Part 2 — Technical Requirements

NRCB Natural Resources Conservation Board

Application under the *Agricultural Operation Practices Act* for a confined feeding operation, manure collection area, and/or manure storage facility(ies)

NRCB USE ONLY	Application number	Legal land description
☑ Approval ☐ Registration ☐ Authorization ☐ Amendment	RA25035	NW-09-047-27 W4

APPLICATION DISCLOSURE

This information is collected under the authority of the *Agricultural Operation Practices Act* (AOPA), and is subject to the provisions of the *Freedom of Information and Protection of Privacy Act*. This information is public unless the NRCB grants a written request that certain sections remain private.

Any construction prior to obtaining an NRCB permit is an offence and is subject to enforcement action, including prosecution.

I, the applicant, or applicant's agent, have read and understand the statements above, and I acknowledge that the information provided in this application is true to the best of my knowledge.

5/9/2025	Signed digitally by Henk and Lizette Schrijv
Date of signing	Signature
New Mars Dairy Ltd	Henk and Lizette Schrijver
Corporate name (if applicable)	Print name

GENERAL INFORMATION REQUIREMENTS

Proposed facilities: list all proposed confined feeding operation facilities and their dimensions. Indicate whether any of the proposed facilities are additions to existing facilities. (attach additional pages if needed)

Proposed facilities	Dimensions (m) (length, width, and depth)
~~4 pens : Feedlot~~	~~122 x 56.5 x 0.1~~
Catchbasin for 4 pens : Catch Basin	120 x 13 x ~~2~~ 1.5 deep
AO note: on August 6, 2025, the applicant indicated in an email that they would like to change the proposed pen area to the following facilities:	
Heifer shed = 122 m x 20 m Livestock pen = 122 m x 36.5 m	
Additionally, on August 12, 2025, the applicant stated in a phone call that they would like to change the depth of the catch basin to 1.5 m deep.	

Existing facilities: list **ALL** existing confined feeding operation facilities and their dimensions

Existing facilities	Dimensions (m) (length, width, and depth)	NRCB USE ONLY
heifer shed: Open Faced Shelter	122 x 20 x ~~1~~	
catch basin: Catch Basin	30 x 26 x 2 deep (aboveground)	
Livestock pen	122 m x 36.5 m	

NRCB USE ONLY

Existing facilities confirmed; permitted under RA23018

Last updated September 11, 2023

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If a new facility is replacing an old facility, please explain what will happen to the old facility and when. ☑ **N/A**

Construction completion date for proposed facilities 12/1/2026, 5/8/2025

Additional information

Livestock numbers: Complete only if livestock numbers are different from what was identified in the Part 1 application. Note: if livestock numbers increase in your Part 2 application, a new Part 1 application must be submitted which may result in a loss of priority for minimum distance separation (MDS).

Livestock category and type (Available in the Schedule 2 of the Part 2 Matters Regulation)	**Permitted number**	**Proposed increase or decrease in number (if applicable)**	**Total**
Beef feeders	250	100	350
Beef feeder calves	250	550	800
AO note: No change from Part 1			

Last updated September 11, 2023

Part 2 — Technical Requirements

NRCB Natural Resources Conservation Board

Application under the *Agricultural Operation Practices Act* for a confined feeding operation, manure collection area, and/or manure storage facility(ies)

DECLARATION AND ACKNOWLEDGMENT OF APPLICANT CONCERNING *WATER ACT* LICENCE

issued by Alberta Environment and Protected Areas (EPA) for a confined feeding operation (CFO)

Date and sign one of the following four options

OPTION 1: Applying through the NRCB for both the AOPA permit and the *Water Act* licence

I **DO** want my water licence application coupled to my AOPA permit application.

Signed this ____day of _____, 20____. _____

Signature of Applicant or Agent

OPTION 2: Processing the AOPA permit and *Water Act* licence separately

1. I (we) acknowledge that the CFO will need a new water licence from EPA under the *Water Act* for the development or activity proposed in this AOPA application.
2. I (we) request that the NRCB process the AOPA application **independently of** EPA's processing of the CFO's application for a water licence.
3. In making this request, I (we) recognize that, if this AOPA application is granted by the NRCB, the NRCB's decision will not be considered by EPA as improving or enhancing the CFO's eligibility for a water licence under the *Water Act*.
4. I (we) acknowledge that any construction or actions to populate the CFO with livestock pursuant to an AOPA permit in the absence of a *Water Act* licence will **not** be relevant to EPA's consideration of whether to grant the *Water Act* licence application.
5. I (we) acknowledge that any such construction or livestock populating will be at the CFO's sole risk if the *Water Act* licence application is denied or if the operation of the CFO is otherwise deemed to be in violation of the *Water Act*. This risk includes being required to depopulate the CFO and/or to cease further construction, or to remove "works" or "undertakings" (as defined in the *Water Act*).
6. **AS RELEVANT:** I (we) acknowledge that the CFO is located in the South Saskatchewan River Basin and that, pursuant to the *Bow, Oldman and South Saskatchewan River Basin Water Allocation Order* [Alta. Reg. 171/2007], this basin is currently closed to new surface water allocations.
7. **Provide:** Water licence application number(s) _____

Signed this ____ day of _____, 20____. _____

Signature of Applicant or Agent

OPTION 3: Additional water licence not required

1. I (we) declare that the CFO will not need a new licence from EPA under the *Water Act* for the development or activity proposed in this AOPA application.
2. **Provide**: Water license number(s) or water conveyance agreement details _____

00168545-00-00

Signed this 8 day of May, 2025. Signed digitally by Henk and Lizette Schrijv

Signature of Applicant or Agent

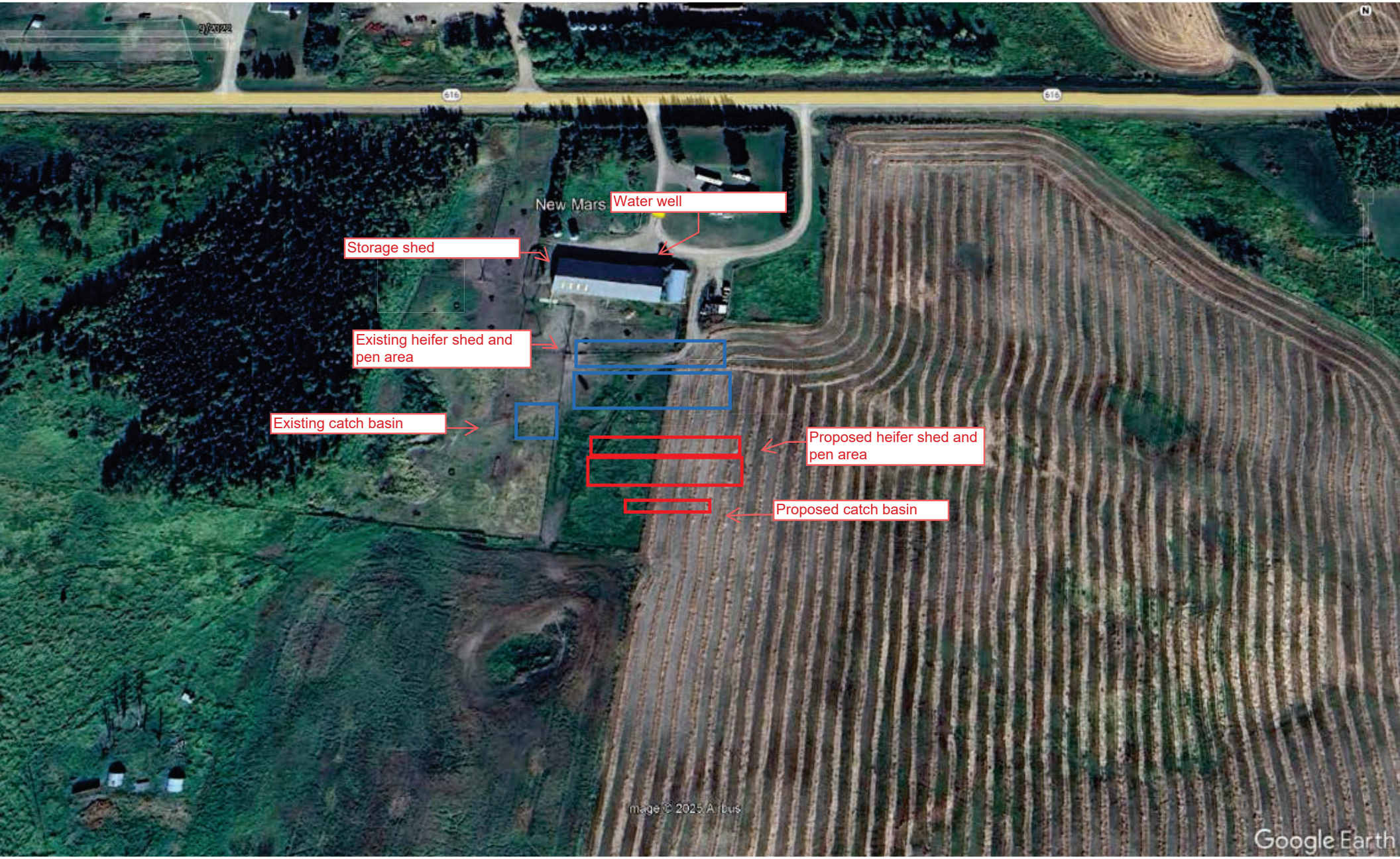
OPTION 4: Uncertain if *Water Act* licence is needed; acknowledgement of risk (for existing CFOs only)

