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	RA21030	W1/2 1-44-25 W4M

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.

Nov 19 2021
Date of signing

Signature

Corporate name (if applicable)

Curtis McKelvie
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)
Permitting existing Pen 7-15 and Catch Basin #1	
#2, and Construction of new Catch Basin	
(30x30) ~~feet~~ meters.	

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

Existing facilities	Dimensions (m) (length, width, and depth)	NRCB USE ONLY
Pen #1-6	See Appendix B.	

NRCB USE ONLY

The confirmed dimensions of the manure collection areas and manure storage facilities are stated on the following page. The new catch basin's (#3) location is on page 10.

Appendix B: Google Earth Imagery July 2018: CFO at W1/2 1-44-25 W4M

Pen 1 (24.9 m x 35 m)
Pen 2 (33.8 m x 15.7 m)
Pen 3 (39.5 m x 24.2 m)
Pen 4 (41.7 m x 63.6 m)
Pen 5 (74.6 m x 35 m)
Pen 6 (54.2 m x 47 m)
Pen 7 (53.5 m x 45 m)
Pen 8 (39.5 m x 59.6 m)
Pen 9 (67 m 56.7 m)
Pen 10 (49.1 m x 134.6 m)
Pen 11 (79.1 m x 40.4 m)
Pen 12 (74.9 m x 55.4 m and 20 m x 26 m)
Pen 13 (48.3 m x 56.9 m)
Pen 14 (48.3 m x 66 m)
Pen 15 (48.3 m x 68.9 m)

* several of the pens are "rectangular" shaped, the above dimensions are representative of average dimensions of each

Catch Basin 1 (62 m x 22 m x 2.3 m deep)
Catch Basin 2 (triangular, 62 m x 44 m x 76 m x 2.1 m deep)

Jeff Froese

From: Curtis [redacted]
Sent: August 10, 2022 1:23 PM
To: Jeff Froese
Subject: Re: Application Change

This sender is trusted.

No all pen floor and catch basins will stay the same just decreasing the head number

Sent from my iPhone

On Aug 10, 2022, at 1:13 PM, Jeff Froese <Jeff.Froese@nrcb.ca> wrote:

Hi Curtis,

Thank you for the below.

Can you please confirm if you intend to make any other changes to your application (the catch basins or pens that you are currently seeking to have permitted)?

Thank you,

Jeff Froese
Approval Officer

Natural Resources Conservation Board

From: Curtis [redacted]
Sent: August 10, 2022 11:01 AM
To: Jeff Froese <Jeff.Froese@nrcb.ca>
Subject: Application Change

Hi Jeff I would like to make change to my application #RA21030. I would like to change the number from 4000 Head of beef finisher to 1950 beef finishers.

Thanks,
??
Curtis McKelvie
McKelvie Feedlot
Box 17 Site 1 RR2
Ponoka, Ab.

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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

N/A.

Construction completion date for proposed facilities ASAP.

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 Finishers.	1000	~~+950~~ ~~+ 3000~~	~~1,950~~ ~~4000~~.

As noted on the previous page, the applicant has reduced the amount of proposed livestock to 1,950 beef finishers. The claimed "permitted" livestock capacity is discussed in Appendix A to Decision Summary RA21030.

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 Parks (AEP) 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

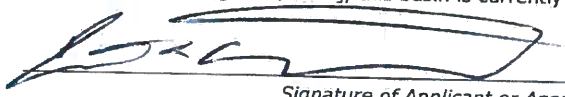
I **DO** want my water licence application coupled to my AOPA permit application.

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 AEP 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** AEP'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 AEP 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 AEP'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.

Signed this 19 day of Nov, 2021. 

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 AEP under the *Water Act* for the development or activity proposed in this AOPA application.

Signed this ____ day of _____, 20____. _____

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 AEP 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** AEP'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 AEP 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 AEP'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.

Signed this ____ day of _____, 20____. _____

Signature of Applicant or Agent

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

ALL SIGNATURES IN FILE ☒ YES ☐ NO

DATES OF APPROVAL OFFICER SITE INSPECTIONS

November 26, 2021 and May 18, 2022	

CORRESPONDENCE WITH MUNICIPALITIES AND REFERRAL AGENCIES

Date deeming letters sent: December 1, 2021

Municipality: Ponoka County

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

Alberta Health Services:

☒ 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: Samson Cree First Nation ☐ N/A

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

Other: Montana First Nation ☐ N/A

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

Natural Resource Conservation Board

0.0 0 0.02 0.0 Kilometers

Projection: NAD_1983_10TM_AEP_Forest
Map Scale: 2,257
Printed on: February 07, 2022 10:31:49 -07:00

Alberta Environment and Parks

Comments:
Vaultus circa 1999-2003

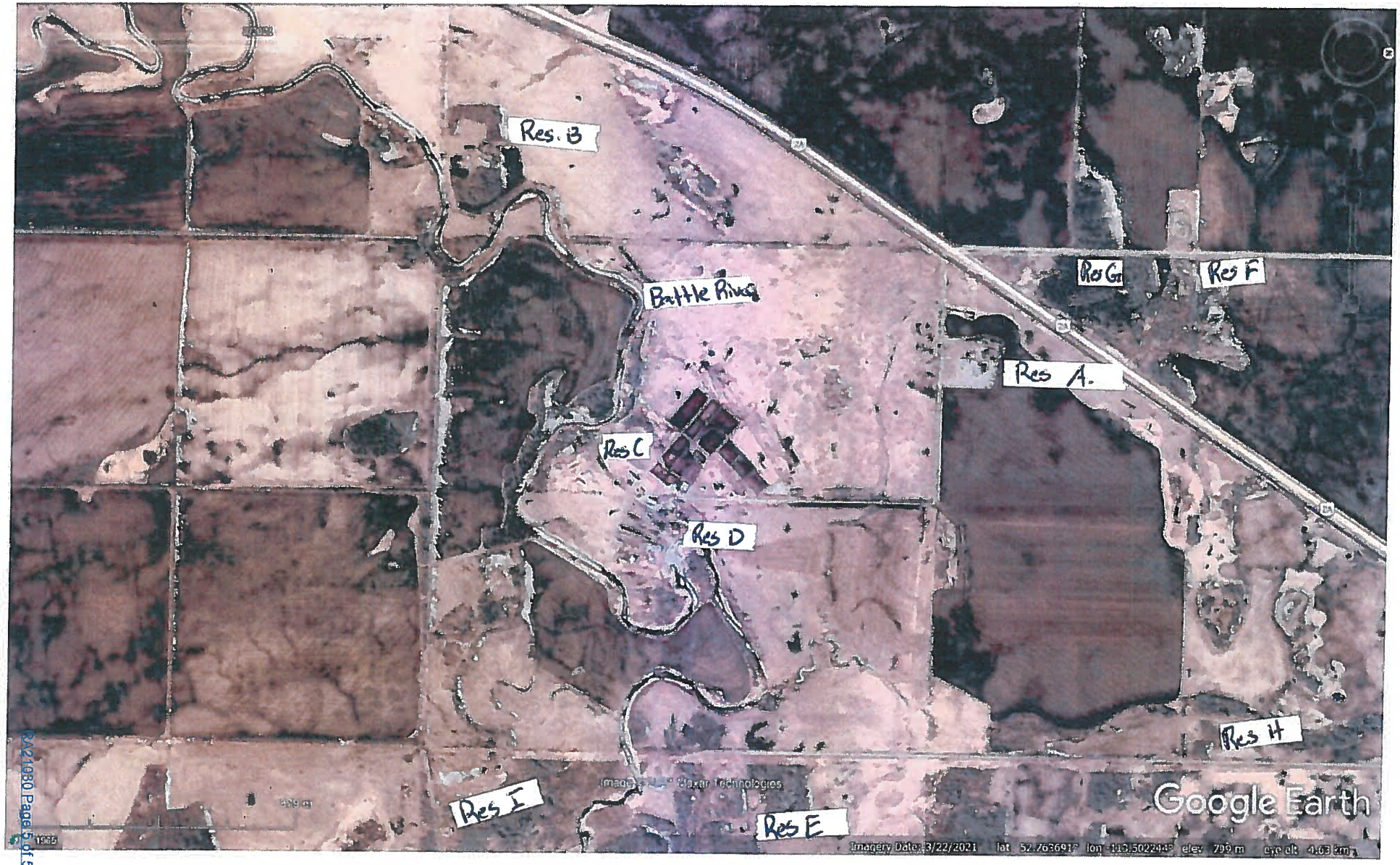
Natural Resource Conservation Board

0.0 0 0.02 0.0 Kilometers

Projection: NAD_1983_10TM_AEP_Forest
Map Scale: 2,257
Printed on: February 07, 2022 10:31:00 -07:00

Alberta Environment and Parks

Comments:
Vaultus circa 1999-2003


Res. B
Battle River
Res G
Res F
Res A.
Res C
Res D
Res H
Res I
Res E
Google Earth
Imagery Date: 3/22/2021

→ Run off Direction.

x well

note: the "x well" is located south of the residence to the southeast of the feedlot

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: all existing pens and catch basins

Proposed 1:

Proposed 2: Catch Basin #3

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	> 1 m based on previous flood events and age of existing structures at the site
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 observed or reported
	How many water wells are within 100 m of the manure storage facility or manure collection area?	2		0		☐ YES ☐ NO ☒ YES with exemption	confirmed, see Appendix F to Decision Summary RA21030
	What is the shortest distance from the manure collection or storage facility to a surface water body? (e.g., lake, creek, slough, seasonal)	200 m		100 m		☒ YES ☐ NO ☐ YES with exemption	
Groundwater information	What is the depth to the water table?	+9 m.		+9 m.		☒ YES ☐ NO ☐ YES with exemption	water table depth varies, see pages 23, 25 and 28 below
	What is the depth to the groundwater resource/aquifer you draw water from?	26.5 m		26.5 m		☒ YES ☐ NO ☐ YES with exemption	UGR depth varies, see pages 23, 25 and 28 below

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

This is a sketch of the facilities and receptors used for risk screening purposes. Green denotes pens draining towards catch basin 1, also green. Red denotes pens draining towards catch basin 2, also in red. Orange denotes pens draining toward the proposed catch basin 3, also orange. Pink denotes pens constructed before AOPA that contain their runoff within the pen.

