Application for Amendment to Land Use Bylaw

Foothills County
309 Macleod Trail, Box 5605, High River, AB T1V 1M7 • Tel: 403-652-2341 Fax: 403-652-7880
www.foothillscountyab.ca
Email: planning@foothillscountyab.ca

Note: An Application Fee of $ 950 shall accompany this application

Date Received _____ Receipt No. _____

THIS SECTION TO BE COMPLETED IN FULL BY THE APPLICANT

I, SAM OSMAN
Name of Registered Owner (please print)

hereby certify that I am the registered owner of the land described above and authorize

_____ to act as agent in the matter
Name of Agent (please print)

PLEASE ACCEPT THIS APPLICATION REGARDING LEGAL LAND DESCRIPTION

All/part of the _____ 1/4 sec. 08 twp. 22 range 04 west of 5 meridian

Being all parts of lot 5 block 1 Reg. Plan No. 9311642 O.T. No. _____

TO: (Choose One)

☐ Redesignate from _____ to _____

☑ Amend the Land use Bylaw by Oversized Personal Arena from 161000 sq ft to 19,972 sq ft

Size of existing parcel/s: _____ Size of proposed parcel/s: _____

The reasons for the (redesignation) (amendment) are as follows:

This is a barn for the 4 horses

I certify that the information given on this form and attachment hereto are full and complete and is to the best of my knowledge a true statement of the facts concerning this application and I am the registered owner and /or the duly authorized agent.

Date Oct 25, 2022 Signed [redacted]

Landowner Information

Phone No. [redacted]

Address [redacted]

I consent to receive documents by email: ✓ Yes ___ No

Email Address: [redacted]

Agent Information

Phone No. [redacted]

Address _____

I consent to receive documents by email: ___ Yes ___ No

Email Address _____

Right of Entry

I, being the owner or person in possession of the above described land and any buildings thereon consent to an authorized person designated by Foothills County to enter upon the land for the purpose of inspection during the processing of this application.

Oct 25, 2022 [redacted]
Date Sig

Is there an access or safety concern with respect to a site inspect

If yes, please clarify

_____

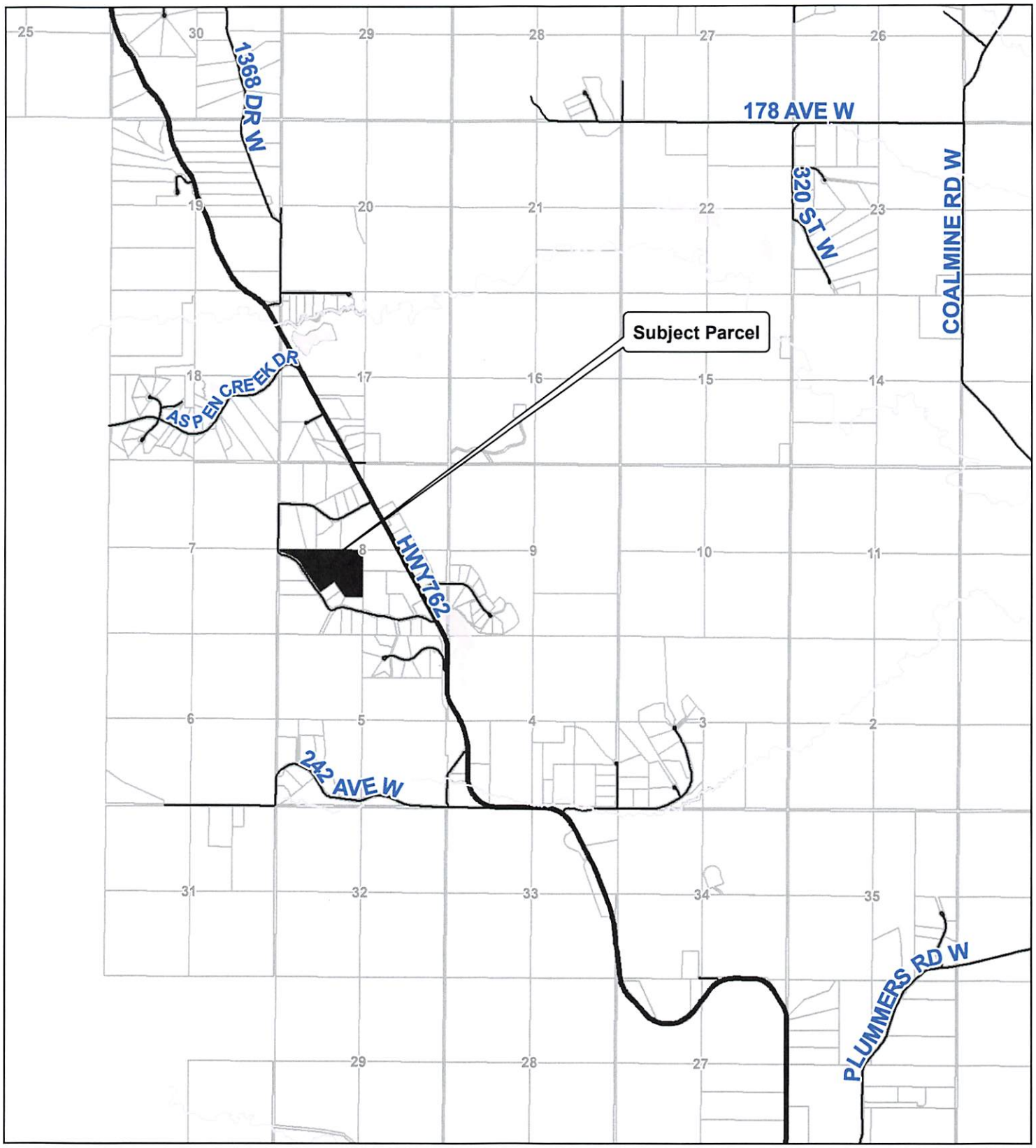
_____

_____

****Important Note: Applications must be received with original signed signature. Photocopies, faxes and emails will not be accepted.**

DISCLAIMER: Please note that the personal information collected on this form is authorized under the Municipal Government Act and is required for the purpose of the County's Planning and Development processes. This information may also be shared with appropriate government agencies and may also be kept on file by those agencies. The application and related file contents will become available to the public and are subject to the provisions of the Freedom of Information and Protection of Privacy Act (FOIP). If you have any questions about the collection and use of this information, please contact the Municipal Planner at 403-652-2341.

S 8-22-4 W5; Plan 831 1642, Blk 1, Lot 5
Council Division #4

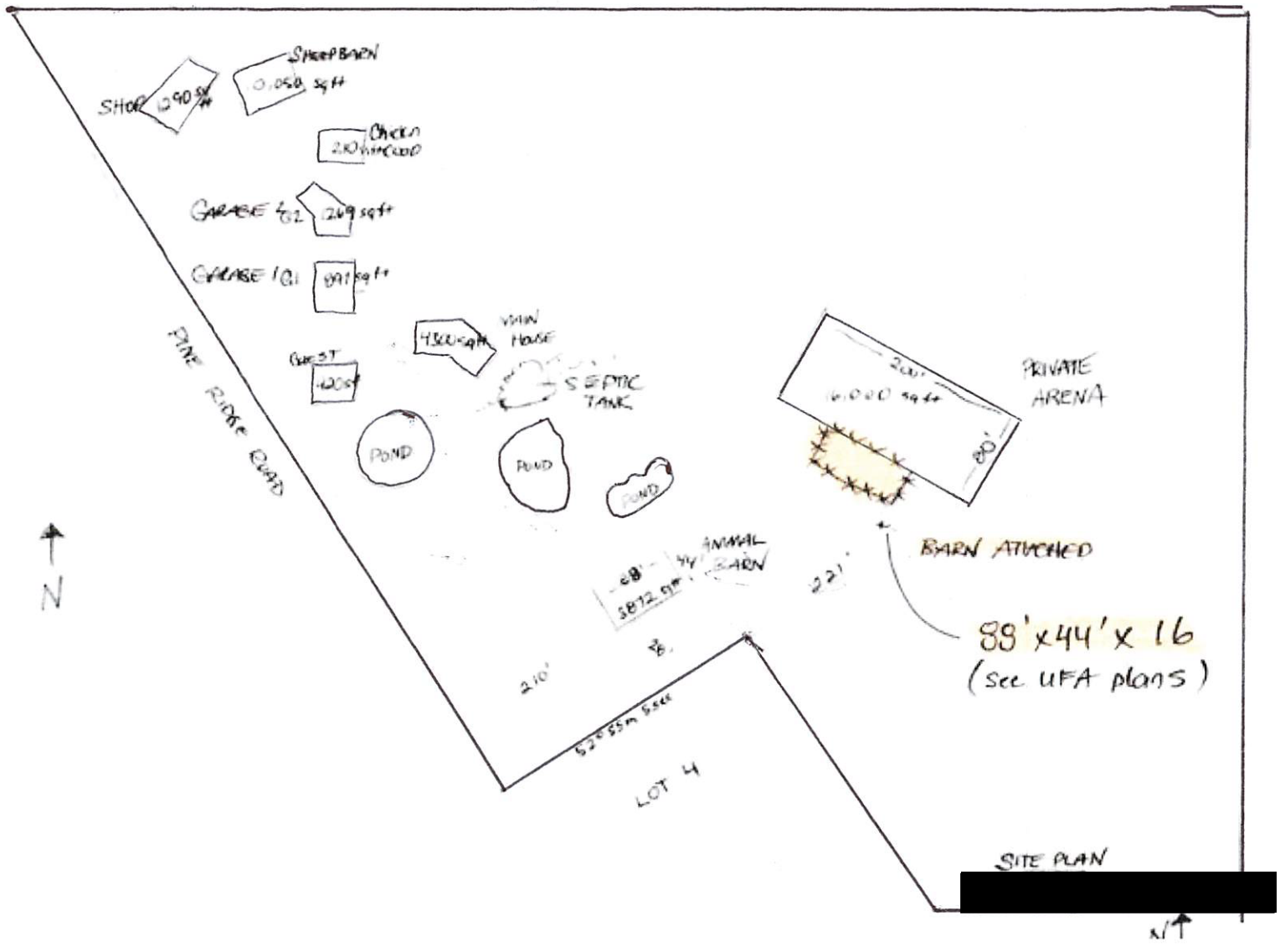


Legend

Roads
Highway
Parcels
Subject Parcel

Date: 12/5/2022

0 0.25 0.5 1 Miles


SHOP 290 sq ft
SHEEP BARN
3,050 sq ft
CHICKEN
280 sq ft COOP
GARAGE / G2
269 sq ft
GARAGE / G1
891 sq ft
MAIN HOUSE
4500 sq ft
SEPTIC TANK
GUEST
400 sq ft
POND
POND
POND
PINE RIDGE ROAD
N
200'
6,000 sq ft
80'
PRIVATE ARENA
BARN ATTACHED
68'
56'
3872 sq ft
ANIMAL BARN
221'
210'
LOT 4
SITE PLAN
[redacted]
N

SAM OSMAN
80' x 200' x 20' Arena w/ 88'x44'x16' Barn

SW-08-22-04-W5
Bragg Creek, AB

UFA COOPERATIVE LTD

DRAWING INDEX

BUILDING

Page: B0.0

Stage: PRELIMINARY - FOR REVIEW

Scale: N.T.S.

Date: 030821

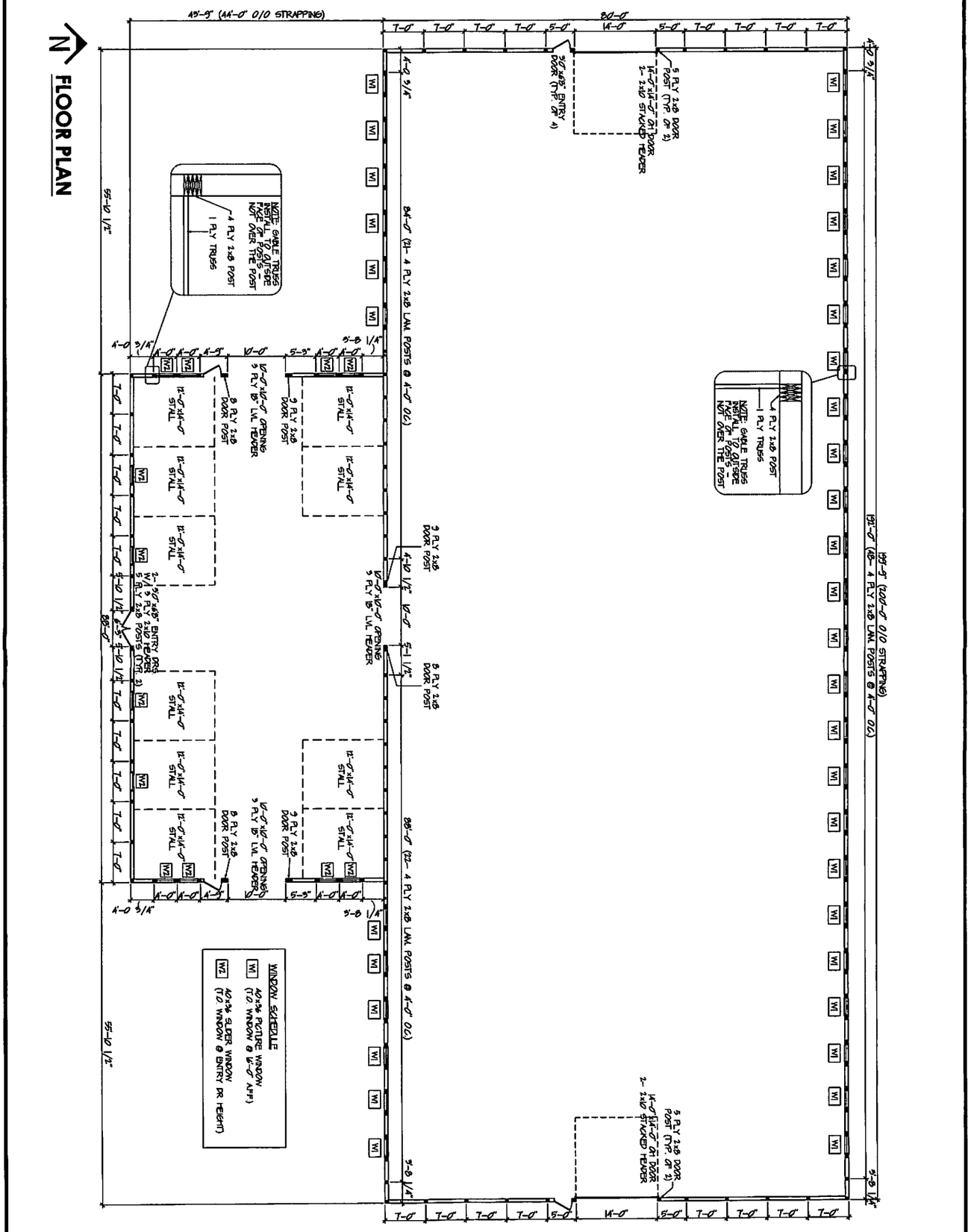
Drawn by: Design 53

Job: 247-21-261

Project Title: SAM OSMAN 80'x200'20' Arena w/ 88'x44'x16' Barn

Index

UFA COOPERATIVE LTD
Suite #700, 4838 Richard Road SW
Calgary, Alberta P: 403-570-4345



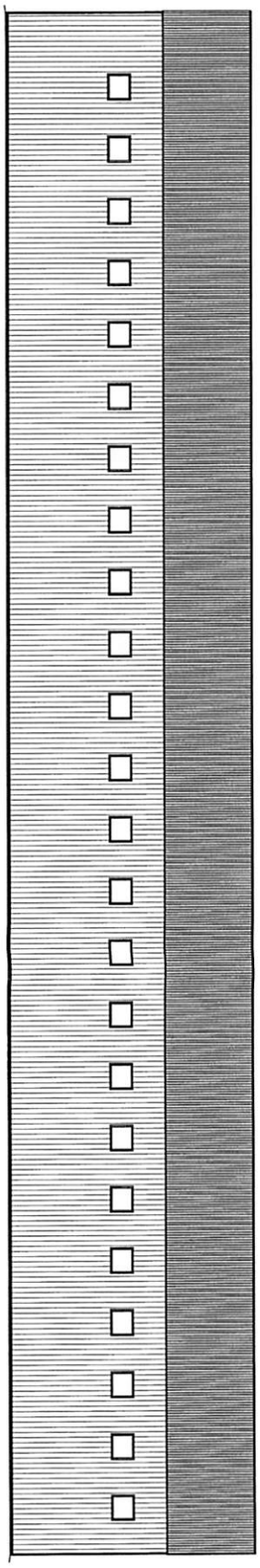
UFA COOPERATIVE LTD
Suite #700, 4838 Richard Road SW
Calgary, Alberta P: 403-570-4345