1. At this time, I (we) do not know whether a new water licence is needed from EPA under the *Water Act* for the development or activity proposed in this AOPA application.
2. If a new *Water Act* licence is needed, I (we) request that the NRCB process the AOPA application **independently of** EPA's processing of the CFO's application for a water licence.
3. In making this request, I (we) recognize that, if this AOPA application is granted by the NRCB, the NRCB's decision will not be considered by EPA as improving or enhancing the CFO's eligibility for a water licence under the *Water Act*.
4. I (we) acknowledge that any construction or actions to populate the CFO with additional livestock pursuant to an AOPA permit in the absence of a *Water Act* licence will **not** be relevant to EPA's consideration of whether to grant my *Water Act* licence application, if a new water licence is needed.
5. I (we) acknowledge that any such construction or livestock increase will be at the CFO's sole risk if the *Water Act* licence application is denied or if the operation of the CFO is otherwise deemed to be in violation of the *Water Act*. This risk includes being required to depopulate the CFO and/or to cease further construction, or to remove "works" or "undertakings" (as defined in the *Water Act*).
6. **AS RELEVANT:** I (we) acknowledge that the CFO is located in the South Saskatchewan River Basin and that, pursuant to the *Bow, Oldman and South Saskatchewan River Basin Water Allocation Order* [Alta. Reg. 171/2007], this basin is currently closed to new surface water allocations.
7. **Provide**: Water license number(s) or water conveyance agreement details _____

_____

Signed this ____ day of _____, 20____. _____

Signature of Applicant or Agent


New Mars
Water well
Storage shed
Existing heifer shed and pen area
Existing catch basin
Proposed heifer shed and pen area
Proposed catch basin
Image © 2025 Airbus
Google Earth

Part 2 — Technical Requirements

NRCB Natural Resources Conservation Board

Application under the *Agricultural Operation Practices Act* for a confined feeding operation, manure collection area, and/or manure storage facility(ies)

GENERAL ENVIRONMENTAL INFORMATION

(complete this section for the worst case of the existing facility which is the closest to water bodies or water wells and for each of the proposed facilities)

Facility description / name *(as indicated on site plan)*

Existing: heifer shed **Proposed 1:** 4 pens

Proposed 2: Catchbasin for 4 pens **Proposed 3:**

Facility and environmental risk information		Facilities				NRCB USE ONLY	
		Existing	Proposed 1	Proposed 2	Proposed 3	Meets requirements	Comments
Flood plain information	What is the elevation of the floor of the lowest manure storage or collection facility above the 1:25 year flood plain or the highest known flood level?	☐ >1 m ■ ≤ 1 m	■ >1 m ☐ ≤ 1 m	■ >1 m ☐ ≤ 1 m	☐ > 1 m ☐ ≤ 1 m	☒ YES ☐ NO ☐ YES with exemption	Not located in a flood plain
Surface water information	How many springs are within 100 m of the manure storage facility or manure collection area?	0	0	0		☒ YES ☐ NO ☐ YES with exemption	None, confirmed on site
	How many water wells are within 100 m of the manure storage facility or manure collection area?	0	0	0		☒ YES ☐ NO ☐ YES with exemption	None within 100 meters of CFO facilities
	What is the shortest distance from the manure collection or storage facility to a surface water body? (e.g., lake, creek, slough, seasonal)	2500	2500	2500		☒ YES ☐ NO ☐ YES with exemption	Slough ~280 m west of existing catch basin
Groundwater information	What is the depth to the water table?	2.5	2.5	3.7		☒ YES ☐ NO ☐ YES with exemption	>3.7 m from drilling reports
	What is the depth to the groundwater resource/aquifer you draw water from?	33.5	33.5	30.5		☒ YES ☐ NO ☐ YES with exemption	30.5 from water well ID 285587

Additional information (attach supporting information, e.g. borehole logs, records, etc. you consider relevant to your application)

Part 2 — Technical Requirements

Application under the *Agricultural Operation Practices Act* for a confined feeding operation, manure collection area, and/or manure storage facility(ies)

NRCB USE ONLY

WATER WELL AND SURFACE WATER INFORMATION

Well IDs: 285587 _____ _____ _____

_____ _____ _____

Surface water related concerns from directly affected parties or referral agencies: ☐ YES ☒ NO

Groundwater related concerns from directly affected parties or referral agencies: ☐ YES ☒ NO

Water wells ☒ N/A

If applicable, exemption for 100 m distance requirements applied: ☐ YES ☐ NO Condition required: ☐ YES ☐ NO

Surface water ☒ N/A

If applicable, exemption for 30 m distance requirements applied: ☐ YES ☐ NO Condition required: ☐ YES ☐ NO

Water Well Exemption Screening Tool ☐ N/A

Water Well ID	Preliminary Screening Score	Secondary Screening Score	Facility

Groundwater or surface water related comments:

N/A

Part 2 — Technical Requirements

Application under the *Agricultural Operation Practices Act* for a confined feeding operation, manure collection area, and/or manure storage facility(ies)

NRCB USE ONLY

ENVIRONMENTAL RISK SCREENING INFORMATION

ERST for **proposed** facilities

Facility	Groundwater score	Surface water score	File number
New (south) heifer shed	low	low	RA25035
New (south) pen	low	low	RA25035
New (south) catch basin	low	low	RA25035

ERST for **existing** facilities

Facility	Groundwater score	Surface water score	File number
Existing heifer shed	low	low	RA23018
Existing pen	↓	↓	↓
Existing catch basin	↓	↓	↓

ERST related comments:

Part 2 — Technical Requirements

NRCB Natural Resources Conservation Board

Application under the *Agricultural Operation Practices Act* for a confined feeding operation, manure collection area, and/or manure storage facility(ies)

DISTANCE OF ANY MANURE STORAGE FACILITY (EXISTING OR PROPOSED) TO NEIGHBOURING RESIDENCES

			NRCB USE ONLY				
Neighbour name(s)	**Legal land description**	**Distance (m)**	**Zoning (LUB) category**	**MDS category (1-4)**	**Distance (m)**	**Waiver attached (if required)**	**Meets regulations**
K HARDEN	SW 16-47-27-4	370	Ag	1	370	N/A	Yes
J HEMMINGS	NW 9-47~~27~~-4	450	↓	↓	450	↓	↓
B HARDEN SE-16-47-27-W4	~~SE 16-727-4~~	700	↓	↓	700	↓	↓
K HARDEN	NE 9-47-27-4	460	↓	↓	460	↓	↓

LAND BASE FOR MANURE AND COMPOST APPLICATION (complete only if an increase in livestock or manure production will occur)

				NRCB USE ONLY	
Name of land owner(s)*	**Legal land description**	**Usable area** (ha)**	**Soil zone ***	**Usable area (ha)**	**Agreement attached (if required)**
Henk and Lizette Schrijver	NW-09-047-27 W4	0	~~Brown~~ Black		
Henk and Li	SE-09-47-27-W4	55	~~Brown~~ Black		N/A
			Total	55 ha	

* If you are **not** the registered landowner, you must attach copies of land use agreements signed by all landowners.

** Available manure spreading area (excluding setback areas from residences, common bodies of water, water wells, etc. as identified in Agdex 096-5 Manure Spreading Regulations)

*** Brown, dark brown, black, grey wooded, or irrigated

Additional information (attach any additional information as required)

Part 2 — Technical Requirements

Application under the *Agricultural Operation Practices Act* for a confined feeding operation, manure collection area, and/or manure storage facility(ies)

NRCB USE ONLY

MINIMUM DISTANCE SEPARATION

Methods used to determine distance (if applicable): Google Earth

Margin of error (if applicable): +/- 3 m

Requirements (m): Category 1: 280 Category 2: 374 Category 3: 467 Category 4: 748

Technology factor: ☐ YES ☒ NO

Expansion factor: ☐ YES ☒ NO

MDS related concerns from directly affected parties or referral agencies: ☐ YES ☒ NO

LAND BASE FOR MANURE AND COMPOST APPLICATION

Land base required: 32.7 ha

Land base listed: 55 ha

Area not suitable: Accounted for

Available area 55 ha Requirement met: ☒ YES ☐ NO

Land spreading agreements required: ☐ YES ☒ NO

Manure management plan: ☐ YES ☒ NO If yes, plan is attached: ☐

PLANS

Submitted and attached construction plans: ☐ YES ☒ NO

Submitted aerial photos: ☒ YES ☐ NO

Submitted photos: ☐ YES ☒ NO

GRANDFATHERING

Already completed: ☐ YES ☐ NO ☒ N/A

If already completed, see _____

Part 2 – Technical Requirements

NRCB Natural Resources Conservation Board

Application under the *Agricultural Operation Practices Act* for a confined feeding operation, manure collection area and/or manure storage facility(ies)

SOLID MANURE, COMPOST, & COMPOSTING MATERIALS: Barns, feedlots, & storage facilities - Concrete liner

*(complete a copy of this section for **EACH** barn, feedlot, and storage facility for solid manure, composting materials, or compost with a concrete liner)*

Facility description / name *(as indicated on site plan)* 1. Heifer Shed

2. _____

Manure storage capacity

	Length (m)	Width (m)	Depth below grade to the bottom of the liner (m)	NRCB USE ONLY Estimated storage capacity (m^3)
1.	~~120 m~~ 122	20 m	0	
2.				
			TOTAL CAPACITY	Sufficient storage with STMS

☑ I plan to use a short-term solid manure storage (STMS) as part of my manure storage and handling plan for this CFO. The AOPA requirements for STMS are set out in the NRCB Short-Term Solid Manure Storage Requirements Fact Sheet.

Surface water control systems

Describe the run-on and runoff control system

No run-on because it is on a hill
Runoff will be collected in a catch basin
Shed will be covered by a roof. Roof runoff will be diverted west away from pen and catch basin

Liner protection

Describe how the physical integrity of the liner will be maintained

We will check for cracks when we clean out regularly.

NRCB USE ONLY
Requirements met: ☒ YES ☐ NO

Part 2 — Technical Requirements

NRCB Natural Resources Conservation Board

Application under the *Agricultural Operation Practices Act* for a confined feeding operation, manure collection area and/or manure storage facility(ies)

SOLID MANURE, COMPOST, & COMPOSTING MATERIALS: Barns, feedlots, & storage facilities - Concrete liner (cont.)