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

ENVIRONMENTAL RISK SCREENING INFORMATION

ERST for **proposed** facilities

Facility	Groundwater score	Surface water score	File number
Pens draining towards catch basin 1	low	low	RA21030
Pens draining towards catch basin 2	low	low	RA21030
Pens draining towards catch basin 3	low	low	RA21030
Catch basin 1	low	low	RA21030
Catch basin 2	low	low	RA21030
Catch basin 3	low	low	RA21030

ERST for **existing** facilities

Facility	Groundwater score	Surface water score	File number
Pre AOPA pens	low	low	RA21030

ERST related comments:

I risk screened the pens based on drainage areas, accordingly some of the pre AOPA pens were included with the ones draining towards catch basin 1.

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

WATER WELL AND SURFACE WATER INFORMATION

Well IDs: 276704, 276716, 2088326

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 See discussion in Appendix F to Decision Summary RA21030

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
2088326	13	18	Pens draining towards catch basin 1
2088326	13	10	Catch basin 1

Groundwater or surface water related comments:

ATT: NRCB

Jeff Froese

Received February 2, 2022

It has been brought to my attention that the distance between my water well and catch basin is not with in spec. Even though it is not with in spec I believe that there shouldn't be any problem with this because the well is located at a significantly higher elevation, than the catch basin, there for all run off drains away from the well, as well as preventing any contamination in the event of the catch basin over filling. The catch basin will have a synthetic liner installed preventing any leaching into the ground. Further adding to the protection of the well is the bentonite seal, 50 meters below ground level, around the well preventing any seepage around the well casing.

Thanks

Curtis Mckelvie

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 Natural Resources Conservation Board

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

Neighbour name(s)	Legal land description	Distance (m)	NRCB USE ONLY: Zoning (LUB) category	MDS category (1-4)	Distance (m)	Waiver attached (if required)	Meets regulations
Res F Ian McKelvie	SW-12-44-25-W4	1400	Ag*	1	1,420	n/a	yes
Res H		1470	**	1	1,385	n/a	yes
Res E		987	**	1	965	n/a	yes
Res I		1500	***	4	1,300	n/a	yes

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

Name of land owner(s)*	Legal land description	Usable area** (ha)	Soil zone ***	NRCB USE ONLY: Usable area (ha)	Agreement attached (if required)
Curtis McKelvie	NW-12-44-25-W4	130 acres	Black	49.4	n/a
Curtis McKelvie	SW-26-43-25-W4	160 acres	Black	57.2	n/a
Curtis McKelvie	NW-26-43-25-W4	160 acres	Black	45.7	n/a
Curtis McKelvie	SW-35-43-25-W4	100 acres	Black	22.4	n/a
Lawrence McKelvie	S 1/2-12-44-25-W4	200 acres	Black	80.5	n/a
			Total	see next page	

* 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)

* - denotes agricultural district in Ponoka County's land use bylaw
** - residence on Samson Cree First Nation lands, see Appendix C in Decision Summary RA21030
*** - residence on Montana First Nation lands, see Appendix C in Decision Summary RA21030

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 Natural Resources Conservation Board

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

Neighbour name(s)	Legal land description	Distance (m)	NRCB USE ONLY				
			Zoning (LUB) category	MDS category (1-4)	Distance (m)	Waiver attached (if required)	Meets regulations
Res C Richard McKelvie.	SW-1-44-25-W4	200	Ag	1	190	n/a	yes
Res D Lawrence McKelvie	NE-1-44-25-W4	250	Ag	1	135	yes	yes
Res A Scott McKelvie	SW-12-44-25-W4	780	Ag	1	770	yes	yes
Res B Ken Walters	SE-2-44-25-W4	950					
Res G Lawrence McKelvie	SW-12-44-25-W4	1100					

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

Name of land owner(s)*	Legal land description	Usable area** (ha)	Soil zone ***	NRCB USE ONLY	
				Usable area (ha)	Agreement attached (if required)
Lawrence McKelvie.	NE-36-43-25-W4	160 acres.	Black.		
			Total		

* 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)

NRCB Natural Resources Conservation Board

Minimum Distance Separation (MDS) Waiver (declaration)

Applicant information NRCB application number: RA21030

Operator/operation name: Curtis McKelvie.

Address: [redacted] Postal Code: [redacted]

Legal land location of confined feeding operation: W1/2 1-44-25-W4

I have requested the residence owner(s) named below to waive the required minimum distance separation (MDS) to their residence for the *Agricultural Operation Practices Act* (AOPA) permit application identified above. In making this request, I have provided the owner(s) with an opportunity to review my permit application and a copy of the Natural Resources Conservation Board (NRCB) Fact Sheet "Minimum Distance Separation (MDS) Waivers" available on the NRCB website at www.nrcb.ca. I have also explained:

- The MDS requirement set out in section 3 of the Standards and Administration Regulation of AOPA. I have advised the owner(s) that section 3(6)(a) of the Standards and Administration Regulation allows this requirement to be waived by the owners of residences, if they agree in writing to grant a waiver;
- That my proposed development does not meet the required MDS to the owner's residence; and,
- That this waiver applies only to this application as described. An increase in livestock capacity, annual manure production, level of odour production, change to the site plan or change to a facility that would increase the MDS would require a new waiver.

Following is a summary of the proposed development:

- The current scope of my confined feeding operation (CFO), including the type, number, and category of livestock, if any, is:
  1000 Beef Finishers.
- My application for a new AOPA permit proposes the following changes to the existing livestock category, type and/or capacity at my CFO:
  Increase Capacity to 4000 Beef Finishers.
- The proposed new CFO facility(ies), or changes to the existing CFO facilities, including manure storage, manure storage volume and any other pertinent details, if any, are (attach a site layout plan if available):

I the applicant understand that the waiver is not valid unless ALL registered owners of the residence sign this document.

Permit Applicant: [signature] Date: July 4/22.
Signature

Residence owner(s) to initial: [redacted]

Minimum Distance Separation (MDS) Waiver (declaration)

Residence owner(s) information

ALL Names on land title: LAWRENCE R MCKELVIE

Legal land location of residence(s): E½ -1-44-25-W4

Telephone number(s) [redacted] Email address(es) [redacted]

Address(es)[1] and Postal code(s)[1]: [redacted]

[1] ***Please note that personal contact information is for NRCB use ONLY and not publicly released***

I am/we are the legal landowner(s) of a residence(s) located at the above noted legal land location/address:

- I/we have read the NRCB Fact Sheet "Minimum Distance Separation (MDS) Waivers";
- I/we have discussed this application with the applicant and understand its potential impacts to our residence(s);
- I/we understand that the application **does not** meet the MDS requirement to my/our residence(s), under the *Agricultural Operation Practices Act* (AOPA);
- **I/we understand that this waiver is not valid unless signed by ALL parties identified on the land title as owners;**
- **I/we are not obligated to waive the MDS requirement to our residence(s);**
- I/we understand that if I/we choose to waive the MDS requirement, I/we can revoke the waiver, by providing written notice to the NRCB approval officer, as set out in the "Minimum Distance Separation (MDS) Waivers" Fact Sheet; and
- I/we understand that this waiver is a public document.

Having considered my/our rights, I/we hereby waive the MDS requirement to my/our residence, with respect to **application number** RA21030.

[redacted]

Signatures of **all** residence owner(s) on title

LAWRENCE R MCKELVIE

Printed names of **all** residence owner(s) on title

Date: JULY 5/22.

Manure Spreading Agreement

This agreement is between Curtis McKelvie, manure producer, and

Lawrence R McKelvie Manure receiver.

Length of agreement: This agreement is valid for a time period of 10 years.
(minimum of one year)

Legal land location	Soil type[1]	Acres suitable for manure spreading[2]
S 1/2-12-44-25-W4	Black	200
NE-36-43-25-W4	Black	160

[1] Soil type choices: Dark brown and brown, Grey wooded, Black, Irrigated.

[2] Land within required setbacks from water bodies, water wells, residences, etc. is not to be included.

Other comments:

Manure producer (confined Feeding Operation) Legal Land Location NW-1-44-25-W4.

Date of signing	Signature	Print name	Corporate name(if appl)
Nov 26/21		Curtis McKelvie	

Manure Receiver – Landowner(s)[3]

Date of signing	Signature	Print name	Corporate name(if appl)
Nov 27/21	[redacted]	Lawrence R McKelvie	

[3] All registered owners of land, or authorized signing authorities must sign.