Project Title:
SAM OSMAN
80'x200'20' Arena w/ 88'x44'x16' Barn

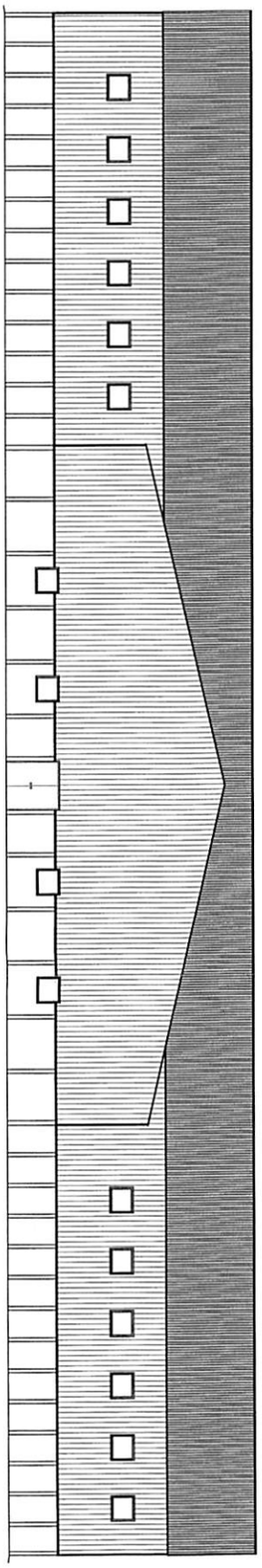
Floor Plan

Stage: PRELIMINARY - FOR REVIEW	Page: B1.0
Scale: 1/16"=1'-0"	Date: 030821
Drawn by: Design 53	Job: 247-21-261

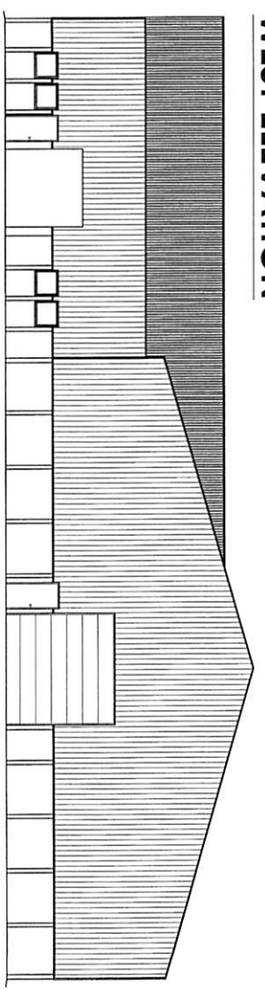
NORTH ELEVATION



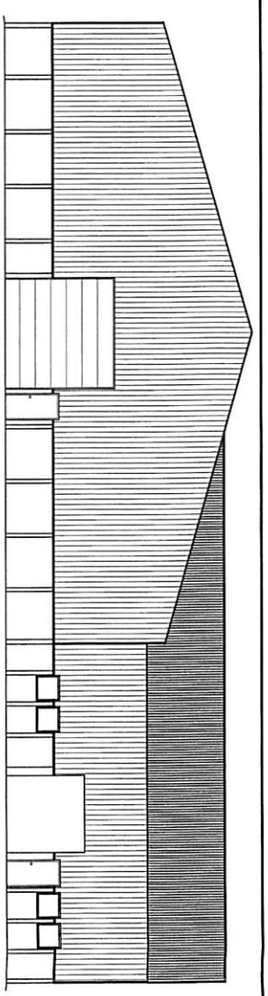
SOUTH ELEVATION



EAST ELEVATION

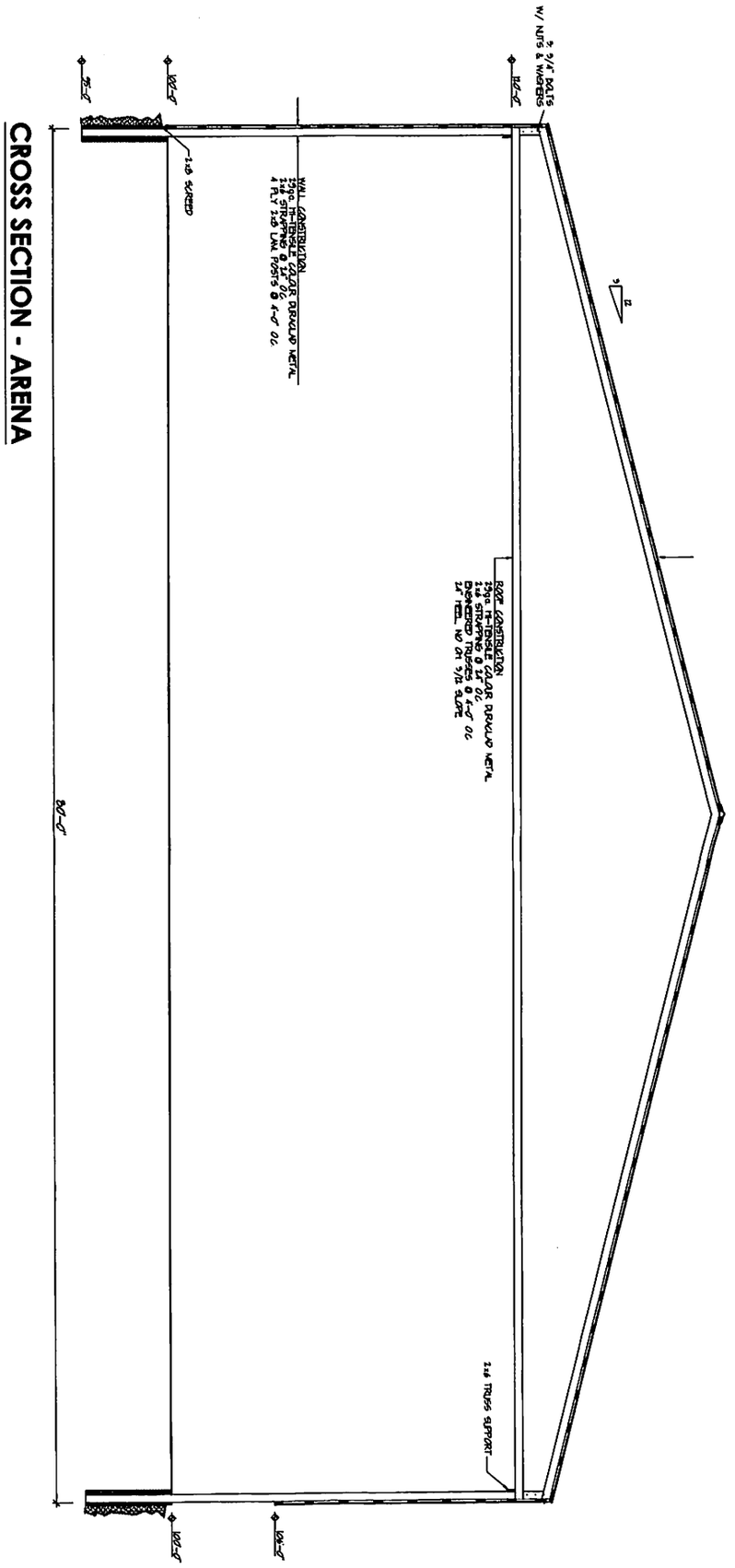


WEST ELEVATION



UFA COOPERATIVE LTD Suite #700, 4838 Richard Road SW Calgary, Alberta P: 403-570-4345	Contractor shall verify all specifications, dimensions and details and notify Designer of any discrepancies prior to the commencement of work for clarification and/or revision. UFA Co-operative Ltd. reserves the right to make corrections to errors on plans. These drawings are the property and responsibility of the Builder. Do no use or reproduce them without their consent.	Project Title: SAM OSMAN 80'x200'20' Arena w/ 88'x44'x16' Barn **Elevations**	Stage: PRELIMINARY - FOR REVIEW Scale: 1/16"=1'-0" / Date: 030821 Drawn by: Design 53 / Job: 247-21-261	Page: B2.0

CROSS SECTION - ARENA



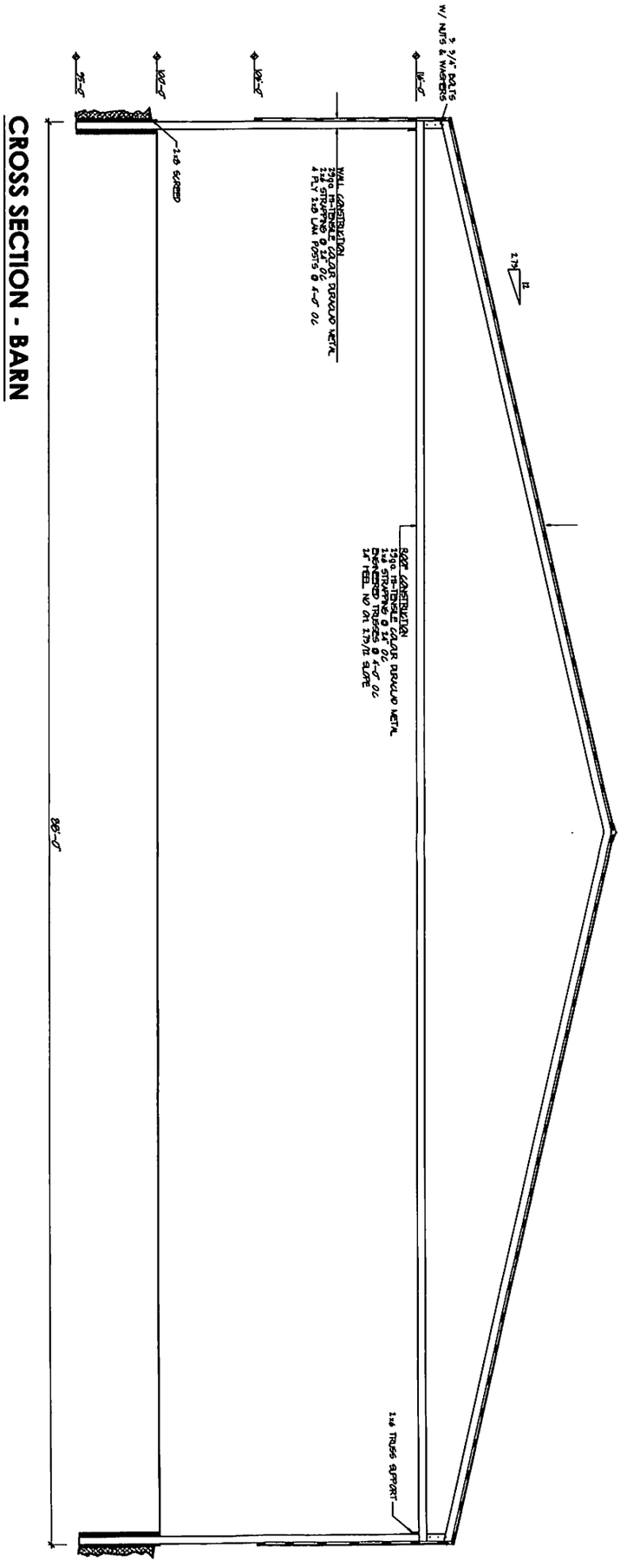
UFA COOPERATIVE LTD
Suite #700, 4838 Richard Road SW
Calgary, Alberta P: 403-570-4345

Project Title:
SAM OSMAN
80'x200'20' Arena w/ 88'x44'x16' Barn

Cross Section - Arena

Stage: PRELIMINARY - FOR REVIEW	Page: B3.1
Scale: N.T.S.	Date: 030821
Drawn by: Design 53	Job: 247-21-261

CROSS SECTION - BARN

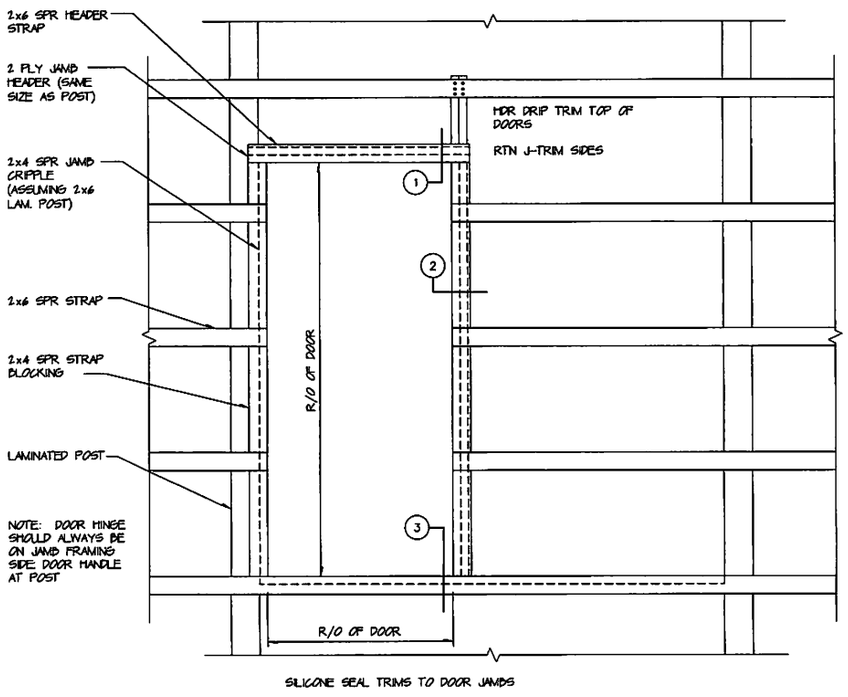


UFA COOPERATIVE LTD
Suite #700, 4838 Richard Road SW
Calgary, Alberta P: 403-570-4345

Project Title:
SAM OSMAN
80'x200'20' Arena w/ 88'x44'x16' Barn

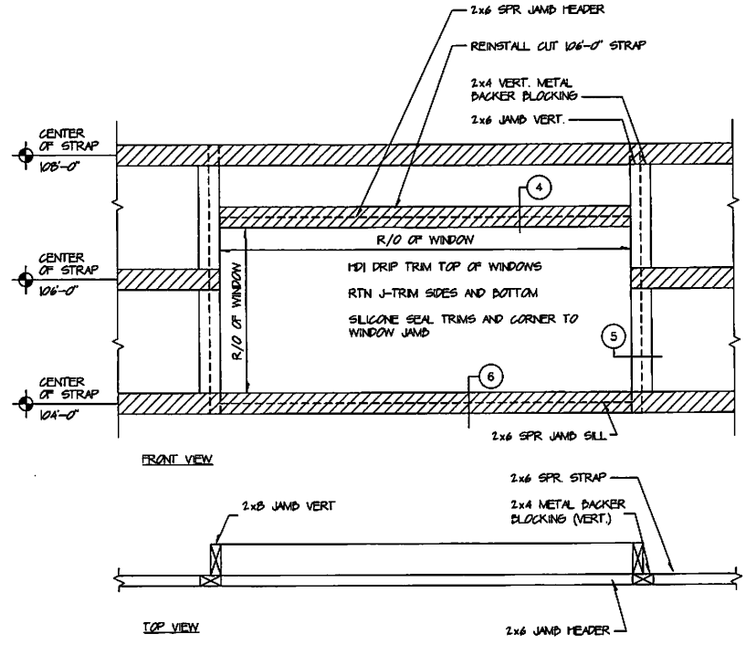
Cross Section - Barn

Stage: PRELIMINARY - FOR REVIEW	Page: B3.2
Scale: N.T.S.	Date: 030821
Drawn by: Design 53	Job: 247-21-261



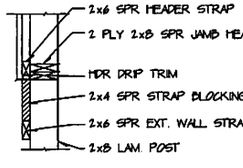
STRAPPED LAM. POST DOOR OPENING DETAIL

Scale: 1/2"=1'-0"



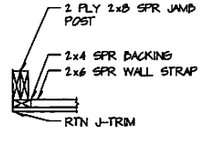
STRAPPED LAM. POST WINDOW OPENING DETAIL