Concrete liner details

Concrete thickness	Method of sulphate protection:
5"	Type 50
Concrete strength	**Concrete reinforcement size and spacing**
25 mpa	rebar 10 mm 15" intervals

Concrete requirements can be found in Technical Guideline Agdex 096-93
Guideline minimums:
Solid manure: 25MPa (D)
Solid manure (wet): 30MPa (C)
Method of sulphate protection:
Type 50 or Type 10 with fly ash or equivalent

NRCB USE ONLY

Requirements met: ☒ YES ☐ NO
Condition required: ☒ YES ☐ NO
Report attached: ☐ YES ☒ NO

Additional information *(attach as required)*

NRCB USE ONLY

Nine month manure storage volume requirements met ☐ YES ☒ YES With STMS ☐ NO

Depth to water table: >3.7 m Requirements met: ☒ YES ☐ NO

Depth to Uppermost groundwater resource: 30.5 m Requirements met: ☒ YES ☐ NO

ERST completed: ☒ see ERST page for details

Surface water control systems

Requirements met: ☒ YES ☐ NO Details/comments:

Concrete liner details

Applicant to provide proof that the concrete meets the requirements.

Leakage detection system required: ☐ YES ☒ NO If yes, please explain why.

Part 2 — Technical Requirements

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Application under the *Agricultural Operation Practices Act* for a confined feeding operation, manure collection area and/or manure storage facility(ies)

SOLID MANURE, COMPOST, & COMPOSTING MATERIALS: Barns, feedlots, & storage facilities - Compacted soil liner

*(complete a copy of this section for **EACH** barn, feedlot, and storage facility for solid manure, composting materials, or compost with a compacted soil liner)*

Facility description / name *(as indicated on site plan)*

Livestock pen

1. ~~4 pens~~

2.

Manure storage capacity

	Length (m)	Width (m)	Depth below grade to the bottom of the liner (m)	**NRCB USE ONLY** Estimated storage capacity (m^3)
1.	122 ~~122~~	36.5 ~~58.5~~	0	
2.				
			TOTAL CAPACITY	Sufficient storage with STMS

AO note: on August 6, 2025, the applicant indicated in an email that they would like to change the proposed pen area dimensions, as listed in blue.

☑ I plan to use a short-term solid manure storage (STMS) as part of my manure storage and handling plan for this CFO. (The AOPA requirements for STMS are set out in the NRCB Short-Term Solid Manure Storage Requirements Fact Sheet.

Surface water control systems

Describe the run-on and runoff control system

Run off will be collected in a catch basin

Liner protection

Describe how the physical integrity of the liner will be maintained

I will check for leaking

NRCB USE ONLY

Requirements met: ☒ YES ☐ NO

Last updated February 26, 2021

SOLID MANURE, COMPOST, & COMPOSTING MATERIALS: Barns, feedlots, & storage facilities - Compacted soil liner (cont.)

Compacted soil liner details

Thickness of compacted liner	0.5 (m)	Provide compacted liner details (as required): see report	
Soil texture	34.5 % sand	34.5 % silt	31 % clay
Atterberg limits	Plastic limit: 13.87	Liquid limit: 43.17	Plasticity index: 29.29
Hydraulic conductivity	Hydraulic conductivity (cm/s): 3.8 x 10.8		
	Describe test standard used: see report		

Additional information *(attach copies of soil test reports)*

NRCB USE ONLY

Requirements met: ☒ YES ☐ NO
Condition required: ☒ YES ☐ NO
Report attached: ☒ YES ☐ NO

NRCB USE ONLY

Nine month manure storage volume requirements met ☐ YES ☒ YES With STMS ☐ NO

Depth to water table: >3.7 m — Requirements met: ☒ YES ☐ NO

Depth to uppermost groundwater resource: 30.5 m — Requirements met: ☒ YES ☐ NO

ERST completed: ☒ see ERST page for details

Surface water control systems

Requirements met: ☒ YES ☐ NO Details/comments:

Compacted soil liner details

Hydraulic conductivity after adjustment: 3.8×10^{-8} cm/sec.

Liner specification comments (e.g. compaction, moisture content, thickness):

Leakage detection system required: ☐ YES ☒ NO If yes, please explain why.

Part 2 – Technical Requirements

NRCB Natural Resources Conservation Board

Application under the *Agricultural Operation Practices Act* for a confined feeding operation, manure collection area and/or manure storage facility(ies)

RUNOFF CONTROL CATCH BASIN: Compacted soil liner

*(complete a copy of this section for **EACH proposed** runoff control catch basin with a compacted soil liner)*

Facility description / name *(as indicated on site plan)*

1. Catch basin
2.
3.

Determination of runoff area

Provide a plan and show how you calculated the area contributing to runoff for each catch basin

See enviro west report

AO note: the calculated runoff from the unpaved pen area (heifer shed will be fully covered by a roof) is 4,453 m^2

Catch basin capacity

	Length (m)	Width (m)	Depth (m)	Depth below ground level (m)	Slope run:rise			NRCB USE ONLY
					Inside end walls	Inside side walls	Outside walls	Calculated storage capacity (excl. 0.5 m freeboard) (m^3)
1.	120	13	~~2~~ 1.5	1.5	3/1	3/1	3/1	
2.								
3.								
							TOTAL CAPACITY	801 m^3

Compacted soil liner details

Thickness of compacted soil liner	1.0 (m)	Provide details (as required): See report	
Soil texture	34.5 % sand	34.5 % silt	31.0 % clay
Atterberg limits	Plastic limit 13.87	Liquid limit 43.17	Plasticity index 29.29
Hydraulic conductivity	Hydraulic conductivity (cm/s): 3.8×10^{-9}		
	Describe test standard used: ASTM D 5084 – 10		

Catch Basin – Design and management requirements can be found in Technical Guideline Agdex 096-101

NRCB USE ONLY

Requirements met: ☒ YES ☐ NO

Condition required: ☒ YES ☐ NO

Report attached: ☒ YES ☐ NO

RUNOFF CONTROL CATCH BASIN: Compacted soil liner (cont.)

NRCB USE ONLY

Catch basin calculator (calculation attached). Total volume @ freeboard: 801 m^3

Runoff capacity requirements met: ☒ YES ☐ NO

Calculation of the volume attached: ☒ YES ☐ NO

Depth to water table: >3.7 m Requirements met: ☒ YES ☐ NO

Depth to Uppermost Groundwater Resource: 30.5 m Requirements met: ☒ YES ☐ NO

ERST completed: ☒ see ERST page for details

Liner specification comments (e.g. compaction required, moisture content, thickness):

Leakage detection system required: ☐ YES ☒ NO If yes, please explain why.

Catch Basin Storage Volume Calculator

Construction Dimensions of Catch Basin

*** Only cells in blue can be changed.**

CFO Name [1]	New Mars Dairy
Land Location [1]	NW-9-47-37 W4

Overall Dimensions of Catch Basin			Catch Basin Dimensions
Total Length*[4]	120.0	m	394 ft
Total Width*[4]	13.0	m	43 ft
Total Depth*[4]	1.5	m	5 ft
Design Capacity Depth	*1.00*	m	3 ft
End Slope*[4]	3	run:rise	3 run:rise
Side Slope*[4]	3	run:rise	3 run:rise
Length of Bottom	111.0	m	364 ft
Width of Bottom	4.0	m	13 ft
Capacity @ top of Bank	*1,483*	m^3	*Capacity (@tob)* *52,363* ft^3 *326,159 Imp. Gal.*

Design Capacity of Catch Basin (freeboard level)			Design Capacity (freeboard level)
Length (design capacity depth)	117.0	m	384 ft
Width (design capacity depth)	10.0	m	33 ft
Total Depth	*1.5*	m	*5* ft
Design Capacity Depth	1.00	m	3 ft
End Slope	3	run:rise	3 run:rise
Side Slope	3	run:rise	3 run:rise
Design Capacity (freeboard level)	**801**	m^3	28,287 ft^3
			176,195 Imp. Gal.
level)	*1,170*	m^2	*12,594* ft^2

Paved Runoff Catchment Area(s)

Area [2]	Length (m)	Width (m)	Area (m^2)
1			0.0
2			0.0
3			0.0
4			0.0
5			0.0
		Total Area (m^2)	**0**

Unpaved Runoff Catchment Area(s)

Area [2]	Length (m)	Width (m)	Area (m^2)
6	122	37	4,453.0
7			0.0
8			0.0
9			0.0
10			0.0
		Total Area (m^2)	**4,453**

Rainfall (Select Town [3])

Wetaskiwin 80

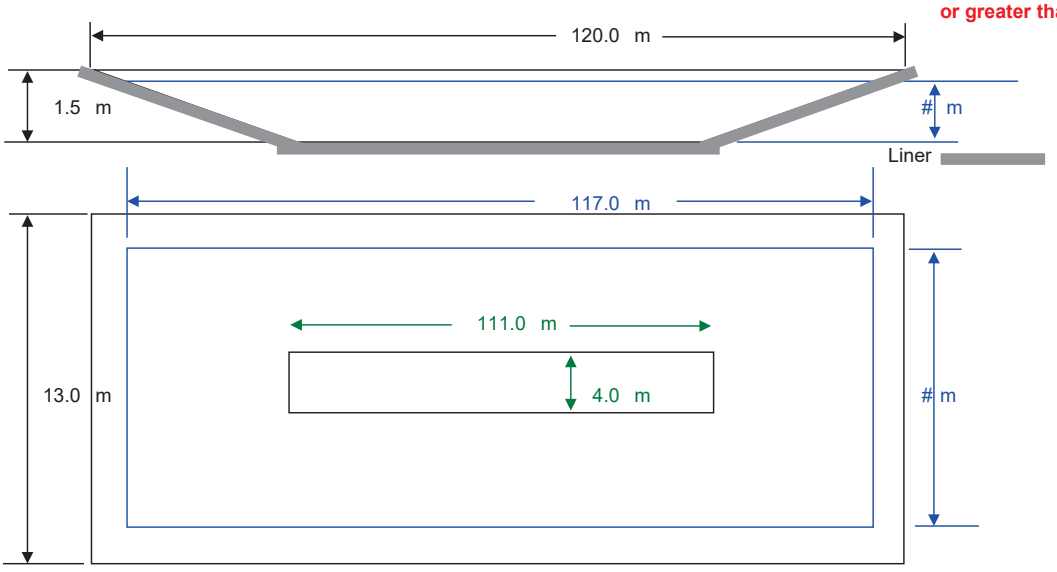
AOPA Design Rainfall **80 mm**

Minimum Catchbasin Storage Volume Required

214 m^3 ** **7548.2981 ft^3**

47017.088 Imp. Gal.

**** Design capacity of catch basin should be equal to or greater than, minimum storage volume required.**



Lines in Black - Overall catch basin dimensions

Lines in Blue - Design capacity depth dimensions (excludes freeboard)

