Comprehensive Development Proposal

Vista Springs

Conscious Living Condominium Development- “Phase 2”

October 27, 2022

Table of Contents

1 Introduction

This report is provided to express our client's interest in providing a Condominium Country Residential development located on the Parcel B & C on NE Section 12-17-18 W2 immediately south of the Meadow Ridge Development within the Rural Municipality of Edenwold No. 158. The proposed name for the development is Vista Springs Condominium Project.

This development is intended to be a high-end bareland condominium project comprised of 11 "lots" located on a 16.1 acre parcel adjacent to Hunter Creek. The developer is creating a country feel with environmentally sustainable principles, while maintaining large as possible common green spaces. These spaces would be open to the neighbouring community.

Phase one of this development is single parcel Country Residential 1, phase two is CR3 consisting of 11 lots as bareland condominium.

2 Proposal Summary

The proposed condominium development parcel sizes fall within the RM's CR3 size requirements. As requested by RM of Edenwold August 26,2022 meeting with Developer, we have amended the CDP to CR3 zoning and allocated additional 5m right of way on north property line. RM advised the developer can have walking path, water line or well within the the RM "Right of way".

- The developer proposes 11 condominium lots located on the larger 16.1 acre parcel. The lots range in size from 0.64 acres to 1.04 acres. The development concept is eco sustainable "Green" Development that maximizes open common space, parks and paths with minimal individual maintenance, while maintaining highest level of architectural controls.

- Development vision is to support and foster Green Building Concepts, including Net Zero and passive construction principles and techniques. Will also include water and wastewater conservation, supporting permaculture concepts while maintaining and maximizing green space. This "Green" goal and initiative is intended to be very much in alignment with RM of Edenwold's strategies and goals.

- The bareland condominium concept with generous common green space, paths and environmental reserve in excess of 30% of the development area, supports the open concept and connection to nature and surrounding community without overwhelming maintenance requirements on the individual. Bareland condominium concept provides long term reliable operation and maintenance. Appealing to those who want to maintain a rural spacious lifestyle without the requirement of significant upkeep and maintenance.

- Potable water service will be provided by a local municipal system.
- Each lot will have individual sanitary sewer service consisting of solid separation, typical type two mound as well as nitrogen removal system similar to “Orenco AdvanTex NSF-40” or equal (appendix E).
- Power, gas and telephone are in close proximity.
- Surface drainage will follow existing drainage patterns towards Hunter Creek. The layout of the subdivision incorporated these existing drainage runs and with the goal to maintain current vegetation growth and limit the chance for erosion. Detailed engineered site drainage design is included in appendix A.
- The houses will be set at the required elevation as outlined by the Water Security Agency.
- Internal roads will have a 7 m top at the entrance to allow for two-way traffic and a 6 m top for the one-way loop around the park. The roads will be constructed with a woven geotextile and surfaced with 200mm of type 32 base as well as 50mm of traffic gravel as per the appended geotechnical report. Internal Road will be expandable with 50mm asphalt structure if desired by Bareland Condominium board in future. (Detailed engineered road design included in appendix A).
- Development access will be via Betteridge Road East extension from Jaxon Road to Development. The developer is amenable to negotiate cost-sharing of the chip seal rehabilitation/upgrade of Park Meadows Drive/Jaxon Rd, as requested by Council, with no further improvements to Betteridge Road required by developer.
- All internal infrastructure will be operated and maintained by the developer until it is taken over by the Condominium Board.
- The developer intends to use the latest sustainable construction methods and materials such as solar power to minimize the environmental footprint of the development. The layout has been designed maximizing south exposure to ensure the most harmonious residential development for the site.

3 Vista Springs / Official Community Plan Vision Alignment

How Vista Springs supports the vision of the RM of Edenwold Official Community Plan:
With reference to the RM of Edenwold's Official Community Plan (OCP) providing guidance and help, we support the vision and the objective to ensure our new development is in alignment to the OCP. The goal for Vista Springs is to create a community that sees the importance of protecting the environment, takes pride in the captivating landscapes and wants to live a more environmentally responsible life. We want to provide others this unique opportunity to live in this wonderful community.

After reviewing the OCP Community Priorities, we feel that our vision and goal is very much in alignment with these goals, see below:

Ensure compatible land uses across the municipality

The goal is to maximize space while still maintaining adequate land division for lots that are larger than city lots, one of the many reasons people choose to live in RM of Edenwold, Emerald Park, etc. Each lot is situated to be able to take advantage of the aesthetically appealing view of the valley, with no obstructions blocking views. The goal is to offer lots that are similar to neighboring areas. Based on all of the maps within Appendix A of the OCP, this area falls within residential planning.

Protect and maintain the character of residential subdivisions in Emerald Park and country residential developments

As stated above we would be developing lots in a similar fashion to neighboring communities to preserve and keep the community look and feel. As well have smaller acreages, a "country residential feel" which is in alignment to the OCP, that states it is a priority to maintain the rural character of the areas, recognizing the need to provide a variety of housing options to cater to the resident's different needs.

Encourage and support the development of local recreation and leisure amenities

The development of Vista Springs embraces the natural state of the land and would create walking paths and cross-country ski trails for those to enjoy the beauty of the creek. It will have a green space to encourage community involvement and leisure amenities. As well, the future home of a community garden/green house to promote health and wellness. It would be a future plan to connect the pathways to the neighboring communities.

Environmental stewardship

This project will aim to improve sustainability and enhance energy efficiency or reduce negative environmental impacts or waste – key objective of the Vista Springs. The driving force behind the development of Vista Springs is to find ways to be as energy efficient and environmentally responsible as we can. The infrastructure will be taking those factors into account wherever possible, including and not limited to: solar power, battery storage, composting, geo thermal heating. And we want to offer that to other like- minded individuals in a cost-effective manner.

Protect prime agricultural / heritage lands

The small ravine and creek will be protected, no construction impacting that area. The pathways will be natural and synonymous with the existing landscape. As well the land was surveyed for any heritage artifacts to ensure we respect the land and policies.

Support the development of a variety of housing forms in appropriate locations to meet the needs of the local work force and the growing population

We feel that the new generation of young families and those who are interested in doing what they can for the environment, want to make a difference but do not know how to start. By developing a pilot home with all the energy efficient technologies available to us, we can offer this opportunity to those and have some evidence that it can be done. So we want to give others the opportunity to fulfill their environmental goals and eliminate some of the risk. This opportunity will also provide potential learnings to other communities and even small changes which can start to have big impacts.

Continue to work collaboratively with neighbouring municipalities, local First Nations and other external authorities and improve working relationship with White City Council

The developer would recognize all the neighboring communities and would work with them as it permits. We would also encourage the amenities in both communities to new families and to support local businesses. We would also explore partnering with local businesses to fulfill these energy efficient objectives

4 Land Use Policy and Zoning

The land is currently zoned Agricultural Resource and would have to be re-zoned as CR3 which fits within the RM's Official Community Plan.
The land is designated as Residential in the RM's Official Community Plan (OCP) Future Land Use Map 7A. The proposed development meets the Community Priorities identified in Section 1.6 of the OCP. This parcel is located close to existing Country Residential developments and does not conflict with adjacent land uses. In fact, it complements the existing subdivisions by providing a secondary access, improves walkability in the area and adds landscaping features,

The following Clauses from the Zoning Bylaw have been addressed:

Clause 3.20 – Additional Information is included with this submission.

Clause 3.24D – A public consultation has been completed. Questions complete with answers from the public open house have been appended to this report.

Clause 3.24E - Walking paths through the development are to be provided.

Clause 3.24F – A formal traffic impact assessment was not required for this development. Improvements are to be made to Betteridge Road from Jaxon Roadd to the internal subdivision road.

Clause 3.24I – See attached preliminary landscaping plan (Appendix G) which meets the setbacks of the RM's 2B. Actual details will be confirmed in detailed design.

Clauses 3.32/3.35 – The developer is prepared to enter into the Servicing Agreement and pay the applicable Development and Connection Fees.

Clause 4.10 - The proposed grading plan complies with general engineering and Water Security Agency standards.

Clause 4.14 – He will ensure the approaches do not alter the intent of the drainage design by submission of an approach permit or engineered road plans to the municipality.

Clause 4.15 – RM standards will be followed for the road design. Construction of the east/west access road will meet and exceed gravel road construction requirements.

Clause 4.33 – A geotechnical report and water drilling report are attached as appendix C & D. A review of these reports does not identify potential contamination issues with this development. All guidelines from Saskatchewan Health Authority and WSA will be followed.

Clauses 4.35/4.36 – WSP has completed an on-site Heritage Resource Impact Assessment which has been included in Appendix H. The section immediately east of the proposed development is identified as Conservation Land in the RM's OCP. As a result, Hunter Creek has been identified as Environmental Reserve on the Concept Plan which prevents any disturbance to the area caused by the development.

Clause 4.37 – We have dedicated the 0.50ha area encompassing Hunter Creek as Environmental Reserve.

Clause 4.44 – The Landscaping will follow RM requirements as well as additional areas, buffers, and permaculture plans and policies. Including vegetative buffers in lieu of fences.

Clause 4.46 – The proposed concept plan meets the setback requirements for development adjacent to pipeline right of ways. The landscape plan shows a pathway on the easement to connect the development to the north/south municipal road located east of the development.

Clause 4.48.1 – The geotechnical report confirmed there was no potential for unstable slopes or issues with the aquifer. No buildings will be located in the floodway.

Clause 4.48.4 – The houses are going to be set a minimum of 1.5 m above the 1:500 flood level which exceeds the RM's 0.5 m guideline. No permanent structures will be installed in the floodway fringe unless they exceed the 1:500 flood elevation by 0.5m. This includes sewer manholes and pumphouses

Clause 4.48.5 – The Creek area has been identified as Environmental Reserve to eliminate the chance to disturb the creek and existing vegetation. The “green” pathways to the creek were identified as existing drainage courses and existing vegetation will be maintained in these areas as well.

Clause 4.48.6 – All structures will be set a minimum of 1.5 m above the 1:500 flood level. Backfill, excavation, storage or depositing earth or other material is not permitted within the floodway fringe, parallel or within flood elevation. All hazardous substances and waist are strictly prohibited.

Clause 4.48.7 – 1:500 flood elevation has been determined (Elev 600 as stated in geotechnical report appendix D and within CDP summary). Trees and vegetation will not be cleared within 20m of watercourse. Minimum building setbacks will be maintained. In all cases development will be carried out in manor that minimizes impact on waterways.

Clause 4.48.8 – Geotechnical report is provided in appendix D. Site is suitable, and drainage will be managed as required, as identified in detailed site grading and drainage plan provided in appendix A. Final engineered drawings will be provided for review upon completion.

5 Architectural and Design Guidelines

It is the intent of the developer to be in full compliance with all RM requirements and all authorities that have jurisdiction. All building and landscaping to be in harmony and support with natural features of the land.

Buildings (following guidelines to be used in design):

- Single story homes are preferred, minimum 1200 ft^2 main floor living space with attached 2 or 3 car garage.
- Highest quality exterior finishes that accentuate in harmony with natural features of the land and surrounding properties (Such as, Stone, Stucco, Architectural Panel, Architectural Wood Panel, and Timber)
- Eco friendly design must be demonstrated, minimizing energy and resource consumption for each home and property.
- Must receive approval of development group prior to construction.
- No vehicle or equipment parking will be allowed on street or front driveway. Secondary shop or carriage houses will be allowed subject to following RM regulations, must be accessible from front with paved or concrete driveway.

Landscaping:

- Natural harmonious sustainable features, plants, and products that support and maintain the natural features of the area.
- Use natural barriers such as trees, hedges, and shrubs to create property barriers, fences will only be approved on special exception and are not preferred.
- Permaculture design including edible landscapes and xeriscape design are preferred.
- Exiting tree and vegetation cover shale be preserved whenever possible.

Building and Landscaping designs must be approved by developer and RM prior to construction.

6 Market Assessment

The City of Regina, and the areas surrounding the City such as the RM of Edenwold, are currently experiencing a residential housing shortage in the move-up or Country Residential market. The region is recognized as a good location to invest in and to raise a family in. There is a growing demand for the “rural” lifestyle but with urban amenities such as treated water and good road access. There is a desire to have an affordable nice house with a larger garages and sufficient spaces for RV parking and landscaping. The proposed Condominium Development provides this option. This development does not compete directly with residential development within the City of Regina, Emerald Park and White City.

7 Proposed Infrastructure Improvements

7.1 Water

The following infrastructure improvements are proposed for this development:

- The proposed development will hook up to a municipal water system.

- The following will be the water demand at full development:

  - Residential Average Day Demand = 16,000 L/day
    = 16 m^3/day
    = 5,840 m^3/year
    = 0.37 L/s*
  - Peak Day Demand = 2.1 x Average Day Demand = 0.78 L/s*

    - Peak Hour Demand = 3.2 x Average Day Demand = 1.18 L/s

    * Flows calculated using 12 hours a day to ensure sufficient pipe size

- Size of looped water line required = 50 mm. The developer has already installed a large diameter well as a water source.

- Developer will make an application to the SHA upon approval of the concept plan and after completion of the detailed engineering drawings.

7.2 Sanitary Sewer

- Each lot will have individual sanitary sewer service consisting of solid separation, typical type two mound as well as nitrogen removal system similar to “Orenco AdvanTex NSF-40” or equal (appendix E).

- The volume of sanitary sewage generated would be approximately 11.10 m^3/day and be treated via septic chamber, nitrogen removal and sewage mound. The septic tanks remove the solids in the effluent and provide 50% of the treatment required. The nitrogen removal will further treat the water prior to discharge into the mound decrease on the area loading.

- The geotechnical investigation (Appendix D), soils investigation (Appendix D) and level 2 assessment (Appendix D).

7.3 Drainage

- Surface drainage will follow existing drainage patterns which are generally north to south to Hunter Creek as shown on the existing contour plan. The Condominium Plan has established walkways and drainage routes to match the existing overflow routes. This will limit grading requirements and reduce the possibility of soil erosion.
- There is no impact to adjacent properties.
- The drainage plan also shows preliminary minimum building grades. The site lends itself to walkout lots which would be determined in detailed design.
- The minimum grades exceed the 1:500 flood level by 1.5 meter as determined by the top of road elevation located at the railway crossing. This meets or exceeds requirements.
- Site drainage will be completed as per site drainage plan to be provided with final site Engineering drawings.
- As part of the architectural controls the developer is strongly recommending that each home will have a rainwater catchment system and storage tank for additional irrigation purposes. The catchment system would be from roof via eve to buried tank.
- Existing vegetation will be maintained by minimizing construction excavation areas, all excavation areas will require pre-approval prior to excavation, and only disruption of the immediate area will be permitted with erosion control and revegetation measures.

7.4 Roadways

- Internal roads to be 7 m for two-way traffic and a 6 m top for one-way traffic surfaced to the following minimum standard:

    - Traffic gravel – 50 mm
    - Type 32 Base – 200 mm
    - Woven Geotextile

- Internal road is complete with shaped drainage ditch, future driveway access to each home will maintain drainage requirements.

- Vista Drive is the proposed name for the developments internal roadway and will be submitted for approval under the RM of Edenwold's Road, Park and Subdivision Naming Policy.

- Development access will be via Betteridge Road East extension from Jaxon Road to Development. The developer is amenable to negotiate cost-sharing of the chip seal rehabilitation/upgrade of Park Meadows Drive/Jaxon Rd, as requested by Council, with no further improvements to Betteridge Road required by developer. Further details to be confirmed as part of the Servicing Agreement

- There were some discussions in the past about using this road allowance to connect Betteridge Road to Highway 48. This was rejected due to the complication of the creek crossings, proximity to existing country residential development and the need to cross the Conservation Land. Further discussion with the RM and White City is required if this road is a possibility.

7.5 Other

- Each individual parcel will be serviced by power, natural gas and telephone which are in close proximity.

- Accessory buildings and storage of recreational vehicles such as RV's or boats will comply with the RM's standards identified within their Zoning Bylaw as well as additional provisions established by the Developer.

8 Traffic Impact Assessment

It is anticipated that upon completion of the new access road in phase 1 there will be little impact to the Meadow Ridge and Park Meadows road network other than the occasional vehicle.
In terms of traffic, phase 1 of the development will generate a maximum of 10 additional vehicle trips/day, upon completion phase 2 generating a maximum of 110 vehicle trips/day (11 @ peak am/pm/hr). This volume will have negligible impact on existing roads and has already been considered in the growth projections for the area. A Development traffic plan & procedure will be created at start up phase and will be managed by developer to ensure development access via the newly constructed access road, this will include signage and management as required.

9 Schedule

In terms of scheduling, it is market dependent, but here is a general framework the developer considers as feasible:

Task	Timeline
Concept Plan and CDP Approval	December 2021 – October 2022
Preliminary Engineering Submission	January 2022
Detailed Design of Infrastructure	March – December 2022
Subdivision and Re-Zoning Approval	January - October 2022
Lot Sales (Phase 2)	Spring 2023
Construction (Phase 2)	2023 - 2024

Staging of the development will also be market driven. Further discussion with the developer and the RM may be required prior to signing the Servicing Agreement.

10 Servicing Costs/Development Levies/Tax Revenue

Detailed servicing costs have been prepared and are appended. The developer will be responsible for the initial construction of the infrastructure. The developer is prepared to pay the Servicing Agreement Fees, Performance Securities and hook-up fees as dictated by the RM. Given that the development will be standing alone as far as water and sewer, the only appropriate connection fees would be for the access road and administration.

In terms of tax revenue for the RM, assuming $5,000 per year per unit at 11 units equates to $55,000 per year or $1.1 million in 20 years with the RM not having to provide internal operation and maintenance of the infrastructure.

11 Public Consultation Plan

A Public Open House for the proposed development, Vista Springs, was held on December 2, 2021 at the RM of Edenwold Office. The developer and members of the design team were present at the event, and Tom Williams from Walker Projects, as well as two RM of Edenwold representatives, managing process and participated where required answering relevant questions.

Eighteen members of the community attended. Sign in sheet is kept in confidence with the RM of Edenwold, as well as minutes taken with questions and concerns raised included in Appendix J. There was an open discussion of concept plan from 7pm to 7:15pm and introductions completed, the development group commenced with presentation at 7:15 pm followed by question and answer period.

Summary of discussion items, question and answers below:

- Question and concerns were raised regarding additional traffic north via Jaxon Road thru Meadow Ridge? (The presentation and discussed reviewed the developers traffic study and traffic plan identifying that both from an accessibility and timing perspective the preferred direction for all west bound traffic is via Betteridge Road. The developer and RM representative identified that an “All Weather” road extension of Betteridge Road would be provided in phase 1 development to connect the development to White City Drive and Betteridge Road West, the developer also identified that traffic plan, signage and construction management would ensure ALL traffic to development during the construction phase would ONLY be permissible via Betteridge Road extension and would be strictly enforced. Further discussion continued identifying that the 14 single family homes would generate a very small amount of traffic, “14 vehicle trips per hour at a peak traffic hour” defined in traffic study plan as provided by Walker Projects)

- Further questions were asked “What is meant by an all-weather road”? (Answer provided, gravel or paved road as per RM requirements, assessable in all four seasons) Followed with additional question asking will the roadway be paved, and if so how will it be paid for? (answer provided “this is still under review and discussion between the RM and developer)

- Water concern was raised asking how the development will be serviced (answer provided, 50mm water line line will be provided by the developer to Town of White City water connection at White City Drive, it was mentioned by Tom (Walker Projects) this new water line may also function as secondary lope, and could be very beneficial in long term planning and operations for all within the community and sounding areas)

- Further discussion followed regarding the developed Vista Sprigs well for irrigation, it was identified this well would have no negative impact on wells in the surrounding area, and the focus of the eco friendly development is water and wastewater conservation and management, including a plan to foster and promote permaculture concepts while maintain green space, as well as rain water capture. These concepts will be used to effectively manage Vista Springs and may provide an example for future developments in alignment with RM of Edenwold’s long term goals and “Green” strategy.

- Question was asked regarding plan for On-site Sanitary (answer provided, intention is a triple redundant on-site sanitary system (Septic tanks to remove & manage solids, aeration, and mound as required), meeting and exceeding Saskatchewan Health Authority “SHA” regulation. Detailed engineering and consultation with SHA are ongoing.
- Question was raised regarding lot size and harmony with the area, and specifically how some lots in the area are larger than 4 or 5 acres (Answer provided, although the intention of this Bare Land Condominium development is large spacious lots in the order triple the size of “typical city lot” these lots are in the order of 0.7 acres, they are purposely smaller than large acreages to minimize the individual maintenance, however the development as whole will only have the 14 defined lots and the remainder of the development will be comprised and managed as common open green space, as well as designated environmental reserve, this extensive and expansive common green space with walking paths and recreation area is accessible to community member in the area. The common green spaces will extend from the central park in front central area of all lots, and continue with paths thru green buffer areas connection to expansive common green space and paths behind all lots, with continuous open sightlines to the environmental reserve encompassing Hunter Creek. The primary focus and feature of this development is to maintain and nurture an open harmonious development that accentuates and maintains the natural features and beauty of the area.

The spirit of the open house was to provide an open and inviting forum for discussion about the proposed development, inform stakeholders and provide an opportunity for all stakeholders to provide comment or questions relating to development.

A mail out was distributed to all neighbours within 0.8 km of the proposed subdivision, and advertised via newspaper to notify additional stakeholders, two weeks prior to the event. The public letters were sent from RM Office. Documents included in the mail out; date, time, location and details of open house, summary of various options to participate and communicate, project summary concept, and comment / question summary sheet. The completed question summary sheets have been received from open house, none received via email prior to December 9, 2021 one week after open house.

The details of the Open House were as follows:

- Communication packages including date, time and location details were mailed from RM of Edenwold (Proposed location 100 Hutchence Rd, from 7 to 9pm).
- Communication packages included, a comment / question summary sheet, with a check option to receive further information or decline, it also provided options to attend the open house via online meeting option, or in person.
- There was a presentation at 7:15pm for all in attendance, however there were no online attendees.
- The Communication package was also available at the Open House for participants to reference during the presentation, and after.

- A sign in sheet was available for those participating to provide their name, address and an optional email for further updates on status of the project
- A question table workspace was provided for those who wanted to submit their questions anonymously
- The Developer provided details regarding the proposed development, as well as representatives from Project / Engineering team answered relevant questions.
- Questions were responded to at the Open House, the correspondence will be made available in a final summary.
- All notes, questions, concerns, and responses are incorporated into the CDP Appendix J.
- Concerns will be taken into consideration pending regulations and policy
- RM of Edenwold Covid 19 policy was followed for all in attendance.

Along with the Open House the Development group will make themselves available via, email, mail, or in person to any community member who has questions. The Developer is available to present or attend a RM Council meetings as required. Public engagement details, including meeting notes, list of attendees, questions or concerns with responses, are included in Appendix J.

12 Recommendations

The RM approve the concept plan and CDP as submitted to allow the developer to proceed with the next steps in the process which are the preparation of the proposed plan of subdivision and the detailed engineering drawings.

Association of Professional Engineers & Geoscientists of Saskatchewan

CERTIFICATE OF AUTHORIZATION

WCE Design Inc.

Number 65465

Permission to Consult held by:

Discipline	Sk. Reg. No.	Signature
Civil	21518	

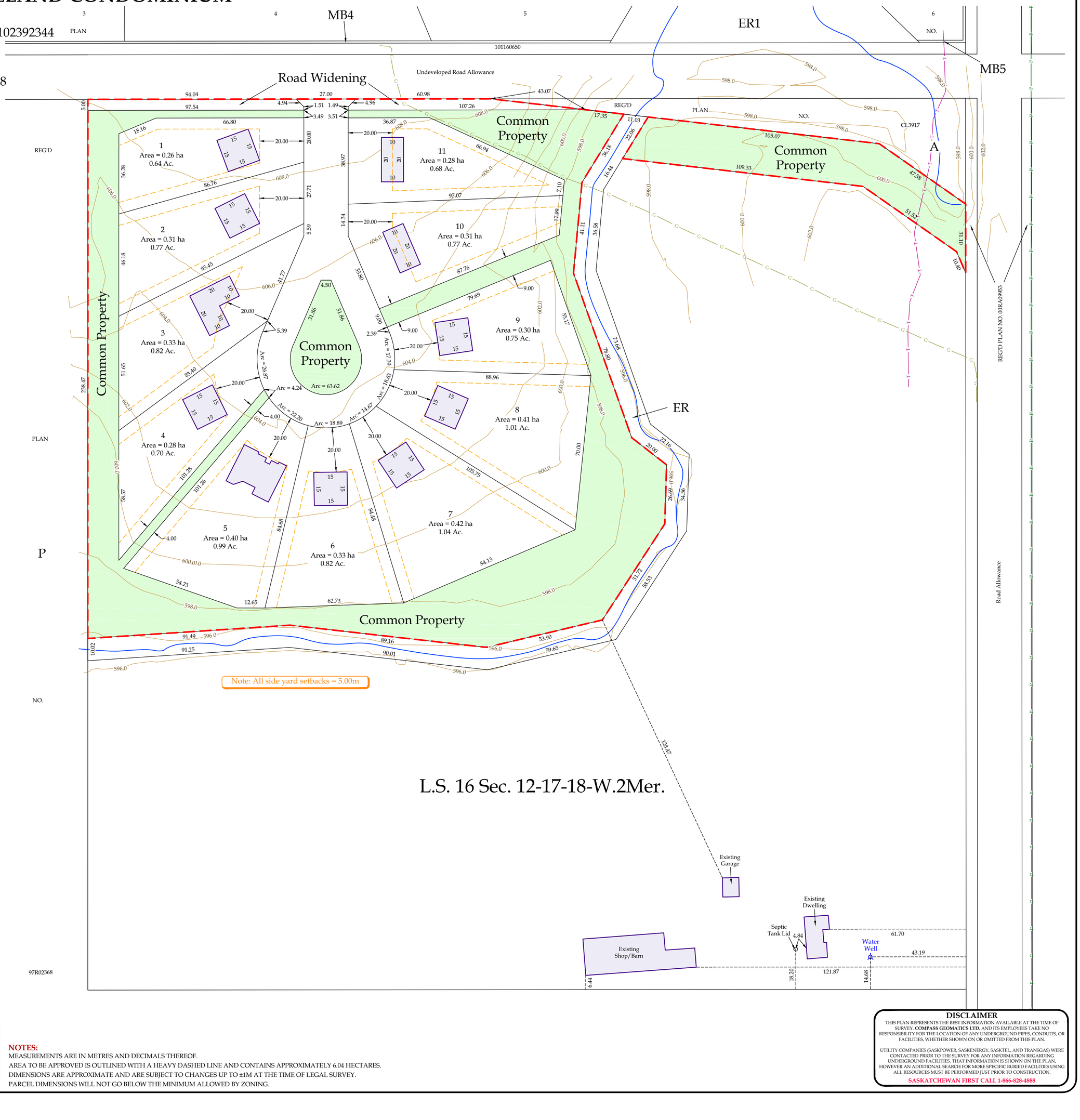
Dustin Weiss, P. Eng.
Senior Civil Engineer
WCE design inc.
dustin.weiss@wcedesign.ca

Appendix A – Subdivision Concept Plan, Site Servicing and Drainage Plans

PLAN SHOWING

PROPOSED BARELAND CONDOMINIUM

OF PART OF
PARCEL B & C, PLAN NO. 102392344
L.S. 16 SEC. 12
TWP. 17 RGE. 18 W.2 Mer.
RM OF EDENWOLD NO. 158
SASKATCHEWAN
SEPTEMBER, 2022
SCALE 1:1000



LEGEND:

- COMMON PROPERTY
- BUILDING
- CREEK C/L
- FENCE
- SASKENERGY
- SASKPOWER
- SASKTEL
- BUILDING SETBACK LINE

COMPASS Geomatics Ltd.
REGISTERED LAND SURVEYORS
COMPASS DWG: 00822-21-PSUB-R18_Concept

NOTES:

MEASUREMENTS ARE IN METRES AND DECIMALS THEREOF.
AREA TO BE APPROVED IS OUTLINED WITH A HEAVY DASHED LINE AND CONTAINS APPROXIMATELY 6.04 HECTARES.
DIMENSIONS ARE APPROXIMATE AND ARE SUBJECT TO CHANGES UP TO ±1M AT THE TIME OF LEGAL SURVEY.
PARCEL DIMENSIONS WILL NOT GO BELOW THE MINIMUM ALLOWED BY ZONING.

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Project Management Initials: Designer: _____ Checked: _____ Approved: _____

ISO A1 594mm x 841mm

DRAWING LIST

DRAWING No.	DRAWING TITLE
C000	COVER SHEET
C100	OVERALL GRADING & DRAINAGE
C101	PLAN & PROFILE BETTERIDGE ROAD STA 0+000 TO 0+300
C102	PLAN & PROFILE BETTERIDGE ROAD STA 0+300 TO 0+600
C103	PLAN & PROFILE BETTERIDGE ROAD STA 0+600 TO 0+900
C104	PLAN & PROFILE BETTERIDGE ROAD STA 0+900 TO 1+200
C105	PLAN & PROFILE BETTERIDGE ROAD STA 1+200 TO 1+351
C106	PLAN & PROFILE SUBDIVISION ACCESS ROAD STA 0+000 TO 0+270
C107	CROSS SECTIONS & DETAILS

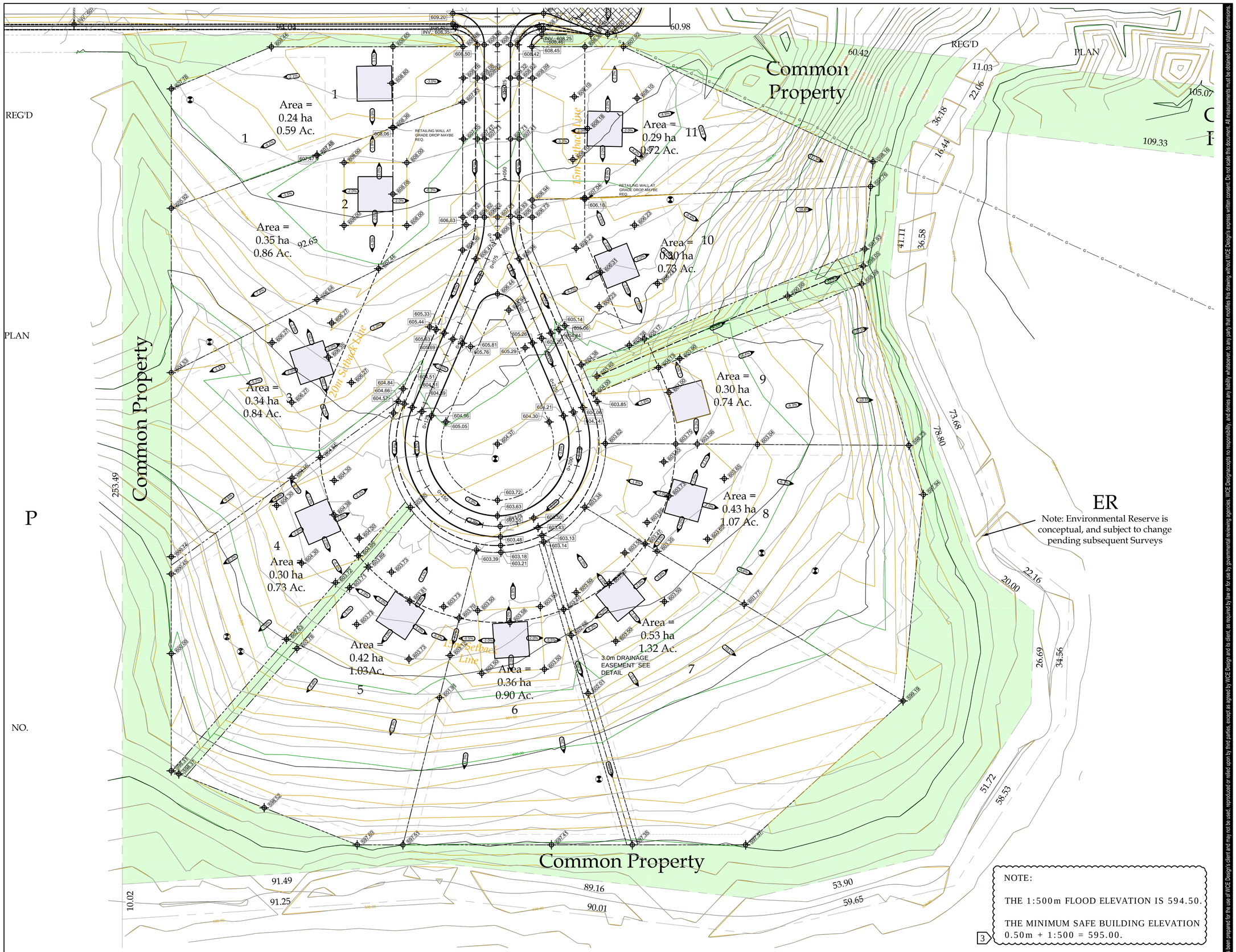
1 C000 KEY PLAN N.T.S.

VISTA SPRINGS
RM of Edenwold, Saskatchewan

WCE design inc.

RE-ISSUED FOR CONSTRUCTION, July 12, 2022

22-003



NOTE:

THE 1:500m FLOOD ELEVATION IS 594.50.

THE MINIMUM SAFE BUILDING ELEVATION 0.50m + 1:500 = 595.00.

3

1 | OVERALL SITE PLAN
C-100 | 1:500

Project Management Initials: ____ Designer: ____ Checked: ____ Approved: ____ ISO A1 594mm x 841mm

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WCE design inc.

PROJECT

VISTA SPRINGS

CLIENT

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1831 MCCRAE DRIVE
REGINA, SASKATCHEWAN
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SEALS

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Association of Professional Engineers & Geoscientists of Saskatchewan
CERTIFICATE OF AUTHORIZATION
WCE Design Inc.
Number 65465
Permission to Consult held by:

Discipline	Sk. Reg. No.	Signature
CIVIL	21018	

ISSUE/REVISION

I/R	DATE	DESCRIPTION
4	22-07-12	ISSUED FOR CONSTRUCTION
3	22-07-07	ISSUED FOR CONSTRUCTION
2	22-06-28	ISSUED FOR CONSTRUCTION
1	22-05-19	ISSUED FOR CONSTRUCTION
0	22-05-06	ISSUED FOR REVIEW

PROJECT NUMBER

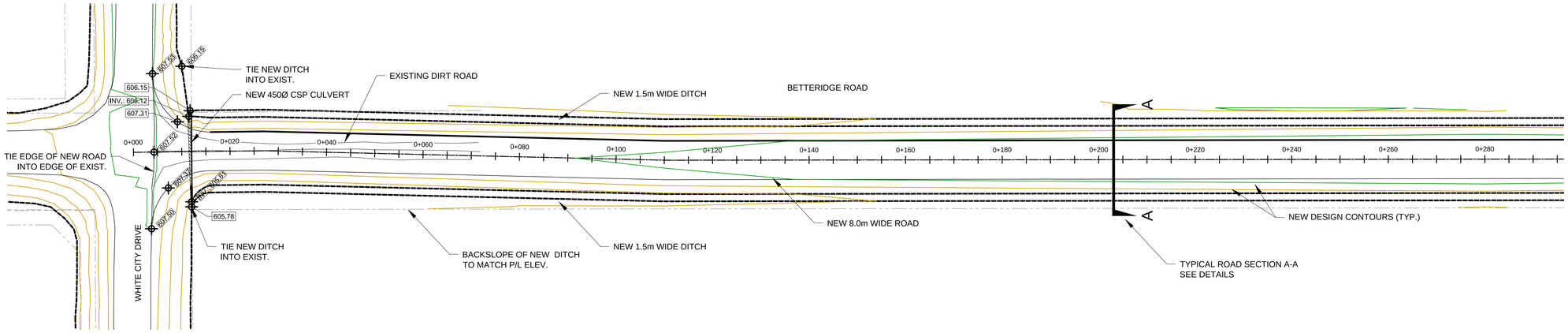
22-003

SHEET TITLE

OVERALL GRADING & DRAINAGE

SHEET NUMBER

C-100



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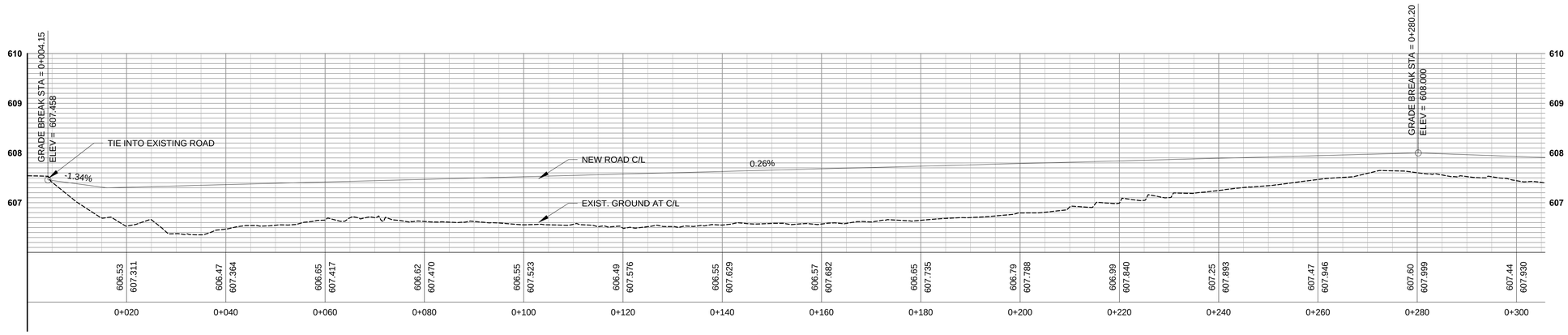
1 | PLAN
C-101 | 1:500



1 | PROFILE
C-101 | H. 1:500 V. 1:50

Project Management Initials: Designer: ____ Checked: ____ Approved: ____ ISO A1 594mm x 841mm

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Filename: G:\SHARED DRIVES\WCE DESIGN\22-003 VISTA SPRINGS\900 - CAD\910 - CAD\DBAS_20220712.DWG

WCE design inc.

PROJECT

VISTA SPRINGS

CLIENT

BMA VENTURES INC.
1831 MCCRAE DRIVE
REGINA, SASKATCHEWAN
S4N 0S4

CONSULTANT

WCE design inc.
80 EMERALD RIDGE EAST
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MEMBER 21568
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Association of Professional Engineers & Geoscientists of Saskatchewan
CERTIFICATE OF AUTHORIZATION
WCE Design Inc.
Number 65465
Permission to Consult held by:

Discipline	Sk. Reg. No.	Signature
CIVIL	21568	

ISSUE/REVISION

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1	22-05-19	ISSUED FOR CONSTRUCTION
0	22-05-06	ISSUED FOR REVIEW

PROJECT NUMBER

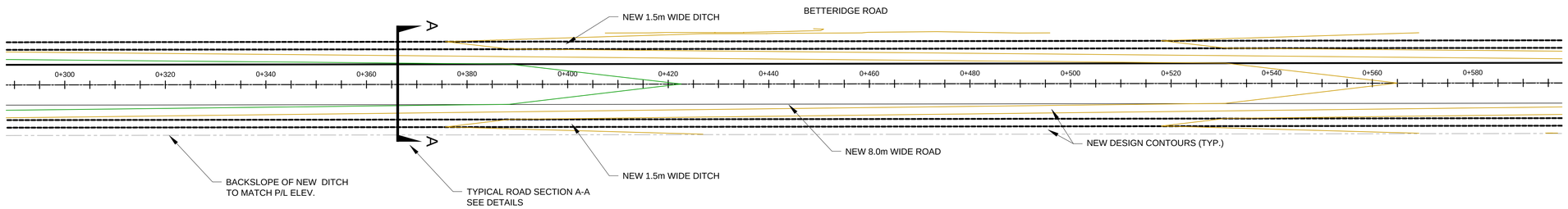
22-003

SHEET TITLE

PLAN & PROFILE
BETTERIDGE ROAD
STA 0+000 to 0+300

SHEET NUMBER

C-101



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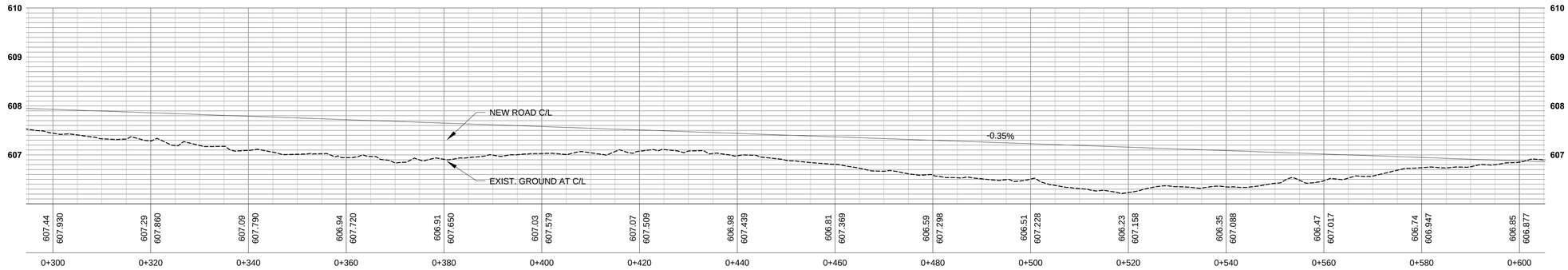
C-102 | 1:500



1 | PROFILE
C-102 | H. 1:500 V. 1:50

WCE design inc.

PROJECT

VISTA SPRINGS

CLIENT

BMA VENTURES INC.
1831 MCCRAE DRIVE
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PROJECT NUMBER

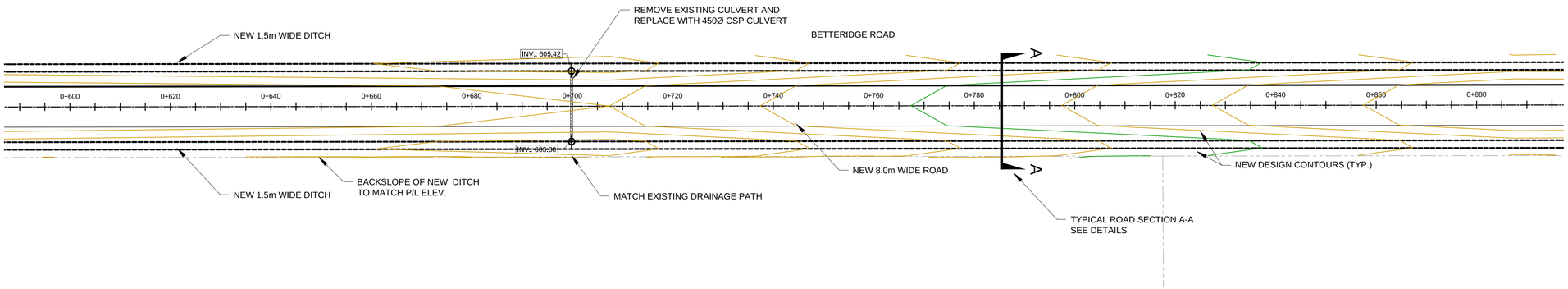
22-003

SHEET TITLE

PLAN & PROFILE
BETTERIDGE ROAD
STA 0+300 to 0+600

SHEET NUMBER

C-102



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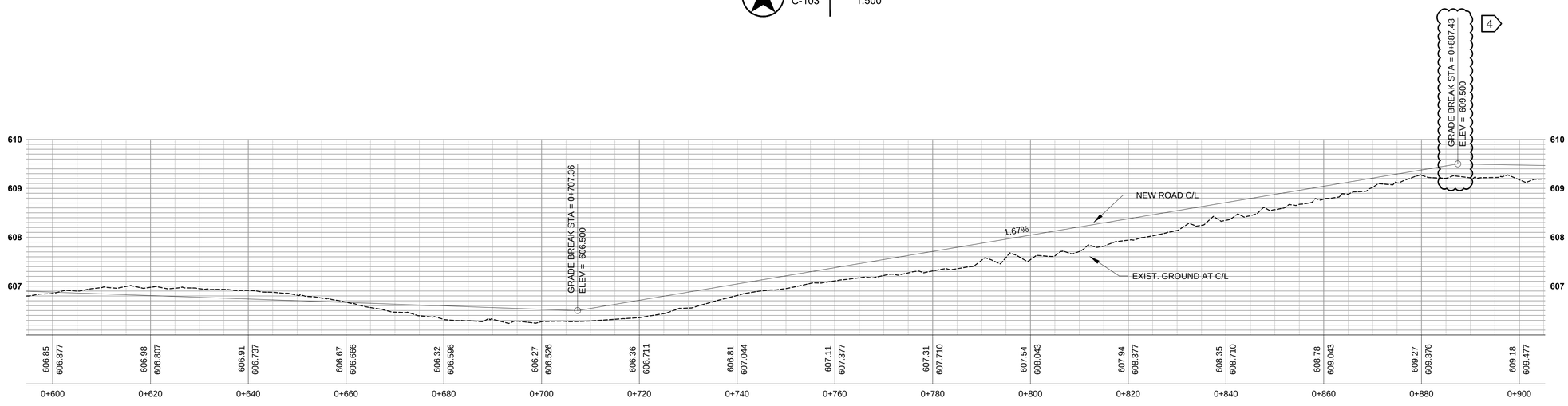
C-103 | 1:500



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WCE design inc.

PROJECT

VISTA SPRINGS

CLIENT

BMA VENTURES INC.
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PROJECT NUMBER

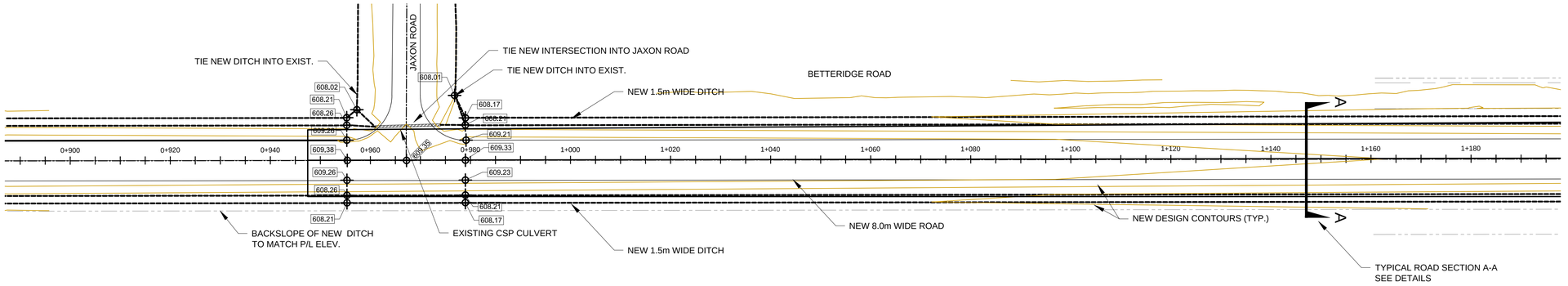
22-003

SHEET TITLE

PLAN & PROFILE
BETTERIDGE ROAD
STA 0+600 to 0+900

SHEET NUMBER

C-103



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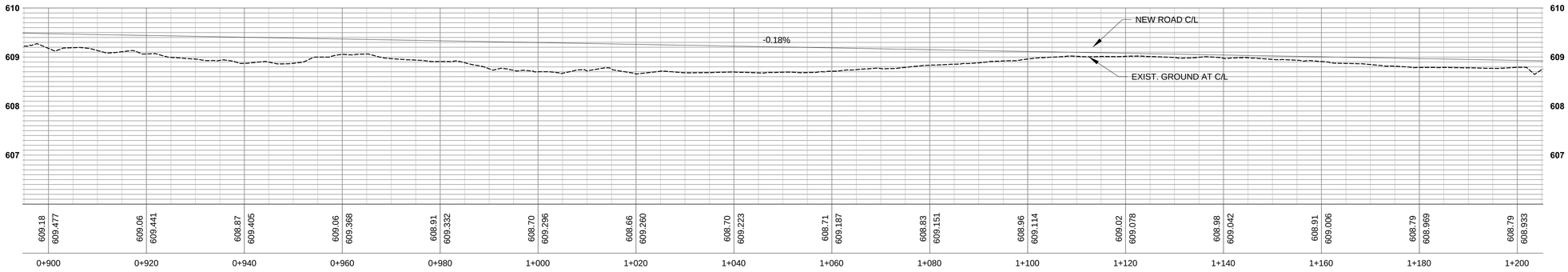
1 | PLAN
C-104 | 1:500



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C-104 | H. 1:500 V. 1:50

Project Management Initials: Designer: Checked: Approved: ISO A1 594mm x 841mm

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WCE design inc.

PROJECT

VISTA SPRINGS

CLIENT

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Discipline: CIVIL | Sk. Reg. No.: 21518 | Signature:

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PROJECT NUMBER

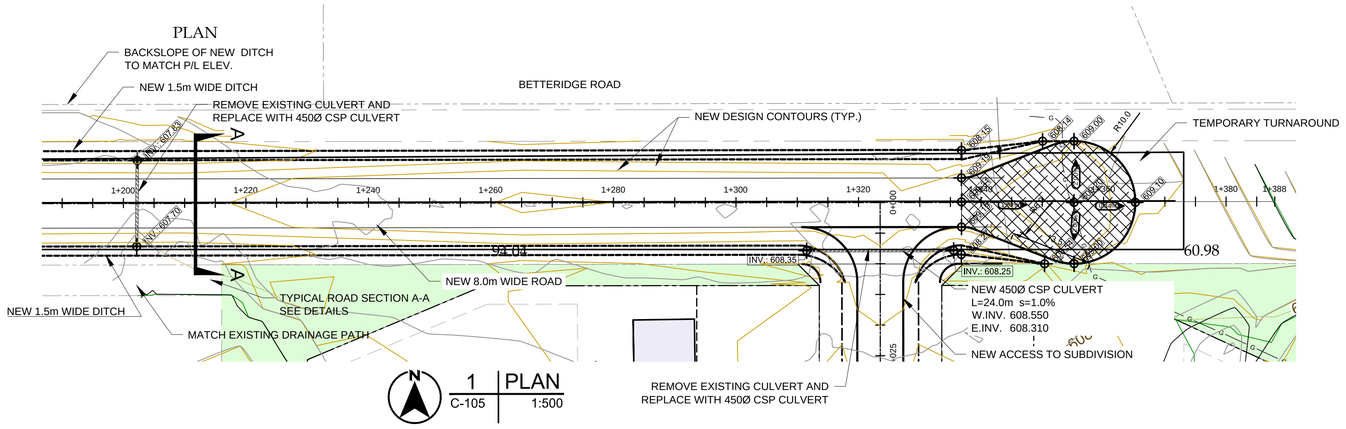
22-003

SHEET TITLE

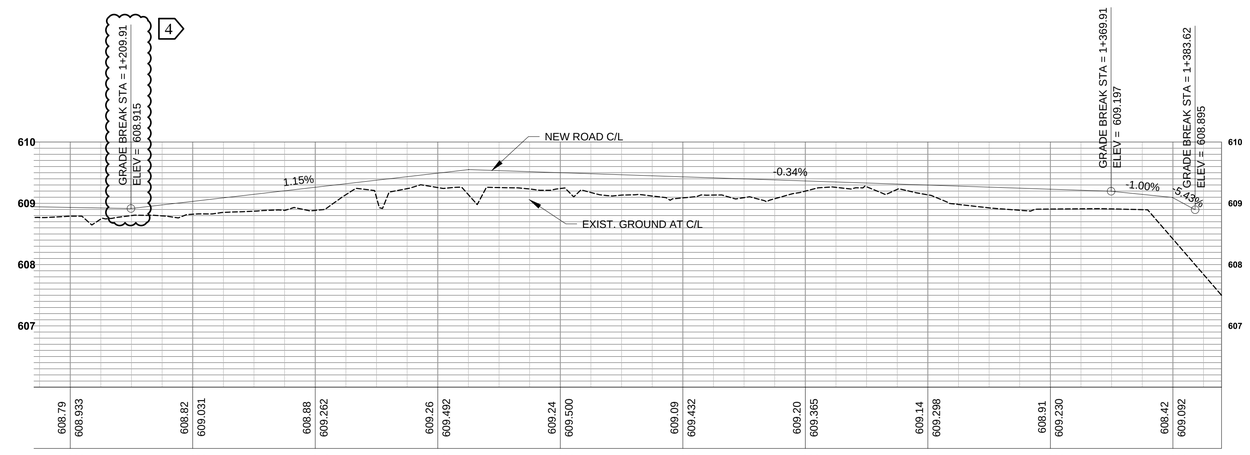
PLAN & PROFILE
BETTERIDGE ROAD
STA 0+900 to 1+200

SHEET NUMBER

C-104



1 | PLAN
C-105 | 1:500



1 | PROFILE
C-105 | H. 1:500 V. 1:50

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PROJECT

VISTA SPRINGS

CLIENT

BMA VENTURES INC.
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PROJECT NUMBER

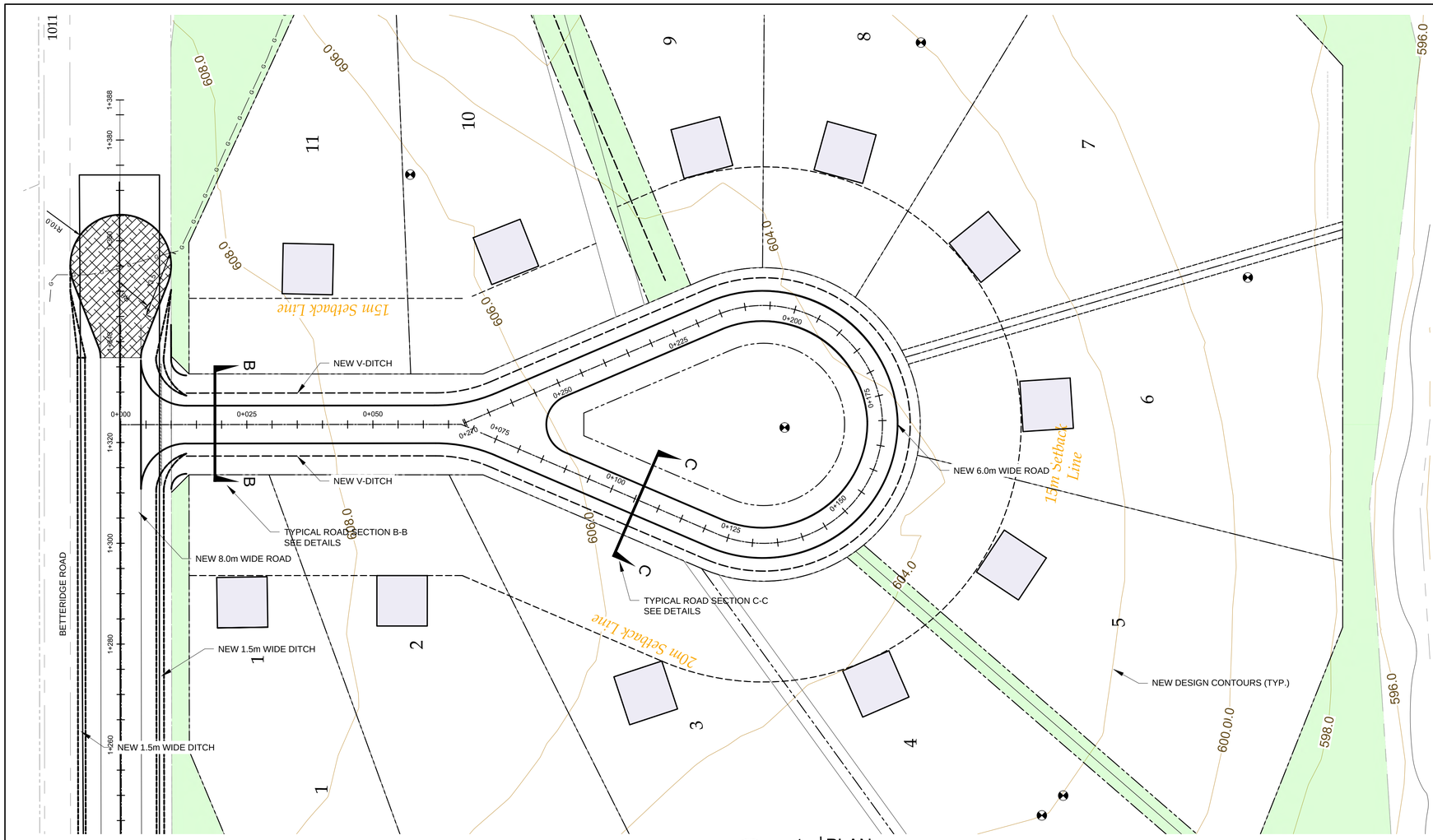
22-003

SHEET TITLE

PLAN & PROFILE
BETTERIDGE ROAD
STA 1+200 to 1+351

SHEET NUMBER

C-105



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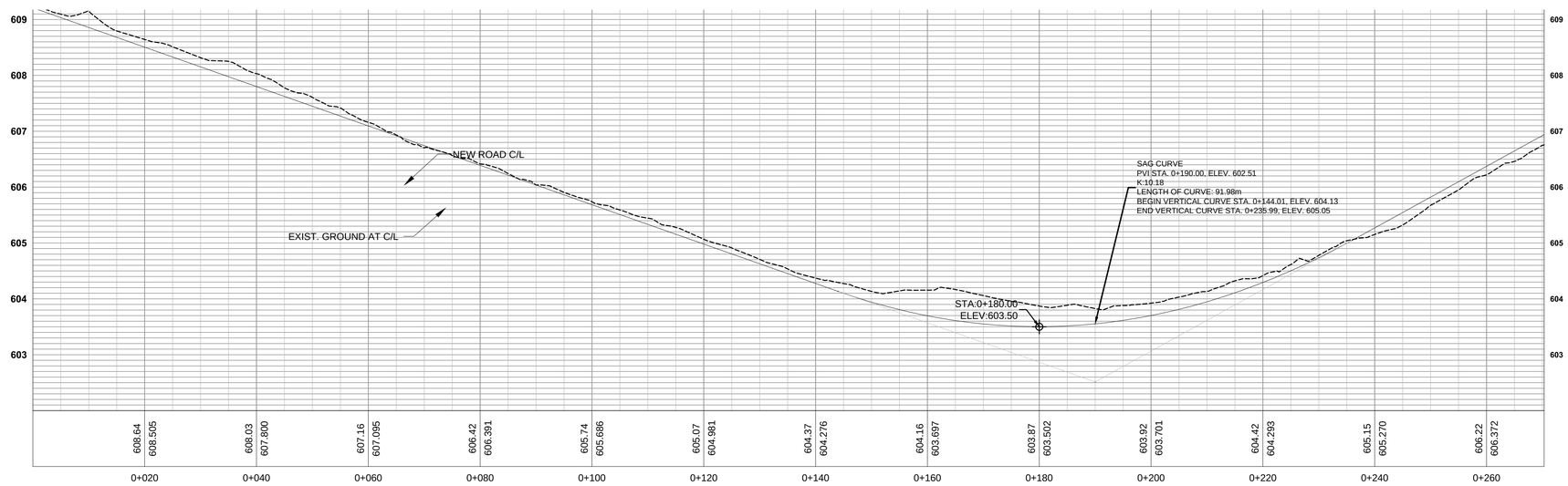
C-106 | 1:500



1 | PROFILE
C-106 | H. 1:500 V. 1:50

WCE design inc.

