = 3ksi	f'_c = 4ksi	f'_c = 5ksi	
22.000	0.250	17.08	363.05	283.6	544.5	631.5	718.4	35.9
22.000	0.281	19.17	360.96	318.3	577.6	664.1	750.5	35.9
22.000	0.312	21.26	358.87	352.9	610.7	696.6	782.5	35.9
22.000	0.344	23.40	356.73	388.5	644.6	730.0	815.4	35.9
22.000	0.375	25.48	354.66	422.9	677.5	762.3	847.2	35.9
22.000	0.406	27.54	352.59	457.1	710.2	794.5	878.9	35.8
22.000	0.438	29.67	350.46	492.4	743.9	827.7	911.5	35.8
22.000	0.469	31.72	348.41	526.5	776.4	859.7	943.0	35.8
22.000	0.500	33.77	346.36	560.4	808.8	891.6	974.4	35.8
22.000	0.562	37.85	342.28	628.0	873.3	955.1	1036.9	35.8
22.000	0.625	41.97	338.16	696.3	938.5	1019.2	1099.9	35.8
24.000	0.250	18.65	433.74	309.7	621.4	725.4	829.3	39.1
24.000	0.281	20.94	431.45	347.7	657.7	761.0	864.3	39.1
24.000	0.312	23.22	429.17	385.5	693.8	796.6	899.3	39.1
24.000	0.344	25.57	426.82	424.4	731.0	833.1	935.3	39.1
24.000	0.375	27.83	424.56	462.0	766.9	868.5	970.1	39.1
24.000	0.406	30.09	422.30	499.5	802.7	903.7	1004.8	39.1
24.000	0.438	32.42	419.97	538.1	839.5	940.0	1040.5	39.1
24.000	0.469	34.67	417.72	575.4	875.1	975.0	1074.9	39.1
24.000	0.500	36.91	415.48	612.6	910.6	1010.0	1109.3	39.1
24.000	0.562	41.38	411.01	686.7	981.4	1079.6	1177.8	39.1
24.000	0.625	45.90	406.49	761.5	1052.8	1149.9	1247.0	39.1
26.000	0.250	20.22	510.71	335.8*	702.9	825.3	947.6	42.4
26.000	0.281	22.71	508.23	377.0	742.2	864.0	985.7	42.4
26.000	0.312	25.18	505.75	418.0	781.4	902.6	1023.7	42.4
26.000	0.344	27.73	503.20	460.3	821.8	942.3	1062.8	42.4
26.000	0.375	30.19	500.74	501.2	860.8	980.7	1100.5	42.4
26.000	0.406	32.65	498.28	541.9	899.7	1019.0	1138.2	42.4
26.000	0.438	35.17	495.76	583.8	939.7	1058.4	1177.0	42.4
26.000	0.469	37.62	493.31	624.4	978.4	1096.4	1214.5	42.4
26.000	0.500	40.06	490.87	664.8	1017.0	1134.4	1251.8	42.4
26.000	0.562	44.91	486.02	745.3	1093.9	1210.1	1326.3	42.4
26.000	0.625	49.82	481.11	826.7	1171.6	1286.6	1401.6	42.4
30.000	0.250	23.37	683.49	388.0*	879.4	1043.2	1207.0	48.9
30.000	0.281	26.24	680.62	435.6*	924.9	1088.0	1251.1	48.9
30.000	0.312	29.10	677.76	483.2	970.3	1132.7	1295.0	48.9
30.000	0.344	32.05	674.81	532.1	1017.0	1178.7	1340.3	48.9
30.000	0.375	34.90	671.96	579.4	1062.2	1223.1	1384.0	48.9
30.000	0.406	37.75	669.11	626.7	1107.3	1267.5	1427.7	48.9
30.000	0.438	40.68	666.18	675.3	1153.7	1313.2	1472.7	48.9
30.000	0.469	43.51	663.35	722.3	1198.6	1357.3	1516.1	48.9
30.000	0.500	46.34	660.52	769.2	1243.4	1401.4	1559.5	48.9
30.000	0.562	51.98	654.88	862.6	1332.6	1489.3	1645.9	48.9
30.000	0.625	57.68	649.18	957.2	1422.9	1578.1	1733.3	48.9
32.000	0.250	24.94	779.31	414.1*	974.4	1161.2	1348.0	52.2
32.000	0.281	28.00	776.25	465.0*	1023.0	1209.1	1395.1	52.2
32.000	0.312	31.06	773.19	515.7*	1071.5	1256.8	1442.0	52.2
32.000	0.344	34.21	770.04	568.0	1121.4	1305.9	1490.4	52.2
32.000	0.375	37.26	766.99	618.6	1169.7	1353.4	1537.1	52.2
32.000	0.406	40.30	763.95	669.0	1217.9	1400.8	1583.8	52.2
32.000	0.438	43.43	760.82	721.0	1267.5	1449.6	1631.8	52.2
32.000	0.469	46.46	757.79	771.2	1315.4	1496.9	1678.3	52.2
32.000	0.500	49.48	754.77	821.4	1363.3	1544.0	1724.6	52.1
32.000	0.562	55.51	748.74	921.3	1458.7	1637.9	1817.0	52.1
32.000	0.625	61.60	742.64	1022.4	1555.3	1732.9	1910.5	52.1
34.000	0.250	26.51	881.41	440.2*	1074.0	1285.3	1496.6	55.4
34.000	0.281	29.77	878.15	494.3*	1125.7	1336.1	1546.6	55.4
34.000	0.312	33.02	874.90	548.3*	1177.2	1386.9	1596.5	55.4
34.000	0.344	36.37	871.55	603.9	1230.4	1439.2	1648.0	55.4
34.000	0.375	39.61	868.31	657.7	1281.7	1489.7	1697.7	55.4
34.000	0.406	42.85	865.07	711.4	1333.0	1540.2	1747.4	55.4
34.000	0.438	46.16	861.74	766.7	1385.8	1592.1	1798.5	55.4
34.000	0.469	49.41	858.52	820.2	1436.8	1642.4	1847.9	55.4
34.000	0.500	52.62	855.30	873.5	1487.8	1692.5	1897.3	55.4
34.000	0.562	59.04	848.88	980.0	1589.4	1792.5	1995.7	55.4
34.000	0.625	65.53	842.39	1087.7	1692.2	1893.7	2095.3	55.4
36.000	0.250	28.08	989.80	466.3*	1178.1	1415.4	1652.6	58.7
36.000	0.281	31.53	986.34	523.6*	1232.9	1469.3	1705.7	58.7
36.000	0.312	34.98	982.90	580.9*	1287.5	1523.1	1758.6	58.7
36.000	0.344	38.53	979.34	639.8*	1343.8	1578.5	1813.1	58.7
36.000	0.375	41.97	975.91	696.9	1398.3	1632.1	1865.8	58.7
36.000	0.406	45.40	972.48	753.8	1452.6	1685.6	1918.5	58.7
36.000	0.438	48.93	968.94	812.4	1508.6	1740.7	1972.7	58.7
36.000	0.469	52.35	965.53	869.1	1562.7	1793.9	2025.1	58.7
36.000	0.500	55.76	962.11	925.7	1616.8	1847.1	2077.5	58.7
36.000	0.562	62.57	955.31	1038.6	1724.6	1953.2	2181.9	58.7
36.000	0.625	69.46	948.42	1152.9	1833.7	2060.6	2287.5	58.7

*These sections have $\frac{O.D.}{t} > \frac{3300}{Fy}$ and by C.S.A. S16-1965 are allowed only with concrete core.

(Concrete Filled)

TABLE OF BASIC LOAD CAPACITIES

For Concrete Strengths of 3000, 4000 and 5000 p.s.i. (28 Days)
Pipe—Minimum Yield Strength of 35000 p.s.i.
(A.S.T.M. Specs. A 252 Grade 2)

Pipe Dia.	Wall In.	Area Concrete	Bearing Capacity Concrete (Kips)			Area of Pipe Less 1/16" Wall	Bearing Capacity Pipe (Kips) fs=14000	Pile or Caisson Bearing Capacity Pipe+Concrete (Kips)		
			f'c—3000	f'c—4000	f'c—5000			f'c—3000	f'c—4000	f'c - 5000
8⅝"	.156	54.272	41.0	54.3	67.7	2.473	34.6	75.6	88.9	102.
	.188	53.456	40.0	53.5	66.6	3.289	46.0	86.0	99.5	112.
	.219	52.651	39.5	52.7	65.6	4.094	57.2	96.7	109.9	122.
	.250	51.849	38.9	51.8	64.9	4.896	68.5	107.4	120.3	133.
10¾"	.156	85.565	64.2	85.6	107	3.099	43.4	107.6	129.0	150.
	.188	84.541	63.4	84.5	106	4.123	57.7	121.1	142.2	163.
	.219	83.528	62.6	83.5	104	5.136	71.8	134.4	155.3	175.
	.250	82.516	61.9	82.5	103	6.146	86.0	147.9	168.5	189.
12¾"	.188	120.28	90.0	120	150	4.91	68.7	158.7	188.7	218.
	.219	119.07	89.3	119	149	6.12	85.6	174.9	204.6	234.
	.250	117.86	88.4	118	147	7.33	103.0	191.4	221.0	250.
	.312	115.47	86.6	115	145	9.72	136.0	222.6	251.0	281.
14"	.188	145.80	109	146	182	5.40	75.5	184.5	221.5	257.
	.219	144.47	108	144	181	6.73	94.2	202.2	238.2	275.
	.250	143.14	107	143	179	8.06	113.0	220.0	256.0	292.
	.312	140.50	105	140	176	10.70	150.0	255.0	290.0	326.
16"	.219	190.20	142	190	237	7.73	108	250	298	
	.250	188.69	141	188	236	9.24	129	270	317	
	.281	187.19	140	187	234	10.75	148	288	335	382
	.312	185.69	139	185	232	12.25	171	310	356	403
20"	.250	298.65	224	298	373	11.60	162	386	460	535
	.281	296.75	223	296	371	13.49	189	412	485	560
	.312	294.80	221	295	368	15.38	215	436	510	583
	.375	291.04	218	291	364	19.20	269	487	560	633
24"	.250	433.74	328	434	547	13.952	195	523	629	742
	.312	429.17	322	429	536	18.517	259	581	688	795
	.375	424.56	318	424	530	23.132	324	642	748	854
	.500	415.48	312	415	520	32.213	451	763	866	971
26"	.250	511.50	384	511	639	15.119	211	595	722	850
	.312	504.85	378	505	630	20.074	281	659	786	911
	.375	501.50	376	501	625	25.085	351	727	852	976
	.500	490.80	369	491	614	34.950	489	858	980	1103
30"	.250	684.70	513	685	855	17.472	244	757	929	1099
	.312	677.60	508	677	846	23.220	325	833	1002	1171
	.375	672.00	504	672	839	29.021	406	910	1078	1245
	.500	660.52	495	660	826	40.459	566	1061	1226	1392
36"	.250	991.50	744	991	1240	21.015	294	1038	1285	1534
	.312	982.90	736	983	1230	27.923	391	1127	1374	1621
	.375	975.91	732	976	1220	34.912	488	1220	1464	1708
	.500	962.12	722	962	1210	48.705	682	1604	1644	1892

APPENDIX B

3300 - 1 DESCRIPTION

1.01 The work shall consist of spreading and compacting screened or crushed aggregate on a prepared surface.

1.02 The following definitions shall apply for this specification:

(a) Mean:

The arithmetic average of a set of 'n' test results constituting the sample.

(b) Moving average:

The arithmetic mean of 3 consecutive test results.

(c) Sub-base aggregate:

The aggregate before mixing, when binder is to be added or the aggregate before spreading and compacting, when no binder is to be added.

(d) Sub-base mix:

The sub-base aggregate after mixing with binder and water but before spreading and compacting.

(e) Sub-base course:

The sub-base aggregate or sub-base mix in place on the road during and after spreading and compacting.

3300 - 2 MATERIALS

Aggregate

2.01 Sub-base aggregate shall be composed of sound, hard, and durable particles of sand, gravel and rock free from injurious quantities of soft or flaky particles, shale, loam, clay balls and organic or other deleterious material.

3300 - 3 CONSTRUCTION

General

3.01 (a) Sub-base course shall comply with the requirements listed in Table 1:

TABLE 1

Sieve Designation	Percent By Weight Passing Canadian Metric Sieve Series		
	TYPE		
	6	8	10
50.0 mm	100.0	100.0	100.0
2.0 mm	0 - 80.0	0 - 90.0	
400 um	0 - 45.0	0 - 60.0	
160 um	0 - 20.0	0- 25.0	
71 um	0 - 6.0	0 - 15.0	0 - 20.0
Plasticity Index (all types)	0 - 6.0		

(b) A tolerance of 3% in the percent by weight passing the maximum size sieve shall be permitted providing 100% of the oversize passes the 63.0 mm sieve.

3.02 The following shall apply to Department owned or controlled aggregate sources shown on the plans or as described in the Special Provisions:

(a) Overburden shall be removed from material deposits in accordance with Specification 2260 For Removal Of Overburden.

(b) Stockpiles shall be constructed in accordance with Specification 3600 For Stockpiling Aggregates.

3.03 Binder, filler and blender sand shall be provided in accordance with Specification 3400 For Binder, Filler And Blender Sand.

3.04 Sub-base aggregate shall be pushed to a trap or into a stockpile prior to screening.

Processing

3.05 The production of sub-base course shall comply with the following:

(a) The Contractor shall cease operations if the moving average for any sieve does not comply with the specified requirements listed in Table 1.

(b) Operations shall not recommence until the specified requirements are met.

(c) Upon recommencement of operations, the specified requirements shall be met on each of the initial 2 tests.

(d) Failure to cease operations shall subject all subsequent materials to the requirements of General Provision 1400-7 (Unacceptable and Unauthorized Work).

Spreading and Compacting

3.06 The thickness of a compacted lift of sub-base course shall not exceed 120 mm. The lift thickness may be increased if the Contractor can demonstrate that with the use of vibratory compaction equipment and construction procedures, the compaction requirements can be achieved for lifts greater than 120 mm.

3.07 Sub-base courses shall be compacted until no further settlement is apparent and the particles are well keyed into place. The sub-base course shall be free from any rutting or deformations before the placement of the next course.

3.08 If excess moisture originating from external causes including but not limited to precipitation and/or Contractor's operation is present in the sub-base course and/or underlying material prior to the acceptance of the completed surfacing structure; the Contractor shall dry the sub-base course and/or the underlying material to the optimum moisture content and compact the sub-base and/or the underlying material to not less than the specified density or the optimum density in accordance with the requirements for Moisture-Density Proctor (STP 205-5).

Stabilizing

3.09 If the sub-base course proves to be unstable, the Engineer shall require the Contractor to stabilize the sub-base aggregate by one or a combination of the following methods:

(a) By the addition of binder or filler at the aggregate source or at the screening plant. The binder or filler shall be added and thoroughly distributed throughout the aggregate until a homogeneous mixture is obtained.

(b) By the addition of crushed aggregate on the road.

(c) By the addition of emulsified asphalt to the compaction water in the proportions designated by the Engineer. The Department shall supply the asphalt.

(d) Any other method proposed by the Contractor and approved by the Engineer.

Seasonal Shutdown

3.10 If work must be carried over from one construction season to the next, there shall be no exposed sub-base aggregate, mix or sub-base course remaining on the road unless covered by a lift of base course.

3300-4 SAMPLING AND TESTING

General

4.01 Unless otherwise specified, test procedures shall be in accordance with Saskatchewan Highways and Transportation's Standard Test Procedures Manual.

4.02 The test procedures in effect on the closing date of the tenders shall apply.

3300 - 5 MEASUREMENT

5.01 Sub-base course shall be measured in tonnes.

3300 - 6 PAYMENT

6.01 Payment for Sub-base Course shall be at the contract unit price per tonne. The contract unit price shall be full compensation for completing the work except for those activities for which specific provision for payment is made in this section.

6.02 If the contract includes a bid item for:

(a) Hauling Sub-base Course and Hauling Binder, Filler And Blender Sand; payment shall be made in accordance with Specification 2405 For Hauling On The Basis Of The Kilometre.

(b) Watering; payment shall be made in accordance with Specification 2500 For Watering.

(c) Binder, Filler And Blender Sand; payment shall be made in accordance with Specification 3400 For Binder, Filler And Blender Sand.

(d) Granular Base Course; payment for Granular Base Course used as stabilizing agent shall be at the contract unit price For Granular Base Course.

(e) Prime, Tack or Flush Coat; payment for emulsified asphalt used as stabilizing agent shall be the contract unit price for Prime, Tack and Flush Coat.

3505 - SPECIFICATION FOR GRANULAR BASE COURSE

3505 - 1 DESCRIPTION

1.01 The work shall consist of spreading and compacting crushed and pugmilled aggregate on a prepared surface.

1.02 The following definitions shall apply:

(a) Acceptance limit:

The maximum or minimum value for a test result above or below which the section of roadway shall be rejected.

(b) Acceptance testing:

The testing performed to determine compliance with the specification regarding certain requirements, limits and tolerances for the quality of materials and workmanship to be supplied.

(c) Base aggregate:

The aggregate before pugmilling.

(d) Base mix:

The mix after pugmilling, but before spreading.

(e) Base course:

The mix in place on the road during and after spreading and compacting.

(f) Mean:

The arithmetic average of a set of 'n' test results constituting the sample.

(g) Moving average:

The arithmetic mean of 3 consecutive test results.

(h) Surface defects:

Surface defects that are due to the Contractor’s operation shall include but shall not be limited to the following:

(i) Potholing.

(ii) Surface failures.

(iii) Ravelling.

(iv) Rutting.

(v) Bumps or dips.

(vi) Irregular cross slopes.

(vii) Segregation.

3505 - 2 MATERIALS

Aggregate

2.01 Base aggregate shall be composed of sound, hard and durable particles of sand, gravel and rock free from injurious quantities of elongated, soft or flaky particles, shale, loam, clay balls and organic or other deleterious material.

3505 - 3 CONSTRUCTION

General

3.01 (a) Base course shall comply with the requirements listed in Table 1.

TABLE 1

SIEVE DESIGNATION	PERCENT BY WEIGHT PASSING CANADIAN METRIC SIEVE SERIES		
	TYPE		
	31	33	35
31.5 mm	100.0		
18.0 mm	75.0 - 90.0	100.0	100.0
12.5 mm	65.0 - 83.0	75.0 - 100.0	81.0 - 100.0
5.0 mm	40.0 - 69.0	50.0 - 75.0	50.0 - 85.0
2.0 mm	26.0 - 47.0	32.0 - 52.0	32.0 - 65.0
900 um	17.0 - 32.0	20.0 - 35.0	20.0 - 43.0
400 um	12.0 - 22.0	15.0 - 25.0	15.0 - 30.0
160 um	7.0 - 14.0	8.0 - 15.0	8.0 - 18.0
71 um	6.0 - 11.0	6.0 - 11.0	7.0 - 12.0
Plasticity Index	0 - 7.0	0 - 6.0	0 - 5.0
Fractured Face %	50.0 Minimum		
Light Weight Pieces %	5.0 Maximum		

(b) A tolerance of 3% in the percent by weight passing the maximum size sieve shall be permitted providing 100% of the oversize passes the 40.0 mm sieve for Type 31 base course and the 22.4 mm sieve for Types 33 and 35 base course.

3.02 The following shall apply to Department owned or controlled aggregate sources shown on the plans or as described in the Special Provisions:

(a) Overburden shall be removed from material deposits in accordance with Specification 2260 For Removal Of Overburden.

(b) Rock passing a 450 mm square opening screen and larger than the maximum specified size shall be crushed and incorporated simultaneously throughout the crushing operation.

(c) Stockpiles shall be constructed in accordance with Specification 3600 For Stockpiling Aggregates.

3.03 Binder, filler, and blender sand shall be provided in accordance with Specification 3400 For Binder, Filler And Blender Sand.

3.04 Binder, filler and blender sand shall be added using a separate conveyor system.

3.05 Binder, filler and blender sand feeds shall be accurately controlled and coordinated.

Reject Aggregate

3.06 If the Contractor is required to reject a fraction of the raw aggregate to meet the aggregate requirements in Table 1, the following shall apply:

(a) The raw aggregate shall be screened over a maximum 9.0 mm square opening screen or a 5.0 mm slotted screen prior to crushing.

(b) The Contractor shall be responsible for the rejected material up to a maximum of 10% of the raw aggregate by weight.