NTS - Not To Scale

Part 2 — Technical Requirements

Application under the *Agricultural Operation Practices Act* for a confined feeding operation, manure collection area and/or manure storage facility(ies)

NRCB USE ONLY **RUNOFF CONTROL CATCH BASIN CAPACITY SUMMARY (if applicable)**	
Facility 1 New (south) catch basin	
Name / description	Capacity 801 m^3
Facility 2	
Name / description	Capacity
Facility 3	
Name / description	Capacity
Facility 4	
Name / description	Capacity
TOTAL CAPACITY	801 m^3
RUNOFF VOLUME FROM CONTRIBUTING AREAS	214 m^3
MEETS AOPA RUNOFF CONTROL VOLUME REQUIREMENTS	☒ YES ☐ NO

Part 2 — Technical Requirements

Application under the *Agricultural Operation Practices Act* for a confined feeding operation, manure collection area, and/or manure storage facility(ies)

NRCB USE ONLY

ALL SIGNATURES IN FILE ☒ YES ☐ NO

DATES OF APPROVAL OFFICER SITE VISITS

May 26, 2025	

CORRESPONDENCE WITH MUNICIPALITIES AND REFERRAL AGENCIES

Date deeming letters sent: June 5, 2025

Municipality: County of Wetaskiwin

☒ letter sent ☒ response received ☒ written/email ☐ verbal ☐ no comments received

Alberta Health Services: ☒ N/A

☐ letter sent ☐ response received ☐ written/email ☐ verbal ☐ no comments received

Alberta Environment and Parks: ☐ N/A

☒ letter sent ☒ response received ☒ written/email ☐ verbal ☐ no comments received

Alberta Transportation: ☐ N/A

☒ letter sent ☒ response received ☒ written/email ☐ verbal ☐ no comments received

Alberta Regulatory Services: ☒ N/A

☐ letter sent ☐ response received ☐ written/email ☐ verbal ☐ no comments received

Other: Battle River Power Coop., ATCO Gas and Pipelines Ltd., and Imperial Oil Resources Ltd. ☐ N/A

☒ letter sent ☐ response received ☐ written/email ☐ verbal ☒ no comments received

Other: West Wetaskiwin Rural Electrification Ltd., and Integrity Land Inc. ☐ N/A

☒ letter sent ☐ response received ☐ written/email ☐ verbal ☒ no comments received

ENVIROWEST
ENGINEERING

SITE AND SOIL ASSESSMENT

Proposed Operation – Solid Manure Storage and Catch Basin
NW¼-09-047-27 W4M

County of Wetaskiwin, Alberta

Site and Soil Assessment
Proposed Operation – Solid Manure Storage and Catch Basin
NW¼-09-47-27 W4M
County of Wetaskiwin, Alberta

Prepared For: New Mars Dairy
Henk Schrijver

Delivered via Email: [redacted]

Prepared By: Envirowest Engineering
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(403) 783-8229

Report Date: July 24, 2023

Project Number: 2304-43022

Private and Confidential

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1.0 Introduction and Scope of Work

Envirowest Engineering (Envirowest) was retained by Henk Schrijver of New Mars Dairy to conduct a Site and Soil Assessment for the proposed construction of corrals with solid manure storage and a catch basin.

The assessment was completed to determine conditions beneath the proposed construction area and assess soil properties for construction of proposed facilities. The operation, herein referred to as "the Site," is located on NW-09-47-27 W4M in County of Westaskiwin.

The assessment has been completed in accordance with the standards and regulations associated with the amended Agricultural Operation Practices Act and associated regulations which govern all new and modified confined feeding operations.

Scope of Work

Five investigative boreholes were drilled using a truck-mounted rotary auger and completed to a maximum depth of 6.0 m below ground surface (mbgs) on April 27, 2023. The boreholes were completed in the area proposed for a solid manure storage and catch basin. The borehole locations are shown on Figure 1 (attached).

A composite sample of soil was collected from a stratum within the proposed area and was submitted to a third-party laboratory for analysis of soil properties as applicable for use in construction of a compacted earthen liner.

2.0 Assessment Results

The Site is generally sloping to south southeast. The Site is currently in cropland and pasture. Five investigative boreholes were drilled using a truck-mounted rotary auger and completed to a maximum depth of 6.0 mbgs on April 27, 2023. The boreholes were completed in the area proposed for solid manure storage and catch basin.

Potential liner construction material (noted in borehole logs as sandy clay) was typically found beneath sand overburden at depths between 0.5 to 2.5 mbgs.

Boreholes 23BH01, 23BH03 and 23BH04 were advanced to determine conditions beneath the proposed corrals. 23BH02 and 23BH05 were completed to determine conditions beneath the proposed catch basin locations.

A water table was found in borehole 23BH02 at 2.5 mbgs, borehole 23BH02 was at an elevation approximately 3 meters below 23BH01. A water table was found within the corrals at 4.8 mbgs. A water table was found in borehole 23BH05 at 3.7 mbgs.

Boreholes were backfilled with the material removed by back spinning the solid stem auger and compacting to depth of the borehole.

The results of the soil analysis completed by a third-party laboratory are presented in Table 1 below. The soil sample locations are presented on Figure 1, and borehole logs are attached.

Table 1: Soil Properties Results

Parameter	Composite
Sample Depth (m)	0.5-4.0
Particle Size (%clay)	31.0
Particle Size (%sand+gravel)	34.5
Particle Size (%silt)	34.5
Texture Class	Sandy Medium Plastic Clay
Liquid Limit (%)	43.17
Plastic Limit (%)	13.87
Plasticity Index (%)	29.29
Moisture Content (%)	18.6
Laboratory Hydraulic Conductivity (cm/sec)	3.8×10^{-9}

The composite soils were identified as a clay loam with a clay content of 31.0%. The hydraulic conductivity was determined to be 3.8×10^{-9} cm/sec at 99% compaction. The maximum dry density was found to be 1,808 kg/m^3 with an optimum moisture content of 15.5%.

Conservatively a safety factor of 10 is to be applied to the hydraulic conductivity based on the NRCB Approvals Policy (2016-7), Section 8.7.2, stating "lab measurements of a sample of material taken from the field are not considered an accurate representation of the actual field hydraulic conductivity values. This is because of the potential variability of soils, differences in compaction methods and variances in compaction." The field hydraulic conductivity of the composite material tested is 3.8×10^{-8} cm/sec.

3.0 Conclusions

The following conclusions are based on the discussed scope of the construction.

The composite soils were determined to be appropriate for the construction of a compacted clay liner for use of a solid manure storage within corrals and a catch basin.

4.0 Design Considerations

4.1 Earthen Lined Corrals

Based on the information obtained it was determined that the native clay, beneath overburden, was found at depths between 0.5 to a minimum of 3.0 mbgs.

Minimum Required Liner Depth for solid manure storage:

$$\frac{0.5 \text{ m}}{5 \times 10^{-7} \text{ cm/sec}} = \frac{\mathbf{X} \text{ m}}{3.8 \times 10^{-8} \text{ cm/sec}}$$

$$\mathbf{X} = 0.04 \text{ m}$$

A compacted liner thickness of 0.5 meters is recommended.

Corrals should be sloped at approximately 3% towards the catch basin with surrounding surface runoff directed away from the solid manure storage.

4.2 Earthen Lined Catch Basin

Based on the information obtained it was determined that the native clay, beneath overburden, was found at depths between 0.5 to 7.0 mbgs.

Minimum Required Liner Depth for EMS:

$$\frac{1 \text{ m}}{5 \times 10^{-7} \text{ cm/sec}} = \frac{\mathbf{X} \text{ m}}{3.8 \times 10^{-8} \text{ cm/sec}}$$

$$\mathbf{X} = 0.08 \text{ m}$$

A compacted liner thickness of 1.0 meters is recommended.

4.3 Catch Basin Storage Sizing

Surface Run-off Area

The current area of contributing run-off is 4,500 m^2, including the shed runoff. A catch basin size is recommended with a storage capacity of at minimum 278 m^3, based on precipitation data from Millet.

- To provide the required capacity, the new catch basin should be 21 m in length x 21 m in width. The overall depth has been designed as 2.0 m. The overall storage capacity of the new catch basin will be 283 m^3. This allows for a 0.5 meter freeboard. The sizing is based on an inside end and side wall slope of 3:1 (run/rise)
- The overall depth of 2.0 m will be achieved through a below grade depth of 2.0 m, the bottom of the compacted liner will be 3.0 meters below grade as measured from borehole 23BH05. The outside dyke walls should be completed to a slope of 4:1 where required along the downward slope. The crest of the dyke should be sloped slightly outward to direct rainfall away from the storage facility
- The below-grade depth of the catch basin must maintain a minimum of a 1.0 m separation above the water table at the time of construction, should one be encountered

5.0 Compacted Liner Construction Considerations

- Construction of the clay liner should be completed in approximately 0.15 m lifts. Preferably, compaction of each lift will be undertaken with a padfoot roller, or the like. The equipment being used for soil compaction must fully penetrate each lift. Each lift should be compacted to not less than 99 percent Standard Proctor Dry Density prior to addition of the subsequent lift
- The soil should be within 2 percent of the optimum moisture as determined by a Standard Proctor Maximum Dry Density to ensure the lowest possible hydraulic conductivity for the completed liner
- Lifts should continue to be added until the recommended liner thickness is achieved. Particular attention should be paid to ensuring that the liner is integrally connected to the lower soil strata and that the soil around the inlet pipe is compacted to the same standard as the remainder of the liner
- Sand pockets that may be encountered during construction should be removed prior to liner installation
- Control of liner moisture content is critical during the construction process. Liner material should not be allowed to become saturated or to become dry. Should a lift surface become dry, the lift should be scarified prior to the placement of the next lift. Lifts which are above the required moisture content due to precipitation etc. should be removed or allowed to dry and re-compacted. The liner should not be allowed to freeze during construction
- Topsoil, frozen soil or rocks larger than 6 inches should not be included in the liner material
- Construction of the catch basin should be supervised by a professional engineer
- The freeboard depth of 0.5 m and outside dyke walls should be covered with 0.1-0.2 m of topsoil and seeded to prevent soil erosion.