PROJECT

VISTA SPRINGS

CLIENT

BMA VENTURES INC.
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PROJECT NUMBER

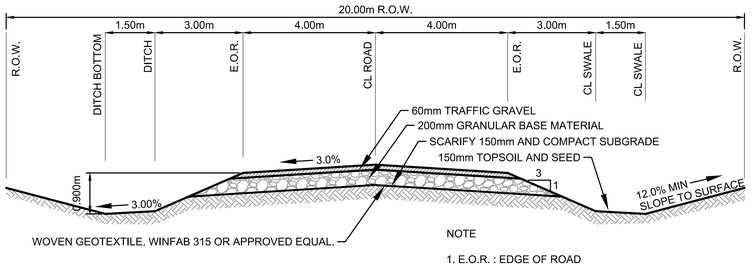
22-003

SHEET TITLE

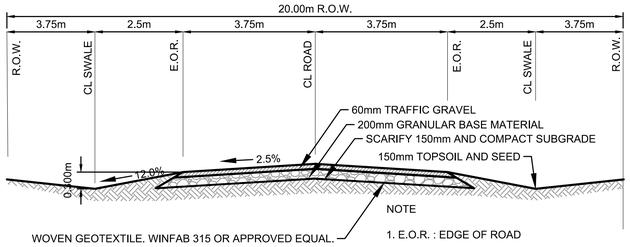
PLAN & PROFILE
SUBDIVISION ACCESS ROAD
STA 0+000 to 0+270

SHEET NUMBER

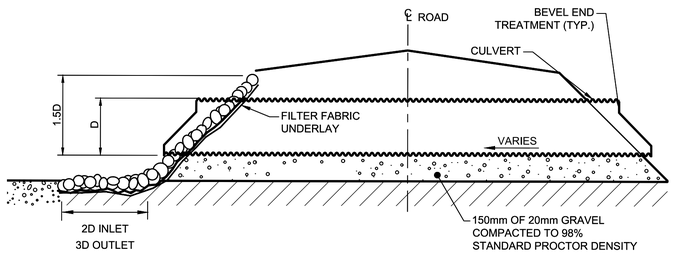
C-106



1 | LOCAL ROAD - CROSS SECTION A-A
C-107 | N.T.S.

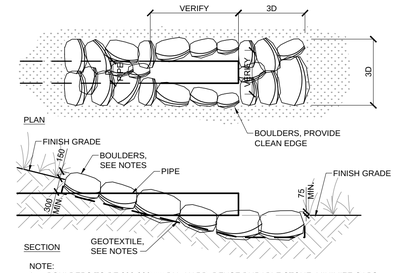


2 | LOCAL ROAD - CROSS SECTION B-B
C-107 | N.T.S.



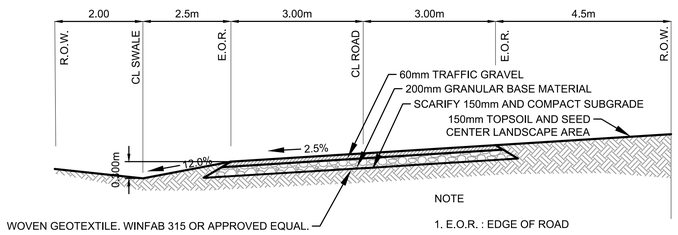
SECTION
CULVERT INLET AND OUTLET

3 | CULVERT INSTALLATION DETAIL
C-107 | N.T.S.

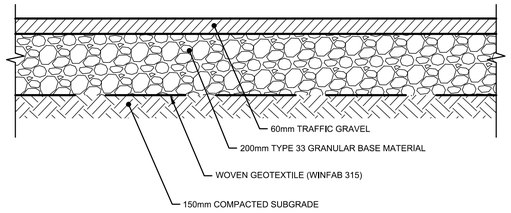


NOTE:
1. BOULDERS TO BE 200-300mm DIA. HARD, DENSE DURABLE STONE. MINIMIZE GAPS. BURY BOULDER WITH EXPOSED SURFACE ABOVE FINISH GRADE AS SHOW.
2. GEOTEXTILE TO BE MEDIUM WEIGHT NON-WOVEN PROPEX 4553 OR EQUIVALENT. INSTALL UNDER ALL BOULDERS AND AS PER MANUFACTURER'S RECOMMENDATIONS.

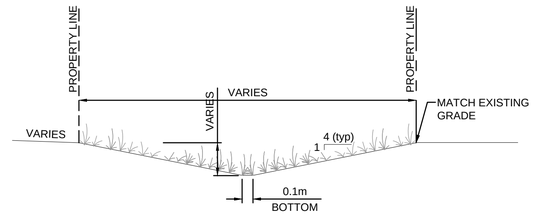
4 | RIP RAP PROTECTION DETAIL
C-107 | N.T.S.



4 | LOCAL ROAD - CROSS SECTION C-C
C-107 | N.T.S.



5 | TURNAROUND - STRUCTURE
C-107 | N.T.S.



6 | TYPICAL DRAINAGE SWALE
C-107 | N.T.S.

SURFACE WORKS NOTES

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ADEQUATE BARRICADING, SIGNING AND TRAFFIC CONTROL TO ENSURE ALL TRAFFIC IS KEPT OFF PAVED SURFACES UNTIL FINISH ROLLED.
2. PLAN AND EXECUTE WORK ON MAJOR ARTERIES TO PROVIDE FOR A REASONABLE MINIMUM OF DISRUPTION TO TRAFFIC FLOW.
3. PLACE WARNING SIGNS AND BARRICADES TO KEEP TRAFFIC OFF OILED SURFACES.
4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING, PROTECTING FROM DAMAGE AND ADJUSTING ALL EXISTING UNDERGROUND UTILITIES AND SERVICES AND RELATED SURFACE STRUCTURES.
5. ALL EXISTING ROADWAYS, DITCHES, CULVERTS AND OTHER SURFACE FEATURES AFFECTED BY THE CONTRACTOR'S OPERATIONS SHALL BE RETURNED TO THEIR ORIGINAL CONDITION UPON COMPLETION OF THE WORK.
6. ALL CONCRETE SHALL BE COMPOSED OF TYPE HS HIGH-SULPHATE RESISTANT PORTLAND CEMENT, FINE AND COURSE AGGREGATE, WATER AND ENTRAINED AIR. THE CONCRETE SHALL HAVE A COMPRESSIVE STRENGTH OF 32 MPA AFTER 28 DAYS, WITH AIR CONTENT OF 4 TO 6 % BY VOLUME. SLUMP SHALL BE LESS THAN 75MM FOR FORMED METHOD AND LESS THAN 25MM FOR MACHINE PLACED. ALL MATERIALS AND TESTING PROCEDURES SHALL BE IN ACCORDANCE WITH CSA A23.1/A23.2-00.
7. ALL CONCRETE WALK OR APRONS TO BE DOWELED INTO GRADE BEAM. INSTALL 15M X750 LG. @ 600 O.C. EMBED 150MM INTO GRADE BEAM WITH HILTI HIT-HY TYPICAL AT ALL CONCRETE SIDEWALKS AND APRONS ADJACENT TO BUILDING.
8. TRANSVERSE CONTRACTION JOINTS SHALL BE PLACED EVERY 3M, ALTERNATING WITH SURFACE JOINTS PLACED EVERY 3M. LONGITUDINAL SURFACE JOINTS SHALL BE PLACED ALONG THE INTERFACE BETWEEN THE WALK AND CURB AND GUTTER PORTION OF A MONOLITHIC STRUCTURE, WHERE APPLICABLE. EXPANSION JOINTS SHALL BE PLACED AROUND STRUCTURES WITHIN THE CONCRETE WORK, AND CONSTRUCTION JOINTS SHALL BE MADE WHEREVER OR WHENEVER THERE WILL BE A 30 MINUTE OR GREATER INTERRUPTION OF PLACEMENT OPERATIONS. SUCH JOINTS SHALL CONTAIN ONE NO. 10M REINFORCING BAR FOR EVERY 300MM OF WIDTH OF THE STRUCTURE, AND THE BARS SHALL EXTEND A MINIMUM OF 600MM INTO BOTH THE EXISTING AND FUTURE POUR.
9. ALL CONCRETE WORK CONSTRUCTED OVER ALL RECENT SERVICE TRENCHES AND ADJACENT TO CATCH BASINS SHALL BE REINFORCED WITH 2 - 10M BARS X 5.0M FOR CURB AND CURB AND SIDEWALK.
10. THE CONTRACTOR SHALL BACKFILL IN FRONT OR ALONG THE FACE OF THE CURB AS SOON AS PRACTICAL AFTER PLACEMENT. THE BACKFILL SHALL BE MECHANICALLY TAMPED TO A MINIMUM DENSITY OF 98% STANDARD PROCTOR DENSITY.
7. GRADE, TRIM AND COMPACT SUBGRADE TO 100% SPD AT OM AND TO SPECIFIED GRADE AND CROSS-SECTION PRIOR TO PLACEMENT OF HOT MIX BITUMINOUS PAVING MATERIAL.
8. GRANULAR SUBBASE TO BE TYPE 8 AS PER THE SASKATCHEWAN MINISTRY OF HIGHWAYS AND INFRASTRUCTURE. MATERIAL TO BE PLACED IN UNIFORM LAYERS NOT EXCEEDING 150MM WHEN COMPACTED. COMPACT TO A DENSITY NOT LESS THAN 100% MAXIMUM DRY DENSITY IN ACCORDANCE WITH ASTM D698, METHOD D. SHAPE AND ROLL TO OBTAIN A SMOOTH, EVEN AND UNIFORMLY COMPACTED BASE TO WITHIN ±10MM OF ESTABLISHED GRADE, BUT NOT UNIFORMLY HIGH OR LOW WITHIN 100MM HORIZONTALLY.
9. GRANULAR BASE TO BE TYPE 33 AS PER THE SASKATCHEWAN MINISTRY OF HIGHWAYS AND INFRASTRUCTURE. MATERIAL TO BE PLACED IN UNIFORM LAYERS NOT EXCEEDING 150MM WHEN COMPACTED. COMPACT TO A DENSITY NOT LESS THAN 100% MAXIMUM DRY DENSITY IN ACCORDANCE WITH ASTM D698, METHOD D. SHAPE AND ROLL TO OBTAIN A SMOOTH, EVEN AND UNIFORMLY COMPACTED BASE TO WITHIN ±10MM OF ESTABLISHED GRADE, BUT NOT UNIFORMLY HIGH OR LOW WITHIN 100MM HORIZONTALLY.
10. HOT MIX ASPHALTIC CONCRETE (HMAC) SHALL CONSIST OF CRUSHED AGGREGATE AND PENETRATION GRADE ASPHALT CEMENT. MAXIMUM AGGREGATE SIZE SHALL BE 12.5MM OR 16MM. 50 BLOW MARSHAL STABILITY SHALL NOT BE LESS THAN 5.7 KN; AIR VOID IN TOTAL MIX SHALL BE 3% TO 5%. FLOW INDEX SHALL BE 2 TO 5 MM. ALL MATERIALS SHALL COMPLY WITH APPROPRIATE SECTIONS OF THE CONTRACT SPECIFICATIONS.
11. ASPHALT TO BE SPREAD BY SELF-PROPELLED MECHANICAL SPREADER IN COMPACTED LIFTS. MAXIMUM LIFT THICKNESS SHALL BE 65MM. WHERE TOTAL ASPHALT THICKNESS EXCEEDS 65MM, PLACE ASPHALT IN TWO LIFTS OF A MINIMUM 40MM THICKNESS. NOT EXCEEDING 80 MM PER LIFT. FINISHED SURFACE SHALL BE TRUE TO THE REQUIRED PROFILE AND CROSS SECTION.
12. THE COMPACTED PAVEMENT SHALL HAVE A DENSITY OF NOT LESS THAN 97% OF LABORATORY TESTED DENSITY.
13. PAINTED PAVEMENT MARKINGS TO BE ALKYD TRAFFIC PAINT, TO CAN/CGSB-1.74 COLOUR YELLOW, THINNER TOP BE PETROLEUM SPIRITS, LOW FLASH TO CAN/CGSB-1.5. ENSURE A UNIFORM APPLICATION USING PRESSURE DISTRIBUTOR EQUIPPED WITH POSITIVE SHUT-OFF. PAVEMENT MARKINGS TO BE LAID OUT AS SHOWN AND APPROVAL IS TO BE OBTAINED BEFORE APPLICATION. APPLY EVENLY AT A REATE OF 3 SQ. M. PER LITRE.
14. UPON COMPLETION OF THE WORK, THE CONTRACTOR SHALL REMOVE ALL DEBRIS RESULTING FROM OPERATIONS. SURPLUS MATERIAL AND ALL EQUIPMENT AND TOOLS SHALL BE REMOVED. THE SITE SHALL BE NEATLY GRADED, TRIMMED AND LEFT IN A NEAT AND ORDERLY CONDITION ACCEPTABLE TO THE OWNER AND THE ENGINEER.

WCE design inc.

PROJECT

VISTA SPRINGS

CLIENT

BMA VENTURES INC.
1831 MCCRAE DRIVE
REGINA, SASKATCHEWAN
S4N 0S4

CONSULTANT

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PROJECT NUMBER

22-003

SHEET TITLE

CROSS SECTIONS & DETAILS

SHEET NUMBER

C-107

Appendix B – Cost Estimates

Date: August 2nd, 2022
Subject: Surface Improvements
Project Name: Vista Springs 22-003
Prepared For: BMA Ventures

ITEM #	EST. QTY.	UNIT	DESCRIPTION	UNIT $			TOTAL $	COMMENTS
1	1	LS	General Conditions	$ 5,000.00	/	LS =	$ 5,000.00	
2	7,500	SM	Stripping & Subgrade Preparation	$ 2.00	/	SM =	$ 15,000.00	
3	2,500	CM	Road Embankment	$ 10.00	/	CM =	$ 25,000.00	
4	1,950	t	Supply & Install 200mm Base	$ 39.00	/	t =	$ 76,050.00	
5	500	t	Supplay and Install 60mm Traffic Gravel	$ 20.00		t =	$ 10,000.00	
6	45	LM	Culverts	$ 300.00		LM =	$ 13,500.00	
7	1	LS	Signage	$ 1,500.00		LS =	$ 1,500.00	
8	1	LS	Ditch Seeding	$ 2,500.00		LS =	$ 2,500.00	
						TOTAL ESTIMATED BASE COST =	$ 148,550.00	
						Engineering Sercices (13.5%)	$ 20,054.25	
						PST (6%) =	$ 8,913.00	
						CONTINGENCY (10%) =	$ 15,746.30	
						TOTAL =	$ 193,263.55	

Appendix C – Hydro Geotechnical Report

February 12, 2022 Project No. 21-008-001

BMA Ventures
1831A MacRae Drive E
Regina, Saskatchewan
S4N 0S4

3 McNall Place
Regina, SK
S4S 2J9
306.536.9722
www.seeleyconsulting.ca

ATTENTION: Mr. Bagnall
President

RE: Subdivision Assessment Table of Contents

Dear Mr. Bagnall:

In follow-up to our letter dated January 30, 2022, Seeley Engineering and Consulting Inc. (SEC) is pleased to submit a draft annotated table of contents for a Level 2 Subdivision Assessment. As the report is developed, there is likely to be valid reasons for adjusted the table of contents.

Prepared By:

Chris Seeley, P.Eng. M.A.Sc.

Senior Environmental Engineer

STATEMENT OF LIMITATIONS AND CONDITIONS

Third Party Use of Report

This report has been prepared for the Client and any use a third party makes of this report or any reliance on or decisions made based on it, are the responsibility of such third parties. Seeley Engineering and Consulting Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions undertaken based on this report.

GEO-ENVIRONMENTAL Statement of Limitations

Seeley Engineering and Consulting Inc. prepared the geo-environmental conclusions and recommendations for this report in a professional manner using the degree of skill and care exercised for similar projects under similar conditions by reputable and competent environmental consultants. The information contained in this report is based on the information that was made available to Seeley Engineering and Consulting Inc. during the investigation and upon the services described, which were performed within the time and budgetary requirements of the client. As the report is based on the available information, some of its conclusions could be different if the information upon which it is based is determined to be false, inaccurate or contradicted by additional information. Seeley Engineering and Consulting Inc. makes no representation concerning the legal significance of its findings or the value of the property investigated.

Appendix A – Draft Table of Contents(Annotated)

1. EXECUTIVE SUMMARY
    - Include answer to highlighted questions, design flow table based on different options. Recommended risk management options.
2. INTRODUCTION
    - Discussion of location
    - High level Scope of work as described by Subdivision Guidelines
        - Density determination
        - Desktop review
        - Field investigation:
        - Analysis: The required elements for analysis are 1) an evaluation of supply aquifer isolation to determine if groundwater is present that may be impacted; and, 2) an estimate of vadose zone conditions to ensure adequate OWTS treatment. Provided that groundwater is identified in the area that may be impacted, we will determine the chance of a groundwater well intercepting a wastewater plume and complete a preliminary estimate of nitrate levels in potential down-gradient wells.

    2.1. Inclusion criteria
    - Describe inclusion/exclusion criteria from guidance.
    - Indicate a study is required.
3. BACKGROUND

    3.1. THE PROPOSED DEVELOPMENT AND SURROUNDING AREA
    - Description of
        - Development/Subdivision area, including all lots
        - Number of existing or proposed parcels on surrounding quarters
        - Description of proposed land use and type of development
        - Proposed and existing sewage systems and their set-backs
        - Existing and proposed water supplies
        - Reserve or contingency areas
        - Show map with residences and facilities within 1.0 kms. Identify which are on municipal water/wells and which have onsite wastewater systems.

    3.2. SURFICIAL GEOLOGY

    3.2.1.Regional Geology
    - Describe
        - regional geology as describe in reference reports. Reference dominant soil formation mechanisms.
        - Predominant soil series or mapping unit
        - Soil profile (texture, structure and indicators of soil moisture)
        - Permeability and drainage classifications

3.2.2. Local Geology

- Reference a list of test holes and withdrawal wells within 1.0 kms (from WSA). Summarize findings from well logs.
- Provide high level summary of previous geotechnical findings with respect to soils
- Provide high level summary of findings from Seeley Engineering Report.
- Describe:
    - Identify soil characteristics that might affect soil suitability, system design and location of the system
    - Identify soil moisture conditions that may adversely affect suitability for onsite systems
    - Evidence of seasonally high-water table.

3.3. BEDROCK GEOLOGY

- Describe the bedrock formations in the area. Example references are reports such as:
    - MacDonald, R. and Broughton, P. 1980. Geological Map of Saskatchewan. Saskatchewan Energy and Mines, 1:1,000,000.
    - Simpson, M.A. 2004. Geology and Groundwater Resources of the Regina Area (72I), Saskatchewan.

3.4. HYDROLOGY

3.4.1. Regional Hydrology

- Describe watershed and drainage path to Qu'Appelle valley. Example source of information could be Watershed Reports from WSA.

3.4.2. Local Hydrology

- For the development, describe surface drainage (existing or planned drainage), presences of sloughs, dugouts, springs, ponds or creeks.

3.5. HYDROGEOLOGY

3.5.1. Regional Hydrogeology

- Describe understood groundwater flow direction and regional and local hydrogeology and geology information, including the presence of any aquifers or shallow sand/gravel units that could be impacted by the project. This information shall include normal hydrogeology information such as lithology, hydraulic conductivities, etc. as well as adequate interpretation of this information.
- Provide groundwater table or piezometric surface contours.
- Provide information on recharge rates in area (if available).
- Draw two typical vertical cross-sections (illustrating groundwater systems, aquifers, and plume locations).

3.5.2. Local Hydrogeology

- Test hole results with respect to ground water.
- Identification of vegetation indicative of soil moisture.
- Interpret shallow aquifer flow direction (if applicable).
- Describe stormwater management features proposed.

3.6. TOPOGRAPHY

- Describe topography in the region and then specifically at the development.

- Identification of features that may cause stability concerns.

3.7. AERIAL PHOTOS

- Review aerial photos of the area and describe.

3.8. PHYSICAL SITE DESCRIPTION & CLIMATE DATA

- Describe ecoregion and ecozone. Likely semi-arid with landscapes heavily influenced by glaciation.
- Provide mean temperatures, annual precipitation (rain versus all) and annual evaporation.

4. DISCUSSION

4.1. APPROACH

4.1.1. Test Hole Drilling and Sampling Program

- Describe the
  - Combined test hole, test pit and sampling program.
  - GW sampling program
  - Laboratory testing
  - Field measured hydraulic conductivities.

4.1.2. Instrumentation

- Describe any infrastructure remaining including standpipe piezometers

4.1.3. Laboratory Testing

- Describe all laboratory testing completed for study.

4.1.4. Groundwater mounding analysis

- Describe selected methodology

4.1.5. Plume intersection percentage

- Describe selected methodology

4.1.6. Preliminary Assessment of Nitrate

- Describe selected methodology

4.1.7. Classify the subdivision's suitability for OWTS

- Describe selected methodology

4.2. FINDINGS

4.2.1. Site Stratigraphy

- Describe findings and test results.
- Include tables of soils information.

4.2.2. Groundwater Conditions

- Describe presence of groundwater noted in the monitoring wells in the area. Table of test results.

4.2.3. Water Quality Results

- Describe whether the shallowest aquifer is considered potable without treatment.
- Describe municipal water quality that will serve the development.

4.3. EVALUATION

4.3.1. Subdivision Density and Sensitivity

What is the density and sensitivity of the area?

The density of the proposed subdivision was calculated following the Saskatchewan Ministry of Health's "Guidance Document for Developments and Subdivisions where Onsite Wastewater Treatment Systems are Proposed" (2012). The guideline describes a low density development or subdivision as one where:

- Less than 5 existing or proposed residential units are located on a ¼ section; or
- The average parcel size associated with each existing or potential residential unit is greater than or equal to 4 hectares (10 acres), with no parcel in the ¼ section smaller than 1 hectare (2.5 acres).

Alternatively, the guideline describes a high density area as one where there is:

- Forty or more existing or proposed residential units located on a quarter section; or,
- An average parcel size associated with each existing or potential residential unit of less than 1 ha and there is more than 4 residential parcels.

Where the development or subdivision is neither low density nor high density, it is considered a medium density area.

The Saskatchewan Onsite Wastewater Disposal Guide bases the selection of onsite wastewater treatment systems on the density of the area, as previously discussed, and whether the area is sensitive. A sensitive area is defined as any area that is:

- Less than 1.0 km to the boundary of any municipality or approved subdivision that utilizes ground water as a source water;
- Located over an unconfined aquifer that can be used for potable water;
- Located over an area where there is less than 1.5 m between the ground surface and subsurface water whether that water is seasonal or permanent.; or,
- Located where there are historical concerns with ground water quality.

Any scenario where the number of lots associated with a residential unit is greater than 40 or the average lot size less than 1.0 ha (2.5 acre) results in a high density development for the purposes of the subdivision assessment guideline.

A density determination is also required for the Saskatchewan Onsite Wastewater Disposal Guide. While this density is calculated differently, in this case, a high density determination also results.

Given that the SHA has determined that the area is sensitive, the area should be considered sensitive for the purposes of determining adequate systems.

For a sensitive location and a high density development, the acceptable private sewage systems are determined by this subdivision study based on managing impacts to the environment.

4.3.2.Wastewater Quantity

- Description of type of OWTS and typical installation & design
- Describe different design flows for individual systems versus a communal system (and why)

4.3.3.Wastewater Quality

- Describe sources of wastewater (ie. residential)
- Describe influence of potable water on wastewater quality (ie. none)

4.3.4.Soils

- Provide soils information relevant to design of onsite wastewater systems from Seeley Engineering and Consulting.
- Describe shallow soils and their impact type of system
    - Vertical separation
    - HLR (table)
    - LLR (table)
    - Potential for mounding

4.3.5.Wastewater Design Options

- Describe technical options under consideration:
    - Individual systems
    - Communal system with advanced treatment
    - Communal system with advanced treatment incorporating summer drip dispersal (in accordance with Alberta's Standard of Practice)

4.3.6.Plume Intersection

What is the chance that the plume is intersected at the downstream property boundary?

- Describe the result of calculation for each design option

4.3.7.Nitrate Nitrogen concentrations

Are there any downgradient wells where >10mg/L nitrate nitrogen is predicted?

- Describe the result of the preliminary nitrate assessment for each design option

4.3.8.Vadose Zone Characteristics

Is there a sufficient Vadose Zone?

- Describe mounding evaluation results for each design option

4.3.9.Supply Aquifer Isolation

Is the Onsite Wastewater Treatment System (OWTS) effluent isolated from a supply aquifer?

- A supply aquifer is a geologic unit that can store and transmit a suitable quality of water at rates fast enough to supply reasonable amounts to wells.
- Make a determination (likely outcome: No)

4.3.10. Preliminary Hydrogeological Model

- Provide geological cross-sections

4.3.11. Fate of OWTS Effluent

- The effluent will migrate initially under unsaturated conditions. This provides a high level of treatment. The effluent will create a small perched saturated mound on the platey clay layer at a depth of just over 4 feet below ground. The effluent will be drawn into this layer under capillary action. Eventually the effluent make its way to the south to the creek and vertically to the ground water table at X feet below ground.

4.3.12. Suitability of the subdivision for OWTS

- Describe the findings and attach determination in an appendix.

4.3.13. Risk Characterization and Risk Mitigation

- Describe typical risks associated with Onsite systems
    - Long-term performance declines if system not operated properly or not maintained.
    - Impact of nitrate on the environment or groundwater sources
    - Increases in effluent volumes over time reduce treatment capacity of system
- Describe additional risk management (a list of ideas is below)
    - Field placement south side of development
    - Piped water to the development (and nearby developments)
    - A responsible management entity involved in the oversight of the OWTS (cleaning filters and managing system)
    - Operating manual for system to include record keeping recommendations, testing requirements and a series of decision points for performing additional maintenance or seeking expert assistance.
    - Certified advanced treatment prior to entering the soil treatment field.
    - Summer-time use of secondary treated effluent in a drip dispersal system for irrigation (reduces nitrate by X% as uptake by grass and trees, provides rest period for larger system, reduces effluent to environment)
        - Includes a commitment for a service contract
    - System monitoring ports included in design
    - Annual education for residents regarding what to flush, impact of excess water, etc.
    - Signage along path system describing wastewater usage and system.

5. RECOMMENDATIONS

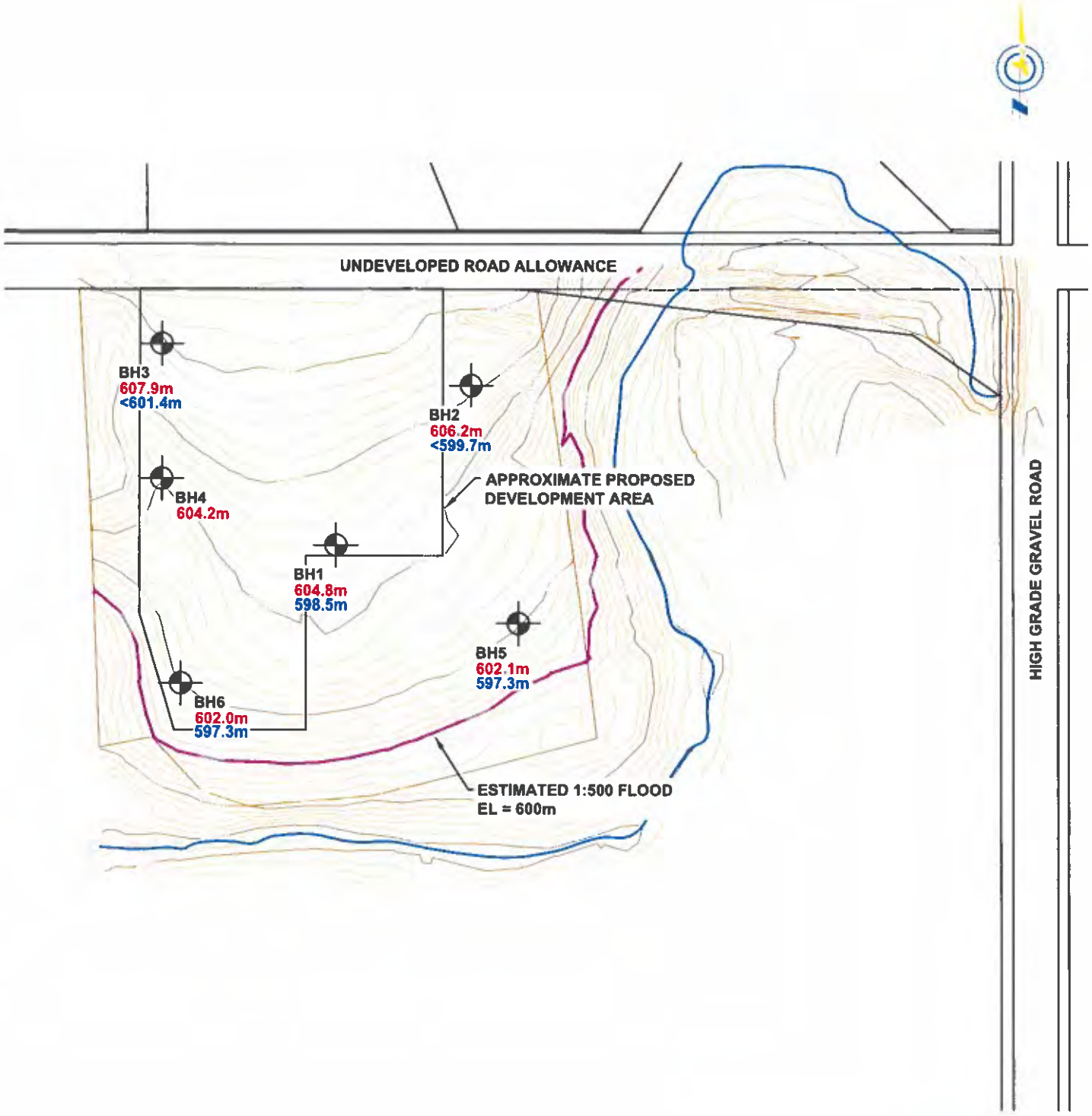
5.1. Environmental Ranking of Design Options

5.2. System recommendations

APPENDICIES

TABLE 2
GROUNDWATER MEASUREMENTS

Borehole	Ground Elevation (m)	Upon Completion		August 9, 2021	
		Slough (m)	Groundwater Level (mbg)	Groundwater Level (mbg)	Elevation (m)
1	604.8	---	7.5	6.30	597.30
2	606.20	---	Dry	---	---
3	607.90	---	Dry	---	---
5	602.10	---	6.5	4.50	597.60
6	602.00	---	6.0	4.75	597.25



NOTE: CONTOURS PROVIDED BY CLIENT, COMPASS GEOMATICS LTD., FILE NO. 00822-21-TOPO-R1, DATED JULY 2021.

ALL BOREHOLE LOCATIONS ARE APPROXIMATE.

604.8m SURFACE ELEVATION

598.5m GROUNDWATER ELEVATION (AUGUST 9, 2021)

SCALE (metres)

-50 -25 0 25 50 100

ParklandGEO

CLIENT: BMA VENTURES INC.

SITE PLAN

PROPOSED SUBDIVISION DEVELOPMENT
NE 12-17-18 W2M, RM OF EDENWOLD NO. 158, SK

DRAWN:	CHK'D.:	REV #:	DATE:
NC	RS	0	AUGUST 2021

SCALE:	JOB NO.	DRAWING NO.
1:2500	SK0352	FIGURE 2

BOREHOLE NO.: 01

CLIENT: BMA Ventures Inc.
SITE: Hunter Creek Developments
NOTES:

PROJECT NO.: SK0352
BH LOCATION: Center of Work Area

SUBSURFACE PROFILE

Depth (m)	Description	Symbol	Moisture (Wp |-----X-----| Wl) 25 50 75	Type	Sample No	SPT (N)	Comments	Well Completion Details	Elevation (m)
0	GROUND SURFACE								604.80
	Topsoil (300 mm) Organic, silty sand, trace rootlets, brown to black.								604.50
1	***Sand*** Fine grained, some silt, trace clay, loose to compact, brown, damp.		4	G	1G1				
2			8	G	1G2		**Grain Size Analysis** Gravel - 0.0 % Sand - 39.4 % Silt - 52.1 % Clay - 8.5 %		
3			3		1D1	10			
4			5	G	1G3				
	- Rust staining, moist to wet at 4.5m.		20	G	1G4				
6	- Grey at 6.0m.		25						
7			22	G	1G5				
	Till Clay, little silt, trace sand, trace gravel, very stiff, low plastic, grey damp to moist.		15		1D2	10	- Water at 7.5m.		597.30
8				G	1G6				
9			17		1D3	17			
10			13	G	1G7				
11			15		1D4	22			
				G	1G8				
12	End of Borehole at 12 m. 25 mm PVC standpipe installed. Backfilled with auger cuttings and bentonite chips Wet upon completion. Water at 6.3 m on August 9, 2021.		14						592.80
13									
14									

Well Completion Details: SOLID PVC PIPE; 598.5 m on August 9, 2021; BACKFILL WITH AUGER CUTTINGS; SLOTTED PIPE

LOGGED BY: NH
CONTRACTOR: Rebel Drillling Ltd.
RIG/METHOD: Truck Mounted / 150mm SSA
DATE: July 29, 2021
CALIBRATION:

GROUND ELEVATION: 604.8 m
NORTHING: 5586072 m
EASTING: 546355 m

BOREHOLE NO.: 02

CLIENT: BMA Ventures Inc.
SITE: Hunter Creek Developments
NOTES:

PROJECT NO.: SK0352
BH LOCATION: North East Corner

SUBSURFACE PROFILE

Depth (m)	Description	Symbol	Moisture (Wp |—X—| Wl) 25 50 75	Type	Sample No	SPT (N)	Comments	Well Completion Details	Elevation (m)
0	GROUND SURFACE								606.20
	Topsoil (200 mm) Organic, silty sand, trace rootlets, brown to black.		11	G	2G1			SOLID PVC PIPE	
1	***Sand*** Fine grained, trace to little silt, loose to compact, brown, damp.								
			3		2D1	13			
2				G	2G2				
			3						
3					2D2	15			602.70
	Silt And fine grained sand, trace gravel, trace clay, compact, low plastic, brown, damp to moist.		23	G	2G3		**Grain Size Analysis** Gravel - 2.9 % Sand - 36.4 % Silt - 51.5 % Clay - 9.2 %		601.70
4	***Sand*** Little to trace silt, loose, brown, damp.		11						
				G	2G4				
5			12						
					2D3	8		SLOTTED PIPE	
6	End of Borehole at 6.5 m. 25 mm PVC standpipe installed. Backfilled with auger cuttings and bentonite chips. Dry upon completion. Dry on August 9, 2021.							BACKFILL WITH AUGER CUTTINGS	599.70
7									
8									
9									
10									
11									
12									
13									
14									

LOGGED BY: NH
CONTRACTOR: Rebel Drillling Ltd.
RIG/METHOD: Truck Mounted / 150mm SSA
DATE: July 29, 2021
CALIBRATION:

GROUND ELEVATION: 606.2 m
NORTHING: 5586144 m
EASTING: 546415 m

BOREHOLE NO.: 03

CLIENT: BMA Ventures Inc.
SITE: Hunter Creek Developments
NOTES:

PROJECT NO.: SK0352
BH LOCATION: North West Corner

SUBSURFACE PROFILE

Depth (m)	Description	Symbol	Moisture (Wp |----X----| Wl) 25 50 75	Type	Sample No	SPT (N)	Comments	Well Completion Details	Elevation (m)
0	GROUND SURFACE								607.90
	Topsoil (300 mm) Organic, silty sand, trace rootlets, brown to black.		2	G	3G1			SOLID PVC PIPE	607.60
1	***Sand*** Fine grained, trace silt, loose to compact, brown, dry to damp.								
			2		3D1	13			
2	- Little silt at 2.4m.			G	3G2				
			13						
3									
			22	G	3G3				
4	- Trace clay, rust staining, damp to moist at 4.1m.								
			14		3D2	8			
5	- Coarse grained sand at 5.0m.							SLOTTED PIPE	602.70
	Till Clay, little silt, trace sand, trace gravel, stiff, low plastic, grey, damp to moist.			G	3G4			BACKFILL WITH AUGER CUTTINGS	
			17						
6					3D3	11			601.40
	End of Borehole at 6.5 m. 25 mm PVC standpipe installed. Backfilled with auger cuttings and bentonite chips. Dry upon completion. Dry on August 9, 2021.								
7									
8									
9									
10									
11									
12									
13									
14									

LOGGED BY: NH
CONTRACTOR: Rebel Drillling Ltd.
RIG/METHOD: Truck Mounted / 150mm SSA
DATE: July 29, 2021
CALIBRATION:

GROUND ELEVATION: 607.9 m
NORTHING: 5586163 m
EASTING: 546276 m

BOREHOLE NO.: 04

CLIENT: BMA Ventures Inc.
SITE: Hunter Creek Developments
NOTES:

PROJECT NO.: SK0352
BH LOCATION: West Side of Site

SUBSURFACE PROFILE

Depth (m)	Description	Symbol	Moisture (Wp |—X—| Wl) 25 50 75	Type	Sample No	SPT (N)	Comments	Well Completion Details	Elevation (m)
0	GROUND SURFACE								604.20
	Topsoil (250 mm) Organic, silty sand, trace rootlets, brown to black.		4	G	4G1		SO_4 - 0.040 %		
1	***Sand*** Fine grained, trace to little silt, loose to compact, brown, damp.								
			3		4D1	8			
2				G	4G2				
			12						
3					4D2	8			
			19	G	4G3				
4	- Moist to wet at 4.0m.								
					4D3	7			599.50
5	***Silt*** Some fine grained sand, trace clay, firm to stiff,, low plastic, brown, moist to wet.		25	G	4G4				
			23						598.20
6	End of Borehole at 6.0 m. Backfilled with auger cuttings . Dry upon completion.								
7									
8									
9									
10									
11									
12									
13									
14									

LOGGED BY: NH
CONTRACTOR: Rebel Drillling Ltd.
RIG/METHOD: Truck Mounted / 150mm SSA
DATE: July 29, 2021
CALIBRATION:

GROUND ELEVATION: 604.2 m
NORTHING: 5586102 m
EASTING: 546276 m

BOREHOLE NO.: 05

CLIENT: BMA Ventures Inc.
SITE: Hunter Creek Developments
NOTES:

PROJECT NO.: SK0352
BH LOCATION: East Side of Site

SUBSURFACE PROFILE

Depth (m)	Description	Symbol	Moisture (Wp |---X---| Wl) 25 50 75	Type	Sample No	SPT (N)	Comments	Well Completion Details	Elevation (m)
0	GROUND SURFACE								602.10
	Topsoil (250mm) Organic, silty sand, trace rootlets, brown to black.		18	G	5G1				
1	**Sand** Fine grained, trace to little silt, loose to compact, brown, moist to wett.								600.70
	Silt little to some sand, trace clay, firm to stiff, low plastic, brown, rust staining, moist.		30	G	5G2				
2									
3			10		5D1	9			
			28	G	5G3				
4	- Grey at 4.5 m								
			24		5D2	5			
5				G	5G4				
			26						
6					5D3	9			595.60
	End of Borehole at 6.5 m. 25 mm PVC standpipe installed. Backfilled with auger cuttings and bentonite chips. Wet upon completion. Water at 4.5 m on August 9, 2021.								
7									
8									
9									
10									
11									
12									
13									
14									

LOGGED BY: NH
CONTRACTOR: Rebel Drillling Ltd.
RIG/METHOD: Truck Mounted / 150mm SSA
DATE: July 29, 2021
CALIBRATION:

GROUND ELEVATION: 602.1 m
NORTHING: 5586037 m
EASTING: 546437 m

BOREHOLE NO.: 06

CLIENT: BMA Ventures Inc.
SITE: Hunter Creek Developments
NOTES:

PROJECT NO.: SK0352
BH LOCATION: South Side of Site

SUBSURFACE PROFILE

Depth (m)	Description	Symbol	Moisture (Wp |----X----| Wl) 25 50 75	Type	Sample No	SPT (N)	Comments	Well Completion Details	Elevation (m)
0	GROUND SURFACE								602.00
	Topsoil (300 mm) Organic, silty sand, trace rootlets, brown to black.		10	G	6G1			SOLID PVC PIPE	
1	***Sand*** Fine grained, trace to little silt, loose to compact, brown, moist to wet.								
			11		6D1	8			
2				G	6G2				
			19						
3					6D2	9			
			21	G	6G3				
4									597.50
	Till Clay, little silt, little sand, trace gravel, low plastic, rust staining, damp to moist, brown..		22		6D3	10			
5				G	6G4		**Grain Size Analysis** Gravel - 1.1 % Sand - 39.2 % Silt - 43.6 % Clay - 16.1 %		
			21						
6	End of Borehole at 6.0 m. 25 mm PVC standpipe installed. Backfilled with auger cuttings and bentonite chips. Wet upon completion. Water at 4.75 m on August 9, 2021.								596.00
7									
8									
9									
10									
11									
12									
13									
14									

Well Completion Details: SLOTTED PIPE; SOLID PVC PIPE; 597.25 m on August 9, 2021; BACKFILL WITH AUGER CUTTINGS

LOGGED BY: NH
CONTRACTOR: Rebel Drillling Ltd.
RIG/METHOD: Truck Mounted / 150mm SSA
DATE: July 29, 2021
CALIBRATION:

GROUND ELEVATION: 602.0 m
NORTHING: 5586010 m
EASTING: 546284 m

Provincial Water Well Drilling

Box 814 Balgonie SK. S0G 0E0
Phone: 306-771-2683 Cell: 306-737-7330 Email: provincialwaterwelldrilling@gmail.com

Date: Sept 1/21

Name: CCR Construction Phone: 539-2405

Address: 1831A Maccrea Dr Regina Postal Code: S4N 0S4

Location: Qtr NE Sec 12 Twp 17 Rge 18 W.Mer 2

TEST HOLES 50,50,50,50	200	/Ft. @	$10.00	/Ft.	2000.00
WELL DRILLING	58	/Ft. @	100.00	/Ft.	5800.00
CASING	60	/Ft. @	100.00	/Ft.	6000.00
COVER	1	@	-	Each	200.00
GRAVEL	10	Cu. Yds. @		Cu. Yds.	450.00
LOADER		Hrs. @		Hrs.	
WATER TRUCK		Hrs @		Hrs	
BENT POWDER		Bags @		Bags	
SLEEVE		@			
OTHER Pump test + Water Sample					400.00

GST# 847 691 631 RT 0001

Sub Total 14850.00

GST 742.50

PST 891.00

TOTAL 16,483.50

No 915

DEPTH BELOW GROUND IN FEET			DEPTH BELOW GROUND IN FEET		
FROM	TO		FROM	TO	

TERMS: NET 30 DAYS. ALL ACCOUNTS PAST DUE ARE SUBJECT TO A SERVICE CHARGE OF 2% PER MONTH (24% PER ANNUM)

Thank You!

Water Security Agency

DRILLER'S REPORT FORM

244766
Water Well Driller's Report
PLEASE PRINT

Client Name	Address	Drilling Contractor	Rig Registration #
CCR Construction	1831A Macrea Dr. Regina	Provincial Water Well Drillers	467

Description of Well

Hole #	Date Completed	Completion Method	Purpose of Water Use
915	Day 01 Month 09 Year 21	Please Check ✓	Please Check ✓

Method Installed (Please Check ✓)
- ☐ Drilled
- ☐ Bored
- ☐ Augered
- ☐ Jetted
- ☐ Hand Dug
- ☐ Backhoe
- ☐ Unknown

Depth of Hole (ft)	Bit Diameter (in)
58	42

* Water Level (ft): 24

If Flowing, Artesian Head Above Ground (ft):

Completion Method (Please Check ✓)
- ☐ Well Screen
- ☐ Well Screen & Gravel Pack
- ☐ Sand Point
- ☐ Perforated Casing (Slotted or Sawed)
- ☐ Open Hole
- ☐ Spring
- ☐ Unknown
- ☐ Other _____

Purpose of Water Use (Please Check ✓)
- ☐ Domestic
- ☐ Municipal
- ☐ Industrial
- ☐ Irrigation
- ☐ Recreation
- ☐ Mineral Water
- ☐ Geothermal
- ☐ ILO
- ☐ Multi-Purpose
- ☐ Research
- ☐ Other _____

Legal Land Description

LSD	Quarter	Section	Township	Range	Mer
	NE	12	17	18	2

Purpose of Well (Please Check ✓)
- ☐ Withdrawal
- ☐ Observation
- ☐ Quality Monitoring
- ☐ Recharge
- ☐ Water Test Hole
- ☐ Soil Test Hole
- ☐ Other _____

Lot | Block

Plan

Parcel #

UTM Coordinates

Easting

Northing

Zone | NAD

Description of Well Casing

Material Description	Diameter (in)	Casing Length (ft)	Bottom Set At (ft)
Fiberglass	30	60	58

Annulus Seal
- ☐ Grout
- ☐ Cement
- ☐ Backfill / Cuttings
- ☐ Bentonite chips
- ☐ Other _____

Additional Information
Pumping Test:
* Depth to water measured from the top of casing

Description of Screens or Perforated Material

Material Description	Slot Size (1/1000 in)	Diameter (in)	Screen Length (ft)	Bottom Set At (ft)
Fiberglass	030	30	40	60

Type of Logger
Model

Number

Pumping Test

Static* Water Level	Pumping Rate (IGPM)	Duration of Test (hrs)	Water Level * at end of Pumping Test	Drawdown From Static
24	10	2		

Method
- ☐ Airlift
- ☐ Constant Rate
- ☐ Step Drawdown
- ☐ Bailing

Water Temp. (°F)	Recommended Pumping Rate (IGPM)	Recommended Pump Intake Set at (ft)
	08	56

E-log
- ☐ Yes
- ☐ No

WSA Use Only
- ☐ Rcd

Driller's Log

Description of Material Encountered	Depth To (ft)		Description of Material Encountered (con't)	Depth To (ft)	
Well: Top Soil	0	1	TH 2 Top Soil	0	1
yellow clay	1	24	yellow clay	1	24
(H2O) Yellow silt	24	36	Dry till	34	50
(H2O) Grey silt sand	36	52			
grey till	52	58	TH 3		
			Top Soil	0	1
Test hole 1			yellow clay	1	24
top soil	0	1	Wet Yellow silt	24	35
yellow clay	1	20	(H2O) Grey silt	35	46
yellow silt (H2O)	20	28	Dry till	46	50
Grey clay	28	39			
Dry till	39	50	TH 4 Top Soil	0	1
			yellow clay	1	24
			Wet yellow silt	24	36
			(H2O) grey silt sand	36	52
			grey till	52	60

Driller's Signature

Client's Copy

Saskatchewan Health Authority

Roy Romanow Provincial Laboratory
Environmental Services

5 Research Drive
Regina, Saskatchewan
S4S 0A4

(306) 787-7138 / (306) 787-3140

Environmental Services Analysis Report - Final

Invoice Number: 2168989
Sample Location: White City
Collected by: LW

Collected Date: 30-Aug-2021 11:00 AM
Received: 30-Aug-2021 1:12 PM
Reported: 31-Aug-2021 11:07 AM
Water Source: Well

Submitted By:
WAGNER, LARRY
BOX 814
BALGONIE, SK
S0G 0E0

Invoice:
WAGNER, LARRY
BOX 814
BALGONIE, SK
S0G 0E0

Analysis	Result	Unit	Sask Guideline	Test Comment	Fee
Regular Panel					23.00
Total Coliform	>100	orgs/100 mL	No orgs/100 mL	*1*	
E. Coli	18	orgs/100 mL	No orgs/100 mL	*2*	

Submitter Phone Number: **306-737-7330**

Emailed results to: provincialwaterwelldrilling@gmail.com

Comments:

1. Testing results indicates that your water is unacceptable for human consumption.
2. The presence of E. coli makes your water unacceptable for human consumption. Consult the Public Health Inspector in your Health Region for appropriate follow up actions prior to drinking the water.

Please include Invoice Number with payment and remit to:

Saskatchewan Health Authority
c/o Finance
2180 23rd Avenue
Regina, Saskatchewan
S4S 0A5

Total Fees (including GST)	23.00
Tax Summary G.S.T. (reg # 89583 0180 RT001)	1.10
Amount Received: (Visa)	23.00
Balance	**$0.00**

Refund to be issued by the Department of Finance.

Contact Us:

Result Interpretation: Please contact your Regina Qu'Appelle Public Health Officer at: (306) 766-7705
Billing Inquiries: Phone: (306) 766-5832, Fax: (306) 766-5188, Email: corpfinance@rqhealth.ca

Saskatchewan Health Authority

Roy Romanow Provincial Laboratory
Environmental Services

5 Research Drive
Regina, Saskatchewan
S4S 0A4

(306) 787-7138 / (306) 787-3140

Environmental Services Analysis Report - Final

Invoice Number: 2169116
Sample Location: McDonald Farm
Collected by:

Collected Date: 01-Sep-2021 12:45 PM
Received: 01-Sep-2021 2:37 PM
Reported: 02-Sep-2021 2:17 PM
Water Source: Well

Submitted By:
WAGNER, LARRY
BOX 814
BALGONIE, SK
S0G 0E0

Invoice:
WAGNER, LARRY
BOX 814
BALGONIE, SK
S0G 0E0

Analysis	Result	Unit	Sask Guideline	Test Comment	Fee
Regular Panel					23.00
Total Coliform	>100	orgs/100 mL	No orgs/100 mL	1	
E. Coli	Absent	orgs/100 mL	No orgs/100 mL	2	

Submitter Phone Number: 306-737-7330

Emailed results to: provincialwaterwelldrilling@gmail.com

Comments:

1. Testing results indicates that your water is unacceptable for human consumption.
2. See above for comment

Please include Invoice Number with payment and remit to:

Saskatchewan Health Authority
c/o Finance
2180 23rd Avenue
Regina, Saskatchewan
S4S 0A5

Total Fees (including GST)	23.00
Tax Summary	1.10
G.S.T. (reg # 89583 0180 RT001)	
Amount Received: (Visa)	23.00
Balance	**$0.00**

Refund to be issued by the Department of Finance.

Contact Us:
Result Interpretation: Please contact your Regina Qu'Appelle Public Health Officer at: (306) 766-7705
Billing Inquiries: Phone: (306) 766-5832, Fax: (306) 766-5188, Email: corpfinance@rqhealth.ca

Saskatchewan Health Authority

Roy Romanow Provincial Laboratory
Environmental Services

5 Research Drive
Regina, Saskatchewan
S4S 0A4

(306) 787-7138 / (306) 787-3140

Environmental Services Analysis Report - Final

Invoice Number: 2169204
Sample Location: White City
Collected by: Larry Wagner

Collected Date: 06-Sep-2021 4:00 PM
Received: 07-Sep-2021 8:53 AM
Reported: 08-Sep-2021 10:46 AM
Water Source: Distributed

Submitted By:
PROVINCIAL WATER WELL DRILLING
LARRY WAGNER
BOX 814
BALGONIE, SK
S0G 0E0

Invoice:
PROVINCIAL WATER WELL DRILLING
LARRY WAGNER
BOX 814
BALGONIE, SK
S0G 0E0

Analysis	Result	Unit	Sask Guideline	Test Comment	Fee
Regular Panel					23.00
Total Coliform	No Detectable	orgs/100 mL	No orgs/100 mL	1	
E. Coli	No Detectable	orgs/100 mL	No orgs/100 mL	2	

Submitter Phone Number: 306-737-7330 **Emailed results to:** provincialwaterwelldrilling@gmail.com

Comments:

1. Testing result indicates that your water meets the Bacteriological standard for Canadian drinking water quality.
2. See above for comment

Please include Invoice Number with payment and remit to:

Saskatchewan Health Authority
c/o Finance
2180 23rd Avenue
Regina, Saskatchewan
S4S 0A5

Total Fees (including GST)	23.00
Tax Summary G.S.T. (reg # 89583 0180 RT001)	1.10
Amount Received: (Visa)	23.00
Balance	**$0.00**

Refund to be issued by the Department of Finance.

Contact Us:
Result Interpretation: Please contact your Regina Qu'Appelle Public Health Officer at: (306) 766-7705
Billing Inquiries: Phone: (306) 766-5832, Fax: (306) 766-5188, Email: corpfinance@rqhealth.ca

Coliform Bacteria

(For Private Water and Health Regulated Public Water Supplies)

What Are Coliform Bacteria?