(c) The quantity of raw aggregate shall be calculated as follows:

Raw aggregate = (Granular base course less binder, filler and blender sand) x 1.11

Processing

3.07 Base mix production shall comply with the following requirements during the pugmilling stage:

(a) The Contractor shall cease operations if the moving average for any sieve does not comply with the specified requirements listed in Table 1.

(b) Operations shall not recommence until the specified requirements are met.

(c) Upon recommencement of operations, the specified requirements shall be met on each of the initial 2 tests.

(d) Failure to cease operations shall subject all subsequent materials to the requirements of General Provision 1400-7 (Unacceptable and Unauthorized Work).

3.08 Base aggregate shall be stockpiled after the crushing operation and prior to the pugmilling.

3.09 During pugmilling operations, the Contractor shall have sufficient base aggregate in stockpile for at least 24 h of pugmilling operation until crushing is completed.

3.10 Pugmilling shall be performed in a stationary mixing plant. The mixing unit shall be designed to ensure complete mixing of the materials.

3.11 The pugmill shall be equipped with spray bars for the addition of water.

3.12 The moisture content of the base mix shall not be greater than 5 % by weight when it leaves the pugmill.

Spreading And Compacting

3.13 Base mix shall be spread on dry and unfrozen surfaces.

3.14 Base mix shall not be compacted if the atmospheric temperature is less than 2 °C.

3.15 Base course spilled on new asphalt concrete shall be removed immediately.

3.16 The finished surface of the base course shall be true to grade and cross section and free of any surface defects.

3.17 If specified in the Special Provisions or shown on the plans, a prime coat shall be placed on the finished final lift of base course in accordance with Specification 4000 For Bituminous Prime, Tack, And Flush Coat. Prime coat shall be placed within 24 h, weather permitting, after receiving written authorization from the Engineer.

3.18 If a seal coat is specified for shoulder base course, the surface of the final lift of shoulder base course shall be constructed 10 mm below the surface of the final lift of the wearing course.

3.19 If excess moisture originating from external causes including but not limited to precipitation and/or Contractor's operation is present in the subgrade and/or sub-base course and/or base course prior to the acceptance of the completed surfacing structure; the Contractor shall dry the subgrade and/or sub-base course and/or base course to the optimum moisture content and compact the subgrade and/or sub-base course and/or base course to not less than the specified density or the optimum density in accordance with the requirements for Moisture-Density Proctor (STP 205-5).

Seasonal Shutdown

3.20 If work must be carried over from one construction season to the next and the number of working days/completion date have not expired, the following shall apply:

(a) For accepted final lift of base course on which a wearing course has not been placed, the following shall apply:

(i) At the time seasonal operations cease, a prime coat, seal coat, or asphalt concrete shall be placed on the full width of base course as directed by the Engineer.

(ii) The Department shall bear all the costs including materials for placing the prime coat, seal coat, and asphalt concrete on the full width of base course up to a maximum length of 1.5 km.

(iii) The Contractor shall bear all the costs including materials for placing the prime coat, seal coat, and asphalt concrete on the full width of base course on all other sections outside the 1.5 km limit. The Contractor may remove the base course in lieu of placing a prime coat, seal coat or asphalt concrete on it.

(iv) When work resumes, the Department shall bear the cost of removing the prime coat, seal coat, and asphalt concrete if required and remedying unacceptable base course including replacing the prime and prime materials on the 1.5 km limit.

(v) When work resumes, the Contractor shall bear the cost of removing the prime coat, seal coat, and asphalt concrete if required and remedying unacceptable base course including replacing the prime and prime materials on all other sections outside the 1.5 km limit.

(b) For unaccepted base course and accepted lower lifts of base course, the following shall apply:

(i) At the time seasonal operations cease, a prime coat, seal coat, or asphalt concrete shall be placed on the full width of base course as directed by the Engineer.

(ii) The Department shall bear all the costs including materials for placing the prime coat, seal coat, and asphalt concrete on the full width of base course up to a maximum length of 1.5 km.

(iii) The Contractor shall bear all the costs including materials for placing the prime coat, seal coat, and asphalt concrete on the full width of base course on all other sections outside the 1.5 km limit. The Contractor may remove the base course in lieu of placing a prime coat, seal coat or asphalt concrete on it.

(iv) When work resumes, the Department shall bear the cost of removing the prime coat, seal coat, and asphalt concrete if required and remedying unacceptable base course including replacing the prime and prime materials on the 1.5 km limit.

(v) When work resumes, the Contractor shall bear the cost of removing the prime coat, seal coat, and asphalt concrete if required and remedying unacceptable base course including replacing the prime and prime materials on all other sections outside the 1.5 km limit.

3.21 If work must be carried over from one construction season to the next and the number of working days/completion date have expired, the following shall apply:

(a) For accepted final lift of base course on which a wearing course has not been placed, the following shall apply:

(i) At the time seasonal operations cease, a prime coat, seal coat, or asphalt concrete shall be placed on the full width of base course as directed by the Engineer.

(ii) The Department shall bear all the costs including materials for placing the prime coat, seal coat, and asphalt concrete on the full width of base course up to a maximum length of 1.0 km.

(iii) The Contractor shall bear all the costs including materials for placing the prime coat, seal coat, and asphalt concrete on the full width of base course on all other sections outside the 1.0 km limit. The Contractor may remove the base course in lieu of placing a prime coat, seal coat or asphalt concrete on it.

(iv) When work resumes, the Contractor shall bear the costs of removing the prime coat, seal coat, and asphalt concrete if required and remedying unacceptable base course including replacing the prime and prime materials on all sections of base course.

(b) For unaccepted base course and accepted lower lifts of base course, the following shall apply:

(i) At the time seasonal operations cease, a prime coat, seal coat, or asphalt concrete shall be placed on the full width of base course as directed by the Engineer.

(ii) The Contractor shall bear all the costs including materials for placing the prime coat, seal coat, and asphalt concrete on the full width of base course. The Contractor may remove the base course in lieu of placing a prime coat, seal coat or asphalt concrete on it.

(iii) When work resumes, the Contractor shall bear the costs of removing the prime coat, seal coat, and asphalt concrete if required and remedying unacceptable base course including replacing the prime and prime materials on all sections of base course.

3.22 The Contractor shall bear the cost of maintenance, except snow and ice removal, on sections of roadway where the road surface has been disturbed by the construction operations.

3505 - 4 SAMPLING AND TESTING

General

4.01 Unless otherwise specified, test procedures shall be in accordance with Saskatchewan Highways and Transportation's Standard Test Procedures Manual.

4.02 The test procedures in effect on the closing date of the tenders shall apply.

Acceptance Testing

4.03 Upon notification from the Contractor that a section of the roadway has been inspected and is ready for acceptance testing, the Engineer shall carry out the required tests for density and surface defects.

Acceptance Testing for Density

4.04 The maximum density value and the corresponding optimum moisture content shall be determined in accordance with the requirements for Moisture-Density Proctor (STP 205-5).

4.05 Densities shall not be taken at locations within 0.5 m of an unsupported edge and 0.1 m of a supported edge.

4.06 Acceptance testing for density of the base course on the road shall be determined in accordance with the requirements for Density-In-Place By Nuclear Gauge (STP 205-7).

4.07 Frequency and locations of testing on any section shall be at the discretion of the Engineer.

3505 - 5 ACCEPTANCE OR REJECTION

5.01 The section of base course shall be considered acceptable if it contains no surface defects and if:

(a) The average density meets or exceeds 100 % of maximum density.

(b) All individual test results are greater than 98 % of maximum density.

(c) The moisture content is less than or equal to the optimum moisture content.

5.02 If shoulder base course is placed in a separate operation and shoulder base course is the final wearing course; the section of shoulder base course shall be considered acceptable if it contains no surface defects and if:

(a) The average density meets or exceeds 95.0 % of maximum density.

(b) All individual test results are greater than 93.0 % of maximum density.

(c) The moisture content is less than or equal to the optimum moisture content.

Product Rejection

5.03 If the densities for any section of the roadway are outside the acceptance limits outlined in Sections 5.01 and 5.02, the section shall be rejected as unacceptable work and the following shall apply:

(a) The Contractor shall have the opportunity to remedy existing base course by rerolling or by any other method suggested by the Contractor and approved by the Engineer. The Contractor may request that the section of the roadway be retested during or after the completion of the remedial attempts.

(b) The section shall be tested a total of 3 times free of cost to the Contractor. The Contractor shall pay the cost of any additional testing. The rate for the Department testing shall be as designated in the Special Provisions.

(c) If the base course in the section remains outside the acceptance limits after the remedial attempts, the Contractor shall remove and replace all the base course in that section. The Engineer may approve a base course overlay of equal thickness in lieu of removing and replacing the base course.

5.04 Any section with surface defects shall be rejected as unacceptable work.

Repairs

5.05 Surface defects shall be repaired in a manner acceptable to the Engineer.

3505 - 6 MEASUREMENT

6.01 Granular base course shall be measured in tonnes.

6.02 Reject aggregate shall be measured by the cross section method. The volume of reject shall be multiplied by 1.7 to calculate tonnes.

3505 - 7 PAYMENT

7.01 Payment for Granular Base Course and Granular Shoulder Base Course shall be at the contract unit price per tonne. The unit price shall be full compensation for completing the work except for those activities for which specific provision for payment is made in this section.

7.02 The rate that the Department shall pay for rejecting aggregate in excess of 10% shall be as designated in the Special Provisions of the contract.

7.03 If the contract includes a bid item for:

(a) Hauling Granular Base Course, Hauling Granular Shoulder Base Course and/or Hauling Binder, Filler And Blender Sand; payment shall be made in accordance with Specification 2405 For Hauling On The Basis Of The Kilometre.

(b) Watering; payment shall be made in accordance with Specification 2500 For Watering.

(c) Binder, Filler And Blender Sand; payment shall be made in accordance with Specification 3400 For Binder, Filler And Blender Sand.

(d) Prime, Tack or Flush Coat; payment shall be made in accordance with Specification 4000 For Bituminous Prime, Tack And Flush Coat.

7.04 All remedial work shall be performed at the Contractor's expense including the cost of materials.

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4100 – SPECIFICATION FOR ASPHALT CONCRETE

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4100.1 GENERAL

4100.1.1 Description

4100.1.1.1 The work shall consist of mixing crushed aggregates, or a combination of crushed aggregates and reclaimed asphalt concrete, blender sand material as required, additives as required, and asphalt in a hot mix plant; and spreading and compacting the mixture on a prepared surface.

4100.1.2 Definitions

4100.1.2.1 The following definitions shall apply for this specification:

4100.1.2.1.1 Acceptance Limit is the maximum or minimum value for a test result above or below which the block and/or lot will be rejected.

4100.1.2.1.2 Acceptance Testing is the testing performed by the Engineer to determine compliance with the specifications regarding specified requirements, limits and tolerances for the quality of materials and workmanship supplied.

4100.1.2.1.3 Adjusted PrI is the adjusted profile results for smoothness in a block in which individual bumps and dips greater than 12 mm have been removed. The adjusted PrI in a block will be recalculated by removing the individual PrI results corresponding to the location of individual bumps and dips that are greater than 12 mm.

4100.1.2.1.4 Asphalt is the asphalt material being added as bituminous binder.

4100.1.2.1.5 Asphalt Concrete is the asphalt mix in place on the road including levelling and surface courses during and after spreading and compacting.

4100.1.2.1.6 Asphalt Mix is the mix after the asphalt mix aggregate and asphalt have been blended together.

4100.1.2.1.7 Asphalt Mix Aggregate is the aggregate after combining all virgin aggregates, additives and reclaimed asphalt concrete aggregate.

4100.1.2.1.8 Asphalt Mix Design is the laboratory determination of the precise proportions of asphalt, reclaimed asphalt concrete, additives, and all virgin aggregates to be blended together to meet the specified properties for the asphalt mix.

4100.1.2.1.9 Asphalt Mix Formula is the field determination during the plant calibration process of the precise proportions of asphalt, reclaimed asphalt concrete, additives, and all virgin aggregates to be blended together to meet the specified properties for the asphalt mix as produced at the plant.

4100.1.2.1.10 Block is the unit of measurement for assessing smoothness and individual bumps and dips. A block is a portion of the final lift of asphalt concrete that is one paver width wide and 100 m long. The first and last block on a construction section may be less than 100 m long.

4100.1.2.1.11 Density

4100.1.2.1.11.1 Asphalt Mix Design Density is the Marshall density for the compacted Asphalt Mix Design specimen (see 4100.1.2.1.8 above).

4100.1.2.1.11.2 Asphalt Mix Formula Density is the Marshall density for the compacted Asphalt Mix Formula specimen (see 4100.1.2.1.9 above).

4100.1.2.1.11.3 Field Density is the density of the Asphalt Concrete as determined by STP 204 – 6, Density-In-Place By Nuclear Gauge.

4100.1.2.1.11.4 Job Mix Formula Density is the Marshall density for the compacted Job Mix Formula specimen (see 4100.1.2.1.13 below).

4100.1.2.1.11.5 Specified Marshall Density is 97% of the 3-point moving average Marshall Density established for the Asphalt Mix Formula or the Job Mix Formula, whichever is in use.

4100.1.2.1.11.6 Target Density is the density established through the rolling pattern strip when the Specified Marshall Density is not achievable.

4100.1.2.1.12 Individual Bump And/Or Dip is a bump or dip measured in the vertical direction that exceeds 12 mm.

4100.1.2.1.13 Job Mix Formula is the field determination of the precise proportions of asphalt, reclaimed asphalt concrete, additives, and all virgin aggregates to be blended together to meet the specified properties for the asphalt mix as produced at the plant.

4100.1.2.1.14 Lot is approximately 200 tonnes of asphalt concrete which is assessed as a unit for the purpose of payment and selected to represent work produced by essentially the same process and materials. The final lot on a project may vary in mass from 101 t to 300 t.

4100.1.2.1.15 Mean is the arithmetic average of the test results within a lot.

4100.1.2.1.16 Moving Average is the arithmetic mean of 3 consecutive test results.

4100.1.2.1.17 Profile Index (PrI) is the sum of the vertical deviations, in millimetres, outside the 5 mm null band that a roadway deviates from a perfectly flat surface over a horizontal distance of 100 m. The PrI categories are as follows:

4100.1.2.1.17.1 Category I PrI applies to all blocks not identified below as Category II PrI.

4100.1.2.1.17.2 Category II PrI applies to the following circumstances:

4100.1.2.1.17.2.1 Curves with radius less than 600 m;

4100.1.2.1.17.2.2 Blocks within 50 m of a bridge or railway crossing;

4100.1.2.1.17.2.3 Single lift rehabilitation projects where the total thickness of asphalt concrete being placed is 50 mm or less, with the exception of profiled-milled sections;

4100.1.2.1.17.2.4 Areas where there is curb and gutter; and

4100.1.2.1.17.2.5 The block at each construction limit.

4100.1.2.1.18 Reclaimed Asphalt Concrete is asphalt concrete reclaimed from the roadway.

4100.1.2.1.19 Reclaimed Asphalt Concrete Aggregate is the aggregate remaining after the asphalt has been extracted from the Reclaimed Asphalt Concrete.

4100.1.2.1.20 Repair

4100.1.2.1.20.1 Class I Repair is a corrective improvement that removes and replaces, or overlays the defective or damaged block(s) or lot(s) and restores the block(s) or lot(s) to the specified standard.

4100.1.2.1.20.2 Class II Repair is a surface treatment that mends or corrects a structural defect to restore the surface to an acceptable standard (e.g. slurry seal).

4100.1.2.1.20.3 Class III Repair is a surface treatment that mends or corrects a surface defect but does not restore the surface to an acceptable standard (e.g. flush coat).

4100.1.2.1.20.4 Class IV Repair is a corrective improvement to the ride by reducing bump(s) and/or dip(s). An acceptable Class IV repair is one which removes or reduces the bump(s) and/or dip(s) through a smooth transition to the surrounding asphalt concrete without impairing the functionality and/or structural characteristics in the area of the bump(s) and/or dip(s).

4100.1.2.1.21 Segregated Area is an area 0.1 m^2 or greater where the surface texture is either too stony or lacking in continuous matrix of asphalt, fine aggregate and coarse aggregate in relation to the surrounding acceptable asphalt concrete.

4100.1.2.1.22 Segregation Severity

4100.1.2.1.22.1 None means a completely uniform surface texture. The matrix of asphalt and fine aggregate is in place between the coarse aggregate.

4100.1.2.1.22.2 Minor means significantly more stone is visible than in the surrounding acceptable asphalt concrete, usually with a lack of continuous contact with the surrounding matrix.

4100.1.2.1.22.3 Severe means areas that usually appear as very stony mix, with stone against stone, and may be missing matrix.

4100.1.2.1.23 Smoothness means the surface profile of the asphalt concrete with the Profile Index (PrI) as the measured output. Individual bumps and/or dips of 12 mm or less are considered a part of smoothness.

4100.1.2.1.24 Surface Defects that are due to the Contractor's operation shall include, but shall not be limited to the following:

4100.1.2.1.24.1 Areas of segregation less than 0.1 m^2;

4100.1.2.1.24.2 Areas containing excess or insufficient asphalt;

4100.1.2.1.24.3 Areas of open texture;

4100.1.2.1.24.4 Improper matching of longitudinal and transverse joints on final lift of asphalt concrete;

4100.1.2.1.24.5 Roller marks on final lift of asphalt concrete;

4100.1.2.1.24.6 Cracking or tearing;

4100.1.2.1.24.7 Contamination by diesel, hydraulic fluids, detergent or other harmful products;

4100.1.2.1.24.8 Foreign objects or materials that are detrimental to the asphalt concrete; and

4100.1.2.1.24.9 Clay balls or oversized materials.

4100.2 MATERIALS

4100.2.1 Asphalt

4100.2.1.1 The Department will supply and pay for the asphalt.

4100.2.2 Aggregate

4100.2.2.1 Virgin aggregate shall be composed of sound, hard and durable particles of sand, gravel and rock, free from injurious quantities of elongated, soft or flaky particles, shale, clay, loam, ironstone, coal and organic or other deleterious material.

4100.2.3 Anti-Stripping Agents

4100.2.3.1 The Department will supply and pay for the anti-stripping agents.

4100.3 CONSTRUCTION

4100.3.1 Department Owned or Controlled Aggregate Sources

4100.3.1.1 The following shall apply to Department owned or controlled aggregate sources shown on the plans or as described in the Special Provisions:

4100.3.1.1.1 Overburden shall be removed from material deposits in accordance with Specification 2260 For The Removal Of Overburden.

4100.3.1.1.2 Rock passing a 610 mm square opening screen and larger than the maximum specified size shall be crushed and incorporated simultaneously throughout the crushing operation.

4100.3.1.1.3 Aggregate stockpiles shall be constructed in accordance with Specification 3600 For Stockpiling Aggregates.

4100.3.2 Binder, Filler and Blender Sand

4100.3.2.1 Filler and blender shall be provided in accordance with Specification 3400 For Binder, Filler And Blender Sand.

4100.3.3 Anti-Stripping Agents

4100.3.3.1 The Department will determine whether or not anti-stripping agent is required.

4100.3.3.2 When the Department has determined that anti-stripping agent is required, the Engineer will determine if hydrated lime or liquid anti-stripping agent shall be used.

4100.3.3.3 Hydrated Lime

4100.3.3.3.1 When hydrated lime is used, the following shall apply:

4100.3.3.3.1.1 The Contractor shall supply the equipment necessary to add the lime.

4100.3.3.3.1.2 The hydrated lime shall be blended by a pugmill into the cold aggregate feed.

4100.3.3.3.1.3 Sufficient water shall be added at the pugmill to ensure a minimum of 3% moisture content in the aggregate.

4100.3.3.3.1.4 The amount of hydrated lime added shall be approximately 1% of the total dry aggregate by weight, or as designated by the Engineer, for the Job Mix Formula.

4100.3.3.3.1.5 The Contractor shall ensure the procedures and equipment used for the addition of hydrated lime anti-stripping agent are adequate to ensure that the hydrated lime is added at a uniform consistent rate.

4100.3.3.3.1.6 The Contractor shall maintain records containing bills of lading, estimated quantities on hand, estimated quantities used, and at the completion of the project, the estimated unused quantity. The record of estimated usage shall be provided to the Engineer on a daily basis.