The following general construction procedures are recommended, though some modifications may be required based on actual site conditions encountered during construction:

- The topsoil should be stripped from the area for construction. The topsoil can be reused on the freeboard area after construction completion
- Sand and gravel seams, if encountered, should be excavated during construction and should be removed

Following completion of the catch basin the operator should:

- Ensure that shrubs, trees, and deep-rooted plants are not allowed to grow on or near the walls of the facility

6.0 Closure

Envirowest Engineering is pleased to submit the report to Henk Schrijver of New Mars Dairy. The information and conclusions contained in this report are for their sole use. No other party is to rely upon the information contained within the report without the express written authorization of Envirowest Engineering.

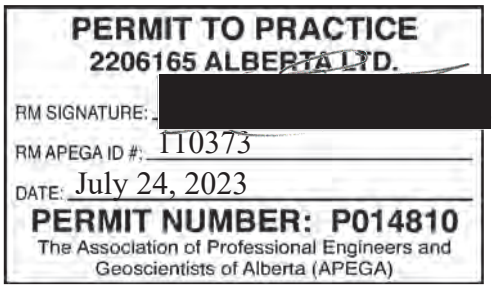
Envirowest Engineering is not responsible for any damages that may be suffered as the result of any unauthorized use of, or reliance on, this report. Envirowest Engineering has performed the work and made the findings and conclusions set out in the report in a manner consistent with the level of care and skill normally exercised by members of the environmental engineer profession practicing under similar conditions at the time the work was performed. Envirowest Engineering accepts no responsibility for any deficiency, misstatement or inaccuracy in this report resulting from misinformation from any individuals or parties that provided information as part of this report.

We trust that this report meets your present needs. Please feel free to contact the undersigned with any questions or should you require additional information.

Respectfully submitted,

2023-07-24

Prepared by:
Emily J. Low, P.Eng.
Envirowest Engineering



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Association of Professional Engineers and Geoscientists of Alberta
Permit to Practice No. P14810

7.0 Qualifications of Assessors

Ms. Emily Low, B.Sc., P.Eng, is an Environmental Engineer with Envirowest Engineering and has approximately 15 years of environmental assessment, monitoring, and remediation experience in the agricultural, industrial, real estate and development, and oil and gas sectors. Ms. Low has a Bachelor of Science in Chemical Engineering from the University of Alberta and is a certified Professional Engineer in Alberta (Association of Professional Engineers and Geoscientists of Alberta).

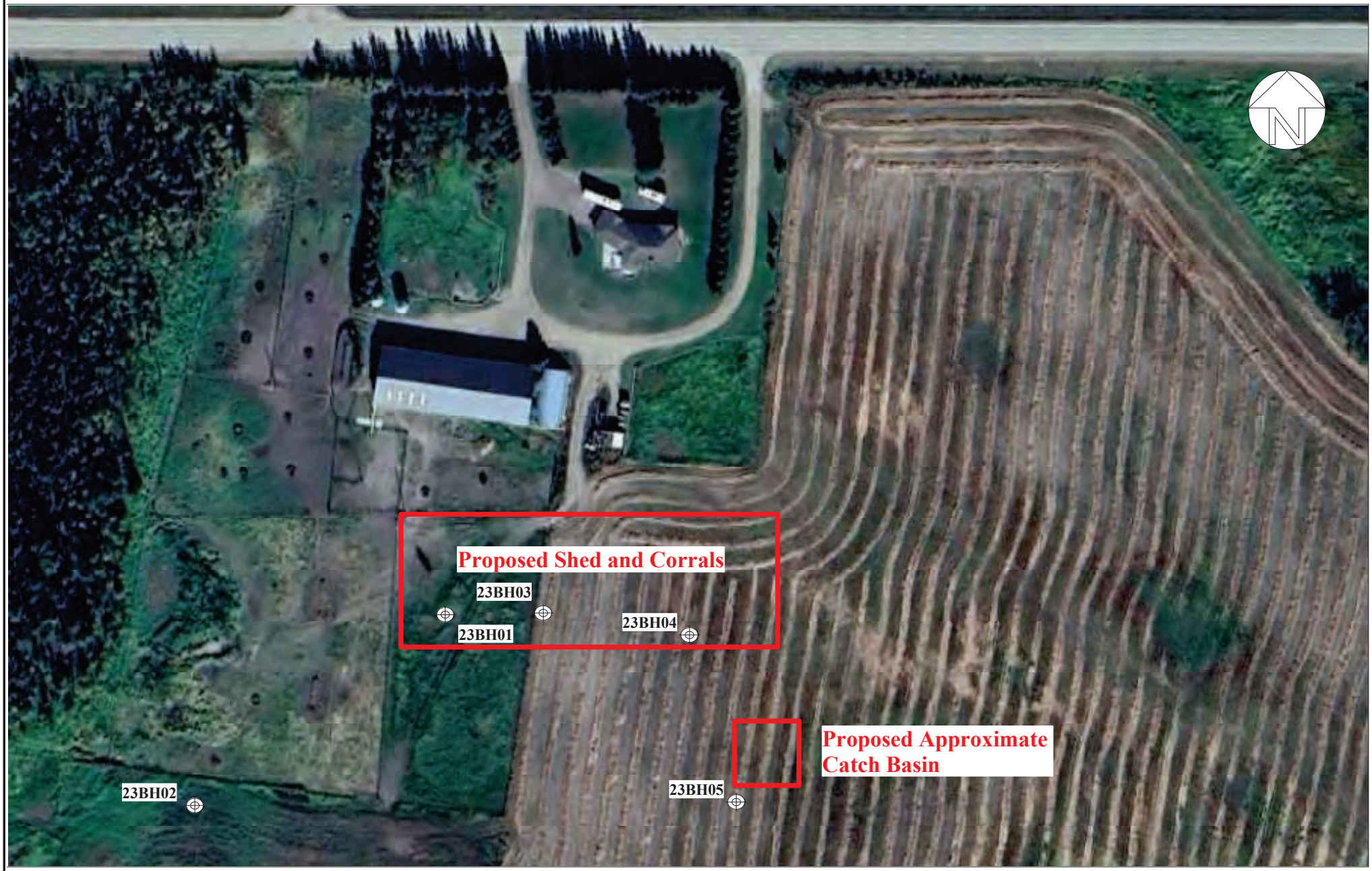
8.0 References

GOA (Government of Alberta). (January 2020). Agricultural Operation Practices Act and Regulations. Edmonton, AB: Author.

GOA (Government of Alberta). (2017). Agricultural Operation Practices Act: Standards and Administration Regulation. Edmonton, AB: Author.

Appendix A

Figure



ENVIROWEST ENGINEERING

Title:

Borehole Locations
Site and Soil Assessment
NW¼-Sec.09-Twp.047-Rge.27-W4M
County of Wetaskiwin , Alberta

Project No: 2304-43022	**Date:** July 24, 2023	**Figure No.:** 1.0
Scale: 1: 2700	**Prepared By:** E.Low	
Image Source: Google Earth Pro (November 21, 2021)		

Appendix B

Borehole Logs

ENVIROWEST ENGINEERING

LOG OF BORING 23BH01

Site and Soil Assessment
NW¼-9-47-27-W4M
County of Wetaskiwin, Alberta
Project Number: 2304-43022

Driller: : Evergreen Drilling
Drilling Method: : Truck Mounted Auger
Drill Date : April 27, 2023
Logged By: : Emily Low P.Eng.

Well:
Elev.:

Depth in Meters	Gastech Reading (ppm) 0 100 200 300 400 500	VOC Reading	GRAPHIC	DESCRIPTION	Water Level
0.0				SAND, some clay, loose, dry	
0.3					
0.5				SANDY CLAY, reddish brown, firm, damp	
0.8					
1.0					
1.3					
1.5					
1.8					
2.0					
2.3					
2.5					
2.8					
3.0					
3.3					
3.5					
3.8					
4.0					
4.3					
4.5					
4.8				water table	
5.0					
5.3					
5.5					
5.8					
6.0					

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ENVIROWEST ENGINEERING

LOG OF BORING 23BH02

Site and Soil Assessment
NW¼-9-47-27-W4M
County of Wetaskiwin, Alberta
Project Number: 2304-43022

Driller: : Evergreen Drilling
Drilling Method: : Truck Mounted Auger
Drill Date : April 27, 2023
Logged By: : Emily Low P.Eng.

Depth in Meters	Gastech Reading (ppm) 0 100 200 300 400 500	VOC Reading	GRAPHIC	DESCRIPTION	Well: Elev.:	Water Level
0.0				SANDY CLAY, sand pockets (0-0.5 m), mottled, reddish brown		
0.3						
0.5						
0.8						
1.0						
1.3						
1.5						
1.8						
2.0						
2.3						
2.5				SAND and clay, water table		
2.8						
3.0						

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ENVIROWEST ENGINEERING

LOG OF BORING 23BH03

Site and Soil Assessment
NW¼-9-47-27-W4M
County of Wetaskiwin, Alberta
Project Number: 2304-43022

Driller: : Evergreen Drilling
Drilling Method: : Truck Mounted Auger
Drill Date : April 27, 2023
Logged By: : Emily Low P.Eng.

Depth in Meters	Gastech Reading (ppm) 0 100 200 300 400 500	VOC Reading	GRAPHIC	DESCRIPTION	Well: 23MW01 Elev.:	Water Level
0.0				SAND, some clay, dry		
0.3						
0.5						
0.8					Bentonite	
1.0					Solid	
1.3						
1.5				SANDY CLAY, reddish brown, firm, damp		
1.8						
2.0						
2.3					Sand	
2.5					Screen	
2.8						
3.0					Bentonite	

07-24-2023 Z:\Operations\Client Data\43022 New Mars\23BH03.boi

ENVIROWEST ENGINEERING

LOG OF BORING 23BH04

Site and Soil Assessment
NW¼-9-47-27-W4M
County of Wetaskiwin, Alberta
Project Number: 2304-43022

Driller: : Evergreen Drilling
Drilling Method: : Truck Mounted Auger
Drill Date : April 27, 2023
Logged By: : Emily Low P.Eng.