Coliform bacteria can result from the environment naturally or be fecal in origin. Not all coliform bacteria are harmful. However, if found in water, their presence suggests other disease causing organisms may exist in your drinking water supply. For example, fecal coliform are found in the intestinal tract of warm-blooded animals such as humans, dogs, and deer. Coliform bacteria have been selected as the most widely used indicator for the bacterial quality of drinking water. The presence of these bacteria in drinking water may signify the well (source) is defective, or that there may be problems with the water treatment, or the water distribution system.

How Do Coliform Bacteria Get Into Water?

It is common to have contamination when maintenance has been performed on the water supply system. Faulty in-ground sewage disposal systems may also be the source of contamination. Coliforms from animal waste can enter directly into water supplies but can also migrate through the soil and contaminate the groundwater. This process is accelerated during spring flooding or heavy rainfall.

How Do Coliform Bacteria Affect My Health?

Coliform bacteria are used as an indicator to suggest the water is not safe to consume. Their presence is of concern in that disease-causing organisms, such as E. coli, fecal coliforms or parasites, may be present. The symptoms from disease causing organisms may include diarrhea, nausea, vomiting, cramps or other gastro intestinal distress and in severe cases can be fatal. Most susceptible are infants, elderly and others with compromised immune systems.

How Can I Remove Coliform Bacteria From My Drinking Water?

Water containing coliform bacteria should not be consumed. As a precautionary measure, until additional testing confirms the safety of the water or otherwise advised by the authorities, the water should be boiled, at a rolling boil, for one minute prior to consumption. Bacteria and other harmful disease causing microorganisms can be reduced or eliminated from water by disinfection (chlorine, ozone or ultraviolet light treatment) and distillation. In some cases filtration in addition to disinfection will be required. Treatment systems should carry the National Sanitation Foundation certification for microbiological removal (NSF Standard 55 Class A for disinfection units, NSF Standard 62 for distillation units).

For groundwater sources, appropriate well maintenance may help to minimize problems with coliform bacteria. Refer to procedures described in the *High Level Well Disinfection Fact Sheet* or *Low Level Well Disinfection Fact Sheet*.

Health Regulated Public Water Supplies

A positive water sample test result, for the presence of coliforms, in a Health regulated public water supply may result in the local health region issuing an advisory or emergency boil water order for the supply. If issued, the advisory/order will remain in effect until all required corrective action is completed and subsequent water test results indicate that the water supply is safe.

What Is The Standard For Coliform Bacteria In Drinking Water?

The Saskatchewan Drinking Water Quality Standards and Health Canada's Guidelines for Canadian Drinking Water Quality state that the maximum acceptable concentration (MAC) for coliform in drinking water is zero organisms detectable per 100 mL.

Acknowledgement:

This Fact Sheet is one of a series developed by an Interagency Committee with representatives from Saskatchewan Health, Regional Health Authorities, Saskatchewan Watershed Authority, Saskatchewan Agriculture, Agriculture and Agri-Food Canada – PFRA and Saskatchewan Environment.

Jul/08

Government of Saskatchewan

How Can I Find Out If There Are Coliforms In My Water?

For information on sampling instructions and containers, you should contact an accredited laboratory. If using the Saskatchewan Disease Control Laboratory, sample containers are available from the laboratory, local Health Regions, or rural municipalities.

Before consuming water from a new well, disinfect and flush the entire system (see *High Level Chlorine Well Disinfection Fact Sheet)* and then sample for coliform bacteria. In general, all private systems should be analysed frequently, at least once or twice a year, or whenever there is reason to believe that the water supply may have become contaminated (e.g. flooding). Health regulated public water supplies must sample as required by the health region.

Need More Information?

Health Regulated Public Water Supply

For more information on this Fact Sheet and/or other water quality issues relating to Health Regulated Public Water Supplies contact your local Health Region Public Health Inspector.

Private Water Supply

For more information on how coliforms impacts on human health contact your local health region office. For information on how coliforms impacts agricultural operations contact Saskatchewan Ministry of Agriculture through your Agricultural Business Centre or the Agricultural Knowledge Centre at 1-866-457-2377 or on the internet (http://www.agriculture.gov.sk.ca/AKC).

Government of Saskatchewan Water Information website www.SaskH20.ca	**Water Inquiry Line** Questions about water? Call 1-866-SASK H2O (1-866-727-5420) to be referred to proper agency.
Saskatchewan Ministry of Health http://www.health.gov.sk.ca/environmental-health **Regional Health Offices** Saskatoon: Saskatoon (306) 655-4605 Sunrise: Yorkton (306) 786-0600 Kelsey Trail: Melfort (306) 752-6310 Five Hills: Moose Jaw (306) 691-1500 Sun Country: Weyburn (306) 842-8618 Heartland: Rosetown (306) 882-6413 Prairie North: North Battleford (306) 446-6400 Prince Albert Parkland: Prince Albert (306) 765-6600 Cypress: Swift Current (306) 778-5280 Regina Qu'Appelle: Regina (306) 766-7755 Mamawetan Churchill River: La Ronge (306) 425-8512 Keewatin Yatthe: Buffalo Narrows (306) 235-5811	**Saskatchewan Watershed Authority,** Head Office, Moose Jaw (306) 694-3900 Website: www.swa.ca *Regional Offices:* http://www.swa.ca/AboutUs/Contact.asp?type=Offices **Sask Water Corporation** Head Office, Moose Jaw Customer Service 1-888-230-1111 Website: http://www.saskwater.com **Prairie Farm Rehabilitation Administration (PFRA)** - Agriculture and Agri-Food Canada Website http://www.agr.gc.ca/pfra/water/intro_e.htm *Regional Offices:* http://www.agr.gc.ca/pfra/sask_e.htm
Saskatchewan Ministry of Health **Saskatchewan Disease Control Laboratory, Regina** General Inquiry 1-866-450-0000 Phone: (306) 798-2125 // Fax (306) 798-0071 Website: http://www.health.gov.sk.ca/lab	**Saskatchewan Ministry of Agriculture** General Inquiry 1-866-457-2377 Agricultural Operations Regina (306) 787-4680 Irrigation Development Outlook (306) 867-5500 Website: www.agriculture.gov.sk.ca
Health Canada First Nation and Inuit Health Branch, Regina (306) 780-6561 Website: http://www.hc-sc.gc.ca	**Saskatchewan Ministry of Environment** Toll-Free 1-800-567-4224 Spill Emergency Toll-Free 1-800-667-7525 Website: http://www.environment.gov.sk.ca

E. Coli Bacteria

(For Private Water and Health Regulated Public Water Supplies)

What Is *E.Coli*?

Escherichia coli or *E. coli* is a type of coliform bacteria commonly found in the intestines of humans and warm-blooded animals. Most strains of *E.coli* do not cause illness in healthy humans and are beneficial to the synthesis of vitamins. Some strains, however, cause cramps and diarrhea in humans. One particular strain named O157:H7 produces a powerful toxin that can cause severe illness.

Health organizations have selected *E.coli* as the most reliable indicator for the bacteriological quality of drinking water. The presence of *E.coli* in water is a strong indication of recent sewage or animal waste contamination. This type of contamination would suggest your water might contain many types of disease-causing organisms.

How Does *E. Coli* Get Into Water?

During rainfalls, snowmelts, or other types of precipitation, *E.coli* may be washed into creeks, rivers, lakes, or groundwater. When these waters are used as sources of drinking water and the water is not treated or inadequately treated, *E.coli* may end up in drinking water. Care is also needed to prevent contamination when performing maintenance to your water supply.

How Does *E. Coli* Affect My Health?

Most strains are harmless to healthy humans however the strain 0157:H7 may cause serious diseases. This strain produces toxins and can cause bloody diarrhea and abdominal cramps and frequently no fever is present. Risks from *E.coli* O157:H7 are greater for young children, the elderly, pregnant women, and those with a weakened immune system. Consult with your physician immediately if you experience any of these symptoms.

How Can I Remove *E. Coli* From My Drinking Water?

Water containing *E. coli* bacteria should not be consumed.

For groundwater sources refer to procedures described in the High Level Well Disinfection Fact Sheet or Low Level Well Disinfection Fact Sheet.

Health Regulated Public Water Supplies

A positive water sample test result for the presence of *E. coli* in a Health regulated public water supply will result in the local health region issuing an Emergency Boil Water Order (EBWO) for the supply. The EBWO will remain in effect until all required corrective action is completed and subsequent water test results indicate that the water supply is safe.

What Is The Standard For *E. Coli* In Drinking Water?

The Saskatchewan Drinking Water Quality Standards state that the maximum acceptable concentration (MAC) for *E. coli* in drinking water is no organisms detectable per 100 mL.

Sask H_2

Acknowledgement:

This Fact Sheet is one of a series developed by an Interagency Committee with representatives from Saskatchewan Health, Regional Health Authorities, Saskatchewan Watershed Authority, Saskatchewan Agriculture, Agriculture and Agri-Food Canada – PFRA and Saskatchewan Environment.

Jul/08

Government of Saskatchewan

How Can I Find Out If There Is Parameter In My Water?

It is not practical to isolate all the pathogens found in water instead microbial indicators are used. The presence of *E. coli* bacteria does not necessarily mean that your drinking water contains a strain of *E. coli* O157:H7. However, if *E. coli* is present in your well, it is highly likely that potentially disease causing organisms are present.

For information on sampling instructions and containers, you should contact an accredited laboratory. If using the Saskatchewan Disease Control Laboratory (Provincial Lab), sample containers are available from the laboratory, local Health Regions, or rural municipalities.

Before consuming water from a new well, disinfect and flush the entire system (see High Level Chlorine Well Disinfection Fact Sheet) and then test for coliform and *E. coli* bacteria. In general, all private systems should be analyzed frequently, at least once or twice a year, or whenever there is reason to believe that the water supply may have become contaminated (e.g. spring flooding or flooding). Health regulated public water supplies must sample as required by the health region.

Need More Information?

Health Regulated Public Water Supply

For more information on this fact sheet and/or other water quality issues relating to health regulated public water supplies contact your local health region public health inspector.

Private Water Supply

For more information on how *E. coli* impacts on human health contact your local health region office. For information on how *E. coli* impacts agricultural operations contact Saskatchewan Ministry of Agriculture through your Regional Office or the Agricultural Knowledge Centre at 1-866-457-2377 or on the internet (http://www.agriculture.gov.sk.ca/AKC).

Government of Saskatchewan Water Information website: www.SaskH20.ca	**Water Inquiry Line** Questions about water? Call 1-866-SASK H2O (1-866-727-5420) to be referred to proper agency.
Saskatchewan Ministry of Health http://www.health.gov.sk.ca/environmental-health **Regional Health Offices** Saskatoon: Saskatoon (306) 655-4605 Sunrise: Yorkton (306) 786-0600 Kelsey Trail: Melfort (306) 752-6310 Five Hills: Moose Jaw (306) 691-1500 Sun Country: Weyburn (306) 842-8618 Heartland: Rosetown (306) 882-6413 Prairie North: North Battleford (306) 446-6400 Prince Albert Parkland: Prince Albert (306) 765-6600 Cypress: Swift Current (306) 778-5280 Regina Qu'Appelle: Regina (306) 766-7755 Mamawetan Churchill River: La Ronge (306) 425-8512 Keewatin Yatthe: Buffalo Narrows (306) 235-5811	**Saskatchewan Watershed Authority**, Head Office, Moose Jaw (306) 694-3900 Website: www.swa.ca *Regional Offices:* http://www.swa.ca/AboutUs/Contact.asp?type=Offices **Sask Water Corporation** Head Office, Moose Jaw Customer Service 1-888-230-1111 Website: http://www.saskwater.com **Prairie Farm Rehabilitation Administration (PFRA)** - Agriculture and Agri-Food Canada Website http://www.agr.gc.ca/pfra/water/intro_e.htm *Regional Offices*: http://www.agr.gc.ca/pfra/sask_e.htm
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Low Level Chlorine Well Disinfection (Shock Disinfection)

(For Private Water and Health Regulated Public Water Supplies)

Disinfection is routinely used to control bacteria in wells and is applied as part of a start-up procedure for newly constructed wells and should be used as semi-annual maintenance for existing wells. Disinfection should also be performed in the event of contamination (e.g.: flooding or unacceptable levels of bacterial growth, see Coliform Bacteria Fact Sheet). Well disinfection can be performed by two methods low and high level disinfection. High level disinfection is the preferred option (see High Level Chlorine Well Disinfection Fact Sheet). However, if proper equipment (e.g. 1360 litres [300 gallons] tank) is not available then low level disinfection, as described in this fact sheet, may be adequate.

Materials Required

Disinfection can be conducted using unscented household bleach. Check the product label to ensure that the chlorine is in the form of sodium hypochlorite or calcium hypochlorite. Some "all purpose bleaches" (such as Javex 2) contain a chlorine alternative and no chlorine and should not be used for disinfecting wells.

Table 1 outlines the quantity of bleach required to properly disinfect a well.

Procedure

1. Follow chlorine manufacturer's instructions for use. Chlorine concentrations at this level are dangerous. Avoid contact with skin, inhaling the fumes and wear protective clothing/eye wear. If your well is located in a pit, you must make sure there is proper ventilation during the chlorination procedure. It is recommended that you contract the services of a licensed well driller who has the proper equipment and experience to do the job safely.
2. Ventilate confined spaces (e.g. well pit, crawl space and all other confined spaces) where potentially dangerous levels of vapours may accumulate.
3. Do **not** run chlorinated water through certain types of water treatment equipment (e.g. softeners, carbon filters, reverse osmosis systems). For specific information, contact your equipment dealer or the Saskatchewan Watershed Authority.
4. If a well is slow yielding or tends to pump any sediment, slowly siphon the solution down the well and pump it out very slowly. Over pumping the well may worsen the sediment problem.
5. The disinfection treatment will require the well to be taken out of service. Therefore, store sufficient water to meet all necessary requirements for a minimum 12-hour period.
6. Slowly add the amount of unscented bleach indicated in Table 1 directly into the well. Connect a garden hose to a nearby tap and wash down the inside wall of the well. This will ensure thorough mixing of the chlorine and the water throughout the well.
7. Start the pump and bleed air from the pressure tank. Open each tap and allow the water to run through all taps until a smell of chlorine is detected, then turn off the taps. If a strong smell is not detected, add more bleach to the well and repeat step 7.
8. Allow the water to sit in the system for at least 12 hours. Chlorine can be very corrosive if left in the water distribution system for too long a period of time.
9. After at least 12 hours, flush the system by pumping the well water through an outside hose (do not exceed the well pumping rate-over pumping the well may worsen any sediment problem) away from grass, shrubs, trees and other sensitive plants until the strong smell of chlorine

disappears. Make certain that the water does not enter any watercourse. Finally, open the indoor taps until the system is completely flushed. Return the system to normal operation. Please note that chlorine can react with organics or other substances to produce by-products in certain cases, therefore it is important to flush the well prior to returning it to service.

10. If low level disinfection is being used to eliminate a bacterial problem, verify that the procedure has removed the bacteria by following the steps under **Disinfection Verification**.

Table 1. Disinfection of Well Water with Unscented Household Bleach (Approximately 5.25% Hypochlorite)

Depth of water in well (m)	Volume of bleach added (5.25% chlorine)			
	Casing diameter 15 cm (drilled)*		Casing diameter 90 cm (bored)**	
	New well	Existing well	New well	Existing well
1.0	100 mL	20 mL	3.2 L	0.6 L
3.0	300 mL	60 mL	9.8 L	2.0 L
5.0	500 mL	100 mL	16.5 L	3.0 L
10.0	1000 mL	200 mL	32.0 L	6.5 L
30.0	3000 mL	600 mL	96.0 L	19.5 L

* A chlorine concentration of about 250 mg/L is used for low-level disinfection of a new well, whereas existing wells require 50 mg/L chlorine.
Table 1 is derived from the Health Canada publication "A Guide to Well Water Treatment and Maintenance", June 5, 2000

** To reduce the volume of chlorine that is required, industrial strength chlorine (12% sodium hypochlorite) available from any chemical dealer, water treatment supplier, or dairy supply retailer can be used.

Disinfection Verification

Until water testing indicates that the water is safe to use, find another source of water, or boil the water for one minute, at a rolling boil, before consuming. This precaution is particularly important for persons who are immunocompromised and also if the water is being used for infant feeding (preparing formula, etc.).

For **private water supplies**, it is recommended that a sample be taken at least five days after treatment and another twelve days after treatment with at least one week of constant use. Two consecutive 'safe' test results are required to ensure that the treatment was effective.

For **Health regulated public water supplies**:

- wells not receiving continuous treatment require a sample taken five days after treatment and another twelve days after treatment with at least one week of constant use,
- Wells receiving continuous disinfection treatment require at least two consecutive sets of samples. The samples should be taken at least one day after the treatment and one day apart. Health Region officials will be advising the owner/operator of the supply on number of samples, sampling locations and as to when the water supply can be used again for human consumption.

In general, all private systems should be analysed at least once a year or whenever there is reason to believe that the water supply may have become contaminated (e.g. flooding).

Health regulated public water supplies must sample as required by the health region.

If the low level disinfection procedure does not eliminate the bacterial problem, obtain a copy of the High Level Disinfection Fact Sheet and follow the procedural steps.

Appendix D – Geotechnical Report

Geotechnical, Environmental and Materials Engineering

Red Deer · Sherwood Park · Grande Prairie · Calgary · Fort McMurray
Peace River · Medicine Hat · Lethbridge · Fort St. John · Estevan · Regina

GEOTECHNICAL INVESTIGATION REPORT

PROPOSED RESIDENTIAL SUBDIVISION
WITHIN NE 12-17-18-W2M
RM OF EDENWOLD NO.158, SASKATCHEWAN

PREPARED FOR

HUNTER CREEK DEVELOPMENTS
C/O BMA VENTURES INC.
REGINA, SASKATCHEWAN

PREPARED BY

PARKLAND GEOTECHNICAL CONSULTING LTD.
REGINA, SASKATCHEWAN

ParklandGEO

PROJECT NO.:	SK0352
DATE:	AUGUST 19, 2021
REVISION:	0

TABLE OF CONTENTS

TABLES

APPENDICES

1.0 INTRODUCTION

Hunter Creek Developments c/o BMA Ventures Inc. is proposing to develop a residential subdivision in the RM of Edenwold No. 158, Saskatchewan. Parkland Geotechnical Consulting Ltd. (ParklandGEO) was commissioned to carry out a geotechnical investigation and preliminary private sewage assessment of the site for the proposed development. This report summarizes results of the field and laboratory testing programs and presents geotechnical recommendations for the proposed development.

1.1 SCOPE OF WORK

The scope of work for this investigation was outlined in ParklandGEO's proposal dated July 22, 2021 (PRO9243). Authorization to proceed with this investigation was given by Mr. Trevor Bagnall of BMA Ventures Inc acting on behalf of Hunter Creek Developments.

1.2 PREVIOUS INVESTIGATIONS

ParklandGEO is not aware of any previous geotechnical investigations having been conducted on this property.

2.0 PROJECT INFORMATION

2.1 SITE DESCRIPTION

The subject property was located within NE12-17-18-W2M, about 1 km south of Highway 48 and 1km east of White City Drive as shown on the Key Plan, Figure 1. The proposed subdivision is adjacent to the Town of White City within the Rural Municipality of Edenwold No.158, and is surrounded by residential subdivision to the north and agricultural land to the east south and west. Access to the site was from White City Drive via an undeveloped road allowance to the west of the site. At the time of drilling, the site was covered in grass and scattered shrubs. Site conditions are shown on the Aerial Plan and Site Photographs, Figures 3 and 4. The surface elevations at the borehole locations ranged from 602.0 to 607.9 m. The slope of the land ranged from about 2 to 10 percent. The current site elevations are shown on the Site Plan, Figure 2.

2.2 PROJECT DESCRIPTION

The proposed development is expected to consist of 8 parcels approximately 0.81 hectares in size. Foundation loads are expected to be relatively light as only single-family residential homes are expected at the site. At this time the roadways have not been constructed but traffic loads are expected to be light to moderate.

3.0 FIELD AND LABORATORY PROGRAMS

3.1 DRILLING PROGRAM

On July 29, 2021, six boreholes were drilled at the site to depths of 6.0 to 12.0 m below existing grade. The borehole locations are shown on Figure 2. The following sampling and testing procedures were followed during the borehole program:

1. Prior to mobilizing the drilling rig, ParklandGEO personnel completed a Saskatchewan One Call to verify the drill sites were clear of underground utilities.

2. The drill rig was owned and operated by Rebel Drilling Ltd. of Weyburn. Drilling operations were monitored by members of ParklandGEO's geotechnical staff. The soil encountered was visually examined during drilling and logged according to the Modified Unified Soil Classification System.

3. Soil samples were collected from auger cuttings at 1.0 m intervals in order to determine the soil/moisture profile. Soil samples were also obtained from auger grab and Standard Penetrations Tests (SPTs) at selected depth intervals.

4. At the completion of drilling, 25 mm hand-slotted PVC standpipes were installed in all boreholes except Borehole 4 and backfilled with auger cuttings and a bentonite cap. Excess auger cuttings were spread at the borehole locations. Groundwater levels and depths where seepage zones were encountered were noted during drilling. Groundwater measurements were recorded on August 9, 2021.

5. The borehole locations were surveyed by ParklandGEO using a Trimble GPS receiver. UTM coordinates and geodetic elevations are provided in the boreholes logs in Appendix A.

3.2 LABORATORY PROGRAM

All soil samples were returned to ParklandGEO's Calgary laboratory for possible further testing. The results of all laboratory testing are shown on the borehole logs in Appendix A, and individual test results are presented in Appendix B.

4.0 SUBSURFACE CONDITIONS

The soil profile encountered at this site consisted of topsoil, sand, overlying deposits of silt or till. Detailed descriptions of the soil profiles at the borehole locations are provided on the borehole logs in Appendix A. Definitions of the terminology and symbols are provided on the explanation sheets, also in Appendix A.

4.1 TOPSOIL

A 200 to 300 mm thick layer of surficial topsoil was encountered at the borehole locations. The topsoil was moderately organic, brown to black, and dry. Based on observations and experience, topsoil thickness is expected to vary and may exist in greater thicknesses across the site, particularly in the area close to the creek at the south of the site. In general, this topsoil is considered to be weak and compressible under load.

4.2 SAND

Deposits of sand were encountered below the topsoil in all boreholes, and below the silt in Borehole 2. The sand extended to depths 1.4 to 7.5 m below grade in Boreholes 1 and Boreholes 3 to 6, and beyond the 6.5 m depth drilled in Borehole 2. The sand contained trace to little silt, trace clay, and was characterized as fine grained and poorly graded with a loose to compact relative density. Moisture contents ranged from 3 to 22 percent with an average of 11 percent which is considered to be near the estimated water content.

4.3 SILT

Deposits of silt were encountered below the sand in Boreholes 2, 4 and 5. The silt extended to a depth of 1.4 m below grade in Borehole 2 and beyond the 6.0 and 6.5 depth drilled in Boreholes 4 and 5. The silt contained some fine-grained sand, trace clay and was characterized as low plastic with a firm consistency. Moisture contents ranged from 10 to 30 percent with an average of 24 percent which is estimated to be above the estimated optimum water content.

4.4 CLAY TILL

Clay (till) was encountered in Boreholes 1, 3 and 6 and extended beyond the depth drilled. This till contained clay, trace gravel, trace sand, little silt and was characterized as low plastic. The deposit was noted to contain occasional rust stains and water bearing sand lenses. Although not encountered, the local till is known to have inclusions of boulders. Standard Penetration Test (SPT) N values ranged from 10 to 22 blows denoting a firm to stiff consistency. Moisture contents ranged from 10 to 22 percent with an average of 17 percent which is estimated to be near the estimated optimum water content.

4.5 LABORATORY SOIL TEST SUMMARY

The following table provides a summary of laboratory classification testing undertaken.

TABLE 1
LABORATORY CLASSIFICATION TEST SUMMARY

BH#	Depth / Elev (m)	Grain Size Distribution (%)				Plasticity (%)			Soil Type	Symbol*
		Gravel	Sand	Silt	Clay	PL	LL	PI		
1	2.3	0.0	39.4	52.1	8.5	---	---	---	Sandy Low Plastic Clay	CL
2	3.8	2.9	36.4	51.5	9.2	14	25	11	Sandy Low Plastic Clay	CL
6	5.3	1.1	39.2	43.6	16.1	16	28	12	Sandy Low Plastic Clay	CL

PL = Plastic Limit; LL = Liquid Limit; PI = Plastic Index
*Modified Unified Soil Classification System (ASTM D2487)

For private sewage treatment systems, soil texture must be classified as per the Canadian System of Soil Classification (CSSC). These classifications can be found in Section 6.4.

4.6 SOIL SULPHATES

Soil samples were taken at a depth of 0.8 m for water soluble sulphate concentration testing which is expressed as a percent of the dry mass of soil. The concentration was 0.04 percent, which indicates a "negligible potential for sulphate attack on buried concrete in direct contact with soil."

5.0 GROUNDWATER CONDITIONS

Groundwater seepage was observed in Borehole 1 at 7.5 m below grade and was wet upon completion of drilling. No other groundwater seepage was noted during drilling and sloughing was not noted at the borehole locations. The groundwater levels observed during drilling and measured on August 9, 2021, about 11 days after drilling, are summarized in the following table.

TABLE 2
GROUNDWATER MEASUREMENTS

Borehole	Ground Elevation (m)	Upon Completion		August 9, 2021	
		Slough (m)	Groundwater Level (mbg)	Groundwater Level (mbg)	Elevation (m)
1	604.8	---	7.5	6.30	597.30
2	606.20	---	Dry	---	---
3	607.90	---	Dry	---	---
5	602.10	---	6.5	4.50	597.60
6	602.00	---	6.0	4.75	597.25

1. The observed groundwater levels are considered to be typical in this area and are considered to be near the seasonal average.
2. Groundwater elevations are expected to fluctuate on a seasonal basis and will be highest after periods of heavy or prolonged precipitation and snow-melt.
3. The regional groundwater table is expected to flow south toward Hunter Creek.
4. Significant groundwater seepage is expected for deeper excavations at the site. The volumes of groundwater encountered will be dependent on seasonal conditions and the permeability of the soils within the profile.

6.0 DISCUSSION AND RECOMMENDATIONS

6.1 GENERAL EVALUATION

The proposed development includes 8 residential lots ranging approximately 0.81 hectares. The soil profile at the site includes topsoil and sand, overlying deposits of silt or till which is considered suitable for the proposed development. The foundation conditions are suited to shallow foundation options such as conventional footings and mats. Screw pile are also a suitable deep foundation for modular residential builds at this site. Foundation parameters are provided for footings. Recommendations for other foundation options can be provided upon request.

Other geotechnical design issues for the proposed development include:

1. Site topography suggests some areas may need to be raised by more than 1.0 m resulting in the potential for filling below proposed building areas. Placement of fill below footing elevation will need to be carefully addressed and monitored to minimize the potential for foundation problems due to settlement.

2. The upper soils mainly consisted of sand, although layers of silt were encountered within the upper 4 m. These soils will provide fair to good bearing capacity for footings. Excavations may experience sloughing if they are left open for an extended period of time.

3. Minor groundwater seepage may be encountered in shallow excavations following heavy precipitation events. Given the coarse-grained nature of the surficial site soils, ponding water is expected to drain rapidly. The use of a perimeter drainage system (weeping tile) is recommended for all basements.

4. The surficial silty sand soils will be susceptible to frost if they are given access to free water or groundwater within the zone of seasonal frost (estimated to an average depth of 2.7 m). In general, the depth to the local water table for much of the site is relatively deep so potential for frost heave will be low and dependent on the soil moisture within the subgrade.

5. Frost action will have an impact on foundations, especially lightly loaded foundations in unheated environments. The pile shaft, pile caps, and grade beam embedded within the frost zone will be affected by an adfreeze force which will result in uplift. Uplift will also act on pile caps and grade beams bearing on the subgrade.
6. Based on the preliminary assessment of this property, the lots would be suitable for onsite wastewater treatment. Once building parcels have been identified and cleared on each lot, test pits should be excavated near the proposed wastewater treatment locations in order to ascertain the suitability of the location where treatment will occur.

6.2 SITE PREPARATION

There is approximately 6 m of relief across the present site, so it is anticipated cuts and fills will be required for the building and pavement areas.

6.2.1 Stripping

In general, all surficial topsoil, organics, non-engineered fill, or unsuitable soils should be stripped from in the building and pavement areas. Some areas of the site may require more stripping or undercutting to remove any remaining topsoil, or root systems. Organic materials should not be mixed with mineral soils. The excavated topsoil and unsuitable materials may be stockpiled at an approved location for future landscaping use.

6.2.2 Subgrade Preparation

Following removal of any undesirable soils, all exposed subgrade soils in pavement areas and building areas to be occupied by a slab-on-grade structures should be scarified to a depth of 150 to 200 mm and recompacted uniformly to a minimum of 98 to 100 percent of SPMDD. Site preparation measures should be monitored by qualified and experienced geotechnical personnel to identify potential soft areas. The exposed subgrade should be proof rolled to identify wet and/or weak soils.

Ideally, site preparation operations should be carried out under dry weather conditions to minimize the risk of disturbance and softening. If adverse weather or groundwater conditions are observed during construction, these recommendations should be reviewed in order to avoid subgrade failure. Uniformity of compaction is of most importance to minimize potential for differential settlement under new loads. Over compaction and wetting should be avoided.

The final compacted subgrade should then be proof-rolled and monitored by a geotechnical engineer to identify non-uniformity and weak/soft areas. Soft areas should be sub-cut and replaced with a suitable fill material to a depth sufficient to support construction traffic. Soft areas should be expected along the majority of the roads and parking areas. Methods to avoid subgrade failure of soft subgrades may include: limiting construction traffic, modification of site preparation procedures (scarification, recompaction, etc.) and sub-cut and replacement with a suitable engineered fill material.

6.2.3 Temporary Excavations

Temporary excavations will likely be required for the foundation and possible underground utility installations. The latest edition of the Construction Safety Regulations of the Occupational Health and Safety Act of Saskatchewan should be followed. Excavation side slopes are not expected to be able to stand near vertical for extended periods of time. For excavations in cohesionless soils (sand) up to 3 m deep, side slopes should be cut back to 1H:1V from the toe. Vertical cuts can be used for excavations in cohesive soils (clay and silt) up to 1.5 m deep. Unsupported excavations up to 3.0 m must be sloped at 1H:1V above a maximum 1.5 m deep vertical cut.

Flatter side-slopes may be required for excavations into the fill, sand lenses or groundwater table. Some sloughing and caving must be anticipated, particularly where a vertical cut is used. Excavation stability should be reviewed for deeper excavation or excavations that will remain open for longer than 4 weeks. Excavations result in a stress release which may induce a non-linear settlement on adjacent foundations. Therefore, the presence of nearby structures and the affect of the excavation should be considered when planning excavations.

For excavations through sand, till or into the static or seasonal perched groundwater table, flatter side-slopes may be required. All temporary surcharge loads should be kept back from the excavated faces a distance of at least one-half the depth of the excavation. All vehicles delivering materials to the site should be kept back from excavated faces at least 1.0 m. Fill materials used to bring the site to grade after excavation may consist of low to medium plastic clay or an approved granular fill. If space does not permit the slopes to be cut back, some form of temporary shoring must be installed to protect workers in the trench.

6.2.4 Fill/ Backfill Materials

Fill required to bring the site up to grade should be low to medium plastic clay, well graded select granular material such as well graded sand or gravel, or select pit-run gravel having a maximum particle size of 80 mm. Fill soils must be free of any organic materials, contamination, deleterious construction debris and stones greater than 80 mm in diameter. Uniformly graded sand or silt should be avoided since these materials require strict moisture control to achieve required compaction standards. Sand which is uniformly graded, or which contains more than 10 percent passing the 0.080 mm sieve, should not be used for engineered subgrade fill. The native silty sand is considered suitable as fill materials provided; they receive moisture conditioning in order to achieve proper compaction. All fill materials should be approved by the geotechnical engineer prior to being brought to or used at site.

6.2.5 Fill/ Backfill Placement and Compaction

Fill material should be placed uniformly to the following compaction specifications.

TABLE 3
RECOMMENDED COMPACTION LEVELS

Fill Location	Minimum Compaction (% SPMDD)	Moisture Content (% OMC)
Building Areas		
New fill greater than 0.6 m thickness (including trenches)	100%	±2%
New fill less than 0.6 m thick (including trenches)	98%	±2%
Under structural slabs	95%	±3%
Other Development Areas		
Subgrade preparation	97%	±2%
Under paved or concrete areas, access roads	98%	±2%
Exterior building area outside of pavement structures	95%	As Required

SPMDD = Standard Proctor Maximum Dry Density and OMC = Optimum Moisture Content as per ASTM D698.

The lift thicknesses should be governed by the ability of the selected compaction equipment to uniformly achieve the recommended density. However, it is generally recommended to use lifts with a maximum compacted thickness of 200 mm for granular fill and 150 mm for clay fill. Uniformity is of most importance. Granular fill is best compacted with large smooth drum vibratory rollers while clay fill is best compacted with large vibratory "padfoot" or "sheepsfoot" rollers. Over compaction and excessive use of vibration to achieve density should be avoided to minimize risk of failing the subgrade. In areas which require higher compaction, it is recommended that granular fill be placed at moisture contents 0 to 2 percent below the OMC and that clay fill be placed at moisture contents about 0 to 2 percent above the OMC. This will help reduce compactive effort and potential risk of subgrade disturbance needed to achieve maximum density.

Fill placement and compaction during the winter months in southern Saskatchewan is challenging due to the difficulty in moisture conditioning fill soils and obtaining high compaction levels. Materials and methodology should be reviewed prior to construction if cold weather compaction of clay fills is proposed. High compaction levels can only be achieved using fill soils that are unfrozen provided the compaction area is heated and hoarded to prevent freezing during placement and compaction.

6.2.6 Basement Backfill

Backfill soils are capable of exerting significant horizontal pressures onto a basement wall. It is recommended the backfilling be delayed until the concrete has gained enough strength to support the horizontal loads. The top and bottom of the wall should be braced prior to backfilling. Therefore, it is recommended to place the basement floor slab and floor joists prior to backfilling around walls. Backfill should be brought up evenly around the building perimeter to minimize differential horizontal pressures on the basement walls.

Rather than heavily compacting the backfill around the basements, it is recommended to nominally compact the backfill (90 - 95 percent of SPMDD) recognizing that settlement of the backfill will occur, particularly after the first freeze/thaw and moisture infiltration cycle. Backfill around basement walls should be sloped to shed water away from the structure with a recommended slope of at least 5 percent. The slope of the backfill should be checked periodically to maintain the slope of the ground surface away from the wall. If possible, the upper 500 mm of backfill should be medium plastic clay, to reduce potential surface water infiltration. Roof leaders from houses and garages may be discharged onto the ground surface well clear of the foundation walls to help reduce wet weather infiltration of water into the subdrainage weeping tile system.

6.2.7 Site Drainage

Surface water should be drained away from the site as quickly as possible, both during and after construction. Site drainage should be directed away from the foundation walls. A minimum grade of 2 percent is recommended to promote surface runoff and minimize potential saturation and degradation of the parking area subgrade. It is recommended to provide a 5 percent back slope from buildings for a distance of at least 5 m. Roof and other drains should discharge well clear of buildings.

Compliance with the recommendation for compaction of fill in exterior areas is important because poorly compacted backfill adjacent to foundation structures will settle, which may lead to ponding of surface water against foundation walls or grade beams. The slope of exterior backfill should be checked periodically to verify water is shed away from buildings. If the backfill settles causing water to pond against foundation walls, the surface should be re-graded. Water should not be allowed to pond adjacent to buildings, equipment, or pavement areas. If possible, the upper 500 mm of backfill around the basement walls should be low to medium plastic clay, to reduce potential surface water infiltration against the foundation walls.

6.3 CONVENTIONAL HOUSE BASEMENT FOUNDATIONS

6.3.1 Conventional Footings

Standard house basement foundations using strip and spread footings will generally be acceptable at this site. Footings based on native sand or silt, shallow development fill, or engineered fill prepared as described in Section 6.2, may be designed based on a maximum allowable bearing pressure of 100 kPa for strip footings and 120 kPa for spread footings placed on undisturbed inorganic soil free from loosened material. The design and construction of residential foundations should conform to the National Building Code of Canada. In general, excavations should be protected against surface water runoff and ingress of groundwater; footing bases should not be allowed to dry out excessively during construction; and the bearing soil should be protected against freezing during and after construction.

Additional design and construction recommendations for footings include:

1. Excavation of the footing trenches should be undertaken in a manner to minimize disturbance to the bearing surface. The use of backhoe or grade-all equipment is strongly recommended over loader or dozer equipment. Sand may be easily disturbed and the final 25 to 50 mm of excavation should be excavated by hand after form work is in place.

2. For protection against frost action, exterior footings in continuously heated structures should be provided with a minimum depth of ground cover of 1.5 m. Interior footings in heated buildings require a minimum of 0.5 m of ground cover. Houses are assumed to have garages which are semi-heated structure with an average monthly temperature of at least 5 degrees Celsius. Therefore, the minimum foundation depth should be increase by 0.2 m for the garage foundation. Isolated footings and exterior footings in unheated structures will require at least 2.7 m of ground cover. Artificial insulation may be used to prevent frost penetration where adequate depths of ground cover cannot be economically provided. Insulation should be placed exterior to the footing wall.

3. Footings and foundation walls should be reinforced to span localized soft spots.

4. The footing trenches should be protected against surface water run-off and seepage water through the use of conventional sumps and ditches, if required. Footing bases should not be allowed to dry out excessively during construction. Foundation soils must not be allowed to freeze at any time prior to, during, or after construction.

5. A gravel mat may be used to replace lesser quality fill or to distribute structural loads onto soft bearing surfaces to minimize potential for differential settlements.

    - The minimum thickness of a gravel mat is 150 mm. The gravel mat must extend beyond all sides of footings a distance equal to the gravel thickness.

    - Gravel should consist of free draining, well graded pit run gravel with a maximum particles size of 50 mm and less than 10 percent fines passing the 0.080 mm sieve.

- The gravel mat should be compacted to at least 100 percent of SPMDD. Over compaction should be avoided.

- A geotextile should be placed over the full base and sides of the excavation prior to backfilling.

6. Preparation of the bearing surfaces should be monitored by a qualified geotechnical engineer prior to placement of footings to verify that design criteria are met.

6.3.2 Grade Supported Floor

Grade supported floor slabs in the basement and garage, supported by the native sand or engineered fill prepared as described in Section 6.2, are expected to perform adequately at this site. Floor slabs should rest on at least 150 mm of well graded, free draining, granular base. Suitable materials would include coarse sand or crushed gravel with less than 10 percent passing the 0.080 mm sieve. The drainage layer below the slab should be compacted uniformly to at least 95 percent of SPMDD. Grade supported floor slabs in continuously heated buildings should be designed based on a modulus of subgrade reaction (K_S) of 30,000 kN/m^3 for slabs placed on at least 150 mm of compacted gravel base.

Small vertical subgrade movements may be experienced therefore, provisions should be made for movements between partitions and adjoining columns or load bearing walls. In addition, where partitions are placed under structural members a space should be left at the top of the partition to allow vertical movement (at least 25 mm). Columns in basements which support floor joists should be adjustable. Slabs should be provided with construction joints or saw cuts in accordance with local practice. The maximum panel dimension between saw-cuts and/or joints should be 4.0 to 4.5 m. The concrete slab should be reinforced with steel bars and dimensioned in accordance with the structural engineer's requirements. The reinforcing bars can be carried through the construction joints. As a minimum, the recommended option for reinforcing steel to keep shrinkage cracks together is properly chaired 10M steel bar on 300 to 450 mm centers. The use of equivalent wire mesh is not recommended. Water lines should be installed carefully to minimize the potential for breakage and leaks below slabs. Heating ducts below grade should be insulated to prevent drying of the subgrade soils.

6.3.3 Basement Sub-drainage System

A permanent sub-drainage system (weeping tile drain) is recommended around the outside perimeter of basements. Access to sumps should be made for manual bailing in the event of a power failure. If the groundwater level is within 0.5 m of the underside of slabs, the basement foundation and slab should be provided with water stops to prevent seepage.

The weeping drain should consist of a minimum 100 mm diameter perforated rigid pipe surrounded by a filter of free draining gravel and enveloped in filter fabric.

- The rigid pipe should drain towards a sump at a cross fall of at least one percent, from which it should be pumped well away from, and down gradient of the building. It is noted

that corrugated HDPE is prone to sagging because it is flexible; to plugging because the corrugations of the pipe promote deposition of the soil; and also, to crushing where backfill thickness exceed 1.2 m. PVC pipe (with two 45-degree fittings at building corners) is more easily flushed, snaked, and unplugged; and is also the less prone to breakage.

- The granular filter should be at least half the pipe diameter thick in all directions, positively graded to frost free collection points for removal, and hydraulically connected to the free draining gravel layer placed below the slab.

- The granular filter should be at least half the pipe diameter thick in all directions, positively graded to frost free collection points for removal, and hydraulically connected to the free draining gravel layer placed below the slab.

6.4 PRIVATE SEWAGE TREATMENT SYSTEMS

The final layout and location of each proposed treatment area was not determined at the time of this study. Therefore, the recommendations given in this section are considered preliminary and are only provided for the purposes of describing general feasibility for PSTS and allowing preliminary sizing to assess possible treatment options at this site. It is expected that a detailed PSTS assessment will be required as a condition for the final subdivision approval in accordance with the "*Saskatchewan Onsite Wastewater Disposal Guide (Third Edition – November 2018)* Based on the area of the property and the number of lots proposed the subdivision would be classified as a medium density area. A detailed assessment for each individual parcel is not within the scope of this assessment. As per the Model process some of the information in this report can be used for the detailed assessment.

6.4.1 Soil Classification

To make effective use of the Standard, the description of the soil must use terms that are set out in the Canadian System of Soil Classification as effluent loading rates and available vertical separations is determined by these characteristics. The upper soils encountered were categorized by the Safety Codes Council (SCC) soil texture classification system, in accordance with the standard. The SCC soil texture classification system is summarized on the Soil Triangle in Appendix B. The results of all grain size tests are appended and the results from three hydrometer test within the upper 6m are summarized in the following table.

TABLE 4
SOIL CLASSIFICATION

Borehole	Depth (m)	Gravel Content (% by wt.)	Sand Content (% by wt.)	Silt Content (% by wt.)	Clay Content (% by wt.)	SCC Soil Texture Classification
1	2.3	0.0	45.0	46.5	8.5	Sandy Loam (SL)
2	3.8	3.8	60.5	26.6	9.2	Sandy Loam (SL)
6	5.3	3.8	47.2	32.9	16.1	Loam (L)

6.4.2 Soil Suitability

As discussed in Section 3.0, six boreholes were drilled at the site to depths from 6.0 to 12.0 m below grade. Soil based treatment systems are also dependent on soil structure which is most easily identified in test pits or undisturbed sampling (ie. direct-push drilling). Soil structure is very important for wastewater treatment and can have great impact on treatment options. The effluent load rate on the soil infiltrative surface was estimated using the soil texture classification method. The upper 3 m of the subsoil profile consisted of fine to very fine Sandy Loam with an assumed structureless shape, massive structure. The effluent loading rate of 8.8L/day/m^2 with a specified effluent quality of 30 – 150 mg/L. For secondary treated effluent with a specified effluent quality of less than 30 mg/L the load rate is 17.6 L/day/m^2. Hydraulic linear load rates for these soils range from 34.3 to 38.8 L/day/m based on a slope of land of between 0 - 4 percent. The hydraulic loading rates and linear loading rates referenced are based on Table 13-2 and Table 13-4 from the Saskatchewan Onsite Wastewater Treatment Guide.

6.4.3 Private Sewage Disposal System Requirements

The peak expected daily wastewater volume for a dwelling (single family and duplex) with 2 bedrooms or less is 340 L per person (assuming 2 people per bedroom). For dwellings other than single family or duplex, the peak expected daily wastewater volume is 675 L per bedroom.

The working capacity for primary treatment (septic tanks) is required to include an additional capacity of 400 L per expected occupant to accommodate sludge and scum accumulation. Septic tank access openings should not be buried and should be located at a height above the surrounding landscape that ensures surface water will drain away from the access opening. Access openings should be equipped with a secure, air-tight lid or cover. A secondary treatment component shall include sampling ports or a suitable location to obtain wastewater and effluent samples to confirm treatment performance and assess operation of the component.

Any soil-based treatment requires the following:

- a minimum vertical separation of 1.5 m between the soil infiltration surface and a restricting layer for primary treated effluent.

- A minimum vertical separation of 0.9 m is required when receiving secondary treated effluent through a pressurized lateral distribution system.

- Adequate soil depth to achieve a 7-day effluent travel time to 2.4 m beneath the infiltration surface or a restrictive layer whichever is less.

For a more detailed outline of all the effluent loading rates and separation distances required by each of the treatment systems mentioned in this report, please refer to the Saskatchewan Onsite Wastewater Disposal Guide.

Additional requirements for private sewage disposal systems (PSDS):

1. The septic tank shall have adequate earth cover or other means to protect it from freezing while in operation and during periods of non-use. A septic tank that has less than 1.2 m of earth cover to protect it from freezing conditions shall be insulated to provide the equivalent of an R-8 insulation value over the top and sides of the tank to a minimum depth of 1.2 m below grade or insulated in some other acceptable manner to achieve a level of protection from freezing that equivalent to tank that has a minimum 1.2 m cover of the in situ soil.

2. The PSDS shall be designed to meet the separation requirements and to not exceed the effluent loading rate. The treatment system should be constructed in accordance with applicable regulations and should be properly sized and installed by a licensed contractor based on normal testing and verification of actual field conditions.

6.4.4 Treatment Mounds

If a treatment mound is proposed for private sewage disposal at each proposed lot, the mound should be constructed with imported materials that meet the required infiltration rate requirements. The onsite wastewater disposal guide also outlines the particle distribution of suitable medium density sand. In addition, the concrete sand specification or provincial CAN/CSA-A23.1 or ASTM-C33 may also be used. The mound berm fill material to form the berm of the overall mound covering the soil infiltration area (sand layer) is also outlined in the guide.

A treatment mound is required to meet the following setback requirements:

- 15 from a water source or water well;
- 15 m from a water course;
- 3 m from a property line;
- 3 m from septic tank;
- 9 m from a building with or without a basement, cellar or crawl space; and

6.4.5 Site Feasibility

Based on the preliminary results obtained by this geotechnical investigation, no discernable evidence was found that would indicate that the property would not be suitable for on-site wastewater treatment. Suitable waste water treatment systems include standard septic tank and fields, mounds and package treatment plants.

6.5 PAVEMENT

New pavement construction is proposed for access roads at the site. The proposed pavement sections are based on the assumption that the subgrade will be constructed on a stable, suitably prepared subgrade with a California Bearing Ratio of 3.0. This is indicative of a low level of subgrade support as expected during spring thaw when the subgrade soils will exist in a weakened condition. If soft conditions are encountered, it is assumed that the subgrade will be improved with coarse gravel to support construction traffic and paving activities. This subgrade improvement gravel is placed together with the subbase.

6.5.1 Proposed Flexible Asphalt Pavement Design

One flexible pavement design is proposed for this residential subdivision. A light traffic section for the local residential streets using a Design Traffic of 2.5×10^4 ESAL's. This design traffic was based on a design period of 20 years. The proposed pavement design section is based on the assumption of a stable subgrade which has a CBR of at least 4.0 in a soaked condition; or a subgrade which has been improved to an equivalent level as described in Section 6.2. The majority of surficial soils across the site are expected to meet this minimum subgrade support condition, but there is the potential for some localized soft areas. Based on the preceding design assumptions, the following flexible pavement section is proposed:

TABLE 5
FLEXIBLE PAVEMENT STRUCTURES

Pavement Material	Light Traffic
Asphalt Concrete Pavement	60 mm
Base Course Gravel (Type 33*)	200 mm
Woven Geotextile	Yes
150 mm Subgrade Preparation	Yes

*Saskatchewan Ministry of Highways and Infrastructure (SMHI)

The thickness of subbase gravel given above is considered to be the minimum requirement assuming some subgrade improvement is required. Based on local experience some localized gravel improvement may be required to facilitate pavement construction. The exposed surface should be proof rolled and any suspected soft areas should be investigated to verify sufficient subbase and a stable subgrade is present to support the new pavement construction. Excavated base gravel could be considered for reuse as subgrade or subbase material in the pavement, provided it is free of excess fine subgrade material.

6.5.2 Pavement Materials

The performance of the proposed pavement design sections will be, in part, dependent on achieving an adequate level of compaction in subgrade and pavement materials. The recommended levels of compaction for the granular materials in the pavement section should be a minimum of 98 percent of SPMDD. The asphalt concrete should be compacted to a minimum of 97 percent of Marshall Density based on a 50 blow laboratory Marshall test for light duty pavement areas. It is recommended to use pavement materials conforming to the following specifications.

TABLE 6
ASPHALT CONCRETE PAVEMENT

	Specification
Stability (kN minimum)	8.5
Flow (mm)	2 - 3.5
Air Voids (percent)	3.0 – 5.0
VMA (minimum percent)	13.0
Asphalt Cement (penetration grade)	150 - 200 (A)

Aggregate materials for base and subbase gravel should be composed of sound, hard, durable particles free from organics and other foreign material. It is recommended to use aggregates conforming to the Saskatchewan Ministry of Highways and Infrastructure specifications.

6.5.3 Geosynthetics

The use of a geotextile filter fabric as a separation barrier between the pavement gravel and the subgrade is recommended to minimize the movement of fines into the gravel base course at all locations. As a minimum for critical access ways, the suggested geotextile specification is:

TABLE 7
WOVEN FILTER CLOTH SPECIFICATION

Parameter	Specification	Test Method
Minimum Grab Tensile Strength	1100 N	ASTM D4632
Minimum Grab Elongation at Failure	<50%	ASTM D4632
Minimum Static CBR Puncture Strength	3300 N	ASTM D6421
Minimum Sewn Seam Strength	990 N	ASTM D3786
Minimum Tear Strength	400 N	ASTM D4533
Maximum Apparent Opening Size	0.6 mm	ASTM D4751

* or equivalent SMHI Standard Medium Weight Woven Filter Cloth

The addition of a geotextile at the subgrade surface on this type of subgrade material would not reduce the granular thickness requirements significantly since the subgrade would have to deform (rut) in order for the strength of the geotextile to be developed. Woven fabrics typically have more favourable stress/strain characteristics (30% elongation at failure) than non-woven filter fabrics (100% elongation at failure). Therefore, the woven fabric will mobilize more strength as the

subgrade deflects under traffic loads. Proposed geosynthetic filter fabrics should be reviewed based on their proposed end use. A slightly less robust geotextile could be given consideration if initial field performance ratings dictate.

The selective use of geo-grid reinforcement may be prudent for critical traffic areas at this site. The need for extra pavement reinforcement measures should be reviewed based on conditions in the field at the time of construction.

6.5.4 Grading and Drainage

Site grading during and after construction is an important consideration. The pavement and road area should be sloped and graded to effectively and rapidly remove all surface water during and after construction. Water should not be allowed to pond on the exposed subgrade. Allowing water to pond on the subbase gravel, base gravel or pavement surface will lead to infiltration of water into the subgrade which could result in weakening of the subgrade soils and may lead to distress/failure of the overlying pavement.

6.6 FOUNDATION CONCRETE

Water soluble sulphate concentration results indicates a negligible potential for sulphate attack of subsurface concrete. As per CSA A23.1-19, a General Use (GU) hydraulic cement is recommended with a minimum 28 day compressive strength of 28 MPa and a water cement ratio of 0.5. All concrete exposed to a freezing environment either during or after construction should be air entrained. Concrete should be placed in accordance with CSA Standard CAN3-A23.1-19. Calcium chloride used as accelerating admixture or any admixture formulation containing chloride should not be used in the subsurface concrete, since they may increase the severity of sulphate attack.

6.7 INSPECTION

It is recommended that on-site inspection and testing be performed to verify that actual site conditions are consistent with assumed conditions which meet or exceed design criteria. The recommendations provided within this report are dependent on proper quality control of fill placement. Initial site stripping and excavation activities should be monitored by experienced and qualified geotechnical personnel. The placement of an engineered fill should be monitored and tested by a qualified soils technician to verify adequate levels of compaction and design standards are achieved. Based on the National Building Code, adequate levels of inspection are considered to be: proof roll of prepared subgrade, monitoring and compaction testing of engineered fill, and review of all completed bearing surfaces for footings.

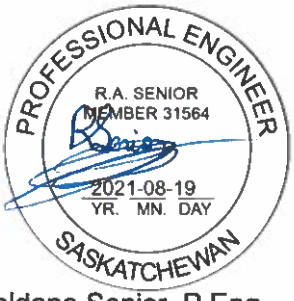
7.0 LIMITATIONS

Geological conditions are variable. At the time this report was prepared, information on the subsurface conditions was available only at the borehole locations. Therefore, it was necessary to make certain assumptions concerning conditions between the borehole locations. The recommendations presented in this report, and any subsequent correspondence, are based on an evaluation of information derived from six boreholes, and additional sources of information referenced in this report. The conditions described are believed to be reasonably representative of the site. If conditions are noted during construction which are believed to be at variance with the conditions described in this report, this office should be contacted immediately.

This report has been prepared for the exclusive use of **Hunter Creek Developments, BMA Ventures Inc.,** and their approved agents, for the specified application of the Proposed Residential Subdivision within NE-12-17-18-W2M, near White City, Saskatchewan. It has been prepared in accordance with generally accepted soil and foundation engineering practices. No other warranty, expressed or implied, is made. Use of the report is subject to acceptance of the General Terms and Conditions provided in Limitation Appendix of this report.

We trust this meets with your present needs. If you have any questions or comments regarding this information, please do not hesitate to contact this office.

Respectfully Submitted,
PARKLAND GEOTECHNICAL CONSULTING LTD.