4100.3.3.3.1.7 At the end of the project the bulk measurement of the hydrated lime used on the project shall not deviate by more than 25% from the specified percentage designated by the Job Mix Formula. If the final amount of hydrated lime used on the project exceeds 125% of the specified percentage designated by the Job Mix Formula, the Department will deduct the cost of the hydrated lime used in excess of 125% from the Final Progressive Estimate. If the final amount of hydrated lime used on the project is less than 75% of the specified percentage designated by the Job Mix Formula, the Contractor shall perform at his expense a Class I repair on the asphalt concrete in a manner acceptable to the Engineer.

4100.3.3.4 Liquid Anti-Stripping Agent:

4100.3.3.4.1 When a liquid anti-stripping agent is used, the following shall apply:

4100.3.3.4.1.1 The Contractor shall supply the equipment necessary to add a liquid anti-stripping agent.

4100.3.3.4.1.2 The addition of liquid anti-stripping agent shall be accomplished through the use of a liquid anti-strip injection system containing a positive displacement pump with a variable speed motor, a totalizing flow meter, a sampling valve, a system check valve, a system isolation valve and an inline check valve. The injector pump motor shall be regulated by a signal from the asphalt flow meter.

4100.3.3.4.1.3 Liquid anti-stripping agent will be injected into the plant asphalt line just prior to entry into the drum mixer.

4100.3.3.4.1.4 The system shall be capable of regulating the flow rate resulting in consistent flow rate of liquid anti-stripping agent.

4100.3.3.4.1.5 The system shall be capable of re-circulating the liquid anti-stripping agent to the storage tank until the asphalt plant bypass valve is actuated.

4100.3.3.4.1.6 Liquid anti-stripping agent shall be added at a rate of approximately 1.0% of the weight of liquid asphalt added, or as designated by the Engineer, for the Job Mix Formula.

4100.3.3.4.1.7 The Contractor shall maintain records containing bills of lading, estimated quantities on hand, estimated quantities used, damaged barrels, and at the completion of the project, any estimated quantities of unused anti-stripping agent. The Contractor shall provide the record of estimated usage to the Engineer on a daily basis.

4100.3.3.4.1.8 At the end of the project the bulk measurement of the liquid anti-stripping agent used on the project shall not deviate by more than 10% from the specified percentage designated by the Job Mix Formula. If the final amount of liquid anti-stripping agent used on the project exceeds 110% of the specified percentage designated by the Job Mix Formula, the Department will deduct the cost of the liquid anti-stripping agent used in excess of 110% from the Final Progressive Estimate. If the final amount of liquid anti-stripping agent used on the project is less than 90% of the specified percentage designated by the Job Mix Formula, the Contractor shall perform at his expense a Class I repair on the asphalt concrete.

4100.3.3.4.1.9 The Contractor shall handle all barrels of liquid anti-stripping agent in such a manner that they can be returned to the supplier. The full cost of any barrels damaged such that they cannot be returned to the supplier, or any environmental clean-up required, will be charged back to the Contractor, and deducted from the Final Progressive Estimate. If the Contractor uses liquid anti-stripping in bulk, the full cost of any environmental clean-up required will be charged back to the Contractor and deducted from the Final Progressive Estimate.

4100.3.4 Aggregate

4100.3.4.1 The Contractor shall split the aggregate into 3 separate stockpiles in accordance with the following:

4100.3.4.1.1 The natural fines stockpile shall be produced by screening the raw aggregate over a maximum 9.0 mm square opening screen or 5.0 mm slotted screen prior to crushing.

4100.3.4.1.2 The aggregate retained on the screen shall be crushed and split into crushed coarse and crushed fine stockpiles.

4100.3.4.1.3 The crushed coarse stockpile shall contain no more than 10% of the material passing the 5.0 mm square opening sieve.

4100.3.4.1.4 The crushed fine stockpile shall contain no less than 90% of the material passing the 5.0 mm square opening sieve.

4100.3.4.1.5 The Contractor shall provide accurate measurements of quantities and percentages of aggregate being placed in each stockpile after producing 50% of the aggregate or 10 000 t, whichever is greater; or when all the aggregate is produced if the total quantity is less than 10 000 t. If the splits provided by the Contractor prove to be inaccurate and result in an aggregate shortage, securing additional equivalent aggregate shall be at the Contractor's expense.

4100.3.4.2 The crushed coarse, crushed fines, and natural fines stockpiles shall be mathematically recombined at the percentages provided by the Contractor. If the resulting aggregate does not meet the requirements of Table 4100.3.T1, the Contractor shall be required to reject a fraction of the material in the natural fines stockpile in accordance with General Provision 1500.2.8.

4100.3.4.3 If recycled asphalt concrete is designated in the contract, the following shall apply:

4100.3.4.3.1 The reclaimed asphalt concrete shall not exceed 40 mm when measured in any direction before entering the plant.

4100.3.4.3.2 The crushed coarse, crushed fines, natural fines and reclaimed asphalt concrete stockpiles shall be mathematically recombined at the percentages provided by the Contractor. If the resulting aggregate does not meet the requirements of Table 4100.3.T1, the Contractor shall be required to reject a fraction of the material in the natural fines stockpile in accordance with General Provision 1500.2.8.

4100.3.5 Asphalt Mix Design

4100.3.5.1 The asphalt mix design will be established by the Engineer in accordance with the requirements for Marshall Mix Design (STP 204-10) within 10 calendar days after 50% of the aggregate has been produced or 10 000 t, whichever is greater, and provided that the Contractor has complied with Section 4100.3.4.1.5.

4100.3.5.2 Further to Section 4100.3.4.1.5, if the Department is required to do an additional mix design because the splits provided by the Contractor prove to be inaccurate, the Contractor will be assessed the rate specified in the Special Provisions.

4100.3.5.3 The asphalt mix design type will be specified in the Special Provisions. The asphalt mix characteristics shall meet the requirements in Table 4100.3.T1.

TABLE 4100.3.T1

ASPHALT CONCRETE MIX DESIGN TYPES AND CHARACTERISTICS

Mix Design Type/ Design Factors -Mix Characteristics	**1**	**2**	**3**	**4**	**5**	**6**
Asphalt Type	150-200 A or 200-300 A			150-200 A or 200-300 A		
Marshall Blows	50 blows			75 blows		
Aggregate Type/Sieve Designation*	70 or 70 R	71 or 71 R	72 or 72 R	70 or 70 R	71 or 71 R	72 or 72 R
18.0 mm	100.0			100.0		
16.0 mm	78.0 – 98.0	100.0		78.0-98.0	100.0	
12.5 mm	68.0 – 92.0	78.0 – 98.0	100.0	68.0 – 92.0	78.0 – 98.0	100.0
9.0 mm	54.0 – 80.0	66.0 – 90.0	66.0 – 90.0	54.0 – 80.0	66.0 – 90.0	66.0 – 90.0
5.0 mm	38.0 – 65.0	46.0 – 72.0	46.0 – 72.0	38.0 – 65.0	46.0 – 72.0	46.0 – 72.0
2.0 mm	18.0 – 46.0	23.0 – 51.0	23.0 – 51.0	18.0 – 46.0	23.0 – 51.0	23.0 – 51.0
900 um	10.0 – 33.0	15.0 – 37.0	15.0 – 37.0	10.0 – 33.0	15.0 – 37.0	15.0 – 37.0
400 um	5.0 – 25.0	10.0 -- 27.0	10.0 -- 27.0	5.0 – 25.0	10.0 – 27.0	10.0 – 27.0
160 um	3.0 – 13.0	3.0 – 14.0	3.0 – 14.0	3.0 – 13.0	3.0 – 14.0	3.0 – 14.0
71 um	2.0 – 9.0	2.0 – 9.0	2.0 – 9.0	2.0 – 9.0	2.0 – 9.0	2.0 – 9.0
Air Voids, %	3.0 – 5.0					
Air Voids (Field), %	4.0 – 9.0					
Deleterious Material, Maximum % **	2.0					
Film Thickness, Minimum um	7.5					
Flow, mm	1.5 – 3.5					
Fracture, Minimum % ***	60.0	70.0	80.0	75.0	85.0	95.0
Lightweight Aggregate, Maximum %	1.0					
Retained Stability, Minimum %	70.0					
Sand Equivalent, Minimum	45					
Stability, Minimum N	5500			7000		
Voids Filled, %	65.0 - 78.0					
V. M. A., %	13.5 – 15.5	14.0 – 16.0	14.0 – 16.0	13.5 – 15.5	14.0 – 16.0	14.0 – 16.0

*A tolerance of 3% in the percent by weight retained on the maximum size sieve will be permitted providing 100% of the oversize passes the 22.4 mm sieve for Type 70 and Type 70 R aggregate, the 18.0 mm sieve for Type 71 and 71 R aggregate and the 16 mm sieve for Type 72 and 72 R aggregate.

**Deleterious material includes all other injurious material other than lightweight pieces.

** *The Fractured Face percentage will be calculated on the aggregate after combining all virgin aggregates and additives, excluding reclaim.

TABLE 4100.3.T1 *continued*

ASPHALT CONCRETE MIX DESIGN TYPES AND CHARACTERISTICS

Mix Design Type/ Design Factors - Mix Characteristics	**7**	**8**	**9**	**10**	**11**	**12**
Asphalt Type	300-400 A			300-400 A		
Marshall Blows	50 blows			75 blows		
Aggregate Type/Sieve Designation*	70 or 70 R	71 or 71 R	72 or 72 R	70 or 70 R	71 or 71 R	72 or 72 R
18.0 mm	100.0			100.0		
16.0 mm	78.0 – 98.0	100.0		78.0-98.0	100.0	
12.5 mm	68.0 – 92.0	78.0 – 98.0	100.0	68.0 – 92.0	78.0 – 98.0	100.0
9.0 mm	54.0 – 80.0	66.0 – 90.0	66.0 – 90.0	54.0 – 80.0	66.0 – 90.0	66.0 – 90.0
5.0 mm	38.0 – 65.0	46.0 – 72.0	46.0 – 72.0	38.0 – 65.0	46.0 – 72.0	46.0 – 72.0
2.0 mm	18.0 – 46.0	23.0 – 51.0	23.0 – 51.0	18.0 – 46.0	23.0 – 51.0	23.0 – 51.0
900 um	10.0 – 33.0	15.0 – 37.0	15.0 – 37.0	10.0 – 33.0	15.0 – 37.0	15.0 – 37.0
400 um	5.0 – 25.0	10.0 – 27.0	10.0 – 27.0	5.0 – 25.0	10.0 – 27.0	10.0 – 27.0
160 um	3.0 – 13.0	3.0 – 14.0	3.0 – 14.0	3.0 – 13.0	3.0 – 14.0	3.0 – 14.0
71 um	2.0 – 9.0	2.0 – 9.0	2.0 – 9.0	2.0 – 9.0	2.0 – 9.0	2.0 – 9.0
Air Voids, %	3.0 – 5.0					
Air Voids (Field), %	4.0 – 9.0					
Deleterious Material, Maximum % **	2.0					
Film Thickness, Minimum um	7.5					
Flow, mm	1.5 – 3.5					
Fracture, Minimum % ***	50.0	60.0	70.0	75.0	85.0	95.0
Lightweight Aggregate, Maximum %	1.0					
Retained Stability, Minimum %	70.0					
Sand Equivalent, Minimum	45.0					
Stability, Minimum N	5500			7000		
Voids Filled, %	65.0 - 78.0					
V. M. A., %	13.5 – 15.5	14.0 – 16.0	14.0 – 16.0	13.5 – 15.5	14.0 – 16.0	14.0 – 16.0

*A tolerance of 3% in the percent by weight retained on the maximum size sieve will be permitted providing 100% of the oversize passes the 22.4 mm sieve for Type 70 and Type 70 R aggregate, the 18.0 mm sieve for Type 71 and 71 R aggregate and the 16 mm sieve for Type 72 and 72 R aggregate.

**Deleterious material includes all other injurious material other than lightweight pieces.

** *The Fractured Face percentage will be calculated on the aggregate after combining all virgin aggregates and additives, excluding reclaim.

4100.3.6 Plant Requirements

4100.3.6.1 A uniform mixture shall be produced in which all particles are thoroughly coated. Aggregate particles shall not be coated with residue from fuel combustion. The asphalt mix shall contain no more than 0.5% moisture by weight.

4100.3.6.2 If reclaimed asphalt concrete is added, the following shall apply:

4100.3.6.2.1 The plant shall contain equipment that will prevent the reclaimed asphalt concrete from coming into direct contact with the flame, thus minimizing oxidation of the asphalt in the reclaimed asphalt concrete.

4100.3.6.2.2 The Contractor shall undertake all the necessary adjustments to ensure proper heat transfer and breakdown of the reclaimed asphalt concrete to form a homogeneous end product. The plant shall be capable of heating the reclaimed asphalt concrete particles and blending them with virgin aggregate and any required asphalt to create a homogeneous mix at the plant discharge.

4100.3.7 Plant Calibration and Operation

4100.3.7.1 Plant Calibration:

4100.3.7.1.1 The Contractor shall provide the Engineer with at least three calendar days advance notice of when he plans to do the plant calibration.

4100.3.7.1.2 During plant calibration, the Engineer will assess the property variations of the asphalt mix produced during the calibration process against the asphalt mix design.

4100.3.7.1.3 If the asphalt mix meets the properties and/or characteristics as shown in Table 4100.3.T1, the Contractor may commence hauling to the road upon receiving written approval from the Engineer.

4100.3.7.1.4 The asphalt mix will be rejected if the requirements of Table 4100.3.T1 are not met, and no asphalt mix shall be hauled to the road. The Engineer will provide a modified or new asphalt mix design.

4100.3.7.1.5 After 24 hours of asphalt mix production, if the asphalt mix properties are consistent and meet all specified requirements, the Engineer will approve the Asphalt Mix Formula as the Job Mix Formula.

4100.3.7.2 Plant Operation

4100.3.7.2.1 For the initial 24 hours of plant production at each plant set-up, the asphalt added shall not vary by more than 0.5% from the design asphalt content. Full-scale plant production shall not commence until the percentage of asphalt added to trial batches of asphalt mix complies with the foregoing requirement.

4100.3.7.2.2 After the initial 24 hours of production, the Contractor shall cease operations if the moving average of asphalt added varies by more than 0.3% from the Job Mix Formula.

4100.3.7.2.3 After the Job Mix Formula aggregate gradation has been established, the following shall apply:

4100.3.7.2.3.1 The Contractor shall cease operations if the moving average for any sieve does not comply with the specified requirements listed below:

TABLE 4100.3.T2

MAXIMUM PERMISSIBLE SIEVE VARIATION

Maximum Permissible Variation from the Job Mix Formula	
Sieve Designation	Percent By Weight Passing Canadian Metric Sieve Series
16.0 mm	±5.0
12.5 mm	±5.0
9.0 mm	±5.0
5.0 mm	±5.0
2.0 mm	±4.0
900 um	±3.0
400 um	±3.0
160 um	±2.0
71 um	±1.5

4100.3.7.2.3.2 Road operations shall not recommence until the specified requirements are met.

4100.3.7.2.3.3 Upon re-commencement of operations, the specified requirements shall be met on each of the initial 2 tests.

4100.3.7.2.3.4 Failure to cease operations shall subject all subsequent materials to the requirements of General Provision 1400-7 (Unacceptable and Unauthorized Work).

4100.3.7.2.4 The Contractor shall immediately shut down the plant when:

4100.3.7.2.4.1 The stack emissions temperature exceeds the asphalt mix temperature at the mixer discharge by more than 20°C or;

4100.3.7.2.4.2 The temperatures exceed the limits outlined in the following table:

TABLE 4100.3.T3

TEMPERATURE LIMITS

Grade of Asphalt	Degrees Celsius		
	Maximum Temperature of Dry Aggregate	Asphalt Storage Temperature	Asphalt Mix Temperature at Mixer Discharge
150-200A	160	120-175	135-155
200-300A	160	120-175	130-150
300-400A	150	114-175	120-140
400-500A	140	110-175	110-130

4100.3.7.2.5 All material produced subsequent to the occurrence of an event specified in Section 4100.3.7.2.4 will be deemed to be unacceptable material for the purposes of General Provision 1400-7 (Unacceptable And Unauthorized Work).

4100.3.7.2.6 Plant operations shall not recommence until the temperature limits in Section 4100.3.7.2.4 are met.

4100.3.7.2.7 The Contractor shall dispose of any rejected asphalt mix or asphalt concrete in a manner that is acceptable by the Engineer.

4100.3.8 Delivering to the Road

4100.3.8.1 Truck boxes shall be clean and free from accumulations of asphalt mix and foreign materials. Excess truck box lubricants such as light oil, detergent, lime solutions, gasoline, kerosene, diesel or other similar products shall not be allowed to contaminate the asphalt mix, and shall be disposed of in an environmentally acceptable manner.

4100.3.8.2 Every truck used to transport the asphalt mix shall be equipped with a tarpaulin which is waterproof and can be securely fastened, when required, to protect the asphalt mix from precipitation and excessive heat loss.

4100.3.8.3 Prior to unloading into the paver, the temperature at a depth of 40 mm below the surface of the asphalt mix in the truck box shall not be less than 110°C.

4100.3.8.4 Trucks shall be turned around only at approaches.

4100.3.9 Pavers

4100.3.9.1 Pavers shall be self-propelled units capable of spreading and finishing the asphalt concrete to the specified typical cross section and thickness shown on the paving plans. For traffic lanes, pavers shall be operated using the following:

4100.3.9.1.1 Automatic screed controls, for the control of longitudinal and transverse slope and joint matching. The automatic control device shall be capable of being operated from either side of the paver.

4100.3.9.1.2 Vibrating screed

4100.3.10 Spreading

4100.3.10.1 If designated by the Engineer, a tack coat shall be applied in accordance with Specification 4000 For Asphalt Prime, Tack and Flush Coat.

4100.3.10.2 Asphalt mix shall be spread on dry, clean, and unfrozen surfaces.

4100.3.10.3 Asphalt concrete shall be placed in accordance with the following temperature limitations:

4100.3.10.3.1 Paving may begin, for other than the final lift, when the temperature is 0°C provided the temperature is forecast, by Environment Canada, for the closest location to the project, to reach at least 5°C that day.

4100.3.10.3.2 The final lift of asphalt concrete shall not be placed if:

4100.3.10.3.2.1 The atmospheric temperature is less than 5°C; or

4100.3.10.3.2.2 The surface temperature is less than 7°C.

4100.3.10.4 The minimum and maximum thickness of a compacted lift of asphalt concrete shall meet the following requirements:

TABLE 4100.3.T4

MINIMUM AND MAXIMUM LIFT THICKNESS

Lift	Type 70 or 70 R Aggregate		Type 71 or 71 R Aggregate		Type 72 or 72 R Aggregate	
	Minimum Thickness	Maximum Thickness	Minimum Thickness	Maximum Thickness	Minimum Thickness	Maximum Thickness
Top	40 mm	60 mm	35 mm	50 mm	30 mm	50 mm
Lower	30 mm	60 mm	30 mm	50 mm	25 mm	50 mm

4100.3.10.5 The following clause shall apply only when shimming and levelling are specified in the Special Provisions as being applicable to the Contract.

4100.3.10.5.1 The Contractor shall shim and level any pavement depressions designated by the Engineer. The use of a motor grader and hand raking will be permitted.

4100.3.10.5.2 All work involved with shimming and levelling will be paid for at the contract unit bid price(s) where applicable.

4100.3.10.5.3 The Contractor shall complete all shimming and levelling operations such that the material has cooled sufficiently before the placement of asphalt concrete.

4100.3.10.6 Longitudinal joints shall not be permitted in the lane. Longitudinal joints shall be vertical butt type, well bonded and sealed, and finished to provide a continuous, smooth profile across the joint.

4100.3.10.7 The asphalt mix temperature in the paver shall not be less than 110°C.

4100.3.10.8 Contact faces of curbs, gutters, manholes, and sidewalks shall be coated with asphalt using a hand applicator before placing the asphalt mix.

4100.3.10.9 When paving is discontinued on the roadway, the asphalt concrete shall be temporarily feathered to a slope of 10 horizontal to 1 vertical. When paving is resumed, the transverse joint shall be straight and have a vertical face when the taper is removed.

4100.3.10.10 Asphalt mix shall not be placed or allowed to fall on previously laid top lift asphalt concrete or the existing asphalt concrete.

4100.3.10.11 Transverse construction joints from one lift to the next shall be separated by at least 2 m.

4100.3.10.12 Road intersections and approaches shall be paved in accordance with the plans or as directed by the Engineer.

4100.3.10.13 If designated by the Engineer, a flush coat shall be applied in accordance with Specification 4000 For Asphalt Prime, Tack and Flush Coat.