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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

MINIMUM DISTANCE SEPARATION

Methods used to determine distance (if applicable): Scaled air photo (2021) from Google Earth

Margin of error (if applicable): _____

Requirements (m): Category 1: 485 Category 2: 647 Category 3: 809 Category 4: 1,294

Technology factor: ☐ YES ☒ NO

Expansion factor: ☐ YES ☒ NO

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

See Appendix E to Decision Summary RA21030

LAND BASE FOR MANURE AND COMPOST APPLICATION

Land base required: 152.1 ha black soil

Land base listed: 368.4 ha black soil

Area not suitable: 53.2 ha

Available area 315.2 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 Decision Summary RA21030, Appendix A

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 - 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)* 1. Pen #7-15

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.	See Att. Sketch.	sketch on page 2.		the pens are capable of storing 9 months of manure
2.				
			TOTAL CAPACITY	

☒ 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

fresh Run of dose not Run through Pens. feed alys act as Dividers. Pen Runoff goes to catch basins.

Liner protection

Describe how the physical integrity of the liner will be maintained

Patch as needed.

NRCB USE ONLY

Requirements met: ☒ YES ☐ NO

Last updated February 26, 2021

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 - Compacted soil liner (cont.)

Compacted soil liner details

Thickness of compacted liner	0.7 (m)	Provide compacted liner details (as required)	
Soil texture	45 % sand	33.8 % silt	21.2 % clay
Atterberg limits	Plastic limit 18	Liquid limit 32	Plasticity index 14
Hydraulic conductivity	Hydraulic conductivity (cm/s): 7.0×10^{-7} cm/s Describe test standard used: ASTM #698		

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 m (based on borehole 21BH03) Requirements met: ☒ YES ☐ NO

Depth to uppermost groundwater resource: see below Requirements met: ☒ YES ☐ NO

ERST completed: ☒ see ERST page for details

conservatively, the UGR could be as shallow as 2 m based on sand in borehole 21BH01

Surface water control systems

Requirements met: ☒ YES ☐ NO Details/comments:

Compacted soil liner details

Hydraulic conductivity after adjustment: 7.0×10^{-7} cm/s

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

See info on page 38

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: Synthetic liner

*(complete a copy of this section for **EACH** proposed manure storage facility with a synthetic liner)*

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

1. Catch Basin #1
2. Catch Basin #2

Determination of minimum required catch basin volume

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

Basin #1 Catch area 27600 m2

Basin #2 Catch area 33500 m2

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.	62	22	2.3	2.3	3-1	3-1		1,330
2.	62	44 (Rectangular) 21		2.1	3-1	3-1		1,576
							TOTAL CAPACITY	

Synthetic liner details

	Thickness and type of liner material	Provide liner material details (as required)
Synthetic liner	40 m min.	HDPE

I interpret 40 M to refer to 40 mil as discussed on page 39 below

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

Liner protection

Describe how the inside walls, bottom and outside walls are protected from erosion

Plastic liner.

Describe how the physical integrity of the liner will be maintained from damage

Key way Trench.

The attached geotechnical report states that a 40 mil thick HDPE liner requires additional design considerations. A condition will be added to the permit requiring those conditions be submitted to and approved by the NRCB in writing, before the liner is installed.

NRCB USE ONLY

Requirements met: ☒ YES ☐ NO

Condition required: ☒ YES ☐ NO

RUNOFF CONTROL CATCH BASIN: Synthetic liner (cont.)

NRCB USE ONLY

Catch basin calculator total volume @ freeboard level: see next page Runoff capacity requirements met: ☒ YES ☐ NO

Calculation of the volume attached: ☒ YES ☐ NO see next page

Depth to water table: > 2 m (based on borehole 21BH07) Requirements met: ☐ YES ☒ NO

Depth to Uppermost Groundwater Resource: 2.8 m (based on borehole 21BH05) Requirements met: ☐ YES ☒ NO

The depth to a water table can vary seasonally and due to climatic conditions and the UGR depth is very conservative. It is possible that both will be more than 1 m below the base of the liner at time of construction. Accordingly, a condition will be added to the permit to address this.

ERST completed: ☒ See details in ERST page

Liner requirements met: ☐ YES ☐ NO Condition required: ☐ YES ☐ NO

Comments:

As noted on the previous page and above, conditions will be added to address water table and UGR separation and liner integrity.

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

Construction plans approved by professional engineer: ☒ YES ☐ NO

Will liner be installed by manufacturer approved contractor and qualified third party?: ☒ YES ☐ NO

Condition required: ☒ YES ☐ NO

Preparation of liner bed (comments):

Construction Dimensions of Catch Basin 1

Only cells in blue can be changed.

Overall Dimensions of Catch Basin		
Total Length*4	62.0	m
Total Width*4	22.0	m
Total Depth*4	2.3	m
Design Capacity Depth	*1.80*	m
End Slope*4	3	run:rise
Side Slope*4	3	run:rise
Length of Bottom	48.2	m
Width of Bottom	8.2	m
Capacity @ top of Bank	*1,950*	m^3

Design Capacity of Catch Basin (freeboard level)		
Length (design capacity depth)	59.0	m
Width (design capacity depth)	19.0	m
Total Depth	2.3	m
Design Capacity Depth	1.80	m
End Slope	3	run:rise
Side Slope	3	run:rise
Design Capacity (freeboard level)	**1,330**	**m^3**
Surface Area of Liquid Manure (freeboard level)	*1,121*	*m^2*

A. The areas contributing runoff to catch basin 1 and 2, respectively, are 21,010 m^2 and 31,620 m^2.

B. The 1:30 year rainfall event for Ponoka is 80 mm (0.08 m).

C. The runoff coefficient for a 80 m rainfall is 0.6.

one day rainfall runoff volume = AxBxC

The area contributing runoff to catch basin 1 will generate 1,008 m^3 in a 1:30 year, one day precipitation event.
Catch basin 1 is adequately sized.

The area contributing runoff to catch basin 2 will generate 1,518 m^3 in a 1:30 year, one day precipitation event.
Catch basin 2 is adequately sized. The catch basin's calculated storage volume is stated on page 72.

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 #3
2. _____
3. _____

Determination of runoff area

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

Catch Basin Area is w 8600 m2
Rain fall event 80 mm.
Run of co ~~not~~ Potetial . 60%.

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.	30	30	1	1	1-1	1-1		406
2.								
3.								
							TOTAL CAPACITY	

Compacted soil liner details

Thickness of compacted soil liner	1.4 (m)	Provide details (as required) See Proofs. Pen APP.	
Soil texture	_____% sand	_____% silt	_____% clay
Atterberg limits	Plastic limit _____	Liquid limit _____	Plasticity index _____
Hydraulic conductivity	Hydraulic conductivity (cm/s)		
	Describe test standard used		

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: 406 m^3

Runoff capacity requirements met: ☒ YES ☐ NO

Calculation of the volume attached: ☒ YES ☐ NO

Depth to water table: 6 m (borehole 21BH01, mottling) Requirements met: ☒ YES ☐ NO

Depth to Uppermost Groundwater Resource: 2 m (borehole 21BH01) Requirements met: ☒ YES ☐ NO

ERST completed: ☒ see ERST page for details

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

See page 38 below.

An area of 8,125 m^2 contributes runoff to this catch basin, based on this and the parameters on page 26, the proposed catch basin is adequately sized.

Leakage detection system required: No

Construction Dimensions of Catch Basin 3

Only cells in blue can be changed.

Overall Dimensions of Catch Basin		
Total Length*4	30.0	m
Total Width*4	30.0	m
Total Depth*4	1.0	m
Design Capacity Depth	*0.50*	m
End Slope*4	1	run:rise
Side Slope*4	1	run:rise
Length of Bottom	28.0	m
Width of Bottom	28.0	m
Capacity @ top of Bank	*841*	m^3

Design Capacity of Catch Basin (freeboard level)		
Length (design capacity depth)	29.0	m
Width (design capacity depth)	29.0	m
Total Depth	*1.0*	m
Design Capacity Depth	0.50	m
End Slope	1	run:rise
Side Slope	1	run:rise
Design Capacity (freeboard level)	**406**	**m^3**
Surface Area of Liquid Manure (freeboard level)	*841*	m^2

Site and Soil Assessment
Current Feedlot
W½, Sec. 01, Twp. 044, Rge. 25, W4M
Ponoka County, Alberta

ENVIROWEST ENGINEERING INC.
Professional Environmental Engineering Services

Envirowest Engineering Inc.
Professional Environmental Engineering Services

Site and Soil Assessment
Current Feedlot
W½, Sec. 01, Twp. 044, Rge. 25, W4M
Ponoka County, Alberta

Prepared for: Curtis McKelvie

Prepared by: Envirowest Engineering
P.O. Box 4248, Ponoka, Alberta, T4J 1R6
(403) 783-8229

Report Prepared: September 30, 2021

Project Number: 2106 - 42977

Private and Confidential

Table of Contents

Appendices

1.0 Introduction and Scope of Work

Envirowest Engineering (Envirowest) was retained by Curtis McKelvie to conduct a Site and Soil Assessment for a solid manure storage within feedlot pens and catch basins associated with an existing feedlot. The property is at W½-01-044-25-W4M in Ponoka County, herein referred to as "the Site."