Roldane Senior, P.Eng.
Geotechnical Engineer

Reviewed by:
Steve Selst, MEM, P.Eng. (Alberta)
Intermediate Geotechnical Engineer

APEGS Permit to Practice No. 27603

Association of Professional Engineers & Geoscientists of Saskatchewan
CERTIFICATE OF AUTHORIZATION
Parkland Geotechnical Consulting Ltd.
Number 27603
Permission to Consult held by:

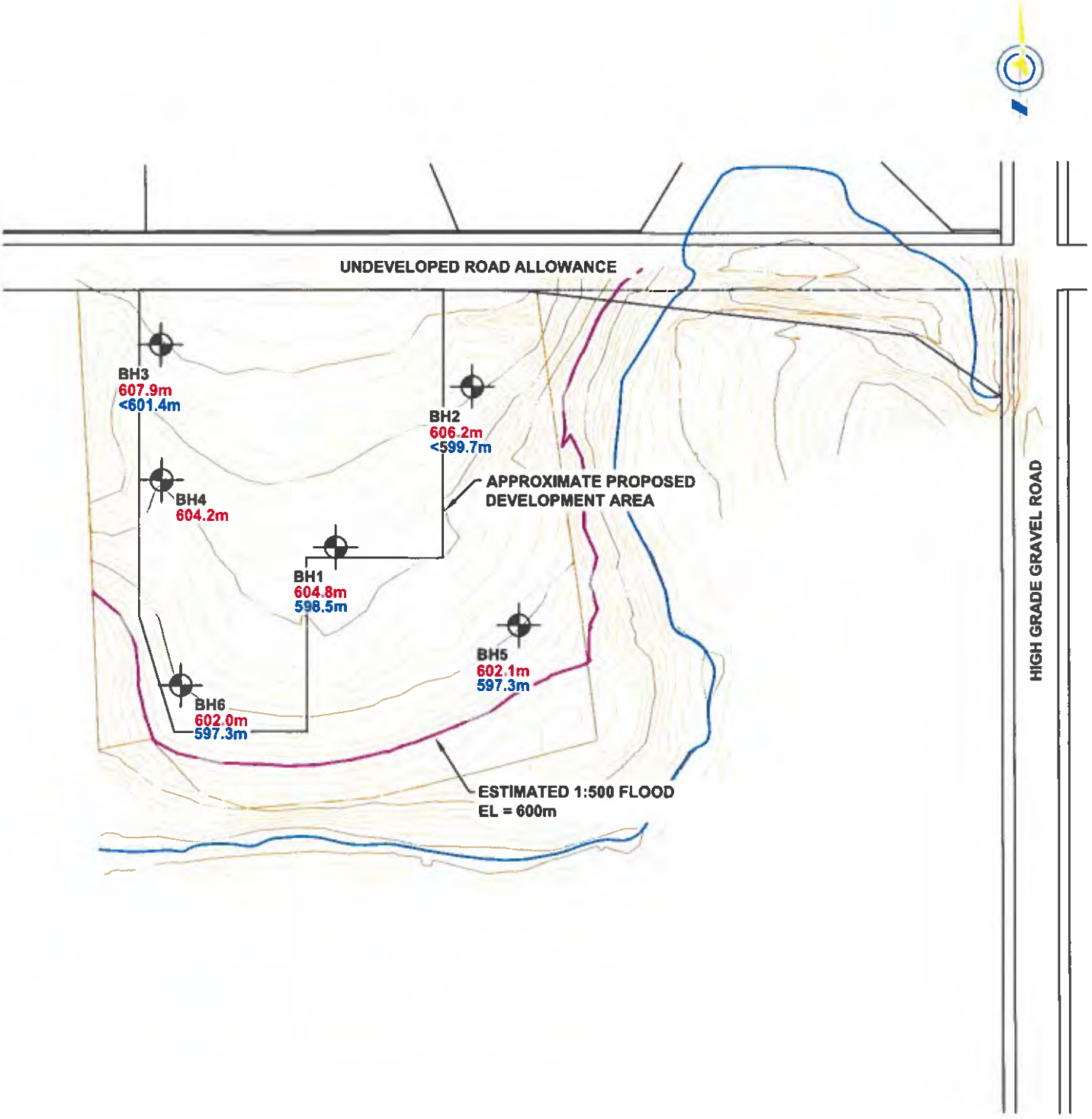
Discipline	Sk. Reg. No.	Signature
CIVIL	27189	

Mark Brotherton, P.Eng.
Principal Geotechnical Engineer
Responsible Member

FIGURES

ParklandGEO	CLIENT: BMA VENTURES INC.	**KEY PLAN** PROPOSED SUBDIVISION DEVELOPMENT NE 12-17-18 W2M, RM OF EDENWOLD NO. 158, SK

DRAWN:	CHK'D.:	REV #:	DATE:
NC	RS	0	AUGUST 2021
SCALE:	JOB NO.		DRAWING NO.
NTS	SK0352		FIGURE 1



NOTE: CONTOURS PROVIDED BY CLIENT, COMPASS GEOMATICS LTD., FILE NO. 00822-21-TOPO-R1, DATED JULY 2021.

ALL BOREHOLE LOCATIONS ARE APPROXIMATE.

604.8m SURFACE ELEVATION

598.5m GROUNDWATER ELEVATION (AUGUST 9, 2021)

SCALE (metres)

-50 -25 0 25 50 100

Parkland GEO

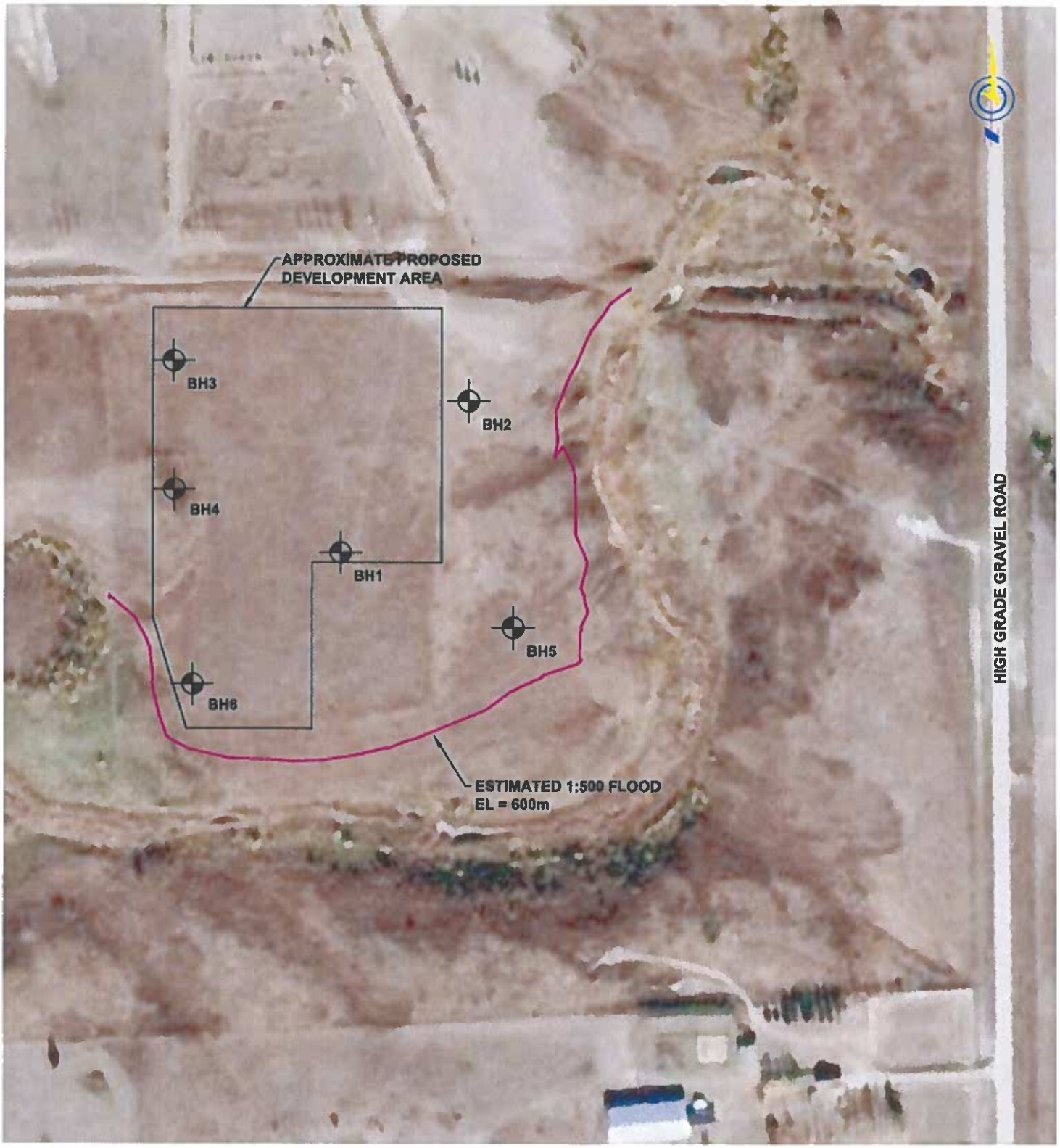
CLIENT: BMA VENTURES INC.

SITE PLAN

PROPOSED SUBDIVISION DEVELOPMENT
NE 12-17-18 W2M, RM OF EDENWOLD NO. 158, SK

DRAWN:	CHK'D.:	REV #:	DATE:
NC	RS	0	AUGUST 2021

SCALE:	JOB NO.	DRAWING NO.
1:2500	SK0352	FIGURE 2



NOTE: AERIAL PHOTOGRAPH OBTAINED FROM GOOGLE EARTH, DATED OCTOBER 9, 2020.

ALL BOREHOLE LOCATIONS ARE APPROXIMATE.

SCALE (metres)

-50 -25 0 25 50 100

Parkland GEO

CLIENT:

BMA VENTURES INC.

AERIAL PLAN

PROPOSED SUBDIVISION DEVELOPMENT
NE 12-17-18 W2M, RM OF EDENWOLD NO. 158, SK

DRAWN:	CHK'D.:	REV #:	DATE:
NC	RS	0	AUGUST 2021

SCALE:	JOB NO.	DRAWING NO.
1:2500	SK0352	FIGURE 3

PHOTOGRAPH 1: SHOWS BH1, FACING WEST

PHOTOGRAPH 2: SHOWS SUBJECT AREA, TAKEN FROM BH2, FACING NORTHEAST

PHOTOGRAPH 3: SHOWS BH3, FACING SOUTH

PHOTOGRAPH 4: SHOWS BH4, FACING NORTH

ParklandGEO	CLIENT: BMA VENTURES INC.	**SITE PHOTOGRAPHS** PROPOSED SUBDIVISION DEVELOPMENT NE 12-17-18 W2M, RM OF EDENWOLD NO. 158, SK

DRAWN:	CHK'D.:	REV #:	DATE:
NC	RS	0	AUGUST 2021

SCALE:	JOB NO.	DRAWING NO.
NTS	SK0352	FIGURE 4

APPENDIX A

Borehole Logs (6)
Explanation of Terms and Symbols

BOREHOLE NO.: 01

CLIENT: BMA Ventures Inc.
SITE: Hunter Creek Developments
NOTES:

PROJECT NO.: SK0352
BH LOCATION: Center of Work Area

SUBSURFACE PROFILE

Depth (m)	Description	Symbol	Moisture (Wp |-----X-----| Wl) 25 50 75	Type	Sample No	SPT (N)	Comments	Well Completion Details	Elevation (m)
0	GROUND SURFACE								604.80
	Topsoil (300 mm) Organic, silty sand, trace rootlets, brown to black.								604.50
1	***Sand*** Fine grained, some silt, trace clay, loose to compact, brown, damp.		4	G	1G1				
2			8						
				G	1G2		**Grain Size Analysis** Gravel - 0.0 % Sand - 39.4 % Silt - 52.1 % Clay - 8.5 %		
3			3		1D1	10			
4			5	G	1G3				
	- Rust staining, moist to wet at 4.5m.								
5			20						
				G	1G4				
6	- Grey at 6.0m.		25						
7			22	G	1G5				
							- Water at 7.5m.		597.30
8	***Till*** Clay, little silt, trace sand, trace gravel, very stiff, low plastic, grey damp to moist.		15		1D2	10			
				G	1G6				
9			17		1D3	17			
10			13	G	1G7				
11			15		1D4	22			
				G	1G8				
12	End of Borehole at 12 m. 25 mm PVC standpipe installed. Backfilled with auger cuttings and bentonite chips. Wet upon completion. Water at 6.3 m on August 9, 2021.		14						592.80
13									
14									

Well Completion Details: SOLID PVC PIPE; 598.5 m on August 9, 2021; BACKFILL WITH AUGER CUTTINGS; SLOTTED PIPE

LOGGED BY: NH
CONTRACTOR: Rebel Drillling Ltd.
RIG/METHOD: Truck Mounted / 150mm SSA
DATE: July 29, 2021
CALIBRATION:

GROUND ELEVATION: 604.8 m
NORTHING: 5586072 m
EASTING: 546355 m

BOREHOLE NO.: 02

CLIENT: BMA Ventures Inc.
SITE: Hunter Creek Developments
NOTES:

PROJECT NO.: SK0352
BH LOCATION: North East Corner

SUBSURFACE PROFILE

Depth (m)	Description	Symbol	Moisture (Wp |----X----| Wl) 25 50 75	Type	Sample No	SPT (N)	Comments	Well Completion Details	Elevation (m)
0	GROUND SURFACE								606.20
	Topsoil (200 mm) Organic, silty sand, trace rootlets, brown to black.		11	G	2G1				
1	***Sand*** Fine grained, trace to little silt, loose to compact, brown, damp.								
			3		2D1	13			
2				G	2G2				
			3		2D2	15			
3									602.70
	Silt And fine grained sand, trace gravel, trace clay, compact, low plastic, brown, damp to moist.		23	G	2G3		**Grain Size Analysis** Gravel - 2.9 % Sand - 36.4 % Silt - 51.5 % Clay - 9.2 %		
4									601.70
	Sand Little to trace silt, loose, brown, damp.		11						
5				G	2G4				
			12						
6					2D3	8			
	End of Borehole at 6.5 m. 25 mm PVC standpipe installed. Backfilled with auger cuttings and bentonite chips. Dry upon completion. Dry on August 9, 2021.								599.70
7									
8									
9									
10									
11									
12									
13									
14									

Well Completion Details: SOLID PVC PIPE; SLOTTED PIPE; BACKFILL WITH AUGER CUTTINGS

LOGGED BY: NH
CONTRACTOR: Rebel Drillling Ltd.
RIG/METHOD: Truck Mounted / 150mm SSA
DATE: July 29, 2021
CALIBRATION:

GROUND ELEVATION: 606.2 m
NORTHING: 5586144 m
EASTING: 546415 m

BOREHOLE NO.: 03

CLIENT: BMA Ventures Inc.
SITE: Hunter Creek Developments
NOTES:

PROJECT NO.: SK0352
BH LOCATION: North West Corner

SUBSURFACE PROFILE

Depth (m)	Description	Symbol	Moisture (Wp |—X—| Wl) 25 50 75	Type	Sample No	SPT (N)	Comments	Well Completion Details	Elevation (m)
0	GROUND SURFACE								607.90
	Topsoil (300 mm) Organic, silty sand, trace rootlets, brown to black.		2	G	3G1			SOLID PVC PIPE	607.60
1	***Sand*** Fine grained, trace silt, loose to compact, brown, dry to damp.								
			2		3D1	13			
2	- Little silt at 2.4m.			G	3G2				
			13						
3									
			22	G	3G3				
4	- Trace clay, rust staining, damp to moist at 4.1m.								
			14		3D2	8			
5	- Coarse grained sand at 5.0m.			G	3G4			SLOTTED PIPE	602.70
	Till Clay, little silt, trace sand, trace gravel, stiff, low plastic, grey, damp to moist.		17					BACKFILL WITH AUGER CUTTINGS	
6					3D3	11			601.40
	End of Borehole at 6.5 m. 25 mm PVC standpipe installed. Backfilled with auger cuttings and bentonite chips. Dry upon completion. Dry on August 9, 2021.								
7									
8									
9									
10									
11									
12									
13									
14									

LOGGED BY: NH
CONTRACTOR: Rebel Drillling Ltd.
RIG/METHOD: Truck Mounted / 150mm SSA
DATE: July 29, 2021
CALIBRATION:

GROUND ELEVATION: 607.9 m
NORTHING: 5586163 m
EASTING: 546276 m

BOREHOLE NO.: 04

CLIENT: BMA Ventures Inc.
SITE: Hunter Creek Developments
NOTES:

PROJECT NO.: SK0352
BH LOCATION: West Side of Site

SUBSURFACE PROFILE

Depth (m)	Description	Symbol	Moisture (Wp |—X—| Wl) 25 50 75	Type	Sample No	SPT (N)	Comments	Well Completion Details	Elevation (m)
0	GROUND SURFACE								604.20
	Topsoil (250 mm) Organic, silty sand, trace rootlets, brown to black.								
1	***Sand*** Fine grained, trace to little silt, loose to compact, brown, damp.		4	G	4G1		SO_4 - 0.040 %		
					4D1	8			
2			3	G	4G2				
			12						
3					4D2	8			
			19	G	4G3				
4	- Moist to wet at 4.0m.								
					4D3	7			599.50
5	***Silt*** Some fine grained sand, trace clay, firm to stiff,, low plastic, brown, moist to wet.		25	G	4G4				
			23						598.20
6	End of Borehole at 6.0 m. Backfilled with auger cuttings . Dry upon completion.								
7									
8									
9									
10									
11									
12									
13									
14									

LOGGED BY: NH
CONTRACTOR: Rebel Drillling Ltd.
RIG/METHOD: Truck Mounted / 150mm SSA
DATE: July 29, 2021
CALIBRATION:

GROUND ELEVATION: 604.2 m
NORTHING: 5586102 m
EASTING: 546276 m

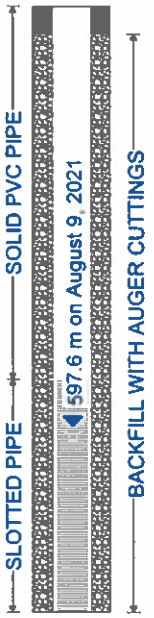
BOREHOLE NO.: 05

CLIENT: BMA Ventures Inc.
SITE: Hunter Creek Developments
NOTES:

PROJECT NO.: SK0352
BH LOCATION: East Side of Site

SUBSURFACE PROFILE

Depth (m)	Description	Symbol	Moisture (Wp |----X----| Wl) 25 50 75	Type	Sample No	SPT (N)	Comments	Well Completion Details	Elevation (m)
0	GROUND SURFACE								602.10
	Topsoil (250mm) Organic, silty sand, trace rootlets, brown to black.		18	G	5G1				
1	***Sand*** Fine grained, trace to little silt, loose to compact, brown, moist to wett.								600.70
	Silt little to some sand, trace clay, firm to stiff, low plastic, brown, rust staining, moist.		30	G	5G2				
2			10						
3					5D1	9			
			28	G	5G3				
4	- Grey at 4.5 m								
			24		5D2	5			
5				G	5G4				
			26						
6					5D3	9			
	End of Borehole at 6.5 m. 25 mm PVC standpipe installed. Backfilled with auger cuttings and bentonite chips. Wet upon completion. Water at 4.5 m on August 9, 2021.								595.60
7									
8									
9									
10									
11									
12									
13									
14									



LOGGED BY: NH
CONTRACTOR: Rebel Drillling Ltd.
RIG/METHOD: Truck Mounted / 150mm SSA
DATE: July 29, 2021
CALIBRATION:

GROUND ELEVATION: 602.1 m
NORTHING: 5586037 m
EASTING: 546437 m

BOREHOLE NO.: 06

CLIENT: BMA Ventures Inc.
SITE: Hunter Creek Developments
NOTES:

PROJECT NO.: SK0352
BH LOCATION: South Side of Site

SUBSURFACE PROFILE

Depth (m)	Description	Symbol	Moisture (Wp |—X—| Wl) 25 50 75	Type	Sample No	SPT (N)	Comments	Well Completion Details	Elevation (m)
0	GROUND SURFACE								602.00
	Topsoil (300 mm) Organic, silty sand, trace rootlets, brown to black.		10	G	6G1				
1	***Sand*** Fine grained, trace to little silt, loose to compact, brown, moist to wet.								
			11		6D1	8			
2				G	6G2				
			19						
3					6D2	9			
			21	G	6G3				
4									597.50
	Till Clay, little silt, little sand, trace gravel, low plastic, rust staining, damp to moist, brown..		22		6D3	10			
5				G	6G4		**Grain Size Analysis** Gravel - 1.1 % Sand - 39.2 % Silt - 43.6 % Clay - 16.1 %		
			21						
6	End of Borehole at 6.0 m. 25 mm PVC standpipe installed. Backfilled with auger cuttings and bentonite chips. Wet upon completion. Water at 4.75 m on August 9, 2021.								596.00
7									
8									
9									
10									
11									
12									
13									
14									

LOGGED BY: NH
CONTRACTOR: Rebel Drillling Ltd.
RIG/METHOD: Truck Mounted / 150mm SSA
DATE: July 29, 2021
CALIBRATION:

GROUND ELEVATION: 602.0 m
NORTHING: 5586010 m
EASTING: 546284 m

THE PARKLANDGEO CONSULTING GROUP
EXPLANATION OF TERMS AND SYMBOLS

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

The borehole logs are a graphical representation summarizing the soil profile as determined during site specific field investigation. The materials, boundaries, and conditions have been established only at the borehole location at the time of drilling. The soil conditions shown on the borehole logs are not necessarily representative of the subsurface conditions elsewhere across the site. The transitions in soil profile can have gradual rather than distinct boundaries.

1. **PRINCIPAL SOIL TYPE** – The major soil type by weight of material or by behaviour.

Material	Grain Size
Boulders	Larger than 300 mm
Cobbles	75 mm to 300 mm
Coarse Gravel	19 mm to 75 mm
Fine Gravel	5 mm to 19 mm
Coarse Sand	2 mm to 5 mm
Medium Sand	0.425 mm to 2 mm
Fine Sand	0.075 mm to 0.425 mm
Silt	0.020 to 0.075 mm
Clay	Smaller than 0.020 mm

2. **DESCRIPTION OF MINOR SOIL TYPE** – Minor soil types are identified by weight of minor component.

Descriptor	Percent
and	35 to 50
some	20 to 35
little	10 to 20
trace	1 to 10

3. **CONSISTENCY OF FINE GRAINED SOILS** – The following terms are used relative to undrained shear strength and Standard Penetration Test (SPT), N value, for blows per 300 mm penetration (ASTM D1586).

Description	Undrained Shear Strength, C_u (kPa)	SPT N Value
Very Soft	Less than 12	Less than 2
Soft	12 to 25	2 to 4
Firm	25 to 50	4 to 8
Stiff	50 to 100	8 to 15
Very Stiff	100 to 150	15 to 30
Hard	Over 150	Over 30

4. **RELATIVE DENSITY OF COARSE GRAINED SOIL** – The following terms are used relative to Standard Penetration Test (SPT), N value, for blows per 300 mm penetration (ASTM D1586).

Description	SPT N Value
Very Loose	Less than 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very Dense	Over 50

5. **TYPICAL SEDIMENTARY BEDROCK TYPES AND CLASSIFICATION** – The following terms are based on visual inspection and field/laboratory identification tests.

Characteristic	Sandstone	Mudrocks			
		Siltstone	Mudstone	Clayshale	Claystone
Composition	>50% Sand $CaCO_3$ or silica binder. Use weak acid to test for $CaCO_3$.	>50% Silt	33% to 66% Silt & 33% to 66% Clay	>50% Clay & <33% Silt	
Bedding	Banding possible Non- Fissile Wackes – dirty sandstone matrix (>15% clay)	Non-Fissile & Non-laminated	Non-Fissile & Non-laminated	Fissile	Non-Fissile

Definitions

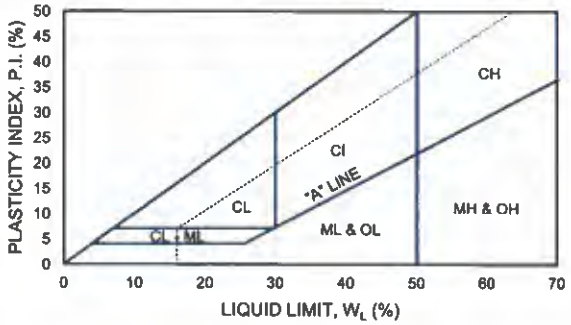
Fissile – Breaks apart on bedding planes, not fractures.
Shale – Only used to describe a fissile clay mudrock.
Slate – Hard mudstone exposed to high pressure and temperature.
Limestone – Sedimentary rock (i.e. particles) formed from calcium carbonate minerals from skeletal fragments of marine organisms such as coral. Particles generally too small to see with eye.

Parkland GEO

THE PARKLANDGEO CONSULTING GROUP
EXPLANATION OF TERMS AND SYMBOLS

MODIFIED UNIFIED CLASSIFICATION SYSTEM FOR SOILS

MAJOR DIVISION			GROUP SYMBOL	GRAPH SYMBOL	TYPICAL DESCRIPTION	LABORATORY CLASSIFICATION CRITERIA	
COARSE GRAINED SOILS (MORE THAN HALF BY WEIGHT LARGER THAN NO. 200 SIEVE)	GRAVELS MORE THAN HALF COARSE GRAINS LARGER THAN NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)	GW		WELL GRADED GRAVELS, GRAVEL-SAND MIXTURE, LITTLE OR NO FINES	$C_U = \frac{D_{60}}{D_{10}} \geq 4$ AND $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1$ to 3	
			GP		POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	NOT MEETING ABOVE REQUIREMENTS	
		DIRTY GRAVELS (WITH SOME FINES)	GM		SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES	CONTENT OF FINES EXCEEDS 12%	ATTERBERG LIMITS BELOW "A" LINE OR P.I. LESS THAN 4
			GC		CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES		ATTERBERG LIMITS ABOVE "A" LINE AND P.I. GREATER THAN 7
	SANDS MORE THAN HALF FINE GRAINS SMALLER THAN NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)	SW		WELL GRADED SANDS, GRAVELLY SANDS WITH LITTLE OR NO FINES	$C_U = \frac{D_{60}}{D_{10}} \geq 6$ AND $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1$ to 3	
			SP		POORLY GRADED SANDS, GRAVELLY SANDS LITTLE OR NO FINES	NOT MEETING ABOVE REQUIREMENTS	
		DIRTY SANDS (WITH SOME FINES)	SM		SILTY SANDS, SAND-SILT MIXTURES	CONTENT OF FINES EXCEEDS 12%	ATTERBERG LIMITS BELOW "A" LINE OR P.I. LESS THAN 4
			SC		CLAYEY SANDS, SAND-CLAY MIXTURES		ATTERBERG LIMITS ABOVE "A" LINE AND P.I. GREATER THAN 7
FINE-GRAINED SOILS (MORE THAN HALF BY WEIGHT PASSES NO. 200 SIEVE)	SILTS BELOW "A" LINE NEGLIGIBLE ORGANIC CONTENT	$W_L < 50\%$	ML		INORGANIC SILTS & VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY	CLASSIFICATION IS BASED UPON PLASTICITY CHART (SEE BELOW)	
		$W_L > 50\%$	MH		INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS, FINE SANDY OR SILTY SOILS		
	CLAYS ABOVE "A" LINE NEGLIGIBLE ORGANIC CONTENT	$W_L < 30\%$	CL		INORGANIC CLAYS OF LOW PLASTICITY, GRAVELLY, SANDY, OR SILTY SOILS		
		$30\% < W_L < 50\%$	CI		INORGANIC CLAYS OF MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS		
		$W_L > 50\%$	CH		INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS		
	ORGANIC SILTS & CLAYS BELOW "A" LINE	$W_L < 50\%$	OL		ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW AND MEDIUM PLASTICITY		
		$W_L > 50\%$	OH		ORGANIC CLAYS OF HIGH PLASTICITY, ORGANIC SILTS		
HIGHLY ORGANIC SOILS			Pt		PEAT AND OTHER HIGHLY ORGANIC SOILS	STRONG COLOR OR ODOR, AND OFTEN FIBROUS TEXTURE	



NOTES ON SOIL CLASSIFICATION AND DESCRIPTION:

1. Soil are classified and described according to their engineering properties and behaviour.
2. Boundary classification for soil with characteristics of two groups are given combined group symbols (e.g. GW-GC is a well graded gravel sand mixture with clay binder between 5 and 12%).
3. Soil classification is in accordance with the Unified Soil Classification System (ASTM D2487) with the exception that an inorganic clay of medium plasticity (CI) is recognized.
4. The use of modifying adjectives may be employed to define the estimated percentage range of minor components.

APPENDIX B

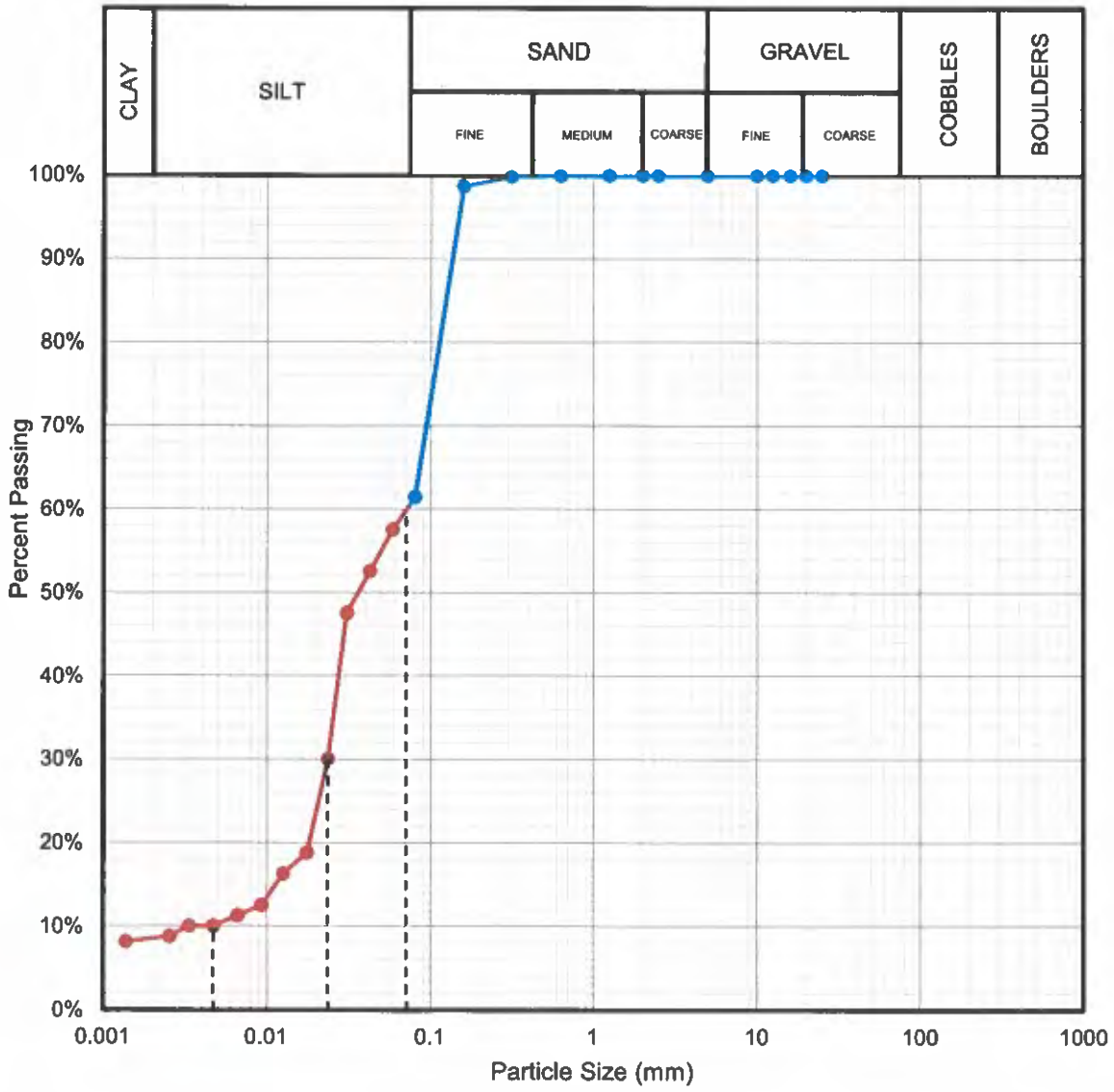
Soil Test Results

PARTICLE-SIZE ANALYSIS

ASTM D422

PROJECT: Hunter Creek Developments
PROJECT#: SK0352
CLIENT: BMA Ventures Inc.
SOIL DESCRIPTION: silt, and sand, trace clay

SAMPLE DATE: July 29, 2021
TEST DATE: August 8, 2021
SAMPLE ID: 1G2
DEPTH: 2.3 m



SUMMARY OF RESULTS		
	Gravel	0.0%
	Sand	39.4%
	Silt	52.1%
	Clay	8.5%

GRAIN SIZE		
	D_{10}	0.0047** mm
	D_{30}	0.0238** mm
	D_{60}	0.0714** mm

*Interpolated value **Extrapolated value

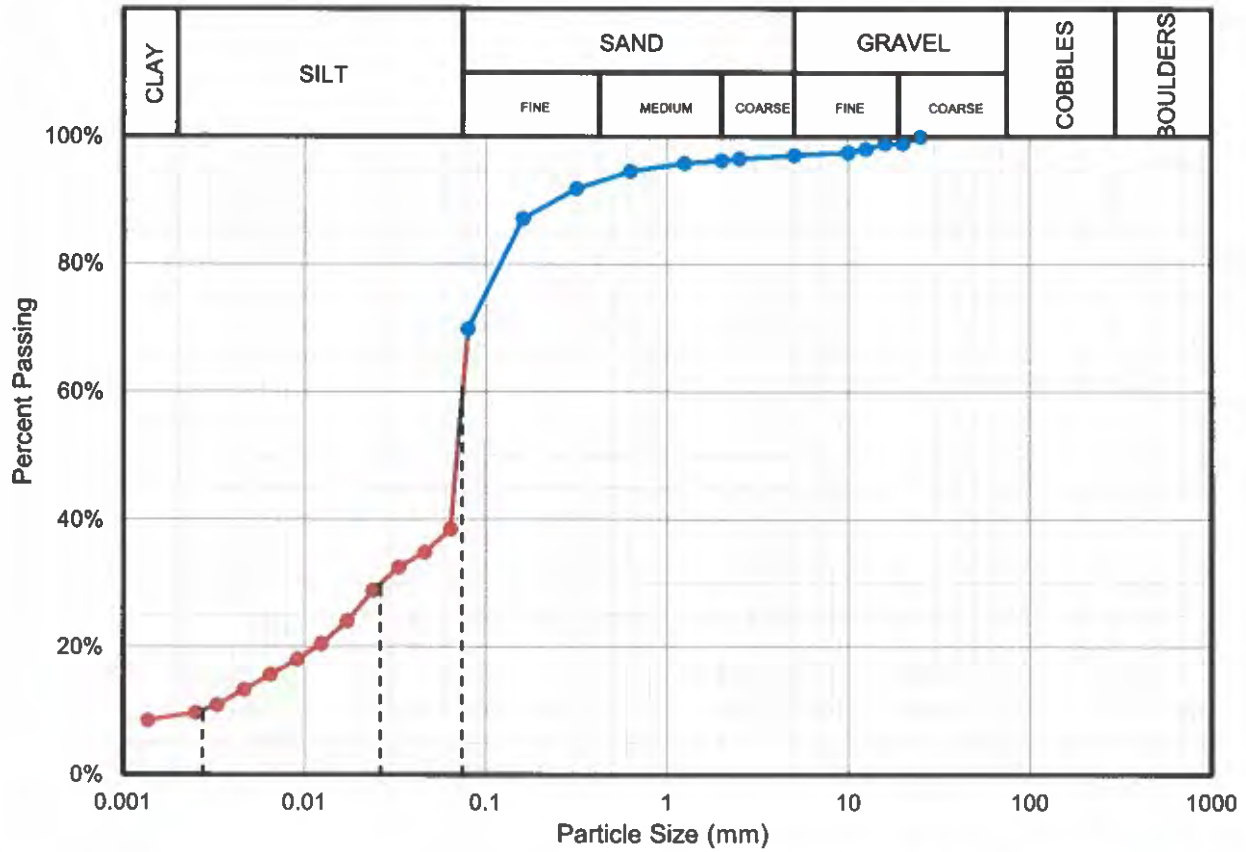
COEFFICIENTS		
	Coefficient of Uniformity, C_U	15.2
	Coefficient of Curvature, C_C	1.7

PARTICLE-SIZE ANALYSIS, LIQUID LIMIT, PLASTIC LIMIT, AND PLASTICITY

ASTM D422 & ASTM D4318

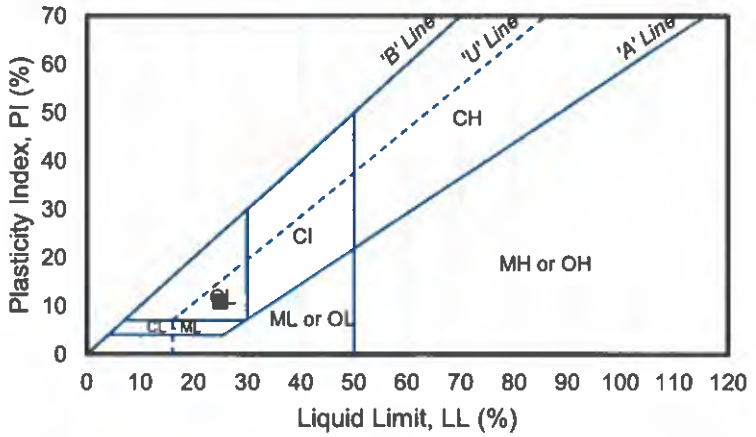
PROJECT: Hunter Developments
PROJECT#: SK0352
CLIENT: BMA Ventures Inc.
SOIL DESCRIPTION: silt, and sand, trace clay, trace gravel

SAMPLE DATE: July 29, 2021
TEST DATE: August 9, 2021
SAMPLE ID: 2G3
DEPTH: 3.8 m



PARTICLE-SIZE ANALYSIS	Gravel	2.9%
	Sand	36.4%
	Silt	51.5%
	Clay	9.2%
	D_{10}	0.0027** mm
	D_{30}	0.0264** mm
	D_{60}	0.0747** mm
	C_U	27.2
	C_C	3.4
LIMITS	PL	14
	LL	25
	PI	11

*Interpolated value **Extrapolated value



Modified Unified Soil Classification	Group Symbol
Sandy low plastic clay	CL

TECH: DS
CHECKED: BH

LIQUID LIMIT, PLASTIC LIMIT, AND PLASTICITY

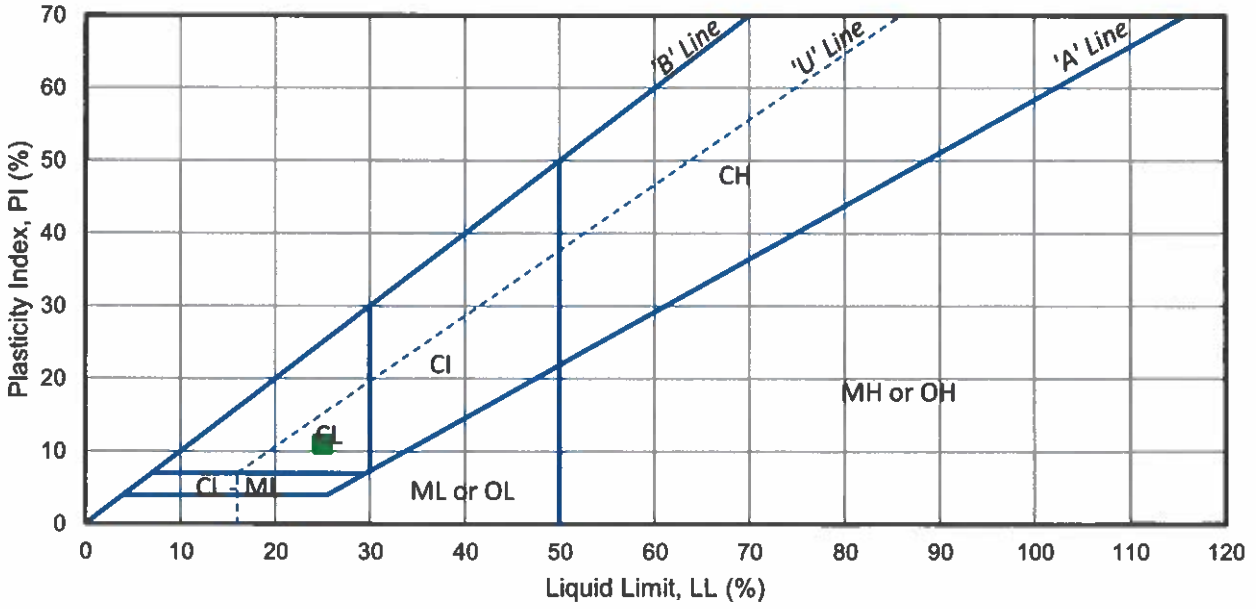
ASTM D4318 - Method B: One-Point

PROJECT: Hunter Developments
PROJECT#: SK0352
CLIENT: BMA Ventures Inc.
SOIL DESCRIPTION: silt, and sand, trace clay, trace gravel

SAMPLE DATE: July 29, 2021
TEST DATE: August 9, 2021
SAMPLE ID: 2G3
DEPTH: 3.8 m

PROCEDURE USED: Dry Preparation - Method B: One-Point

	AS RECEIVED	PLASTIC LIMIT				LIQUID LIMIT	
		1	2	3	4	1	2
Number of blows, N						20	21
Container Number	B	C	X	AA		XX	FF
Tare Container, M_C (g)	393.200	7.230	7.300	7.330		14.175	14.485
Wet Sample + Tare, M_{CMS} (g)	1631.400	8.605	8.860	8.985		42.610	58.310
Dry Sample + Tare, M_{CDS} (g)	1443.900	8.440	8.675	8.785		36.825	49.340
Dry Sample, M_S (g)	1050.700	1.210	1.375	1.455		22.650	34.855
Water, M_W (g)	187.500	0.165	0.185	0.200		5.785	8.970
Moisture Content, w (%)	17.8	13.6	13.5	13.7		25.5	25.7
One point liquid limit for given trial, $LL^n = w^n \cdot (N/25)^{0.121}$ (%)						24.9	25.2



Plastic Limit, PL or w_P (%)	14
Liquid Limit, LL or w_L (%)	25
Plasticity Index, PI (%)	11
Modified USCS Classification	CL

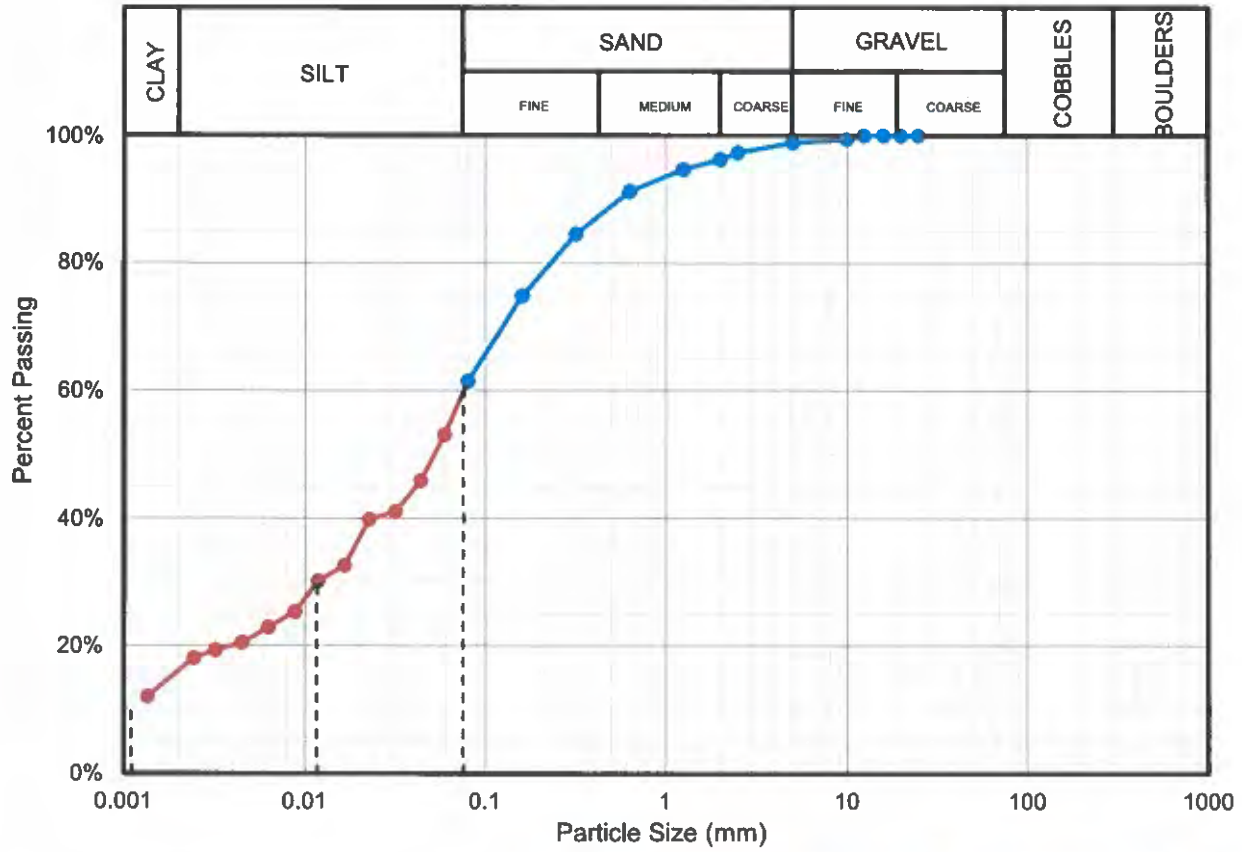
TECH: DS
CHECKED: BH

PARTICLE-SIZE ANALYSIS, LIQUID LIMIT, PLASTIC LIMIT, AND PLASTICITY

ASTM D422 & ASTM D4318

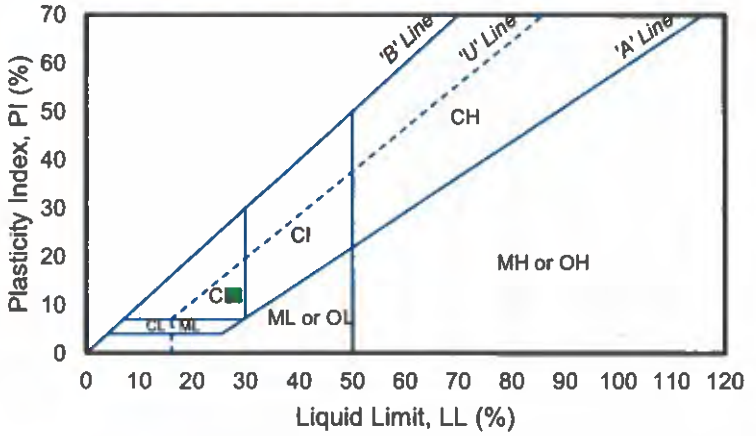
PROJECT: Hunter Developments
PROJECT#: SK0352
CLIENT: BMA Ventures Inc.
SOIL DESCRIPTION: silt, and sand, little clay, trace gravel

SAMPLE DATE: July 29, 2021
TEST DATE: August 8, 2021
SAMPLE ID: 6G4
DEPTH: 5.3 m



PARTICLE-SIZE ANALYSIS	Gravel	1.1%
	Sand	39.2%
	Silt	43.6%
	Clay	16.1%
	D_{10}	0.0011** mm
	D_{30}	0.0117** mm
	D_{60}	0.0759** mm
	C_U	69.0
	C_C	1.6
LIMITS	PL	16
	LL	28
	PI	12

*Interpolated value *Extrapolated value



Modified Unified Soil Classification	Group Symbol
Sandy low plastic clay	CL

TECH: DS
CHECKED: BH

LIQUID LIMIT, PLASTIC LIMIT, AND PLASTICITY

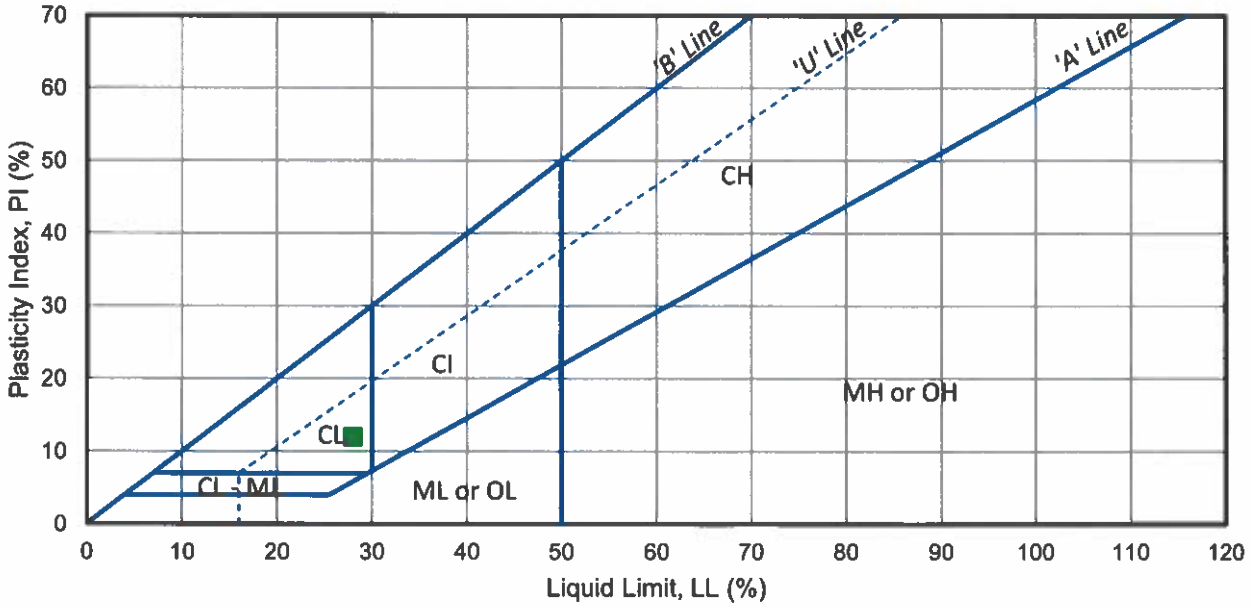
ASTM D4318 - Method B: One-Point

PROJECT: Hunter Developments
PROJECT#: SK0352
CLIENT: BMA Ventures Inc.
SOIL DESCRIPTION: silt, and sand, little clay, trace gravel

SAMPLE DATE: July 29, 2021
TEST DATE: August 8, 2021
SAMPLE ID: 6G4
DEPTH: 5.3 m

PROCEDURE USED: Dry Preparation - Method B: One-Point

	AS RECEIVED	PLASTIC LIMIT				LIQUID LIMIT	
		1	2	3	4	1	2
Number of blows, N						20	21
Container Number	A	11	N	E		I	C
Tare Container, M_C (g)	392.100	7.180	7.200	7.215		14.520	14.100
Wet Sample + Tare, M_{CMS} (g)	1972.400	8.310	8.050	8.110		45.840	54.895
Dry Sample + Tare, M_{CDS} (g)	1718.600	8.160	7.930	7.985		38.855	45.750
Dry Sample, M_S (g)	1326.500	0.980	0.730	0.770		24.335	31.650
Water, M_W (g)	253.800	0.150	0.120	0.125		6.985	9.145
Moisture Content, w (%)	19.1	15.3	16.4	16.2		28.7	28.9
One point liquid limit for given trial, $LL^n = w^n \cdot (N/25)^{0.121}$ (%)						27.9	28.3



Plastic Limit, PL or w_P (%)	16
Liquid Limit, LL or w_L (%)	28
Plasticity Index, PI (%)	12
Modified USCS Classification	CL

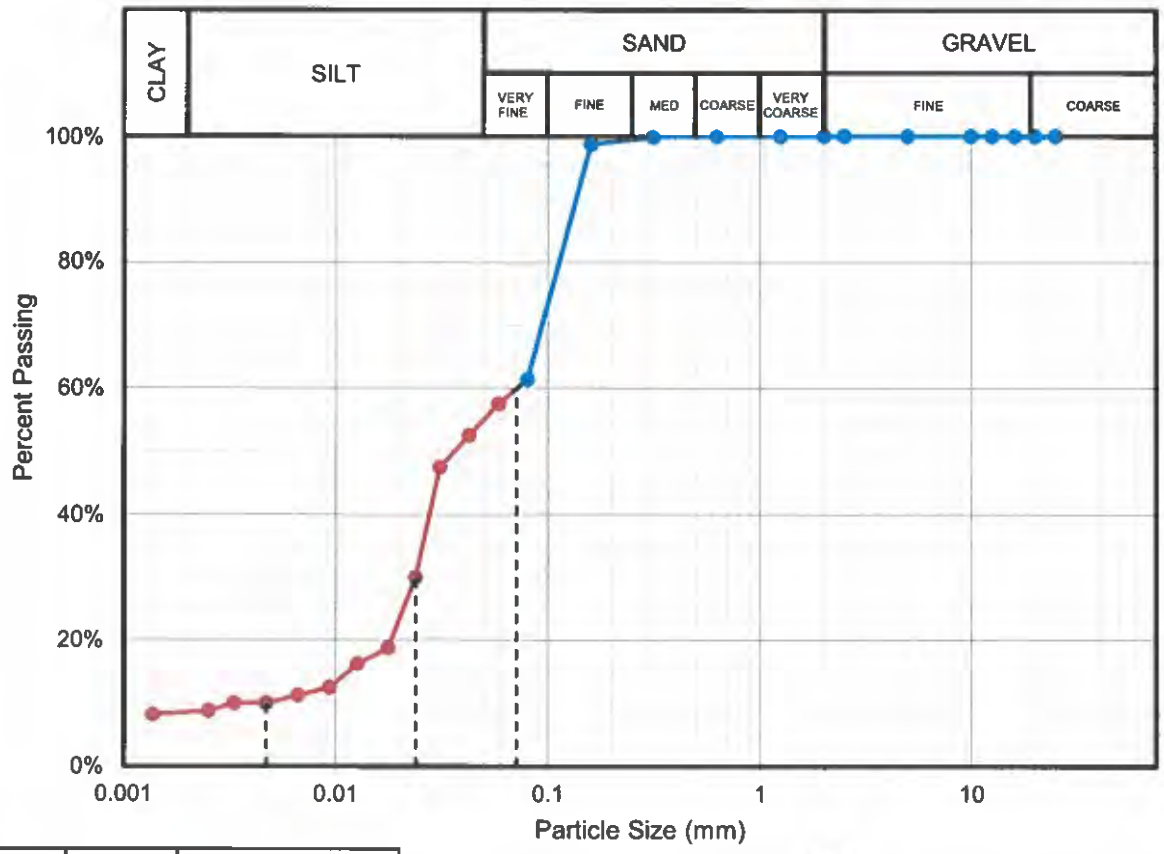
TECH: DS
CHECKED: BH

PARTICLE-SIZE ANALYSIS AND SOIL TEXTURE CLASSIFICATION

ASTM D422

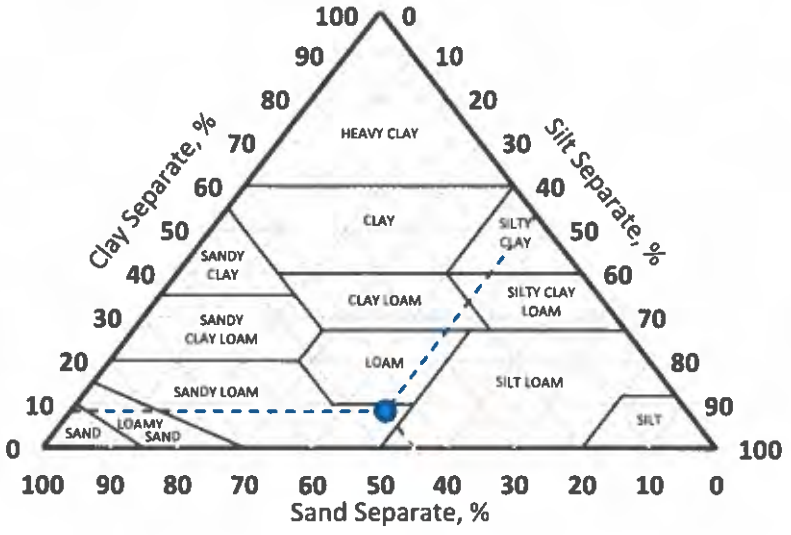
PROJECT: Hunter Creek Developments
PROJECT#: SK0352
CLIENT: BMA Ventures Inc.
SOIL DESC.: silt, and sand, trace clay

SAMPLE DATE: July 29, 2021
TEST DATE: August 8, 2021
SAMPLE ID: 1G2
DEPTH: 2.3 m



PARTICLE-SIZE ANALYSIS	Gravel	0.0%
	Sand	45.0%
	Silt	46.5%
	Clay	8.5%
	D_{10}	0.0047** mm
	D_{30}	0.0238** mm
	D_{60}	0.0714** mm
	C_U	15.2
	C_C	1.7
LIMITS	PL	---
	LL	---
	PI	---