Scale: 1/2"=1'-0"



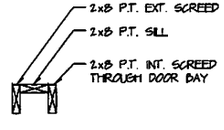
1 HEADER DETAIL

Scale: 1/2"=1'-0"



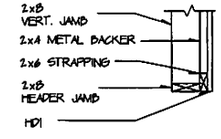
2 JAMB DETAIL

Scale: 1/2"=1'-0"



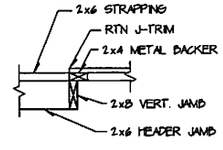
3 THRESHOLD DETAIL

Scale: 1/2"=1'-0"



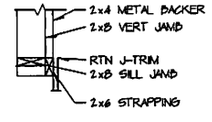
4 HEADER DETAIL

Scale: 1/2"=1'-0"



5 VERT. JAMB DETAIL

Scale: 1/2"=1'-0"



6 SILL DETAIL

Scale: 1/2"=1'-0"

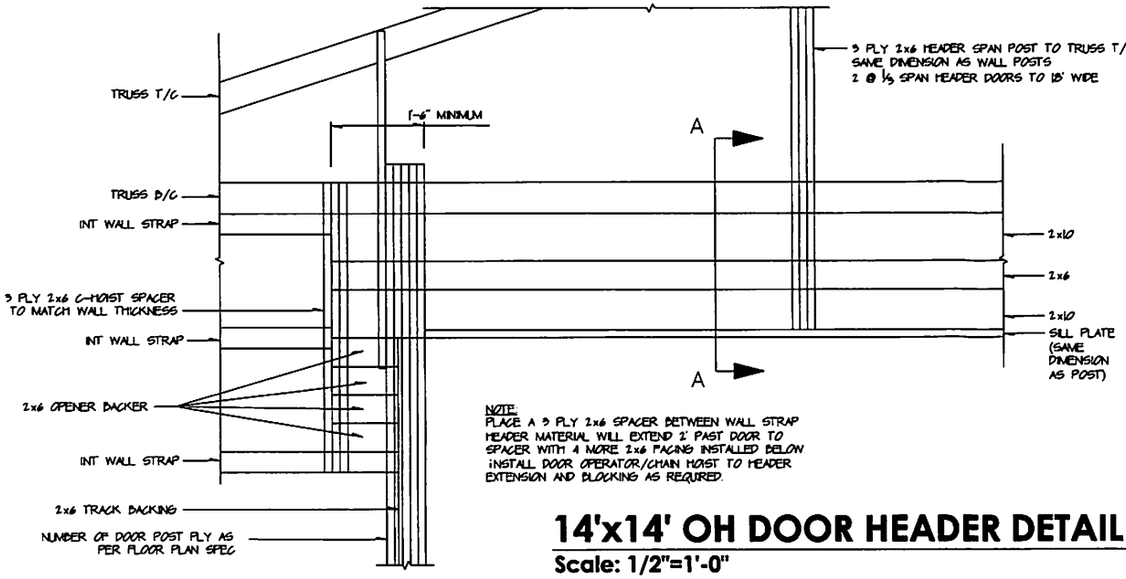
Page: B4.1

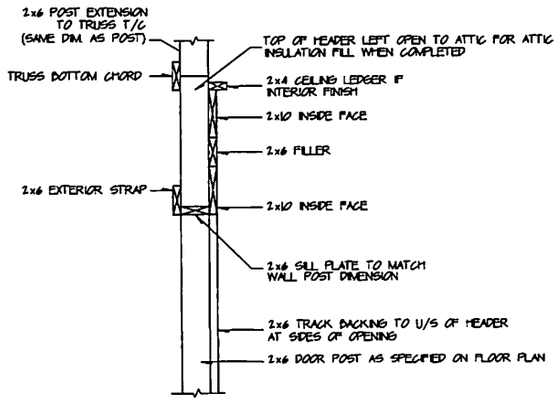
Stage: PRELIMINARY - FOR REVIEW
Date: 030821
Scale: 1/2"=1'-0"
Job: 247-21-261
Drawn by: Design 53

Project Title:
SAM OSMAN
80'x200'20' Arena w/ 88'x44'x16' Barn

Wall Opening Details

UFA COOPERATIVE LTD
Suite #700, 4838 Richard Road SW
Calgary, Alberta P: 403-570-4345

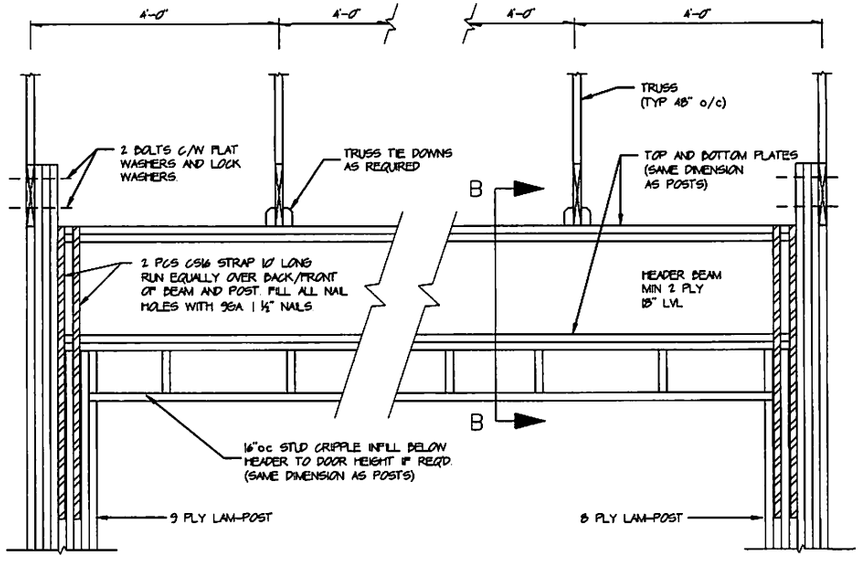


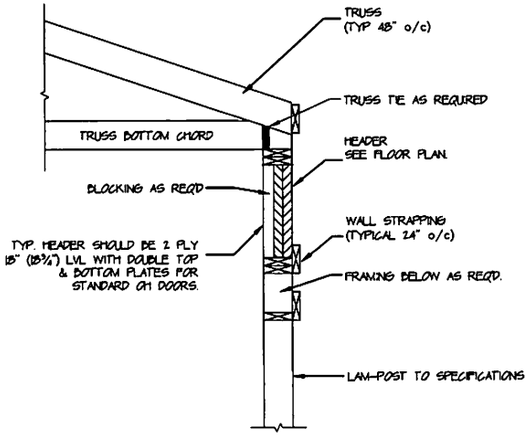


SECTION A–A

14'x14' OH DOOR HEADER DETAIL (END WALL)

Scale: 1/2"=1'-0"





SECTION B–B

10'x10' OPENING HEADER DETAIL (SIDE WALL)

Scale: 1/2"=1'-0"

Page: B4.2

Stage: PRELIMINARY - FOR REVIEW

Scale: 1/2"=1'-0"

Date: 030821

Drawn by: Design 53

Job: 247-21-261

Project Title: SAM OSMAN
80'x200'x20' Arena w/ 88'x44'x16' Barn

Wall Opening Details

UFA
COOPERATIVE LTD
Suite #700, 4838 Richard Road SW
Calgary, Alberta P: 403-570-4345

24' 4 PLY 2x8 LAMINATED POST DETAIL

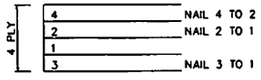
TREATED SECTION	SPF SECTION
8' P/T GRD CONTACT	16' SPF NO.1/NO.2
16' P/T GRD CONTACT	8' SPF NO.1/NO.2
12' P/T GRD CONTACT	12' SPF NO.1/NO.2
10' P/T GRD CONTACT	14' SPF NO.1/NO.2

NAILING: TREATED SECTION – 3 ROWS @ 9" o/c 3-¼" AIR STICK NAILS, EG GALV.
SPF SECTION – 3 ROWS @ 9" o/c 3-¼" AIR STICK NAILS

NAILING DETAILS

TRUSS MEMBER SHOWN FOR ILLUSTRATION

SEQUENCE OF PLY ASSEMBLY



28' 4 PLY 2x8 LAMINATED POST DETAIL

TREATED SECTION	SPF SECTION
8' P/T GRD CONTACT	20' SPF NO.1/NO.2
16' P/T GRD CONTACT	12' SPF NO.1/NO.2
12' P/T GRD CONTACT	16' SPF NO.1/NO.2
10' P/T GRD CONTACT	18' SPF NO.1/NO.2

NAILING: TREATED SECTION – 3 ROWS @ 9" o/c 3-¼" AIR STICK NAILS, EG GALV.
SPF SECTION – 3 ROWS @ 9" o/c 3-¼" AIR STICK NAILS

NAILING DETAILS

TRUSS MEMBER SHOWN FOR ILLUSTRATION

24' 5 PLY 2x8 LAMINATED POST DETAIL

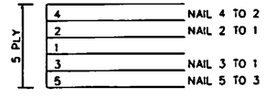
TREATED SECTION	SPF SECTION
8' P/T GRD CONTACT	16' SPF NO.1/NO.2
14' P/T GRD CONTACT	10' SPF NO.1/NO.2
16' P/T GRD CONTACT	8' SPF NO.1/NO.2
12' P/T GRD CONTACT	12' SPF NO.1/NO.2
10' P/T GRD CONTACT	14' SPF NO.1/NO.2

NAILING: TREATED SECTION – 3 ROWS @ 9" o/c 3-¼" AIR STICK NAILS, EG GALV.
SPF SECTION – 3 ROWS @ 9" o/c 3-¼" AIR STICK NAILS

NAILING DETAILS

TRUSS MEMBER SHOWN FOR ILLUSTRATION

SEQUENCE OF PLY ASSEMBLY



28' 5 PLY 2x8 LAMINATED POST DETAIL

TREATED SECTION	SPF SECTION
8' P/T GRD CONTACT	20' SPF NO.1/NO.2
14' P/T GRD CONTACT	14' SPF NO.1/NO.2
16' P/T GRD CONTACT	12' SPF NO.1/NO.2
12' P/T GRD CONTACT	16' SPF NO.1/NO.2
10' P/T GRD CONTACT	18' SPF NO.1/NO.2

NAILING: TREATED SECTION – 3 ROWS @ 9" o/c 3-¼" AIR STICK NAILS, EG GALV.
SPF SECTION – 3 ROWS @ 9" o/c 3-¼" AIR STICK NAILS

NAILING DETAILS

TRUSS MEMBER SHOWN FOR ILLUSTRATION

Page: B4.3

Stage: PRELIMINARY - FOR REVIEW

Scale: N.T.S.

Date: 030821

Drawn by: Design 53

Job: 247-21-261

Project Title: SAM OSMAN 80'x200'20' Arena w/ 88'x44'x16' Barn

Miscellaneous Details

UFA COOPERATIVE LTD
Suite #700, 4838 Richard Road SW
Calgary, Alberta P: 403-570-4345

24' 8 PLY 2x8 LAMINATED POST DETAIL

TREATED SECTION	SPF SECTION
8' P/T GRD CONTACT	16' SPF NO.1/NO.2
10' P/T GRD CONTACT	14' SPF NO.1/NO.2
14' P/T GRD CONTACT	10' SPF NO.1/NO.2
16' P/T GRD CONTACT	8' SPF NO.1/NO.2
8' P/T GRD CONTACT	16' SPF NO.1/NO.2
16' P/T GRD CONTACT	8' SPF NO.1/NO.2
12' P/T GRD CONTACT	12' SPF NO.1/NO.2
8' P/T GRD CONTACT	16' SPF NO.1/NO.2

NAILING: TREATED SECTION – 3 ROWS @ 9" o/c 3-¼" AIR STICK NAILS, EG GALV.
SPF SECTION – 3 ROWS @ 9" o/c 3-¼" AIR STICK NAILS

NAILING DETAILS

TRUSS MEMBER SHOWN FOR ILLUSTRATION

SEQUENCE OF PLY ASSEMBLY

8 PLY

8	NAIL 8 TO 6
6	NAIL 6 TO 4
4	NAIL 4 TO 2
2	NAIL 2 TO 1
1	
3	NAIL 3 TO 1
5	NAIL 5 TO 3
7	NAIL 7 TO 5

28' 8 PLY 2x8 LAMINATED POST DETAIL

TREATED SECTION	SPF SECTION
8' P/T GRD CONTACT	20' SPF NO.1/NO.2
10' P/T GRD CONTACT	18' SPF NO.1/NO.2
14' P/T GRD CONTACT	14' SPF NO.1/NO.2
16' P/T GRD CONTACT	12' SPF NO.1/NO.2
8' P/T GRD CONTACT	20' SPF NO.1/NO.2
16' P/T GRD CONTACT	12' SPF NO.1/NO.2
12' P/T GRD CONTACT	16' SPF NO.1/NO.2
8' P/T GRD CONTACT	20' SPF NO.1/NO.2

NAILING: TREATED SECTION – 3 ROWS @ 9" o/c 3-¼" AIR STICK NAILS, EG GALV.
SPF SECTION – 3 ROWS @ 9" o/c 3-¼" AIR STICK NAILS

NAILING DETAILS

TRUSS MEMBER SHOWN FOR ILLUSTRATION

24' 9 PLY 2x8 LAMINATED POST DETAIL

TREATED SECTION	SPF SECTION
8' P/T GRD CONTACT	16' SPF NO.1/NO.2
10' P/T GRD CONTACT	14' SPF NO.1/NO.2
12' P/T GRD CONTACT	12' SPF NO.1/NO.2
14' P/T GRD CONTACT	10' SPF NO.1/NO.2
8' P/T GRD CONTACT	16' SPF NO.1/NO.2
16' P/T GRD CONTACT	8' SPF NO.1/NO.2
12' P/T GRD CONTACT	12' SPF NO.1/NO.2
10' P/T GRD CONTACT	14' SPF NO.1/NO.2
8' P/T GRD CONTACT	16' SPF NO.1/NO.2

NAILING: TREATED SECTION – 3 ROWS @ 9" o/c 3- ¼" AIR STICK NAILS, EG GALV.
SPF SECTION – 3 ROWS @ 9" o/c 3- ¼" AIR STICK NAILS

NAILING DETAILS

TRUSS MEMBER SHOWN FOR ILLUSTRATION

SEQUENCE OF PLY ASSEMBLY

9 PLY

8	NAIL 8 TO 6
6	NAIL 6 TO 4
4	NAIL 4 TO 2
2	NAIL 2 TO 1
1	
3	NAIL 3 TO 1
5	NAIL 5 TO 3
7	NAIL 7 TO 5
9	NAIL 9 TO 7

28' 9 PLY 2x8 LAMINATED POST DETAIL

TREATED SECTION	SPF SECTION
8' P/T GRD CONTACT	20' SPF NO.1/NO.2
10' P/T GRD CONTACT	18' SPF NO.1/NO.2
12' P/T GRD CONTACT	16' SPF NO.1/NO.2
14' P/T GRD CONTACT	14' SPF NO.1/NO.2
8' P/T GRD CONTACT	20' SPF NO.1/NO.2
16' P/T GRD CONTACT	12' SPF NO.1/NO.2
12' P/T GRD CONTACT	16' SPF NO.1/NO.2
10' P/T GRD CONTACT	18' SPF NO.1/NO.2
8' P/T GRD CONTACT	20' SPF NO.1/NO.2

NAILING: TREATED SECTION – 3 ROWS @ 9" o/c 3- ¼" AIR STICK NAILS, EG GALV.
SPF SECTION – 3 ROWS @ 9" o/c 3- ¼" AIR STICK NAILS

NAILING DETAILS

TRUSS MEMBER SHOWN FOR ILLUSTRATION

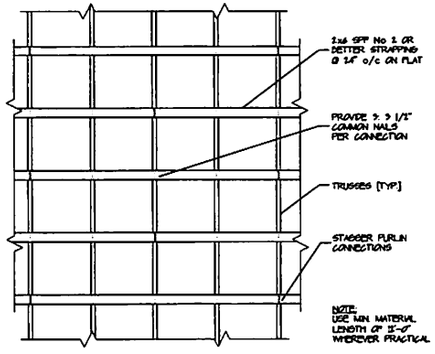
Page: B4.4

Stage: PRELIMINARY - FOR REVIEW
Date: 030821
Scale: N.T.S.
Job: 247-21-261
Drawn by: Design 53

Project Title: SAM OSMAN
80'x200'x20' Arena w/ 88'x44'x16' Barn

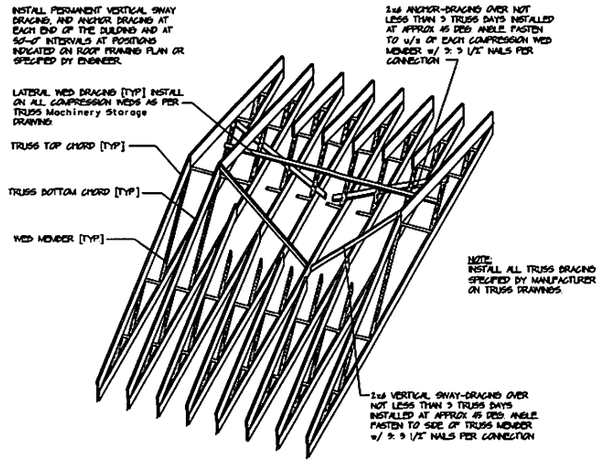
Miscellaneous Details

UFA COOPERATIVE LTD
Suite #700, 4838 Richard Road SW
Calgary, Alberta P: 403-570-4345



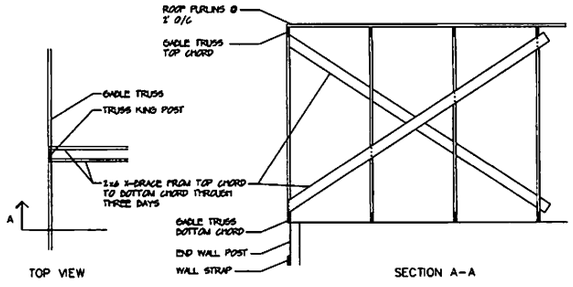
ROOF PURLIN DETAIL

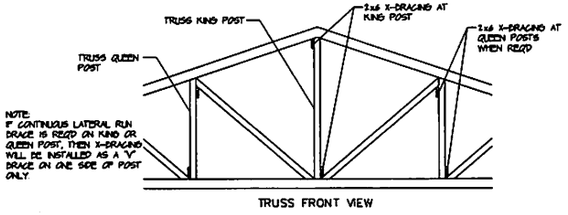
Scale: N.T.S.