4100.3.11 Compacting

4100.3.11.1 At the beginning of the work, the Contractor shall establish a rolling pattern for achieving the Specified Marshall Density. The rolling pattern strip shall comply with the following:

4100.3.11.1.1 The rolling pattern strip shall have a length of at least 250 m and shall be of the same thickness as the lift it represents.

4100.3.11.1.2 The material used shall conform to the requirements of the asphalt concrete stated in the contract or as specified by the Engineer.

4100.3.11.1.3 The Engineer and/or the Contractor at any time may order the construction of a new rolling pattern strip if there are reasons to indicate that the paving operation, the mix design or lift thickness have been altered.

4100.3.11.1.4 Compaction shall commence immediately and shall be completed before the temperature of the asphalt concrete falls below 55°C for 150-200 A and 200-300 A asphalt concrete mixes, and 40°C for 300-400 A and 400-500 A asphalt concrete mixes.

4100.3.11.1.5 Compaction shall continue until the Specified Marshall Density is achieved or until no appreciable increase in the Field Density can be achieved, even with the use of fully ballasted pneumatic tired rollers with a minimum tire pressure of 620 kPa and having the tire size and wheel load indicated in the table below:

TABLE 4100.3.T5

ROLLER TIRE SIZE AND MINIMUM LOAD

Tire Size (mm)	Minimum Load Per Tire (kg)
190.5 x 381.0	950
228.5 x 508.0	1 300
279.4 x 508.0	1 900

4100.3.11.1.6 The speed of steel rollers shall not exceed 5 km/h and the speed of pneumatic rollers shall not exceed 8 km/h.

4100.3.11.1.7 The rolling pattern strip, if accepted, shall remain in place and shall become part of the completed work.

4100.3.11.2 If the Specified Marshall Density is not achieved, then the value of the Field Density achieved after complying with Section 4100.3.11.1 will be used as the Target Density. Job Mix Formula Densities will continue to be taken, and should change occur in Field Density, lift thickness, or the lane being paved, the Engineer may direct that the Specified Marshall Density control procedure be re-established.

4100.3.11.3 Each lift of asphalt concrete shall be compacted to the Specified Marshall Density established for the lot in accordance with the following:

4100.3.11.3.1 The Specified Marshall Density for the lot will be established using a 3-point moving average.

4100.3.11.3.2 When a new moving average is initiated, it will include the entire lot where the sample is taken and will apply to subsequent lots until the next 3-point moving average is established.

4100.3.11.3.3 A new moving average will be initiated for each new asphalt mix design.

4100.3.11.4 Longitudinal joints shall be rolled directly behind the paver.

4100.3.11.5 All asphalt mix shall be thoroughly compacted, and after final rolling, the finished surface of the mat shall be free from segregation, waves, hairline cracks, and other obvious defects.

4100.3.11.6 Traffic shall not be allowed to travel on the finished surface until the surface has cooled to a temperature as to ensure that no deformation or other defects to the surface will occur.

4100.4 SAMPLING AND TESTING

4100.4.1 General

4100.4.1.1 The failure of the Engineer to provide test results within the time provided in this specification shall not relieve the Contractor of his obligation to remedy any defect, but the Department will be obligated to reimburse the Contractor for any additional costs incurred by the Contractor to remedy the defect, if the additional costs are attributable to the delay in receiving results.

4100.4.2 Acceptance Testing

4100.4.2.1 General

4100.4.2.1.1 Within this specification, certain requirements, limits and tolerances are specified regarding the quality of materials and workmanship to be supplied. Compliance with these requirements, where so specified, will be judged by testing as described in this section. These tests cannot be disputed on the grounds of statistical theory or a specified or implied Contractor's risk.

4100.4.2.1.2 The results of acceptance testing for Field Density, smoothness, individual bumps and dips, segregation and surface defects will be used for acceptance, rejection and pay adjustments for the block or lot.

4100.4.2.1.3 Initial acceptance testing will be performed free of cost to the Contractor.

4100.4.2.1.4 If the remedial work by the Contractor on a rejected block or lot involves a repair of the asphalt concrete in the block or lot, all test results from acceptance testing performed on the rejected block or lot prior to the remedial work will be discarded and new sampling and acceptance testing will be performed in accordance with Section 4100.4.2.2.

4100.4.2.2 Sampling and acceptance testing will be in accordance with the following:

4100.4.2.2.1 For **Field Density**:

4100.4.2.2.1.1 The Engineer will develop a correlation between the results of the nuclear gauge and the results of the asphalt concrete cores obtained from the compacted lift of asphalt concrete. The density results obtained from the cores will be used to correct the Field Density results obtained from the nuclear gauge.

4100.4.2.2.1.2 Testing will be conducted prior to the placement of the next lift of asphalt concrete.

4100.4.2.2.1.3 Upon notification from the Contractor that a lot has been inspected and is ready for acceptance testing, the Engineer will locate 3 test sites in the lot in accordance with the requirements for Sampling Location By Random Method (STP 107).

4100.4.2.2.1.4 The Engineer will measure the Field Density at 3 test sites for each lot in accordance with the requirements for Density-In-Place By Nuclear Gauge (STP 204-6).

4100.4.2.2.1.5 The Engineer will provide the Contractor with a copy of the results of acceptance tests within 2 calendar days of receiving notification from the Contractor that the lot is ready for acceptance testing.

4100.4.2.2.1.6 If the acceptance test results on a lot indicate a penalty for Field Density, the Contractor will be allowed one opportunity to re-roll the lot. The random sampling procedure for re-testing will exclude areas falling within traffic wheel paths.

4100.4.2.2.2 For **smoothness** and **individual bumps and dips**:

4100.4.2.2.2.1 The surface of the blocks will be profiled by the Engineer in accordance with the standard test procedures.

4100.4.2.2.2.2 If a block is located within a rejected lot, the surface of the block will not be profiled until the lot has been remedied.

4100.4.2.2.2.3 The Engineer will provide the Contractor with a copy of the results of acceptance tests for smoothness and individual bumps and dips within 12 calendar days of the placement of the asphalt concrete.

4100.4.2.2.2.4 When all the acceptance tests for a block are completed, the Engineer will advise the Contractor as to the acceptability of the block with respect to smoothness and individual bumps and dips.

4100.4.2.2.3 For **segregation**:

4100.4.2.2.3.1 Each lane-km, including the shoulder, will be inspected for areas of segregation.

4100.4.2.2.3.2 After receiving notification from the Contractor that the asphalt concrete is ready for acceptance testing, the Engineer will provide the Contractor with the locations of the visually identified segregation in accordance with the following:

4100.4.2.2.3.2.1 Within 12 calendar days during the course of the construction; and

4100.4.2.2.3.2.2 Within 4 calendar days after the completion of all the asphalt concrete.

4100.4.2.2.3.3 A segregated area will be categorized by the worst condition prevalent for 50% or more of the length of the segregated area.

4100.4.2.2.3.4 If the worst condition in a segregated area is not prevalent for at least 50% of the length of the area, then the area will be measured in relation to the length of minor and severe segregation.

4100.4.2.2.4 For **surface defects**:

4100.4.2.2.4.1 Each lane-km, including the shoulder, will be inspected for surface defects.

4100.4.2.2.4.2 After receiving notification from the Contractor that the asphalt concrete is ready for acceptance testing, the Engineer will provide the Contractor with the locations of the visually identified surface defects in accordance with the following:

4100.4.2.2.4.2.1 Within 12 calendar days during the course of the construction; and

4100.4.2.2.4.2.2 Within 4 calendar days after the completion of all the asphalt concrete.

4100.4.3 Exclusions to Random Sampling

4100.4.3.1 Random sampling methods will not apply to the following:

4100.4.3.1.1 Smoothness;

4100.4.3.1.2 Small areas such as approaches, tapers, areas of handwork and gores;

4100.4.3.1.3 Areas of visually identified segregation; and

4100.4.3.1.4 Areas of surface defect repair.

4100.4.4 Appeal of Acceptance Test Results and Appeal Testing

4100.4.4.1 General

4100.4.4.1.1 The Contractor cannot appeal test results that are within the full or bonus payment range.

4100.4.4.1.2 The Engineer will provide the Contractor with a copy of the results of appeal tests within 6 calendar days of delivery of the samples.

4100.4.4.1.3 Appeal testing will be performed by the Department, and the new results shall be binding on the Contractor and the Department.

4100.4.4.1.4 If the appeal testing does not result in a decrease of the pay adjustments, all testing costs incurred during the appeal procedures shall be paid by the Contractor. The rate for Department testing will be as designated in the Special Provisions.

4100.4.4.1.5 If the Engineer determines that certain test results are faulty due to testing equipment malfunction, improper testing procedures or calculations, re-testing will be performed at the expense of the Department.

4100.4.4.1.6 In the case of an appeal, the Department will not be responsible for any delays including but not limited to Contractor's downtime, or other costs as a result of awaiting the receipt of the appeal test results, or due to the nature and values of the appeal test results.

4100.4.4.2 Appeal of the acceptance test results shall be in accordance with the following:

4100.4.4.2.1 For **Field Density**:

4100.4.4.2.1.1 Within 2 calendar days of receipt of the acceptance test results for a lot, the Contractor may appeal the acceptance test results by requesting appeal tests. The following procedures shall apply:

4100.4.4.2.1.1.1 The Engineer will locate 2 appeal test sites in the lot in accordance with the requirements for Sampling Location By Random Method (STP 107).

4100.4.4.2.1.1.2 The Engineer will measure the Field Density at each appeal test site and in the vicinity of the original 3 acceptance test sites in accordance with the requirements for Density-In-Place By Nuclear Gauge (STP 204-6).

4100.4.4.2.1.1.3 The mean of the test results from the 5 referee sites will be used for the purpose of acceptance, rejection and determination of pay adjustments.

4100.4.4.2.2 For **smoothness** and **individual bumps and dips**:

4100.4.4.2.2.1 Within 2 calendar days of receipt of the acceptance test results for a block, the Contractor may appeal the test results by requesting appeal tests.

4100.4.4.2.2.2 The Engineer will re-test the entire block for smoothness and individual bumps and dips, if either is under appeal.

4100.4.4.2.3 For **segregation**:

4100.4.4.2.3.1 Within 6 calendar days of receipt of the locations of the visually identified segregation, the Contractor may appeal the acceptance test results by requesting appeal tests.

4100.4.4.2.3.2 The Engineer will obtain a core sample at a location that is representative of the area being considered. The core sample will be obtained in accordance with the requirements for Asphalt Concrete Samples Obtained By Coring (STP 204-5).

4100.4.4.2.3.3 The Engineer will determine the Field Density, asphalt content and the aggregate gradation of the sample.

4100.4.4.2.3.4 The area will be considered non-segregated if the aggregate gradation complies with requirements specified in section 4100.3.7.2.3.

4100.4.4.2.3.5 If the aggregate gradation does not comply with the requirements specified in section 4100.3.7.2.3:

4100.4.4.2.3.5.1 The area will be considered minor segregation if the test results indicate the Field Density of the asphalt concrete meets or exceeds 94% of the Marshall Density established for the Job Mix Formula or Asphalt Mix Formula, and the asphalt content deviates by not more than 0.6% from the asphalt content approved for the Job Mix Formula or Asphalt Mix Formula.

4100.4.4.2.3.5.2 The area will be considered severe segregation if the conditions in section 4100.4.4.2.3.5.1 are not met.

4100.5 ACCEPTANCE, REJECTION AND REPAIRS

4100.5.1 General

4100.5.1.1 The Contractor shall provide a finished product conforming in quality and accuracy of detail to the dimensional and tolerance requirements of the specifications and drawings. Where no tolerances are specified, the standard of workmanship shall be in accordance with normally accepted good practice.

4100.5.2 Rejection

4100.5.2.1 The block or lot will be rejected as unacceptable work if:

4100.5.2.1.1 The Field Density for the lot is outside the acceptance limits outlined in section 4100.7.2.1.1.

4100.5.2.1.2 The PrI for the Block is outside the acceptance limits outlined in section 4100.7.2.1.2.

4100.5.2.1.3 Any individual bumps and/or dips exceed 12 mm.

4100.5.2.2 Areas of segregation and surface defects will be considered unacceptable work until the areas are repaired and accepted by the Engineer.

4100.5.3 Repairs

4100.5.3.1 General

4100.5.3.1.1 The Contractor shall not undertake any repair on any defective work prior to notifying the Engineer. Any areas repaired prior to obtaining the Engineer's approval will not be considered for payment.

4100.5.3.1.2 Work on any block or lot which has been rejected shall be remedied within 30 calendar days of receipt of the acceptance test results.

4100.5.3.1.3 All remedial work shall be performed at the Contractor's expense, including the cost of materials.

4100.5.3.1.4 The Contractor shall pay the cost of all re-testing performed following the remedying of work in any block or lot that has been rejected. The rate for Department testing will be as designated in the Special Provisions.

4100.5.3.1.5 Repairs shall be subject to the approval of the Engineer.

4100.5.3.1.6 Alternate repair methods proposed by the Contractor shall be subject to approval of the Engineer. The nature of the deficiencies shall be taken into account in the consideration of the method of repair.

4100.5.3.1.7 Acceptable remedial measures to a rejected block or lot, or areas within a block or lot are as follows:

4100.5.3.1.7.1 A **Class I repair** either overlays or removes and replaces the asphalt concrete.

4100.5.3.1.7.1.1 If an overlay is used as the remedial measure, the following shall apply:

4100.5.3.1.7.1.1.1 A tack coat shall be applied in accordance with Specification 4000 For Asphalt Prime, Tack and Flush Coat unless otherwise directed by the Engineer.

4100.5.3.1.7.1.1.2 The minimum overlay thickness shall be as specified in Table 4100.3.T4 for top lift.

4100.5.3.1.7.1.1.3 Adjacent lanes and shoulders shall be overlaid to the same thickness and length.

4100.5.3.1.7.1.1.4 On all lifts of asphalt concrete below the final lift, the overlay shall be completed prior to the next lift being placed.

4100.5.3.1.7.1.2 If a removal and replace operation is used as the remedial measure, the following shall apply:

4100.5.3.1.7.1.2.1 The work shall be performed in accordance with Specification 4105 For Reclaiming Asphalt Concrete.

4100.5.3.1.7.1.2.2 The asphalt concrete shall be removed by cold milling to a minimum depth as specified in Table 4100.3.T4 for the lift being removed.

4100.5.3.1.7.1.2.3 A tack coat in accordance with Specification 4000 For Asphalt Prime, Tack and Flush Coat, unless otherwise directed by the Engineer, shall be applied to the milled surface.

4100.5.3.1.7.1.2.4 The asphalt concrete material removed by the milling operation shall be the property of the Contractor.

4100.5.3.1.7.1.2.5 The asphalt concrete used for back-filling the milled area shall be subject to the same specifications as the original pavement.

4100.5.3.1.7.2 A **Class II repair** is typically either the placing of a slurry seal on the entire block or lot, or the placing of a spot slurry seal patch or patches within the block or lot.

4100.5.3.1.7.2.1 For slurry seals or slurry seal patches, the following shall apply:

4100.5.3.1.7.2.1.1 The seal shall be a mixture of a dry, non- plastic sand, an emulsified asphalt SS-1 (slurry), potable water, and, if needed, acceptable additives such as Portland Cement, and Carbon Black, for colour.

4100.5.3.1.7.2.1.2 The gradation of the sand shall be as follows:

TABLE 4100.3.T6

SLURRY SEAL SAND GRADATION

Sieve Designation	Percent by Weight Passing Canadian Metric Sieve Series
900 um	100.0
400 um	70.0 – 95.0
160 um	60.0 – 80.0
71 um	20.0 – 42.0
Plasticity Index	Non Plastic

4100.5.3.1.7.2.1.3 The mix proportions for a 1 000 litre batch of seal shall be as follows:

4100.5.3.1.7.2.1.3.1 360 litres of SS-1 (slurry);

4100.5.3.1.7.2.1.3.2 270 litres of potable water; and

4100.5.3.1.7.2.1.3.3 850 kg of dry, non-plastic sand.

4100.5.3.1.7.2.1.4 The Contractor shall add the water to the emulsified asphalt followed by the addition of the sand.

4100.5.3.1.7.2.1.5 The Contractor shall thoroughly mix the seal. If a mineral filler is used, it shall be blended into the mixture. A minimum amount of additional water may be added to obtain a fluid, homogeneous mixture.

4100.5.3.1.7.2.1.6 If a tack coat is required, the same asphalt chosen for the seal binder shall be used. The tack coat shall be applied in accordance with Specification 4000 For Asphalt Prime, Tack And Flush Coat, unless otherwise directed by the Engineer.

4100.5.3.1.7.2.1.7 The seal shall be neat and square; and uniform and homogeneous with no uncovered areas, ridges or loose aggregate.

4100.5.3.1.7.2.1.8 Hand or mechanical squeegees may be used to spread the seal.

4100.5.3.1.7.2.1.9 The completed seal shall be kept free of all traffic until it has cured sufficiently to prevent pickup of aggregate particles.

4100.5.3.1.7.2.1.10 Any tests performed by the Engineer on the seal will be quality assurance tests and will not be considered as quality control tests.

4100.5.3.1.7.3 A **Class III repair** is typically a flush coat on the entire block or lot, or the placing of a spot flush coat(s) within the block or lot.

4100.5.3.1.7.3.1 A flush coat or spot flush coat shall be applied in accordance with Specification 4000 For Asphalt Prime, Tack and Flush Coat, unless otherwise directed by the Engineer.

4100.5.3.1.7.4 A **Class IV repair** is typically either a re-rolling operation to remove or reduce the bump(s) or a shim operation to remove or reduce dip(s). Other methods of Class IV repairs proposed by the Contractor shall be subject to the approval of the Engineer.

4100.5.3.1.7.4.1 For repairs to a bump(s), the following shall apply:

4100.5.3.1.7.4.1.1 The repair procedure shall not cause damage to the asphalt concrete such as, but not limited to, excessive crushing, pulverizing or displacing the asphalt concrete or its surface.

4100.5.3.1.7.4.1.2 The area repaired shall have a smooth transition to the surrounding pavement without impairing the functionality and/or structural characteristics of the service life of the area.

4100.5.3.1.7.4.2 For repairs to a dip(s), the following shall apply:

4100.5.3.1.7.4.2.1 If shimming is used, the area shimmed shall have a smooth transition to the surrounding pavement. The shim shall have sufficient thickness and be thoroughly compacted to prevent ravel of the shimmed area.

4100.5.3.1.7.4.2.2 If a tack coat is required, the tack coat shall be applied in accordance with Specification 4000 For Asphalt Prime, Tack and Flush Coat, unless otherwise directed by the Engineer.

4100.5.3.2 Repairs shall be in accordance with the following:

4100.5.3.2.1 For **Field Density**:

4100.5.3.2.1.1 If after re-rolling, the Field Density of a lot remains outside the acceptance limit, the Contractor shall perform a Class I repair.

4100.5.3.2.1.2 If the area(s) requiring repairs appears to be isolated:

4100.5.3.2.1.2.1 The Engineer may identify the area(s) through additional testing.

4100.5.3.2.1.2.2 The Contractor shall perform a Class I repair for only the portion of the lot requiring repairs.

4100.5.3.2.1.2.3 If the isolated repair area continues into an adjacent lot, which is deemed acceptable through acceptance testing, that portion of the adjacent lot shall be repaired along with the portion of the unacceptable lot.

4100.5.3.2.2 For **smoothness**:

4100.5.3.2.2.1 If the acceptance test results on a block indicate a pay adjustment for smoothness, additional work to improve the smoothness will not be allowed except the Contractor will be allowed to perform a Class I or Class IV repair on individual bumps and dips that exceed 12 mm.

4100.5.3.2.2.2 If the smoothness of the final lift of asphalt concrete of a block is outside the acceptance limit outlined in Table 4100.7.T9, the block shall be repaired by a Class I repair.

4100.5.3.2.3 For **individual bumps and dips**:

4100.5.3.2.3.1 Individual bumps and dips that exceed 12 mm in the vertical direction shall be repaired by a Class I or Class IV repair.

4100.5.3.2.3.2 Work to repair individual bumps and dips $\leq$ 12 mm will not be permitted.

4100.5.3.2.4 For **segregation**:

4100.5.3.2.4.1 The Contractor shall repair all segregated areas, except for minor segregation on lower lifts, but including segregated areas with nil pay adjustment. These repairs will not affect the initial pay adjustments assessed in accordance with Tables 4100.7.T10 and 4100.7.T11 with the exception of a Class I repair.