*Interpolated value *Extrapolated value

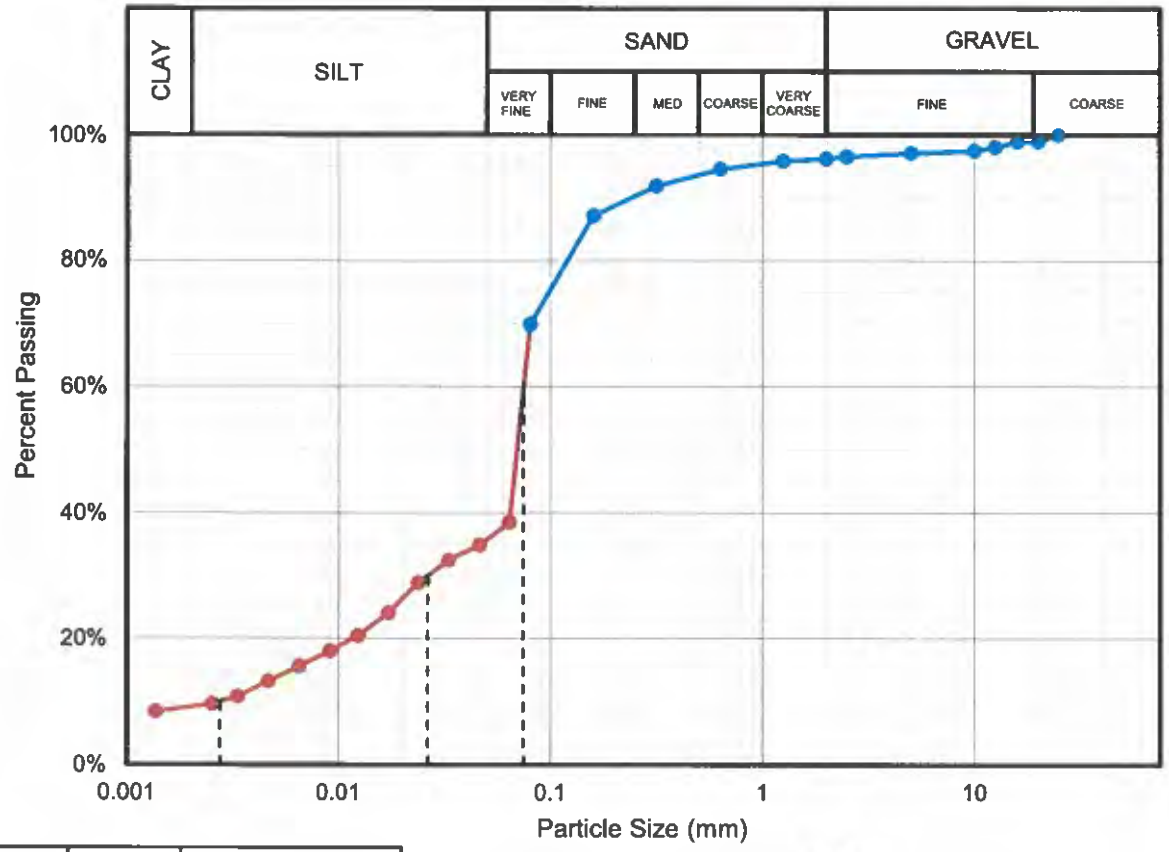


PARTICLE-SIZE ANALYSIS AND SOIL TEXTURE CLASSIFICATION

ASTM D422

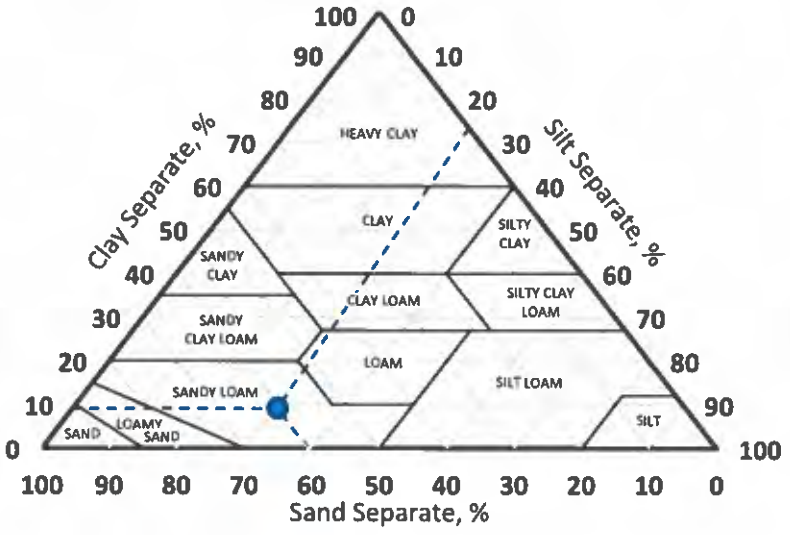
PROJECT: Hunter Developments
PROJECT#: SK0352
CLIENT: BMA Ventures Inc.
SOIL DESC.: silt, and sand, trace clay, trace gravel

SAMPLE DATE: July 29, 2021
TEST DATE: August 9, 2021
SAMPLE ID: 2G3
DEPTH: 3.8 m



PARTICLE-SIZE ANALYSIS	Gravel	3.8%
	Sand	60.5%
	Silt	26.6%
	Clay	9.2%
	D_{10}	0.0027** mm
	D_{30}	0.0264** mm
	D_{60}	0.0747** mm
	C_U	27.2
	C_C	3.4
LIMITS	PL	14
	LL	25
	PI	11

*Interpolated value *Extrapolated value

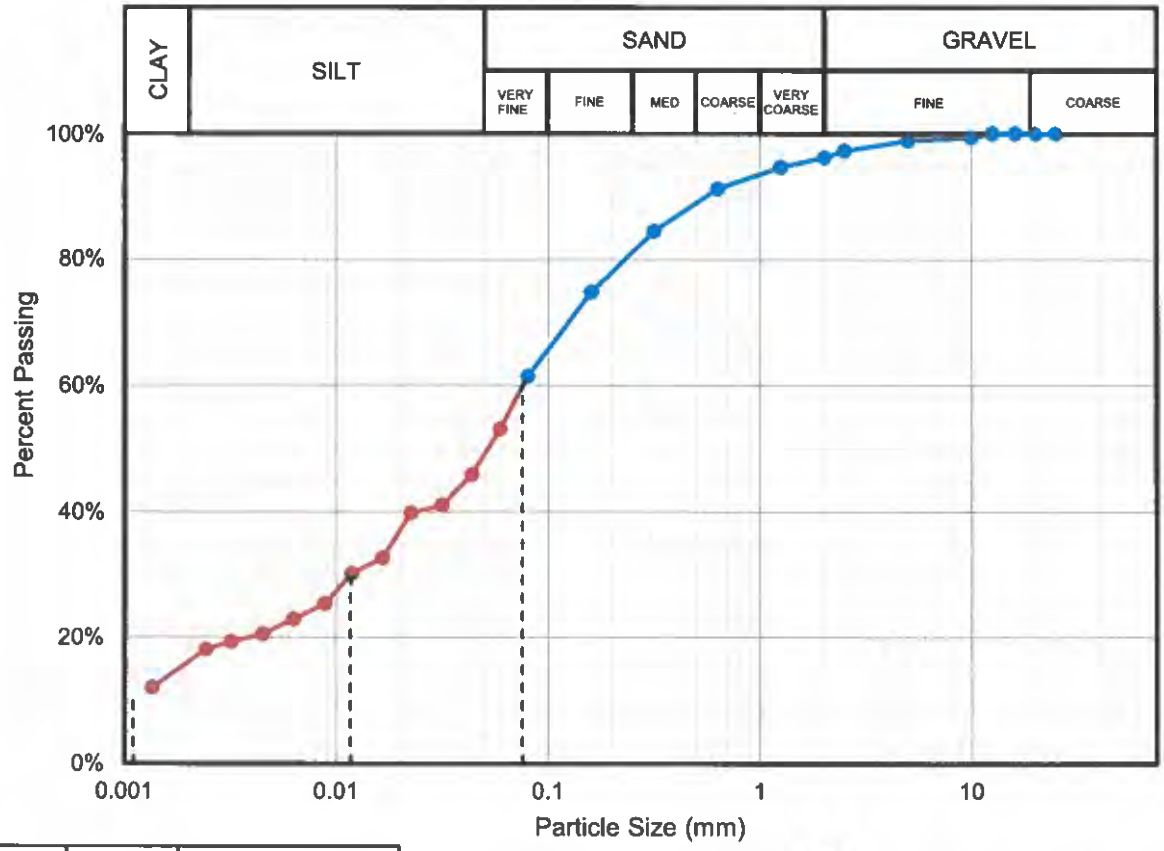


PARTICLE-SIZE ANALYSIS AND SOIL TEXTURE CLASSIFICATION

ASTM D422

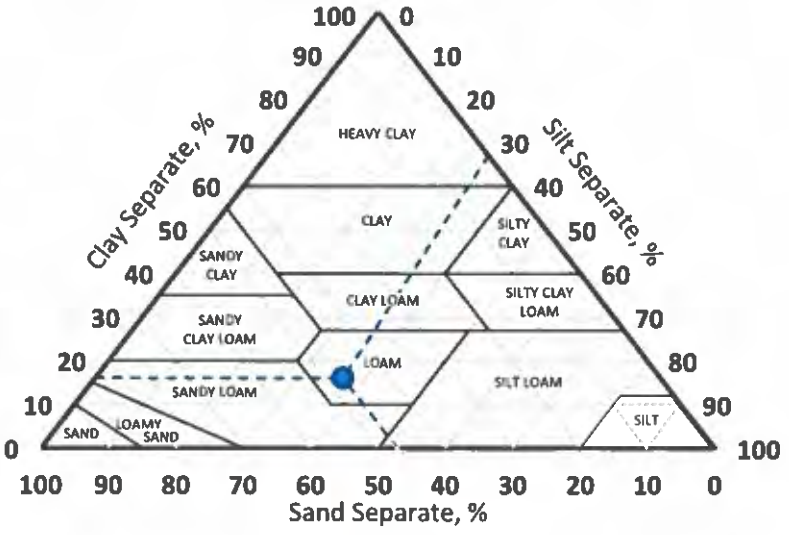
PROJECT: Hunter Developments
PROJECT#: SK0352
CLIENT: BMA Ventures Inc.
SOIL DESC.: silt, and sand, little clay, trace gravel

SAMPLE DATE: July 29, 2021
TEST DATE: August 8, 2021
SAMPLE ID: 6G4
DEPTH: 5.3 m



PARTICLE-SIZE ANALYSIS	Gravel	3.8%
	Sand	47.2%
	Silt	32.9%
	Clay	16.1%
	D_{10}	0.0011** mm
	D_{30}	0.0117** mm
	D_{60}	0.0759** mm
	C_U	69.0
	C_C	1.6
LIMITS	PL	16
	LL	28
	PI	12

*Interpolated value *Extrapolated value



WATER-SOLUBLE SULPHATE IN SOIL

PROJECT: Hunter Developments
PROJECT#: SK0352
CLIENT: BMA Ventures Inc.

SAMPLE DATE: July 30, 2021
TEST DATE: August 4, 2021

Sample #:	4G1	Sample #:	
Borehole:	4	Borehole:	
Depth:	0.8 m	Depth:	
Result:	0.040%	Result:	
Sample #:		Sample #:	
Borehole:		Borehole:	
Depth:		Depth:	
Result:		Result:	
Sample #:		Sample #:	
Borehole:		Borehole:	
Depth:		Depth:	
Result:		Result:	
Sample #:		Sample #:	
Borehole:		Borehole:	
Depth:		Depth:	
Result:		Result:	
Sample #:		Sample #:	
Borehole:		Borehole:	
Depth:		Depth:	
Result:		Result:	
Sample #:		Sample #:	
Borehole:		Borehole:	
Depth:		Depth:	
Result:		Result:	

Comments: Range of 0.04 to 0.04 percent. Sulphate Exposure Classification Negligible

REQUIREMENTS FOR CONCRETE SUBJECTED TO SULPHATE ATTACK (CAN/CSA-A23.1-14)

EXPOSURE CLASSIFICATION	DEGREE OF EXPOSURE	WATER-SOLUBLE SULFATE (SO_4) IN SOIL SAMPLE, %	SULFATE (SO_4) IN GROUNDWATER SAMPLES, mg/L	MINIMUM SPECIFIED 56-DAY COMPRESSIVE STRENGTH, MPa	MAXIMUM WATER-CEMENTING MATERIAL RATIO	PORTLAND CEMENT TO BE USED
S-1	Very Severe	over 2.0	over 10,000	35	0.40	HS
S-2	Severe	0.20 to 2.0	1,500 to 10,000	32	0.45	HS
S-3	Moderate	0.1 to 0.2	150 to 1,500	30	0.50	MS or HS

TECH: CZ
CHECKED: BH

LIMITATIONS

General Terms and Conditions

ParklandGEO

THE PARKLANDGEO CONSULTING GROUP
GENERAL TERMS, CONDITIONS AND LIMITATIONS

The use of this attached report is subject to the following general terms and conditions.

1. STANDARD OF CARE - In the performance of professional services, ParklandGEO used the degree of care and skill ordinarily exercised under similar circumstances by reputable members of its profession practicing in the same or similar localities. No other warranty expressed or implied is made in any manner.

2. INTERPRETATION OF THE REPORT - The CLIENT recognizes that subsurface conditions will vary from those encountered at the location where borings, surveys, or explorations are made and that the data, interpretations and recommendation of ParklandGEO are based solely on the information available to him. Classification and identification of soils, rocks, geological units, contaminated materials and contaminant quantities will be based on commonly accepted practices in geotechnical or environmental consulting practice in this area. ParklandGEO will not be responsible for the interpretation by others of the information developed.

3. SITE INFORMATION - The CLIENT has agreed to provide all information with respect to the past, present and proposed conditions and use of the Site, whether specifically requested or not. The CLIENT acknowledged that in order for ParklandGEO to properly advise and assist the CLIENT, ParklandGEO has relied on full disclosure by the CLIENT of all matters pertinent to the Site investigation.

4. COMPLETE REPORT - The Report is of a summary nature and is not intended to stand alone without reference to the instructions given to ParklandGEO by the CLIENT, communications between ParklandGEO and the CLIENT, and to any other reports, writings or documents prepared by ParklandGEO for the CLIENT relative to the specific Site, all of which constitute the Report. The word "Report" shall refer to any and all of the documents referred to herein. In order to properly understand the suggestions, recommendations and opinions expressed by ParklandGEO, reference must be made to the whole of the Report. ParklandGEO cannot be responsible for use of any part or portions of the report without reference to the whole report. The CLIENT has agreed that "This report has been prepared for the exclusive use of the named CLIENT. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. ParklandGEO accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report."

   The CLIENT has agreed that in the event that any such report is released to a third party, the above disclaimer shall not be obliterated or altered in any manner. The CLIENT further agrees that all such reports shall be used solely for the purposes of the CLIENT and shall not be released or used by others without the prior written permission of ParklandGEO.

5. LIMITATIONS ON SCOPE OF INVESTIGATION AND WARRANTY DISCLAIMER
   There is no warranty, expressed or implied, by ParklandGEO that:
   a) the investigation uncovered all potential geo-hazards, contaminants or environmental liabilities on the Site; or
   b) the Site is entirely free of all geo-hazards or contaminants as a result of any investigation or cleanup work undertaken on the Site, since it is not possible, even with exhaustive sampling, testing and analysis, to document all potential geo-hazards or contaminants on the Site.

   The CLIENT acknowledged that:
   a) the investigation findings are based solely on the information generated as a result of the specific scope of the investigation authorized by the CLIENT;
   b) unless specifically stated in the agreed Scope of Work, the investigation will not, nor is it intended to assess or detect potential contaminants or environmental liabilities on the Site;
   c) any assessment regarding geological conditions on the Site is based on the interpretation of conditions determined at specific sampling locations and depths and that conditions may vary between sampling locations, hence there can be no assurance that undetected geological conditions, including soils or groundwater are not located on the Site;
   d) any assessment is also dependent on and limited by the accuracy of the analytical data generated by the sample analyses;
   e) any assessment is also limited by the scientific possibility of determining the presence of unsuitable geological conditions for which scientific analyses have been conducted; and
   f) the laboratory testing program and analytical parameters selected are limited to those outlined in the CLIENT's authorized scope of investigation; and
   g) there are risks associated with the discovery of hazardous materials in and upon the lands and premises which may inadvertently discovered as part of the investigation. The CLIENT acknowledges that it may have a responsibility in law to inform the owner of any affected property of the existence or suspected existence of hazardous materials and in some cases the discovery of hazardous conditions and materials will require that certain regulatory bodies be informed. The CLIENT further acknowledges that any such discovery may result in the fair market value of the lands and premises and of any other lands and premises adjacent thereto to be adversely affected in a material respect.

6. COST ESTIMATES - Estimates of remediation or construction costs can only be based on the specific information generated and the technical limitations of the investigation authorized by the CLIENT. Accordingly, estimated costs for construction or remediation are based on the known site conditions, which can vary as new information is discovered during construction. As some construction activities are an iterative exercise, ParklandGEO shall therefore not be liable for the accuracy of any estimates of remediation or construction costs provided.

7. LIMITATION OF LIABILITY - The CLIENT has agreed that to the fullest extent permitted by the law ParklandGEO's total liability to CLIENT for any and all injuries, claims, losses, expenses or damages whatsoever arising out of or in anyway relating to the Project is contractually limited, as outlined in ParklandGEO's standard Consulting Services Agreement. Further, the CLIENT has agreed that to the fullest extent permitted by law ParklandGEO is not liable to the CLIENT for any special, indirect or consequential damages whatsoever, regardless of cause.

8. INDEMNIFICATION - To the fullest extent permitted by law, the CLIENT has agreed to defend, indemnify and hold ParklandGEO, its directors, officers, employees, agents and subcontractors, harmless from and against any and all claims, defence costs, including legal fees on a full indemnity basis, damages, and other liabilities arising out of or in any way related to ParklandGEO's work, reports or recommendations.

Appendix E – Sanitary Design with FRP Attachments & Certificate

Vista Springs

Level 2 Assessment
OTWS Suitability

Report Submission

Prepared by:

WCE design inc.
80 Emerald Ridge East
White City, SK, Canada S4L 0C3
306.540.8312

Project Number:

22-003

Date:

April 19th, 2022

Statement of Qualifications and Limitations

The attached Report (the “Report”) has been prepared by WCE design inc. (“Consultant”) for the benefit of the client (“Client”) in accordance with the agreement between Consultant and Client, including the scope of work detailed therein (the “Agreement”).

The information, data, recommendations, and conclusions contained in the Report (collectively, the “Information”):

- is subject to the scope, schedule, and other constraints and limitations in the Agreement and the qualifications contained in the Report (the “Limitations”)
- represents Consultant’s professional judgement considering the Limitations and industry standards for the preparation of similar reports
- may be based on information provided to Consultant which has not been independently verified
- has not been updated since the date of issuance of the Report and its accuracy is limited to the time period and circumstances in which it was collected, processed, made, or issued
- must be read as a whole and sections thereof should not be read out of such context
- was prepared for the specific purposes described in the Report and the Agreement
- in the case of subsurface, environmental, or geotechnical conditions, may be based on limited testing and on the assumption that such conditions are uniform and not variable either geographically or over time

Consultant shall be entitled to rely upon the accuracy and completeness of information that was provided to it and has no obligation to update such information. Consultant accepts no responsibility for any events or circumstances that may have occurred since the date on which the Report was prepared and, in the case of subsurface, environmental or geotechnical conditions, is not responsible for any variability in such conditions, geographically or over time.

Consultant agrees that the Report represents its professional judgement as described above and that the Information has been prepared for the specific purpose and use described in the Report and the Agreement, but Consultant makes no other representations, or any guarantees or warranties whatsoever, whether express or implied, with respect to the Report, the Information or any part thereof.

The Report is to be treated as confidential and may not be used or relied upon by third parties, except:

- as agreed in writing by Consultant and Client
- as required by law
- for use by governmental reviewing agencies

Consultant accepts no responsibility, and denies any liability whatsoever, to parties other than Client who may obtain access to the Report or the Information for any injury, loss or damage suffered by such parties arising from their use of, reliance upon, or decisions or actions based on the Report or any of the Information (“improper use of the Report”), except to the extent those parties have obtained the prior written consent of Consultant to use and rely upon the Report and the Information. Any damages arising from improper use of the Report or parts thereof shall be borne by the party making such use.

This Statement of Qualifications and Limitations is attached to, and forms part of the Report and any use of the Report is subject to the terms hereof.

WCE design inc.
80 Emerald Ridge East
White City, SK. S4L 0C3

tel: 306.540.8312
email: dustin.weiss@wcedesign.ca

April 19th, 2022

Trevor Bagnall
Vista Springs
306.539.2405

Dear Mr. Bagnall:

Project No: **22-003 – Vista Springs**

Regarding: Vista Springs – Level 2 Assessment

WCE Design is pleased to submit this revision to the level 2 assessment for Vista Springs. This study establishes the requirements for use of on-site wastewater treatment systems on the proposed development as per the Saskatchewan Health Authorities (SHA) *Guidance Document for Developments and Subdivisions where Onsite Wastewater Treatment Systems are Proposed*.

Should you have any questions, please contact the undersigned at 306.540.8312.

Sincerely,
WCE Design

Dustin Weiss, P. Eng.
Senior Civil Engineer
WCE Design
dustin.weiss@wcedesign.ca

DW:dw
Encl.
cc:

Distribution List

# of Hard Copies	PDF Required	Association / Company Name
0	1	Trevor Bagnall – BMA Ventures
0	1	Kelvin Koo – Saskatchewan Health Authority

Revision Log

Revision #	Revised By	Date	Issue / Revision Description
0	DAW	22-03-04	Issued for Draft Review
1	DAW	22-03-14	Final Report
1	DAW	22-04-19	Final Report – Revised Lot Configuration

WCE Design Signatures

Report Prepared By:

Dustin Weiss, P. Eng.
Civil Engineer
WCE design inc.

Stamp

Association of Professional Engineers & Geoscientists of Saskatchewan

CERTIFICATE OF AUTHORIZATION

WCE Design Inc.

Number 65465

Permission to Consult held by:

Discipline	Sk. Reg. No.	Signature
Civil	21518	

Executive Summary

WCE Design (WCE) was commissioned by BMA Ventures to complete a level 2 assessment for the suitability of onsite wastewater treatment systems (OWTS) located on L.S. 16 Section 12-17-18 W2M. The purpose of this subdivision is in the RM of Edenwold and consists of 11 bare land condominium lots on 16.1 acres of land. The purpose of this assessment is to assess the suitability of the development for OTWS by minimizing the negative environmental impacts. Each lot size on the proposed development exceed the minimum requirement of 465m^2 for a type II mound.

This assessment consists of a desktop review, field investigation and some additional analysis to determine the plume interception, conceptual hydrogeology model and nitrate carrying capacity or dilution model. A geotechnical investigation was previously completed by Parkland Geo consisting of 6 boreholes and included piezometers installed to measure ground water elevation. An additional soils investigation was completed by Seeley Engineering and Consulting inc. where 3 test pits were completed and characterized the soils and the loading rates.

From the soils investigation the loading rates determined the soils were able to treat the secondary effluent and there was adequate capacity and vertical separation to achieve treatment. The geotechnical investigation was primarily conducted to investigate the suitability for housing on the parcel, but boreholes were used to produce the vertical cross sections for the preliminary hydrogeological model, determine the flow of groundwater and determine the depth of the groundwater.

A OTWS suitability evaluation was completed using the *Alberta Suitability Evaluation*, which determined which determined the site to be a level 3. The Site is considered to contain variables that producing limitations to the treatment due to a single factor or a combination of factors and that advanced design and technology may be needed for onsite treatment. These limitations are the high density of the site, parcel size, non-isolated aquifer, and the potential of nitrate to be greater than 10 mg/L in the down gradient.

As the aquifer is not isolated the parcel size is the largest factor in the nitrate concentration as the carrying capacity of the land is low. The plume interception was calculated at 56%, which is less than the 90% and a cumulative nitrate assessment is not required. A preliminary hydrogeological concept model was completed, and 2 cross-sections provided. From this model the groundwater flow direction was determined as northwest to southeast along the parcel towards Hunter Creek. The nitrogen dilution was then model using the carrying capacity method *Trela and Douglas (1978).* This method determines the land area required for dilution of nitrates in the groundwater. From this model it was found a reduction in 50% nitrates is required by either advanced treatment removal from the effluent, diverting effluent seasonally form the groundwater or a combination of both.

In order to make this site suitable for an OWTS the development either needs to increase the size of lots or provide advanced treatment to remove nitrates. This report recommends the latter, as it will reduce the concentration of nitrates entering the groundwater and not rely on dilution of the groundwater. The development with the addition of nitrogen reduction to the OTWS, shall seek subdivision approval.

Table of Contents

List of Figures

List of Tables

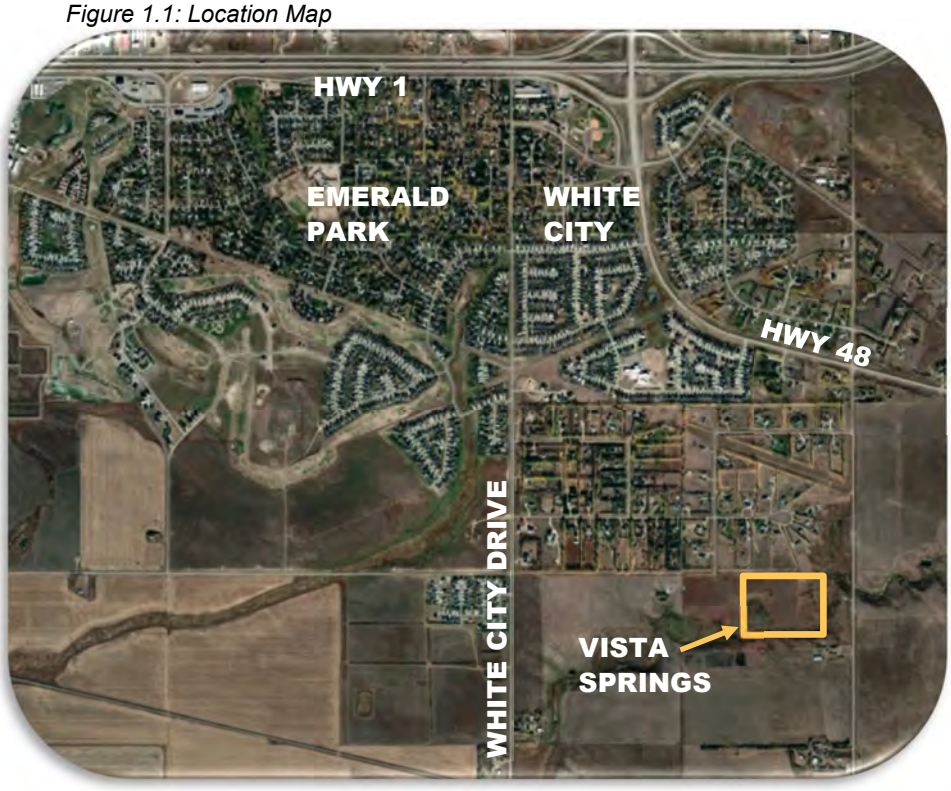
Appendices

1.0 Introduction

WCE design inc. (WCE) has been contracted by BMS Ventures to complete a Level 2 Assessment for use of Onsite Wastewater Treatment Systems (OWTS) for the purpose of seeking subdivision approval. The subdivision to be known as Vista Springs located on the L.S. 16 Section 12-17-18 W2M, immediately south of the Meadow Ridge Development within the R.M. of Edenwold No. 158. As illustrated on figure 1 below. The development is a condominium plan consisting of 14 units on a 16.1-acre parcel. The intent of the development is to develop a neighbourhood community that has a country living feel. A detailed site plan in appendix A. The area is considered a High-Density Area where the average parcel size is less than 1 hectare, and more than four residential parcels exist. The area is also listed as a high-sensitivity area within the RM of Edenwold as it is above the Condie Aquifer.

The proposed development falls under the inclusion criteria A as the development has an average lot size less than 4-hectares and upon completion of the subdivision and existing development exists within 0.4km. The proposed development does not meet the exception criteria and assessment is required.

Figure 1.1: Location Map



This report will follow the requirements for a Level 2 Assessment as laid out in the Guidance Document for Developments and Subdivisions where Onsite Wastewater Treatment Systems are Proposed. The level 2 assessment consists of the full level 1 assessment with some additional fieldwork. The additional field requirements were extrapolated from a completed geotechnical investigation by Parkland Geo and the OTWS design completed by Seeley Engineering and Consulting Inc. The level 2 assessment will detail the following requirements:

- Details about the proposed development & surrounding area.
- Preliminary conceptual hydrogeological model.
- Soils information.
- Preliminary assessment of the fate of OWTS effluent.
- Classify the subdivision suitability for OWTS.
- Inventory of water wells within 1.0 km of the proposed development.
- Inventory of OTWS within 1.0 km of the proposed development.
- Production of a hydrogeological conceptual model; and
- Proposed stormwater management plan.

Resources utilized for this assessment include:

- Water Security Agency – Water Well Information Database
- Geotechnical Investigation Report NE 12-17-18 W2M – Parkland Geo
- Soils Investigation OTWS Design – Seeley Engineering and Consulting Inc.
- Guidance document for developments and subdivision where onsite wastewater treatment systems are proposed.
- Saskatchewan Onsite wastewater disposal guide.

2.0 Background

2.1 Proposed Development

The proposed residential development consists of a 11 bare land condominium with an average parcel size of approximately 0.35 ha (0.86 ac), which is greater than the minimum parcel size of 465m^2 (0.11ac). The total development area is 16.1 acres with the lots consisting of 9.53 acres and the remaining area to be common property, greenspace, roadways and dedicated environmental reserve. The development is within NE 12-17-18 W2M in the Rm of Edenwold No. 158. The proposed development is to have the following characteristics:

- Single story 2–3-bedroom homes.
- Municipal supplied water.
- Garburators are not to be permitted.
- Sump pits and weeping tile are not to discharge into the sanitary system.
- No salt-based water softeners should be permitted.
- No commercial or industrial waste is allowed to enter the treatment system; and
- Pools/hot tubs are not permitted to be drained into the treatment system.

The subdivision site plan can be found in Appendix A and illustrates the conceptual layout of lots and the relation to the common property. The existing ground slopes from North to South with a 10m relief. Surface water drainage from the property outfalls into Hunter Creek, which runs from the from east to west along the southern property boundary. The existing drainage pattern is to be utilized with final grading design of the development.

The development is proposing individual OTWS for each parcel with the preferred system to be type II mounds. As per the *Onsite wastewater disposal guide 2018,* holding tanks, pressure absorption, type II mounds, lagoons and package treatment plants are permitted within high sensitivity areas with the completion of a detailed level 2 assessment. Most lots do not have sufficient space for a reserve or contingency area for a new OWTS should the first fail. Therefore, proper operation and

maintenance of the original OWTS is important. Additionally, should the first system experience issues, it will have to be renovated rather than abandoned.

2.2 Site Evaluation

The surface expression of the development is a hummocky dissected with moderate slopes of 5-10% sloping to the south towards Hunter Creek. The geotechnical report performed by Parkland Geo did not identify concerns with slope stability. The area is covered in scattered shrubs and grass and vegetation near the creek increases, which is indicative of improved soil moisture conditions. The agricultural capability of the area is rated as class 5 (“Soils in this class have very severe limitations that restrict their use to the production of native or tame species of perennial forage crops. Improvement practices are feasible”). The limitations are related to unfavourable topography and excess water due to local runoff to Hunter Creek. (Soils of Saskatchewan)

2.3 Minimum Setback Distances

Relevant setback distances used for soil treatment field:

- Building – 30 ft
- Embankment/cut – 10 ft
- Driveway – 5 ft
- Water Course – 10 ft
- Property Boundary – 10 ft

Relevant setback distances used for septic tanks:

- Building – 3 ft
- Embankment/cut – 10 ft
- Driveway – 5 ft
- Water Course – 10 ft

2.4 Proposed Wastewater Volume

2.4.1 Individual Onsite Wastewater Treatment Systems

The wastewater volume is based on a 341 L, at 3 bedrooms per home and 1.5 people per bedroom or 4.5 people per household as per the On-site Wastewater Guide This produces 1,534.50 L/day or 1.53 m^3/day. Each of the 11 parcels will use this volume to determine the system size. Each system will require a septic tank containing 1.0 times the daily volume plus an allowance for sludge and scum. The minimum working capacity of septic tank for a three-bedroom home is 3360 Lor 3.36 m^3.

Each home will have to be evaluated at the time of construction for actual bedrooms, extraneous flows, and wastewater quality factors.

2.4.2 Communal Wastewater Treatment System

While a communal wastewater treatment system is not being contemplated at this time, the calculation of average day flows and peak day flows for the combined effluent is calculated differently. In this case, the peak day flow is 16.8 m^3 and average day flow is 11.1 m^3.

2.5 Surrounding Area

The proposed development of Vista Springs is surrounded by a mix of residential development, agricultural land, single residences and a WCRM 158 wastewater treatment facility. The surrounding areas are shown in *Figure 2.1 Surrounding features*.

As outlined in the “Guidance for Developments and Subdivisions where Onsite Wastewater Treatment Systems are Proposed”, a Subdivisions are considered high density where:

- Forty or more existing or proposed residential units will be located on a ¼ section; or,
- The average parcel size associated with each existing or potential residential units is less than 1 hectare (2.5 acres) and more than 4 (four) residential parcels.

Therefore, this development is considered high density for the purposes of this report due to the average parcel size being less than 1 hectare. Even if the lot size were increased to more than 1 hectare, it is expected that because of surrounding developments, the development would still be considered to be in a high density area.

To the north and northeast of the proposed development consists of Meadow Ridge. Meadow Ridge is to quarter-sections consisting of 58 residential parcels. East of Vista Springs is environmental reserve land used for agriculture activities. South of the development is two single residents and 1.0 km south is the WCRM 158 wastewater treatment facility. Each residential lot contains an existing water supply well, including each parcel within Meadow Ridge. The residents of Meadow Ridge each utilize OWTS’ both septic tanks and septic mounds. As each of the OWTS are relatively new, it is assumed that they comply with the set-back requirements in force at the time of their construction. All nearby OWTS are far enough away that they do not impact the location or design of the Vista Springs development or OWTS used to service homes in Vista Springs. Within 1.0 km of the proposed development a total of 60 wells are registered with WSA. 6 of these wells south of Vista Springs with the remainder in the Meadow Ridge development.

Figure 2.1: Surrounding Features

3.0 Surficial Geology

3.1 Regional Geology

The soils in the proposed development include three genetic mineral materials, chernozemic, regosolic and gleysolic soils. The Chernozemic and Regosolic soil orders are the lead two.

Chernozemic soils are high in organic matter and have dark surfaces. The organic matter present is the effect of soil organic matter through the roots of grasses due to dry soil moisture conditions as the soils are typically well to imperfectly drained. Chernozemic soils are typically underlain by a B horizon which has undergone minor alterations due to chemical weathering. The calcium carbonate that was originally present in the A and B horizons typically has been dissolved in the upper horizons and re-precipitates in the upper C horizon, creating a Cca horizon. This carbonate-enriched horizon overlies a Ck horizon, which has the same levels of carbonate as the parent material (College of Agriculture and Bioresource).

“Regosolic soils lack significant soil formation and occur typically on very young surfaces (such as sand dunes or river floodplains) or unstable surfaces (such as slope positions that experience high rates of soil erosion). Regosolic soils either completely lack a B horizon or have a thin B less than 5 cm thick. In rolling or hummocky agricultural landscapes in Saskatchewan, the soils on

the knolls have often been heavily eroded by tillage and the calcium carbonate-rich C horizon become mixed by tillage into the A horizon. This Apk horizon often directly overlies the C horizon. In sand dunes or recent river floodplain deposits there may be no A horizon and the C horizon extends to the surface of the soil." (Saskatchewan Soil Information System). These soils are not typically suitable for a soil treatment field of an onsite wastewater system.

Reference:

https://www.agr.gc.ca/atlas/agpv?webmapen=c225cc78d5b142d58eacefae91cc535b&webmap-fr=ad0b6822a33e411683f99979a1167efa
https://soilsofsask.ca/soil-classification/chernozemic-soils.php
Geotechnical Investigation Report NE 12-17-18 W2M – Parkland Geo
Soils Investigation OTWS Design – Seeley Engineering and Consulting Inc.

3.2 Local Geology

During the initial investigations two studies were conducted a Geotechnical Analysis was undertaken by Parkland GEO and a soils assessment was completed by Seeley Engineering and Consulting inc.

3.2.1 Borehole Logs

During the geotechnical investigation 6 test holes were drilled to 6m in depth from the surface. Detailed results of these borehole logs are appended to this report. Table 2 in the Geotechnical report summarizes the groundwater measurements for each borehole. The geotechnical investigation classified the soils as a sandy loam. The soil profile at this site consisted of a topsoil, sand, overlying deposits of silt or till and are summarized below:

3.2.1.1 Topsoil

Approximately 200mm thick layer of surficial topsoil. Moderately organic, brown to black and dry.

3.2.1.2 Sand

Sand deposits were discovered below the topsoil and extends from depth of 1.4m to 7.5m. The sand contains trace to little silt, trace clay and was classified as fine grained and poorly graded moisture contents ranging from 3 to 22 percent.

3.2.1.3 Silt

Silt deposits were discovered below the sand in borehole 2, 4 and 5 to a depth of 1.4m below grade. The silt contained some fin-grained sand, trace clay and was characterized as low plastic with a firm consistency. The moisture ranged from 10 to 30 percent.

3.2.1.4 Clay Till

Clay (till) was encountered in boreholes 1, 3 and 6 and extended beyond the drilling depths. The till contained clay, trace gravel, trace sand, little silt and was characterized as low plastic. Moisture ranged from 10 to 22 percent.

3.2.2 Test Pits

Three test pits were completed during the soil investigation for OWTS design by Seeley Engineering and Consulting inc. All three test pits encountered similar characteristics and were summarized as follows:

- A layer of loamy sand at the surface.
- Below the loamy sand, there is a loam layer with a poorly defined structure
- There is layer between 53 and 78 inches below grade that is a moderate platy silty loam.
- Mottling begins 40-50 inches below grade, which indicates that a seasonal water table may reach this height.
- Some effervescence was noted in the layer above the mottling.
- Weak gleying was noted near the bottom of test pit #2 indicating that it is likely there is saturated conditions 80 inches or more below grade.

Additionally, no soil moisture conditions that could adversely impact the design of an OWTS was noted.

The report noted a restrictive layer in all test pits at 53 to 78 inches below grade. This was classified as a moderately platy silt loam. This soil texture was noted within the Geotechnical investigation borehole logs as well.

4.0 Hydrology

4.1 Regional Hydrology

The proposed development is part of the Wascana Creek watershed one of the smallest in Saskatchewan, with the largest population density. Wascana Creek flows southeast of Regina loops around west, through Wascana Lake and the enters the Qu'Appelle River outside of Lumsden and eventually makes its way to the Qu'Appelle Valley.

4.2 Local Hydrology

The proposed development and surrounding area drain south to Hunter Creek, which flows southwest. Hunter Creek eventually outlets into Wascana Creek and enters Wascana Lake. A series of dugouts can be found off Hunter Creek and Wascana Creek, however more than 1.0km downstream from the development. Existing runoff from Vista Springs enters Hunter Creek and the post-development drainage plan would utilize this natural slope to continue this drainage pattern. The Parcel has a 10m relief from the north road to the edge of Hunter Creek. Existing contours are illustrated on the Plan of Prosed Subdivision appended to this report.

5.0 Hydrogeology

5.1 Regional Hydrogeology

The proposed development is located above the Condie Aquifer. Due to the shallow depth of this aquifer and its proximity to Regina and surrounding communities, it is an important groundwater resource. The Condie aquifer is composed of course to very coarse sandy gravel grading upwards to silt and ranges in thickness from 5m to 20m.

Typical wells in the area are bored to an average depth of 15m below the surface with the water level ranging at 7.5m to 9m below the surface. Typically, wells in the area have an average pumping rate of 10 usgpm.

5.2 Local Hydrogeology

Based on the geotechnical investigation competed by Parkland Geo the groundwater ranges from 4.5m to 6.3m form the surface and flows in a southeasterly direction. The groundwater flow direction runs the same direction as the surface drainage. Two vertical cross sections have been provided depicting the soil types and groundwater depth and groundwater contours are depicted topographic plan, both appended to this report. Table 1 below depicts the groundwater elevation data from the geotechnical investigation.

Table 5.1 – Groundwater Elevation

BOREHOLE	GROUND ELEVATION (m)	GROUNDWATER LEVEL (mbg)	ELEVATION (m)
1	604.8	6.30	597.30
2	606.2	---	---
3	607.9	---	---
5	602.10	4.50	597.60
6	602.00	4.75	597.25

From the geotechnical investigation the groundwater was found to be 597.3m asl which varies from 4.5m to 6.3m below grade. From the soils investigation test pits a seasonal water line was found at 1.0m to 1.2m below the surface.

5.3 Climate Data

Vista Springs is located in the Prairies ecozone and is in the moist mixed grassland ecoregion. This area is semi-arid, heavily landscaped by glaciation. Agriculture production is predominant in this region and zone. The temperature averages in this region from -19C to 26C. The area has a net evaporation of 525mm with an annual precipitation of 425mm and evapotranspiration of 950mm.

The aquifer recharge rate was determined using the annual precipitation for the site and the rational method for determining runoff. The runoff coefficient for residential areas is typically C=0.4, but as this site has a high percentage slope and to account for some evaporation a runoff coefficient of C=0.6 was used. The aquifer recharge rate was then calculated to b Ri = 170 mm/yr.

6.0 Discussion

6.1 Approach

6.1.1 Field Investigation

The field investigation was carried out in to separate studies, a geotechnical investigation, and a soils investigation. This resulted in a mix of boreholes and test pits as described in sections 3.2.1 and 3.2.2. soil was classified in all boreholes and test pits and can be found in the subsequent report in the appendix. The geotechnical classified the soil as a sandy loam while the soils investigations findings were similar. Piezometers were installed during the geotechnical investigation and the ground water level was measured at various times to determine the depth.

6.1.2 Plume Interception Percentage

The total width of all plumes from the soil treatment fields as a percentage of the downstream property boundary length is known as the plume interception percentage. This percentage is accomplished by mapping each soil treatment field plume in plan view and calculation the percentage of the plume and the property boundary. The plan figure for the plume interception has been appended to this report.

6.1.3 Preliminary Assessment of Nitrate

To model the nitrate dilution the Trela and Douglas (1978) formula was utilized. This method determines the nitrate carrying capacity for a given area. The carrying capacity is characterized as the smallest lot size in acres on which a soil treatment field can be constructed and operated without raising the groundwater nitrate concentration above the set standard. This is calculated using the following formula:

$$H = \frac{\mathrm{VeCe}}{(Vi + Ci)Cq}$$

Where:

Ve = volume of septic effluent entering system
Ce = concentration of nitrate in septic effluent
Vi = volume of infiltrating precipitation
Ci = concentration of nitrate in precipitation
Cq = selected water quality standard for nitrate
H = carrying capacity

This equation was further simplified to include the persons per household (P) and Vi was modified to use the recharge rate Ri. The formula to calculate the carrying capacity to model the nitrate dilution is:

$$H = \frac{365\mathrm{QP}(\mathrm{Ce} - \mathrm{Cq})}{(27{,}154.29Ri)Cq}$$

The selected water standard for nitrate (Cq) was chosen to be 5-10 mg/L a common industry standard. The upper limit for safe drinking water nitrate is 10 mg/L. The concentration of nitrate in septic effluent (Ce) was selected at 40 mg/L. This is a common concertation in septic effluent with no remediation.

The two largest factors for the determining the carrying capacity is the recharge rate and the concentration of the septic effluent. To increase carrying capacity removal of nitrate-nitrogen would be required.

6.1.4 Subdivision's Suitability for OWTS

To determine the sites suitability for onsite wastewater treatment systems the *Alberta Suitability Evaluation* method was used. The results of this evaluation can be found in section 6.2 and are appended to this report. The method evaluates the site variables and then assigns a suitability type. The limiting factors of the site can then be identified, and the overall suitability can be determined. The site variables are as follows:

- Soil texture and structure.
- Depth of suitable soil.
- Hydraulic capacity of soil.
- Soil horizons.
- Depth to water table.
- Topography or proposed site.
- Flooding.
- Density.
- Encumbrances.
- Parcel Size.

6.2 Findings

6.2.1 Wastewater Quantity

The proposed plan for the subdivision is to provide 11 single home type II septic mounds. Each system is to be installed on the individual lot, however as this land is proposed to be a bare land condominium the operation and maintenance will be completed and managed by the condo board, made up of members from each individual parcel.

The wastewater volume for each system is calculated as a 3-bedroom home with 4.5 persons per house.

The peak daily flow assumes 341 L/person for a total of 1,534.5 L/day (405 usgal or 337 igal.).

The average daily flow assumes 227 L/person for a total flow of 1,012.5 L/day (267 usgal or 222 igal.).

6.2.2 Wastewater Quality

The wastewater is assumed to be residential with the following parameters:

- Garburators are not to be permitted.
- Sump pits and weeping tile are not to discharge into the sanitary system.

- No salt-based water softeners should be permitted;
- No commercial or industrial waste is allowed to enter the treatment system; and
- Pools/hot tubs are not permitted to be drained into the treatment system.

6.2.3 Soils

As detailed in the appended Soils investigation report completed by Seeley Engineering and Consulting inc., the soils are considered suitable for a soil treatment field provided adequate engineering and design is completed.

A restrictive layer was noted in all test pits during the investigation. This layer was noted at 53 and 78 inches below grade. This layer consisted of a moderately platy silt loam. The limiting layer was observed in test pit 2 labelled Cca and is a loam blocky grade 1.

The following loading rates were noted during the investigation:

Table 6.1 – Loading Rates

Parameter	Max Loading Rate Primary Effluent	Max Loading Rate Secondary Effluent
Hydraulic Loading Rate	0.30 igal/d/ ft^2	0.45 igal/d/ ft^2
Linear Loading Rate	NA/ 4.3 igal/d/ ft^2	NA / 4.3igal/d/ ft^2
Organic Loading Rate	1.23 lb BOD_5/1000 ft^2 /d	1.23 lb BOD_5/1000 ft^2 /d

6.2.4 Wastewater Design Options

Individual OWTS are proposed for the development. Several scenarios can be developed for each home. However, as each system will have to be designed as the home is built, only one typical scenario is presented. Using a peak flow of 1535 L/d, the required native soil infiltration surface area where secondary treatment is used is 140 m^2 (1440 ft^2). The physical linear length and width of a type II mound is then 28m (90 ft) by 5 m (16 ft). An on-lot drip irrigation system would be in addition to the mound.

The size of the field may increase for a specific house due to several factors such as specific soil results for the lot, increase in bedrooms, additional fixtures, and proposed household activities that increase the strength of the wastewater. The size of the field may decrease due to factors such as specific soil results for the lot and wastewater flow management.

6.2.5 Plume Intersection

The probability of intersecting an OTWS plume is calculated at 56%. This was determined using the total plume width at the downstream property boundary of 410.2m and the total downstream property boundary of 732.5m. The plume intersecting figure can be found appended to this report.

As the plume intersecting is greater than 10%, the down gradient nitrate was modeled as two downstream supply wells exist. The plume intersecting was less than 90% and a cumulative nitrate assessment is not required.

6.2.6 Nitrate Carrying Capacity

The nitrate carrying capacity method Trela and Douglas (1978) was used to model the nitrate dilution. This method uses the following formula to determine the minimum lot size to accommodate the nitrate loading into the aquifer.

$$H = \frac{365\mathrm{QP}(\mathrm{Ce} - \mathrm{Cq})}{(27{,}154.29Ri)Cq}$$

Where:

P = population per household. (3.15 P/household, total development 44)
Ce = concentration of nitrate in septic effluent. (40 mg/L)
Ri= aquifer recharge rate in inches per year. (6.7 inches/year)
Q = wastewater discharge in us gallons based on the average day per person.
Cq = selected water quality standard for nitrate. (5mg/L)
H = carrying capacity. (acres)

Concentration rates were discussed in 6.1.3, where Ce is 40 mg/L and Cq is 5-10mg/L. The average wastewater flow, Q is 225 L/day/person or 60 usgal/day/person. The annual aquifer recharge rate was based on the annual precipitation for the area 425mm/year and the runoff rate for the development. The aquifer recharge rate was determined at 170 mm/year or 6.7 inches/year.

From these variables the carrying capacity H is 2.65 acres. This would be the minimum lot size to provide the dilution to 5 mg/L from a single household. Looking at the development as a combined 11 lots we find 38 acres is the minimum lot size.

The carrying capacity, can be greatly reduced by means of nitrogen removal. A package plant addition to the on-site system can remove nitrogen up to 50-65% of the total nitrogen prior to the dispersal system. Another method to reduce the total nitrogen is to deliver the secondary effluent to a drip dispersal system during the summer season. This method would divert approximately 6 months of effluent in the year reducing the long-term nitrogen loading and increasing the carrying capacity. In order utilize the drip irrigation the system must use secondary treated effluent or better and the drip tubing is to be installed with less than 300mm of cover. Additional treatment may be required to reduce the SAR to a higher level.

Implementation of a nitrogen reducing package plant would reduce then reduce the nitrogen concentration in the septic effluent from 50% and therefore decrease the carrying capacity for the entire development to 16.10 acres at a nitrate concentration of 5.4 mg/L less than the upper limit of 10 mg/L. As the development area is 16.1 acres, the application of a nitrogen removal package plant would be sufficient. The drip irrigation alone would be sufficient to reduce the carrying capacity as it diverts half of the loading within a year. Drip irrigation diversion if permitted with the package plant, would significantly reduce the carrying capacity area down to 5.10 acres.

6.2.7 Vadose Zone Characteristics

As per the soils investigation a restrictive layer was found to be 53 inches (1.3m). This layer was classified as a moderately platy silt loam. This restrictive layer provides more than 48 inches (1.2m) between the restrictive layer and the infiltration surface, providing adequate retention time and pathogen removal.

6.2.8 Supply Aquifer Isolation

No isolation to the supply aquifer was found in either the geotechnical investigation or the soils investigation. No non fractured bedrock or impermeable clay seams were encountered within the soil stratigraphy.

6.2.9 Preliminary Hydrogeological Model

From the appended geological cross-sections, water primarily enters the hydrogeologic system by surface infiltration. From the two cross-section the ground water flows from north to south approximately 15 to 20 feet below the surface. Section 3 & 5 summarizes the soil stratigraphy and characteristics of the of the hydrogeology.

6.2.10 Fate of the OTWS Effluent

The effluent will migrate initially under unsaturated conditions. This provides a high level of treatment. The effluent will create a small perched saturated mound on the platey clay layer at a depth of approximately 4 feet below ground. The effluent will be drawn into this layer under capillary action. Eventually the effluent makes its way to the south to the creek and vertically to the ground water table approximately 20 feet below the ground. The effluent will be well treated to secondary treatment standards provided the soil treatment fields are well maintained and operated. Nitrate will continue in long narrow plumes mixing with existing groundwater and diluting through the aquifer.

6.2.11 Suitability of the Subdivision for OTWS

The *Alberta Suitability Evaluation* method was used to review the subdivision and determine if OTWS are applicable. The results of this evaluation can be found appended to the report. From the evaluation the subdivision is considered a type 3, which is limited. The major factors of note within this evaluation are density and parcel size. Both have been discussed with regards to suitability. Advanced design and technology of onsite systems will be required.

6.2.12 Risk Characterization & Mitigation

The following summarizes the risks associated with the OTWS with regards to this subdivision

- Long term performance declines if system is not operated or maintained.
- Lack of space for new systems should the original systems experience issues.
- Impact of Nitrate on the environment or groundwater sources.
- Increases in effluent volumes over time reduce treatment capacity of soil treatment systems.

In order to mitigate these risks, the following steps are to be put in place.

- Separation of the water distribution system from the OTWS in order to limit contamination.
- Additional, treatment to be recommended to remove or divert nitrates from entering the groundwater, reducing the environmental impact.

- Subdivision to be a bare land condo and will have a dedicated condo board with representatives from each home. The maintenance on each system will be provided by this board and will then have oversite and management for the required upkeep of the OWTS
- The design and installation of each system will be conducted by the condo association for the subdivision ensuring each system meets the requirements for treatment, installation accuracy, operation, and maintenance.
- System monitoring and inspection ports to be provided in the design for each OWTS.
- Annual education for residents regarding the impacts of excess water and waste.

7.0 Recommendations

The following are the recommendations to apply to the design of individual OTWSs as per the findings of this level 2 assessment. With the design of each system the recommendations from the soils investigation should be considered as well as the additional findings from this assessment.

- Recommendations from the soil investigation (Seeley Engineering and Consulting Inc.)
    - *A system that provides secondary treatment prior to the insitu soils is required.*
    - *The vertical separation is such that secondary effluent can be treated using the following methods:*
        - *A common package treatment plant that discharges to a soil treatment field.*
        - *A common dose tank and type II mound system.*
        - *A common dose tank and EviroSeptic field system.*
        - *Individual type II mounds on each lot.*
        - *Individual EnviroSeptic field systems or package treatment plants to a soil treatment field on each lot.*

- *All required design elements must be included from the SOWDG. However, the following minimum required items are highlighted for their importance.*
    - *The soil treatment field should be long and narrow with the long axis being perpendicular to the slope so that the infiltration surface is level.*
    - *Each house should have a minimum working capacity of one peak day flow plus an allowance for sludge and scum. Using the assumed values, a tank with a working capacity of 1050 imperial gallons (4.78 m3) would be sufficient. A pump chamber is also required and would be in addition to the working capacity.*

System design elements in addition to the minimum requirements for individual systems found in the SOWDG.

- *Sewage volumes*
    - *Sewage volumes should be calculated considering the volume requirements of the SOWDG as the hydraulic loading rates were developed using these volumes.*
    - *A dose tank should be used to store periods of high flow to reduce the impact of peak day flow on the system and thereby reduce the size of the soil treatment field. The dosing tank is typically double the average daily flow. However, more detailed calculations should be completed to determine the dose tank size necessary to manage peak flows.*
    - *Appropriate community controls should be enacted to ensure that extraneous flows do not impact the system (e.g. sump pumps and water softener do not enter the communal system).*

- *Sewage quality*
  - *Individual homeowners should be educated annually on the type of material that should be flushed into the system.*
  - *Appropriate community controls should be enacted to protect the sewage quality entering the system including preventing wastewater generating home-based businesses such as food production.*
  - *Each septic tank should have an effluent filter installed.*

- *System controls and monitoring systems*
  - *Timed dosing of the soil treatment field should be incorporated. High liquid level warning in individual septic tanks and any communal tanks should be included.*
  - *Data logging of flows and liquid levels and operational conditions in the communal system should be part of the control system.*
  - *One vertical separation monitoring well should be installed underneath the system to measure the depth of unsaturated conditions beneath the native soil infiltration surface.*
  - *One upgradient and two downgradient groundwater wells should be installed in the shallowest unconfined aquifer beneath the system if one is present.*

- *Septic tanks*
  - *All septic tanks should be serviced regularly.*

- *Soil treatment field*
  - *Secondary treated effluent should be applied to the insitu soil infiltration surface as this allows a significant reduction in field size.*
  - *A surface water diversion swale should be designed to divert runoff from impacting the soil treatment field.*
  - *A pressurized timed dosing system should be installed as this reduces the required field size.*
  - *A system with two or more zones will reduce the cost of the pumping system and result in a system that is easier to design, build and operate.*
  - *Given the size of the system, additional monitoring ports should be installed to allow monitoring of the system.*

Each system would be designed when house plans for each lot are available. At that time, individual Sewage Disposal permits should be obtained. Each system will require an additional treatment system to remove nitrogen from the effluent prior to reaching the soil treatment field. Reduction in the order of 50% per household is required to bring the nitrogen dilution down to 5.4 mg/L. It is recommended that each system uses the same system to keep maintenance and operation uniform within the development.

Alternatively, the lot size and configuration can be adjusted to provide more area per household resulting in less nitrate concentration. Drip irrigation of the secondary effluent may also be utilized to reduce the annual nitrogen loading or a combination of all three methods. The minimum parcel size for a type II mound is 465m^2 (0.11 ac) and each lot within the proposed development exceeds this requirement.

Based on the finding of this report and risk-based framework matrix provided as figure 2 in the SHA guidance document, it is our recommendation this development seek approval for subdivision, based on the use of individual onsite wastewater treatment systems with nitrogen removal.