VERTICAL SWAY-BRACING & ANCHOR-BRACING DETAIL

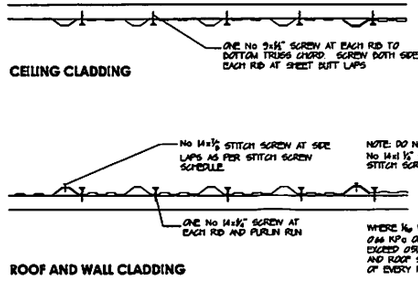
Scale: N.T.S.





ROOF GABLE BRACING DETAIL

Scale: N.T.S.



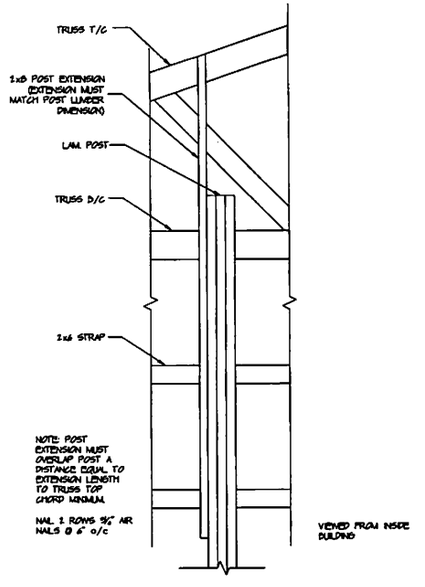
TYPICAL SCREW DETAIL

Scale: N.T.S.

STITCH SCREW SCHEDULE	
ROOF	NOT REQUIRED
SIDE WALLS	NOT REQUIRED
END WALLS	NOT REQUIRED

CLADDING OVERLAP DETAIL

Scale: N.T.S.



POST EXTENSION DETAIL

Scale: N.T.S.

Page: B4.5

Stage: PRELIMINARY - FOR REVIEW
Scale: As Shown
Date: 030821
Drawn by: Design 53
Job: 247-21-261

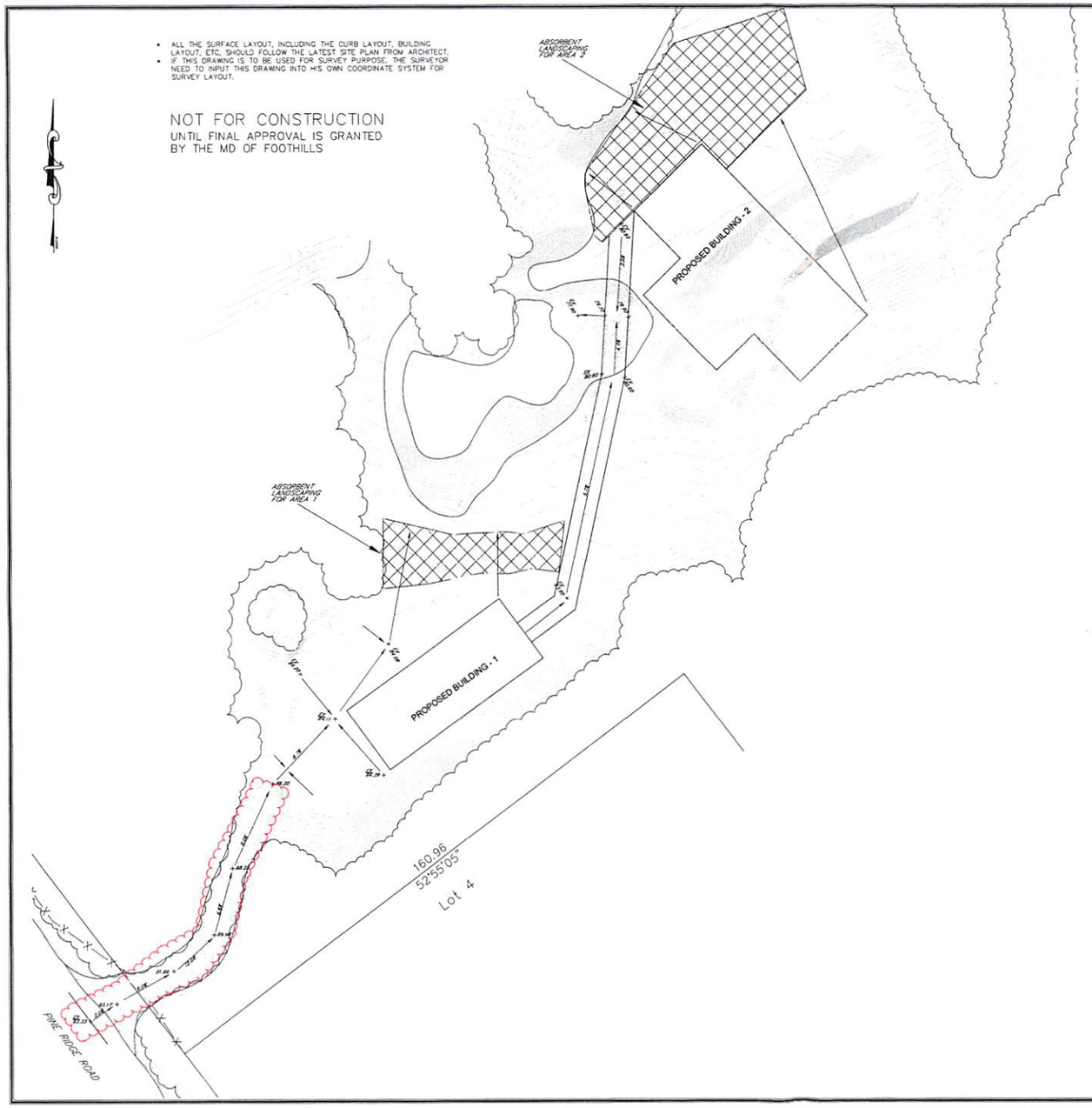
Project Title: SAM OSMAN
80'x200'x20' Arena w/ 88'x44'x16' Barn

Roof Bracing Details

UFA COOPERATIVE LTD
Suite #700, 4838 Richard Road SW
Calgary, Alberta P: 403-570-4345

- ALL THE SURFACE LAYOUT, INCLUDING THE CURB LAYOUT, BUILDING LAYOUT, ETC, SHOULD FOLLOW THE LATEST SITE PLAN FROM ARCHITECT.
- IF THIS DRAWING IS TO BE USED FOR SURVEY PURPOSE, THE SURVEYOR NEED TO INPUT THIS DRAWING INTO HIS OWN COORDINATE SYSTEM FOR SURVEY LAYOUT.

NOT FOR CONSTRUCTION
UNTIL FINAL APPROVAL IS GRANTED
BY THE MD OF FOOTHILLS



RICHVIEW ENGINEERING INC.
CONSULTING ENGINEERS
#200, 3821-27th ST. NE, CALGARY, AB. T1Y 7G2
PHONE: (403) 230-3218 FAX: (403) 230-3208

NOTES:
1. ALL DIMENSIONS ARE IN METRES AND DECIMALS THEREOF.
2. ALL ELEVATIONS REFERENCED TO 1300 GEODETIC DATUM.
3. ALL WORK TO BE DONE TO FOOTHILL COUNTY SPECIFICATIONS.

LEGEND

PROPOSED GRADE	×179
PROPOSED SLOPE	1.00%
EXISTING GRADE	179
SLAB ELEVATION	MF=48.75

MUNICIPAL ADDRESS
352248 PINE RIDGE ROAD, IRRIGO CREEK FOOTHILL COUNTY

LEGAL ADDRESS
LOT 5 BLOCK 1
PLAN 831 1642

REVISIONS

REV.	Y	M	D	ISSUE/REVISION DESCRIPTION	DRN	CHK
0	21	09	02	FOR APPROVAL	EL	RL

ENGINEER

PERMIT NUMBER: P09809
28 Feb 22

CLIENT
PREMIER BUILDING SOLUTIONS LTD.

PROJECT
[redacted]

DESIGN: RL	SITE GRADING AND OVERLAND DRAINAGE PLAN				
DRAWN: EL					
CHECKED: RL					
DATE: SEP 02 2021	DEVELOPMENT PERMIT No. DP	PROJECT No. 1340	DWG. No. 01	ISS./REV. 00	
SCALE: 1:500	MECHANICAL DRG. No. MC				

PrairieGEO Engineering Ltd.
#28 - 2333 18 Avenue NE
Calgary, AB, T2E 8T6
prairiegeo.ca
T: 403 230 9777

Project No. PGE21-82-REV1
January 28, 2022

Via e-mail: [redacted]
Original will remain on file

Premier Building Solutions c/o Film Alberta Studios
[redacted]

ATTN: Wayne Knash
Project Manager

Re: Geotechnical and Slope Stability Assessment
Proposed Shop and Arena Buildings
[redacted]

Dear Mr. Knash,

1.0 INTRODUCTION

Premier Building Solutions c/o Film Alberta Studios is proposing to construct an equestrian facility located at [redacted] PrairieGEO Engineering was requested to perform a geotechnical study to investigate the soil conditions and provided slope assessment for the proposed development. Authorization to proceed with this investigation was given by Mr. Osman on December 20, 2021 via email.

2.0 BACKGROUND INFORMATION

2.1 SITE DESCRIPTION

The proposed equestrian facility is located at [redacted] as shown in the Key Plan, Figure 1 in Appendix. It is understood that the facility will consist of a shop building and a riding arena. The site is accessible from Pine Ridge Road to the west.

2.2 PREVIOUS INVESTGATIONS

PrairieGEO was not provided with a previous geotechnical report for review during preparation of this report.

3.0 FIELD PROGRAMS

On August 17, 2021 and January 3, 2022, two site visits were conducted by PrairieGEO personnel to inspect the overall site and slope conditions. Two testpits were observed at the site and locations are shown in Site Plan, Figure 2. The soil encountered was visually examined during drilling and logged according to the Modified Unified Soil Classification System.

At the time of visits, no obvious tensile cracks or sliding movements was observed around the proposed building areas and nearby slopes. Some earthwork including site grading, cut and fill have been conducted and site photographs are provided in Figure 3 in Appendix.

4.0 SITE CONDITIONS

4.1 SURFACE CONDITIONS

The proposed arena and shop buildings are located at [redacted] as shown on Key Plan, Figure 1. The site is accessible from Pine Ridge Road to the west.

There were multiple existing residential buildings located near northwest corner of the lot. The topography map of the site indicated that the site was sloping down from the south side of the property to the north where the existing buildings located with an average elevation change of 5.5 m. Slope angles ranged from 6 to 15 degree. The surrounding land use consists of residential acreage lots. Site conditions are shown on the Site Photographs, Figure 3.

4.2 SUBSURFACE CONDITIONS

The general soil profile encountered at the site was relatively uniform at the testpit locations consisted of in descending order: topsoil overlying gravelly clay 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 used on the testpit logs are provided on the explanation sheets, also in Appendix A. The following is a brief description of the main soil types found at the site.

4.2.1 Topsoil

A 0.15 m to 0.2 m thick layer of topsoil was encountered at the Testpit 1 and 2 locations. The topsoil was moderate organic, brown, and moist. Based on observations and experiences, topsoil thickness is expected to vary and may exist in greater thickness across the site. In general, this topsoil is considered weak and compressible under load.

4.2.2 Clayey Gravel

Clayey gravel was encountered below the topsoil layer at both testpits and extended to depth of 2.5 m below grade. The clayey gravel was well-graded, coarse and stiff. The clay mixture in the gravel was characterized as low plastic, brown, and moist.

4.3 GROUNDWATER CONDITIONS

It was observed that a dry pond was present between the existing buildings and proposed buildings. Water level and seepage of the pond is at about 2.5 m below the proposed building grade. Based on the local soil experience of PrairieGEO personnel:

1. Based on previous geotechnical investigation experiences of nearby sites, a relatively shallow groundwater condition near the gravel deposit elevation which is expected at about 2.5 m below grade for this area in the Bragg Creek area.

2. Groundwater levels are expected to be dependent on precipitation infiltration for recharge. Groundwater elevations are expected to fluctuate on a seasonal and annual basis and will be highest after periods of heavy or prolonged precipitation and snow-melt.

3. Groundwater seepage is expected for excavation deeper than 2 m. High flow rates are possible in the permeable gravel layer or fractured bedrock formation. The volumes of groundwater encountered will be dependent on seasonal conditions and the permeability of the soils within the profile.

5.0 ASSESSMENT OF SLOPE STABILITY

A slope stability study was required by the Foothills County to assess the sensitivity and risk of the local slope impacts on the proposed development and to minimize impacts on the slope and surrounding landscape. The stability analysis for this study was carried out using the Slope/W computer program, and comply with all requirements from typical development standards such as the county requirements.

5.1 GENERAL SLOPE STABILITY COMMENTS

Slope stability is described in terms of a factor of safety (FS) against slope failure which is the ratio of total forces resisting failure divided by the sum of forces promoting failure. In general, a FS of less than 1 indicates that failure is expected and a FS of more than 1 indicates that the slope is stable. A steepened slope will slump back over time to establish a stable profile for the existing soil and groundwater conditions. The FS of a slope will increase slightly as vegetation is established on the face to protect the subgrade soil from weathering. Given the possibility of soil variation, groundwater fluctuation, erosion and other factors, slopes with a FS ranging between 1.1 and 1.3 are considered to be marginally stable. A "long term" stable slope is considered to have a FS of over 1.3. For permanent structures such as houses, which represent a higher risk and potential for loss of investment, a FS of at least 1.5 is desired for development on or near slopes.

5.2 DEVELOPMENT SETBACKS AND RESTRICTIONS

General geotechnical practice is to review stability for slopes in the range of 15 percent or steeper (ie. less than about 6.5H:1V). As a visual aid this angle of inclination is roughly the typical side yard slope for a house with full walk-out basement. Many municipalities use this limit as a red flag to trigger the requirement for a geotechnical assessment. Development on slightly steeper slope faces is possible if the slope is stable. On steepened slopes which are not stable, the typical recommendation is to provide buffer areas along the crest and toe of the slope based on the critical failure surface with the appropriate FS for the proposed development feature. A permanent structure would need to be set back an appropriate distance from the crest to provide a safe buffer for the in the structure in the event of a landslide at the site. The FS for the critical failure surface intersecting this structure should at least be 1.5. Less risk sensitive residential development such as yard landscaping and temporary structures (sheds, decks, etc.) would be allowed in marginally stable areas.