4100.5.3.2.4.2 Severe segregation on lower lifts of asphalt concrete shall be repaired by a Class I repair.

4100.5.3.2.4.3 Segregated areas on the final lift of asphalt concrete shall be repaired in accordance with the following:

4100.5.3.2.4.3.1 Minor segregation on the lane or shoulder shall be repaired by a Class II repair. If the minor segregation is more than one half the lane width or is across the centre of the lane, the full width shall be repaired.

4100.5.3.2.4.3.2 Severe segregation:

4100.5.3.2.4.3.2.1 Individual areas less than 100 m in length shall be repaired with a Class II repair slurry seal patch over the full lane or shoulder width.

4100.5.3.2.4.3.2.2 Individual areas 100 m or greater in length shall be repaired over the full lane or shoulder by a Class II repair slurry seal or by a remove and replace Class I repair.

4100.5.3.2.5 For **surface defects**:

4100.5.3.2.5.1 On all lifts of asphalt concrete, surface defects shall be repaired with a Class I to Class IV repair, in a manner that is acceptable to the Engineer.

4100.5.3.3 Payment options in lieu of repairs:

4100.5.3.3.1 For smoothness and individual bumps and/or dips, the following shall apply, at the discretion of the Engineer, for the final lift of asphalt concrete in a block:

4100.5.3.3.1.1 If the Category I PrI is $\leq$ 23 or the Category II PrI is $\leq$ 28, and individual bumps and/or dips exceed 12 mm, a $2,000 penalty per bump and/or dip plus the adjusted PrI pay adjustment may apply, to a maximum of $6,000.

4100.5.3.3.1.2 If the Category I PrI is > 23 or the Category II PrI is > 28, and no individual bumps and/or dips exceed 12 mm, a $6,000 penalty may apply.

4100.5.3.3.1.3 If the Category I PrI is > 23 or the Category II PrI is > 28, and individual bumps and/or dips exceed 12 mm:

4100.5.3.3.1.3.1 A $6,000 penalty may apply if the adjusted PrI for the Category I PrI is > 23 or the Category II PrI is > 28.

4100.5.3.3.1.3.2 A $2,000 penalty per bump and/or dip plus the adjusted PrI pay adjustment may apply, if the adjusted PrI for the Category I PrI is $\leq$ 23 or the Category II PrI is $\leq$ 28.

4100.5.3.3.2 For segregation and surface defects requiring a Class II repair, the Contractor may, subject to the discretion of the Engineer, be charged a fee as shown in the Special Provisions to compensate the Department for having others make the repairs at a later date.

4100.6 MEASUREMENT

4100.6.1 Asphalt Concrete

4100.6.1.1 Asphalt concrete will be measured in tonnes.

4100.7 PAYMENT

4100.7.1 General

4100.7.1.1 Payment for Asphalt Concrete will be at the contract unit price per tonne with pay adjustments for Field Density, smoothness, severity of segregation, segregation frequency and final surface condition.

4100.7.1.2 The contract unit price will be full compensation for completing the work except for those activities for which specific provision for payment is made in this section.

4100.7.1.3 If it is stated in the Special Provisions that anti-stripping agent is required, the addition of hydrated lime or liquid anti-stripping agent shall be a subsidiary obligation of the Contractor. If it is determined during the contract that anti-stripping agent is required, the Contractor will be paid at the rate specified in the Special Provisions.

4100.7.1.4 If the shoulder is laid separately from the main lane, the pay adjustments for Field Density for asphalt concrete on the shoulder will be at 50% of the regular rates specified in Tables 4100.7.T7 or 4100.7.T8.

4100.7.1.5 Segregation and surface defects on the shoulder will be excluded from pay adjustments for segregation severity, segregation frequency and final surface condition. The Contractor shall repair segregation and surface defects on the shoulder in accordance with section 4100.5.3.

4100.7.1.6 If the contract includes a bid item for:

4100.7.1.6.1 Hauling Asphalt Concrete, payment will be made in accordance with Specification 2405 For Hauling On The Basis Of The Kilometre.

4100.7.1.6.2 Reclaimed Asphalt Concrete, payment will be made in accordance with Specification 4105 For Reclaiming Asphalt Concrete.

4100.7.1.6.3 Hauling Reclaimed Asphalt Concrete, payment will be made in accordance with Specification 2405 For Hauling On The Basis Of The Kilometre.

4100.7.1.6.4 Filler And Blender, payment will be made in accordance with Specification 3400 For Binder, Filler And Blender Sand.

4100.7.1.6.5 Hauling Filler And Blender, payment will be made in accordance with Specification 2405 For Hauling On The Basis Of The Kilometre.

4100.7.1.6.6 Tack Coat And Flush Coat, payment will be made in accordance with Specification 4000 For Asphalt Prime, Tack and Flush Coat.

4100.7.1.7 The rate the Department will pay for rejecting aggregate in excess of 10%, or for rejecting aggregate to improve the quality of the asphalt mix design, will be as designated in the Special Provisions of the contract.

4100.7.1.8 The Contractor will be charged at cost for the value of the asphalt and other additives in any asphalt mix that is rejected or wasted, in accordance with the following:

4100.7.1.8.1 The quantity of material rejected or wasted will be determined by the Engineer.

4100.7.1.8.2 The Contractor will not be charged for rejected or wasted material if it has been incorporated back into the work in a manner acceptable to the Engineer.

4100.7.1.8.3 For calculation purposes, the asphalt content will be that of the Job Mix Formula or Asphalt Mix Formula.

4100.7.1.9 When defects in rejected blocks or lots have been remedied, the pay adjustments for Field Density, smoothness, severity of segregation, segregation frequency and final surface condition will be based on testing of the repaired sections where applicable.

4100.7.1.10 The pay adjustments determined through testing of the remedial work will be applied to that quantity of material in the block or lot which was originally rejected.

4100.7.1.11 If any lot or block has been rejected under section 4100.5.2, payment will not be made for the asphalt concrete in the lot or block until the rejected work has been remedied.

4100.7.2 Pay Adjustments

4100.7.2.1 The dollar value of the pay adjustment will be as follows:

4100.7.2.1.1 For **Field Density**:

4100.7.2.1.1.1 The pay adjustment for each lot will be determined from Table 4100.7.T7. If the asphalt mix is a recycled mix with more than 10% reclaimed material, the pay adjustments will be at 50% of the values specified in Table 4100.7.T7.

TABLE 4100.7.T7

PAY ADJUSTMENTS FOR FIELD DENSITY

% of Marshall Density of Job Mix Formula	Pay Adjustment Dollars Per Tonne
≥ 99.0	+1.00
98.9	+0.90
98.8	+0.80
98.7	+0.70
98.6	+0.60
98.5	+0.50
98.4	+0.40
98.3	+0.30
98.2	+0.20
98.1	+0.10
98.0	0.00
97.9	0.00
97.8	0.00
97.7	0.00
97.6	0.00
97.5	0.00
97.4	0.00
97.3	0.00
97.2	0.00
97.1	0.00
97.0	0.00
96.9	-0.05
96.8	-0.10
96.7	-0.20
96.6	-0.30
96.5	-0.40
96.4	-0.50

Table 4100.7.T7 Continued	
% of Marshall Density of Job Mix Formula	Pay Adjustment Dollars Per Tonne
96.3	-0.60
96.2	-0.70
96.1	-0.80
96.0	-0.90
95.9	-1.00
95.8	-1.50
95.7	-2.00
95.6	-2.50
95.5	-3.00
95.4	-3.50
95.3	-4.00
95.2	-4.50
95.1	-5.00
95.0	-5.50
94.9	-6.00
94.8	-7.00
94.7	-8.00
94.6	-9.00
94.5	-10.00
94.4	-11.00
94.3	-12.00
94.2	-13.00
94.1	-14.00
94.0	-15.00
92.5 – ≤ 93.9	No Payment
< 92.5	Reject

4100.7.2.1.1.2 If the Specified Marshall Density is not achieved and the Target Density of Section 4100.3.11.2 must be used, the pay adjustment for each lot will be determined from Table 4100.7.T8. If the asphalt mix is a recycled mix with more than 10% reclaimed material, the pay adjustments will be at 50% of the values specified in Table 4100.7.T8.

TABLE 4100.7.T8

PAY ADJUSTMENTS FOR TARGET DENSITY APPLICATIONS

% of Target Density	Pay Adjustment - Dollars Per Tonne
≥ 99.0	0.00
98.9	-0.10
98.8	-0.20
98.7	-0.30
98.6	-0.40
98.5	-0.50
98.4	-0.60
98.3	-0.70
98.2	-0.80
98.1	-0.90
98.0	-1.00
97.9	-1.10
97.8	-1.20
97.7	-1.30
97.6	-1.40
97.5	-1.50
97.4	-1.60
97.3	-1.70
97.2	-1.80
97.1	-1.90
97.0	-2.00

Table 4100.7.T8 Continued	
% of Target Density	Pay Adjustment - Dollars Per Tonne
96.9	-2.50
96.8	-3.00
96.7	-3.50
96.6	-4.00
96.5	-4.50
96.4	-5.00
96.3	-5.50
96.2	-6.00
96.1	-6.50
96.0	-7.00
95.9	-7.50
95.8	-8.00
95.7	-8.50
95.6	-9.00
95.5	-10.00
95.4	-11.00
95.3	-12.00
95.2	-13.00
95.1	-14.00
95.0	-15.00
≤ 94.9	Reject

4100.7.2.1.2 For **smoothness**:

4100.7.2.1.2.1 The pay adjustment for each block in the final lift of asphalt concrete will be determined in accordance with Table 4100.7.T9:

TABLE 4100.7.T9

PAY ADJUSTMENTS FOR SMOOTHNESS

Category I PrI	Category II PrI	Pay Adjustment for Smoothness of Top Lift - Dollars per Block Lump Sum
0	0 – 1	+200
1 – 2	2 – 3	+150
3 – 4	4 – 6	+100
5 – 6	7 – 9	+50
7 – 10	10 – 15	0
11 – 12	16 – 17	-25
13	18	-50
14	19	-75
15	20	-100
16	21	-150
17	22	-200
18	23	-300
19	24	-400
20	25	-500
21	26	-600
22	27	-800
23	28	-1000
> 23	> 28	Reject

4100.7.2.1.2.2 The pay adjustment for smoothness will be prorated for blocks less than 100 metres in length.

4100.7.2.1.3 For **severity of segregation**:

4100.7.2.1.3.1 The pay adjustment will be determined from Table 4100.7.T10.

TABLE 4100.7.T10

PAY ADJUSTMENTS FOR SEVERITY OF SEGREGATION

Severity of Segregation	Pay Adjustment Dollars per Square Metre
None	0
Minor	- 3.00
Severe	- 6.00

4100.7.2.1.4 For **segregation frequency**:

4100.7.2.1.4.1 The pay adjustment will be determined from Table 4100.7.T11.

TABLE 4100.7.T11

PAY ADJUSTMENTS FOR SEGREGATION FREQUENCY

Segregation Frequency per Lane Kilometre	Pay Adjustment Dollars per Lane Kilometre
0 – 5	0
6 – 15	- 250
16 +	- 500

4100.7.2.1.5 For **final surface condition**:

4100.7.2.1.5.1 For each lane-kilometre of top lift meeting all of the requirements from Table 4100.7.T12, a bonus of $350 will be paid.

TABLE 4100.7.T12

REQUIREMENTS FOR FINAL SURFACE CONDITION BONUS

Number of Blocks with PrI > 10	Number of Individual Bumps/Dips > 8 mm	Number of Segregated Areas	Number of Surface Defects
0	0	0 – 2	0 – 5

4100.7.3 Maximum Pay Adjustment

4100.7.3.1 The sum of the pay adjustments for each lot will not exceed the maximum pay adjustment. The maximum pay adjustment will be calculated as follows:

Maximum Pay Adjustment per Lot	=	Contract Unit Price per Tonne	x	Tonnes of Asphalt Concrete in Lot

Appendix I – Aquifer Protection Plan

GROUND ENGINEERING CONSULTANTS LTD.

CIVIL & GEOENVIRONMENTAL ENGINEERS

415 – 7TH AVENUE · REGINA · SASKATCHEWAN · S4N 4P1

Tel: (306) 569-9075 FAX: (306) 565-3677 Email: groundeng@myaccess.ca

FILE: GE-2217 December 19, 2022

102133212 Saskatchewan Ltd.
1615 North Service Road East
Swift Current, Saskatchewan
S9H 3X6

ATTENTION: MR. YOGIN SONI

Dear Sir:

SUBJECT: AQUIFER PROTECTION PLAN
PROPOSED BURGER KING RESTAURANT
2 SOUTH PLAINS ROAD
PART OF LOT 1, BLOCK 3, PLAN No. 82R55377, EXT. 0
R.M. OF EDENWOLD, SASKATCHEWAN

The proposed development of the above captioned property consists of a Burger King Restaurant with a paved parking lot. Our Company conducted a geotechnical investigation at the subject property earlier this year at which time it was determined that the groundwater table is located at a depth of approximately 2 to 3 metres below grade

The subject property is located within the Extreme Sensitivity Aquifer zone as identified in the R.M. of Edenwold Official Community Plan (Map 12, Appendix A). The OCP requires that an Aquifer Protection Plan be implemented as part of the development process to limit any potential contamination of the aquifer.

The following recommendations and comments are provided to limit the potential impact the proposed development may have on the underlying aquifer:

.1 Any fill material which is required to grade the property shall be from a pre-approved borrow source. Random fill from various sources shall not be permitted. Importing of the fill shall be monitored and the fill shall be placed in lifts which are compacted. Grading the property with controlled fill will limit the potential contamination of the underlying aquifer.

.2 Building foundation options include driven steel pipe, augercast concrete piles and screw piles. Regardless of the foundation type selected, the buildings foundation will not increase the contaminant risk of the aquifer.

.3 Installation of the site services (sewer/water) will require excavations which may extend below the water table in some areas. The trenches may be backfilled with the excavated soil which is placed in lifts which are compacted. Backfilling the trenches in this manner will limit the potential contamination of the underlying aquifer.

.4 No fuel shall be stored onsite during and after development.

The proposed development consists of a restaurant and paved parking lot which is not considered to pose an elevated risk of contamination to the underlying aquifer. Provided the recommendations outlined in this letter are implemented, the potential for contamination of the underlying aquifer will be satisfactorily addressed.

We trust that this letter is satisfactory for your purposes. If you have any questions, please contact this office.

Yours very truly
Ground Engineering Consultants Ltd.

Steve Harty, P. Eng.

Distribution: 102133212 Saskatchewan Ltd. (1 PDF copy)
Office (1 copy)

Appendix J – Water Well Report

Water Well Driller's Report

18-Dec-2022
WSaskWWDR01

Well Name: Bredt WWDR #: 10889

Well Location

Land Location 17-18-2
LSD
Reserve
RM:
NTS Map:
Elevation (ft) 0
Aquifer

Location of Well (in Quarter)
ft from N/S Boundary
ft from E/W Boundary
Major Basin:
SubBasin: 23

Well Information

Driller Buffalo Water Well Drilling
Completion Date 1964.02.01
Hole #
Install Method Bored
Borehole Depth (ft) 32
Bit Dia (in) 30
Water Level 12
Flowing Head 0
Water Use Domestic
Well Use Withdrawal
Completion Method Curbed
E-Log None

Well Casings

Length (ft)	Btm (ft)	Dia (in)	Material
0	22	30	Unknown
0	32	24	Unknown

Well Screens

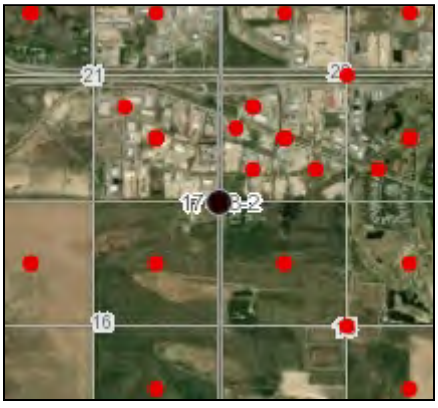
Length (ft)	Bottom (ft)	Dia (in)	Slot (in)	Material

Pump Test

Draw Down	0	ft
Duration	0	hrs
Pumping Rate	0	igpm
Temperature	0	deg. F
Rec. Pumping Rate	0	igpm

Lithology List

Depth (ft):	Material	Colour	Description
3	Topsoil	Unknown	Unknown
12	Sand	Unknown	Fine
19	Sand	Unknown	Unknown
22	Silt	Blue	Unknown
32	Clay	Blue	Unknown



Water Well Driller's Report

18-Dec-2022
WSaskWWDR01

Well Name: Livesey WWDR #: 10891

Well Location

Land Location 17-18-2
LSD
Reserve
RM:
NTS Map:
Elevation (ft) 0
Aquifer

Location of Well (in Quarter)
ft from N/S Boundary
ft from E/W Boundary
Major Basin:
SubBasin: 23

Well Information

Driller Langford Drilling
Completion Date 1968.05.27
Hole #
Install Method Drilled
Borehole Depth (ft) 44
Bit Dia (in) 0
Water Level 0
Flowing Head 0
Water Use Domestic
Well Use Water Test Hole
Completion Method
E-Log None

Well Casings

Length (ft)	Btm (ft)	Dia (in)	Material

Well Screens

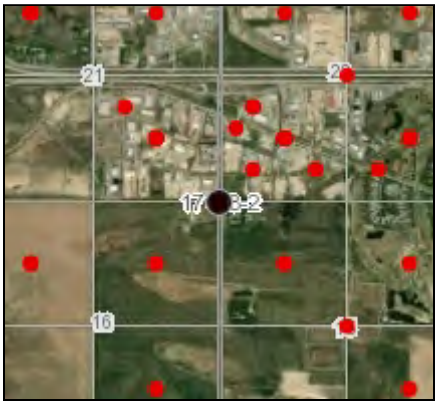
Length (ft)	Bottom (ft)	Dia (in)	Slot (in)	Material

Pump Test

Draw Down	0	ft
Duration	0	hrs
Pumping Rate	0	igpm
Temperature	0	deg. F
Rec. Pumping Rate	0	igpm

Lithology List

Depth (ft):	Material	Colour	Description
44	Gravel	Unknown	Unknown



Water Well Driller's Report

18-Dec-2022
WSaskWWDR01

Well Name: Vester WWDR #: 10914

Well Location

Land Location	SE-21-17-18-2	Location of Well (in Quarter)		
LSD		900	ft from N/S Boundary	N
Reserve		500	ft from E/W Boundary	E
RM:				
NTS Map:		Major Basin:		
Elevation (ft)	1980	SubBasin:	23	
Aquifer				

Well Information

Driller	Buffalo Water Well Drilling
Completion Date	1961.08.20
Hole #	
Install Method	Bored
Borehole Depth (ft)	29
Bit Dia (in)	36
Water Level	14
Flowing Head	0
Water Use	Domestic
Well Use	Withdrawal
Completion Method	Curbed
E-Log	None

Well Casings

Length (ft)	Btm (ft)	Dia (in)	Material
0	10	36	Unknown
0	19	36	Unknown
0	29	30	Corrugated Metal

Well Screens

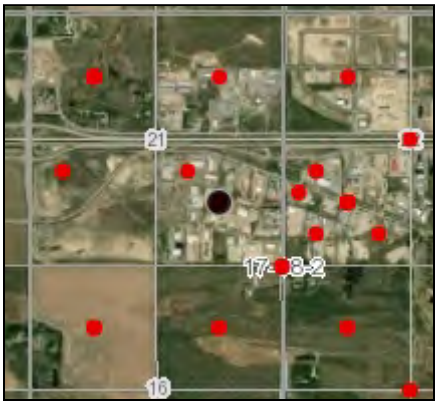
Length (ft)	Bottom (ft)	Dia (in)	Slot (in)	Material

Pump Test

Draw Down	29	ft
Duration	1	hrs
Pumping Rate	12	igpm
Temperature	0	deg. F
Rec. Pumping Rate	0	igpm

Lithology List

Depth (ft):	Material	Colour	Description
1	Topsoil	Unknown	Unknown
4	Clay	Grey	Unknown
14	Clay	Brown	Sandy
29	Clay	Blue	Unknown



Water Well Driller's Report

Well Name: Langan WWDR #: 10916

Well Location

Land Location	NW-22-17-18-2	Location of Well (in Quarter)	
LSD		ft from N/S Boundary	
Reserve		ft from E/W Boundary	
RM:			
NTS Map:		Major Basin:	
Elevation (ft)	2000	SubBasin:	23
Aquifer	10		