APPENDIX A

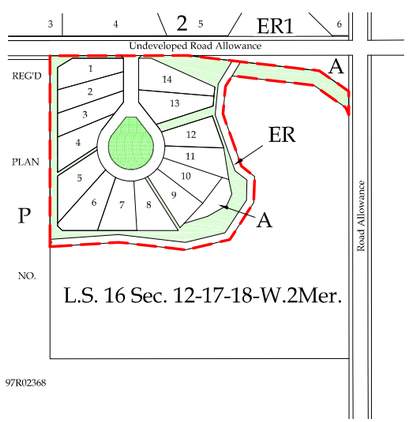
Figures

PLAN SHOWING

PROPOSED BARELAND CONDOMINIUM

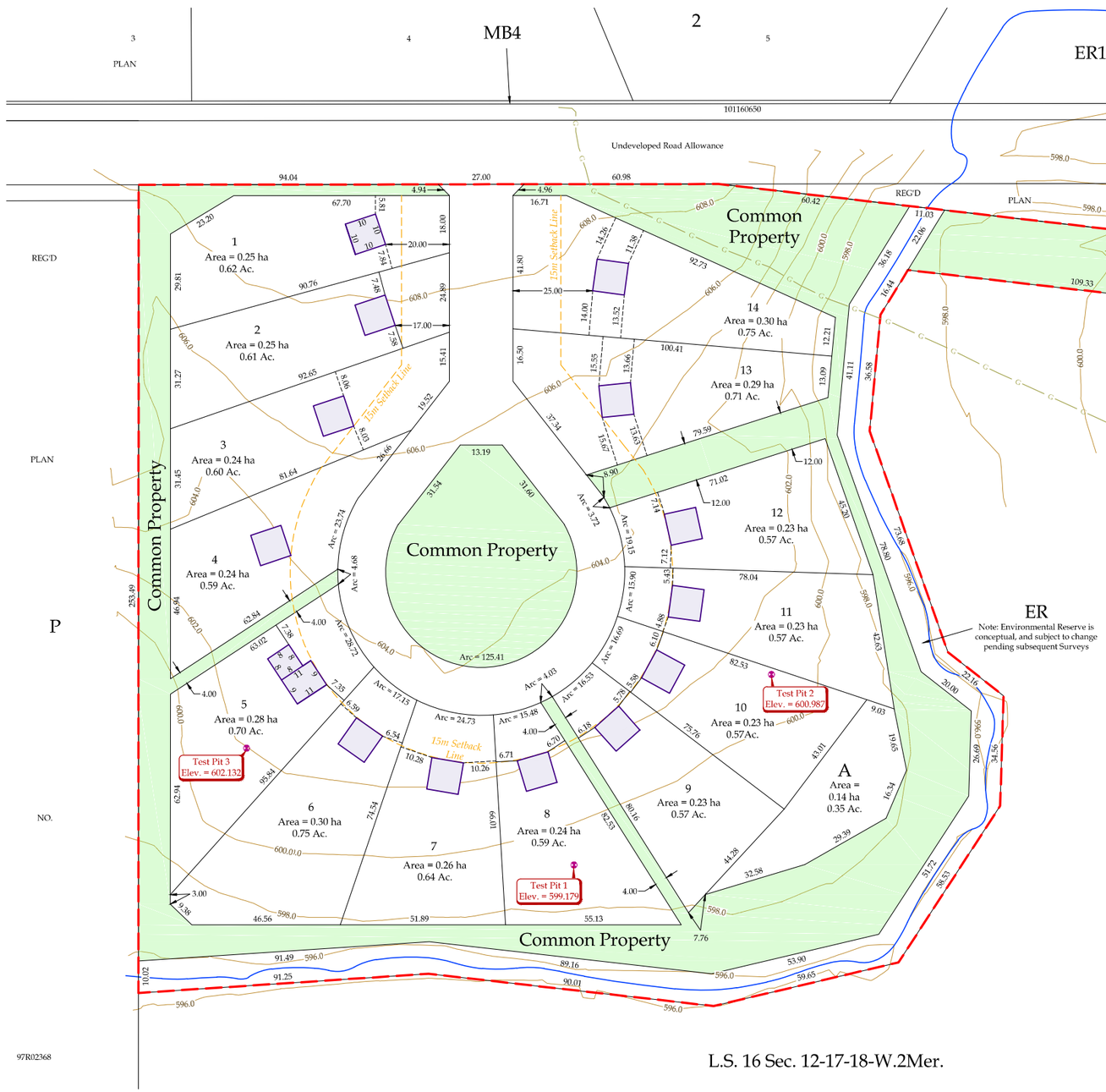
OF PART OF
L.S. 16 SEC. 12
TWP. 17 RGE. 18 W.2 Mer.
RM OF EDENWOLD NO. 158
SASKATCHEWAN
OCTOBER, 2021
SCALE 1:1000

SCHEDULE OF UNIT FACTORS AND AREAS			
Unit Number	**Unit Type**	**Unit Factor**	**Approx. Area (Ac.)**
1	Bare Land / Com	701	0.62
2	Bare Land / Com	690	0.61
3	Bare Land / Com	679	0.60
4	Bare Land / Com	667	0.59
5	Bare Land / Com	793	0.70
6	Bare Land / Com	848	0.75
7	Bare Land / Com	724	0.64
8	Bare Land / Com	667	0.59
9	Bare Land / Com	645	0.57
10	Bare Land / Com	645	0.57
11	Bare Land / Com	645	0.57
12	Bare Land / Com	645	0.57
13	Bare Land / Com	803	0.71
14	Bare Land / Com	848	0.75
Total		**10000**	



KEY PLAN

0 10 20 40 60 metres
Scale 1:1,000



LEGEND:

- COMMON PROPERTY
- BUILDING
- CREEK C/L
- FENCE — X — X — X
- SASKENERGY — G — G
- SASKPOWER — P — P
- SASKTEL — T — T

COMPASS Geomatics Ltd.
REGISTERED LAND SURVEYORS
COMPASS DWG: 00822-21-PSUB-R12_Concept

NOTES:

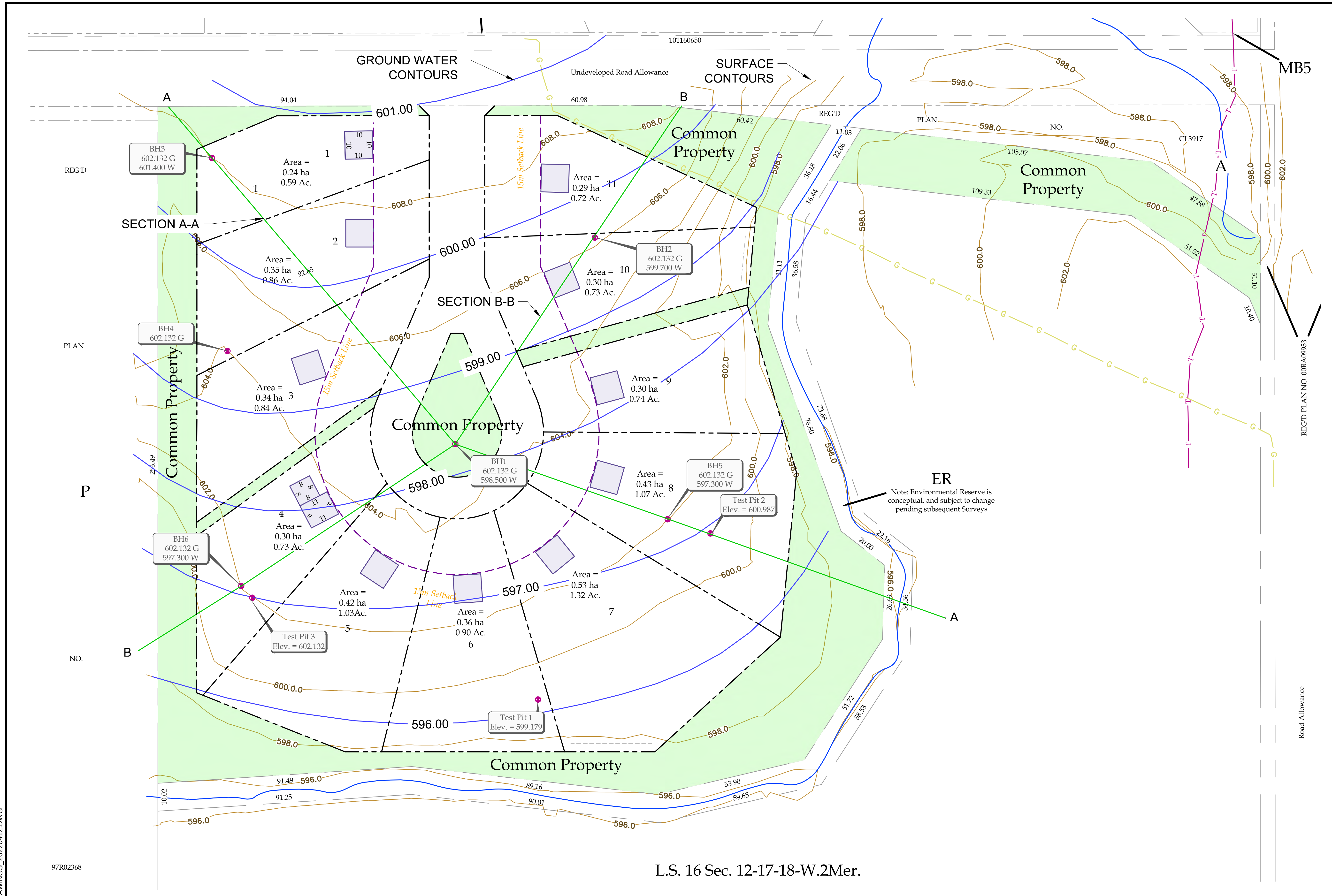
MEASUREMENTS ARE IN METRES AND DECIMALS THEREOF.
AREA TO BE APPROVED IS OUTLINED WITH A HEAVY DASHED LINE AND CONTAINS APPROXIMATELY 6.53 HECTARES.
DIMENSIONS ARE APPROXIMATE AND ARE SUBJECT TO CHANGES UP TO ±10M AT THE TIME OF LEGAL SURVEY.
PARCEL DIMENSIONS WILL NOT GO BELOW THE MINIMUM ALLOWED BY ZONING.

DISCLAIMER

THIS PLAN REPRESENTS THE BEST INFORMATION AVAILABLE AT THE TIME OF SURVEY. **COMPASS GEOMATICS LTD.** AND ITS EMPLOYEES TAKE NO RESPONSIBILITY FOR THE LOCATION OF ANY UNDERGROUND PIPES, CONDUITS, OR FACILITIES, WHETHER SHOWN ON OR OMITTED FROM THIS PLAN.

UTILITY COMPANIES (SASKPOWER, SASKENERGY, SASKTEL, AND TRANSGAS) WERE CONTACTED PRIOR TO THE SURVEY FOR ANY INFORMATION REGARDING UNDERGROUND FACILITIES. THAT INFORMATION IS SHOWN ON THE PLAN, HOWEVER AN ADDITIONAL SEARCH FOR MORE SPECIFIC BURIED FACILITIES USING ALL RESOURCES MUST BE PERFORMED JUST PRIOR TO CONSTRUCTION.

SASKATCHEWAN FIRST CALL 1-866-828-4888



WCE design inc.

Figure: 1

RM OF EDENWOLD
VISTA SPRINGS
GROUND WATER CONTOURS
Project No.: 22-003

Date: 2022-04-19

ANSI B 11" x 17"

Approved: ____ Checked: ____ Designer: ____ Project Management Initials: ____

Project Management Initials: ____ Designer: ____ Checked: ____ Approved: ____ ANSI B 11" x 17"

WCE design inc.

Figure: 2

101160650

Undeveloped Road Allowance

MB5

94.04

60.98

60.42

REG'D PLAN NO. CL3917

Common Property

15m Setback Line

BH3
602.132 G
601.400 W

BH4
602.132 G

BH2
602.132 G
599.700 W

BH1
602.132 G
598.500 W

BH5
602.132 G
597.300 W

BH6
602.132 G
597.300 W

Test Pit 1
Elev. = 599.179

Test Pit 2
Elev. = 600.987

Test Pit 3
Elev. = 602.132

Area = 0.24 ha 0.59 Ac. — 1
Area = 0.35 ha 0.86 Ac. — 2
Area = 0.34 ha 0.84 Ac. — 3
Area = 0.30 ha 0.73 Ac. — 4
Area = 0.42 ha 1.03Ac. — 5
Area = 0.36 ha 0.90 Ac. — 6
Area = 0.53 ha 1.32 Ac. — 7
Area = 0.43 ha 1.07 Ac. — 8
Area = 0.30 ha 0.74 Ac. — 9
Area = 0.30 ha 0.73 Ac. — 10
Area = 0.29 ha 0.72 Ac. — 11

PROPOSED MOUND CONFIGURATION
A: PRIMARY MOUND LOCATION
B: SECONDARY MOUND LOCATION

MOUND SETBACKS

ER
Note: Environmental Reserve is conceptual, and subject to change pending subsequent Surveys

REG'D PLAN NO. 00RA09953

Road Allowance

PLAN NO.

P

97R02368

L.S. 16 Sec. 12-17-18-W.2Mer.

RM OF EDENWOLD
VISTA SPRINGS
MOUND SETBACKS
Project No.: 22-003

Date: 2022-04-19

Elevations Only
DRAWINGS_20220412.DWG

Project Management Initials: Designer: Checked: Approved: ANSI B 11" x 17"

WCE design inc.

Figure: 3

101160650

REG'D PLAN NO. CL3917

REG'D

PLAN

NO.

BH3
602.132 G
601.400 W

BH4
602.132 G

BH1
602.132 G
598.500 W

BH2
602.132 G
599.700 W

BH5
602.132 G
597.300 W

BH6
602.132 G
597.300 W

Test Pit 1
Elev. = 599.179

Test Pit 2
Elev. = 600.987

Test Pit 3
Elev. = 602.132

15m Setback Line

Area = 0.24 ha 0.59 Ac.

Area = 0.35 ha 0.86 Ac.

Area = 0.34 ha 0.84 Ac.

Area = 0.29 ha 0.72 Ac.

Area = 0.30 ha 0.73 Ac.

Area = 0.30 ha 0.74 Ac.

Area = 0.43 ha 1.07 Ac.

Area = 0.30 ha 0.73 Ac.

Area = 0.42 ha 1.03Ac.

Area = 0.36 ha 0.90 Ac.

Area = 0.53 ha 1.32 Ac.

A B

OTWS PLUME

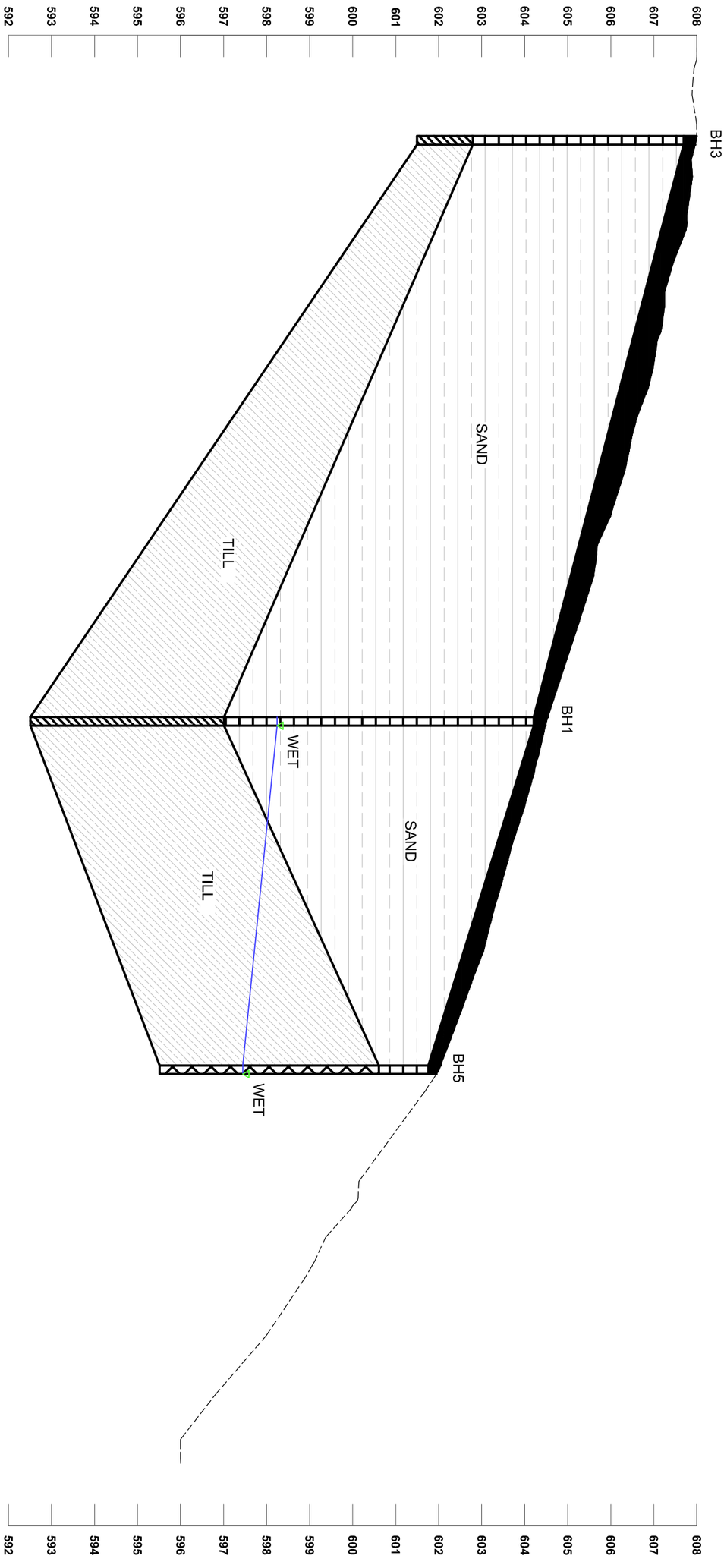
OTWS PLUME

97R02368

Date: 2022-04-19

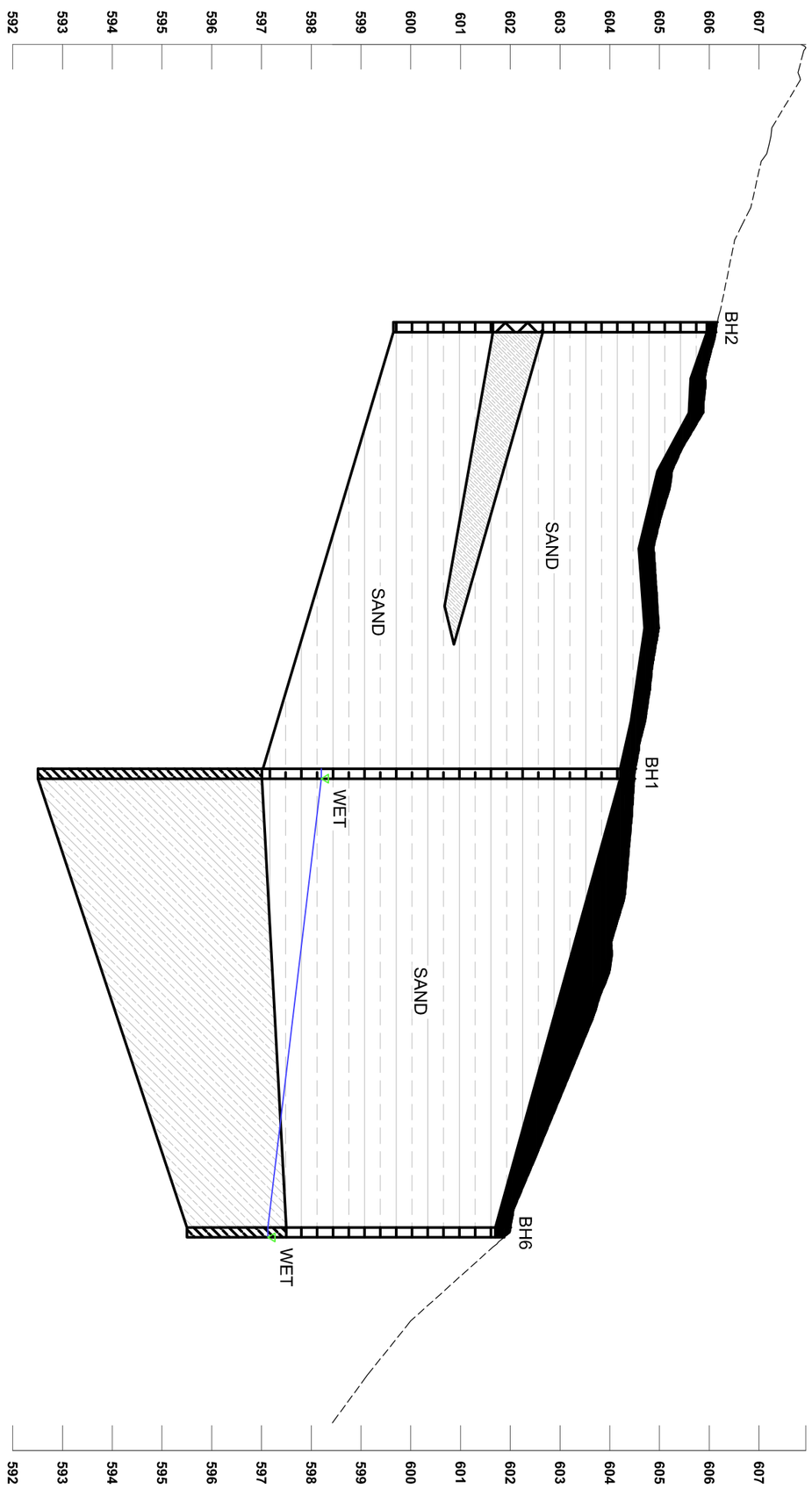
RM OF EDENWOLD
VISTA SPRINGS
PLUME INTERSECTION
Project No.: 22-003

Filename(s): W:\CEED PROJECTS\VISTA SPRINGS\900 - CAD\910 - CAD\FIGURE DRAWINGS_20220412.DWG



RM OF EDENWOLD
VISTA SPRINGS
HYDROGEOLOGICAL SECTION A-A
Project No.: 22-003 Date: 2022-03-14

WCE design inc.
Figure: 4



RM OF EDENWOLD
VISTA SPRINGS
HYDROGEOLOGICAL SECTION B-B
Project No.: 22-003 Date: 2022-03-14

WCE design inc.
Figure: 5

JOB TITLE: Vista Springs - OTWS Suitability Evaluation

JOB NO.: 22-003 CALCULATION NO.: 1

PREPARED BY: DAW DATE: 2022-03-04

CHECKED BY: DAW DATE: 2022-03-04

SHEET: 1 OF 1

A number of variables have been grouped in Types to indicate the general suitability of the land for OWTS. The variables are rated, assessed and grouped in Types based on the degree they affect the suitability of land. Limitations on the suitability of land will

Site Variable	Suitability Type				
Description of suitability type	***Parcels with all or most of their variables in this group (and no variables beyond Type 2) can be considered highly suitable for on-site sewage. Any system type could be used.***	***Limitations could be easily overcome with selection of an appropriate system type and design. Sites that contain variables in this type should be suitable for most systems unless to accommodate development system size is large.***	***Sites that contain variables in this Type have limited suitability for on-site sewage. The limitations can be due to a serious single factor or a combination of several limitations. Advanced design and technology of onsite systems is needed. A key limit is depth of suitable soil***	***Type 4.Severely Limited or Unsuitable Except for Holdin Tanks***	***Sites that contain variables in this Type are usually unsuitable for most on-site sewage systems.***
Soil texture and structure	Soils are of a medium texture and have good structure (strong grade of structure)	Soil texture is finer or coarser than ideal but is still suited for treatment field use.	Soils have a fine or very coarse soil texture and/or an adverse structure (weak grade with resistance to water flow)	Soils have very unsuitable texture and structure.	
	Texture class in this type typically includes Loamy fine sand, Sandy loam, Loam, Silt loam.	Texture class in this type typically includes sandy clay loam, clay loam, loamy coarse sand.	Texture class would typically include Silty clay loam, sandy clay, silty clay, clay, very coarse loamy sand, or course to medium Sand and may include a high amount of coarse fragments (40 – 80%)	Texture classes typically include heavy clay, coarse sand, gravelly or very gravelly loamy sand; extremely gravelly soils (exceeds 45%).	
	Structure is a strong grade of blocky, granular, prismatic or columnar structure	Structure is a medium to strong grade of Blocky, granular, prismatic or columnar	Structure is weak or is platy or massive (no structure)	Structure is single grained (sand) or massive or platy (combined with poor soil texture	
Depth of Suitable Soil	There is greater than 2.5 m (8 feet) in depth of well-suited soil.	Soil is moderately suitable to at least 2.5 m (8 feet) in depth to bedrock, impermeable layers, or saturated soils. Limited suitability at depths below 1.5m (5 feet) may be	Soil has less than 1.8 m (6 feet) of generally suitable soils to bedrock, impermeable layers, or saturated soils, but not less than 900 mm (3 feet).	Soil has less than 900mm (36 inches) in depth to bedrock, impermeable layers, or seasonally saturated soil.	
Hydraulic Capability of Soil	Soils are rated as very rapidly to rapidly drained and have good permeability.	Soils are rated as well drained and have good to moderate permeability.	Soils are rated as moderately well drained to imperfectly drained or are very rapidly drained and slowly permeable. Alternatively, the soil could be very	Soils are rated as imperfectly to poorly drained (gleysolic soils or soils restricted by presence of ground water less than 1 m below surface) and or are relatively impermeable	
Soil characteristics are required to rate permeability			permeable, minimizing the capacity of the soil to treat the	or are extremely permeable.	
Soil Horizons	Soil horizons have negligible or minor textural contrast or stratified materials	Soil horizons have moderate textural contrast and mild stratification of materials and indicators that suggest moderate restriction to vertical water movement	Soil horizons have significant textural contrast, some stratified materials, and indicators that suggest significant restriction to vertical water movement or include highly	Soils horizons have severe textural contrast, stratified materials, and indicators that suggest severe restriction to vertical water movement or include highly permeable	
Depth to Water Table	No indication of saturated soil conditions or water table to a depth greater than 2.5 m (8 ft.)	No indication of saturated soil conditions or water table to a depth greater than 2.5 m (8 ft.)	Indication of saturated soil conditions or water table at a depth less than 2.5 m (8 ft.) but is deeper than 900mm (3 feet)	Extremely high water table or signs of saturated soil conditions at less than 3 feet below surface.	
Topography or proposed site	Land has a slight slope (0 – 8%) that is convex in nature	Land has a slight slope (0 – 8%) that is convex in nature	Land has a moderate slope (8-12%) that is convex in nature	Land has significant concave slope or a severe slope (over 15%) where soil stability is a concern or surrounding lands cause surface drainage to accumulate	
Flooding	None, protected	None, protected	Extremely Rare (1 in 100 year event)	1 in 50 year event or more frequent	
Density	Limited existing or planned development in area. Meets definition of low density	Existing or planned development of a moderate density. Meets definition of medium density.	Existing or planned development of high density. Meets definition of high density.	Extreme high density or large number of parcels. Parcels are less than 500 sq. meters in area	
Encumbrances (ie. Wells, water sources, surface water, buildings, property lines, lines of easement, interceptors or drainage ditches, cuts, banks, fills, driveways or parking areas, existing on-site sewage systems, or	Parcel has two suitable sites identified for an on-site system or parcel size is large enough that few restrictions are created for choosing a site.	Encumbrances cause moderate siting limitations but sufficient setbacks exist and two suitable sites for on-site sewage systems have been identified.	Encumbrances cause significant siting limitations but sufficient setbacks exist and space is available for one onsite system.	Encumbrances cause extreme siting limitations or less than required setback from encumbrances exist.	
Parcel Size	Large parcel sizes greater than 4 Ha. Parcels have sufficient space to easily provide a reserve area for a replacement system.	Sufficient parcel size	Marginal parcel size. Parcel size typically less than 1 acre.	Parcel size is Less than 500 sq. meters or insufficient to meet all minimum distance requirements set out in Saskatchewan Guidelines document for intended system.	

APPENDIX B

Previous Reports

OWTS DESIGN

BMA Ventures
1831A MacRae Drive E
Regina, SK
S4N 0S4
File No: 21-008-001

Chris Seeley. M.A.Sc., P.Eng.
Seeley Engineering and Consulting Inc.
3 McNall Place
Regina, SK
S4S 2J9
Email: seeleyengconsulting@gmail.com
Cell: 306-536-9722

1 BACKGROUND

Seeley Engineering and Consulting Inc. has been contracted by BMS Ventures to complete a soil investigation related to the potential design and construction of a communal onsite wastewater treatment system to serve a small subdivision of 14 homes. The agreed to scope of work includes:

1. Site Evaluation

The site evaluation includes an investigation of the site and soils. This includes:

- Assessment of the density and sensitivity of the surrounding area.
- Determination of the type of onsite wastewater system that would be permissible.
- A site evaluation with one site visit to complete:
    - A site investigation to identifying surface features that influence the design and location of an onsite wastewater treatment system.
    - A soils investigation in two to three test pits including a description of the soil profile, sampling for laboratory testing of particle sizing, and identification of limiting and restrictive layers.
- Site Evaluation Report (As per Annex 10 of the Saskatchewan Onsite Wastewater Disposal Guide, 2018) excluding design spreadsheets and site drawing.
- Letter report describing the soils found and design recommendations.

Note: Following the field work, all soil samples will be sent to a third-party laboratory for analysis.

The client is responsible for all Sask1stCall clearances and locating all private buried infrastructure.

2 PROJECT DESCRIPTION

The system and home will be located on NE-12-17-18-W2M in the Rural Municipality of Edenwold 158. The development is located on the south side of the Town of White City at the south end of Jaxon Road. The site is also south and east of the Hamlet of Emerald Park. A creek travels east to west across the southern portion of the lot. Agricultural land is on the east, south and west of the land in question.

The project is in a high-density area due to the proximity to the Town of White City. There have been historical concerns with ground water quality and quantity in the area. Therefore, it is likely that the Saskatchewan Health Authority would deem this to be a sensitive location.

Figure 1 - Site Location

2.1 PROJECT TIMELINES

Element	Date Completed	Reference
Initial Proposal Submitted	December 2, 2021	
Signed Contract Returned	December 3, 2021	
Sask First Call	December 2, 2021	20214908529
Site Evaluation	December 4, 2021	
Laboratory Samples Submitted	December 6, 2021	
Test Results Received	December 11, 2021	
Client Meeting to Review Draft Report	December 18, 2021	
Report submitted to client	December 22, 2021	

3 SITE EVALUATION

3.1 SITE INVESTIGATION

3.1.1 Site Description

The following development characteristics and wastewater volumes and quality are assumed to allow for the comparison of alternatives.

Development Characteristics

- 14 homes in a bareland condominium arrangement.
- Homes will be single story with three bedrooms each
- Power, gas and telephone will be provided to the house site
- Municipal water will be provided to the site.
- The minimum lot size is 0.57 acres (0.23 Ha). The average lot size is 0.63 Acres (0.25 Ha).
- There is significant common property and environmental reserve on within the development

- It is assumed that:
  - Garburators are not permitted.
  - Sump pumps discharge to surface away from any onsite wastewater treatment system.
  - Commercial and industrial waste is not allowed to enter the treatment system.
  - Pools or hot tubs are not drained to the onsite sewage system.

Assumed Wastewater Volume and Quality Characteristics

- 3 bedrooms at 1.5 people per bedroom is 4.5 people per house with no more than 25 fixture units per house. This results in 337.5 imperial gallons per day (1530 L/d) of peak daily flow and 225 imperial gallons per day (1000 L/d) of average daily flow. This is considered unusually low for new luxury development.
- The wastewater is typical domestic wastewater strength (BOD_5< 220 mg/L & TSS < 220 mg/L).
- The wastewater does not contain significant fats, oils and grease content. The oils and grease shall be less than 50 mg/L.

3.1.2 Minimum Setback Distances

Relevant set back distances used for the soil treatment field are:

- Building = 30 ft
- Embankment/cut = 10 ft
- Driveway = 5 ft
- Water course = 50 ft
- Property boundary = 10 ft

Relevant set back distances used for septic tanks are:

- Building = 3 ft
- Embankment/cut = 10 ft
- Driveway = 5 ft
- Water course = 30 ft

Additional setbacks are in the Saskatchewan Onsite Wastewater Disposal Guide, 2018 (SOWDG).

3.2 SOILS INVESTIGATION

3.2.1 Soil Description

3.2.1.1 General Information

Soils in the area are a complex of soils formed in various deposits associated with shallow drainage channels and gullies. A sequence of more than three types of genetic mineral materials may be present including chernozemic, regosolic and gleysolic soils. However, in the area two types dominate (Agriculture and Agri-food Canada). These are the Chernozemic or Regosolic orders.

Chernozemic soils are characterized by being well to imperfectly drained soils with surface horizons darkened with the accumulation of organic matter. The high organic matter surface soil

horizon is typically underlain by a B horizon which has undergone minor alterations due to chemical weathering. The calcium carbonate that was originally present in the A and B horizons typically has been dissolved in the upper horizons and re-precipitates in the upper C horizon, creating a Cca horizon. This carbonate-enriched horizon overlies a Ck horizon, which has the same levels of carbonate as the parent material (College of Agriculture and Bioresources). These soils can often have an onsite wastewater system.

"Regosolic soils lack significant soil formation and occur typically on very young surfaces (such as sand dunes or river floodplains) or unstable surfaces (such as slope positions that experience high rates of soil erosion). Regosolic soils either completely lack a B horizon or have a thin B less than 5 cm thick. In rolling or hummocky agricultural landscapes in Saskatchewan, the soils on the knolls have often been heavily eroded by tillage and the calcium carbonate-rich C horizon become mixed by tillage into the A horizon. This Apk horizon often directly overlies the C horizon. In sand dunes or recent river floodplain deposits there may be no A horizon and the C horizon extends to the surface of the soil." (Saskatchewan Soil Information System). These soils are not typically suitable for a soil treatment field of an onsite wastewater system.

References:

- https://app.sksis.ca/map
- https://www.agr.gc.ca/atlas/agpv?webmap-en=c225cc78d5b142d58eacefae91cc535b&webmap-fr=ad0b6822a33e411683f99979a1167efa
- https://soilsofsask.ca/soil-classification/

3.2.1.2 Site Information

All three test pits have similar characteristics.

- A layer of loamy sand at the surface.
- Below the loamy sand, there is a loam layer with a poorly defined structure
- There is layer between 53 and 78 inches below grade that is a moderate platy silty loam.
- Mottling begins 40-50 inches below grade, which indicates that a seasonal water table may reach this height.
- Some effervescence was noted in the layer above the mottling.
- Weak gleying was noted near the bottom of test pit #2 indicating that it is likely there is saturate conditions 80 inches ore more below grade.

For the purposes of design, test pit #2 should be considered typical for the area closer to the creek.

Soil logs and lab results are found in Appendix B.

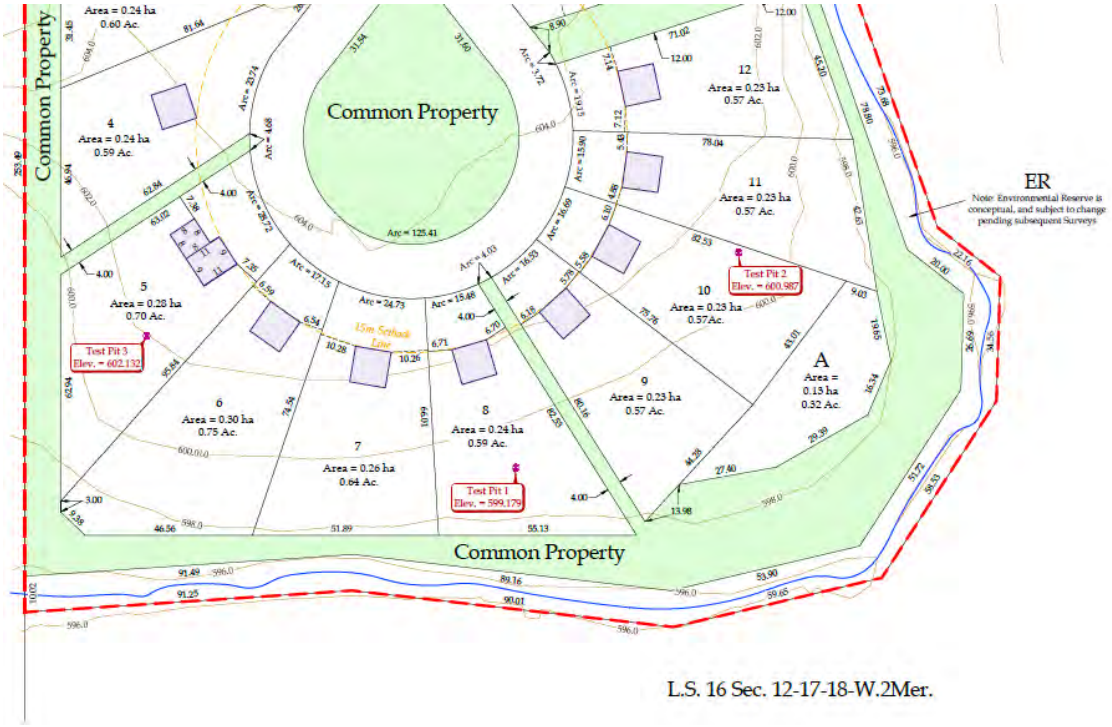


Figure 2 - Test Pit Locations

3.2.1.2.1 Restrictive Layer

A restrictive layer was noted in all test pits. At between 53 and 78 inches below grade, a layer of moderately platy silt loam was noted. For design purposes, this should be assumed to occur at 53 inches below grade.

3.2.1.2.2 Limiting Layer

The limiting layer in test pit 2 is the layer labelled Cca. This is a loam blocky grade 1.

3.2.1.2.3 Loading Rates

Based on a soil texture of loam and a structure of blocky grade 1, the following loading rates can be used.

Parameter	**Max Loading Rate Primary Effluent**	**Max Loading Rate Secondary Effluent**
Hydraulic Loading Rate	0.30 igal/d/ft²	0.45 igal/d/ft²
Linear Loading Rate*	NA / 4.3 igal/d/ft²	NA / 4.3 igal/d/ft²
Organic Loading Rate	1.23 lb BOD_5/1000ft²/day	1.23 lb BOD_5/1000ft²/day

*The linear loading rate is not applicable for at-grade or above-grade sewage systems as there is more than 48 inches (1.2 m) between the restrictive layer and the infiltration surface. A below grade system using secondary effluent is possible, in this case linear loading would have to be included as part of the design.

4 ANALYSIS

Using the SOWDG as a primary reference and 14 – three bedroom homes:

- The peak daily flow for the development is 4725 imperial gallons (21.5 m^3) and
- The average daily flow for the development is 3150 imperial gallons (14.3 m^3)

The preliminary estimate of the footprint of a communal soil treatment field using peak day flow and where:

- pressure demand dosing is used and primary effluent is applied: 13,125 ft^2 (0.30 acres, 0.122 Ha).
- pressure demand dosing to chambers is used and secondary effluent is applied: 9545 ft^2 (0.22 acres, 0.089 Ha).
- timed dosing, pressure distribution and secondary effluent is applied: 8750 ft^2 (0.20 acres, 0.08 Ha).

The actual dimensions required for a system will be linked to the type of soil treatment field designed.

Table 1 - Estimated Field Size Requirements

Type of System	Assumed native soil infiltration surface area needed	Preliminary system length*	Preliminary System Width*
Type II mound with timed dosing	10500 ft^2 (975 m^2)	1116 ft (340 m)	23 ft (7 m)
Shallow buried trenches with secondary effluent and timed dosing	8750 ft^2 (813 m^2)	730 ft (225 m)	24 ft (7.3 m)
EnviroSeptic field	10500 ft^2 (975 m^2)	1020 ft (310 m)	30 ft (9.1 m)

*includes end slopes at 3:1. Assumes 3 feet mound and EviroSeptic height. Incorporates spacing between trenches where applicable.

If flow management is incorporated into the system, the native soil infiltration surface estimate will decrease by more than 30%.

5 RECOMMENDATIONS

The following preliminary recommendations apply to the design of a communal wastewater solution. During further design, additional homeowner education, development requirements and operation and maintenance requirements should be considered and developed.

- General design recommendations
    - The infiltrative surface of the communal system should be no more than 17 inches (0.43 m) below grade. If less than 48 inches (1.2 m) remain between the restrictive layer and the infiltrative layer, linear loading rates are required to be used.
    - A system that provides secondary treatment prior to the insitu soils is required. There is insufficient vertical separation to support a typical soil treatment field using primary effluent. Design alternatives could include:
        - A common package treatment plant that discharges to a soil treatment field.
        - A common dose tank and type II mound system.
        - A common dose tank and EviroSeptic field system.
        - Individual type II mounds on each lot.
        - Individual EnviroSeptic field systems or package treatment plants to a soil treatment field on each lot.
- All required design elements must be included from the SOWDG. However, the following minimum required items are highlighted for their importance.
    - The soil treatment field should be long and narrow with the long axis being perpendicular to the slope so that the infiltration surface is level.
    - Each house should have a minimum working capacity of one peak day flow plus an allowance for sludge and scum. Using the assumed values, a tank with a working capacity of 1050 imperial gallons (4.78 m^3) would be sufficient. A pump chamber is also required and would be in addition to the working capacity.
- System design elements in addition to the minimum requirements for individual systems found in the SOWDG
    - Sewage volumes
        - Sewage volumes should be calculated considering the volume requirements of the SOWDG as the hydraulic loading rates were developed using these volumes.
        - A dose tank should be used to store periods of high flow to reduce the impact of peak day flow on the system and thereby reduce the size of the soil treatment field. The dosing tank is typically double the average daily flow. However, more detailed calculations should be completed to determine the dose tank size necessary to manage peak flows.
        - Appropriate community controls should be enacted to ensure that extraneous flows do not impact the system (e.g. sump pumps and water softener do not enter the communal system).
    - Sewage quality
        - Individual homeowners should be educated annually on the type of material that should be flushed into the system.

        - Appropriate community controls should be enacted to protect the sewage quality entering the system including preventing wastewater generating home-based businesses such as food production.
        - Each septic tank should have an effluent filter installed to reduce the possibility of one individual home from damaging the communal system.
    - System controls and monitoring systems
        - Timed dosing of the soil treatment field should be incorporated.
        - High liquid level warning in individual septic tanks and any communal tanks should be included.
        - Data logging of flows and liquid levels and operational conditions in the communal system should be part of the control system.
        - One vertical separation monitoring well should be installed underneath the system to measure the depth of unsaturated conditions beneath the native soil infiltration surface.
        - One upgradient and two downgradient groundwater wells should be installed in the shallowest unconfined aquifer beneath the system if one is present.
    - Septic tanks
        - All septic tanks should be serviced regularly.
    - Soil treatment field
        - Even though linear loading rate may not be applicable for certain system options, the communal system should be designed with groundwater mounding considered as part of the design. Ground water mounding underneath the system should be considered to prevent effluent surfacing or treatment failure. A guide produced by Poeter et al describes one methodology to do this. This will determine the width of the system and whether it can fit within the defined boundaries.
        - Secondary treated effluent should be applied to the insitu soil infiltration surface as this allows a significant reduction in field size.
        - A surface water diversion swale should be designed to divert runoff from impacting the soil treatment field.
        - A pressurized timed dosing system should be installed as this reduces the required field size.
        - A system with two or more zones will reduce the cost of the pumping system and result in a system that is easier to design, build and operate.
        - Given the size of the system, additional monitoring ports should be installed to allow monitoring of the system.

The technical recommendations above assume the development of a communal onsite wastewater disposal system. Should individual onsite wastewater systems be installed, it is highly likely that each lot will have a suitable area. Each system would be designed when house plans for each lot are available. At that time, individual Sewage Disposal permits should be obtained.

6 NEXT STEPS FOR THE WASTEWATER TREATMENT SYSTEM

The following steps should be completed in order to advance the sewage management options for the development:

1. Contact the Saskatchewan Health Authority at environmentalhealth@rqhealth.ca with the following questions:
    - Are there any specific technical requirements beyond those found in the Saskatchewan Onsite Wastewater Disposal Guide for a communal onsite wastewater system used for 14 lots?
    - What are the technical requirements required by the Saskatchewan Health Authority for developments where a communal onsite wastewater system is proposed?
        - Specifically, are any parts the "Guidance for Development and Subdivisions where onsite wastewater treatment systems are proposed" are required to be followed?
    - Is this area considered a sensitive location under the SOWDG?
    - What are the administrative and effluent quality requirements for using treated effluent for irrigation during the summer?
2. Based on the discussion with the SHA, either:
    - Complete a subdivision study focused on the suitability of the land for onsite wastewater treatment systems. The study will develop options. This would be followed by preliminary design (i.e. option evaluation) and detailed design (i.e. drawings and specification); or,
    - Complete a preliminary design based on options developed by the designer, such as those described herein, followed by detailed design.

7 STATEMENT OF LIMITATIONS AND CONDITIONS

7.1 THIRD PARTY USE OF REPORT

This report has been prepared for the Client and any use a third party makes of this report or any reliance on or decisions made based on it, are the responsibility of such third parties. Seeley Engineering and Consulting Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions undertaken based on this report.

7.2 GEO-ENVIRONMENTAL STATEMENT OF LIMITATIONS

Seeley Engineering and Consulting Inc. prepared the geo-environmental conclusions and recommendations for this report in a professional manner using the degree of skill and care exercised for similar projects under similar conditions by reputable and competent environmental consultants. The information contained in this report is based on the information that was made available to Seeley Engineering and Consulting Inc. during the investigation and upon the services described, which were performed within the time and budgetary requirements of the client. As the report is based on the available information, some of its conclusions could be different if the information upon which it is based is determined to be false, inaccurate or contradicted by additional information. Seeley Engineering and Consulting Inc. makes no representation concerning the legal significance of its findings or the value of the property investigated.

8 REFERENCES

Saskatchewan Onsite Wastewater Disposal Guide. 2018. Access from Plumbing and Sewage | Environmental Health | Government of Saskatchewan on April 18, 2021.

Poeter E., J. McCray, G. Thyne, and R. Siegrist. 2005. Guidance for Evaluation of Potential Groundwater Mounding Associated with Cluster and High-density Wastewater Soil Absorption Systems. Project No. WU-HT-02-45. Prepared for the National Decentralized Water Resources Capacity Development Project, Washington University, St. Louis, MO, by the International Groundwater Modeling Center, Colorado School of Mines, Golden, CO.

Prepared By:

PROFESSIONAL ENGINEER C.F. SEELEY MEMBER 11947 SASKATCHEWAN

Christopher F. Seeley, P. Eng., M. ASc
Environmental Engineer

Association of Professional Engineers & Geoscientists of Saskatchewan
CERTIFICATE OF AUTHORIZATION
Seeley Engineering & Consulting Inc.
Number 35834
Permission to Consult held by:

Discipline	Sk. Reg. No.	Signature
Env	11947	

Appendix A – Site Information

Safe Work Form

Sask First Call Information

SAFE WORK FORM (SWF)

GENERAL INFORMATION

Job Number:	21-008-001
Date:	Dec 4/21
Client:	Trevor Bagnell
Location:	N
LSD:	NE 12-17-18-W2M RM Edenwold No 158
Scope of Work:	Test Pits.
Installer:	PSDS #:

UTILITY CHECK INFORMATION

Utility Check Complete:	Yes	No	First Call # 20212908529
Date Utilities Cleared/Located:	Called Trevor Bagnell		
By Whom (attach Alberta 1st Call & Private Locate Documents):	Trev-		
Utilities and restrictions noted on site during kick off meeting:			

	Yes	No	Location and Details
Water		✓	Wells to NW/Town
Sewer		✓	
Power		✓	
Cable		✓	
Fiber optic		✓	
Gas	✓		Northern Lights Gas
Phone		✓	
Underground tanks		✓	
Other pipelines		✓	
Right of ways		✓	

SAFETY

Is 911 available?	(Yes)	No	Note: if 911 is not available, dial "0" from a LAND LINE, give operator your legal location and what emergency response you require.
Location of Nearest Hospital	General Hospital	Phone Number:	911
How many first aiders on site?			
Are Emergency Shutdown Procedures identified?	Truck / Main Line	(Yes)	No Engine
Are Fire Extinguisher locations identified?	Pickup truck	(Yes)	No
Are First Aid Kit locations identified?	Ont / Truck	(Yes)	No

PERSONAL PROTECTIVE EQUIPMENT REQUIRED

Coveralls		Standard	Fire Retardant	
Reflective Vest	✓	Standard	Traffic	
Eye Protection		Safety Glasses	Goggles	
Respirator		Cartridge	SCBA	
Gas Monitor		H2S	4-Head	Other
Hearing		Ear Plugs	Ear Muffs	
Foot Protection	✓	Standard	Rubber	Winter
Gloves		Standard	Nitrile	
Hard Hat	✓	Standard	Side Impact	
Cell Phone				
Other (specify)				

SAFE WORK FORM (SWF)

SITE HAZARDS

Task	Hazards	Corrective Actions
1) Dig Test pit.	unknown buried line	1) Spotter 2) locates
2) Work in test pit.	Wall Collapse	1) Spoil pile >1m from edge 2) No entry >3-4 feet. 3) other workers on site
3) Hole After work Complete.	unknown fall	1) Fill when work done. 2) Mark if needed.

TICKETS

First Aid	Ground Disturbance	TDG	CSTS	WHMIS	H2S
Other:					

The following have reviewed and understood the Safe Work Form (Aptryx and Contractor Representatives)

Company	Print Name	*Signature*	Date	Tickets Checked
SEC	Chris Seeley		Dec 4/21	
SERBIA	MARC DESAUTELS		DEC 4/21	
BMA Industry	Trevor Bagnall		Dec 4/21	

NOTES:

Ticket No: 20214908529

Excavator Details

Caller Id: 171104
Contact: Crystal Bedier
Company: CCR Construction Limited
Phone: 306-585-1967
Mobile: Not Supplied
Email: crystal@ccrconstruction.ca

Dig Site and Ticket Details

Open Map

Area is marked.

Land Grids: LLD
NE-12-17-18-W2

Latitude: 50.424086 **Longitude:** -104.346221

Ticket Status	Original
Ticket Type	Planning & Design
Previous Ticket No.	Not Supplied
User Reference	Not Supplied
Ticket Date	2021-12-02T09:18:42-06:00
Work Start Date	2021-12-11T02:00:00-06:00
Address	100 Hutchence Road Emerald Park S4L 1C6
Nearest Cross Street	Not Supplied
Type of work	Water
Activity	Test Pits
Excavation Method	Mechanical Excavation
Excavation Depth	1m to 3m
Public Property	None
Private Property	Residential
Onsite Contact	Trevor Bagnall
Onsite Phone	306-539-2405
Municipality	Not Supplied
Nearest Community	Not Supplied
Rural Subdivision	Not Supplied
Lot No.	
Block No.	
Plan No.	

Your Responsibilities

- Do not proceed with any excavation until all notified asset owners have responded by providing clearance, OR by identifying the location of their facilities with maps OR by placing locate marks on the ground.
- Pothole to establish the exact location of all underground assets using a hand shovel, before using heavy machinery.
- If you damage an underground asset you MUST advise the asset owner immediately.
- By using the Before You Dig Partners service, you agree to our privacy policy and the terms and conditions set out at on our web site.
- **For more information, visit www.BeforeYouDigPartners.com**

Utility Owner Details

The public utility owners listed below with a Status of "Notification Sent" have been requested to respond to your request. They may contact you directly for clarification of your request details.

Station Code	Authority Name	Status
SEI LAS	SASKENERGY - LAS	Notification Sent
SKPOWER LAS1	SASKPOWER - LAS	Notification Sent
SASKTEL LAS1	SASKTEL - LAS	Notification Sent

END OF UTILITIES LIST

Request Utility Locates Online at www.BeforeYouDigPartners.com – 24 hours a day, 7 days a week

Appendix B – Site Information

Soil Logs

Lab Results

Pit Name	TP1	Latitude	50.424001	
Organic Layer Depth	5-7"	Longitude	-104.346866	
Slope of Land	5%		599.179	
Horizon	1	2	3	4
Horizon Name	Ah	B	C	C2
Horizon Depth	5-12"	12-48	48-78"	78-96"
Colour	7.5YR 3/1	2.5Y5/4	2.5Y 7/4	2.5Y 4/2
	Very Dark Grey	Light Olive Brown	Pale Brown	Dark Greyish Brown
Moisture	Dry	Dry	Dry	Dry
Root Depth	12+	27	-	-
Roots	Common	Common	None	None
Root Size	V.Fine to Fine	V.Fine to Fine	NA	NA
% Coarse Fragments	0	0	0	0
Size of CF	0	0	0	0
Inclusions (Y/N)	N	N	N	N
Salt inclusions Volume	NA	NA	NA	NA
Salt inclusion Size	NA	NA	NA	NA
Salt Inclusion Colour	NA	NA	NA	NA
Effervescence Inclusion	NA	NA	NA	NA
Effervescence Matrix	None	None	None	None
Structure	SG	SG	SG	Platey
Grade				2
Ped Size				medium
Consistence	Loose	Loose	Loose	V. Friable
Abundance of Mottles	None	None	Common	Common
Mottle Size	NA	NA	Medium	Medium
Mottle Contrast	NA	NA	Distinct (est)	Distinct (est)
Mottle Colour	NA	NA	Orange	Orange
Gleying	None	None	None	None
Sample Taken	8"	27	72	90
Percentage Sand				
Percentage Silt				
Percentage Clay				
Hand Texture	SL	SL	Sand	Silty Clay
Calculated Texture				
Assumed Texture	LMS	LMS	LFS	Silt Loam
HLR (1st/2nd) igpd/ft2	0.6/1.2	0.6/1.2	0.56/0.95	0/0
Layer Type (NA,Limiting,Restrictive)			Limiting	Restrict
			Layer of rust at 50-56". Mottling below as well	597.197796

Pit Name	TP2	Latitude	50.424572		
Organic Layer Depth	5-7	Longitude	-104.345981		
Slope of Land	4%		600.987		
Hoizon	1	2	3	4	5
Horizon Name	Ah	B	Cca	Ck	C2
Horizon Depth	5-19"	19-30"	30-41"	41-53	53-96"
Colour	2.5Y 4/2	2.5Y 6/4	2.5Y 7/4	2.5Y 4/5	2.5Y 6/3
	Dark Greyish Brown	Light Yellowish Brown	Pale Brown	Dark Greyish Brown	Light Yellowish Broawn
Moisture	Dry	Moist	Moist	Moist	Moist
Root Depth	19+	24	NA	NA	NA
Roots	Common	Common	None	None	None
Root Size	Vfine to Fine	Vfine to Fine	NA	NA	NA
% Coarse Fragments	0	0	0	0	1
Size of CF	NA	NA	NA	NA	Small Stones
Inclusions (Y/N)	NA	NA	NA	NA	N
Salt inclusions Volume	NA	NA	NA	NA	NA
Salt inclusion Size	NA	NA	NA	NA	NA
Salt Inclusion Colour	NA	NA	NA	NA	NA
Effervescence Inclusion	NA	NA	NA	NA	None
Effervescence Matrix	None	None	Moderate	Moderate	None
Structure	SG	SG	Blocky	Blocky	Platey
Grade			1	1	2
Ped Size	NA	NA	V Fine	V Fine	Medium
Consistence	Loose	Loose	V Friable	V Friable	V Friable
Abundance of Mottles	None	None	None	Few	Common
Mottle Size	NA	NA	NA	Fine	Large
Mottle Contrast	NA	NA	NA	Faint	Distinct
Mottle Colour	NA	NA	NA	Orange	Orange
Gleying	None	None	None	None	Weak
Sample Taken	10"	24	36	45	90"
Percentage Sand	76	77	41	47.1	16.9
Percentage Silt	18.3	16.2	37.1	39.1	67.4
Percentage Clay	5.8	6.8	21.8	13.8	15.8
Hand Texture	SL	Sand	Sandy Clay	Sandy Loam	Silty Clay
Calculated Texture	LMS	LFS	Loam	Loam	Silt Loam
HLR (1st/2nd) igpd/ft2	0.6/1.2	0.56/0.95	0.30/0.45	0.30/0.45	0/0
Layer Type (NA,Limiting,Restrictive)			Limiting		Restrict
					599.6407973

Pit Name	TP3	Latitude	50.424338
Organic Layer Depth	2-3"	Longitude	-104.348379
Slope of Land	4%		602.132
Hoizon	1	2	3
Horizon Name	Ah	B to Cca	C2
Horizon Depth	3-12"	12-72"	72-104"
Colour	7.5 YR 3/2	2.5 Y 6/4	2.5Y 5/3
	Dark Brown	Light Yellowish Broawn	Brown
Moisture	Dry	Dry	Moist
Root Depth	12+	27	NA
Roots	Some	Some	None
Root Size	Vfine to Fine	Vfine to Fine	NA
% Coarse Fragments	0	0	0
Size of CF	NA	NA	NA
Inclusions (Y/N)	NA	NA	NA
Salt inclusions Volume	NA	NA	NA
Salt inclusion Size	NA	NA	NA
Salt Inclusion Colour	NA	NA	NA
Effervescence Inclusion	NA	NA	NA
Effervescence Matrix	None	Weak	None
Structure	SG	Columnar	Platey
Grade		1	2
Ped Size		V Fine	Medium
Consistence	V.Friable	V.Friable	Friable
Abundance of Mottles	None	None	Few
Mottle Size	NA	NA	Medium
Mottle Contrast	NA	NA	Distinct (est)
Mottle Colour	NA	NA	Red
Gleying	None	None	None
Sample Taken	8"	28"	96"
Percentage Sand		46.9	
Percentage Silt		39.4	
Percentage Clay		13.8	
Hand Texture	SL	SiCL	SICL
Calculated Texture		Loam	Silt Loam
Assumed Texture	LMS		
HLR (1st/2nd)	0.6/1.2	0.3/0.45	0/0
Layer Type (NA,Limiting,Restrictive)		Limiting	Restrict
			600.3031963

Down To Earth Labs Inc.