Well:
Elev.:

Depth in Meters	Gastech Reading (ppm) 0 100 200 300 400 500	VOC Reading	GRAPHIC	DESCRIPTION	Water Level
0.0				SAND, some clay	
0.3					
0.5				SANDY CLAY, reddish brown, firm, damp	
0.8					
1.0					
1.3					
1.5					
1.8					
2.0					
2.3					
2.5					
2.8					
3.0					

07-24-2023 Z:\Operations\Client Data\43022 New Mars\23BH04.boi

ENVIROWEST ENGINEERING

LOG OF BORING 23BH05

Site and Soil Assessment
NW¼-9-47-27-W4M
County of Wetaskiwin, Alberta
Project Number: 2304-43022

Driller: : Evergreen Drilling
Drilling Method: : Truck Mounted Auger
Drill Date : April 27, 2023
Logged By: : Emily Low P.Eng.

Well:
Elev.:

Depth in Meters	Gastech Reading (ppm) 0 100 200 300 400 500	VOC Reading	GRAPHIC	DESCRIPTION	Water Level
0.0				SANDY CLAY, low plasticity	
0.3				reddish brown, firm, damp, medium plasticity	
0.5					
0.8					
1.0					
1.3					
1.5					
1.8					
2.0					
2.3					
2.5					
2.8					
3.0					
3.3					
3.5					
3.8				water table	
4.0				SANDY CLAY and silt, gray	
4.3					
4.5					

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Appendix C

Certificate of Analysis

Moisture Content

Project No.: **43022**

Sample:	Large Bag						
Depth (ft):	-						
Tare No.:	20						
Wt. Tare:	4.41						
Wt. Wet + Tare:	103.06						
Wt. Dry. + Tare:	87.59						
Wt. Water:	15.47						
Wt. Dry Soil:	83.18						
Moisture Content:	**18.6%**						

Sample:							
Depth (ft):							
Tare No.:							
Wt. Tare:							
Wt. Wet + Tare:							
Wt. Dry. + Tare:							
Wt. Water:							
Wt. Dry Soil:							
Moisture Content:							

Sample:							
Depth (ft):							
Tare No.:							
Wt. Tare:							
Wt. Wet + Tare:							
Wt. Dry. + Tare:							
Wt. Water:							
Wt. Dry Soil:							
Moisture Content:							

Sample:							
Depth (ft):							
Tare No.:							
Wt. Tare:							
Wt. Wet + Tare:							
Wt. Dry. + Tare:							
Wt. Water:							
Wt. Dry Soil:							
Moisture Content:							

Union Street Geotechnical

CLIENT:	Envirowest	**FILE No.:**	USG1680
PROJECT:	Geotech Inv.	**DATE:**	20-Jun-23
LOCATION:	Red Deer, Alberta	**TECH:**	C.L.

Laboratory Proctor — Sample No.: W234

Sample Information

Date:	-	**By:**	E.L.	**of:**	Envirowest	**Type:**	Bag
Location:	-					**Natural Moisture:**	18.6 %
Description:	Till. Clay and silt, sandy, trace gravel						

Specfication: ASTM D 698 - Method A

Comments: Permeability completed based on optimum results from proctor.

Proctor Results:

Test Number	1	2	3	4	5
Dry Density (Kg/m^3)	**1702**	**1746**	**1803**	**1766**	**1714**
Moisture Content (%)	**11.1**	**13.2**	**15.5**	**17.6**	**19.2**

Oversize Correction (Calculated using assumed Specific Gravity of 2.40)

Oversize (%)	5	10	15	20	25
Density	**1830**	**1859**	**1887**	**1915**	**1943**

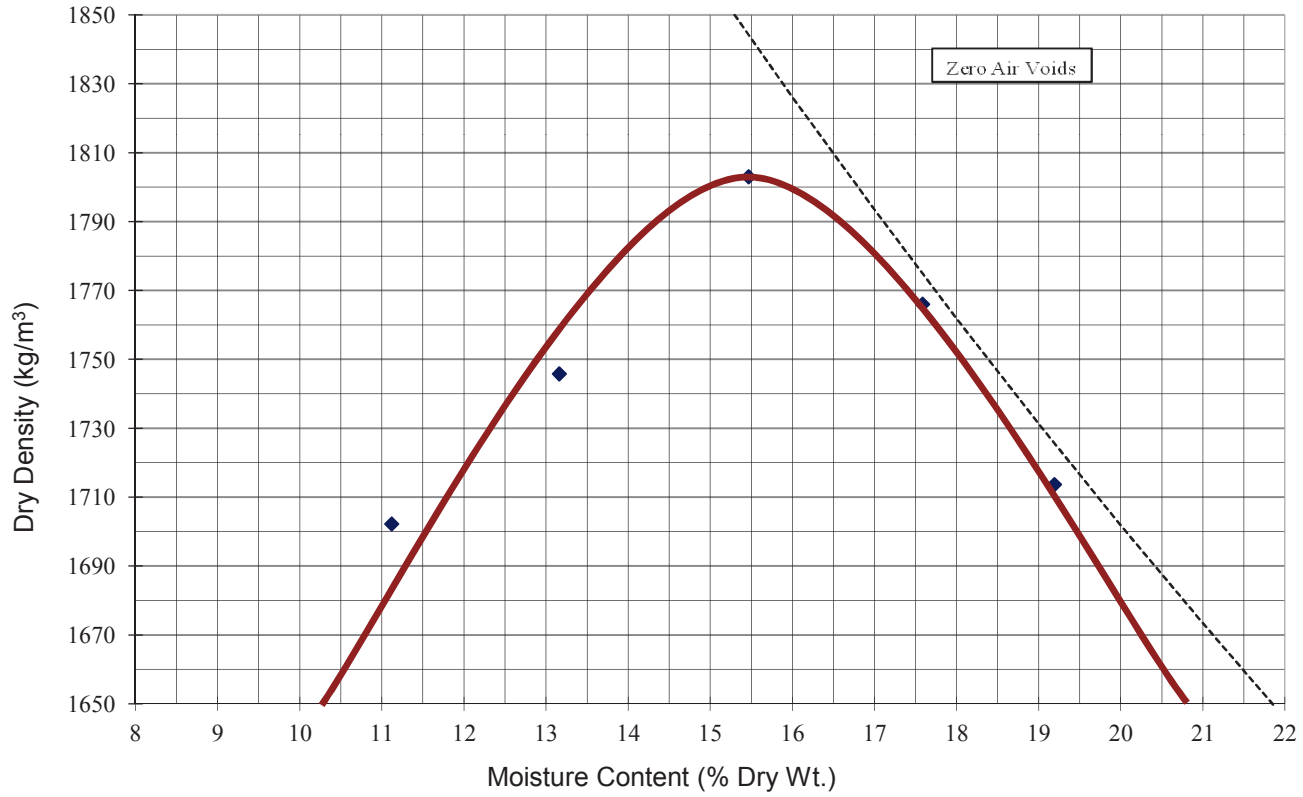
Optimum Results:

Moisture Content = **15.5** %

Dry Density = **1802** Kg/m^3

Corrected Density = **1808** Kg/m^3

Oversize Material = **1.0** %



Union Street Geotechnical

CLIENT:	Envirowest	**FILE No.:**	USG1680
PROJECT:	2023 Materials Testing	**DATE:**	20-Jun-23
LOCATION:	Red Deer, Alberta	**TECH:**	G.S.

Laboratory Hydrometer — Sample No.: W234

Sample Information

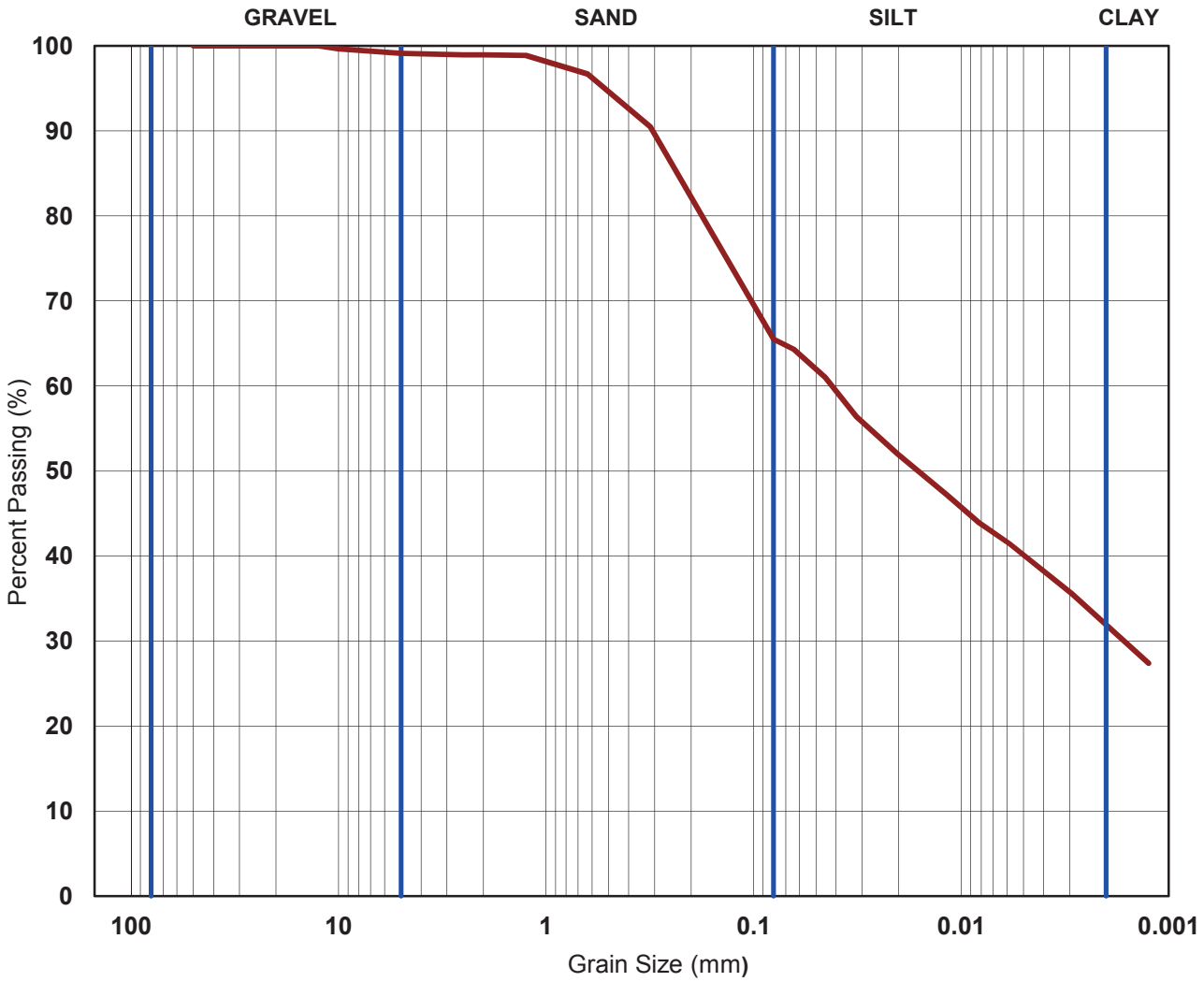
Date:	-	**By:**	E.L.	**of:**	Envirowest	**Type:**	Bag
Location:	-					**Specification:**	ASTM D 422
Description:	Silt, sandy, clayey, gravel inclusions.						