Representative soil samples were collected at the Site to allow for the assessment of applicable soil properties. The samples were collected by completing investigative boreholes using a truck-mounted rotary auger and a skid steer-mounted auger. Soil samples were collected from selected boreholes and surface soil sites and reserved for potential laboratory analysis. The site assessment occurred on June 10, 2021. Two boreholes were completed as monitoring wells to perform in-situ hydraulic conductivity testing. The hydraulic conductivity testing was completed on July 15, 2021 and September 2, 2021.

The scope of work included the assessment of a potential natural barrier beneath the current feedlot pens, an assessment of current feedlot pen liner depth, an assessment of current catch basin liners, and the assessment of borrow material used to create the pen liners.

The work has been completed in accordance with the standards and regulations associated with the amended Agricultural Operation Practices Act (GOA, 2020) and associated Standards and Administration Regulation (GOA, 2017) which govern all new and modified confined feeding operations.

This report will summarize the findings of the soil assessment.

2.0 Site Description

The Site is located approximately 9 kilometers (km) northeast of Ponoka, Alberta, as indicated on Figure 1.0. Assessment locations are indicated on Figure 2.0.

The Alberta Soil Information Viewer indicates the Site is in an area of undulating topography with high relief (GOA, 2021).

The Geological Map of Alberta indicates that the site is located in an area where the uppermost bedrock is of the Paskapoo formation which consists of grey to greenish grey, thick bedded calcareous, cherty sandstone; grey and green siltstone and mudstone; minor conglomerate, thin limestone, coal and tuff beds, and is non-marine in nature (Prior, 2013).

The quaternary geological map for Central Alberta identifies that the site is in an area influenced by a lacustrine deposit. In this area, the coarse sediment consists of sand and silt. There may be undulating surfaces in places modified by wind (Shetsen, 1990).

There are two catch basins in the feedlot area, as shown on Figure 2.0. The Battle River is approximately 160 m to the southwest of the Site. The uppermost groundwater flow direction is predicted to be to the southwest.

3.0 Site Assessment Methodology

Eight investigative boreholes were drilled using a truck-mounted rotary auger and completed to depths between 3.0 and 9.0 meters below ground surface (mbgs) on June 10, 2021. A skid steer-mounted auger was also utilized to drill surface soil samples within the existing feedlot pens (indicated as "SS" on Figure 2.0). Borehole logs and locations can be found in Appendix B.

Soil samples were taken from boreholes 21BH01 at 5.75 mbgs, 21BH02, and 21BH04 at 0.5 mbgs. A soil sample was also obtained from SS02 at 1.0 mbgs. A composite sample was obtained from the borrow location as indicated on Figure 2.0. The soil samples were submitted to KaizenLAB for analysis for particle size distribution (hydrometer). The composite soil sample underwent additional analysis for Atterburg limits, hydraulic conductivity, standard proctor, and moisture content.

In-situ hydraulic conductivity testing was completed at borehole 21BH07 (21MW02) on July 15, 2021 and at borehole 21BH06 (21MW01) on September 2, 2021.

The soil from the Site was assessed based on the requirements specified in the Agricultural Operation Practices Act (GOA, 2020) and associated regulations (GOA, 2017). One of the critical aspects of meeting these requirements is the assessment of native soil properties to facilitate manure storage facility construction. It is recommended that the solid manure storage be constructed in such a way and of appropriate material with an hydraulic conductivity of 1.0×10^{-6} cm/sec. It is also important to construct such storage facilities in an area where the water table is at least 1.0 m below the bottom of the facility and in an area not prone to flooding.

The analytical methodologies are referenced with the laboratory reports presented in Appendix C.

4.0 Site Assessment Results

The results of the soil analysis completed by a third-party accredited laboratory are presented in Table 1 below. The soil sample locations are presented on Figure 2.0, and borehole logs and well completion details are attached.

Table 1: Soil Properties Results

Parameter	21BH01	21BH02	21BH04	SS02*	Composite
Sample Depth (mbgs)	5.75	4.8	0.5	1.0	-
Particle Size (% sand)	36.2	43.8	41.2	42.5	45.0
Particle Size (% silt)	35.0	32.5	32.5	32.5	33.8
Particle Size (% clay)	28.8	23.7	26.3	25.0	21.2
Texture Class	Clay loam	Loam	Loam	Loam	Loam
Moisture (%)	-	-	-	-	14.3
Hydraulic Conductivity (cm/sec)	-	-	-	-	7.0×10^{-8}
Liquid Limit (%)	-	-	-	-	32
Plastic Limit (%)	-	-	-	-	18
Plasticity Index (%)	-	-	-	-	14

* Identified as "Pen" on Certificates of Analysis

The composite soils were identified as Loam with a clay content of 21.2%. The hydraulic conductivity was determined to be 7.0×10^{-8} cm/sec at 99% compaction. The maximum dry density was found to be 1,898 kg/m^3 with an optimum moisture content of 13.9%.

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 7.0×10^{-7} cm/sec.

Monitoring well 21MW01 and 21MW02 were hydrated with water prior to completing the in-situ hydraulic conductivity testing. Homeostasis was met prior to completing the test. The hydraulic conductivity test was completed for 21MW02 on July 15, 2021. The initial depth to water in the well was measured. A volume of water was then added to the well and the change in depth to water was measured over time. The depth was measured every thirty seconds for ten minutes, then every five minutes to forty-five minutes. The results of the test were analyzed as a falling head test using AQTESOLV Bouwer-Rice method for unconfined wells. Results for 21MW02 were not analyzed as the liner was deemed in the field to not meet the requirements.

The results of the assessment were an in-situ hydraulic conductivity of 1.63×10^{-6} cm/sec.

There was no saturated water table encountered in the proposed construction area at the time of drilling. Bedrock was not encountered to the extent of investigation.

5.0 Surface Run-off Area

The current area of contributing run-off is divided into 3 areas as noted in Figure 2.0. Area 1 currently drains into Catch Basin 1, a volume of $1{,}300 m^3$ is required for Catch Basin 1.

Area 2 currently drains into Catch Basin 2, a volume of $1{,}500\ m^3$ is required for Catch Basin 2.

Area 3 currently drains into the grassed area south of the feedlot, a catch basin volume of $400\ m^3$ is required for this area.

6.0 Conclusions

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

The soil tested for properties of a natural barrier (21MW02) was found in two layers in boreholes 21BH01 and 21BH02 and beneath a gravel layer in borehole 21BH02. The soils exhibit sufficient hydraulic conductivity as a naturally occurring layer to provide protection as solid manure storage.

The current pens were measured to have a compacted liner from 0.5-1.0 meters constructed of material primarily from the borrow area.

The current catch basins require an appropriate liner as per AOPA requirements. The south pen (area 3) requires run-off control.

7.0 Recommendations

Solid Manure Storage

It is recommended that the current pens maintain the compacted liner that was measured to be from 0.5 to 1.0 meters in addition to the naturally occurring barrier.

Catch Basins

It is recommended that the current catch basins be emptied and lined. The material tested from the borrow area would require that the liner be 1.4 meters in thickness. An alternative would be to line the catch basins with a synthetic liner.

Compacted Liner Requirements

- The area for the catch basin should be over-excavated to allow the installation of a side, end wall, and bottom liner of at least 1.4 m thick for the catch basin
- 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
- 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 lagoon should be supervised by a professional engineer

Synthetic Liner Requirements

Two types of synthetic liner which are readily available in the market and are suitable for such an installation are polyvinyl chloride (PVC) and high density polyethylene (HDPE). Both materials are resistant to degradation from animal manures. The suitability of these materials in this application will be somewhat dependent on the intended operation of the facility. Operational practices for the catch basin will need to be considered to determine the potential for mechanical damage to the liner. Some suppliers also offer specially blended materials for such an installation. The use and suitability of these materials should be discussed directly with the supplier.

PVC is a flexible material which is more easily installed and repaired than liners constructed of polyethylene material. Seams in PVC liners can be completed in the field without special equipment. These liners require a soil covering, generally 30 cm thick, to protect them from degradation from ultraviolet light, cold temperatures and mechanical damage. This presence of such a soil cover can be troublesome on the sidewalls due to gravitational sloughing and liquid drawdown. Additional care is required during installation to avoid liner damage during construction of the backfill layer.

Liners constructed of HDPE are more rigid and more resistant to damage. Both seams completed in the field and repairs to the liner require the use of special equipment to "weld" the material. The material is not degraded by ultraviolet light and does not require a soil backfill.

Should damage occur to the liner after installation, repair can be time consuming and costly, particularly with respect to HDPE liners. The liner construction should consider areas of high risk (areas of manure removal and agitation) to reduce the potential for damage. There are various methods for securing these higher risk areas such as double liner installation or concrete filled geofabrics which allow equipment to enter and exit the lagoon with less risk of damage.

Liner material is available in a range of thicknesses from 20 mil to 100 mil (1 mil= 0.001 inches or 1 mm = 39 mils). The selection of liner thickness should consider material availability, cost, durability and operational procedures. Thicker liners are less prone to damage but are more costly.

Based on the liquid level fluctuation in the lagoon and the need to periodically access the lagoon for manure and solid withdrawal, a HDPE liner is recommended as no soil covering is required. A thickness of 60 mil is suggested to reduce the potential for liner damage. The thickness of the material could be reduced to 40 mil with additional design consideration in high risk areas of the lagoon.

On site preparation is required for the installation of a synthetic liner. The sub-grade must be compacted and stable. It should be smooth and uniform, must be free of sharp fragments, stones, roots or other material which could damage the liner and should not have any rapid changes in elevation. Care is required during the installation of synthetic liners to ensure damage does not result from vehicular activity or improper installation. Supervision by the supplier is recommended.