Well Information

Driller	FFIB Dept of Agriculture
Completion Date	1963.11.12
Hole #	
Install Method	Jetted
Borehole Depth (ft)	30
Bit Dia (in)	36
Water Level	16
Flowing Head	0
Water Use	Domestic
Well Use	Withdrawal
Completion Method	Curbed
E-Log	None

Well Casings

Length (ft)	Btm (ft)	Dia (in)	Material
0	27	36	Unknown

Well Screens

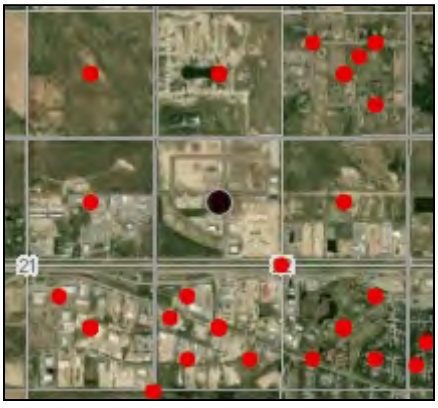
Length (ft)	Bottom (ft)	Dia (in)	Slot (in)	Material
3	30	2	16	Unknown

Pump Test

Draw Down	0	ft
Duration	3	hrs
Pumping Rate	5	igpm
Temperature	0	deg. F
Rec. Pumping Rate	0	igpm

Lithology List

Depth (ft):	Material	Colour	Description



Water Well Driller's Report

18-Dec-2022
WSaskWWDR01

Well Name: Great Plains Development WWDR #: 114769

Well Location

Land Location	5-SW-22-17-18-2
LSD	5
Reserve	
RM:	158
NTS Map:	72I08
Elevation (ft)	2001
Aquifer	

Location of Well (in Quarter)
ft from N/S Boundary
ft from E/W Boundary

Major Basin:
SubBasin: 72

Well Information

Driller	Solie Drilling Ltd.
Completion Date	1980.07.02
Hole #	016
Install Method	Drilled
Borehole Depth (ft)	75
Bit Dia (in)	0
Water Level	7
Flowing Head	0
Water Use	Domestic
Well Use	Observation
Completion Method	Unknown
E-Log	Colctd

Well Casings

Length (ft)	Btm (ft)	Dia (in)	Material
0	30	0	Unknown

Well Screens

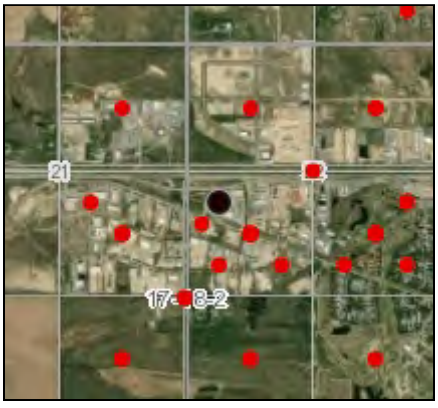
Length (ft)	Bottom (ft)	Dia (in)	Slot (in)	Material
3	33	0	0	Unknown

Pump Test

Draw Down	0	ft
Duration	0	hrs
Pumping Rate	0	igpm
Temperature	0	deg. F
Rec. Pumping Rate	0	igpm

Lithology List

Depth (ft):	Material	Colour	Description
12	Clay	Unknown	Unknown
14	Sand	Unknown	Unknown
18	Till	Unknown	Unknown
27	Sand	Unknown	Unknown
30	Clay	Unknown	Unknown
33	Sand	Unknown	Unknown
45	Clay	Unknown	Unknown
48	Sand	Unknown	Unknown
75	Till	Unknown	Unknown



Water Well Driller's Report

18-Dec-2022
WSaskWWDR01

Well Name: Straw Track Manufacturing Inc. WWDR #: 121012

Well Location

Land Location	SE-21-17-18-2	Location of Well (in Quarter)	
LSD		ft from N/S Boundary	
Reserve		ft from E/W Boundary	
RM:	158		
NTS Map:	72I08	Major Basin:	
Elevation (ft)	1969	SubBasin:	72
Aquifer			

Well Information

Driller	Earth Drilling Co. Ltd.
Completion Date	2003.10.19
Hole #	
Install Method	Bored
Borehole Depth (ft)	68
Bit Dia (in)	42
Water Level	23
Flowing Head	0
Water Use	Domestic
Well Use	Withdrawal
Completion Method	Perforated Casing
E-Log	None

Well Casings

Length (ft)	Btm (ft)	Dia (in)	Material
70	68	30	Fiberglass

Well Screens

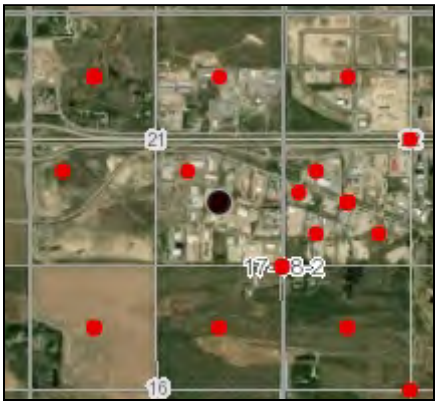
Length (ft)	Bottom (ft)	Dia (in)	Slot (in)	Material
50	70	30	38	Fiberglass

Pump Test

Draw Down	0	ft
Duration	2	hrs
Pumping Rate	25	igpm
Temperature	0	deg. F
Rec. Pumping Rate	12	igpm

Lithology List

Depth (ft):	Material	Colour	Description
1	Topsoil	Unknown	Unknown
23	Silty Clay	Yellow	Unknown
35	Sand	Yellow	Water
63	Sand	Grey	Water
68	Till	Grey	Unknown



Water Well Driller's Report

18-Dec-2022
WSaskWWDR01

Well Name: Schneider WWDR #: 14225

Well Location

Land Location	SW-22-17-18-2	Location of Well (in Quarter)	
LSD		ft from N/S Boundary	
Reserve		ft from E/W Boundary	
RM:			
NTS Map:		Major Basin:	
Elevation (ft)	1975	SubBasin:	23
Aquifer			

Well Information

Driller	Cardele Water Well Contractors
Completion Date	1974.10.25
Hole #	
Install Method	Bored
Borehole Depth (ft)	68
Bit Dia (in)	30
Water Level	10
Flowing Head	0
Water Use	Domestic
Well Use	Withdrawal
Completion Method	Curbed
E-Log	None

Well Casings

Length (ft)	Btm (ft)	Dia (in)	Material
0	68	30	Galvanized Iron

Well Screens

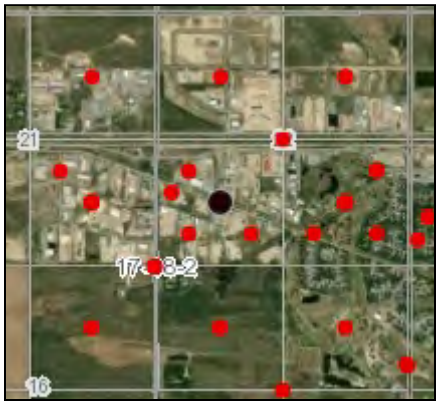
Length (ft)	Bottom (ft)	Dia (in)	Slot (in)	Material
40	68	30	60	Galvanized Iron

Pump Test

Draw Down	0	ft
Duration	0	hrs
Pumping Rate	0	igpm
Temperature	0	deg. F
Rec. Pumping Rate	20	igpm

Lithology List

Depth (ft):	Material	Colour	Description
1	Topsoil	Unknown	Unknown
20	Silt	Brown	Sandy
64	Silt	Blue	Unknown
68	Clay	Unknown	Unknown



Water Well Driller's Report

18-Dec-2022
WSaskWWDR01

Well Name: Schneider WWDR #: 14226

Well Location

Land Location	SW-22-17-18-2	Location of Well (in Quarter)	
LSD		ft from N/S Boundary	
Reserve		ft from E/W Boundary	
RM:			
NTS Map:		Major Basin:	
Elevation (ft)	1987	SubBasin:	23
Aquifer			

Well Information

Driller	Cardele Water Well Contractors
Completion Date	1974.06.20
Hole #	
Install Method	Bored
Borehole Depth (ft)	79
Bit Dia (in)	30
Water Level	15
Flowing Head	0
Water Use	Domestic
Well Use	Withdrawal
Completion Method	Curbed
E-Log	None

Well Casings

Length (ft)	Btm (ft)	Dia (in)	Material
0	74	30	Galvanized Iron

Well Screens

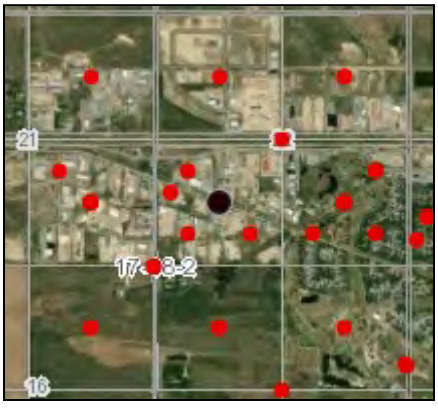
Length (ft)	Bottom (ft)	Dia (in)	Slot (in)	Material
60	79	30	60	Galvanized Iron

Pump Test

Draw Down	0	ft
Duration	0	hrs
Pumping Rate	0	igpm
Temperature	0	deg. F
Rec. Pumping Rate	15	igpm

Lithology List

Depth (ft):	Material	Colour	Description
1	Topsoil	Unknown	Unknown
20	Sandy Clay	Yellow	Soft
29	Sandy Clay	Grey	Unknown
65	Sand	Grey	Silty
79	Clay	Grey	Unknown



Water Well Driller's Report

Well Name: Flame Fabricators WWDR #: 201743

Well Location

Land Location	SW-22-17-18-2	Location of Well (in Quarter)	
LSD		ft from N/S Boundary	
Reserve		ft from E/W Boundary	
RM:	158		
NTS Map:	72I08	Major Basin:	
Elevation (ft)	1985	SubBasin:	72
Aquifer			

Well Information

Driller	Hwy One Drilling Ltd.
Completion Date	2009.03.23
Hole #	
Install Method	Bored
Borehole Depth (ft)	36
Bit Dia (in)	42
Water Level	0
Flowing Head	0
Water Use	Domestic
Well Use	Withdrawal
Completion Method	Perforated Casing
E-Log	None

Well Casings

Length (ft)	Btm (ft)	Dia (in)	Material
38	36	30	Fiberglass

Well Screens

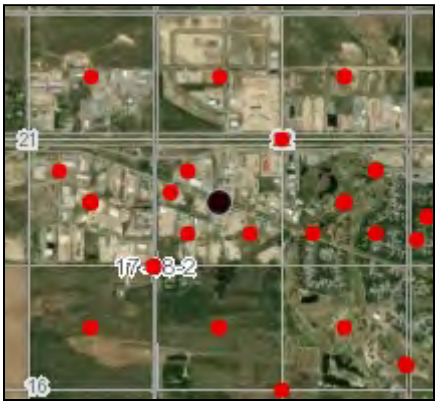
Length (ft)	Bottom (ft)	Dia (in)	Slot (in)	Material
24	36	30	30	Fiberglass

Pump Test

Draw Down	0	ft
Duration	2	hrs
Pumping Rate	1	igpm
Temperature	0	deg. F
Rec. Pumping Rate	1	igpm

Lithology List

Depth (ft):	Material	Colour	Description
7	Till	Brown	Silty
32	Silt	Grey	Till Streaks
36	Till	Grey	Silty



Water Well Driller's Report

18-Dec-2022
WSaskWWDR01

Well Name: Westcam WWDR #: 212988

Well Location

Land Location	SE-21-17-18-2	Location of Well (in Quarter)	
LSD		ft from N/S Boundary	
Reserve		ft from E/W Boundary	
RM:	158		
NTS Map:	72I08	Major Basin:	
Elevation (ft)	1968	SubBasin:	72
Aquifer			

Well Information

Driller	Hwy One Drilling Ltd.
Completion Date	2008.03.12
Hole #	00000001
Install Method	Bored
Borehole Depth (ft)	35
Bit Dia (in)	42
Water Level	0
Flowing Head	0
Water Use	Domestic
Well Use	Withdrawal
Completion Method	Perforated Casing
E-Log	None

Well Casings

Length (ft)	Btm (ft)	Dia (in)	Material
36	35	30	Casing

Well Screens

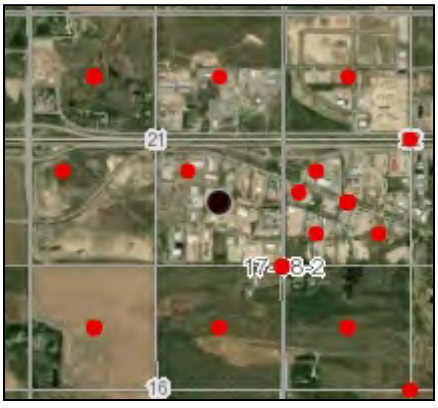
Length (ft)	Bottom (ft)	Dia (in)	Slot (in)	Material
20	35	30	30	Casing

Pump Test

Draw Down	0	ft
Duration	2	hrs
Pumping Rate	3	igpm
Temperature	0	deg. F
Rec. Pumping Rate	3	igpm

Lithology List

Depth (ft):	Material	Colour	Description
7	Till	Brown	Silty
20	Silt	Brown	Unknown
35	Unknown	Grey	Fine



Water Well Driller's Report

18-Dec-2022
WSaskWWDR01

Well Name: Gidluck Bros Trucking WWDR #: 216517

Well Location

Land Location	SW-22-17-18-2	Location of Well (in Quarter)	
LSD		ft from N/S Boundary	
Reserve		ft from E/W Boundary	
RM:	158		
NTS Map:	72I08	Major Basin:	
Elevation (ft)	1968	SubBasin:	72
Aquifer			

Well Information

Driller	Earth Drilling Co. Ltd.
Completion Date	2009.09.08
Hole #	00004952
Install Method	Bored
Borehole Depth (ft)	48
Bit Dia (in)	42
Water Level	3
Flowing Head	0
Water Use	Domestic
Well Use	Withdrawal
Completion Method	Perforated Casing
E-Log	None

Well Casings

Length (ft)	Btm (ft)	Dia (in)	Material
50	48	30	Fiberglass

Well Screens

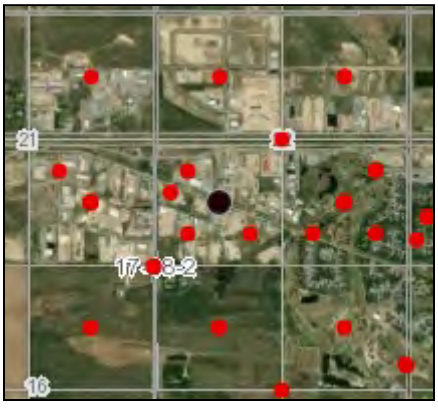
Length (ft)	Bottom (ft)	Dia (in)	Slot (in)	Material
40	48	30	375	Fiberglass

Pump Test

Draw Down	0	ft
Duration	2	hrs
Pumping Rate	2	igpm
Temperature	0	deg. F
Rec. Pumping Rate	2	igpm

Lithology List

Depth (ft):	Material	Colour	Description
1	Topsoil	Unknown	Unknown
18	Silt	Unknown	Water
31	Clay	Grey	Unknown
37	Sand	Grey	Silt
48	Till	Grey	Unknown



Water Well Driller's Report

18-Dec-2022
WSaskWWDR01

Well Name: Powder Coating Ltd. WWDR #: 217024

Well Location

Land Location	SW-22-17-18-2	Location of Well (in Quarter)	
LSD		ft from N/S Boundary	
Reserve		ft from E/W Boundary	
RM:	158		
NTS Map:	72I08	Major Basin:	
Elevation (ft)	1985	SubBasin:	72
Aquifer			

Well Information

Driller	Hwy One Drilling Ltd.
Completion Date	2009.06.04
Hole #	
Install Method	Bored
Borehole Depth (ft)	36
Bit Dia (in)	42
Water Level	0
Flowing Head	0
Water Use	Domestic
Well Use	Withdrawal
Completion Method	Perforated Casing
E-Log	None

Well Casings

Length (ft)	Btm (ft)	Dia (in)	Material
38	36	30	Fiberglass

Well Screens

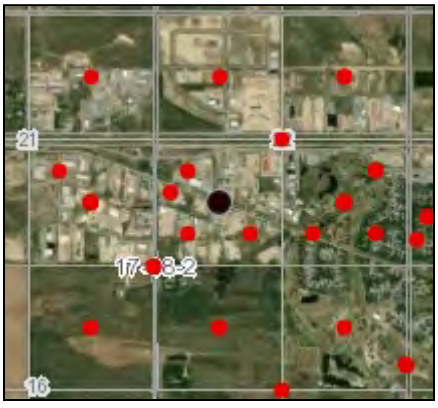
Length (ft)	Bottom (ft)	Dia (in)	Slot (in)	Material
20	36	30	30	Fiberglass

Pump Test

Draw Down	0	ft
Duration	2	hrs
Pumping Rate	5	igpm
Temperature	0	deg. F
Rec. Pumping Rate	10	igpm

Lithology List

Depth (ft):	Material	Colour	Description
10	Clay	Brown	Unknown
15	Till	Grey	Silty
36	Silt	Grey	Sand Streaks



Water Well Driller's Report

18-Dec-2022
WSaskWWDR01

Well Name: Great Plains Leaseholds Ltd. WWDR #: 228056

Well Location

Land Location	SW-22-17-18-2	Location of Well (in Quarter)	
LSD		ft from N/S Boundary	
Reserve		ft from E/W Boundary	
RM:	158		
NTS Map:	72I08	Major Basin:	
Elevation (ft)	1982	SubBasin:	72
Aquifer			

Well Information

Driller	Hwy One Drilling Ltd.
Completion Date	2013.05.07
Hole #	
Install Method	Bored
Borehole Depth (ft)	64
Bit Dia (in)	0
Water Level	12
Flowing Head	0
Water Use	Domestic
Well Use	Withdrawal
Completion Method	Perforated Casing
E-Log	None

Well Casings

Length (ft)	Btm (ft)	Dia (in)	Material
66	64	30	Fiberglass

Well Screens

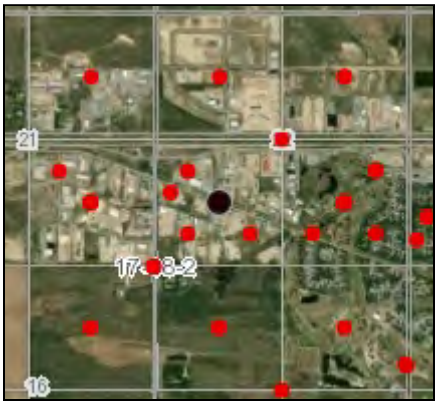
Length (ft)	Bottom (ft)	Dia (in)	Slot (in)	Material
40	61	30	30	Fiberglass

Pump Test

Draw Down	0	ft
Duration	2	hrs
Pumping Rate	10	igpm
Temperature	0	deg. F
Rec. Pumping Rate	10	igpm

Lithology List

Depth (ft):	Material	Colour	Description
20	Silt	Brown	Unknown
34	Silt	Grey	Unknown
50	Sand	Grey	Fine
61	Silt	Grey	Unknown
64	Till	Grey	Unknown



Water Well Driller's Report

18-Dec-2022
WSaskWWDR01

Well Name: Koschorke WWDR #: 243911

Well Location

Land Location	05-SW-22-17-18-2	Location of Well (in Quarter)	
LSD	05	ft from N/S Boundary	
Reserve		ft from E/W Boundary	
RM:	158		
NTS Map:	72I08	Major Basin:	
Elevation (ft)	1987	SubBasin:	72
Aquifer			

Well Information

Driller	Hwy One Drilling Ltd.
Completion Date	2020.11.25
Hole #	00000001
Install Method	Bored
Borehole Depth (ft)	57
Bit Dia (in)	42
Water Level	5
Flowing Head	0
Water Use	Domestic
Well Use	Withdrawal
Completion Method	Perforated Casing
E-Log	None

Well Casings

Length (ft)	Btm (ft)	Dia (in)	Material
12	10	30	Fiberglass
5	57	30	Unknown

Well Screens

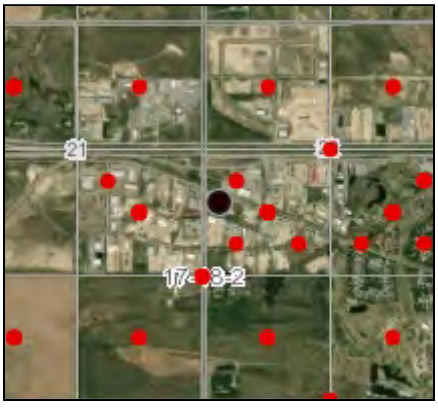
Length (ft)	Bottom (ft)	Dia (in)	Slot (in)	Material
42	52	30	30	Fiberglass