Specifications: Laboratory Specifications as per ASTM D 422.

Comments:

Sieve Results:

By Type (%): Gravel = **0.9** Sand = **33.6** Silt = **34.5** Clay = **31.0**



Union Street Geotechnical

CLIENT:	Envirowest	**FILE No.:**	USG1680
PROJECT:	2023 Materials Testing	**DATE:**	20-Jun-23
LOCATION:	Red Deer, Alberta	**TECH:**	C.L./G.S.

Project Name:	2023 Geotech Inv.	Depth:	
Project Number:	USG 1680	Testing Company:	Union Street Geo.
Client:	Envirowest	Field Technician:	E.L.
Testhole:		Sample Date:	21 June, 2023
Location:	Red Deer, Alberta	Lab Technician:	B.B.
Sample Number:	W234	Date Tested:	22 June, 2023

Flexible Wall Permeameter (ASTM D5084-10)

Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

Material and Test Description

Material Description:

Till. Clay and silt, sandy, trace gravel

Test Type:	Constant Head
Mould Size:	Flexible Wall
Sample Source:	Re-moulded
Fluid Used:	Deaired Water
Fluid Reservoir:	Burrettes

Remoulding Details	
Max Dry Density (kg/m^3):	-
Proctor ID:	-
Percent Max (%):	-
Target Dry Density (kg/m^3):	-

Initial Sample Characteristics

Water Content	
Wet + Tare (g):	406
Dry + Tare (g):	352.1
Tare (g):	12.0
Water Content (%):	15.8%

Sample Size					
Trial	1	2	3	4	Average
Diameter (mm):	72.7	72.9	73.0	72.9	72.9
Length (mm):	73.8	74.1	74.3	73.8	74.0
Weight (g)	647.0				

Area (cm^2):	41.7
Volume (cm^3):	308.7
Wet Density (kg/m^3):	2096
Dry Density (kg/m^3):	1809

Specific Gravity (Note 2):	2.63
Void Ratio:	45.5%
Saturation:	91.8%
Porosity:	31.3%

Final Sample Characteristics

Water Content	
Wet + Tare (g):	668.2
Dry + Tare (g):	568.8
Tare (g):	12.4
Water Content (%):	17.9%

Sample Size					
Trial	1	2	3	4	Average
Diameter (mm):	72.9	73.1	73.1	72.9	73.0
Length (mm):	74	73.9	74.1	73.8	74.0
Weight (g)	653				

Area (cm^2):	41.9
Volume (cm^3):	309.5
Wet Density (kg/m^3):	2110
Dry Density (kg/m^3):	1790

Specific Gravity (Note 1):	2.63
Void Ratio:	47.0%
Saturation:	100.0%
Porosity:	32.0%

Note 1: Specific gravity for final sample characteristics calculation adjusted to result in 100.0% saturation.

Note 2: Specific gravity for initial sample characteristics calculation set equal to that of the final.

Project Name:	2023 Geotech Inv.	Depth:	
Project Number:	USG1680	Testing Company:	Union Street Geo.
Client:	Envirowest	Field Technician:	E.L.
Testhole:		Sample Date:	21 June, 2023
Location:	Red Deer, Alberta	Lab Technician:	B.B.
Sample Number:	W234	Date Tested:	22 June, 2023

Flexible Wall Permeameter (ASTM D5084-10)

Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

Saturation Data

Cell Pressure (kPa):	160.0	Top Pressure (kPa):	130.0
Bottom Pressure (kPa):	130.0	Pressure Difference (kPa):	-

Date & Time	Elapsed Time (Days)	Room Temp (°C)	Top Burret (mL)	Bottom Burret (mL)	Cell (mL)	Total Vol. Change (mL)	Volume Strain (%)
6/22/23 6:49	0.00	20.0	3.3	3.3	12.0	0	0.00%
6/22/23 13:26	0.28	21.0	2.9	3.2	13.4	-0.90	-0.29%
6/23/23 7:38	1.03	21.0	2.3	3.0	16.2	-2.90	-0.94%
6/23/23 14:02	1.30	21.0	2.3	3.0	16.7	-3.37	-1.09%
6/25/23 10:08	3.14	21.0	2.5	2.9	19.7	-6.54	-2.12%
6/26/23 7:41	4.04	21.0	2.7	3.0	20.7	-7.71	-2.50%
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
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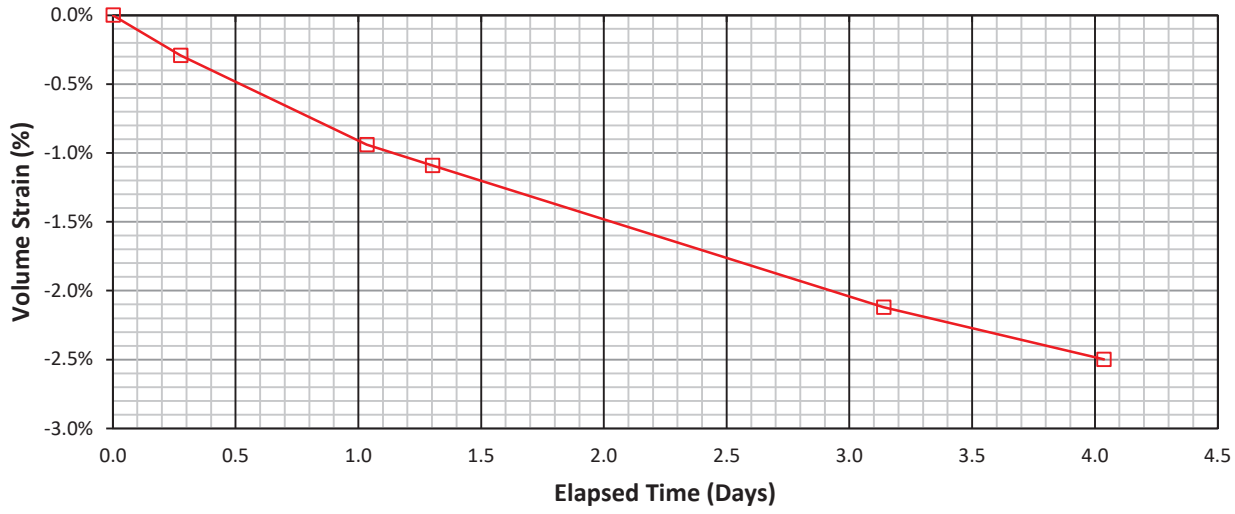
-	-	-	-	-	-	-	-



Project Name:	2023 Geotech Inv.	Depth:	
Project Number:	USG1680	Testing Company:	Union Street Geo.
Client:	Envirowest	Field Technician:	E.L.
Testhole:		Sample Date:	21 June, 2023
Location:	Red Deer, Alberta	Lab Technician:	B.B.
Sample Number:	W234	Date Tested:	22 June, 2023

Flexible Wall Permeameter (ASTM D5084-10)

Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

Permeation Data

Cell Pressure (kPa):	160.0	Top Pressure (kPa):	120.0
Bottom Pressure (kPa):	140.0	Pressure Difference (kPa):	20.0

Date & Time	Elapsed Time (Minutes)	Room Temp (°C)	Top Burret (mL)	Bottom Burret (mL)	Top Vol. Change (mL)	Bottom Vol. Change (mL)	Average Vol. Change (mL)
6/26/23 7:45	0	21.0	9.88	0.10	0.00	0.00	0.00
6/26/23 14:35	410	21.0	9.62	0.28	0.26	0.18	0.22
6/29/23 7:41	4316	21.0	8.59	1.39	1.29	1.29	1.29
6/29/23 9:41	4436	22.0	8.58	1.44	1.30	1.34	1.32
6/29/23 11:41	4556	22.0	8.57	1.48	1.31	1.38	1.35
6/29/23 13:51	4686	22.0	8.54	1.52	1.34	1.42	1.38
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
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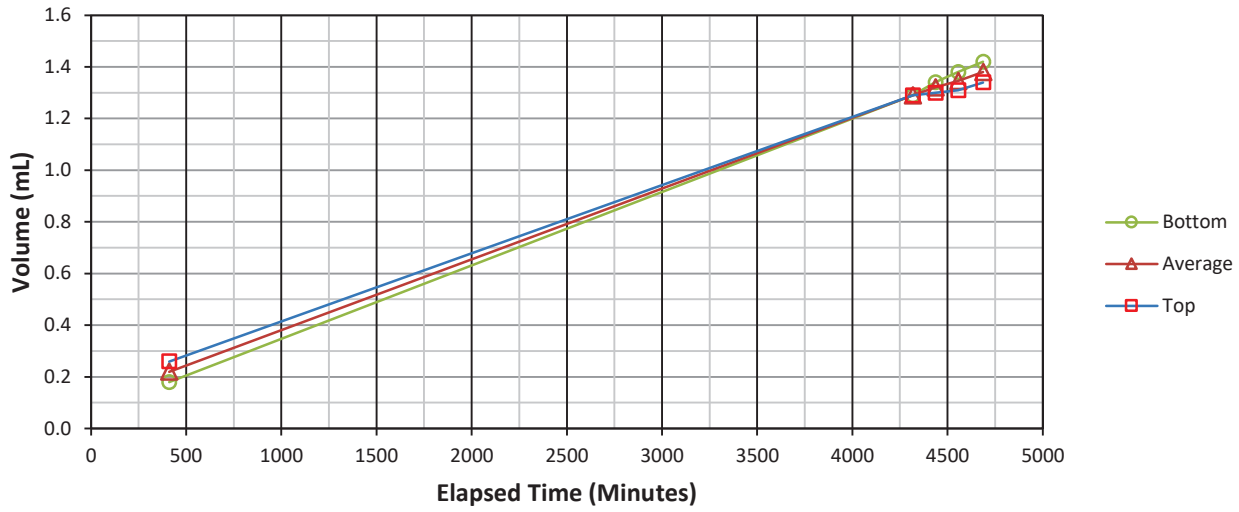