Applicable material and workmanship warranties should be discussed prior to installation.

To improve the sub-grade preparation and to again reduce the risk of liner damage, a geotextile may be installed under the geomembrane liner. The placement of this textile over the sub-grade provides a clean working area for field seams, provides added puncture resistance when loads are applied, improves the geomembrane to soil interface and can allow for the lateral and upward escape of subsurface water and gases that rise up beneath the geomembrane during its service life.

Upward moving water is caused by high groundwater levels. Upward moving gases are caused by biodegradation of organic material in the subsurface soils and from rising water table levels which expel the air from the soil voids. Vapour "strips" can be placed to allow for trapped vapours to be released from beneath the liner.

Following installation of the liner, each seam and repair area should be tested to ensure a complete seal has been achieved. The supplier/installer should provide an installation report detailing the testing of the material, the seams and any required repairs.

Catch Basin Sizing

Should you choose to utilize the current catch basin locations the following dimensions are recommended.

Area 1: 62 m x 22 m x 2.3 mbgs to top of berm. This includes a 0.5 m freeboard

Area 2: 62 m (a) x 44m (b) x 2.1 mbgs to top of berm. This includes a 0.5 m freeboard

Area 3: 30 m x 30 m x 1.0 mbgs. This includes a 0.5 m freeboard. In this area it is recommended to have topsoil replaced and seeded with vegetation that has an established perennial root mass. Due to this recommendation it is also suggested that the liner be constructed of a compacted clay.

8.0 Closure

Envirowest Engineering is pleased to submit the Site and Soil Assessment report to Curtis McKelvie. The information and conclusions contained in this report are for their sole use and such parties as may be normally involved in the approval process for such a facility. 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,

October 1, 2021

Prepared by:

Leah Predy, P.Ag
Envirowest Engineering

PERMIT TO PRACTICE
2206165 ALBERTA LTD.
RM SIGNATURE:
RM APEGA ID #: 110373
DATE: October 1, 2021
PERMIT NUMBER: P014810
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

PROFESSIONAL ENGINEER ALBERTA
EMILY J. LOW

2021-10-01

Prepared and Reviewed by:

Emily J. Low, P.Eng
Envirowest Engineering

2206165 Alberta Ltd. o/a Envirowest Engineering
Association of Professional Engineers and Geoscientists of Alberta
Permit to Practice No. P14810

9.0 References

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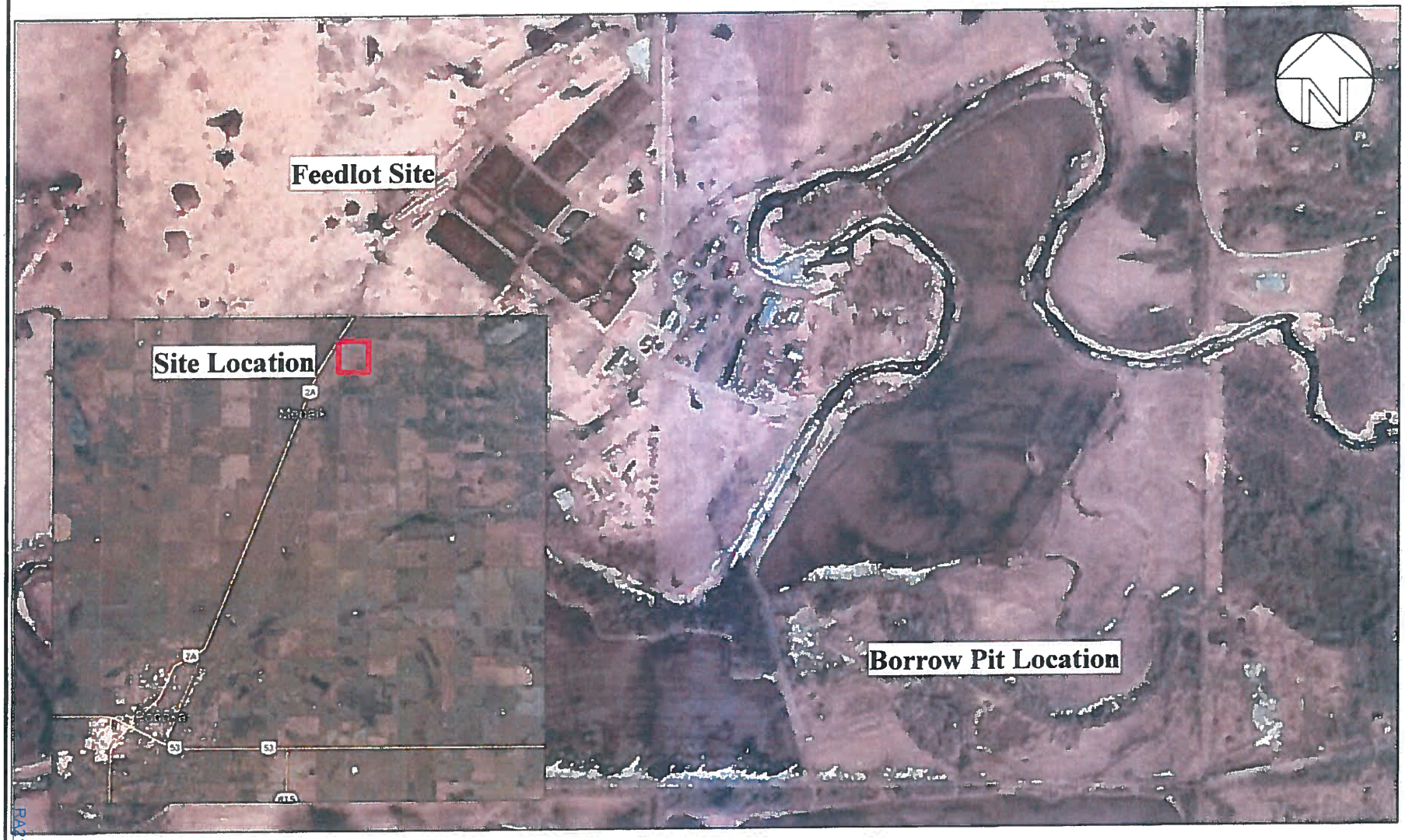
Shetsen, I. (1990). Quaternary Geology, Central Alberta. Edmonton, AB: Alberta Research Council, Natural Resources Division, Terrain Sciences Department

Appendix A

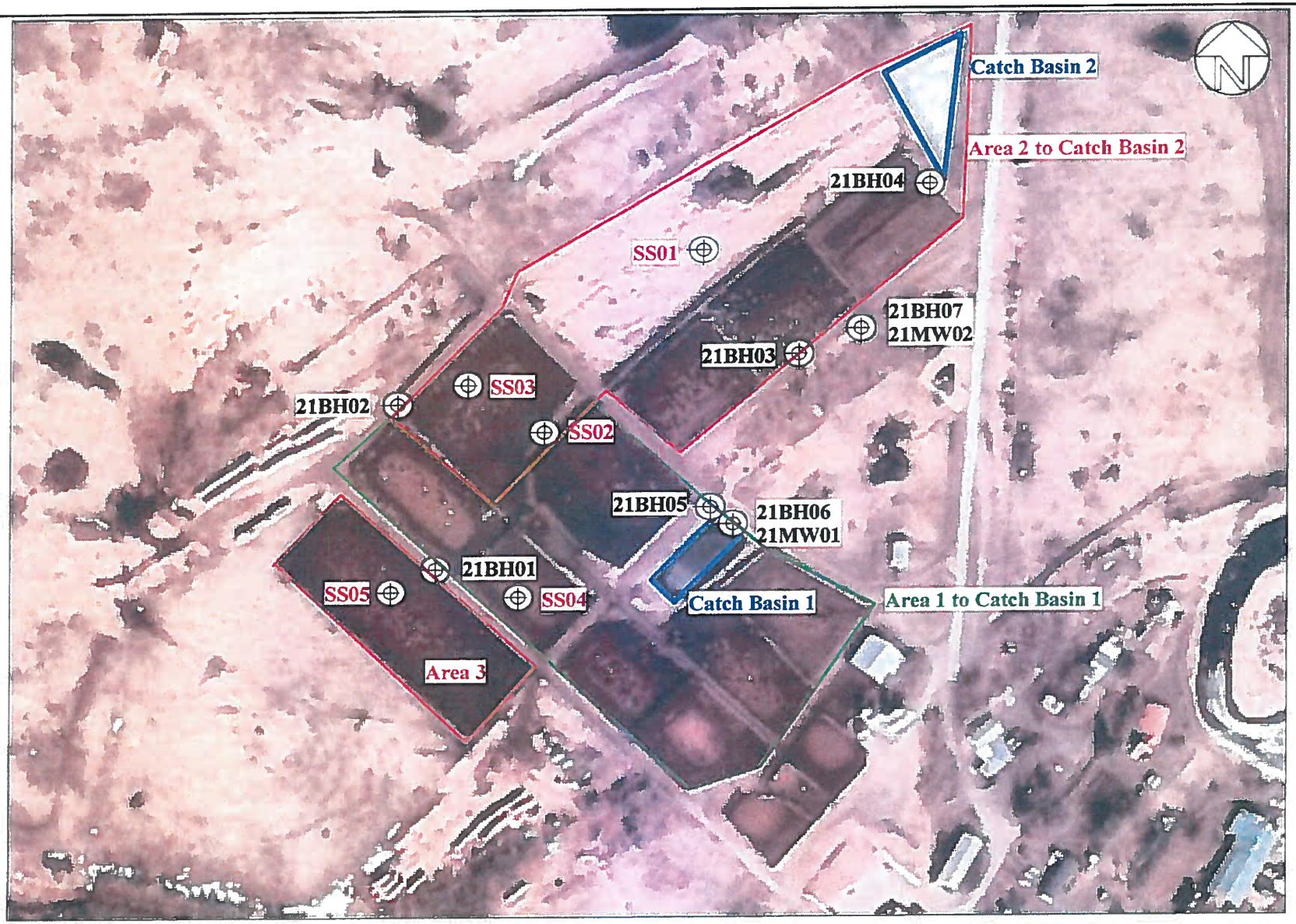
Site Location



ENVIROWEST ENGINEERING INC. Professional Environmental Engineering Services	**Title:** Site Location Site and Soil Assessment W1/2-01-044-25-W4M Ponoka County, Alberta	**Project No:** 2106-42977	**Date:** August 23, 2021
		Prepared by: L. Predy	**Figure No.:** 1.0