Pump Test

Draw Down	52	ft
Duration	2	hrs
Pumping Rate	15	igpm
Temperature	0	deg. F
Rec. Pumping Rate	10	igpm

Lithology List

Depth (ft):	Material	Colour	Description
8	Clay	Brown	Dry
18	Silt	Brown	Wet
54	Silt	Grey	Fine
57	Silty Clay	Grey	Hard



Water Well Driller's Report

18-Dec-2022
WSaskWWDR01

Well Name: Lovelace WWDR #: 7912

Well Location

Land Location	NE-21-17-18-2	Location of Well (in Quarter)	
LSD		ft from N/S Boundary	
Reserve		ft from E/W Boundary	
RM:			
NTS Map:		Major Basin:	
Elevation (ft)	2000	SubBasin:	23
Aquifer			

Well Information

Driller	Cardele Water Well Contractors
Completion Date	1973.06.09
Hole #	
Install Method	Bored
Borehole Depth (ft)	46
Bit Dia (in)	30
Water Level	15
Flowing Head	0
Water Use	Domestic
Well Use	Withdrawal
Completion Method	Curbed
E-Log	None

Well Casings

Length (ft)	Btm (ft)	Dia (in)	Material
0	46	30	Galvanized Iron

Well Screens

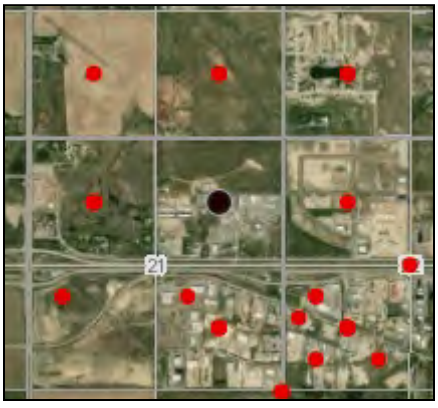
Length (ft)	Bottom (ft)	Dia (in)	Slot (in)	Material
40	46	30	60	Galvanized Iron

Pump Test

Draw Down	29	ft
Duration	1	hrs
Pumping Rate	10	igpm
Temperature	0	deg. F
Rec. Pumping Rate	10	igpm

Lithology List

Depth (ft):	Material	Colour	Description
17	Clay	Yellow	Unknown
40	Sand	Blue	Unknown
46	Clay	Blue	Unknown



Water Well Driller's Report

18-Dec-2022
WSaskWWDR01

Well Name: Fouilard WWDR #: 80444

Well Location

Land Location	SW-22-17-18-2	Location of Well (in Quarter)	
LSD		ft from N/S Boundary	
Reserve		ft from E/W Boundary	
RM:			
NTS Map:		Major Basin:	
Elevation (ft)	2000	SubBasin:	23
Aquifer			

Well Information

Driller	Hwy One Drilling Ltd.
Completion Date	1985.04.25
Hole #	
Install Method	Augered
Borehole Depth (ft)	40
Bit Dia (in)	6
Water Level	0
Flowing Head	0
Water Use	Domestic
Well Use	Water Test Hole
Completion Method	
E-Log	None

Well Casings

Length (ft)	Btm (ft)	Dia (in)	Material

Well Screens

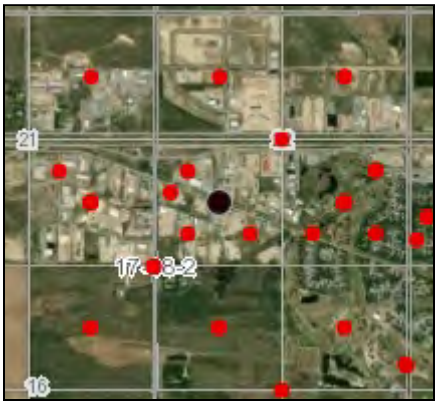
Length (ft)	Bottom (ft)	Dia (in)	Slot (in)	Material

Pump Test

Draw Down	0	ft
Duration	0	hrs
Pumping Rate	0	igpm
Temperature	0	deg. F
Rec. Pumping Rate	0	igpm

Lithology List

Depth (ft):	Material	Colour	Description
1	Topsoil	Unknown	Unknown
5	Sand	Brown	Unknown
15	Sand	Brown	Water
40	Sand	Grey	Water



Water Well Driller's Report

18-Dec-2022
WSaskWWDR01

Well Name: Fouliard Farm Supply WWDR #: 80445

Well Location

Land Location	SW-22-17-18-2	Location of Well (in Quarter)	
LSD		ft from N/S Boundary	
Reserve		ft from E/W Boundary	
RM:			
NTS Map:		Major Basin:	
Elevation (ft)	2000	SubBasin:	23
Aquifer			

Well Information

Driller	Hwy One Drilling Ltd.
Completion Date	1985.05.02
Hole #	
Install Method	Bored
Borehole Depth (ft)	45
Bit Dia (in)	42
Water Level	0
Flowing Head	0
Water Use	Domestic
Well Use	Withdrawal
Completion Method	Perforated Casing
E-Log	None

Well Casings

Length (ft)	Btm (ft)	Dia (in)	Material
47	45	30	Casing

Well Screens

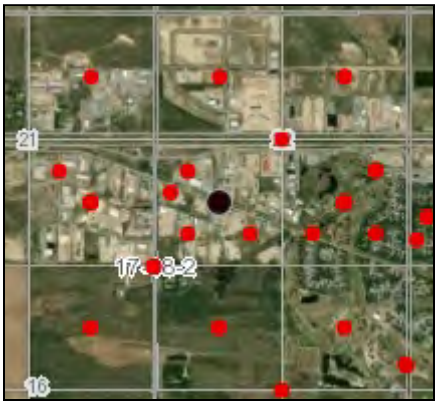
Length (ft)	Bottom (ft)	Dia (in)	Slot (in)	Material
25	43	30	20	Casing

Pump Test

Draw Down	0	ft
Duration	2	hrs
Pumping Rate	50	igpm
Temperature	0	deg. F
Rec. Pumping Rate	10	igpm

Lithology List

Depth (ft):	Material	Colour	Description
1	Topsoil	Unknown	Unknown
12	Sand	Brown	Clayey
17	Sand	Brown	Water
45	Silt	Grey	Water



Water Well Driller's Report

18-Dec-2022
WSaskWWDR01

Well Name: Bechard WWDR #: 64272

Well Location

Land Location	SE-21-17-18-2	Location of Well (in Quarter)	
LSD		ft from N/S Boundary	
Reserve		ft from E/W Boundary	
RM:			
NTS Map:		Major Basin:	
Elevation (ft)	1985	SubBasin:	23
Aquifer			

Well Information

Driller	Earth Drilling Co. Ltd.
Completion Date	1980.11.19
Hole #	
Install Method	Bored
Borehole Depth (ft)	32
Bit Dia (in)	42
Water Level	12
Flowing Head	0
Water Use	Domestic
Well Use	Withdrawal
Completion Method	Perforated Casing
E-Log	None

Well Casings

Length (ft)	Btm (ft)	Dia (in)	Material
32	31	30	Copper Bearing Steel

Well Screens

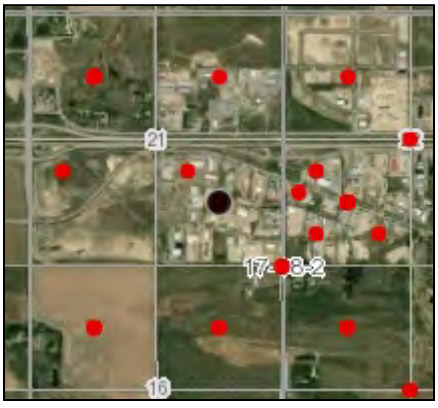
Length (ft)	Bottom (ft)	Dia (in)	Slot (in)	Material
15	30	30	375	Unknown

Pump Test

Draw Down	10	ft
Duration	2	hrs
Pumping Rate	25	igpm
Temperature	0	deg. F
Rec. Pumping Rate	10	igpm

Lithology List

Depth (ft):	Material	Colour	Description
1	Topsoil	Unknown	Unknown
18	Silty Clay	Yellow	Unknown
32	Sand	Blue	Water



Water Well Driller's Report

18-Dec-2022
WSaskWWDR01

Well Name: Lakeman Equipment Rental WWDR #: 201701

Well Location

Land Location	SW-22-17-18-2	Location of Well (in Quarter)	
LSD		ft from N/S Boundary	
Reserve		ft from E/W Boundary	
RM:	158		
NTS Map:	72I08	Major Basin:	
Elevation (ft)	1985	SubBasin:	72
Aquifer			

Well Information

Driller	Hwy One Drilling Ltd.
Completion Date	2004.05.18
Hole #	
Install Method	Bored
Borehole Depth (ft)	37
Bit Dia (in)	42
Water Level	0
Flowing Head	0
Water Use	Domestic
Well Use	Withdrawal
Completion Method	Perforated Casing
E-Log	None

Well Casings

Length (ft)	Btm (ft)	Dia (in)	Material
38	37	30	Fiberglass

Well Screens

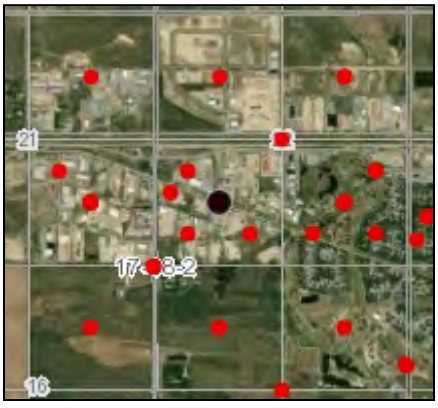
Length (ft)	Bottom (ft)	Dia (in)	Slot (in)	Material
22	37	30	30	Fiberglass

Pump Test

Draw Down	0	ft
Duration	2	hrs
Pumping Rate	10	igpm
Temperature	0	deg. F
Rec. Pumping Rate	5	igpm

Lithology List

Depth (ft):	Material	Colour	Description
15	Silt	Brown	Dry
25	Silt	Brown	Wet
37	Silt	Grey	Wet
37	Sand	Unknown	Fine



Water Well Driller's Report

18-Dec-2022
WSaskWWDR01

Well Name: Nick's Service Ltd. WWDR #: 201752

Well Location

Land Location	SE-21-17-18-2	Location of Well (in Quarter)	
LSD		ft from N/S Boundary	
Reserve		ft from E/W Boundary	
RM:	158		
NTS Map:	72I08	Major Basin:	
Elevation (ft)	1969	SubBasin:	72
Aquifer			

Well Information

Driller	Hwy One Drilling Ltd.
Completion Date	2004.10.15
Hole #	
Install Method	Bored
Borehole Depth (ft)	40
Bit Dia (in)	42
Water Level	0
Flowing Head	0
Water Use	Domestic
Well Use	Withdrawal
Completion Method	Perforated Casing
E-Log	None

Well Casings

Length (ft)	Btm (ft)	Dia (in)	Material
42	40	30	Fiberglass

Well Screens

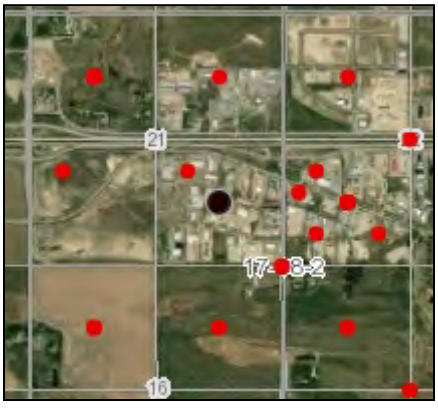
Length (ft)	Bottom (ft)	Dia (in)	Slot (in)	Material
20	40	30	30	Fiberglass

Pump Test

Draw Down	0	ft
Duration	2	hrs
Pumping Rate	20	igpm
Temperature	0	deg. F
Rec. Pumping Rate	10	igpm

Lithology List

Depth (ft):	Material	Colour	Description
3	Silty Clay	Brown	Unknown
15	Silt	Brown	Unknown
30	Silt	Brown	Wet
40	Sand	Grey	Wet



Water Well Driller's Report

18-Dec-2022
WSaskWWDR01

Well Name: Livesey WWDR #: 10890

Well Location

Land Location 17-18-2
LSD
Reserve
RM:
NTS Map:
Elevation (ft) 0
Aquifer

Location of Well (in Quarter)
ft from N/S Boundary
ft from E/W Boundary
Major Basin:
SubBasin: 23

Well Information

Driller Langford Drilling
Completion Date 1968.05.27
Hole #
Install Method Drilled
Borehole Depth (ft) 145
Bit Dia (in) 0
Water Level 0
Flowing Head 0
Water Use Domestic
Well Use Water Test Hole
Completion Method
E-Log None

Well Casings

Length (ft)	Btm (ft)	Dia (in)	Material

Well Screens

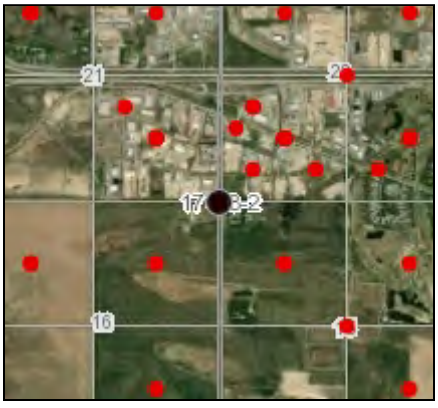
Length (ft)	Bottom (ft)	Dia (in)	Slot (in)	Material

Pump Test

Draw Down	0	ft
Duration	0	hrs
Pumping Rate	0	igpm
Temperature	0	deg. F
Rec. Pumping Rate	0	igpm

Lithology List

Depth (ft):	Material	Colour	Description
65	Gravel	Unknown	Unknown
145	Clay	Blue	Boulders



Water Well Driller's Report

18-Dec-2022
WSaskWWDR01

Well Name: Livesey WWDR #: 10892

Well Location

Land Location 17-18-2
LSD
Reserve
RM:
NTS Map:
Elevation (ft) 0
Aquifer

Location of Well (in Quarter)
ft from N/S Boundary
ft from E/W Boundary
Major Basin:
SubBasin: 23

Well Information

Driller Langford Drilling
Completion Date 1968.05.27
Hole #
Install Method Drilled
Borehole Depth (ft) 55
Bit Dia (in) 0
Water Level 0
Flowing Head 0
Water Use Domestic
Well Use Water Test Hole
Completion Method
E-Log None

Well Casings

Length (ft)	Btm (ft)	Dia (in)	Material

Well Screens

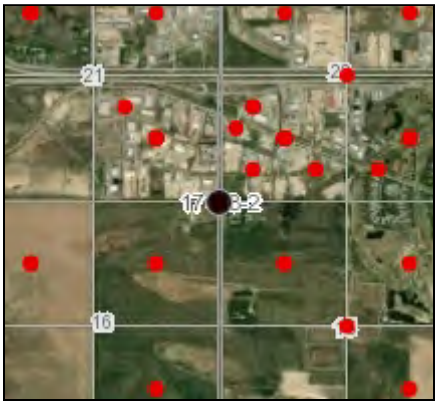
Length (ft)	Bottom (ft)	Dia (in)	Slot (in)	Material

Pump Test

Draw Down	0	ft
Duration	0	hrs
Pumping Rate	0	igpm
Temperature	0	deg. F
Rec. Pumping Rate	0	igpm

Lithology List

Depth (ft):	Material	Colour	Description
55	Gravel	Unknown	Unknown



Water Well Driller's Report

18-Dec-2022
WSaskWWDR01

Well Name: Nester WWDR #: 10915

Well Location

Land Location	SE-21-17-18-2	Location of Well (in Quarter)	
LSD		114 ft from N/S Boundary	N
Reserve		300 ft from E/W Boundary	E
RM:			
NTS Map:		Major Basin:	
Elevation (ft)	1980	SubBasin:	23
Aquifer			

Well Information

Driller	Buffalo Water Well Drilling
Completion Date	1963.03.05
Hole #	
Install Method	Bored
Borehole Depth (ft)	22
Bit Dia (in)	36
Water Level	11
Flowing Head	0
Water Use	Domestic
Well Use	Withdrawal
Completion Method	Curbed
E-Log	None

Well Casings

Length (ft)	Btm (ft)	Dia (in)	Material
0	10	36	Unknown
0	22	36	Unknown

Well Screens

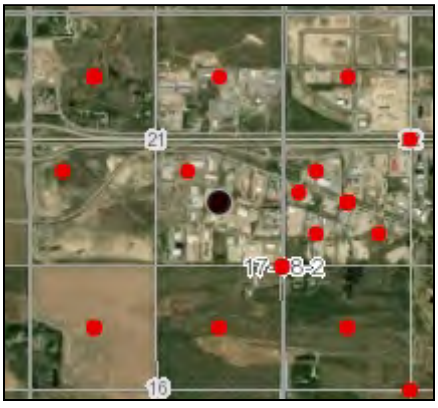
Length (ft)	Bottom (ft)	Dia (in)	Slot (in)	Material

Pump Test

Draw Down	0	ft
Duration	0	hrs
Pumping Rate	1	igpm
Temperature	0	deg. F
Rec. Pumping Rate	0	igpm

Lithology List

Depth (ft):	Material	Colour	Description
1	Topsoil	Unknown	Unknown
19	Clay	Yellow	Unknown
22	Sandy Clay	Blue	Unknown



Water Well Driller's Report

Well Name: Mid Can Livestock WWDR #: 76158

Well Location

Land Location	SW-22-17-18-2	Location of Well (in Quarter)	
LSD		ft from N/S Boundary	
Reserve		ft from E/W Boundary	
RM:			
NTS Map:		Major Basin:	
Elevation (ft)	1975	SubBasin:	23
Aquifer			

Well Information

Driller	Hwy One Drilling Ltd.
Completion Date	1983.10.31
Hole #	
Install Method	Augered
Borehole Depth (ft)	60
Bit Dia (in)	6
Water Level	0
Flowing Head	0
Water Use	Industrial
Well Use	Water Test Hole
Completion Method	
E-Log	None

Well Casings

Length (ft)	Btm (ft)	Dia (in)	Material

Well Screens

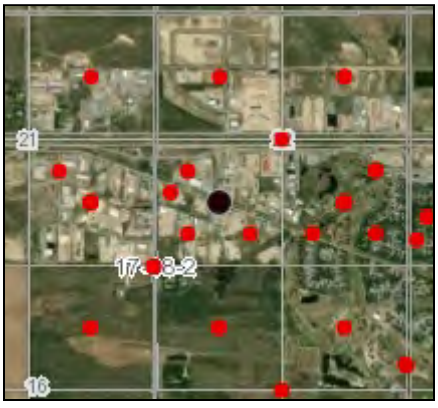
Length (ft)	Bottom (ft)	Dia (in)	Slot (in)	Material

Pump Test

Draw Down	0	ft
Duration	0	hrs
Pumping Rate	0	igpm
Temperature	0	deg. F
Rec. Pumping Rate	0	igpm

Lithology List

Depth (ft):	Material	Colour	Description
1	Topsoil	Unknown	Unknown
5	Till	Brown	Unknown
15	Sand	Brown	Water
30	Till	Grey	Silty
50	Silt	Grey	Water
60	Till	Blue	Unknown



Water Well Driller's Report

18-Dec-2022
WSaskWWDR01

Well Name: Koka WWDR #: 77311

Well Location

Land Location	17-18-2	Location of Well (in Quarter)	
LSD		ft from N/S Boundary	
Reserve		ft from E/W Boundary	
RM:			
NTS Map:		Major Basin:	
Elevation (ft)	2000	SubBasin:	23
Aquifer			

Well Information

Driller	Haig Water Well Drilling
Completion Date	1984.05.07
Hole #	001
Install Method	Drilled
Borehole Depth (ft)	80
Bit Dia (in)	4.5
Water Level	20
Flowing Head	0
Water Use	Domestic
Well Use	Withdrawal
Completion Method	Well Screen
E-Log	None