Project Name:	2023 Geotech Inv.	Depth:	
Project Number:	USG1680	Testing Company:	Union Street Geo.
Client:	Envirowest	Field Technician:	E.L.
Testhole:		Sample Date:	21 June, 2023
Location:	Red Deer, Alberta	Lab Technician:	B.B.
Sample Number:	W234	Date Tested:	22 June, 2023

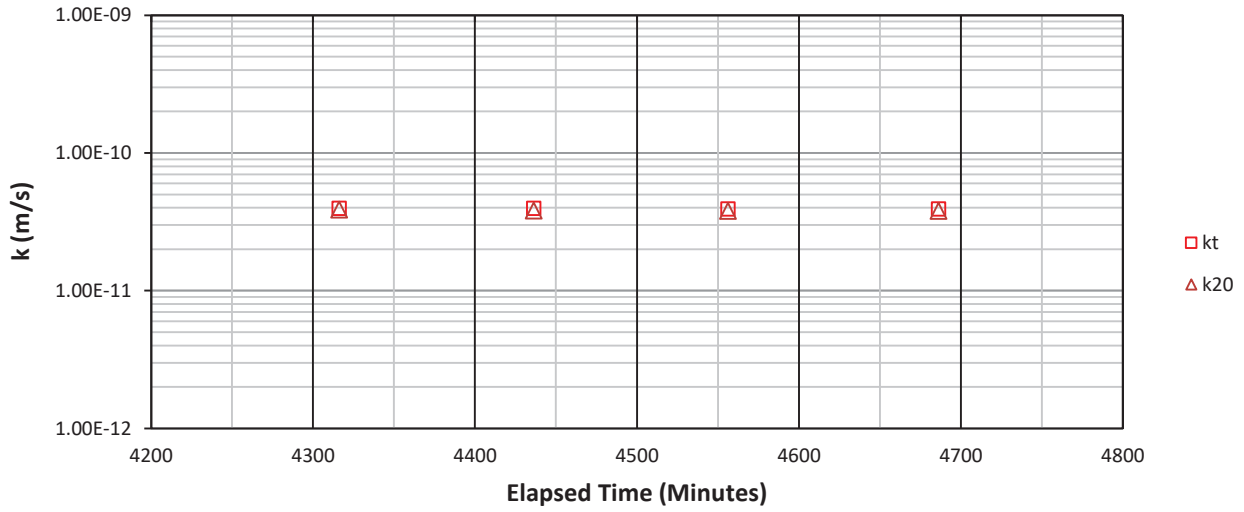
Flexible Wall Permeameter (ASTM D5084-10)

Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

Permeation Data

Head Difference (m):	2.0	Area of Sample (m^2)	4.178E-03
Length of Sample (m):	7.398E-02	Gradient, i	2.756E+01

Elapsed Time (Minutes)	Average Volume Change (mL)	Average Temperature (°C)	k_t (m/s)	R_T	k_{20} (m/s)
4316	1.29	21.0	3.965E-11	0.976	3.869E-11
4436	1.32	21.5	3.954E-11	0.965	3.816E-11
4556	1.35	21.5	3.927E-11	0.965	3.790E-11
4686	1.38	21.5	3.926E-11	0.965	3.789E-11
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	AVERAGE	3.943E-11		3.816E-11

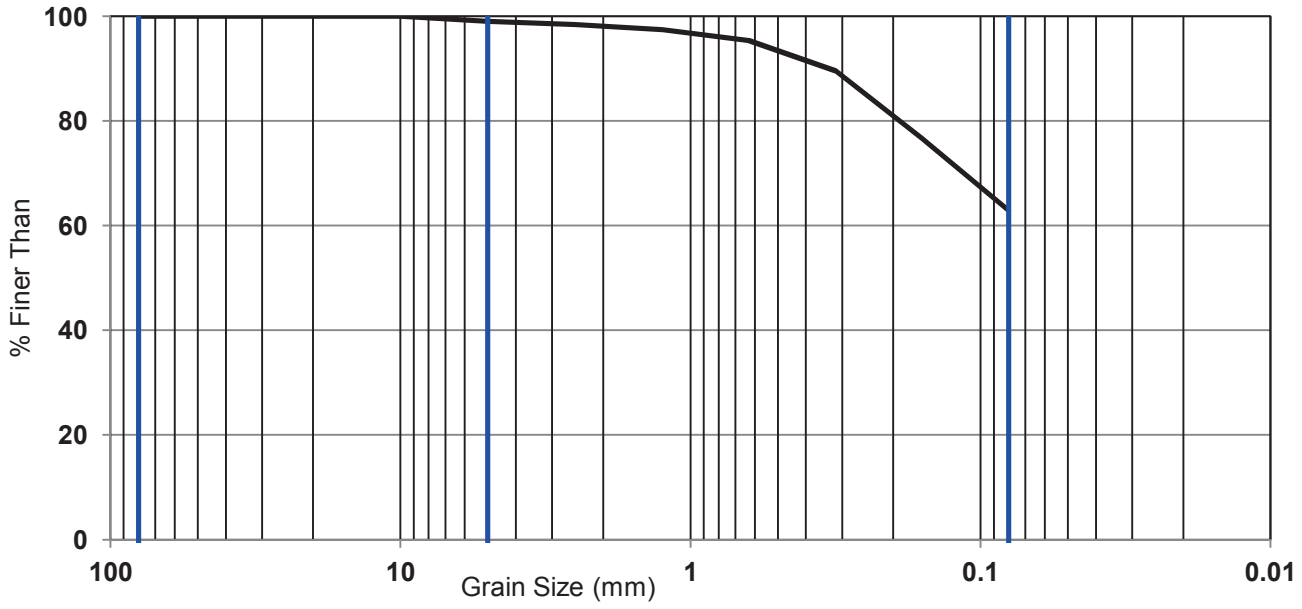


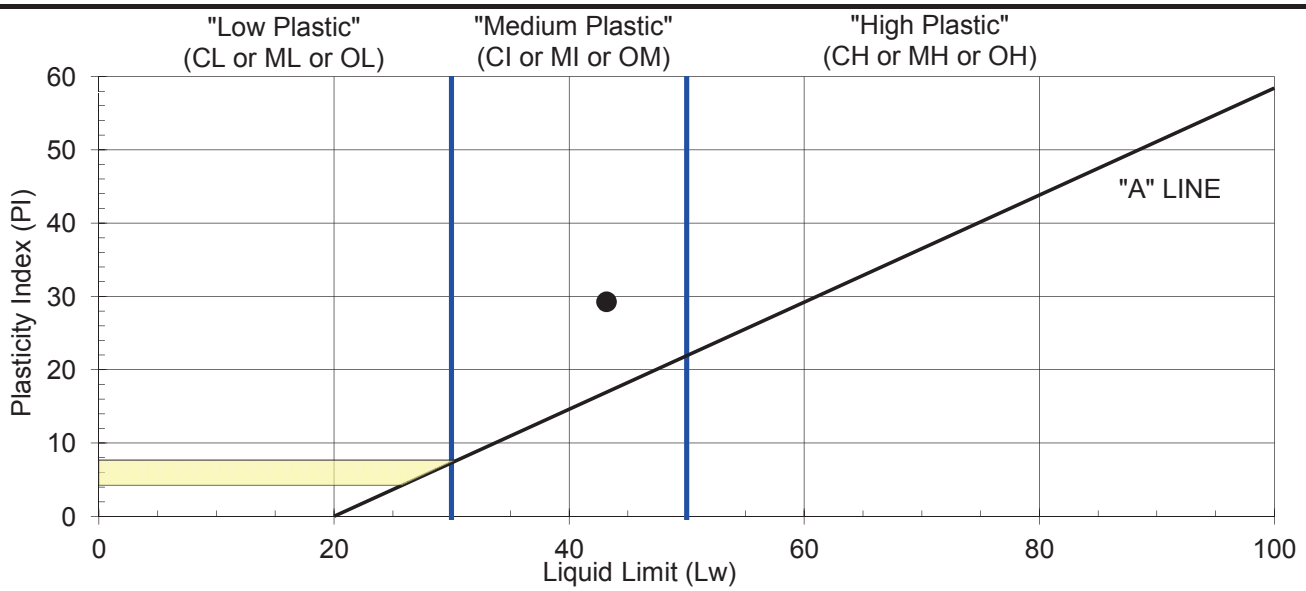
Lab Unified Soils Classification — Sample No.: W234

Sample Information

Classification:	**Particle Size:**	Gravel =	1.0%	**Borehole No.:**	-
Sand, silty, clayey, trace gravel		Sand =	36.2%	**Sample No.:**	W234
		Silt & Clay =	62.9%	**Depth (m):**	-

Particle Size Analysis - Washed Sieve





Plastic Limit:	13.87%	**Group Index:**	15.3
Liquid Limit:	43.17%	**Soil Type:**	Inorganic
Plasticity Index:	29.29%	**Classification:**	CI : Sandy Medium Plastic Clay

Union Street Geotechnical

CLIENT:	Envirowest	**FILE No.:**	USG1680
PROJECT:	Geotech. Inv.	**DATE:**	20-Jun-23
LOCATION:	Red Deer, Alberta	**TECH:**	C.L.