Appendix B

Borehole Locations and Borehole Logs



ENVIROWEST ENGINEERING INC.
Professional Environmental Engineering Services

Title:
Borehole Locations
Site and Soil Assessment
W½-Sec.01-Twp.044-Rge.25-W4M
Ponoka County, Alberta

Project No: 2106-42977	**Date:** August 23, 2021
Scale: 1:3000	**Prepared By:** L. Predy

Figure: 2.0

ENVIROWEST ENGINEERING INC.

LOG OF BORING 21BH01

Site and Soil Assessment
W1/2-01-44-25-W4
Ponoka County, Alberta

Project Number: 2106-42977

Driller: : Ever Green Drilling
Drilling Method: : Truck Mounted Auger
Drill Date: : June 10, 2021
Logged By: : Emily Low P.Eng.

Well:
Elev.:

Depth in Meters	Gastech Reading (ppm) 0 / 1000 / 2000	VOC Reading	GRAPHIC	DESCRIPTION	Water Level
0.0 – 0.3				SAND and GRAVEL (road), reddish brown, loose, damp	
0.3 – 1.8				SANDY CLAY, grey, firm, damp	
1.8 – 4.3				SAND, trace clay, loose, damp	
4.3 – 4.8				CLAYEY SAND, grey, compact, damp	
4.8 – 9.0				SANDY CLAY loam, grey, very compact Clay 28.8% grey brown mottling	

09-24-2021 Z:\Operations\Client Data\42977 Curtis McKelvie\21BH01.bor

ENVIROWEST ENGINEERING INC.

LOG OF BORING 21BH02

Site and Soil Assessment
W1/2-01-44-25-W4
Ponoka County, Alberta

Project Number: 2106-42977

Driller: : Ever Green Drilling
Drilling Method: : Truck Mounted Auger
Drill Date : June 10, 2021
Logged By: : Emily Low P.Eng.

Well:
Elev.:

Depth in Meters	Gastech Reading (ppm) 0 / 1000 / 2000	VOC Reading	GRAPHIC	DESCRIPTION	Water Level
0.0				SAND and GRAVEL road, reddish brown, loose, damp	
0.3					
0.5					
0.8					
1.0					
1.3				GRAVEL, reddish brown, loose, damp	
1.5					
1.8					
2.0					
2.3					
2.5					
2.8					
3.0					
3.3				SANDY CLAY loam, grey, very compact	
3.5					
3.8					
4.0					
4.3					
4.5					
4.8				Clay 23.7%	
5.0					
5.3					
5.5					
5.8					
6.0					
6.3					
6.5					
6.8					
7.0					
7.3					
7.5					
7.8					
8.0					
8.3					
8.5					
8.8					
9.0					

09-24-2021 Z:\Operations\Client Data\42977 Curtis McKelvie\21BH02.bor

ENVIROWEST ENGINEERING INC.

LOG OF BORING 21BH03

Site and Soil Assessment
W1/2-01-44-25-W4
Ponoka County, Alberta

Project Number: 2106-42977

Driller: : Ever Green Drilling
Drilling Method: : Truck Mounted Auger
Drill Date : June 10, 2021
Logged By: : Emily Low P.Eng.

Depth in Meters	Gastech Reading (ppm) 0 1000 2000	VOC Reading	GRAPHIC	DESCRIPTION	Well: Elev.:	Water Level
0.0 – 0.3				SAND and GRAVEL road, pit run		
0.3 – 1.3				SANDY CLAY, grey, firm, damp		
1.3 – 3.0				SAND and GRAVEL, trace clay, damp to wet		
3.0 – 9.0				SANDY CLAY with silt, grey, very compact		

09-24-2021 Z:\Operations\Client Data\42977 Curtis McKelvie\21BH03.bor

ENVIROWEST ENGINEERING INC.

LOG OF BORING 21BH04

Site and Soil Assessment
W1/2-01-44-25-W4
Ponoka County, Alberta

Project Number: 2106-42977

Driller: : Ever Green Drilling
Drilling Method: : Truck Mounted Auger
Drill Date : June 10, 2021
Logged By: : Emily Low P.Eng.

Well:
Elev.:

Depth in Meters	Gastech Reading (ppm) 0 / 1000 / 2000	VOC Reading	GRAPHIC	DESCRIPTION	Water Level
0.0				SANDY CLAY, mottled, firm, damp	
0.3					
0.5				Clay 26.3%	
0.8					
1.0					
1.3					
1.5					
1.8					
2.0					
2.3				SAND	
2.5				SANDY CLAY loam, grey, very compact	
2.8					
3.0					
3.3					
3.5					
3.8					
4.0					
4.3					
4.5					

09-24-2021 Z:\Operations\Client Data\42977 Curtis McKelvie\21BH04.bor

ENVIROWEST ENGINEERING INC.

LOG OF BORING 21BH05

Site and Soil Assessment
W1/2-01-44-25-W4
Ponoka County, Alberta

Project Number: 2106-42977

Driller: : Ever Green Drilling
Drilling Method: : Truck Mounted Auger
Drill Date : June 10, 2021
Logged By: : Emily Low P.Eng.

Well:
Elev.:

Depth in Meters	Gastech Reading (ppm) 0 / 1000 / 2000	VOC Reading	GRAPHIC	DESCRIPTION	Water Level
0.0				SAND and GRAVEL road	
0.3					
0.5				CLAY compacted liner, tapered from dugout	
0.8					
1.0					
1.3				SAND and GRAVEL	
1.5					
1.8					
2.0					
2.3				CLAY loam	
2.5					
2.8				SAND and GRAVEL	
3.0					
3.3					
3.5					
3.8					
4.0					
4.3					
4.5				SANDY CLAY loam, grey, very compact	
4.8					
5.0					
5.3					
5.5					
5.8					
6.0					

09-24-2021 Z:\Operations\Client Data\42977 Curtis McKelvie\21BH05.bor

ENVIROWEST ENGINEERING INC.

LOG OF BORING 21BH06

Site and Soil Assessment
W1/2-01-44-25-W4
Ponoka County, Alberta

Project Number: 2106-42977

Driller: : Ever Green Drilling
Drilling Method: : Truck Mounted Auger
Drill Date : June 10, 2021
Logged By: : Emily Low P.Eng.

Well: 21MW01
Elev.:

Depth in Meters	Gastech Reading (ppm) 0 1000 2000	VOC Reading	GRAPHIC	DESCRIPTION	Water Level
0.0				CLAY compacted liner	
0.3					
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					
4.0					
4.3					
4.5					
4.8					
5.0					
5.3					
5.5					
5.8					
6.0					

09-24-2021 Z:\Operations\Client Data\42977 Curtis McKelvie\21BH06.bor

ENVIROWEST ENGINEERING INC.