Well Casings

Length (ft)	Btm (ft)	Dia (in)	Material
20	59	5	Stainless Steel

Well Screens

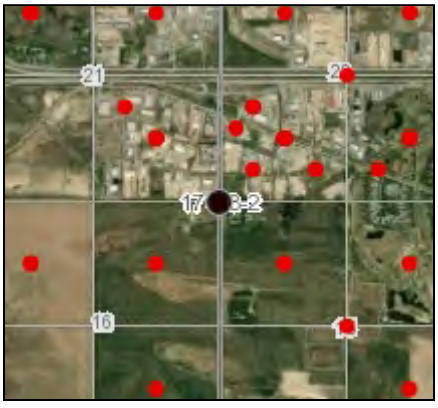
Length (ft)	Bottom (ft)	Dia (in)	Slot (in)	Material
5	64	4	15	Stainless Steel

Pump Test

Draw Down	21	ft
Duration	4	hrs
Pumping Rate	10	igpm
Temperature	40	deg. F
Rec. Pumping Rate	8	igpm

Lithology List

Depth (ft):	Material	Colour	Description
1	Topsoil	Unknown	Unknown
20	Till	Brown	Unknown
58	Till	Grey	Unknown
64	Sand	Unknown	Medium
80	Till	Grey	Unknown



Water Well Driller's Report

18-Dec-2022
WSaskWWDR01

Well Name: Mid Can Livestock WWDR #: 77504

Well Location

Land Location	SW-22-17-18-2	Location of Well (in Quarter)	
LSD		ft from N/S Boundary	
Reserve		ft from E/W Boundary	
RM:			
NTS Map:		Major Basin:	
Elevation (ft)	1975	SubBasin:	23
Aquifer			

Well Information

Driller	Hwy One Drilling Ltd.
Completion Date	1983.10.13
Hole #	
Install Method	Bored
Borehole Depth (ft)	60
Bit Dia (in)	42
Water Level	0
Flowing Head	0
Water Use	Domestic
Well Use	Withdrawal
Completion Method	Perforated Casing
E-Log	None

Well Casings

Length (ft)	Btm (ft)	Dia (in)	Material
59	56	30	Stainless Steel

Well Screens

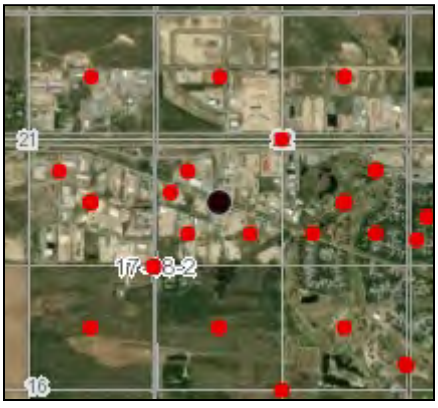
Length (ft)	Bottom (ft)	Dia (in)	Slot (in)	Material
40	50	30	20	Stainless Steel

Pump Test

Draw Down	0	ft
Duration	1	hrs
Pumping Rate	130	igpm
Temperature	0	deg. F
Rec. Pumping Rate	7	igpm

Lithology List

Depth (ft):	Material	Colour	Description
1	Topsoil	Unknown	Unknown
5	Till	Brown	Unknown
50	Silt	Unknown	Unknown
60	Till	Blue	Silty



Water Well Driller's Report

18-Dec-2022
WSaskWWDR01

Well Name: Farm King Ltd. WWDR #: 77505

Well Location

Land Location	SW-22-17-18-2	Location of Well (in Quarter)	
LSD		ft from N/S Boundary	
Reserve		ft from E/W Boundary	
RM:			
NTS Map:		Major Basin:	
Elevation (ft)	1975	SubBasin:	23
Aquifer			

Well Information

Driller	Hwy One Drilling Ltd.
Completion Date	1983.10.14
Hole #	
Install Method	Bored
Borehole Depth (ft)	50
Bit Dia (in)	42
Water Level	0
Flowing Head	0
Water Use	Domestic
Well Use	Withdrawal
Completion Method	Perforated Casing
E-Log	None

Well Casings

Length (ft)	Btm (ft)	Dia (in)	Material
52	50	30	Stainless Steel

Well Screens

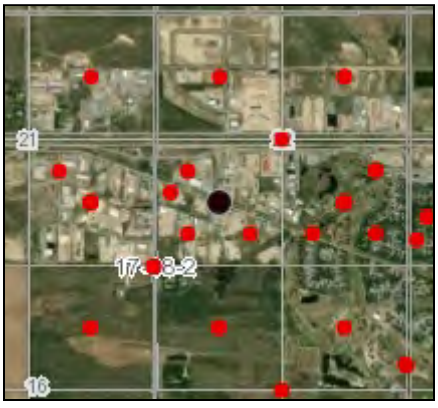
Length (ft)	Bottom (ft)	Dia (in)	Slot (in)	Material
40	48	30	20	Stainless Steel

Pump Test

Draw Down	0	ft
Duration	1	hrs
Pumping Rate	130	igpm
Temperature	0	deg. F
Rec. Pumping Rate	12	igpm

Lithology List

Depth (ft):	Material	Colour	Description
1	Topsoil	Unknown	Unknown
10	Till	Brown	Unknown
50	Silt	Unknown	Water



Water Well Driller's Report

18-Dec-2022
WSaskWWDR01

Well Name: Great Plains Development WWDR #: 114763

Well Location

Land Location	7-SE-21-17-18-2	Location of Well (in Quarter)	
LSD	7	ft from N/S Boundary	
Reserve		ft from E/W Boundary	
RM:	158		
NTS Map:	72I08	Major Basin:	
Elevation (ft)	1968	SubBasin:	72
Aquifer			

Well Information

Driller	Solie Drilling Ltd.
Completion Date	1980.03.24
Hole #	002
Install Method	Drilled
Borehole Depth (ft)	135
Bit Dia (in)	0
Water Level	0
Flowing Head	0
Water Use	Domestic
Well Use	Water Test Hole
Completion Method	Unknown
E-Log	Colctd

Well Casings

Length (ft)	Btm (ft)	Dia (in)	Material

Well Screens

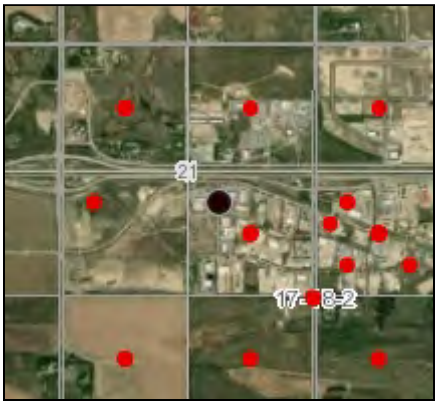
Length (ft)	Bottom (ft)	Dia (in)	Slot (in)	Material

Pump Test

Draw Down	0	ft
Duration	0	hrs
Pumping Rate	0	igpm
Temperature	0	deg. F
Rec. Pumping Rate	0	igpm

Lithology List

Depth (ft):	Material	Colour	Description
12	Clay	Unknown	Unknown
22	Silt	Unknown	Unknown
54	Silt	Unknown	Sandy
84	Till	Unknown	Sandy
90	Silt	Unknown	Sandy
135	Clay	Unknown	Unknown



Water Well Driller's Report

Well Name: Great Plains Development WWDR #: 114766

Well Location

Land Location	3-SW-22-17-18-2	Location of Well (in Quarter)	
LSD	3	ft from N/S Boundary	
Reserve		ft from E/W Boundary	
RM:	158		
NTS Map:	72I08	Major Basin:	
Elevation (ft)	2001	SubBasin:	72
Aquifer			

Well Information

Driller	Solie Drilling Ltd.
Completion Date	1980.03.25
Hole #	005
Install Method	Drilled
Borehole Depth (ft)	75
Bit Dia (in)	0
Water Level	0
Flowing Head	0
Water Use	Domestic
Well Use	Water Test Hole
Completion Method	Unknown
E-Log	Colctd

Well Casings

Length (ft)	Btm (ft)	Dia (in)	Material

Well Screens

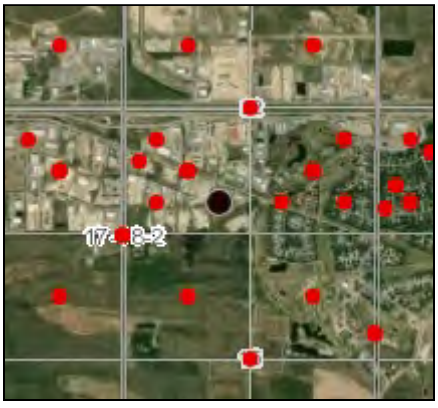
Length (ft)	Bottom (ft)	Dia (in)	Slot (in)	Material

Pump Test

Draw Down	0	ft
Duration	0	hrs
Pumping Rate	0	igpm
Temperature	0	deg. F
Rec. Pumping Rate	0	igpm

Lithology List

Depth (ft):	Material	Colour	Description
12	Clay	Unknown	Unknown
32	Silt	Unknown	Unknown
42	Silt	Unknown	Sandy
44	Till	Unknown	Unknown
48	Sand	Unknown	Unknown
49	Silt	Unknown	Unknown
53	Sand	Unknown	Unknown
75	Till	Unknown	Unknown



Water Well Driller's Report

18-Dec-2022
WSaskWWDR01

Well Name: Great Plains Development WWDR #: 114767

Well Location

Land Location	4-SW-22-17-18-2
LSD	4
Reserve	
RM:	158
NTS Map:	72I08
Elevation (ft)	1968
Aquifer	

Location of Well (in Quarter)
ft from N/S Boundary
ft from E/W Boundary

Major Basin:
SubBasin: 72

Well Information

Driller	Solie Drilling Ltd.
Completion Date	1980.03.25
Hole #	004
Install Method	Drilled
Borehole Depth (ft)	75
Bit Dia (in)	0
Water Level	0
Flowing Head	0
Water Use	Domestic
Well Use	Water Test Hole
Completion Method	Unknown
E-Log	Colctd

Well Casings

Length (ft)	Btm (ft)	Dia (in)	Material

Well Screens

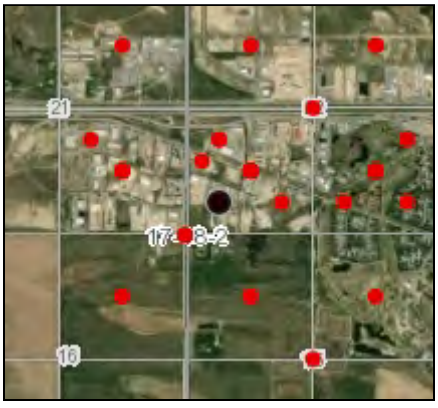
Length (ft)	Bottom (ft)	Dia (in)	Slot (in)	Material

Pump Test

Draw Down	0	ft
Duration	0	hrs
Pumping Rate	0	igpm
Temperature	0	deg. F
Rec. Pumping Rate	0	igpm

Lithology List

Depth (ft):	Material	Colour	Description
14	Clay	Unknown	Unknown
20	Sand	Unknown	Unknown
30	Silt	Unknown	Unknown
50	Sand	Unknown	Unknown
56	Silt	Unknown	Sandy
75	Till	Unknown	Unknown



Water Well Driller's Report

Well Name: Great Plains Development WWDR #: 114768

Well Location

Land Location	5-SW-22-17-18-2	Location of Well (in Quarter)	
LSD	5	ft from N/S Boundary	
Reserve		ft from E/W Boundary	
RM:	158		
NTS Map:	72I08	Major Basin:	
Elevation (ft)	2001	SubBasin:	72
Aquifer			

Well Information

Driller	Solie Drilling Ltd.
Completion Date	1980.03.24
Hole #	001
Install Method	Drilled
Borehole Depth (ft)	140
Bit Dia (in)	0
Water Level	0
Flowing Head	0
Water Use	Domestic
Well Use	Water Test Hole
Completion Method	Unknown
E-Log	Colctd

Well Casings

Length (ft)	Btm (ft)	Dia (in)	Material

Well Screens

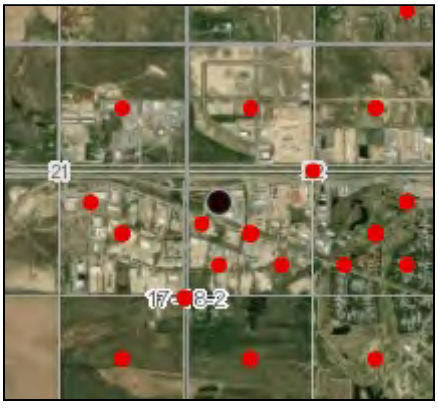
Length (ft)	Bottom (ft)	Dia (in)	Slot (in)	Material

Pump Test

Draw Down	0	ft
Duration	0	hrs
Pumping Rate	0	igpm
Temperature	0	deg. F
Rec. Pumping Rate	0	igpm

Lithology List

Depth (ft):	Material	Colour	Description
8	Clay	Unknown	Unknown
14	Silt	Unknown	Unknown
39	Silt	Unknown	Sandy
54	Sand	Unknown	Unknown
63	Till	Unknown	Unknown
65	Sand	Unknown	Unknown
68	Till	Unknown	Unknown
70	Sand	Unknown	Unknown
102	Till	Unknown	Unknown
120	Till	Unknown	Silty
140	Till	Unknown	Unknown



Water Well Driller's Report

18-Dec-2022
WSaskWWDR01

Well Name: Great Plains Leaseholds Ltd. WWDR #: 228050

Well Location

Land Location	SW-22-17-18-2	Location of Well (in Quarter)	
LSD		ft from N/S Boundary	
Reserve		ft from E/W Boundary	
RM:	158		
NTS Map:	72I08	Major Basin:	
Elevation (ft)	1978	SubBasin:	72
Aquifer			

Well Information

Driller	Hwy One Drilling Ltd.
Completion Date	2012.10.01
Hole #	
Install Method	Bored
Borehole Depth (ft)	57
Bit Dia (in)	0
Water Level	10
Flowing Head	0
Water Use	Domestic
Well Use	Withdrawal
Completion Method	Perforated Casing
E-Log	None

Well Casings

Length (ft)	Btm (ft)	Dia (in)	Material
59	57	30	Casing

Well Screens

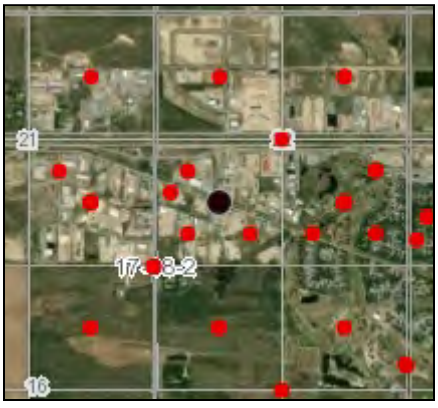
Length (ft)	Bottom (ft)	Dia (in)	Slot (in)	Material
43	53	30	30	Casing

Pump Test

Draw Down	0	ft
Duration	2	hrs
Pumping Rate	18	igpm
Temperature	0	deg. F
Rec. Pumping Rate	15	igpm

Lithology List

Depth (ft):	Material	Colour	Description
10	Silt	Brown	Unknown
25	Sand	Brown	Fine
50	Sand	Grey	Silty
54	Silt	Grey	Unknown
57	Till	Grey	Unknown



Water Well Driller's Report

18-Dec-2022
WSaskWWDR01

Well Name: Sunbird Developments WWDR #: 57238

Well Location

Land Location 22-17-18-2
LSD
Reserve
RM:
NTS Map:
Elevation (ft) 1995
Aquifer

Location of Well (in Quarter)
ft from N/S Boundary
ft from E/W Boundary
Major Basin:
SubBasin: 23

Well Information

Driller Solie Drilling Ltd.
Completion Date 1977.07.01
Hole # 006
Install Method Drilled
Borehole Depth (ft) 120
Bit Dia (in) 0
Water Level 0
Flowing Head 0
Water Use Municipal
Well Use Water Test Hole
Completion Method
E-Log None

Well Casings

Length (ft)	Btm (ft)	Dia (in)	Material

Well Screens

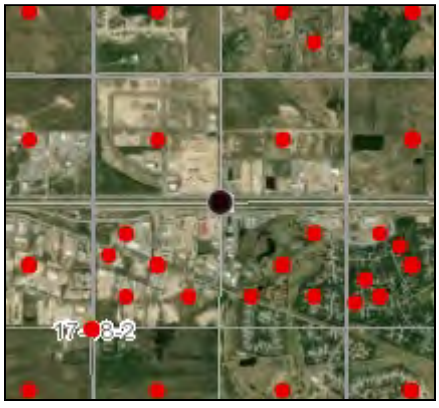
Length (ft)	Bottom (ft)	Dia (in)	Slot (in)	Material

Pump Test

Draw Down	0	ft
Duration	0	hrs
Pumping Rate	0	igpm
Temperature	0	deg. F
Rec. Pumping Rate	0	igpm

Lithology List

Depth (ft):	Material	Colour	Description
12	Silty Clay	Brown	Oxidized
13	Sand	Grey	Unoxidized
42	Sand	Grey	Unoxidized
45	Silt	Grey	Unoxidized
48	Silt	Grey	Unoxidized
56	Silt	Grey	Clay Streaks
78	Till	Grey	Unoxidized
95	Till	Grey	Unoxidized
96	Sand	Unknown	Medium-coarse
107	Till	Grey	Unoxidized
110	Sand	Unknown	Fine
120	Till	Grey	Unoxidized



Water Well Driller's Report

18-Dec-2022
WSaskWWDR01

Well Name: Schneider WWDR #: 14224

Well Location

Land Location	SW-22-17-18-2	Location of Well (in Quarter)	
LSD		ft from N/S Boundary	
Reserve		ft from E/W Boundary	
RM:			
NTS Map:		Major Basin:	
Elevation (ft)	1975	SubBasin:	23
Aquifer			

Well Information

Driller	Cardele Water Well Contractors
Completion Date	1974.10.24
Hole #	
Install Method	Bored
Borehole Depth (ft)	78
Bit Dia (in)	30
Water Level	10
Flowing Head	0
Water Use	Domestic
Well Use	Withdrawal
Completion Method	Curbed
E-Log	None

Well Casings

Length (ft)	Btm (ft)	Dia (in)	Material
0	78	30	Galvanized Iron

Well Screens

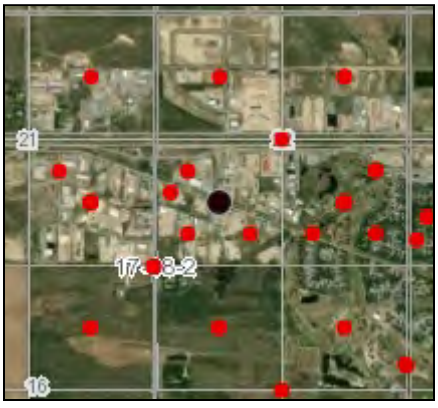
Length (ft)	Bottom (ft)	Dia (in)	Slot (in)	Material
52	78	30	60	Galvanized Iron

Pump Test

Draw Down	0	ft
Duration	0	hrs
Pumping Rate	0	igpm
Temperature	0	deg. F
Rec. Pumping Rate	20	igpm

Lithology List

Depth (ft):	Material	Colour	Description
1	Topsoil	Unknown	Unknown
20	Silt	Brown	Sandy
69	Sand	Grey	Unknown
78	Clay	Blue	Unknown



Appendix K – Public Engagement

October 12, 2022

Dear Property Owner(s):

You are receiving this letter as a public acknowledgement that you are a registered owner of a property within 150 meters of a proposed commercial restaurant development in Emerald Park, Saskatchewan.

The proposed development is of a single parcel subdivision for a restaurant with a drive through at the intersection of South Plains Road and Great Plains Industrial Drive. This site is zoned for commercial development and the development will complement existing commercial uses in the immediate vicinity. The lot provides sufficient space for a principle building that is 3,141 square feet in area and covers 10.31 percent of the proposed lot. The configuration and layout of the site proposes 28 parking stalls, 1 being accessible.

There are two proposed automobile access points for this development. An existing approach via South Plains Road to the north will be upgraded to accommodate both the proposed and residual lot. A second access is proposed along Great Plains Industrial Drive to the west. A private internal road network will connect the two access points as well as provide access to parking and drive through services.

If you wish to comment on the development you may contact GeoVerra by email at olivia.tomcala@geoverra.com to provide the submission. Please respond by August 24, 2022. Further information may be obtained at the RM Office located at 100 Hutchence Road. Emerald Park, SK. S4L 1C6.

Attached is a copy of the site plan of the proposed restaurant.

Sincerely,

Olivia Tomcala
Planner

Encl.