5.3 SLOPE PROFILE

Slope profiles for the site were based on elevation survey information provided in drawing prepared by Zoom Surveys Ltd. of Calgary. The existing slopes at this site were considered to be formed by natural erosions. There was no evidence of recent land sliding at the site, suggesting subsurface conditions are stable over formation conditions. Examples of the slope profiles at the site are provided on Figures A1 and A2.

5.4 SUBSURFACE PROFILE

Based on the field observations and local experiences of Bragg Creek areas, the slope profile used for the stability analysis was a deep deposit of clayey gravel. It was assumed that the topsoil will be removed, and engineered fill will be used for site grading purposes.

For slope modelling, conservative groundwater conditions were assumed in the analysis based on estimated peak seasonal groundwater depths below the slope face. The modelled water elevations are about 3 m below grade, this was considered to be representative of near saturated conditions for the down slope which might occur during periods of prolonged or heavy precipitation and spring snow melt.

5.5 STABILITY ANALYSIS

A stability analysis was carried out using the *Slope/W* computer program to evaluate the factor of safety for the representative slope profile. Initial analysis was performed to calibrate the soil parameters for the silt, using water well data and observations of the original slopes and to develop a model that was consistent with the assumed formation conditions. Local experience and file data were used to estimate the soil parameters and groundwater or soil moisture conditions. The following effective strength parameters were used in the analysis.

TABLE 1
SOIL PARAMETERS FOR STABILITY ANALYSIS

Soil	Unit Weight (kN/m^3)	Undrained Shear Strength (kPa)	Cohesion, c' (kPa)	Phi, φ' (Degrees)
Clayey Gravel	19	-	-	28

The following table summarizes the results of the slope stability analysis.

TABLE 2
SLOPE STABILITY MODELING RESULTS

Stability Run	Section	CASE	Factor of Safety	Figure
Slope with Proposed Building	AA'	Long Term	1.54	A1
Slope with Proposed Building	BB'	Long Term	1.94	A2

Representative slope profiles for the analysis are shown in Appendix B. It should be noted that a series of stability runs have be undertaken for both localized failures and global stability and the example runs provided in Appendix are just samples of typical analysis results for various cases and conditions.

5.6 SLOPE ASSESSMENT

The findings of the slope stability analysis for the slope model and the proposed soil parameters listed in Table 2 were in general agreement with both the assumed formation conditions and local slope experience.

The long-term assessment at this site is that the potential for a major slope movement impacting the proposed development is low under present normal conditions with reasonable variation. The FS against a small shallow "slump-type" failure might fall close to 1.0 if the slope face at the site was subject to grading causing excessive steepening, or if areas of the slope face were to become saturated. However, it would take unusually wet conditions to cause a shallow slumping of the slope face. Saturation of the surficial soils, leading to the regressive slumping of the slope face is considered to be the most likely mode of slope failure at this site. If a large movement were to occur, the failure in the subgrade would be expected to be slow moving and would provide some warning in the form of cracks on the slope face prior to failure.

A minimum setback distance of 5 m from the slope crest is recommended to satisfy a FOS of 1.5 m for the proposed buildings. In conclusion, the impact of the proposed development on local slope stability will be minimal as long as the existing slope face remained close to the existing condition and recommended minimum setback distance of 5 m is maintained.

6.0 GEOTECHNICAL RECOMMENDATIONS

6.1 GEOTECHNICAL EVALUATION

The proposed one storey shop / arena buildings are expected to consist of a light to moderate structural load. The site soil conditions are considered to be typical for this area of the Bragg Creek, Foothills areas and will be suitable for the proposed development. The main geotechnical considerations for this development include:

1. The clayey gravel deposits will provide a suitable bearing strata for the conventional concrete footing foundations. Recommendations for concrete footings are given in Section 6.4. Recommendations on other foundation systems can be provided upon request.

2. A 1.5 to 3 m excavation will be required for the foundation construction. An unsupported excavation is considered feasible if the availability of space on the site to cutback side slopes to stabilize the excavation. Excavation stability should be reviewed once more details regarding the design and construction methods are known.

3. Due to possible fluctuation of ground water table in the area, ground water seepage could be encountered in utility trench excavations. A conventional sump pump system should be sufficient for this excavation.

4. The soils at the site should be suitable for use as backfill for service trenches. Over-sized rock (diameter larger than 300 mm should be screened and removed prior to backfilling).

6.2 SLOPE RECOMMENDATIONS

6.2.1 Slope Development

The proposal to excavate the proposed arena buildings near the existing pond slope is considered to be stable if a minimum 5 m setback distance from the crest is maintained. The expected long-term FOS of the slope is higher than 1.5. In addition:

1. The general profile of the slope below the proposed shop should be maintained with no net increase in material (ie. cut / fill should be employed for landscape features such as retaining walls or patios.)

2. Landscape features such as retaining walls may be used, provided and designed by a qualified geotechnical engineer. Retaining walls will need to be checked for internal stability and global stability related to the overall slope. The preceding slope assessment has not included any detail analysis for retaining walls.

3. Run-off related to the natural slope south of the shop should not discharge uncontrolled or concentrated onto the slope face.

6.2.2 General Slope Care

The slope face below the proposed house may be subject to saturation and minor surficial failures influenced by precipitation, surface erosion, groundwater and soil moisture conditions. It is important that site development does not initiate any detrimental changes to the subsurface conditions and slope geometry. In order to minimize the potential for destabilization that could lead to localized slumping, the crest areas and the top area of the slope faces should be kept away from any water ponding condition. For lower slope face and toe, erosion control and vegetation should be maintained. The following general recommendations are intended as a guide to minimize the impact of the proposed house on the stability of the slope.

1. Site grading carried out should be designed to drain surface water due to rainfall and snowmelt away from the slope. New fills should not be placed at the top of the slope. If fill is required to establish grades around the house; the excavation material from the basement should be utilized.

2. All discharge from roof leaders and possible weeping tile systems should be directed away from the top-of-bank in the vicinity of the house and slope face below the house. Drainage from roof leaders and/or weeping tile sump discharges should not be allowed to flow uncontrolled over the crest or be allowed to pond on the ground surface causing increased water infiltration into the slope.

3. It is suggested that exposed soils around the house footprint should be vegetated soon after site grading is complete. It is suggested that any new vegetation for this site be selected from native species with deep root systems that can grow with a minimum of watering. Leaving graded areas of the site unvegetated for extended periods of time will cause increased infiltration into the slope, resulting in the saturation of the upper soils of the slope. This is especially critical if severe storm is anticipated in this area.

4. Underground sprinkler lines should not be allowed on the slope face. If underground sprinkler system is proposed, the design should be reviewed with respect to impacts on slope stability. This review should be performed by a qualified geotechnical engineer. No pools or below grade ponds should be allowed on this lot without detailed review. If proposed, water features would need secondary containment and controlled discharge design measures.

5. Building contractors often make the mistake of pushing excavation soil from basements out onto the slope face in an attempt to establish larger level backyard areas. This usually results in over loading and steepening of the original slope, resulting in very unstable conditions. Under no circumstances should the basement excavation soil be placed on the slope face.

The general recommendations in this section are considered to be "common sense" actions to undertake or avoid in order to minimize potential disturbance to the slope. It is considered prudent to follow these recommendations to maintain a low risk to the property (and thereby to the house). It should be noted, that the possibility that future property owners may undertake activities which are detrimental to the stability of the slope is assumed when assessing the factor of safety of the slope. These general recommendations and guidelines may be subject to site specific modifications based on the review of a qualified geotechnical engineer.

6.3 SITE PREPARATION

6.3.1 General Site Stripping

In general, all remaining surficial topsoil, organics, non-engineered fill, or unsuitable soils should be stripped from in the building and pavement areas. Based on drilling observations, surficial topsoil thicknesses or stripping depths are anticipated to average 300 mm below the existing surface. Some areas of the site may require more stripping or undercutting to remove thicker topsoil, or root systems of underbrush or trees. 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.

6.3.2 Subgrade Preparation

Site preparation should be carried out under dry weather conditions to minimize the risk of disturbance and softening. The exposed subgrade should be scarified to a depth of 150 mm and recompacted uniformly to a minimum of 98 percent of Standard Proctor Maximum Dry Density (ASTM D698 – SPMDD). Site preparation measures should be monitored by qualified and experienced geotechnical personnel to identify potential soft areas. The inspection may include a proof-roll test to confirm that deflections are minimal. If adverse weather or groundwater conditions are observed, these recommendations should be reviewed in order to avoid subgrade failure. Soft areas should be sub-cut and replaced with a suitable fill material to a depth sufficient to support construction traffic. 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.

6.3.3 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 3 m. Roof and other drains should discharge well clear of buildings. Concentrated drainage should be directed away from the slope.

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. 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.

SUBCATCHMENT 2	(mm)	(m3)
TOTAL MSC PRECIPITATION	20897.0	96126.2
AVERAGE PRECIPITATION	409.7	
MEDIAN PRECIPITATION	404.7	
TOTAL RUNOFF (INCLUDING SUBDRAIN)	737.1	3390.5
% OF RAINFALL AS RUNOFF	3.5	
AVERAGE RUNOFF (INCLUDING SUBDRAIN)	14.5	66.5
MEDIAN RUNOFF (INCLUDING SUBDRAIN)	2.2	10.3
TOTAL IRRIGATION DEMAND	0.0	0.0
MAXIMUM RUNOFF (ANY TIMESTEP)	48.6	223.7
AVERAGE EVAPORATION	331.7	1525.6
AVERAGE PERCOLATION	23.7	109.1
TOTAL RUNOFF + EVAP + PERCOLATION	369.8	1701.3

SC2: IMPERVIOUS AREA	(mm)	(m3)
TOTAL MSC PRECIPITATION	20897.0	38555.0
TOTAL RUNOFF	15856.8	29255.8
% OF RAINFALL AS RUNOFF	75.9	
AVERAGE RUNOFF	310.9	573.6
MEDIAN RUNOFF	307.0	566.4
MAXIMUM RUNOFF (ANY TIMESTEP)	91.0	167.9
TOTAL RUNON	0.0	0.0
TOTAL DEP STORAGE (EVAPORATION LOSS)	5033.6	9287.0
TOTAL SUBLIMATION LOSS	0.0	0.0
SNOW PACK AT THE END OF SIMULATION	6.6	12.2
WATER BALANCE (OVER PERIOD OF RECORD)	0.0	0.0

ANNUAL SUMMARIES

IMPERVIOUS SURFACE

YEAR	MSC PRECIP	TOTAL RUNOFF	% RUNOFF	MAX RUNOFF
	(mm)	(mm)	(-)	(mm)
1960	373.0	277.4	74.4	34.1
1961	392.1	305.6	77.9	35.7
1962	285.3	187.2	65.6	27.4
1963	425.0	341.6	80.4	41.1
1964	392.4	283.1	72.1	38.5
1965	590.2	491.5	83.3	49.2
1966	403.7	322.4	79.9	53.3
1967	256.4	181.2	70.7	20.6
1968	358.6	253.0	70.6	38.3
1969	428.1	357.5	83.5	28.9

SUBCATCHMENT 1	(mm)	(m3)	
TOTAL MSC PRECIPITATION	20897.0	125382.0	
AVERAGE PRECIPITATION	409.7		
MEDIAN PRECIPITATION	404.7		
TOTAL RUNOFF (INCLUDING SUBDRAIN)	694.2	4165.3	
% OF RAINFALL AS RUNOFF	3.3		
AVERAGE RUNOFF (INCLUDING SUBDRAIN)	13.6	81.7	
MEDIAN RUNOFF (INCLUDING SUBDRAIN)	5.6	33.9	
TOTAL IRRIGATION DEMAND	0.0	0.0	
MAXIMUM RUNOFF (ANY TIMESTEP)	45.4	272.4	
AVERAGE EVAPORATION	363.9	2183.3	
AVERAGE PERCOLATION	17.1	102.7	
TOTAL RUNOFF + EVAP + PERCOLATION	394.6	2367.6	

SC1: IMPERVIOUS AREA	(mm)	(m3)	
TOTAL MSC PRECIPITATION	20897.0	18807.3	
TOTAL RUNOFF	15856.8	14271.1	
% OF RAINFALL AS RUNOFF	75.9		
AVERAGE RUNOFF	310.9	279.8	
MEDIAN RUNOFF	307.0	276.3	
MAXIMUM RUNOFF (ANY TIMESTEP)	91.0	81.9	
TOTAL RUNON	0.0	0.0	
TOTAL DEP STORAGE (EVAPORATION LOSS)	5033.6	4530.2	
TOTAL SUBLIMATION LOSS	0.0	0.0	
SNOW PACK AT THE END OF SIMULATION	6.6	5.9	
WATER BALANCE (OVER PERIOD OF RECORD)	0.0	0.0	

SUBCATCHMENT 1

OVERALL WATER BALANCE OVE
TOTAL MSC PRECIPITATION
TOTAL EXTERNAL RUNON
TOTAL RUNOFF (INCLUDING SUB
TOTAL EVAPORATION IMPERVIOU
TOTAL EVAPOTRANSP PERVIOU
TOTAL RECHARGE FROM POND
TOTAL PERCOLATION
TOTAL SUBLIMATION LOSSES
SNOW PACK AT THE END OF SIM
TANK WATER BALANCE
WATER BALANCE
CONTINUITY ERROR

SC1: PERVIOUS AREA

TOTAL MSC PRECIPITATION
TOTAL RUNOFF
% OF RAINFALL AS RUNOFF
AVERAGE RUNOFF
MEDIAN RUNOFF
MAXIMUM RUNOFF (ANY TIMESTE
TOTAL IRRIGATION DEMAND
AVERAGE IRRIGATION DEMAND
MEDIAN IRRIGATION DEMAND
TOTAL RUNON
AVERAGE RUNON
MEDIAN RUNON
TOTAL SEEPAGE
AVERAGE SEEPAGE
MEDIAN SEEPAGE
TOTAL EVAPORATION
AVERAGE EVAPORATION
MEDIAN EVAPORATION
TOTAL SUBLIMATION LOSSES
SNOW PACK AT THE END OF SIM

WBSCC - PROJECT DATA SHEET - Sub-Catchment 2: Weekly Watering Schedule

Weekly Watering Schedule #1 (Depth of Irrigation) (mm)

	Sun	Mon	Tue	Wed	Thu	Fri	Sat
Jan							
Feb							
Mar							
Apr							
May						10	
Jun			10			15	
Jul		10		10		15	
Aug		10		10		15	
Sep			10			15	
Oct							
Nov							
Dec							

Weekly Watering Schedule #2 (Depth of Irrigation) (mm)

	Sun	Mon	Tue	Wed	Thu	Fri	Sat
Jan							
Feb							
Mar							
Apr							
May							25
Jun							25
Jul							25
Aug							25
Sep							25
Oct							
Nov							
Dec							

Precipitation treshold (mm) during irrigation day and preceding two days	10

WBSCC - PROJECT DATA SHEET - Sub-Catchment 2: Crops, Irrigation, Storage/Reuse Tank

Storage/ Reuse Tank Parameters		Values
Tank Water Surface Area (assumed bath tub)	(m^2)	
Spill Crest Elevation, above Tank Floor	(m)	
Starting Water Level	(m)	
Minimum Tank Water Elevation for Recharge	(m)	
Maximum Tank Water Elevation for Recharge	(m)	
Use Recharge from Storm Ponds		No
Recharge Source		POND #1
Additional Non-Potable Demand	(l/s)	0
Municipal Supply Available		No

Ground Cover Crop-Mix Profiles (Mix as %)

Crops	Profile #1	Profile #2	Profile #3
KENTUCKY BLUE GRASS	90	100	50
SAGE BRUSH	10	0	50
Unnamed 1	0	0	0
Unnamed 2	0	0	0
Unassigned	0	0	0

Irrigation Crop Profile or Scheduling Assignment:

Pervious Surface Cover Type			
Use Irrigation Schedule	No	Schedule Number	1
Use Crop Demand Profile	No	Profile Number	1
Absorbent Landscaping Cover Type			
Use Irrigation Schedule	No	Schedule Number	1
Use Crop Demand Profile	No	Profile Number	1
Green Roof Media			
Use Irrigation Schedule	No	Schedule Number	1
Use Crop Demand Profile	No	Profile Number	1