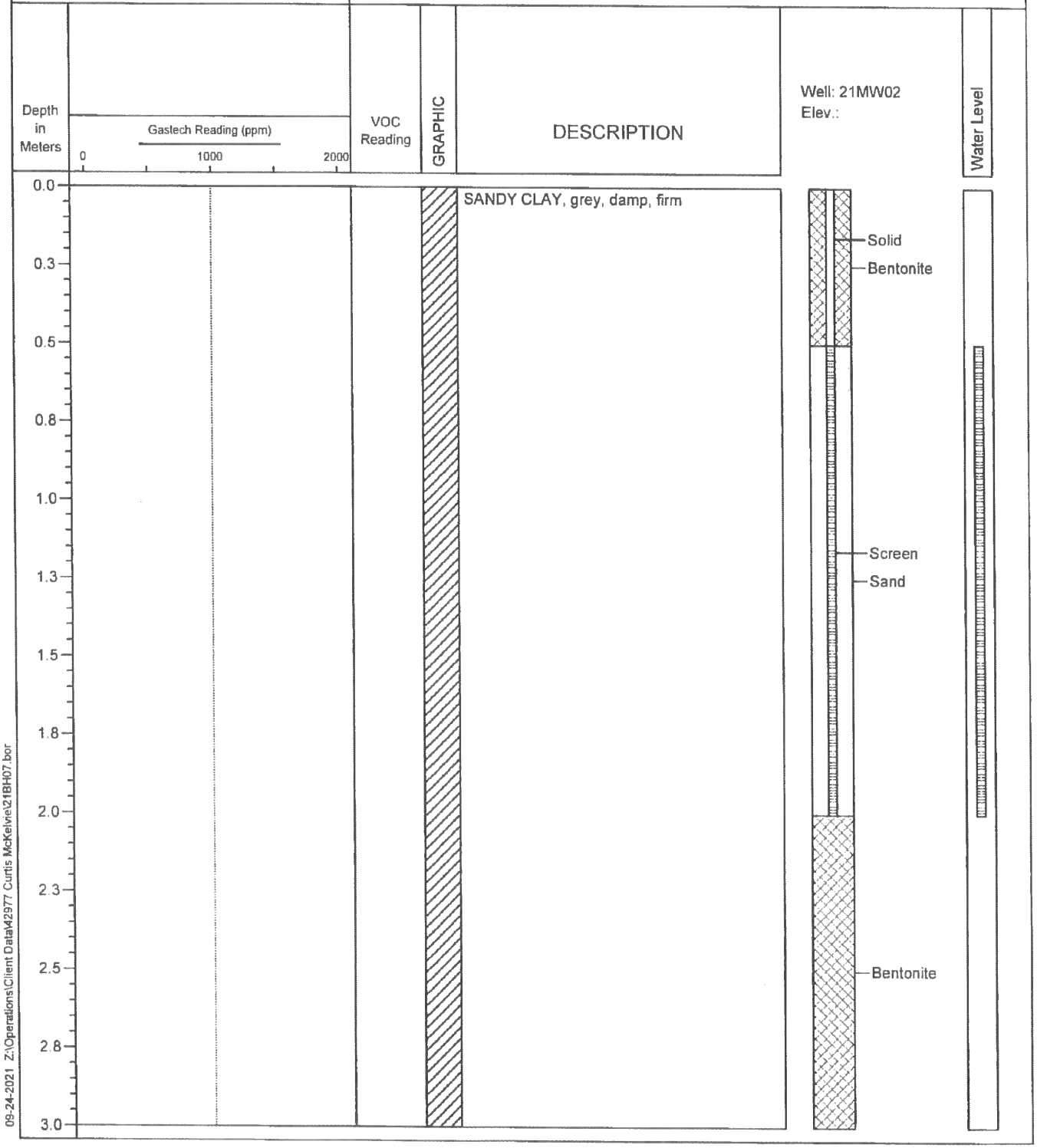
LOG OF BORING 21BH07

(Page 1 of 1)

Site and Soil Assessment
W1/2-01-44-25-W4
Ponoka County, Alberta

Project Number: 2106-42977

Driller: : Ever Green Drilling
Drilling Method: : Truck Mounted Auger
Drill Date : June 10, 2021
Logged By: : Emily Low P.Eng.



09-24-2021 Z:\Operations\Client Data\42977 Curtis McKelvie\21BH07.bor

Appendix C

Certificates of Analysis

333 50th Ave. S.E.
Calgary, AB, T2G 2B3
Phone (403) 297-0868
Fax: (403) 297-0869

KaizenLAB

ANALYTICAL REPORT

Client: Envirowest Engineering
5118 50 St
Ponoka, AB, T4J 1R6

Attention: Emily Low

KaizenLAB JOB #:	315240
DATE RECEIVED:	09-Jul-2021
DATE REPORTED:	16-Jul-2021
PROJECT ID:	42977 / Mckelvie
LOCATION:	

KaizenLAB Sample #: 315240_001 **Sample ID:** Pen
Date Sampled: 10-Jul-2021 **Matrix:** Soil

Parameter Description	Units	Result	Detection Limit
Particle Size Distribution by Hydrometer: Regular			
Clay	%	25.0	2.5
Silt	%	32.5	2.5
Sand	%	42.5	2.5
Texture		Loam	

KaizenLAB Sample #: 315240_002 **Sample ID:** 21BH01-01
Date Sampled: 10-Jul-2021 **Matrix:** Soil

Parameter Description	Units	Result	Detection Limit
Particle Size Distribution by Hydrometer: Regular			
Clay	%	28.8	2.5
Silt	%	35.0	2.5
Sand	%	36.2	2.5
Texture		Clay loam	

KaizenLAB Sample #: 315240_003 **Sample ID:** 21BH04-01
Date Sampled: 10-Jul-2021 **Matrix:** Soil

Parameter Description	Units	Result	Detection Limit
Particle Size Distribution by Hydrometer: Regular			
Clay	%	26.3	2.5
Silt	%	32.5	2.5
Sand	%	41.2	2.5
Texture		Loam	

KaizenLAB Sample #: 315240_004 **Sample ID:** 21BH02-01
Date Sampled: 10-Jul-2021 **Matrix:** Soil

Parameter Description	Units	Result	Detection Limit
Particle Size Distribution by Hydrometer: Regular			
Clay	%	23.7	2.5
Silt	%	32.5	2.5
Sand	%	43.8	2.5
Texture		Loam	

333 50th Ave. S.E.
Calgary, AB, T2G 2B3
Phone (403) 297-0868
Fax: (403) 297-0869
e-Mail: kaizenlan@kaizenlab.ca

KaizenLAB

KaizenLAB Sample #: 315240_005 **Sample ID:** Composite
Date Sampled: 10-Jul-2021 **Matrix:** Soil

Parameter Description	Units	Result	Detection Limit
Atterberg Limits			
Atterberg Limits of Soil			
Liquid Limit	%	32	1
Plastic Limit	%	18	1
Plasticity Index	%	14	1
Particle Size Distribution by Hydrometer: Regular			
Clay	%	21.2	2.5
Silt	%	33.8	2.5
Sand	%	45.0	2.5
Texture		Loam	
Moisture Content	%	14.3	0.1

Test Methodologies

Liquid Limit, Plastic Limit and Plasticity Index in Soil: Modified from ASTM D 4318-05
Moisture Content in Soil. Modified from Soil Sampling & Methods of Analysis, M.R. Carter, 2008
Particle Size by Hydrometer in Soil: Modified from Soil Sampling & Methods of Analysis, M.R. Carter, 2008

Final Review by: Shirley Lowe

Shirley Lowe
Client Service Representative / Project Coordinator

333 50th Ave. S.E.
Calgary, AB, T2G 2B3
Phone (403) 297-0868
Fax: (403) 297-0869
e-Mail: kaizenlab@kaizenlab.ca

KaizenLAB

QUALITY CONTROL REPORT

Client: Envirowest Engineering
Attention: Emily Low

KaizenLAB JOB #:	315240
PROJECT:	42977 / Mckelvie
LOCATION:	
DATE REPORTED:	16-Jul-2021

	Method Blank	Calibration Verification Standard %Recovery		Laboratory Control Sample %Recovery		Duplicate or Matrix Spike Duplicate Rel. % Diff.	
Test: Particle Size Distribution by Hydrometer: Regular **QC Batch #:** BS_HYDRO_210712_01 **Date:** 12-Jul-2021							
Clay	N/A	N/A-NC	-	98	Pass	N/A-NC	-
Sand	N/A	N/A-NC	-	99	Pass	N/A-NC	-
Silt	N/A	N/A-NC	-	100	Pass	N/A-NC	-
Test: Atterberg Limits of Soil **QC Batch #:** BS_ATTERBG_210714_01 **Date:** 14-Jul-2021							
Liquid Limit	N/A	N/A-NC	-	112	Pass	N/A-NC	-
Plastic Limit	N/A	N/A-NC	-	118	Pass	N/A-NC	-
Plasticity Index	N/A	N/A-NC	-	91	Pass	N/A-NC	-

Final Review by: Shirley Lowe

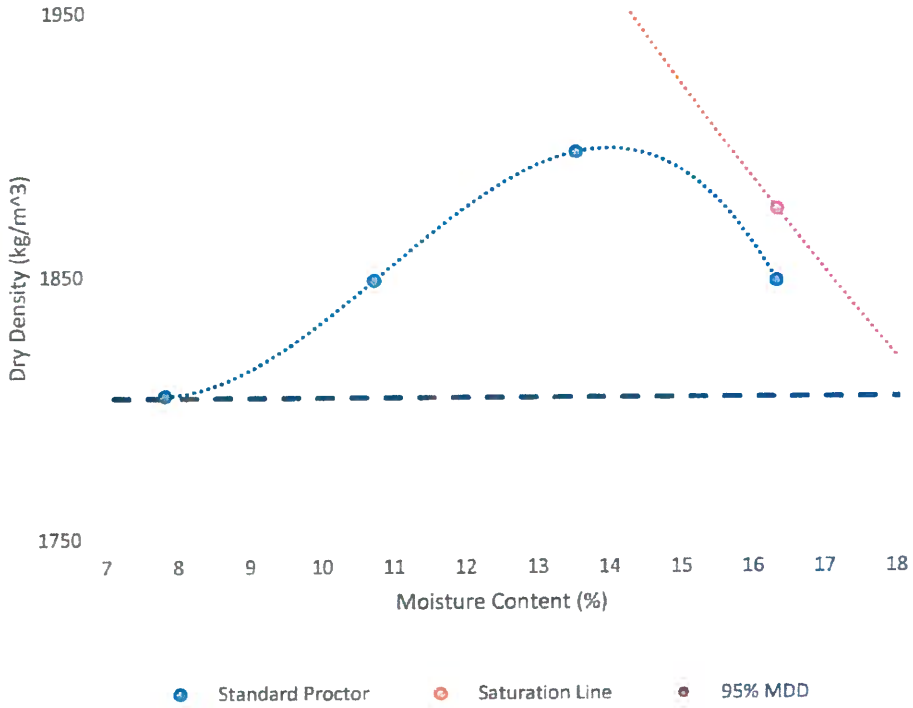
Shirley Lowe
Client Service Representative / Project Coordinator