The Science of Higher Yields

Chris Seeley
Seeley Engineering and Consulting

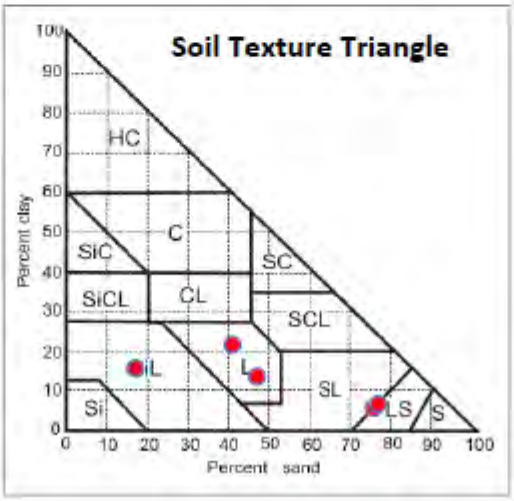
Report #: 125685
Report Date: 2021-12-10
Received: 2021-12-08
Completed: 2021-12-10
Test Done: ST

Project : BMA 21-008

PO:

3510 6th Ave North
Lethbridge, AB T1H 5C3
403-328-1133
www.downtoearthlabs.com
info@downtoearthlabs.com

			Sample ID:	211208M009	211208M010	211208M011	211208M012	211208M013
			Cust. Sample ID:	TP2-1	TP2-2	TP2-3	TP2-4	TP2-5
Analyte	Units	Limit		10"	24"	36"	45"	7.5'
Sand	%	0.1		76.0	77.0	41.0	47.1	16.9
Silt	%	0.1		18.3	16.2	37.1	39.1	67.4
Clay	%	0.1		5.8	6.8	21.8	13.8	15.8
Soil Texture	-	1		Loamy Sand	Loamy Sand	Loam	Loam	Silt Loam
Very Coarse Sand	%	0.01		1.8	1.3			
Coarse Sand	%	0.01		4.6	3.2			
Medium Sand	%	0.01		19.6	15.5			
Fine Sand	%	0.01		33.6	43.1			
Very Fine Sand	%	0.01		16.3	13.9			
% Soil less than 53 µM	%	0.1		24.0	23.0			
Soil Texture w/ Sand	-	1		LMS	LFS			
SAR	-	0.1						0.7
EC	dS/m	0.1						0.8
COLE	%	0.1						1.22
Dispersion	-	0.1						None



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Report #: 125685
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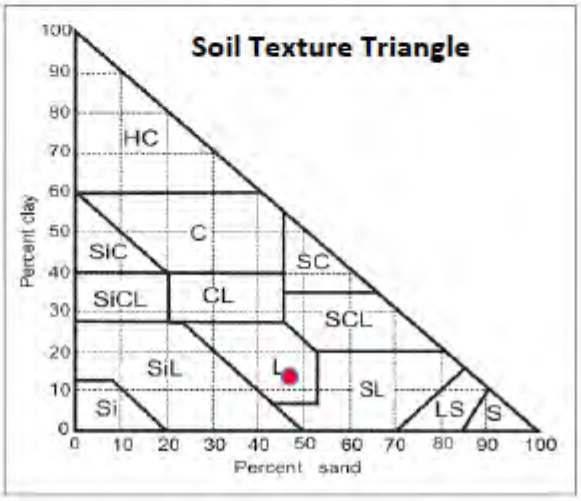
PO:

3510 6th Ave North
Lethbridge, AB T1H 5C3
403-328-1133
www.downtoearthlabs.com
info@downtoearthlabs.com

		Sample ID:	211208M014
		Cust. Sample ID:	TP3-2
Analyte	Units	Limit	6'
Sand	%	0.1	46.9
Silt	%	0.1	39.4
Clay	%	0.1	13.6
Soil Texture	-	1	Loam
Very Coarse Sand	%	0.01	
Coarse Sand	%	0.01	
Medium Sand	%	0.01	
Fine Sand	%	0.01	
Very Fine Sand	%	0.01	
% Soil less than 53 µM	%	0.1	
Soil Texture w/ Sand	-	1	
SAR	-	0.1	
EC	dS/m	0.1	
COLE	%	0.1	
Dispersion	-	0.1	



Raygan Boyce - Chemist

Appendix C – Site Photos

Figure 3 - Test Pit 1

Figure 4 - Test Pit 2

Figure 5 - Test Pit 3

Figure 6 - Landscape Near Test Pit 3

Appendix F – Bare Land Condo Letter from Lawyer

MILLER THOMSON
AVOCATS | LAWYERS

MILLER THOMSON LLP
BANK OF MONTREAL BUILDING
2103 - 11TH AVENUE, SUITE 600
REGINA, SK S4P 3Z8
CANADA

T 306.347.8300
F 306.347.8350

MILLERTHOMSON.COM

November 3, 2021

Stewart Berringer
Direct Line: 306.347.8303
sberringer@millerthomson.com

File: 0263846.0001

Private and Confidential

RM of Edenwold No. 158
100 Hutchence Road
Emerald Park, SK S4L 1C6

Dear Sir/Madam:

Re: BMA Ventures Inc.
12-17-18 W2 - Vista Springs Development – Proposed Subdivision north of Hunter Creek

We act as solicitors for BMA Ventures Inc. ("BMA"). As you are aware, BMA is in the process of acquiring a subdivided portion of the foregoing lands. The intention is to proceed with a residential bare land condominium development on the subdivided portion to be acquired. Bare land condominiums are governed by the provisions of *The Condominium Property Act, 1993*.

The following is a summary of the of the legal characteristics of a bare land condominium:

1. A bare land condominium corporation comes into existence upon the registration of a condominium plan, which occurs after the project is complete to the stage where the plan can be surveyed and verified. Prior to this stage, approvals must be obtained from the Department of Justice, the Chief Surveyor's Office, and from the municipal jurisdiction in which the condominium is situated, in this case the RM of Edenwold No. 158 (the "RM");

2. In order to register a bare land condominium, the developer needs to provide a declaration respecting the bare land condominium project and undertaking to complete all of the common areas and obtain a certificate from an engineer, architect, or appraiser verifying the cost to complete the bare land project (see Form J and Form K attached);

3. The developer must also provide a bond to ensure completion of the common property and common facilities on the bare land condominium (see Form E attached). The amount of the bond is dependent upon the cost of the work to be completed. If the cost to complete the work is less than $500,000, the bond must be for the amount of the cost to complete the work; if the If the cost to complete the work is more than $500,000, but less than $2,500,000, the bond must be for $500,000;

4. Once the survey is complete and the documents have been submitted to the Department of Justice for approval, ISC will provide a transform approval certificate;

5. A bare land condominium consists of bare land units (title to which is held by individual the units holders), and common property (which is owned by the property of the corporation). In the case of bare land condominiums, common property usually consist solely of roadways, parking areas, boulevards and green spaces. The condominium corporation is responsible for maintenance of the common property; individual unit owners are responsible to maintain their own units (including any buildings located thereon) in accordance with the condominium corporation's bylaws; and

6. In the case of this development, no special agreements or documents with third parties will be required regarding the development relating to the maintenance or operation of the condominium. The condominium corporation will be governed by a board consisting of bare land unit holders. The role of the board will be to manage the affairs of the condominium corporation. This will all occur in accordance with the corporation's bylaws and the Act.

In summary, the registration of the bare land condominium plan is similar to the registration of a plan of subdivision. Individual titles are created which will indicate unit factors pursuant to which each owner pays condominium fees. The condominium fees will be used, in part, to cover all of the costs of the common property, including road maintenance and repair. As such, there may be a limited responsibility for the RM since the condominium corporation will be responsible for common areas including road maintenance.

Our expectation is that the RM will work in conjunction with planning and development authority to ensure that the development meets the RM's zoning and development objectives. The legislation itself has numerous assurances and checks in place to ensure that the development actually conforms to intended use. We note that this type of bare land condominium development has been successfully implemented in various locations in Saskatchewan.

We would be pleased to hear from you if you have any further questions or concerns.

Yours truly,

MILLER THOMSON LLP

Per:

Stewart Berringer
SJOB/

Enclosures

FORM J
[*Section 22*]

Declaration of Developer

(Applies to all condominium plans for which the developer is required to provide security pursuant to section 5.2 or 16 of *The Condominium Property Act, 1993*)

The developer declares:

1. That _____ is the developer of a condominium
(*name of the developer*)

pursuant to Condominium Plan Number _____

and situated in _____
(*name of local authority*)

to be located on the following land: _____

_____

_____
(*insert a legal description of the parcel of land from which the condominium plan will be created*)

and that purports to:

☐ divide a parcel into bare land units, divide a parcel into units some or all of which are intended for residential purposes or to create conversion units pursuant to section 5.2 of *The Condominium Property Act, 1993.*

☐ create a phased development pursuant to section 16 of *The Condominium Property Act, 1993.*

2. That the developer undertakes to provide the following as shown on the sketch plan attached to this declaration and described as:

(*Insert a list of common property, common facilities, services units, improvements and additional units, as applicable. Attach a separate sheet if necessary*)

(a) _____

(b) _____

(c) _____

(d) _____

(e) _____

3. That if the developer adopts architectural controls respecting improvements on the units, the developer will apply those controls consistently.

4. That the developer undertakes to construct or has constructed the condominium in accordance with the requirements of *The Uniform Building and Accessibility Standards Act*, the regulations made pursuant to that Act and the local building bylaw.

5. (If a phased development pursuant to section 16 of *The Condominium Property Act, 1993* and the developer intends to register additional developer's reservations against the titles issued pursuant to any replacement plan or plans, the developer must include a statement of that fact.)

Dated this _____ day of _____, 20 _____ .

Signed, sealed and delivered in the presence of

(affix seal here)

_____ _____

(Witness) *(Signature of the developer)*

Certificate of Acceptance

(to be completed by the Minister Responsible for the administration of The Condominium Property Act, 1993)

The above declaration is accepted.

Dated this ___ day of _____, 20__.

_____

Minister Responsible for the administration of *The Condominium Property Act, 1993*

OR

Waiver

(to be completed by the Minister Responsible for the administration of The Condominium Property Act, 1993)

In accordance with subsection 17(3) of *The Condominium Property Regulations, 2001*, this is a waiver of the requirement to obtain security mentioned in section 17 of those regulations for the proposed condominium mentioned above.

Dated this ___ day of _____, 20__.

_____

Minister Responsible for the administration of *The Condominium Property Act, 1993*

FORM K
[*Section 17*]

Certificate of Cost

(Applies to all condominium plans for which the developer is required to provide security pursuant to section 5.2 or 16 of *The Condominium Property Act, 1993*)

I, _____, of the _____ of _____,

in _____, being a registered _____,
(province) *(engineer, architect or supplier)*

certify that the cost of completing the common property, common facilities, services units, improvements and additional units, as applicable and as described in the attached Form J Declaration of the developer, dated _____,

for Condominium Plan Number _____ in relation to the parcel of land described as: _____

_____

_____

(insert a legal description of the parcel of land from which the condominium plan will be created)

and that purports to:

☐ divide a parcel into bare land units, divide a parcel into units some or all of which are intended for residential purposes or to create conversion units pursuant to section 5.2 of *The Condominium Property Act, 1993.*

☐ create a phased development pursuant to section 16 of *The Condominium Property Act, 1993.*

is as follows:

(insert a list of common property, common facilities, services units, improvements and additional units, itemized, as applicable and as set out in Form J, Declaration of Developer, and their costs. Attach a separate sheet if necessary)

(a) _____	$ _____
(b) _____	$ _____
(c) _____	$ _____
(d) _____	$ _____
(e) _____	$ _____
TOTAL	$ _____

Dated this _____ day of _____, 20 _____.

Signed, sealed and delivered in the presence of

(affix professional seal here)

_____
(Signature of engineer, architect or appraiser)

FORM E
[*Section 16*]

Bond

I/we _____ *(the Principal)* as Principal and _____ *(the Surety)* as Surety are held and firmly bound to the Crown in right of Saskatchewan *(the Obligee)* in the sum of _____ dollars, to be paid to the Obligee, for which payment we jointly and severally bind ourselves, our executors, administrators, successors and assigns.

Sealed with the respective seals of the Principal and of the Surety and dated the _____ _____ day of _____ , 20 ____ .

If the obligation is not realized on pursuant to *The Condominium Property Regulations, 2001*, the obligation is void but otherwise remains in force and is subject to being realized on as provided by *The Condominium Property Act, 1993*.

The obligation may be released in accordance with section 18 of *The Condominium Property Regulations, 2001*.

SIGNED, SEALED AND DELIVERED
in the presence of:

(affix seal here)

_____ Witness

_____ Principal

(affix seal here)

_____ Witness

_____ Surety
By Its Authorized Officer

_____ Authorized Officer (*print name*)

Appendix G – Landscape Concept Plan & Rendering


Vista Springs
Concept Rendering

Appendix H – Heritage Resource Impact Assessment & Letter

Saskatchewan

Ministry of Parks, Culture and Sport
Heritage Conservation Branch
2nd Floor, 3211 Albert Street
Regina, Canada S4S 5W6

Phone: 306.787.2848
Fax: 306.787.0069

Email: kim.cloutier@gov.sk.ca

September 24, 2021

Our file: 21-967

Blake Wahl
Compass Geomatics
Agent For: **D.W. and M.A. McDonald**
Box 400003
REGINA SK S4W 0L3
Email: blake.wahl@compassgeomatics.ca
Phone: 306.345.7080

Dear Blake Wahl:

RE: RM of Edenwold No. 158 – Residential Subdivision (R0622-21R):
Proposed Parcel B (6.53 ha) including Access Road
Portion of 16-12-17-18 W2M
HERITAGE RESOURCE REVIEW

Community Planning forwarded the *Application to Subdivide Land* form to this office for heritage review.

In determining the need for, and scope of, Heritage Resource Impact Assessment (HRIA) pursuant to s.63 of *The Heritage Property Act*, the following factors were considered: the presence of previously recorded heritage sites, the area's overall heritage resource potential, the extent of previous land disturbance, and the scope of new proposed land development.

There are no known archaeological sites located in conflict with the proposed Parcel B, although the site EcNc-2 is located within the same quarter section. EcNc-2 contains archaeological materials (stone tools, pottery, obsidian) dating from periods occurring between 200 to 10,500 years ago. The project will impact an upland with some ridges/hills adjacent to a small drainage. Archaeological sites have been found on similar terrain in the region so the potential to find new archaeological sites is moderate to high. Since this project could damage or disturb archaeological sites, an HRIA is required.

The required HRIA, including systematic surface survey and sub-surface test exploration, is a proponent responsibility. The study will first establish the presence of heritage sites within the project area and where suitable site avoidance and protection measures (including relocation of

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development components and flagging of site boundaries prior to construction activity) may be implemented. If heritage site locations are in unavoidable conflict with the development, the study must also establish the content, structure and significance of those sites, and, on that basis, recommend both the need for and scope of any further study (including archaeological salvage excavation or other heritage management action).

The HRIA must be carried out by qualified personnel under an approved investigation permit issued through this office; a list can be found on this website https://publications.saskatchewan.ca/api/v1/products/84403/formats/97820/download. A minimum of two business days are required to process a permit application for an archaeological HRIA. The HRIA must be conducted under snow-free and frost-free conditions.

If you have any questions regarding these heritage regulatory requirements, please contact Kim Weinbender at kim.weinbender@gov.sk.ca or by calling 306-787-8157. Thank you for referring the proposed developments and for your cooperation in protecting the province's cultural heritage.

Sincerely,

Kim Cloutier

Kim Cloutier
Acting Assistant Director, Archaeology and Heritage Management

c. Shelby Williams, Community Planning (R0622-21R), Ministry of Government Relations

BMA VENTURES LTD.

HERITAGE RESOURCE IMPACT ASSESSMENT FOR MCDONALD SUBDIVISION PARCEL B PROJECT (LSD 16-12-17-18-W2M)

PERMIT 21-161

NOVEMBER 4, 2021

HERITAGE RESOURCE IMPACT ASSESSMENT FOR MCDONALD SUBDIVISION PARCEL B PROJECT (LSD 16-12-17-18-W2M)

PERMIT 21-161

BMA VENTURES LTD.

PERMIT NO. 21-161
HCB FILE NO. 21-967

DRAFT REPORT (VERSION 1)

PROJECT NO.: 211-11589-00
DATE: NOVEMBER 2021

WSP
203 WELLMAN CRESCENT
SASKATOON, SK, CANADA S7T 0J1

WSP.COM

SIGNATURES

PREPARED BY

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REVIEWED BY

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This report was prepared by WSP Canada Inc. for the account of BMA Ventures Ltd., in accordance with the professional services agreement. The disclosure of any information contained in this report is the sole responsibility of the intended recipient. The material in it reflects WSP Canada Inc.'s best judgement in light of the information available to it at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. WSP Canada Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report. This limitations statement is considered part of this report.

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PRODUCTION TEAM

CLIENT

CCR Construction / BMA Ventures	Trevor Bagnall, President / General Manager

WSP

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Project Archaeologist	Kristian Sullivan
Field Personnel:	
Project Archaeologist	Kristian Sullivan
Archaeological Field Technician	Graeme Revering
Report Author(s):	
Project Archaeologist	Kristian Sullivan
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Senior Project Manager	Reed Hentze

EXECUTIVE SUMMARY

BMA Ventures Ltd. (the Client) is proposing to develop a subdivision parcel in LSD 16-12-17-18-W2M, south of White City, Saskatchewan (the Project). The proposed development, called Parcel 'B', will be developed for residential purposes and will include access and utility installation. The Client contracted WSP Canada Inc. (WSP) to conduct a Heritage Resource Impact Assessment (HRIA) for the project.

The Client submitted the Project to the Heritage Conservation Branch (HCB) for review. In Heritage Letter File # 21-967, the HCB stated that the subdivision development had the potential to impact upland ridges and hills adjacent to a drainage, terrain considered to have moderate to high potential for archaeological resources. Therefore, an HRIA was required for the development.

WSP Project Archaeologist Kristian Sullivan and Archaeological Technician Graeme Revering conducted an HRIA of Parcel B on October 18, 2021 under Permit 21-161. The fieldwork included a visual overview, pedestrian survey, and shovel test program. A total of 29 shovel tests were dug for the HRIA. One test contained potential cultural materials. In shovel test K13P on the middle valley bench, fragmented burnt and calcined bone fragments were recovered from a 1 cm burn layer 18-19 cm DBS. No other possible cultural materials were documented during the HRIA. There was no clear evidence for the presence of an intact cultural component at this location that could be further explored with archaeological investigation.

Although potential archaeological materials were recorded within the proposed development, it is the opinion of WSP that the heritage value of the documented information would not be substantially enhanced through further investigation. WSP recommends that no further heritage assessment or mitigative work is required for this Project and recommends the Project may proceed as planned.

TABLE OF CONTENTS

PHOTOS

FIGURES

APPENDICES

1 PROJECT DESCRIPTION

1.1 DESCRIPTION OF PROPOSED ACTIVITIES

BMA Ventures Ltd. (the Client) is proposing to develop a subdivision parcel south of White City, Saskatchewan (the Project). The proposed development, called Parcel 'B', will be developed for residential purposes and will include access and utility installation. The Client contracted WSP Canada Inc. (WSP) to conduct a Heritage Resource Impact Assessment (HRIA) for the project.

The project is located in LSD 16-12-17-18-W2M (Figure 1 in Appendix A). The development area measures approximately 250 m (north-south) by 270 m (east-west), with a 160 m long and 20 m wide easement extending from the northeast corner. The total development area is 6.53 ha (Figure 2).

1.2 ASSESSMENT OF HERITAGE RESOURCE POTENTIAL

Heritage resources in Saskatchewan are protected under the *Heritage Property Act*. Commercial land development projects in Saskatchewan that involve ground disturbance must be reviewed for their potential to impact heritage resources. The Heritage Conservation Branch (HCB) within the Saskatchewan Ministry of Parks, Culture, and Sport oversees the heritage resources of the province and is responsible for determining if a Heritage Resource Impact Assessment (HRIA) is required for the Project. Several factors are considered when a project is assessed for heritage potential. Environmental factors include the project's proximity to major bogs, fens, watercourses, lakes, and strandlines, as well as the presence of high potential landforms within the Project area, such as prominent dry uplands, escarpments, hills, ridges, and islands. Sociocultural factors include the Project's proximity to previously recorded archaeological sites, Sites of a Special Nature, historic communities, historic trails, traplines, and Traditional Land Use areas. Project scope factors are also weighed, including the types of activities that will be carried out in the Project area and how the Project will cause ground disturbance and impact mineral soils and subsoils.

1.2.1 POTENTIAL IMPACTS TO HERITAGE RESOURCES AND THE ENVIRONMENT

Ground disturbance resulting from the Project has the potential to negatively impact archaeological sites, sacred sites and the surrounding environment. Construction activities for the Project are considered high impact and may involve, but are not limited to: topsoil and vegetation removal, excavation and removal of subsoils, compaction, grading, and heavy equipment traffic. Some of this work will be done within previously disturbed contexts and thus hold a low potential to negatively impact undisturbed archaeological resources. However, construction activities conducted in previously undisturbed contexts could potentially negatively impact archaeological resources.

1.2.2 HERITAGE RESOURCE SCREENING

In August 2021, Community Planning for the R.M. of Edenwold on behalf of the Client, submitted the Project to the HCB for a Heritage Resource Review. In September 2021, the HCB responded with Heritage Letter File # 21-967. The letter stated that the subdivision development had the potential to impact upland ridges and hills adjacent to a drainage, terrain considered to have moderate to high potential for archaeological resources. Therefore, an HRIA was required for the development.

2 PROJECT AREA LANDSCAPE

2.1 ECOREGIONAL LANDSCAPE

The proposed Project area is located within the Regina Plain Ecodistrict of the Moist Mixed Grassland Ecoregion of Saskatchewan (Acton, Padbury, & Stushnoff, 1998).

The Regina Plain Ecodistrict is part of the Prairie Ecozone. The Ecodistrict extends from the base of the Missouri Coteau south and west of Moose Jaw to the Moose Mountain Upland east of Regina. The Ecodistrict is characterized as a large level glacial lake plain that formed the bed of Glacial Lake Regina. The lake was later drained into the Qu'Appelle Valley in response to the retreat of glacier from the area, creating considerable drainage throughout. Sediments are predominantly sandy and clayey glaciolacustrine deposits.

The Project footprint is located along the north margin of Hunter Creek, a northeast-to-southwest running drainage that forms part of the tributary system to Wascana Creek to the west. The Project is situated on the lower and upper benches of the creek's relatively gently sloping valley.

3 HISTORICAL BACKGROUND

3.1 SASKATCHEWAN CULTURE HISTORY

Saskatchewan has an archaeologically demonstrated occupancy of over 12,000 years – although Indigenous oral history indicates people have lived here since time immemorial. Archaeologists categorize this time into two distinct periods: The Pre-contact Period (ca. 12,000 to 170 Years Before Present [B.P.]) and the Historic or Post-contact Period (300 B.P to present). These periods are divided by the arrival of Europeans during exploration and more significantly, the Fur Trade Era, which was well established by the 1700s. The overlap between these two periods is identified as the Proto-Historic Period, during which European influence on the First Nations traditional lifestyle was introduced during the initial phases of (typically indirect) contact between European and Aboriginal populations (Peck, 2011; McMillan & Yellowhorn, 2004; Saskatchewan Association of Professional Archaeologists, 2005; Wood, 1998).

Changes in technology and subsistence methods reflected in the archaeological record have been used to subdivide the Precontact into Early, Middle, and Late Precontact periods (McMillian & Yellowhorn, 2004; Peck, 2011; Wood, 1998).

The Early Precontact (12,000 to 7,500 B.P.) is identified by the presence of large projectile points used for spear-hunting megafauna such as the mammoth (*Mammuthus* sp.) and large species of bison (*Bison antiquuus* and *Bison occidentalis*) present during this time. This period initiates toward the end of the Pleistocene geological epoch (approximately 2.5 million to 11, 700 B.P.), at which time most of these large mammals became extinct or began to evolve into their modern-day equivalents (i.e. *Bison bison*).

The Middle Precontact (7,500 to 2,000 B.P.) was marked by the Hypsithermal, a climatic warming event that altered the landscape from sub-tropical to a desert-like, grasslands environment in the south, and boreal forest to the north. This drastic change introduced a drought-ridden environment, which forced a change in subsistence methods and resulted in both human and animal migration north, where water-sources were more readily available (Pletz, 2010). Subsistence became more diversified. Atlatl (spear-thrower) technology was introduced, and the introduction of atlatl projectile points is diagnostic of this era in the archaeological record. These dart tips were smaller than those made previously and were hafted onto a shaft that was propelled using a longer spear and a lever. This technology allowed the skilled hunter to throw farther with more efficiency and accuracy.

The Late Precontact (2,000 to 170 B.P.) is marked by great technological change. Projectile points decrease in size significantly for use with bow and arrow weaponry. The introduction of pottery also occurred, and for some groups the technology represented an increased dependence on horticulture and a move to a more sedentary lifestyle. Trade and the dissemination of information and ideas

between different First Nations is most apparent during this time and is demonstrated by the increased presence of imported lithic materials and items manufactured from materials such as coastal shell.

During the Post-contact Period, the advancement and success of the fur trade gradually led to the influx of permanent settlers and traders. The birth of the Métis culture was a product of the permanent establishment of European fur traders, a blending of predominantly French and First Nations traditions. Fur trade posts are an example of material culture from this prominent era. The decline and near extinction of the plains bison by the late 1800s forced a move from a traditional way of life for both Indigenous and Métis peoples and marked a period of change that led to the establishment of the Treaties with the Crown.

3.2 PREVIOUS ARCHAEOLOGICAL WORK IN STUDY AREA

3.2.1 SITE FILE INVENTORY SEARCH

The provincial archaeological inventory for National Topographic Survey (NTS) Mapsheet 72 I/8 was reviewed to determine what archaeological research had been completed in the region of the Project area as of 2021. More specifically, the inventory was examined to determine the types of sites and site frequency observed within the Project area. In this dataset, 80 archaeological sites have been previously recorded. The large number of sites is reflective of the topography and presence of upland terrain along numerous drainages that would permit sustenance and security for past peoples.

This area demonstrates a varied selection of sites, including alignment configurations (n=1), single features (n=1), recurrent features (n=5), artifact/feature combinations (n=8), artifact scatters (n=25), single artifact finds (n=37), and sites of an unknown nature (n=1). There are also Sites of a Special Nature (n=2) located within this NTS dataset.

Diagnostic evidence from several sites in the area indicates people have inhabited this region since the Early Pre-contact Period (at least 10,550 years B.P., as represented by Agate Basin). The Middle and Late Periods are also well-represented, suggesting a long and sustained timeline of cultural activity in the area; several sites contain occupational layers associated with both time periods. Several sites of historic European origin have also been documented.

There are 19 recorded archaeological sites within a 5 km radius of the Project (Figure 1). Of these, four are located within 1 km of the Project along the same drainage. The sites include a cairn feature (EcNb-27, an artifact find (EcNc-16), and two artifact scatters (EcNb-17 and EcNc-2). The artifacts collected at EcNc-2, located 500 m southwest from the site area on the opposite side of the drainage, included an Agate Basin projectile point. No previously recorded archaeological sites are in direct conflict with the Project.

4 OBJECTIVES AND METHODS

4.1 OBJECTIVES

The objectives for the HRIA, as outlined by HCB Heritage Letter File #21-967, are as follows:

1. To establish the presence of heritage sites within the project area;
2. To establish the content, structure, and significance of those sites;
3. To establish suitable avoidance measures (including right-of-way relocation) for any heritage sites found within the project footprint;
4. And to recommend both the need for and scope of any further study (including archaeological salvage excavation or other conservation action);

The letter also indicated that the HRIA must be carried out by a qualified archaeologist, in snow- and frost-free conditions, under an approved investigation permit issued by the HCB.

4.2 METHODS

The methods of the fieldwork outlined below are based upon WSP's 2021 Statement of Methods, submitted to the HCB as part of their annual assessment of qualifications for archaeological fieldwork. In general, the assessment methods include initial visual overview, pedestrian survey, and subsurface testing. The methods are modified as appropriate for project-specific conditions.

4.2.1 PERMITTING

Prior to conducting the HRIA, the Project Archaeologist applied for a Heritage Resource Impact Investigation (HRIA) Permit from the HCB, as required by the *Heritage Property Act*.

4.2.2 INITIAL VISUAL OVERVIEW

Prior to conducting a full archaeological assessment, the Project Archaeologist conducted an initial visual overview to:

- Gather geographical, environmental, and topographical data
- Determine if the area had been previously disturbed
- Detect causes of previous disturbance
- Determine an appropriate assessment strategy, and
- Identify any outstanding areas of archaeological interest.

4.2.3 PEDESTRIAN SURVEY

Linear transects were walked across the Project area to provide a comprehensive examination. Transects were spaced in 25 m intervals across a majority of the Project area. Notes and photographs were taken to document the environment, terrain, and condition of the Project area.

If any surface features were noted during the pedestrian survey, their locations would be marked with a handheld GPS unit. The field crew would record the general size, composition, stone count, stone spacing, vegetative cover, and relative location of each feature in relation to topography.

4.2.4 SUBSURFACE TESTING

Subsurface testing in the form of hand-dug shovel tests was completed where the potential for intact buried archaeological strata was present. Testing frequency was determined during the assessment according to interpretations in landscape, visibility, and determined archaeological potential. Due to the relatively flat nature of the terrain and its association with a drainage, the testing strategy focused both on a systematic approach (where tests are placed in equal distribution across the Project area) and a landform-based approach (where tests are clustered within high potential landforms).

Test dimensions were excavated to a minimum of 40 x 40 cm and 20 cm depth below surface (DBS). In general, shovel test depth (which is taken to the depth of the culturally-sterile "C-horizon" deposits, whenever possible) may be affected by glacial till, floodplain sediments, sand dune deposits, agricultural or other soil disturbances, and other depositional events. In this HRIA, tests were dug to the presence of clays. In most areas this reached 40-50 cm DBS. All excavated soils were hand screened through 6 mm mesh and examined for artifacts. Notes and photographs were taken to document the stratigraphy of the tests and the location of artifacts found below the surface.

4.3 HERITAGE SITE MANAGEMENT

Any heritage sites found during the HRIA would be recorded, photographed, and mapped. Sites would be documented through the use of Saskatchewan Archaeological Resource Records (SARRs) and submitted to the HCB. HCB then assigns the site a Borden identification number.

Artifacts found during the HRIA would have their location recorded on GPS. Collected artifacts would be brought back to the laboratory and cleaned, photographed, and catalogued according to Royal Saskatchewan Museum standards.

5 RESULTS

The HRIA was completed on October 18, 2021 by Kristian Sullivan (permit holder) and Graeme Revering (field technician) under HCB Archaeological Permit 21-161. The weather conditions were snow-free, bright, sunny, and warm with occasional wind. The results of the HRIA, including a summary of observations and findings, are presented in the following sub-sections.

5.1 FIELDWORK RESULTS

Parcel B is located along the side of the north valley of a drainage (Figure 3). At the location of Parcel B, the drainage ran east for 240 m, curled north for 250 m, then followed a 180 m curl south before it continued east across Kennedy Road. At the time of the visit the drainage was dry.

The main body of Parcel B was situated on the north and west side of the gently sloping drainage valley (Photo 1). The valley had a flat upper margin with a rounded crest that gently sloped to the south (Photo 2). The slope flattened into a middle valley bench about 100 m north of the drainage (Photo 3). The middle bench also had a rounded crest with a slightly steeper incline to the drainage below. The east-facing valley slope was steeper than the south-facing slope (Photo 4). At the bend in the drainage in the southeast portion of Parcel B the slope flattened into a slight rounded terrace. Parcel B was flanked on its west side by a gently sloping runoff channel that meets with the drainage to the south (Photo 5). Vegetation in Parcel B was dominated by short prairie grasses and hay. The west margin of the drainage also included stands of wolf willow and stunted aspen.

Photo 1. View west of Parcel B (background, far side of the drainage valley) in LSD-16-12-17-18-W2M.

Photo 2. View north across the gently sloping upper portion of the valley in LSD-16-12-17-18-W2M.

Photo 3. View east across the middle bench on the north valley side in LSD-16-12-17-18-W2M.

Photo 4. View south along east-facing valley slope in LSD-16-12-17-18-W2M.

Photo 5. View west of runoff channel on west boundary of Parcel B in LSD-16-12-17-18-W2M.

An easement extension from the northeast corner of the parcel ran for 160 m. It extended off the parcel at the steepest portion of the west valley of the drainage, crossed the drainage and a lower bench on the east valley, then ran alongside the north slope of a hill until it ended at Kennedy Road (Photo 6).

The field crew documented previous ground disturbance within in Parcel B. Most of the footprint had been disturbed by agricultural activity; at the very least the area had been seeded to hay, but it may have been cultivated in the past. A buried gas utility line ran northwest-southeast across the northeast portion of the landform and through the valley. The gas line crossed 110 m of the parcel footprint. In the northwest corner of Parcel B a cistern had been recently installed (Photo 7). The associated backdirt pile was still sitting next to the installation. The pile stood 2 m high and was composed of almost all clay. A round auger test hole was documented 135 m south of the cistern (Photo 8). About 1 m of sod had been removed and a 40 cm round hole had been drilled to a depth of 70 cm. The test hole showed the landform to have stratigraphy of silt overtop clay. There was also abundant rodent activity throughout Parcel B, including an especially focused area of holes and backdirt piles on the southern lip of the middle bench. The field crew inspected all backdirt piles, excavations, and exposures for cultural materials, but none were evident.

Photo 6. View east from Parcel B across drainage to east easement extension in LSD-16-12-17-18-W2M (area of easement shown in box).

Photo 7. View southeast of cistern and associated backdirt pile in the northwest corner of Parcel B in LSD-16-12-17-18-W2M.

Photo 8. View of auger test hole in western portion of Parcel B in LSD-16-12-17-18-W2M.

The field crew also conducted a shovel test program within the Parcel B footprint (Figure 3). Shovel tests were dug throughout the proposed development with particular focus on the middle and lower benches of the drainage valley. A total of 29 shovel tests were dug throughout the project area (see Table B.1 in Appendix B for full shovel test results). Tests contained silts and clays. Tests dug on the upper slope and top margin of the valley contained plowzone stratigraphy in the top 13 cm (Photo 9). Tests in the middle bench area displayed a loamy silt in the upper 15 cm that may also be interpreted as a plowzone (Photo 10).

No verifiable archaeological materials were recovered from the shovel tests. One shovel test, K13P, yielded interesting results. K13P was dug on the east-facing portion of the middle bench (Photos 11-12). K13P was found to contain a 1 cm thick burnt organic layer, situated at 18-19 cm DBS between loamy silt above and brown silt below (Photo 13). The test was expanded to 50 x 50 cm to capture more of the potential feature. The burnt layer contained charcoal and 73 bone fragments (Photo 14). The bone was highly fragmented and unidentifiable. All were burnt, including 12 calcined fragments, but did not exhibit any cultural markings or modifications. The layer continued in the shovel test wall to the northeast. Shovel test G14 was dug 1 m to the northeast. The G14 wall profile did not contain the burn layer. Four more tests were dug around shovel test K13P in cardinal directions. None of the tests contained the burnt layer. No cultural materials, such as lithic debitage, were recovered from any of the tests.

Photo 9. View of north wall stratigraphic profile of shovel test K08 on upper valley in LSD-16-12-17-18-W2M.

Photo 10. View of north wall stratigraphic profile of shovel test K06 on middle valley bench in LSD-16-12-17-18-W2M.

Photo 11. View south from upper valley of shovel test K13P location in LSD-16-12-17-18-W2M.

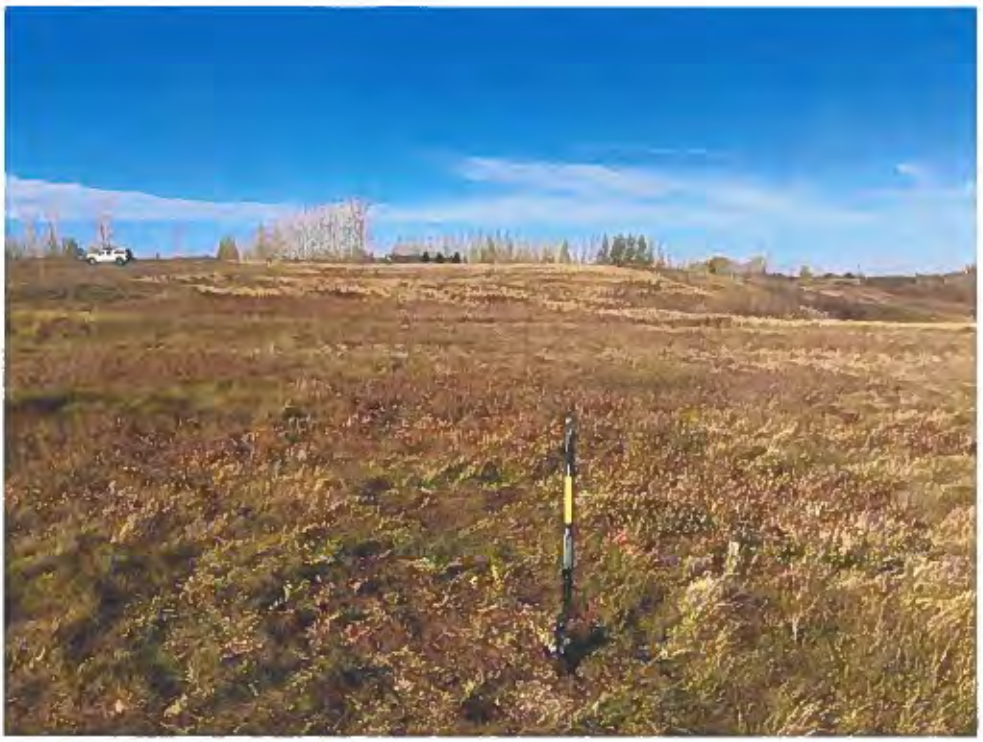

Photo 12. View north from shovel test K13P across middle bench location in LSD-16-12-17-18-W2M.

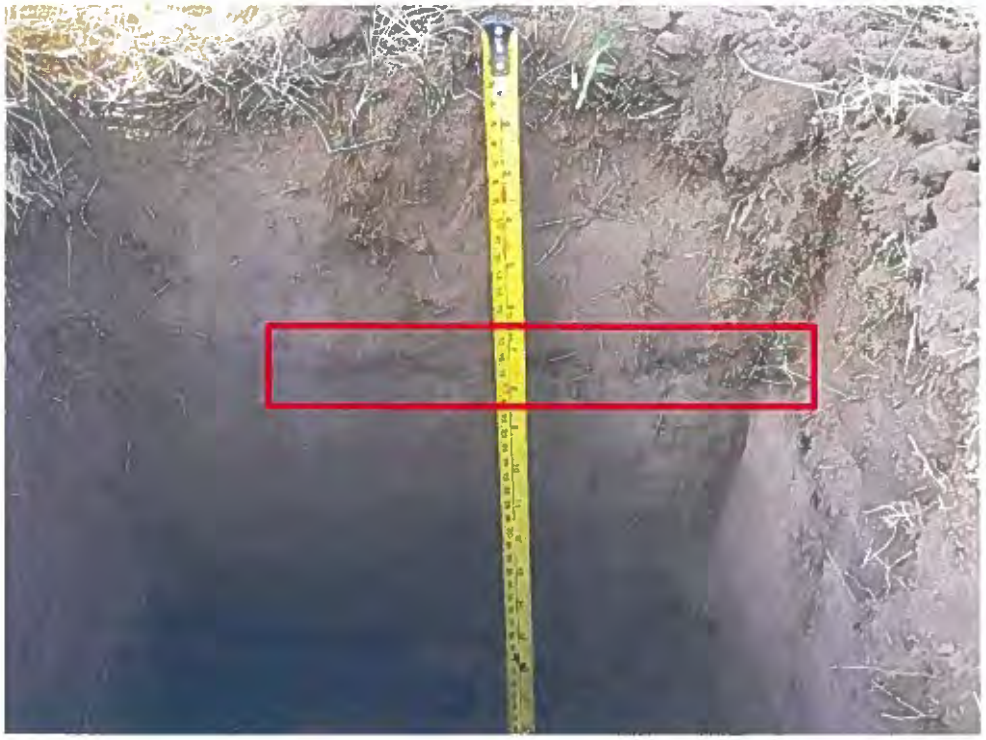

Photo 13. View of north wall stratigraphic profile of shovel test K13P (with burn layer) on middle valley bench in LSD-16-12-17-18-W2M.

Photo 14. Burnt (left) and calcined (right) bone recovered from a burn layer in shovel test 13P in Parcel B in LSD-16-12-17-18-W2M.

The presence of fragmented burnt and calcined bone did suggest the possibility that a cultural event had taken place at this location, but the lack of archaeological material made this event difficult to classify. The bone was very localized in both its surface area and stratigraphic depth. The burn layer was also situated in the stratigraphy at a depth similar to the bottom of the plowzone identified in other tests on the upper valley bench, suggesting that the area may have been subject to past disturbance or that the burn layer was historical in nature. There was no clear evidence for the presence of an intact cultural component at this location that could be further explored with archaeological investigation.

6 SUMMARY AND RECOMMENDATIONS

6.1 ARCHAEOLOGICAL SUMMARY

WSP Project Archaeologist Kristian Sullivan and Archaeological Technician Graeme Revering conducted an HRIA of Parcel B on October 18, 2021 under Permit 21-161. A pedestrian survey and shovel test program were carried out in the proposed development. A total of 29 shovel tests were dug for the HRIA. One test contained potential cultural materials. In shovel test K13P on the middle valley bench, fragmented burnt and calcined bone fragments were recovered from a 1 cm burn layer 18-19 cm DBS. No other possible cultural materials were documented during the HRIA. There was no clear evidence for the presence of an intact cultural component at this location that could be further explored with archaeological investigation.

6.2 RECOMMENDATIONS

Although potential archaeological materials were recorded within the proposed development, it is the opinion of WSP that the heritage value of the documented information would not be substantially enhanced through further investigation. **WSP recommends that no further heritage assessment or mitigative work is required for this Project as currently proposed, and recommends the Project may proceed as planned.** Should the project footprint change it should be reviewed by a professional archaeologist to determine if any additional work would be required.

While archaeological materials are not expected to be encountered, the Client is advised that even the most thorough archaeological study may not identify all archaeological materials that may be present. Should archaeological materials be encountered during construction, all work should stop in the immediate vicinity and the Heritage Conservation Branch and/or a professional archaeologist must be contacted. Should potential human remains be encountered during construction, the Client must contact the RCMP.

The recommendations in this report are subject to approval by HCB.

Note: This report was written without prejudice to issues of aboriginal rights and/or title. The assessment addresses the potential for archaeological materials only and does not encompass traditional use or other heritage concerns.

7 BIBLIOGRAPHY

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APPENDIX

A REPORT FIGURES

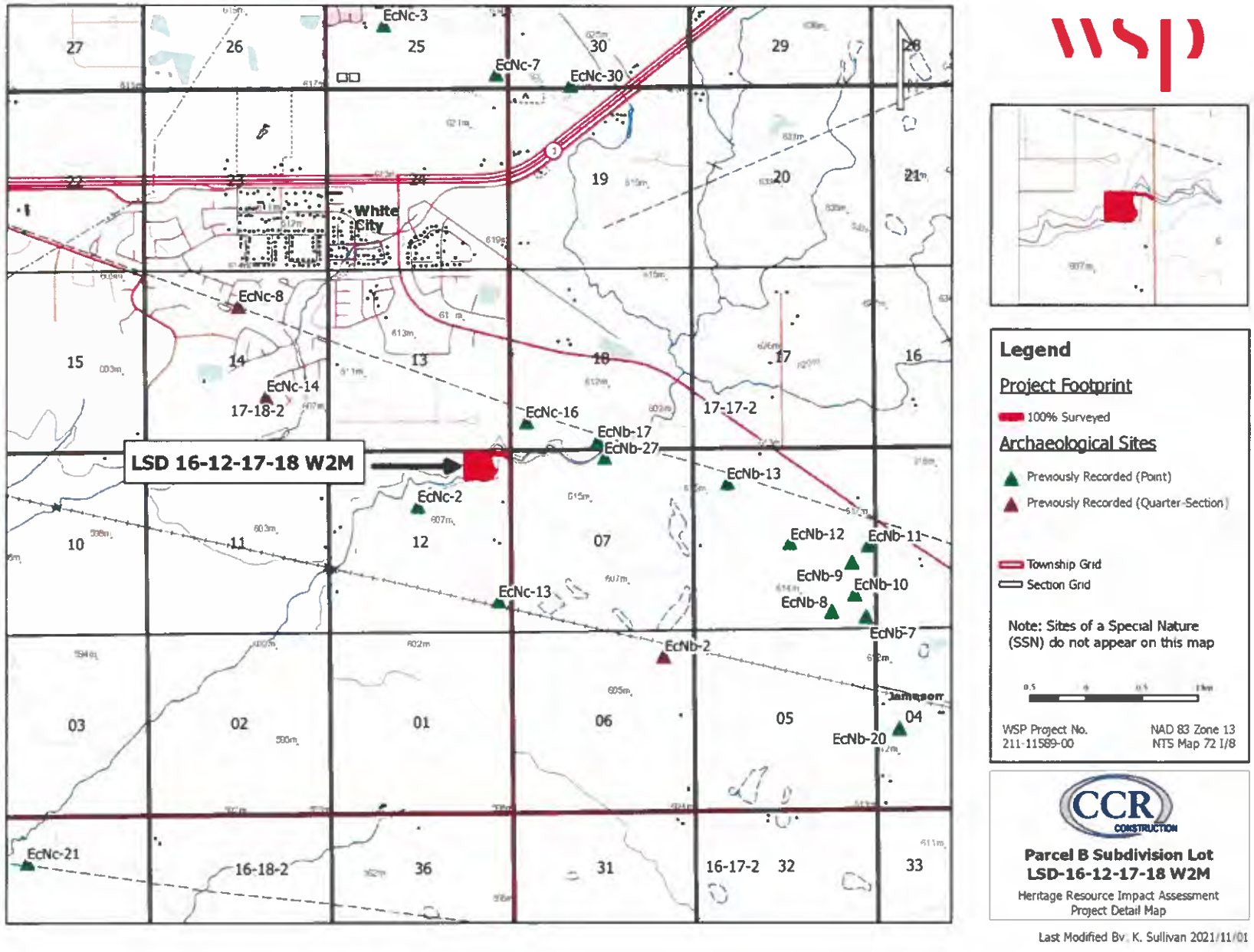


Figure 1. Parcel B Subdivision Lot area overview (1:50,000).

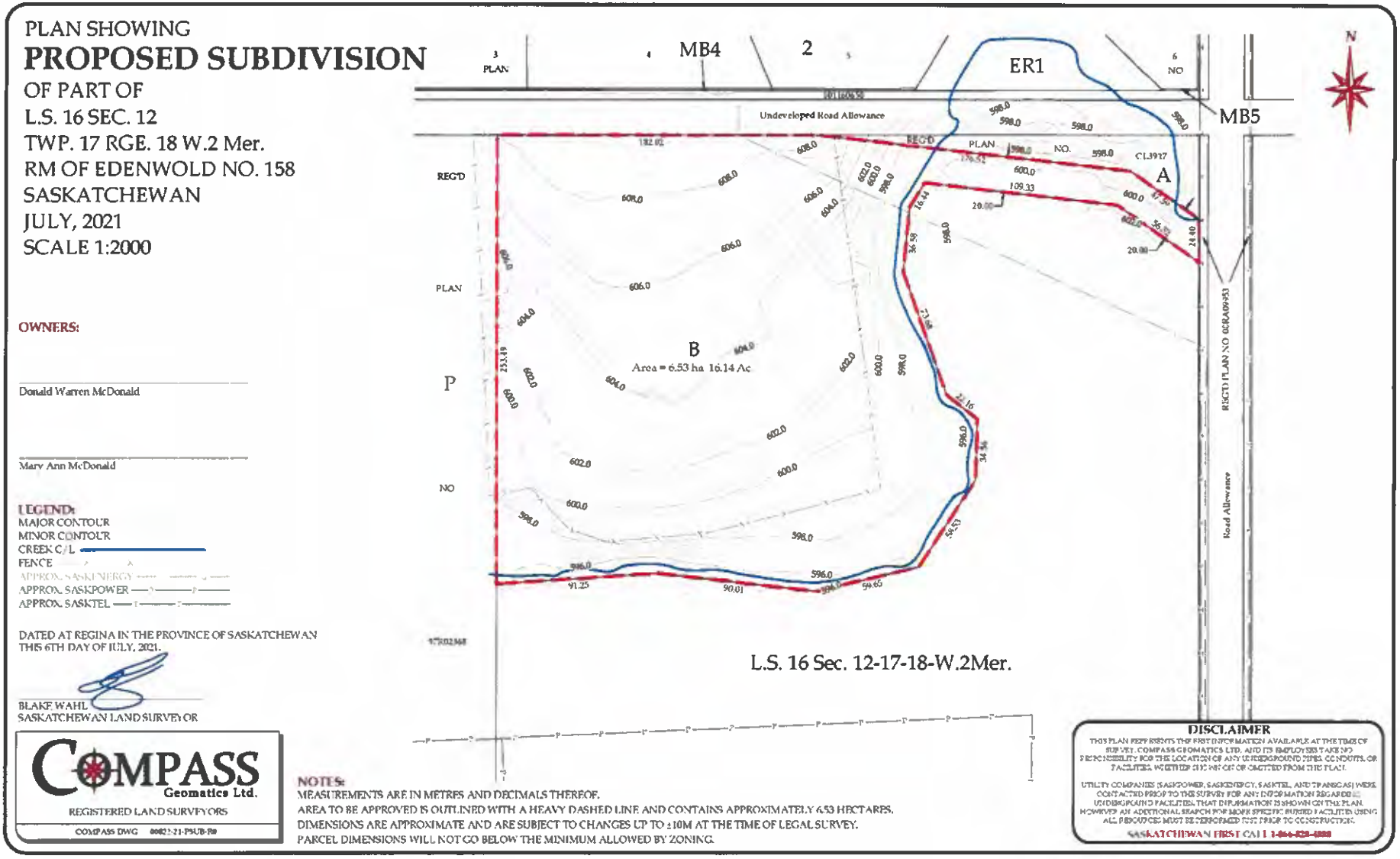


Figure 2. Parcel B Subdivision Project Footprint.

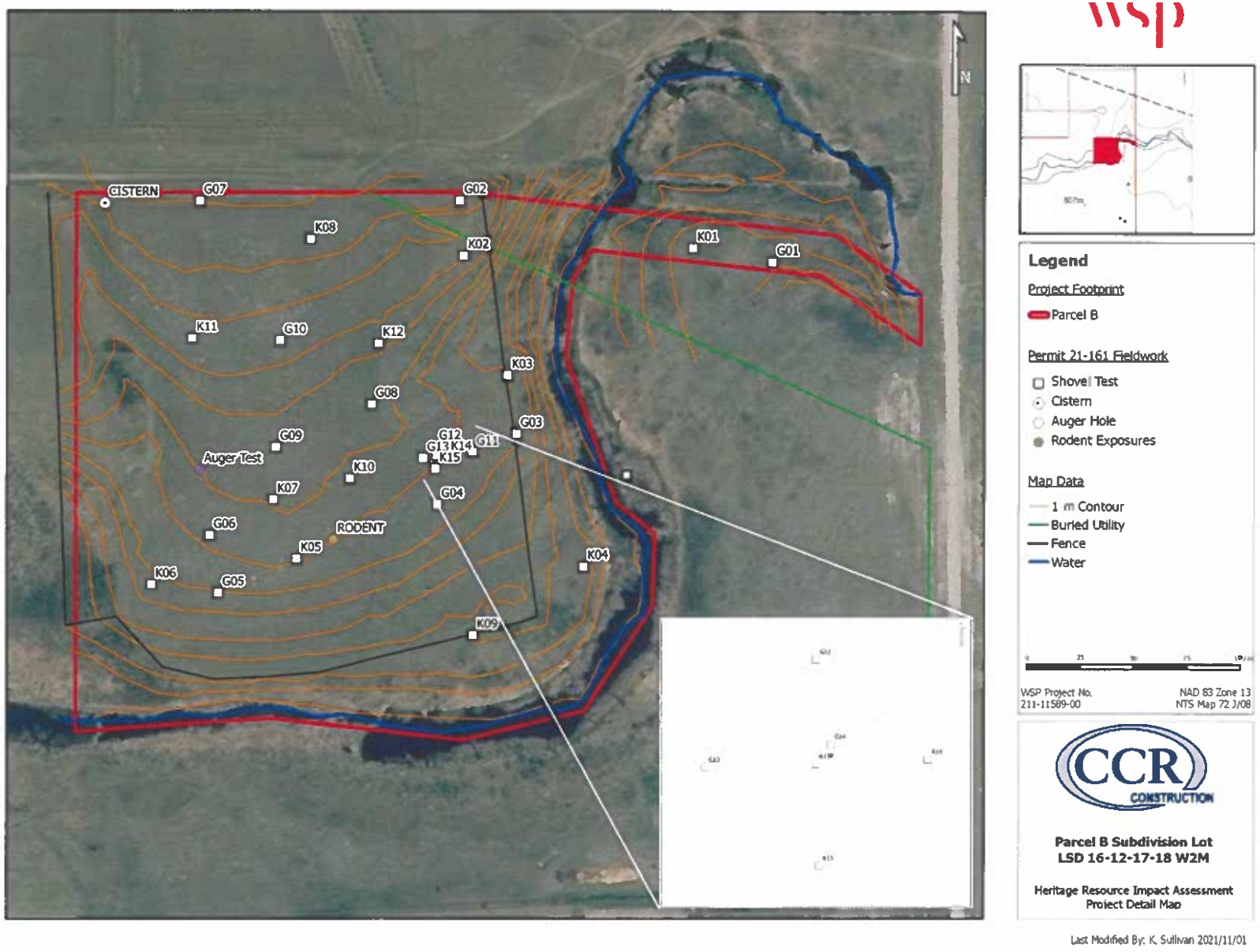


Figure 3. Parcel B Subdivision Project Fieldwork Results under Permit 21-161.