The City of Calgary Water Resources
Water Balance Spreadsheet for the City of Calgary - Version 1.2 - November 2011

WBSCC - PROJECT DATA SHEET - Sub-Catchment 2: Parameters, Runoff Allocation
Usage:

Sub-catchment Parameters		Cover Type					
		Impervious Surface	Pervious Surface	Absorbent Landscaping	Green Roof Media	Bioretention/ Bioswale Medium	Unassigned Area
Area (Total: 0.46)	(ha)	0.1845	0.144	0.1315	0	0	0
Depression Loss	(mm)	1.6					
Soil Type: Sand					100	90	
Silt			100	100	0	10	
Clay							
Custom							
Unassigned			0	0	0	0	
Soil or Media Depth	(mm)		150	500	200	1000	
Porosity			0.46	0.46	0.512	0.469	
Field Capacity			0.271	0.271	0.132	0.092	
Wilting Point			0.126	0.126	0.057	0.038	
Saturated Hydraulic Conductivity	(m/s)		5.00E-06	5.00E-06	2.50E-05	3.50E-05	
Sub-soil Hydraulic Conductivity	(m/s)		1.00E-08	1.00E-08		1.00E-06	
Ponding Depth	(mm)		0	0	0	300	
Inv. Slope of Log. Tension Moisture Curve			4.98	4.98	4.55	4.32	
Subdrain Invert (above bottom of media)	(mm)					0	
Subdrain Capacity	(m^3/s)					0.00026	

% of Runoff Allocated To:	Runoff Allocated from Cover Type/ Facility:						
	Impervious Surface	Pervious Surface	Absorbent Landscaping	Green Roof Media	Bioretention/ Bioswale Media	Storage/ Reuse Tank	Discharge
Pervious Surface	100			0			
Absorbent Landscaping	0	100		0			
Green Roof Media	0						
Storage/ Reuse Tank	0	0	0	0			
Bioretention/Bioswale Media	0	0	0	0			
Discharge	0	0	100	100	100	100	
Pond 1/Pond 2							POND #1

Consultant

WBSCC - PROJECT DATA SHEET - Sub-Catchment 1: Weekly Watering Schedule

Weekly Watering Schedule #1 (Depth of Irrigation) (mm)

	Sun	Mon	Tue	Wed	Thu	Fri	Sat
Jan							
Feb							
Mar							
Apr							
May						10	
Jun			10			15	
Jul		10		10		15	
Aug		10		10		15	
Sep			10			15	
Oct							
Nov							
Dec							

Weekly Watering Schedule #2 (Depth of Irrigation) (mm)

	Sun	Mon	Tue	Wed	Thu	Fri	Sat
Jan							
Feb							
Mar							
Apr							
May							30
Jun							30
Jul							30
Aug							30
Sep							30
Oct							
Nov							
Dec							

Precipitation treshold (mm) during irrigation day and preceding two days	10

WBSCC - PROJECT DATA SHEET - Sub-Catchment 1: Crops, Irrigation, Storage/Reuse Tank

Storage/ Reuse Tank Parameters		Values
Tank Water Surface Area (assumed bath tub)	(m^2)	
Spill Crest Elevation, above Tank Floor	(m)	
Starting Water Level	(m)	
Minimum Tank Water Elevation for Recharge	(m)	
Maximum Tank Water Elevation for Recharge	(m)	
Use Recharge from Storm Ponds		No
Recharge Source		POND #1
Additional Non-Potable Demand	(l/s)	0
Municipal Supply Available		No

Ground Cover Crop-Mix Profiles (Mix as %)

Crops	Profile #1	Profile #2	Profile #3
KENTUCKY BLUE GRASS	90	100	50
SAGE BRUSH	10	0	50
Unnamed 1	0	0	0
Unnamed 2	0	0	0
Unassigned	0	0	0

Irrigation Crop Profile or Scheduling Assignment:

Pervious Surface Cover Type			
Use Irrigation Schedule	No	Schedule Number	1
Use Crop Demand Profile	No	Profile Number	1
Absorbent Landscaping Cover Type			
Use Irrigation Schedule	No	Schedule Number	1
Use Crop Demand Profile	No	Profile Number	1
Green Roof Media			
Use Irrigation Schedule	No	Schedule Number	1
Use Crop Demand Profile	No	Profile Number	1

The City of Calgary Water Resources
Water Balance Spreadsheet for the City of Calgary - Version 1.2 - November 2011

WBSCC - PROJECT DATA SHEET - Sub-Catchment 1: Parameters, Runoff Allocation

Usage:

Sub-catchment Parameters		Cover Type					
		Impervious Surface	Pervious Surface	Absorbent Landscaping	Green Roof Media	Bioretention/ Bioswale Medium	Unassigned Area
Area (Total: 0.6)	(ha)	0.09	0.45	0.06	0	0	0
Depression Loss	(mm)	1.6					
Soil Type: Sand					100	90	
Silt			100	100	0	10	
Clay			0				
Custom							
Unassigned			0	0	0	0	
Soil or Media Depth	(mm)		150	500	200	600	
Porosity			0.46	0.46	0.512	0.469	
Field Capacity			0.271	0.271	0.132	0.092	
Wilting Point			0.126	0.126	0.057	0.038	
Saturated Hydraulic Conductivity	(m/s)		5.00E-06	5.00E-06	2.50E-05	3.50E-05	
Sub-soil Hydraulic Conductivity	(m/s)		1.00E-08	1.00E-08		1.00E-06	
Ponding Depth	(mm)		0	0	0	300	
Inv. Slope of Log. Tension Moisture Curve			4.98	4.98	4.55	4.32	
Subdrain Invert (above bottom of media)	(mm)					0	
Subdrain Capacity	(m^3/s)					0	

% of Runoff Allocated To:	Runoff Allocated from Cover Type/ Facility:						
	Impervious Surface	Pervious Surface	Absorbent Landscaping	Green Roof Media	Bioretention/ Bioswale Media	Storage/ Reuse Tank	Discharge
Pervious Surface	100			0			
Absorbent Landscaping	0	100		0			
Green Roof Media	0						
Storage/ Reuse Tank	0	0	0	0			
Bioretention/Bioswale Media	0	0	0	0			
Discharge	0	0	100	100	100	100	
Pond 1/Pond 2							POND #1

Consultant

WBSCC - PROJECT DATA SHEET - Environmental Information (Cont'd.)

Actual to Potential Evapotranspiration Modification Factors

Sand		Silt		Clay		Customized Media	
AW/AWC	F	AW/AWC	F	AW/AWC	F	AW/AWC	F
0	0	0	0	0	0	0	0
0.2	1	0.2	0.1	0.2	0.05	0.2	0.1
0.4	1	0.4	0.8	0.4	0.3	0.4	0.5
0.6	1	0.6	1	0.6	0.6	0.6	0.7
0.8	1	0.8	1	0.8	0.95	0.8	0.9
1	1	1	1	1	1	1	1
50	1	50	1	50	1	50	1
100	1	100	1	100	1	100	1

AW: Available Water Content (mm)
AWC: Available Water Capacity (mm)

The City of Calgary Water Resources
Water Balance Spreadsheet for the City of Calgary - Version 1.2 - November 2011

WBSCC - PROJECT DATA SHEET - Environmental Information

Minimum Temperature to Trigger Runoff (°C)	0
Sublimation Losses (%)	0
Precipitation Multiplication Factor (% Decrease)	0

Month	Is Winter or Summer?	Crop Water Requirement (mm/month)			
		KENTUCKY BLUE GRAS	SAGE BRUSH	Unnamed 1	Unnamed 2
January	Winter	0	0	0	0
February	Winter	0	0	0	0
March	Winter	0	0	0	0
April	Summer	0	0	0	0
May	Summer	110	50	0	0
June	Summer	110	50	0	0
July	Summer	110	60	0	0
August	Summer	110	50	0	0
September	Summer	110	50	0	0
October	Summer	0	20	0	0
November	Winter	0	0	0	0
December	Winter	0	0	0	0

Catchment Area Data

Sub-Catchment	Description of Sub-catchment Use	Area (ha)
Sub-Catchment 1		0.6
Sub-Catchment 2		0.46
Sub-Catchment 3		
Sub-Catchment 4		
Sub-Catchment 5		
Total		1.06

Pond Area Data

Pond	Description of Pond	Pond Area (m^2)
Pond 1		0
Pond 2		0

Consultant

WBSCC

Water Balance Spreadsheet for the City of Calgary
Version 1.2

PROJECT SUMMARY SHEET

Project Name:	BRAGG CREEK INDUSTRIAL
Project Description:	PROPOSED CONDITION
Location:	
Date:	2021-09-02
Designed by:	Jacky Wang
Company Name:	Richview Engineering Inc.
Reviewed by:	Robin Li

Consultant

SUBCATCHMENT 2	(mm)	(m3)
TOTAL MSC PRECIPITATION	20897.0	96126.2
AVERAGE PRECIPITATION	409.7	
MEDIAN PRECIPITATION	404.7	
TOTAL RUNOFF (INCLUDING SUBDRAIN)	731.7	3365.9
% OF RAINFALL AS RUNOFF	3.5	
AVERAGE RUNOFF (INCLUDING SUBDRAIN)	14.3	66.0
MEDIAN RUNOFF (INCLUDING SUBDRAIN)	8.3	38.2
TOTAL IRRIGATION DEMAND	0.0	0.0
MAXIMUM RUNOFF (ANY TIMESTEP)	48.3	222.1
AVERAGE EVAPORATION	380.7	1751.2
AVERAGE PERCOLATION	14.4	66.0
TOTAL RUNOFF + EVAP + PERCOLATION	409.4	1883.3

SC2: IMPERVIOUS AREA	(mm)	(m3)
TOTAL MSC PRECIPITATION	20897.0	0.0
TOTAL RUNOFF	15856.8	0.0
% OF RAINFALL AS RUNOFF	75.9	
AVERAGE RUNOFF	310.9	0.0
MEDIAN RUNOFF	307.0	0.0
MAXIMUM RUNOFF (ANY TIMESTEP)	91.0	0.0
TOTAL RUNON	0.0	0.0
TOTAL DEP STORAGE (EVAPORATION LOSS)	5033.6	0.0
TOTAL SUBLIMATION LOSS	0.0	0.0
SNOW PACK AT THE END OF SIMULATION	6.6	0.0
WATER BALANCE (OVER PERIOD OF RECORD)	0.0	0.0

ANNUAL SUMMARIES

IMPERVIOUS SURFACE

YEAR	MSC PRECIP	TOTAL RUNOFF	% RUNOFF	MAX RUNOFF
	(mm)	(mm)	(-)	(mm)
1960	373.0	277.4	74.4	34.1
1961	392.1	305.6	77.9	35.7
1962	285.3	187.2	65.6	27.4
1963	425.0	341.6	80.4	41.1
1964	392.4	283.1	72.1	38.5
1965	590.2	491.5	83.3	49.2
1966	403.7	322.4	79.9	53.3
1967	256.4	181.2	70.7	20.6
1968	358.6	253.0	70.6	38.3
1969	428.1	357.5	83.5	28.9

SUBCATCHMENT 1	(mm)	(m3)	
TOTAL MSC PRECIPITATION	20897.0	125382.0	
AVERAGE PRECIPITATION	409.7		
MEDIAN PRECIPITATION	404.7		
TOTAL RUNOFF (INCLUDING SUBDRAIN)	731.7	4390.4	
% OF RAINFALL AS RUNOFF	3.5		
AVERAGE RUNOFF (INCLUDING SUBDRAIN)	14.3	86.1	
MEDIAN RUNOFF (INCLUDING SUBDRAIN)	8.3	49.9	
TOTAL IRRIGATION DEMAND	0.0	0.0	
MAXIMUM RUNOFF (ANY TIMESTEP)	48.3	289.7	
AVERAGE EVAPORATION	380.7	2284.2	
AVERAGE PERCOLATION	14.4	86.1	
TOTAL RUNOFF + EVAP + PERCOLATION	409.4	2456.4	

SC1: IMPERVIOUS AREA	(mm)	(m3)	
TOTAL MSC PRECIPITATION	20897.0	0.0	
TOTAL RUNOFF	15856.8	0.0	
% OF RAINFALL AS RUNOFF	75.9		
AVERAGE RUNOFF	310.9	0.0	
MEDIAN RUNOFF	307.0	0.0	
MAXIMUM RUNOFF (ANY TIMESTEP)	91.0	0.0	
TOTAL RUNON	0.0	0.0	
TOTAL DEP STORAGE (EVAPORATION LOSS)	5033.6	0.0	
TOTAL SUBLIMATION LOSS	0.0	0.0	
SNOW PACK AT THE END OF SIMULATION	6.6	0.0	
WATER BALANCE (OVER PERIOD OF RECORD)	0.0	0.0	

SUBCATCHMENT 1

OVERALL WATER BALANCE OVE
TOTAL MSC PRECIPITATION
TOTAL EXTERNAL RUNON
TOTAL RUNOFF (INCLUDING SUB
TOTAL EVAPORATION IMPERVIOU
TOTAL EVAPOTRANSP PERVIOU:
TOTAL RECHARGE FROM PONDS
TOTAL PERCOLATION
TOTAL SUBLIMATION LOSSES
SNOW PACK AT THE END OF SIM
TANK WATER BALANCE
WATER BALANCE
CONTINUITY ERROR

SC1: PERVIOUS AREA

TOTAL MSC PRECIPITATION
TOTAL RUNOFF
% OF RAINFALL AS RUNOFF
AVERAGE RUNOFF
MEDIAN RUNOFF
MAXIMUM RUNOFF (ANY TIMESTE
TOTAL IRRIGATION DEMAND
AVERAGE IRRIGATION DEMAND
MEDIAN IRRIGATION DEMAND
TOTAL RUNON
AVERAGE RUNON
MEDIAN RUNON
TOTAL SEEPAGE
AVERAGE SEEPAGE
MEDIAN SEEPAGE
TOTAL EVAPORATION
AVERAGE EVAPORATION
MEDIAN EVAPORATION
TOTAL SUBLIMATION LOSSES
SNOW PACK AT THE END OF SIM

WBSCC - PROJECT DATA SHEET - Sub-Catchment 2: Weekly Watering Schedule

Weekly Watering Schedule #1 (Depth of Irrigation) (mm)

	Sun	Mon	Tue	Wed	Thu	Fri	Sat
Jan							
Feb							
Mar							
Apr							
May						10	
Jun			10			15	
Jul		10		10		15	
Aug		10		10		15	
Sep			10			15	
Oct							
Nov							
Dec							

Weekly Watering Schedule #2 (Depth of Irrigation) (mm)

	Sun	Mon	Tue	Wed	Thu	Fri	Sat
Jan							
Feb							
Mar							
Apr							
May							25
Jun							25
Jul							25
Aug							25
Sep							25
Oct							
Nov							
Dec							

Precipitation treshold (mm) during irrigation day and preceding two days	10

WBSCC - PROJECT DATA SHEET - Sub-Catchment 2: Crops, Irrigation, Storage/Reuse Tank

Storage/ Reuse Tank Parameters		Values
Tank Water Surface Area (assumed bath tub)	(m^2)	
Spill Crest Elevation, above Tank Floor	(m)	
Starting Water Level	(m)	
Minimum Tank Water Elevation for Recharge	(m)	
Maximum Tank Water Elevation for Recharge	(m)	
Use Recharge from Storm Ponds		No
Recharge Source		POND #1
Additional Non-Potable Demand	(l/s)	0
Municipal Supply Available		No

Ground Cover Crop-Mix Profiles (Mix as %)

Crops	Profile #1	Profile #2	Profile #3
KENTUCKY BLUE GRASS	90	100	50
SAGE BRUSH	10	0	50
Unnamed 1	0	0	0
Unnamed 2	0	0	0
Unassigned	0	0	0

Irrigation Crop Profile or Scheduling Assignment:

Pervious Surface Cover Type			
Use Irrigation Schedule	No	Schedule Number	1
Use Crop Demand Profile	No	Profile Number	1
Absorbent Landscaping Cover Type			
Use Irrigation Schedule	No	Schedule Number	1
Use Crop Demand Profile	No	Profile Number	1
Green Roof Media			
Use Irrigation Schedule	No	Schedule Number	1
Use Crop Demand Profile	No	Profile Number	1