APPENDIX

B SHOVEL TEST PROGRAM RESULTS

Table B 1. Summary of shovel test program under Permit 21-161 (NAD 83 Zone 13U).

Test No.	Easting	Northing	Stratigraphy (cm below surface)	Result	Comment
K01	546546	5586167	0-5 Sod 5-14 Brown loamy silt 14-44 Gray silt w/ gravel	Negative	Lower valley bench east of drainage
K02	546438	5586164	0-5 Sod 5-10 Brown silty loam 10-16 Dark brown silt 16-37 Light brown silt 37-45 Light brown clayey silt	Negative	Upper bench, west drainage margin
K03	546458	5586107	0-4 Sod 4-14 Dark brown loamy silt 14-40 Light brown silt	Negative	West drainage margin
K04	546494	5586017	0-4 Sod 4-20 Brown loamy silt 20-50 Brown silt	Negative	Lower bench, west drainage margin
K05	546359	5586021	0-4 Sod 4-12 Brown loamy silt w/ gravel 12-25 Light brown silt w/ gravel 25-35 Light brown clay	Negative	North drainage margin Square bottle base sherd at 15 cm DBS (not collected)
K06	546291	5586008	0-4 Sod 4-12 Brown loamy silt w/ gravel 12-25 Light brown silt w/ gravel 25-35 Light brown clay	Negative	Lower slope, north drainage margin
K07	546348	5586049	0-5 Sod 5-12 Brown loamy silt 12-50 Brown silt w/ gravel	Negative	Middle slope bench
K08	546365	5586172	0-3 Sod 3-13 Dark brown loamy silt 13-30 Light brown silt 30-33 Light brown clay	Negative	Upper bench Plowzone 0-13 cm DBS
K09	546442	5585985	0-4 Sod 4-20 Brown loamy silt 20-50 Brown silt	Negative	Lower bench, north drainage margin
K10	546384	5586059	0-4 Sod 4-12 Brown loamy silt w/ gravel 12-25 Light brown silt w/ gravel 25-35 Light brown clay	Negative	Middle slope bench
K11	546310	5586125	0-3 Sod 3-13 Dark brown loamy silt 13-30 Light brown silt 30-33 Light brown clay	Negative	Upper slope

Test No.	Easting	Northing	Stratigraphy (cm below surface)	Result	Comment
K12	546397	5586122	0-4 Sod 4-14 Dark brown loamy silt 14-40 Light brown silt	Negative	Upper slope
K13P	546424	5586067	0-5 Sod 5-18 Dark brown loamy silt 18-19 Black burnt organic 19-45 Dark brown silt	Positive	Middle bench Organic layer: charcoal, 73 unidentified bone fragments (61 burnt, 12 calcined)
K14	546430	5586069	0-4 Sod 4-14 Dark brown loamy silt 14-40 Light brown silt	Negative	Middle bench around K13P
K15	546424	5586063	0-4 Sod 4-14 Dark brown loamy silt 14-40 Light brown silt	Negative	Middle bench around K13P
G01	546583	5586161	0-2 Sod 2-15 Brown silt 15-60 Brown sand	Negative	Lower valley bench east of drainage
G02	546436	5586189	0-5 Sod 5-20 Brown silt 20-50 Brown sandy silt 50 Gravel	Negative	Upper bench, west drainage margin
G03	546462	5586080	0-5 Sod 5-50 Brown silt	Negative	West drainage margin
G04	546425	5586046	0-5 Sod 5-50 Brown silt 50-60 Brown sand	Negative	Middle bench
G05	546322	5586005	0-5 Sod 5-40 Brown silt 40-50 Brown clay	Negative	Lower slope, north drainage margin
G06	546318	5586032	0-2 Sod 2-40 Brown silt 40-42 Gray clay	Negative	Middle bench
G07	546313	5586189	0-2 Sod 2-30 Brown silt 30-50 Gray clay	Negative	Upper bench
G08	546394	5586093	0-2 Sod 2-10 Brown loamy silt 10-40 Brown silt 40-50 Brown silty clay	Negative	Middle bench
G09	546349	5586073	0-2 Sod 2-10 Brown loamy silt 10-45 Brown silt	Negative	Middle bench

Test No.	Easting	Northing	Stratigraphy (cm below surface)	Result	Comment
			45-46 Gray clay		
G10	546351	5586123	0-2 Sod 2-10 Brown loamy silt 10-45 Brown silt 45-46 Gray clay	Negative	Upper slope
G11	546442	5586071	0-2 Sod 2-5 Brown loamy silt 5-70 Brown silt	Negative	Middle bench near west drainage margin
G12	546424	5586074	0-2 Sod 2-40 Brown silt	Negative	Middle bench around K13P
G13	546417	5586068	0-2 Sod 2-40 Brown silt	Negative	Middle bench around K13P
G14	546424	5586070	0-2 Sod 2-50 Brown silt	Negative	Middle bench around K13P

APPENDIX

Appendix I – Street Lights

Date: Nov 4, 2021

Job Name: CCR Construction - Area Lighting

STREET LIGHTING

Bid Date: Nov 4, 2021
Submittal Date: Nov 4, 2021

Submitted by Titan Electrical Group Inc.

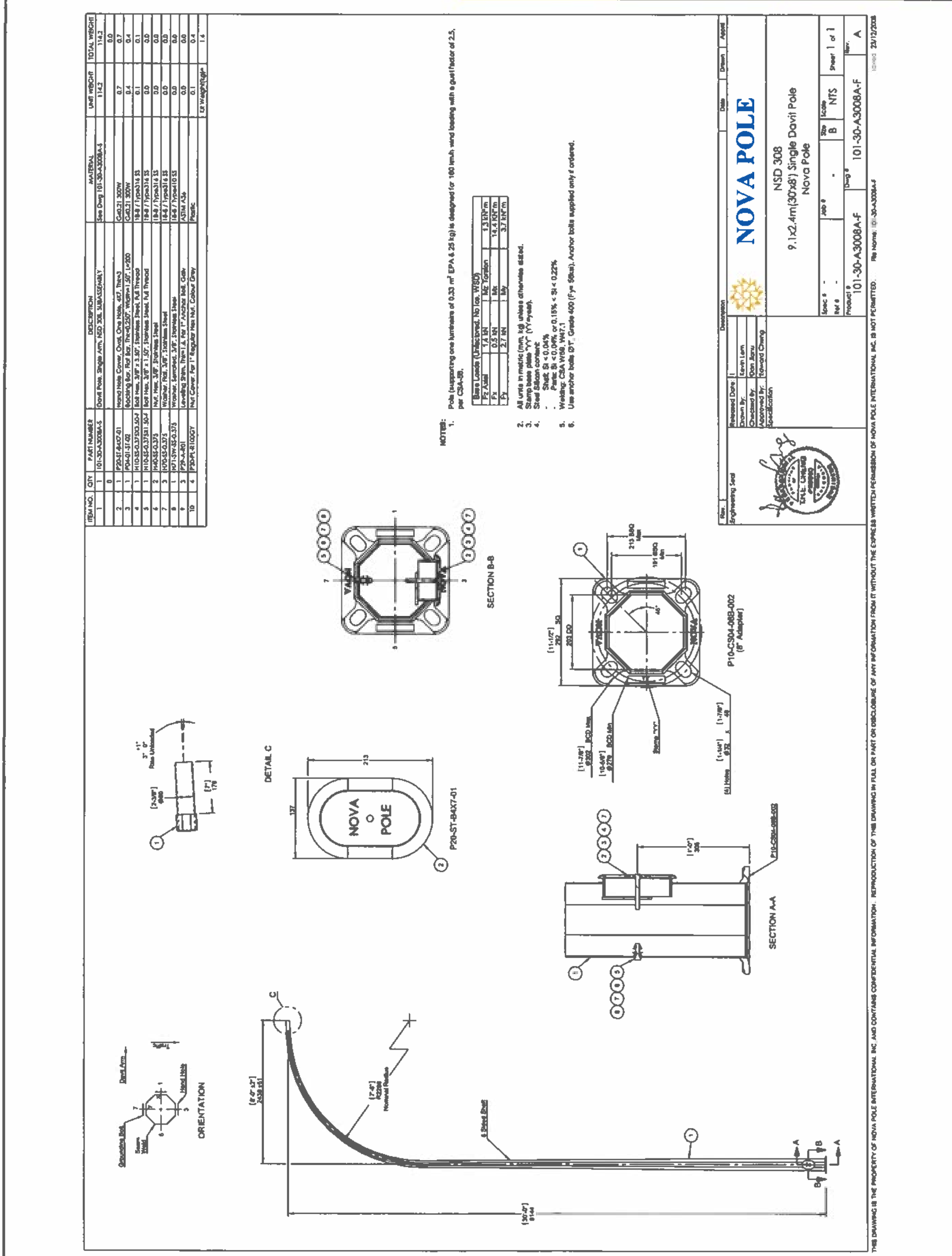
Job Name:
CCR Construction - Area Lighting

Catalog Number:
NSD308

Notes:

Type:

TITANREG21-201395

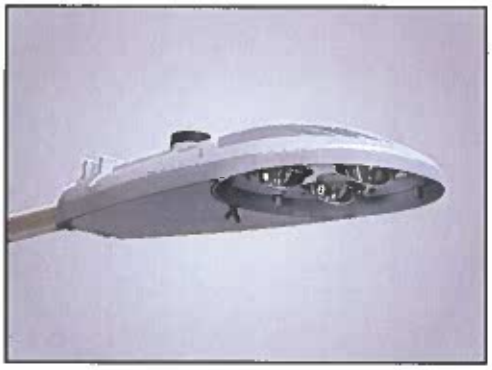


Submitted by Titan Electrical Group Inc.			
CCR CONSTRUCTION	**Job Name:** CCR Construction - Area Lighting	**Catalog Number:** ATBM P40 MVOLT R3 Notes:	**Type:** TITANREG21-201395

Consistent with LEED® goals & Green Globes™ criteria for light pollution reduction

Autobahn Series ATBM
Roadway

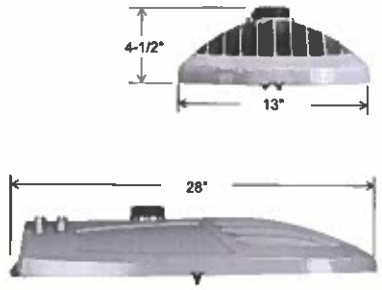
PRODUCT OVERVIEW



Applications:

Residential streets
Parking lots
High speed roadways

DIMENSIONS



Effective Projected Area (EPA)
The EPA for the ATBM is 0.3 sq. ft.,
Approx. Wt. = 21 lbs. (9.5 kg)

STANDARDS

Color temperatures of ≤ 3000K must be specified for International Dark-Sky Association certification.

Rated for -40°C to 40°C ambient
CSA Certified to U.S. and Canadian standards
Complies with ANSI: C136.2, C136.10, C136.14, C136.31, C136.15, C136.37

Features:

OPTICAL

Same Light: Performance is comparable to 150W – 250W HPS

White Light: Correlated color temperature - 4000K, 70 CRI minimum, 3000K, 70 CRI minimum or optional 5000K, 70 CRI minimum.

IP66 rated borosilicate glass optics ensure longevity and minimize dirt depreciation. Unique IP66 rated LED light engines provide 0% uplight and restrict backlight to within sidewalk depth, providing optimal application coverage and optimal pole spacing.

Available distributions are Type II, III, IV, & V roadway distributions.

DualOptix™ visual comfort option is also available for all distributions.

ELECTRICAL

Expected Life: LED light engines are rated >100,000 hours at 25°C, L70. Electronic driver has an expected life of 100,000 hours at a 25°C ambient.

Lower Energy: Saves an expected 40-60% over comparable HID luminaires.

Robust Surge Protection: Standard surge protection is 20kV/10kA "Extreme Level" per ANSI C136.2. An optional MOV pack provides 10kV/5kA "Enhanced Level.

MECHANICAL

Includes standard AEL lineman-friendly features such as tool-less entry, 3 station terminal block and quick disconnects. Bubble level located inside the electrical compartment for easy leveling at installation.

Rugged die-cast aluminum housing and door are polyester powder-coated for durability and corrosion resistance. Rigorous five-stage pre-treating and painting process yields a finish that achieves a scribe creepage rating of 8 (per ASTM D1654) after over 5000 hours exposure to salt fog chamber (operated per ASTM B117).

Mast arm mount is adjustable for arms from 1-1/4" to 2" (1-5/8" to 2-3/8" O.D.) diameter. The 2 – bolt and optional 4 bolt damping mechanism provide 3G vibration rating per ANSI C136.31.

The Wildlife shield is cast into the housing (not a separate piece).

CONTROLS

NEMA 3 pin photocontrol receptacle is standard, with the Acuity designed ANSI standard 7 pin receptacle optionally available.

Premium solid state locking-style photocontrol – PCSS (10 year rated life) Extreme long life solid state locking-style photocontrol – PCL1 (20 year rated life).

Extreme long life solid state locking-style photocontrol with on demand remote on/off control - PCCC (15 year rated life).

Optional onboard Adjustable Output module allows the light output and input wattage to be modified to meet site specific requirements, and also can allow a single fixture to be flexibly applied in many different applications.

Autobahn Series ATBM

Roadway

ORDERING INFORMATION

Series	Performance Packages	Voltage	Optics	Mounting
ATBM Autobahn LED Roadway	**P05** 9,700 lumens **P10** 11,000 lumens **P20** 12,800 lumens **P30** 15,500 lumens **P40** 17,400 lumens **P50** 18,700 lumens **P60** 20,000 lumens **P70** 21,500 lumens	**MVOLT** Multi-volt, 120-277V **347** 347V **480** 480V	**R2** Roadway Type II **R3** Roadway Type III **R4** Roadway Type IV **R5** Roadway Type V	**(Blank)** 2 Bolt Mounting **4B** 4 Bolt Mounting

Options

Color Temperature (CCT)

- **(Blank)** 4000K CCT, 70 CRI Min.
- **3K** 3000K CCT, 70 CRI Min.
- **5K** 5000K CCT, 70 CRI Min.

Paint

- **(Blank)** Gray
- **BK** Black
- **BZ** Bronze
- **DDB** Dark Bronze
- **GI** Graphite
- **WH** White

Surge Protection

- **(Blank)** Standard 20kV/10kA SPD
- **MP** MOV Pack

Miscellaneous Options

- **HSS** House Side Shield
- **NL** NEMA Label Indicating Wattage
- **XL** Not CSA Certified – No Terminal Block Cover
- **VR**[5] Dual Optix visual comfort
- **UMR-XX** 8" Horizontal Arm for Round Pole, Painted to match Fixture
- **UMS-XX** 8" Horizontal Arm for Square Pole, Painted to match Fixture
- **UMR-GALV** 8" Horizontal Arm for Round Pole, Galvanized
- **UMS-GALV** 8" Horizontal Arm for Square Pole, Galvanized

Control Options

- **(Blank)** 3 Pin NEMA Photocontrol Receptacle
- **P7** 7 Pin Photocontrol Receptacle (dimmable driver included) [1]
- **NR** No Photocontrol Receptacle
- **AO** Field Adjustable Output [2]
- **DM** 0-10V Dimmable Driver [2]
- **PCSS** Solid-State Lighting Photocontrol [4]
- **PCLL** Solid-State Long Life Photocontrol
- **PCCC** Solid-State Long Life Photocontrol with remote control on/off [4]
- **SH** Shorting Cap

Packages

- **(Blank)** Standard Pack
- **JP** Job Pack (36/pallet)

Accessories

- **ATBMHSS** House Side Shield
- **ATBMLTS** Light Trespass Shield
- **RKATBMMVOLTSPD** ATBM Acuity SPD, MVOLT
- **RKATBMHVSPD** ATBM Acuity SPD, 347/480V
- **RKATBMMVOLTMP** ATBM MOV Pack, MVOLT
- **RKATBMHVMP** ATBM MOV Pack, 347/480V

Notes:

1. Dimmable Driver included. Not available with DM or NR.
2. Controls by others. Not available with P7 or AO.
3. Not available with DM.
4. MVOLT only.
5. VR option does not provide zero uplight performance.

AEL American Electric Lighting

AEL Headquarters, 3825 Columbus Road, Granville, OH 43023
www.americanelectriclighting.com

Warranty Five-year limited warranty. Complete warranty terms located at: www.acuitybrands.com/support/warranty/terms-and-conditions
Actual performance may differ as a result of end-user environment and application.
Specifications subject to change without notice.

Please contact your sales representative for the latest product information.

ATBM

Submitted by Titan Electrical Group Inc.			
CCR CONSTRUCTION	**Job Name:** CCR Construction - Area Lighting	**Catalog Number:** ATBM P40 MVOLT R3 Notes:	**Type:** TITANREG21-201395

Autobahn Series ATBM
Roadway

PERFORMANCE PACKAGE

Performance Package	Distribution	Input Watts	3K (3000K CCT, 70 CRI)					4K/5K (4000K/5000K CCT, 70 CRI)					LLD @ 25°C		
			Lumens	LPW	B	U	G	Lumens	LPW	B	U	G	25k Hours	75k Hours	100k Hours
P05	R2	68	9,396	138	1	0	2	9,718	143	1	0	2	0.93	0.86	0.83
	R3		9,366	138	1	0	3	9,688	142	1	0	3			
	R4		9,030	133	1	0	3	9,340	137	1	0	3			
	R5		10,334	152	3	0	2	10,689	157	3	0	2			
P10	R2	81	10,635	131	2	0	3	11,299	139	2	0	3	0.93	0.86	0.83
	R3		10,675	132	2	0	3	11,302	140	2	0	3			
	R4		10,391	128	2	0	4	10,994	136	2	0	4			
	R5		11,504	142	3	0	2	12,086	149	3	0	2			
P20	R2	94	12,073	128	2	0	3	12,874	137	2	0	3	0.93	0.86	0.83
	R3		12,065	128	2	0	3	12,818	136	2	0	3			
	R4		11,946	127	2	0	4	12,525	133	2	0	4			
	R5		13,085	139	4	0	2	13,776	147	4	0	2			
P30	R2	118	14,637	124	2	0	3	15,514	131	2	0	3	0.93	0.86	0.83
	R3		14,631	124	2	0	3	15,452	131	2	0	3			
	R4		14,317	121	2	0	4	15,151	128	2	0	5			
	R5		15,775	134	4	0	2	16,685	141	4	0	2			
P40	R2	135	16,233	120	2	0	3	17,493	130	2	0	3	0.93	0.86	0.83
	R3		16,402	121	2	0	3	17,367	129	2	0	3			
	R4		15,911	118	2	0	5	17,008	126	2	0	5			
	R5		17,507	130	4	0	2	18,595	138	4	0	2			
P50	R2	152	17,541	115	2	0	3	18,748	123	2	0	3	0.93	0.86	0.83
	R3		17,677	116	2	0	4	18,712	123	2	0	4			
	R4		17,154	113	2	0	5	18,246	120	2	0	5			
	R5		19,008	125	4	0	2	20,088	132	4	0	2			
P60	R2	168	18,770	112	2	0	3	20,095	120	3	0	3	0.93	0.86	0.83
	R3		18,830	112	2	0	4	20,094	120	3	0	4			
	R4		18,369	109	2	0	5	19,648	117	2	0	5			
	R5		20,350	121	4	0	2	21,505	128	4	0	2			
P70	R2	190	20,190	106	3	0	3	21,565	114	3	0	3	0.93	0.86	0.83
	R3		20,142	106	3	0	4	21,504	113	3	0	4			
	R4		19,680	103	2	0	5	21,024	111	3	0	5			
	R5		21,988	116	4	0	2	23,076	121	4	0	2			

Note: Individual fixture performance may vary. Specifications subject to change without notice.

AEL American Electric Lighting
AEL Headquarters, 3825 Columbus Road, Granville, OH 43023
www.americanelectriclighting.com

Warranty Five-year limited warranty. Complete warranty terms located at: www.acuitybrands.com/support/warranty/terms-and-conditions
Actual performance may differ as a result of end-user environment and application.
Specifications subject to change without notice.

Please contact your sales representative for the latest product information.

ATBM

Date: Nov 4, 2021

Job Name: CCR Construction - Area Lighting

AREA LIGHTING

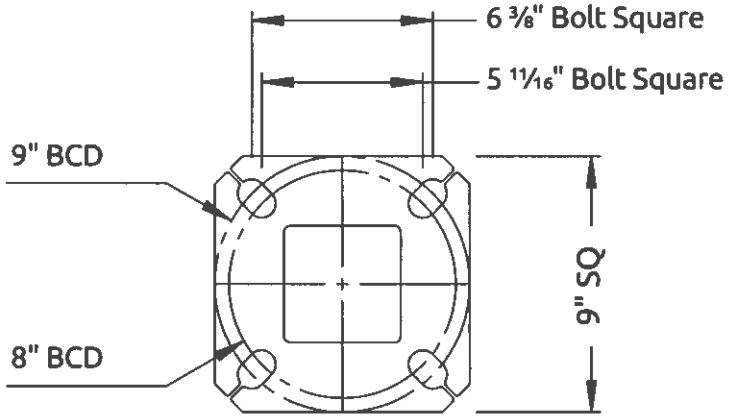
Bid Date: Nov 4, 2021
Submittal Date: Nov 4, 2021

Submitted by Titan Electrical Group Inc.		Catalog Number:	Type:
CCR CONSTRUCTION	Job Name: CCR Construction - Area Lighting	NSS 424 MD DP1 PC XXX Notes:	TITANREG21-201395

NOVA POLE

NSS4

4" Straight Square Steel



NSS Type A

(¾" x 24" Anchor Bolts)

- If supplied, the festoon box is installed at 5m height. Notify Nova Pole if different mounting height is required.
- Hand hole ring mounting height is 12" to centre and comes with (3"x5") hand hole cover
- Wind speeds (mph) in the table denote the maximum wind gust speed at the project site (i.e. gust factor included).
- Maximum EPA rating includes fixture(s) and supporting arm(s) and is for standard pole installation on concrete bases/footings.
- All poles are supplied with nut covers, shims and top plastic cap.
- Pole designs based on AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals.
- Contact Sales Team for custom sizes and/or applications.
- Specific information and details may be subject to change without notice.
- Please see *Warranty* and *Terms & Conditions*.

Submitted by Titan Electrical Group Inc.			
CCR CONSTRUCTION	**Job Name:** CCR Construction - Area Lighting	**Catalog Number:** NSS 424 MD DP1 PC XXX Notes:	**Type:** TITANREG21-201395

NOVA POLE

4" Straight Square Steel

CATALOGUE #	
PROJECT NAME	
CITY	
PREPARED BY	DATE
COMMENTS	

FIXTURE INFO	
QUANTITY	
EPA (sq.ft.)	
WEIGHT (lbs)	

Catalogue #	Pole Height (ft)	Pole Weight (lbs)	Pole Type	Anchor Bolt Size	Base Plate Type	Maximum EPA (sq.ft.) 80MPH	90MPH	100MPH	110MPH
NSS410LD	10	80	LD	3/4" x 24"	A	32.0	26.0	21.0	17.0
NSS412LD	12	93	LD	3/4" x 24"	A	27.0	21.5	17.0	14.0
NSS416LD	16	118	LD	3/4" x 24"	A	20.0	15.5	12.0	9.5
NSS418LD	18	131	LD	3/4" x 24"	A	16.5	13.0	10.0	7.5
NSS420LD	20	144	LD	3/4" x 24"	A	14.0	10.5	8.0	6.0
NSS420MD	20	205	MD	3/4" x 24"	A	22.0	17.0	13.0	10.5
NSS424LD	24	170	LD	3/4" x 24"	A	10.0	7.0	5.0	3.5
NSS424MD	24	242	MD	3/4" x 24"	A	16.5	12.0	9.0	7.0
NSS430MD	30	299	MD	3/4" x 24"	A	10.0	7.0	4.5	3.0

Order Entry Info

HEIGHT (ft)

- 10 (LD)
- 12 (LD)
- 16 (LD)
- 18 (LD)
- 20 (LD)
- 20 (MD)
- 24 (LD)
- 24 (MD)
- 30 (MD)

MOUNTING TYPE *(See Note 1)*

TOP TENON MOUNT
TT238 - 2 3/8" x 5" tenon
TT278 - 2 7/8" x 5" tenon
TT350 - 3 1/2" x 5" tenon

SIDE TENON MOUNT
Dimensions: 2 3/8" dia. x 5" long
ST1 - Single Head
ST2180 - 2 Heads at 180
ST290 - 2 Heads at 90
ST390 - 3 Heads at 90
ST490 - 4 Heads at 90

DRILL PATTERN
DP1 - Single Head
DP2180 - 2 Heads at 180
DP290 - 2 Heads at 90
DP390 - 3 Heads at 90
DP490 - 4 Heads at 90

N - None

FINISH TYPE

PC - Powder Coated

NTPC - Nova Tuff Powder Coated (*Colour Chart*)

GALV - Galvanized

GALVPC - Galvanized and Powder Coated

GALVNT - Galvanized and Nova Tuff Powder Coated

For PC or GALVPC, please select Colour from next column

PC COLOUR

- **WHT** - White (RAL-9003)
- **BLK** - Black (BK50)
- **DBZ** - Dark Bronze (RAL-8019)
- **GRY** - Grey (RAL-7040)
- **GRN** - Green (RAL-6005)
- **CC** - Custom Colour (RAL-)
  (Additional charges may apply)
- **N** - None

Confirm Finish

OPTIONS *(Click descriptions to view product)*

- ☐ **DUPR** - 1110 Box Provision (Festoon Box)
- ☐ **DUPRGFI** - 1110 Box Provision c/w 15A 120V GFI Receptacle and Weatherproof Cover
- ☐ **BCP** - Type 4 Plastic Base Cover
- ☐ **BCCS** - Type 4 Cast Square Base Cover
- ☐ **HHSS** - Hand Hole Security System
- ☐ **FBA1** - Flower Basket Arm One Side *(See Note 2)*
- ☐ **FBA2** - Flower Basket Arm Dual *(See Note 2)*
- ☐ **BA1** - Banner Arms One Side *(See Note 3)*
- ☐ **BA2** - Banner Arms Dual *(See Note 3)*
- ☐ **AB** - Anchor Bolts
- ☐ **BH** - Bullhorns Select Bullhorn
- ☐ **N** - None

Height	Mounting	Finish Type	PC Colour	Options
NSS4 Select	Select Mounting	Select Finish	Select PC Colour	

Pole Type: LD = Light Duty, MD = Medium Duty, HD = Heavy Duty

Sample Catalogue #: NSS416LD-ST1-GALVPC-BLK-HHSS-BA1

Note 1: Please provide fixture cutsheet.
Note 2: Please provide basket weight, arm length and mounting height.
Note 3: Please provide banner size and mounting height.

Reset Order Entry Form RESET

For more customization contact sales@novapole.com 1.866.874.8889 novapole.com

Submitted by Titan Electrical Group Inc.			
CCR CONSTRUCTION	**Job Name:** CCR Construction - Area Lighting	**Catalog Number:** RSX1 LED P4 40K R3 MVOLT RPA FAO DDBXD **Notes:**	**Type:** TITANREG21-201395

RSX1 LED
Area Luminaire

Catalog Number

Notes

Type

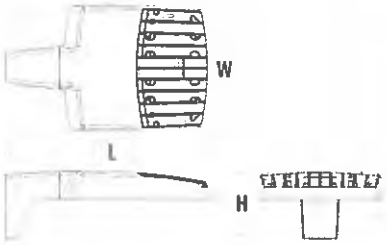
Introduction

The new RSX LED Area family delivers maximum value by providing significant energy savings, long life and outstanding photometric performance at an affordable price. The RSX1 delivers 7,000 to 17,000 lumens allowing it to replace 70W to 400W HID luminaires.

The RSX features an integral universal mounting mechanism that allows the luminaire to be mounted on most existing drill hole patterns. This "no-drill" solution provides significant labor savings. An easy-access door on the bottom of mounting arm allows for wiring without opening the electrical compartment. A mast arm adaptor, adjustable integral slipfitter and other mounting configurations are available.

Specifications

EPA (ft²@0°):	0.57 ft² (0.05 m²)
Length:	21.8" (55.4 cm) (SPA mount)
Width:	13.3" (33.8 cm)
Height:	3.0" (7.6 cm) Main Body 7.2" (18.4 cm) Arm
Weight: (SPA mount):	22.0 lbs (10.0 kg)



Ordering Information

EXAMPLE: RSX1 LED P4 40K R3 MVOLT SPA DDBXD

RSX1 LED

Series	Performance Package	Color Temperature	Distribution	Voltage	Mounting
RSX1 LED	P1 P2 P3 P4	30K 3000K 40K 4000K 50K 5000K	R2 Type 2 Wide R3 Type 3 Wide R3S Type 3 Short R4 Type 4 Wide R4S Type 4 Short R5 Type 5 Wide [1] R5S Type 5 Short [1] AFR Automotive Front Row AFRR90 Automotive Front Row Right Rotated AFRL90 Automotive Front Row Left Rotated	MVOLT (120V-277V) [2] HVOLT (347V-480V) [3] (use specific voltage for options as noted) 120 [1] 277 [4] 208 [1] 347 [4] 240 [1] 480 [4]	SPA Square pole mounting (3.0" min. SQ pole for 1 at 90°, 3.5" min. SQ pole for 2, 3, 4 at 90°) RPA Round pole mounting (3.2" min. dia. RND pole for 2, 3, 4 at 90°, 3.0" min. dia. RND pole for 1 at 90°, 2 at 180°, 3 at 120°) MA Mast arm adaptor (fits 2-3/8" OD horizontal tenon) IS Adjustable slipfitter (fits 2-3/8" OD tenon) [5] WBA Wall bracket [1] WBASC Wall bracket with surface conduit box AASP Adjustable tilt arm square pole mounting [5] AARP Adjustable tilt arm round pole mounting [5] AAWB Adjustable tilt arm with wall bracket [5] AAWSC Adjustable tilt arm wall bracket and surface conduit box [5]

Options

Shipped Installed

HS	House-side shield [6]
PE	Photocontrol, button style [7,8]
PEX	Photocontrol external threaded, adjustable [8,9]
PER7	Seven-wire twist-lock receptacle only (no controls) [8,10,11]
CE34	Conduit entry 3/4" NPT (Qty 2)
SF	Single fuse (120, 277, 347) [4]
DF	Double fuse (208, 240, 480) [4]
SPD20KV	20KV Surge pack (10KV standard)
FAO	Field adjustable output [8,12]
DMG	0-10V dimming extend out back of housing for external control (control ordered separate) [12]

Shipped Installed

***Standalone and Networked Sensors/Controls (factory default settings, see table page 9)**

NLTAIR2	nLight AIR generation 2 [12,13,14]
PIRHN	Networked, Bi-Level motion/ambient sensor (for use with NLTAIR2) [13,14]

***Note: PIRHN with nLight Air can be used as a standalone or networked solution. Sensor coverage pattern is affected when luminaire is tilted.**

Shipped Separately (requires some field assembly)

EGS	External glare shield [6]
EGFV	External glare full visor (360° around light aperture)
BS	Bird spikes [16]

Finish

DDBXD	Dark Bronze
DBLXD	Black
DNAXD	Natural Aluminum
DWHXD	White
DDBTXD	Textured Dark Bronze
DBLBXD	Textured Black
DNATXD	Textured Natural Aluminum
DWHGXD	Textured White

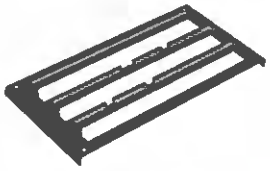
Ordering Information

Accessories
Ordered and shipped separately.

RSX1HS	RSX1 House side shield (includes 1 shield)
RSX1HSASRA U	RSX1 House side shield for AFR rotated optics (includes 1 shield)
RSX1EGS (FINISH) U	External glares hield (specify finish)
RSX1EGFV (FINISH) U	External glare full visor (specify finish)
RSXRPA (FINISH) U	RSX Universal round pole adaptor plate (specify finish)
RSXWBA (FINISH) U	RSX WBA wall bracket (specify finish) [1]
RSXSCB (FINISH) U	RSX Surface conduit box (specify finish, for use with WBA, WBA not included)
DLL127F 1.5 JU	Photocell -SSL twist-lock (120-277V) [2]
DLL347F 1.5 CUL JU	Photocell -SSL twist-lock (347V) [2]
DLL480F 1.5 CUL JU	Photocell -SSL twist-lock (480V) [2]
DSHORT SBK U	Shorting cap [2]

NOTES
1. Any Type 5 distribution, is not available with WBA.
2. MVOLT driver operates on any line voltage from 120-277V (50/60 Hz).
3. HVOLT driver operates on any line voltage from 347-480V (50/60 Hz).
4. Single fuse (SF) requires 120V, 277V or 347V. Double fuse (DF) requires 208V, 240V or 480V.
5. Maximum tilt is 90° above horizontal.
6. It may be ordered as an accessory.
7. Requires MVOLT or 347V.
8. Not available in combination with other light sensing control options (following options cannot be combined: PE, PEX, PER7, FAO, DMG, PIRHN).
9. Requires 120V, 208V, 240V or 277V.
10. Twistlock photocell ordered and shipped as a separate line item from Acuity Brands Controls. See accessories. Shorting Cap included. Dimming leads capped for future use.
11. For units with option PER7, the mounting must be restricted to +/- 45° from horizontal aim per ANSI C136.10-2010.
12. Two or more of the following options cannot be combined including DMG, PER7, FAO and PIRHN.
13. Must be ordered with PIRHN.
14. Requires MVOLT or HVOLT.
15. Must be ordered with NLTAIR2. For additional information on PIRHN visit here.
16. Must be ordered with fixture for factory pre-drilling.
17. Requires luminaire to be specified with PER7 option. Ordered and shipped as a separate line item from Acuity Brands Controls.

External Shields



House Side Shield

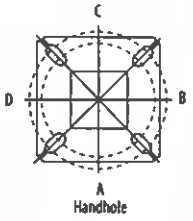
External Glare Shield

External 360 Full Visor

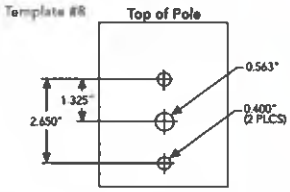
Pole/Mounting Informatiion

Accessories including bullhorns, cross arms and other adpaters are available under the accessories tab at Lithonia's Outdoor Poles and Arms product page. Click here to visit Accessories.

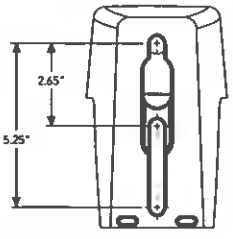
HANDHOLE ORIENTATION



RSX POLE DRILLING



RSX STANDARD ARM & ADJUSTABLE ARM



Round Tenon Mount - Pole Top Slipfitters

Tenon O.D.	RSX Mounting	Single	2 at 180°	2 at 90°	3 at 120°	3 at 90°	4 at 90°
2-3/8"	RPA, AARP	AS3-5 190	AS3-5 280	AS3-5 290	AS3-5 320	AS3-5 390	AS3-5 490
2-7/8"	RPA, AARP	AST25-190	AST25-280	AST25-290	AST25-320	AST25-390	AST25-490
4"	RPA, AARP	AST35-190	AST35-280	AST35-290	AST35-320	AST35-390	AST35-490

Drill/Side Location by Configuration Type

Drilling Template	Mounting Option	Single	2 at 180	2 at 90	3 at 120	3 at 90	4 at 90
	Head Location	Side B	Side B & D	Side B & C	Round Pole Only	Side B, C & D	Side A, B, C & D
#R	Drill Nomenclature	DM19AS	DM28AS	DM29AS	DM32AS	DM39AS	DM49AS

RSX1 - Luminaire EPA

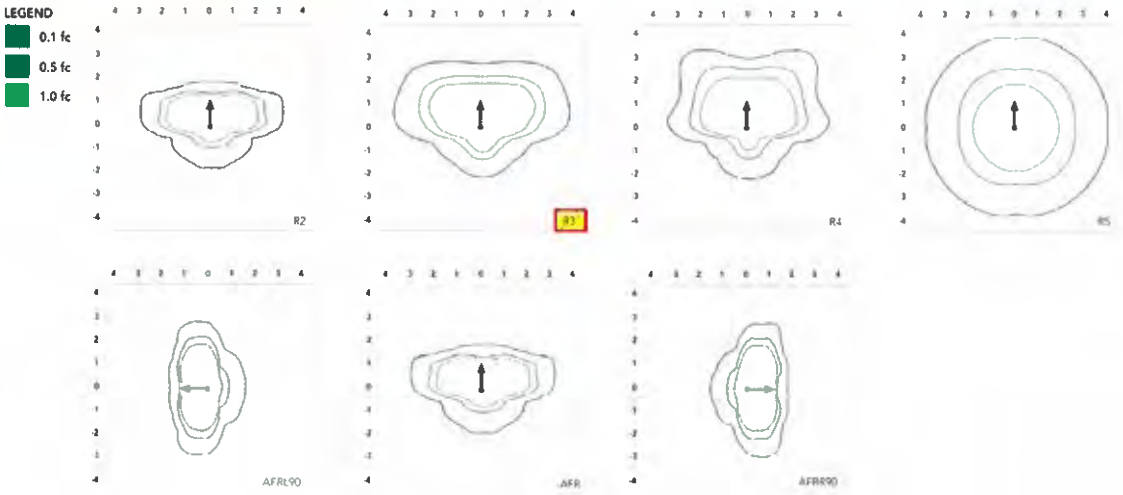
*Includes luminaire and integral mounting arm. Other tenons, arms, brackets or other accessories are not included in this EPA data.

Fixture Quantity & Mounting Configuration		Single	2 at 90	2 at 180	3 at 90	3 at 120	4 at 90	2 Side by Side	3 Side by Side	4 Side by Side
Mounting Type	Tilt									
SPA - Square Pole Adaptor		0.57	1.03	1.05	1.52	1.36	2.03	1.31	1.7	2.26
RPA - Round Pole Adaptor	0°	0.62	1.08	1.15	1.62	1.46	2.13	1.36	1.8	2.36
MA - Mast Arm Adaptor		0.49	0.95	0.89	1.36	1.2	1.87	1.23	1.54	2.1
	0°	0.57	1.03	1.05	1.52	1.36	2.03	1.31	1.7	2.26
	10°	0.68	1.34	1.33	2	1.74	2.64	1.35	2.03	2.71
	20°	0.87	1.71	1.73	2.56	2.26	3.42	1.75	2.62	3.49
	30°	1.24	2.19	2.3	3.21	2.87	4.36	2.49	3.73	4.97
IS - Integral Slipfitter	40°	1.81	2.68	2.98	3.85	3.68	5.30	3.62	5.43	7.24
AASP/AARP - Adjustable Arm Square/Round Pole	45°	2.11	2.92	3.44	4.2	4.08	5.77	4.22	6.33	8.44
	50°	2.31	3.17	3.72	4.52	4.44	6.26	4.62	6.94	9.25
	60°	2.71	3.66	4.38	5.21	5.15	7.24	5.43	8.14	10.86
	70°	2.78	3.98	4.54	5.67	5.47	7.91	5.52	8.27	11.03
	80°	2.76	4.18	4.62	5.97	5.76	8.31	5.51	8.27	11.03
	90°	2.73	4.25	4.64	6.11	5.91	8.47	5.45	8.18	10.97

Photometric Diagrams

To see complete photometric reports or download .ies files for this product, visit Lithonia Lighting's RSX Area homepage.

Isofootcandle plots for the RSX1 LED P4 40K. Distances are in units of mounting height (20').



Performance Data

Lumen Ambient Temperature (LAT) Multipliers

Use these factors to determine relative lumen output for average ambient temperatures from 0-50°C (32-122°F).

Ambient	Ambient	Lumen Multiplier
0°C	32°F	1.05
5°C	41°F	1.04
10°C	50°F	1.03
15°C	59°F	1.02
20°C	68°F	1.01
25°C	77°F	1.00
30°C	86°F	0.99
35°C	95°F	0.98
40°C	104°F	0.97
45°C	113°F	0.96
50°C	122°F	0.95

Electrical Load

		Current (A)					
Performance Package	System Watts (W)	120V	208V	240V	277V	347V	480V
P1	51W	0.42	0.25	0.21	0.19	0.14	0.11
P2	72W	0.60	0.35	0.30	0.26	0.21	0.15
P3	109W	0.91	0.52	0.45	0.39	0.31	0.23
P4	133W	1.11	0.64	0.55	0.48	0.38	0.27

Projected LED Lumen Maintenance

Operating Hours	50,000	75,000	100,000
Lumen Maintenance Factor	>0.97	>0.95	>0.92

Values calculated according to IESNA TM-21-11 methodology and valid up to 40°C.

Performance Data

Lumen Output

Lumen values are from photometric tests performed in accordance with IESNA LM-79-08. Data is considered to be representative of the configurations shown, within the tolerances allowed by Lighting Facts. Contact factory for performance data on any configurations not shown here.

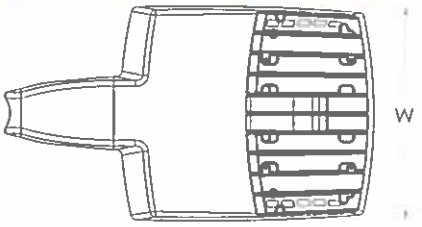
Performance Package	System Watts	Distribution Type	30K (3000K, 70 CRI)					40K (4000K, 70 CRI)					50K (5000K, 70 CRI)				
			Lumens	B	U	G	LPW	Lumens	B	U	G	LPW	Lumens	B	U	G	LPW
P1	51W	R2	6,482	1	0	1	126	7,121	1	0	1	139	7,121	1	0	1	139
		R3	6,459	1	0	2	127	7,096	1	0	2	139	7,096	1	0	2	139
		R3S	6,631	1	0	1	129	7,286	1	0	2	142	7,286	1	0	2	142
		R4	6,543	1	0	2	128	7,189	1	0	2	141	7,189	1	0	2	141
		R4S	6,313	1	0	1	124	6,936	1	0	1	136	6,936	1	0	1	136
		R5	6,631	3	0	2	130	7,286	3	0	2	143	7,286	3	0	2	143
		R5S	6,807	3	0	1	133	7,479	3	0	1	147	7,479	3	0	1	147
		AFR	6,473	1	0	1	127	7,112	1	0	1	139	7,112	1	0	1	139
		AFRR90	6,535	2	0	2	127	7,179	2	0	2	140	7,179	2	0	2	140
		AFRL90	6,562	2	0	1	128	7,210	2	0	2	140	7,210	2	0	2	140
P2	72W	R2	8,991	2	0	1	123	9,878	2	0	1	135	9,878	2	0	1	135
		R3	8,959	2	0	2	124	9,843	2	0	2	137	9,843	2	0	2	137
		R3S	9,198	2	0	2	126	10,106	2	0	2	139	10,106	2	0	2	139
		R4	9,077	2	0	2	126	9,972	2	0	2	139	9,972	2	0	2	139
		R4S	8,757	1	0	2	122	9,622	2	0	2	134	9,622	2	0	2	134
		R5	9,198	4	0	2	128	10,106	4	0	2	140	10,106	4	0	2	140
		R5S	9,443	3	0	1	131	10,374	3	0	1	144	10,374	3	0	1	144
		AFR	8,979	2	0	1	125	9,865	2	0	1	137	9,865	2	0	1	137
		AFRR90	9,064	3	0	2	124	9,959	3	0	2	137	9,959	3	0	2	137
		AFRL90	9,102	3	0	2	125	10,001	3	0	2	137	10,001	3	0	2	137
P3	109W	R2	12,808	2	0	1	117	14,072	2	0	2	129	14,072	2	0	2	129
		R3	12,763	2	0	2	117	14,023	2	0	2	129	14,023	2	0	2	129
		R3S	13,104	2	0	2	120	14,397	2	0	2	132	14,397	2	0	2	132
		R4	12,930	2	0	2	119	14,206	2	0	2	130	14,206	2	0	2	130
		R4S	12,475	2	0	2	114	13,707	2	0	2	126	13,707	2	0	2	126
		R5	13,104	4	0	2	120	14,397	4	0	2	132	14,397	4	0	2	132
		R5S	13,452	3	0	2	123	14,779	3	0	2	136	14,779	3	0	2	136
		AFR	12,791	2	0	1	117	14,053	2	0	2	129	14,053	2	0	2	129
		AFRR90	12,913	3	0	3	118	14,187	3	0	3	130	14,187	3	0	3	130
		AFRL90	12,967	3	0	2	118	14,247	3	0	3	130	14,247	3	0	3	130
P4	133W	R2	14,943	2	0	2	112	16,417	2	0	2	123	16,417	2	0	2	123
		R3	14,890	2	0	3	112	16,360	2	0	3	123	16,360	2	0	3	123
		R3S	15,287	2	0	2	115	16,796	2	0	2	126	16,796	2	0	2	126
		R4	15,085	2	0	3	113	16,574	2	0	3	125	16,574	2	0	3	125
		R4S	14,554	2	0	2	109	15,991	2	0	2	120	15,991	2	0	2	120
		R5	15,287	4	0	2	115	16,796	4	0	2	126	16,796	4	0	2	126
		R5S	15,693	4	0	2	118	17,242	4	0	2	130	17,242	4	0	2	130
		AFR	14,923	2	0	2	112	16,395	2	0	2	123	16,395	2	0	2	123
		AFRR90	15,065	3	0	3	113	16,551	3	0	3	124	16,551	3	0	3	124
		AFRL90	15,128	3	0	3	114	16,621	3	0	3	125	16,621	3	0	3	125

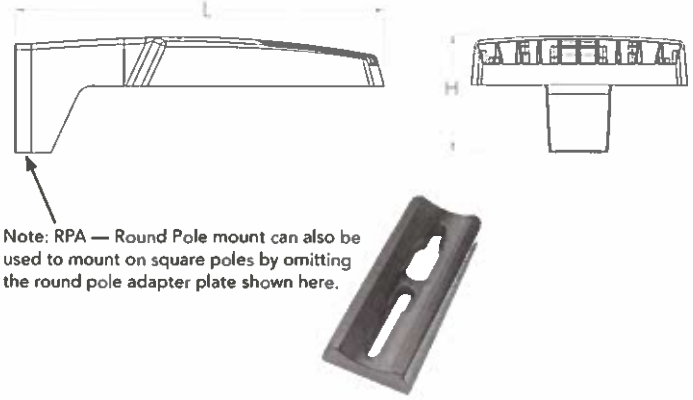
Dimensions & Weights

Luminaire Weight by Mounting Type

Mounting Configuration	Total Luminaire Weight
SPA	22 lbs
RPA	24 lbs
MA	22 lbs
WBA	25 lbs
WBASC	28 lbs
IS	25 lbs
AASP	25 lbs
AARP	27 lbs
AAWB	28 lbs
AAWSC	31 lbs

RSX1 with Round Pole Adapter (RPA)

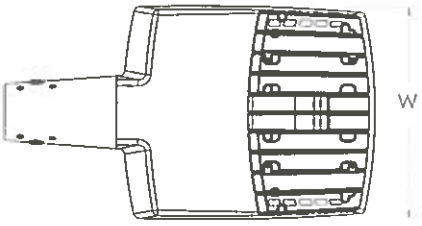


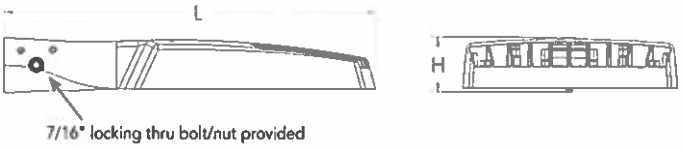


Note: RPA — Round Pole mount can also be used to mount on square poles by omitting the round pole adapter plate shown here.

Length: 22.8" (57.9 cm)
Width: 13.3" (33.8 cm)
Height: 3.0" (7.6 cm) Main Body
7.2" (18.4 cm) Arm

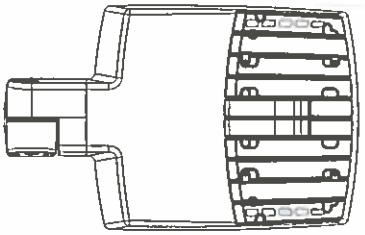
RSX1 with Mast Arm Adapter (MA)





Length: 23.2" (59.1 cm)
Width: 13.3" (33.8 cm)
Height: 3.0" (7.6 cm) Main Body
3.5" (8.9 cm) Arm

RSX1 with Adjustable Slipfitter (IS)



Length: 20.7" (52.7 cm)
Width: 13.3" (33.8 cm)
Height: 3.0" (7.6 cm) Main Body
7.6" (19.3 cm) Arm

Appendix J – Public Open House

100 HUTCHENCE ROAD, EMERALD PARK, SASKATCHEWAN, S0G 0E0 • PH: 306-771-2522 • FAX: 306-347-2970

November 8th, 2021

Dear Area Resident,

RE: Notice of Informational Open House

This letter is to advise you of a scheduled Informational Open House being facilitated by the Developer at the R.M. of Edenwold Office in regard to the proposed Residential Subdivision on L.S. 16 Section 12-17-18-W2M, south of Meadow Ridge Estates.

The Informational Open House will be held for the general public to review the proposed residential development. The Development team has prepared a short presentation with a question-and-answer period to follow. The Development team along with the RM Planning team will be there to answer any questions you may have. The following documents have been prepared by the Developer

The Informational Open House will be held **Thursday, December 2nd, 2021, from 7:00 p.m. to 9:00 p.m.** in the R.M. of Edenwold Council Chambers at 100 Hutchence Road in Emerald Park.

The following documents attached to this mail out were prepared by the Developer and provide more information on the project and the event.

For further information please contact Alexa O'Hanley by phone at (306) 347-2963 or by email at alexa.ohanley@edenwold-sk.ca.

Sincerely,

Alexa O'Hanley
Planner I: Subdivision
R.M. of Edenwold No. 158
Email: alexa.ohanley@edenwold-sk.ca
Phone: 306-347-2963

Vista Springs Development

CO: BMA Ventures Inc
1831 MacRae Drive, Regina, SK S4N0S4

Date: November 5, 2021

Dear Area Resident,

The intent of this letter is to inform you of a Public Open House, that is scheduled for Thursday, December 2, 2021 regarding a proposed subdivision and Country Residential rezoning application, that will be submitted to the RM of Edenwold for consideration.

The development is located at:

- L.S. 16, Sec. 12, TWP.17, RGE.18, W.2 Mer.

The proposed development "Vista Springs" is located on the L.S. 16 Section 12 – 17 – 18 W2 south of the Meadow Ridge Development within the Rural Municipality of Edenwold No. 158.

Vista Springs vision and priority is to be in harmony with existing developments, landscape, and environment, while creating a spacious residential development with highest level of architectural control.

Please find the package of information including the map showing the location, a summary of the concept plan for this residential development and an Input form.

The Public Open House is scheduled for:

- Thursday, December 2, 2021 from 7:00 – 9:00pm
- Location: RM of Edenwold Town Office, 100 Hutchence Road

There will be a short presentation starting at 7:30pm, followed by a question and answer period. This open house is intended to provide an opportunity for neighbours to discuss potential issues, possible solutions to those issues and to ask general questions. The Developers and members of the design team will be present at the open house.

If you are unable to attend the open house in person, there will be a virtual meeting set up via Microsoft Teams. If you are wanting to attend via online, please send your email address to: info@vistasprings.ca and a link to the meeting will be sent to you one day in advance.

If you are unable to attend the open house, via in person or online, please email your questions, suggestions, or comments of support to: info@vistasprings.ca.

We look forward to seeing or hearing from you.

Trevor Bagnall

Response Form

Vista Springs Development

L.S. 16, Sec. 12, TWP.17, RGE.18, W.2 Mer.

Please use this form to provide any questions, suggestions or comments in support of the proposed Residential Subdivision, Vista Springs.

Please return form on or before December 9th to:

RM of Edenwold,
100 Hutchence Road,
Emerald Park, SK, S4L 1C6,
Attention: Vista Springs Development

Alternatively, you may email questions to: info@vistasprings.ca. We will be addressing each response form directly.

Comments:

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Signature:_____

Would you like to receive future updates on the progress of the development?
_____yes_____no

If yes, please provide your email address for more correspondence:

_____


CDI 21-084 Appendix B
Emerald Park
WHITE CITY
WHITE CITY DRIVE
HWY 48
Park Meadow Estates
Meadow Ridge Estates
Prairie View Business Park
BETTERIDGE ROAD
PROPOSED RESIDENTIAL SUBDIVISION


Vista Springs
Concept Rendering

Questions from the Open House:

Q: How are you going to pay for the roadway extension?
A: To be addressed through the Servicing Agreement. Cost-share is a possibility.

C: Traffic going to Regina will go North through Meadow Ridge, not West to Betteridge.
A: Traffic study says most will take Betteridge, but a few may cut through Meadow Ridge, yes if for example they are going to Balgonie.

Q: Will Betteridge Road be paved?
A: To be address through the Servicing Agreement

Q: What type of road will be installed?
A: For sure an all-weather road, as per RM requirements. To be addressed through the Servicing Agreement.

Q: Why rezoning? How is this development in harmony with the existing landscape?
A: Lot sizes are smaller than acreage but larger than City lots.
C: St Andrew's Bay doesn't look like this.

Q: What does the wastewater system look like? Field system?
A: A 3 phase treatments system – triple redundant system. First septic tank, then aeration system then mound system. Wastewater must have WSA approval as per RM requirements.

Q: On the RM maps, the entire area is within the flood zone. Is the intention to bring in fill?
A: No. Monitoring of the water table has been done, test holes have been drilled, and planning to drill more test holes to ensure. Grading is to be at 1:500 which is at the 600m elevation line. If flooding event occurs, all roadways, train tracks etc., will be also flooded – a Noah's Arc scenario.

Q: A question to the RM. Was the geotechnical report submitted?
A from the RM: Yes, it is appended in the Comprehensive Development Proposal which is being reviewed. Further to the geotechnical report, we will need drainage approved by WSA, and water and sewer approved by SHA. Summary of Open House to be attached to CDP then it will go to Council.

Q: How deep is the well (drilled)?
A: I don't know, maybe 60 feet.
C: My well is depleting already and your well with 14 units using it for irrigation will take away more water from those already struggling (in the southern lots of Meadow Ridge).
A: The well should not affect your well at all.

Q: Where is the field system located on the map?
A: We will make sure to have an adequate distance from the creek and all buildings. We are not at a place yet to say where it will be as we are still in conversations with SHA.

Q: Won't a building be needed for the aeration system your proposing?
A: Correct, it will probably be tucked into the Southeast corner, out of sight.

Q: What is considered an all-weather road? When will it be constructed? Won't this increase traffic in the area because the road is now paved.
A: Gravel or pavement, whatever the RM says is required. No traffic, no. 14 houses will generate insignificant traffic. We are planning to pave 1.4 km of road just to manage the traffic.

C: If you pave Betteridge then everything West of the subject parcel will get developed.
A: It is an ongoing conversation whether the road is required to be paved.
A from the RM: As part of the Servicing Agreement, Council will say if and when paving is required. This is likely to be in the first phase of development.

Q: Is Betteridge tied to Jaxon Road?
A from the RM: Yes, an intersection will be required. As a reminder, the approval process requires a Public Hearing where we invite all these comments and concerns to be given. A summary of this Public Open House will also be provided to Council.

C: Trevor has completed all the environmental requirements, and some. He also completed a heritage review.
A: The Heritage Review came back indicating some features of significance. These were tested and the results indicated that the development may proceed.