WBSCC - PROJECT DATA SHEET - Sub-Catchment 2: Parameters, Runoff Allocation

Usage:

Sub-catchment Parameters		Cover Type					
		Impervious Surface	Pervious Surface	Absorbent Landscaping	Green Roof Media	Bioretention/ Bioswale Medium	Unassigned Area
Area (Total: 0.46)	(ha)	0	0.46	0	0	0	0
Depression Loss	(mm)	1.6					
Soil Type: Sand					100	90	
Silt			100	100	0	10	
Clay							
Custom							
Unassigned			0	0	0	0	
Soil or Media Depth	(mm)		150	300	200	1000	
Porosity			0.46	0.46	0.512	0.469	
Field Capacity			0.271	0.271	0.132	0.092	
Wilting Point			0.126	0.126	0.057	0.038	
Saturated Hydraulic Conductivity	(m/s)		5.00E-06	5.00E-06	2.50E-05	3.50E-05	
Sub-soil Hydraulic Conductivity	(m/s)		1.00E-08	1.00E-08		1.00E-06	
Ponding Depth	(mm)		0	0	0	300	
Inv. Slope of Log. Tension Moisture Curve			4.98	4.98	4.55	4.32	
Subdrain Invert (above bottom of media)	(mm)					0	
Subdrain Capacity	(m^3/s)					0.00026	

% of Runoff Allocated To:	Runoff Allocated from Cover Type/ Facility:						
	Impervious Surface	Pervious Surface	Absorbent Landscaping	Green Roof Media	Bioretention/ Bioswale Media	Storage/ Reuse Tank	Discharge
Pervious Surface	0			0			
Absorbent Landscaping	0	0		0			
Green Roof Media	0						
Storage/ Reuse Tank	0	0	0	0			
Bioretention/Bioswale Media	100	0	0	0			
Discharge	0	100	100	100	100	100	
Pond 1/Pond 2							POND #1

WBSCC - PROJECT DATA SHEET - Sub-Catchment 1: Weekly Watering Schedule

Weekly Watering Schedule #1 (Depth of Irrigation) (mm)

	Sun	Mon	Tue	Wed	Thu	Fri	Sat
Jan							
Feb							
Mar							
Apr							
May						10	
Jun			10			15	
Jul		10		10		15	
Aug		10		10		15	
Sep			10			15	
Oct							
Nov							
Dec							

Weekly Watering Schedule #2 (Depth of Irrigation) (mm)

	Sun	Mon	Tue	Wed	Thu	Fri	Sat
Jan							
Feb							
Mar							
Apr							
May							30
Jun							30
Jul							30
Aug							30
Sep							30
Oct							
Nov							
Dec							

Precipitation treshold (mm) during irrigation day and preceding two days	10

Consultant

WBSCC - PROJECT DATA SHEET - Sub-Catchment 1: Crops, Irrigation, Storage/Reuse Tank

Storage/ Reuse Tank Parameters		Values
Tank Water Surface Area (assumed bath tub)	(m^2)	
Spill Crest Elevation, above Tank Floor	(m)	
Starting Water Level	(m)	
Minimum Tank Water Elevation for Recharge	(m)	
Maximum Tank Water Elevation for Recharge	(m)	
Use Recharge from Storm Ponds		No
Recharge Source		POND #1
Additional Non-Potable Demand	(l/s)	0
Municipal Supply Available		No

Ground Cover Crop-Mix Profiles (Mix as %)

Crops	Profile #1	Profile #2	Profile #3
KENTUCKY BLUE GRASS	90	100	50
SAGE BRUSH	10	0	50
Unnamed 1	0	0	0
Unnamed 2	0	0	0
Unassigned	0	0	0

Irrigation Crop Profile or Scheduling Assignment:

Pervious Surface Cover Type			
Use Irrigation Schedule	No	Schedule Number	1
Use Crop Demand Profile	No	Profile Number	1
Absorbent Landscaping Cover Type			
Use Irrigation Schedule	No	Schedule Number	1
Use Crop Demand Profile	No	Profile Number	1
Green Roof Media			
Use Irrigation Schedule	No	Schedule Number	1
Use Crop Demand Profile	No	Profile Number	1

The City of Calgary Water Resources
Water Balance Spreadsheet for the City of Calgary - Version 1.2 - November 2011

WBSCC - PROJECT DATA SHEET - Sub-Catchment 1: Parameters, Runoff Allocation
Usage:

Sub-catchment Parameters		Cover Type					
		Impervious Surface	Pervious Surface	Absorbent Landscaping	Green Roof Media	Bioretention/ Bioswale Medium	Unassigned Area
Area (Total: 0.6)	(ha)	0	0.6		0	0	0
Depression Loss	(mm)	1.6					
Soil Type: Sand					100	90	
Silt			100	100	0	10	
Clay			0				
Custom							
Unassigned			0	0	0	0	
Soil or Media Depth	(mm)		150	600	200	600	
Porosity			0.46	0.46	0.512	0.469	
Field Capacity			0.271	0.271	0.132	0.092	
Wilting Point			0.126	0.126	0.057	0.038	
Saturated Hydraulic Conductivity	(m/s)		5.00E-06	5.00E-06	2.50E-05	3.50E-05	
Sub-soil Hydraulic Conductivity	(m/s)		1.00E-08	1.00E-08		1.00E-06	
Ponding Depth	(mm)		0	0	0	300	
Inv. Slope of Log. Tension Moisture Curve			4.98	4.98	4.55	4.32	
Subdrain Invert (above bottom of media)	(mm)					0	
Subdrain Capacity	(m^3/s)					0	

% of Runoff Allocated To:	Runoff Allocated from Cover Type/ Facility:						
	Impervious Surface	Pervious Surface	Absorbent Landscaping	Green Roof Media	Bioretention/ Bioswale Media	Storage/ Reuse Tank	Discharge
Pervious Surface	0			0			
Absorbent Landscaping	0	0		0			
Green Roof Media	0						
Storage/ Reuse Tank	0	0	0	0			
Bioretention/Bioswale Media	0	0	0	0			
Discharge	100	100	100	100	100	100	
Pond 1/Pond 2							POND #1

Consultant

WBSCC - PROJECT DATA SHEET - Environmental Information (Cont'd.)

Actual to Potential Evapotranspiration Modification Factors

Sand		Silt		Clay		Customized Media	
AW/AWC	F	AW/AWC	F	AW/AWC	F	AW/AWC	F
0	0	0	0	0	0	0	0
0.2	1	0.2	0.1	0.2	0.05	0.2	0.1
0.4	1	0.4	0.8	0.4	0.3	0.4	0.5
0.6	1	0.6	1	0.6	0.6	0.6	0.7
0.8	1	0.8	1	0.8	0.95	0.8	0.9
1	1	1	1	1	1	1	1
50	1	50	1	50	1	50	1
100	1	100	1	100	1	100	1

AW: Available Water Content (mm)
AWC: Available Water Capacity (mm)

The City of Calgary Water Resources
Water Balance Spreadsheet for the City of Calgary - Version 1.2 - November 2011

WBSCC - PROJECT DATA SHEET - Environmental Information

Minimum Temperature to Trigger Runoff (°C)	0
Sublimation Losses (%)	0
Precipitation Multiplication Factor (% Decrease)	0

Month	Is Winter or Summer?	Crop Water Requirement (mm/month)			
		KENTUCKY BLUE GRAS	SAGE BRUSH	Unnamed 1	Unnamed 2
January	Winter	0	0	0	0
February	Winter	0	0	0	0
March	Winter	0	0	0	0
April	Summer	0	0	0	0
May	Summer	110	50	0	0
June	Summer	110	50	0	0
July	Summer	110	60	0	0
August	Summer	110	50	0	0
September	Summer	110	50	0	0
October	Summer	0	20	0	0
November	Winter	0	0	0	0
December	Winter	0	0	0	0

Catchment Area Data

Sub-Catchment	Description of Sub-catchment Use	Area (ha)
Sub-Catchment 1		0.6
Sub-Catchment 2		0.46
Sub-Catchment 3		
Sub-Catchment 4		
Sub-Catchment 5		
Total		1.06

Pond Area Data

Pond	Description of Pond	Pond Area (m^2)
Pond 1		0
Pond 2		0

Consultant

WBSCC

Water Balance Spreadsheet for the City of Calgary
Version 1.2

PROJECT SUMMARY SHEET

Project Name:	BRAGG CREEK INDUSTRIAL
Project Description:	EXISTINGCONDITION
Location:	
Date:	2021-09-02
Designed by:	Jacky Wang
Company Name:	Richview Engineering Inc.
Reviewed by:	Robin Li

Consultant

Richview *Engineering Inc.*
Unit D, 203-38 Avenue N.E. Tel: (403)230-3218
Calgary AB T2E 2M3

September 13, 2021 Our file#: 1340

Re: Stormwater Technical Memo for the [redacted]
Lot 5, Block 1, Plan 831 1642

Please note that we are engaged by the owner to provide Stormwater Management calculation for the above project to support the proposed site grading design.

The site is located in Bragg Creek with a municipal address of [redacted]

We proposed to have 2 new buildings on the east and south side of the site with an gravel access road to Pine Ridge Road.

The target is to keep the annual runoff volumes under the proposed condition equal or less than the existing condition. We have calculated the annual runoff volume by the Water Balance Sheet. Please refer to the Site Grading and Overland Drainage Plan (Drawing 01) for the site grading design and overland drainage design, as well as the stormwater calculation.

The Plan identifies the location of the proposed homes as well as the proposed gravel access road and proposed absorbent landscaping area.

Below is the table showing pervious / impervious area and the Average Runoff Volume for the Existing Condition and Proposed Condition by Water Balance Sheet.

TABLE 1

	Area NO.	Total Area (ha)	Impervious Area (ha)	Pervious Area (ha)	Absorbent Landscaping Area (ha)	Average Volume (mm)
Existing Condition	1	0.6	0	0.6	0	**86.1**
Proposed Condition	1	0.6	0.09	0.45	0.06	**81.7**
Existing Condition	2	0.46	0	0.46	0	**66.0**
Proposed Condition	2	0.46	0.1845	0.1440	0.1315	**66.5**

As per the table above, the Average Volume of the Proposed Condition will be equal or less than the Existing Condition.

Should you have any concern or question, please feel free to contact myself @ 403-230-3218.
Yours truly,

Robin Li
Richview Engineering

PRAIRIEGEO ENGINEERING LTD.
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, PrairieGEO 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 PrairieGEO 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. PrairieGEO 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 PrairieGEO to properly advise and assist the CLIENT, PrairieGEO 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 PrairieGEO by the CLIENT, communications between PrairieGEO and the CLIENT, and to any other reports, writings or documents prepared by PrairieGEO 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 PrairieGEO, reference must be made to the whole of the Report. PrairieGEO 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. PrairieGEO 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 PrairieGEO.

5. **LIMITATIONS ON SCOPE OF INVESTIGATION AND WARRANTY DISCLAIMER**
   There is no warranty, expressed or implied, by PrairieGEO 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, PrairieGEO 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 PrairieGEO'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 PrairieGEO's standard Consulting Services Agreement. Further, the CLIENT has agreed that to the fullest extent permitted by law PrairieGEO 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 PrairieGEO, 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 PrairieGEO's work, reports or recommendations.

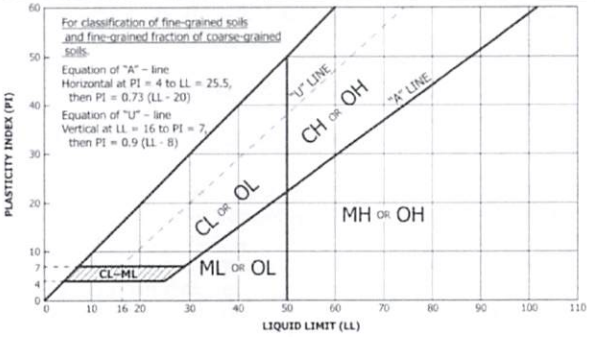
EXPLANATION OF TERMINOLOGY AND SYMBOLS

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	$C_U = \frac{D_t}{D_{1C}} \geq 4$ AND $Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1$ 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	$C_U = \frac{D_t}{D_{1C}} \geq 6$ AND $Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1$ 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.



EXPLANATION OF TERMINOLOGY AND SYMBOLS

1. **PRINCIPAL SOIL TYPE –** Major soil type

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. **MINOR SOIL TYPE -** 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 –** Terms as per 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.

PROJECT: Proposed Shop and Arena Buildings	LOCATION: [redacted]	TESTPIT ID: TP02
PROJECT NO: PGE21-82	DATE: August 17, 2021	
CLIENT: Premier Building Solutions c/o Film Alberta Studios	DRILLING METHOD: Excavation	

DEPTH (m)	ELEVATION (m)	SOIL PROFILE	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	Water Content (20 40 60 80)	Shear Str (kPa) (50 100 150 200) / Pocket Pen (bar) (1 2 3 4)	COMMENT
0	-0.150		TOPSOIL, moderate organic, moist, brown.					
			CLAYEY GRAVELS, gravel-sand-clay mixtures, stiff, low plastic, brown, moist.					
1.0	-1.500		End of test pit at 1.5 m.					
2.0								
3.0								
4.0								

PrairieGEO Engineering

Logged by: JN

Ground Elevation: Grade

UTM Coordinates:

PROJECT: Proposed Shop and Arena Buildings	LOCATION: [redacted]	TESTPIT ID: TP01
PROJECT NO: PGE21-82	DATE: August 17, 2021	
CLIENT: Premier Building Solutions c/o Film Alberta Studios	DRILLING METHOD: Excavation	

DEPTH (m)	ELEVATION (m)	SOIL PROFILE	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	Water Content (20 40 60 80)	Shear Str (kPa) (50 100 150 200) / Pocket Pen (bar) (1 2 3 4)	COMMENT
0	-0.200		TOPSOIL, moderate organic, moist, brown.					
			CLAYEY GRAVELS, gravel-sand-clay mixtures, stiff, low plastic, brown, moist.					
1.0								
2.0								
	-2.500		End of test pit at 2.5 m.					
3.0								
4.0								

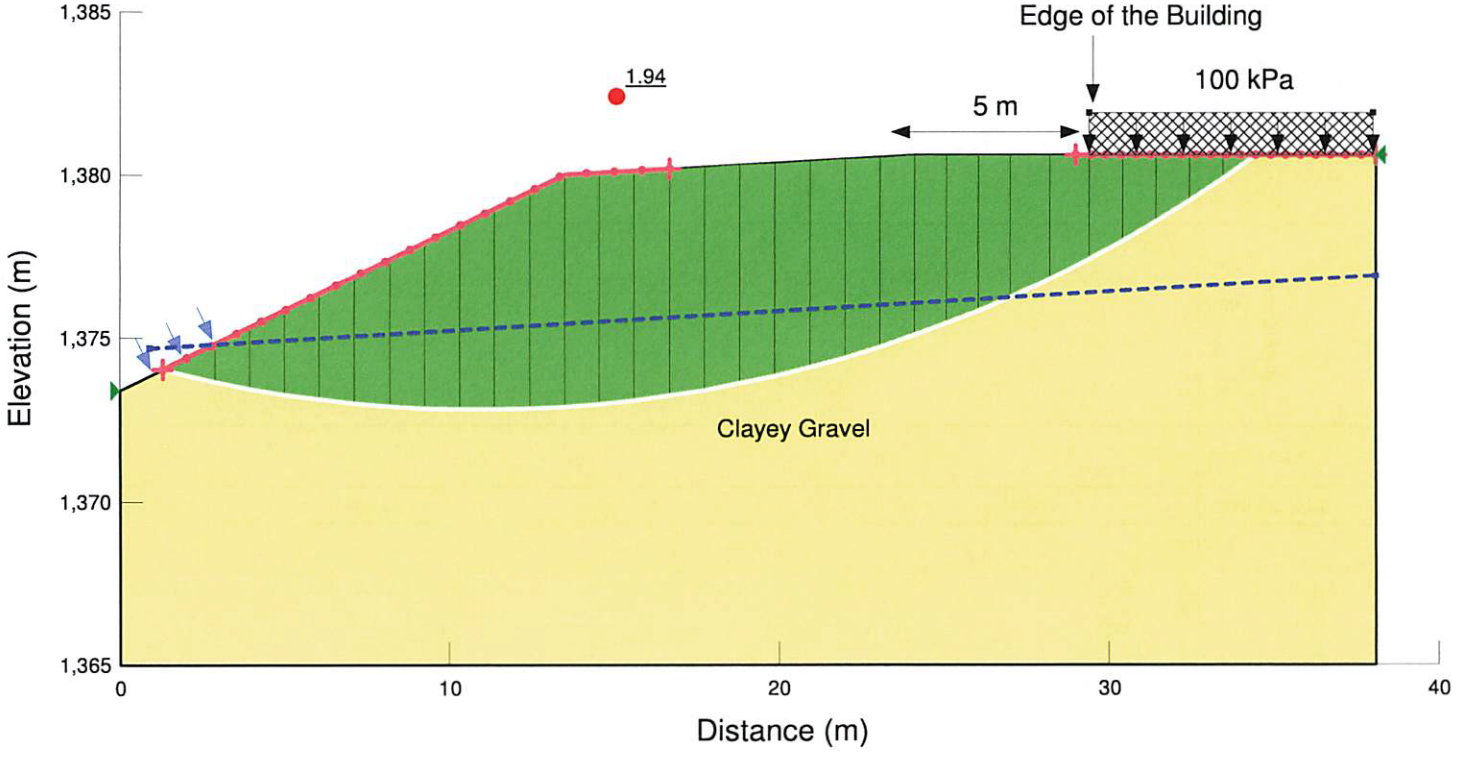
PrairieGEO Engineering

Logged by: JN

Ground Elevation: Grade

UTM Coordinates:

Color	Name	Model	Unit Weight (kN/m³)	Cohesion' (kPa)	Phi' (°)	Phi-B (°)	Piezometric Line
	Clayey Gravel	Mohr-Coulomb	19	0	28	0	1

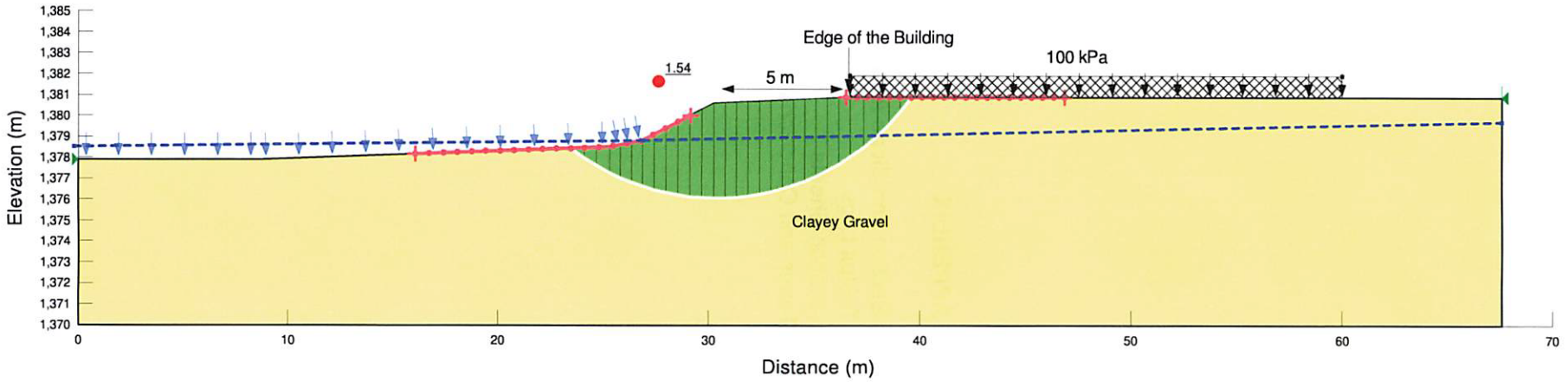


PrairieGEO Engineering

BB' - LONG TERM WITH PROPOSED BUILDING

PROJECT:	[redacted]	**DATE:**	2022-01-05
PROJECT ID:	PGE21-82	**FIGURE:**	A2

Color	Name	Model	Unit Weight (kN/m³)	Cohesion' (kPa)	Phi' (°)	Phi-B (°)	Piezometric Line
	Clayey Gravel	Mohr-Coulomb	19	0	28	0	1



PrairieGEO Engineering

AA' - LONG TERM WITH PROPOSED BUILDING

PROJECT:	[redacted]	**DATE:**	2022-01-05
PROJECT ID:	PGE21-82	**FIGURE:**	A1

APPENDIX

Figure A1 & A2 – Cross Section and Slope Analysis Results
Testpit Logs
Explanation Sheets
General Terms and Conditions

AUGUST 17, 2021 - LOOKING AT THE SITE FROM WEST TOWARDS EAST

JANUARY 3, 2022 - LOOKING AT THE POND FROM ARENA AREA TOWARDS WEST.

PREPARED BY:

PrairieGEO Engineering

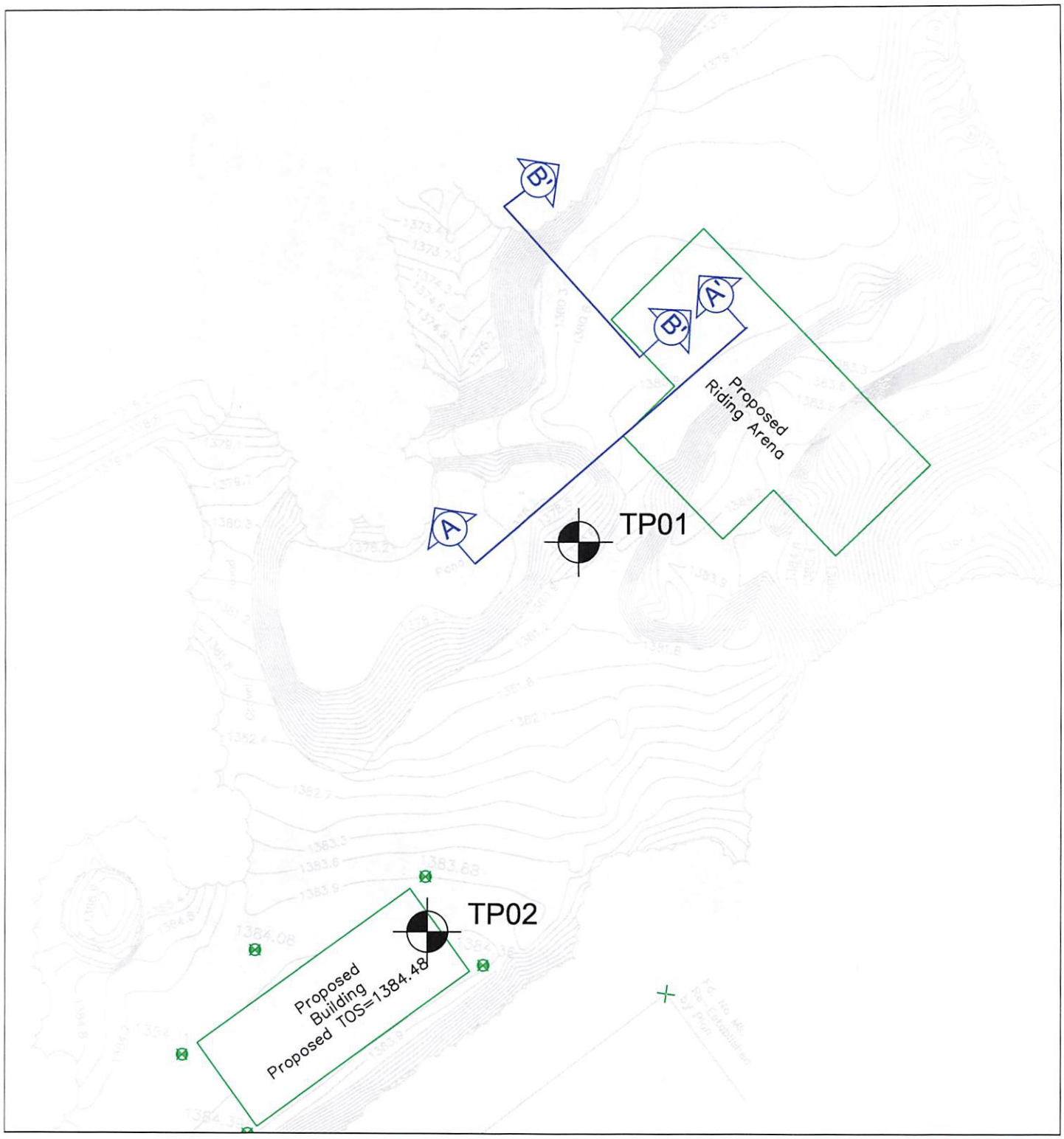
PHOTOGRAPH

[redacted]

DRAWN:	REVIEWED:	REV #:	DATE:
JL	JZ	0	JANUARY 2022
SCALE:	JOB NO.		DRAWING NO.
NTS	PGE21-82		3

PREPARED FOR:

PREMIER BUILDING SOLUTIONS



SCALE (metres)

-20 -10 0 10 20 40

PREPARED BY:

PrairieGEO Engineering

SITE PLAN & CROSS SECTION

[redacted]

DRAWN:	REVIEWED:	REV #:	DATE:
JL	JZ	0	JANUARY 2022
SCALE:	JOB NO.		DRAWING NO.
1:1000	PGE21-82		2

PREPARED FOR:

PREMIER BUILDING SOLUTIONS

PREPARED BY:

PrairieGEO Engineering

KEY PLAN

[redacted]

DRAWN:	REVIEWED:	REV #:	DATE:
JL	JZ	0	JANUARY 2022

SCALE:	JOB NO.	DRAWING NO.
NTS	PGE21-82	1

PREPARED FOR:

PREMIER BUILDING SOLUTIONS

FIGURES

Figure 1 - Key Plan
Figure 2 – Site / Cross Section Plan
Figure 3 – Site Photographs

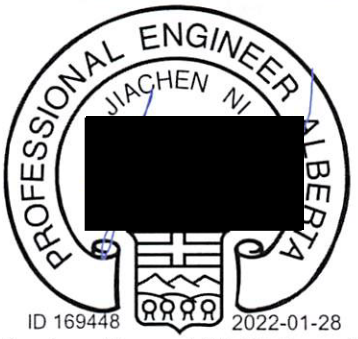
7.0 CLOSURE

Geological conditions are variable. At the time this report was prepared, information on the subsurface conditions from the field observations. Therefore, it was necessary to make certain assumptions concerning conditions across the site. 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 the **Premier Building Solutions c/o Film Alberta Studios,** and their approved agents, for the specified application of Geotechnical and Slope Stability Assessment project located at [redacted] 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 the original report (a copy of which is attached).

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,
PRAIRIEGEO ENGINEERING LTD.



Jiachen (Jason) Ni, M.Eng., P.Eng.
Principal Geotechnical Engineer

PERMIT TO PRACTICE
PRAIRIEGEO ENGINEERING LTD.
RM SIGNATURE: [redacted]
RM APEGA ID #: 169448
DATE: 2022-01-28
PERMIT NUMBER: P015159
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

6.5 FLEXIBLE ASPHALT PAVEMENTS

The proposed pavement design sections are based on the assumption that the pavement will be constructed on a stable, prepared subgrade with a soaked California Bearing Ratio (CBR) of 3.0. Proposed parking lots may be considered to carry mainly light-duty traffic with occasional heavy-duty traffic. Light-duty traffic areas are assumed to be used only by cars and light trucks (i.e., vans and ½-ton pickups). Heavy-duty traffic areas, including the main access road and other designated areas, are assumed to be used by heavier vehicles, such as transport vehicles, garbage trucks, and delivery trucks. Using the subgrade conditions and subgrade preparation described above, the recommended pavement structures are presented in the following table.

TABLE 4
FLEXIBLE PAVEMENT DESIGN

	Light	Heavy
Asphalt Concrete (City of Calgary Mix Type B or Equivalent)	75 mm	100 mm
20 mm Crushed Base Gravel	200 mm	150 mm*
63 or 80 mm Pitrun Gravel (Minimum)	-	250 mm*

*Alternatively, a single layer with a thickness of 400 mm of 20 mm granular base may be used.

The proposed pavement sections are considered to be the minimum assuming a stable prepared subgrade. If soft subgrade conditions are encountered, it is assumed that the subgrade will be improved with select clay fill or coarse gravel to support construction traffic and paving activities.

6.4 BUILDING FOUNDATIONS

6.4.1 Footings

Standard house basement foundations using strip and spread footings will generally be acceptable at this site. Footings based on gravel layer or native clayey gravel within 2 m below grade may be designed based on a maximum allowable bearing pressure of 120 kPa for strip footings and 150 kPa for pad footings placed on undisturbed inorganic soil free from loosened material. The design and construction of private building foundations should conform to all applicable local building codes. 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. If localized soft subgrade areas are encountered, it may be necessary to found footings on an engineered granular mat to distribute the load on the weaker subgrade soils. The decision to construct footings on an engineered gravel mat is best made at the time of construction when footing subgrade soils are exposed.

6.4.2 Grade Supported Slabs

Grade supported basement floor slabs, supported by the native clay till deposits or engineered fill prepared as described in Section 6.3, are expected to perform adequately at this site. The magnitude of the expected vertical slab movements is considered to be within acceptable design tolerance. If proposed, grade supported floor slabs in continuously heated buildings should be designed based on a modulus of subgrade reaction (K_s) of 35,000 kN/m^3 for slabs placed on at least 150 mm of compacted gravel base. The following recommendations should be followed:

1. Lightly loaded (less than 10 kPa) grade supported concrete slabs should be underlain with 150 mm of well graded, free draining; crushed gravel compacted to 95 percent of SPMDD.

2. Concrete flatwork will experience shrinkage cracking and must be placed the floor with a high level of workmanship. Slabs should be provided with construction joints or saw cuts in accordance with local practice. The concrete slab should be reinforced with steel bars and dimensioned in accordance with the structural engineer's requirements.

3. Slabs should be constructed independently of all walls, columns and grade beams. Slab on grade floors should be tied into the grade beam with dowels at doorways. Alternatively, the slab may be tied to grade beams if a construction joint is placed parallel to the wall at a distance of about 2.0 m.

4. Non-load bearing partitions should be designed to accommodate slight vertical movements. Mechanical equipment placed on floor slabs should be designed to permit some relevelling should the equipment be susceptible to small changes in level.

6.3.4 Fill Placement and Compaction

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

TABLE 3
RECOMMENDED FILL COMPACTION SPECIFICATIONS

Fill Location	Minimum Compaction (% SPMDD*)	Moisture Content (% of 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%
Foundation Backfill	95 to 98%	±2%
Other Development Areas		
Subgrade preparation (within 1.0 m of final grade)	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. 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 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.

LAND TITLE CERTIFICATE

S

LINC	SHORT LEGAL	TITLE NUMBER
0014 067 573	8311642;1;5	211 178 652

LEGAL DESCRIPTION

PLAN 8311642
BLOCK ONE (1)
LOT FIVE (5)
CONTAINING 52.21 HECTARES (129.01 ACRES) MORE OR LESS
EXCEPTING THEREOUT

PLAN	NUMBER	HECTARES	ACRES
SUBDIVISION	8911620	4.71	11.6
SUBDIVISION	9011185	23.44	57.9

EXCEPTING THEREOUT ALL MINES AND MINERALS

ATS REFERENCE: 5;4;22;8;S
ESTATE: FEE SIMPLE

MUNICIPALITY: FOOTHILLS COUNTY

REFERENCE NUMBER: 181 269 489

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
211 178 652	16/09/2021	TRANSFER OF LAND	$3,289,094	SEE INSTRUMENT

OWNERS

FILM ALBERTA STUDIOS INC.
[redacted]

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
831 107 213	13/06/1983	UTILITY RIGHT OF WAY GRANTEE - CANADIAN WESTERN NATURAL GAS COMPANY LIMITED.

(CONTINUED)

REGISTRATION
NUMBER DATE (D/M/Y) PARTICULARS

181 269 490 14/12/2018 MORTGAGE
MORTGAGEE - THE TORONTO DOMINION BANK.
500 EDMONTON CITY CENTRE EAST
EDMONTON
ALBERTA T5J5E8
ORIGINAL PRINCIPAL AMOUNT: $2,270,400

TOTAL INSTRUMENTS: 002

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 5 DAY OF DECEMBER, 2022 AT 09:11 A.M.

ORDER NUMBER: 46002919

CUSTOMER FILE NUMBER:

END OF CERTIFICATE