N/A-NC: Not Applicable-Not Calculated. Result does not apply to this test or the difference between duplicate and its parent sample is not significant to perform a calculation (results are too close to the detection limit)

SOLUM CONSULTANTS LTD.
GEOTECHNICAL & MATERIAL TESTING LABORATORY

Standard Proctor Test Report (ASTM D698)

Project Info:	315240 / PO # 125319	**Reviewed by:**	S. F.
Client:	KaizenLab Inc.		
Solum Job No.:	01801210715(123)		
Sample Info:	Composite (315240-5)		



Natural MC (%)	**16.4**
Test Method	**A**
Opt MC(%)	**13.9**
Max. Dry Density (kg/m^3)	**1898**
95% of MDD (kg/m^3)	**1804**
% Particles Ret.	**0.0**
Sieve Size	**4.75mm**
Oversize Correction	**N/A**

SOLUM CONSULTANTS LTD.
GEOTECHNICAL & MATERIAL TESTING LABORATORY

Hydraulic Conductivity Test (ASTM D5084- Method A)

Project Info: 315240 / PO # 125319 — *Reviewed by:* S. F.
Client: KaizenLab Inc.
Solum Job No.: 01801210715(123)
Sample Info: ***Composite*** ***(315240-5)***

Test Parameters

Soil Type: Remoulded | Approx. Sat. Time (days): 10 | Test Fluids: tap water | Asuumed Gs: 2.70

	Sample Information						Remoulding Information			
	Height (cm)	Diameter (cm)	MC (%)	mass (g)	Wet BD (kg/m^3)	Sat. Degree (%)	OPT MC(%)	MAXDD (kg/m^3)	Remoulding Percentage	Target Density (kg/m^3)
Pre-Test Data	11.43	7.00	14.2	942.7	2143	87	13.9	1898	99	1879
Post-Test Data	11.46	6.98	16.4	960.5	2190	102				

Test Information

Tail Pressure (kPa): 100 | Head Pressure (kPa): 120 | Cell Pressure (kPa): 150 | Effective Stress (kPa): 50 | Hydraulic Gradient: 17.8

Test Results

Tial No.	Test Time (h)	Test Time (sec)	Temp (deg. C)	Rt	In Burrets ΔV (mL)	Out Burrets ΔV (mL)	Hydraulic Conductivity K_{20} (cm/sec)
1	14.00	50400	21.5	0.965	5.60	1.20	9.48E-08
2	14.00	50400	21.5	0.965	3.90	2.00	8.22E-08
3	14.00	50400	21.5	0.965	2.50	2.50	6.97E-08
4	14.00	50400	21.5	0.965	2.50	2.50	6.97E-08

Avg. K_{20} (cm/sec) **7.0E-08** | **Avg. K_{20} (m/sec)** **7.0E-10**

Hydraulic Conductivity → 28 Jul 21

KaizenLAB

333 -50 Avenue SE, Calgary, Alberta T2G 2B3
Phone: (403) 297-0699 Fax: (403) 297-0869
e-mail: kaizencsr@kaizenlab.ca

CHAIN OF CUSTODY / [illegible] FORM

KaizenLAB Job #: 315240

SERVICE REQUESTED (3PM Cut off)

Service	Surcharge	TAT *Business days	
Regular	None	4 days	☑

RUSH TAT (3PM Cut off)

Rush	50%	2 - 3 days	☐
Priority	100%	Next day	☐
Emergency	200%	Weekend/Holiday Same day	☐

Report Date: 16 Jul 21 * Please call (403) 615-5815 to coordinate rush analysis

REPORT CONTACT

Company: Envirowest Engineering
Contact: Emily Law / Leah Pady
Emails: elaw@envirowestengineering.ca lpady@
Address:
Phone: 403 783-8229

INVOICE CONTACT

Same as Report ☑
Company:
Contact:
Email:
Address:
Phone:

PROJECT DETAILS

Project ID: 42977 / McKelvie
Location ID:
P.O. :
Quotation #:

Guideline

☐ AB Tier 1 ☐ BC
☐ CCME ☐ MB
☐ SPIGEC
☐ Drinking Water
☐ D50
☐ Other _____

Client	Depot	Lab
Rel. by: Leah P.	Rec. by:	Rec. by: TT
Date: July 9/21	Date:	Date: 09 Jul 21
Time: 11:00 am	Time:	Time: 3:25 PM

Additional Notes:

LAB USE ONLY
Temp: 24.5°C

ANALYSIS REQUESTED

LAB ID	SAMPLE IDENTIFICATION	DEPTH	DATE SAMPLED (DD/MM/YYYY)	TIME SAMPLED	MATRIX (SOIL / WATER)	Hydrometer	Atterberg Limits	Hydraulic Conductivity (Compaction 99%)	Standard Proctor (ASTM D698)	Moisture Cont.						HOLD ANALYSIS	SPECIAL INSTRUCTIONS
1	Pen		June 10/21		Soil	X											
2	21BH01-01					X											
3	21BH04-01					X											
4	21BH02-01					X											
5	Composite					X	X	X	X	X							

Fill out chain of custody completely to avoid processing delays. Gray fields are for lab use only.

White - Lab Copy Yellow - Client Copy

Page of

Rev: April 2019

RA21030 Page 46 of 50

RA21030 TD Page 60 of 73

Data Set: Z:\Operations\Client Data\42977 Curtis McKelvie\21BH07.aqt
Date: 09/24/21
Time: 12:24:40

PROJECT INFORMATION

Company: Envirowest Engineering
Client: 42977
Project: 2106-42977
Test Date: July 15, 2021
Test Well: 21BH07

AQUIFER DATA

Saturated Thickness: 1.005 m
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: New Well

X Location: 0. m
Y Location: 0. m

Initial Displacement: 0.295 m
Static Water Column Height: 1.005 m
Casing Radius: 0.0254 m
Well Radius: 0.0254 m
Well Skin Radius: 0.0762 m
Screen Length: 1.5 m
Total Well Penetration Depth: 2. m

No. of Observations: 27

Observation Data

Time (min)	Displacement (m)	Time (min)	Displacement (m)
0.	0.295	7.	0.265
0.5	0.285	7.5	0.265
1.	0.28	8.	0.265
1.5	0.28	8.5	0.265
2.	0.28	9.	0.265
2.5	0.275	9.5	0.265
3.	0.27	10.	0.265
3.5	0.27	15.	0.25
4.	0.27	20.	0.245
4.5	0.27	25.	0.24
5.	0.265	30.	0.235
5.5	0.265	35.	0.235
6.	0.265	40.	0.23
6.5	0.265		

SOLUTION

Slug Test

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 3.23

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	1.625E-6	cm/sec
y0	0.2488	m

T = K*b = 0.0001634 cm²/sec

Jeff Froese

From: Curtis [redacted]
Sent: November 19, 2021 4:26 PM
To: Jeff Froese
Subject: Fwd: Pen Liner Information
Attachments: image001.jpg; Figure 2_Borehole Locations_42977.pdf

Sent from my iPhone

Begin forwarded message:

From: elow@envirowestengineering.ca
Date: November 19, 2021 at 3:42:57 PM MST
To: Curtis [redacted]
Subject: Pen Liner Information

Hi Curtis,

Please see below. As per our conversation I believe this should provide you with enough information to forward to the NRCB.

Samples collected using a solid stem rotary auger

- SS01 (completed in the alley and representative of three pens to the east of the sample location): from surface to 0.6 meters, Sandy Clay, compacted. Material was not originally from borrow pit area however has been maintained with borrow pit material. Soil sample from SS02 as representative sample. **Recommended to add 0.1 meters of liner**

- SS02 (completed in alley and representative of the pen to the east of the sample): from surface to 0.9 meters, Sandy Clay, compacted. Soil sample collected ("Pen") representing SS01 and SS02, Material was not originally from borrow pit area however has been maintained with borrow pit material [Clay 25%, Silt 32.5%, Sand 42.5%].

- SS03 (representative of the pen it was completed in): from surface to 0.5 meters, Sandy Clay, compacted. Material was from borrow pit. **Recommended to add 0.2 meters of liner**

- SS04 (representative of the pen it was completed in and the pen to the northwest): from surface to 0.6 meters, Sandy Clay, compacted. Material was from borrow pit. **Recommended to add 0.1 meters of liner**

- SS05 (representative of the pen it was completed in): surface to 0.8 meters, Sandy Clay, compacted. Material was from borrow pit.

Please advise should you require anything else.

Regards,
Emily

Water Well Drilling Report

View in Imperial | Export to Excel

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GOWN ID

GIC Well ID 276704
GoA Well Tag No.
Drilling Company Well ID
Date Report Received 1970/02/17

Well Identification and Location

Measurement in Metric

Owner Name	Address	Town	Province	Country	Postal Code
MCKELVIO, RICHARD	PONOKA				

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	SW	1	44	25	4				

Measured from Boundary of
m from
m from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 52.759782 Longitude -113.504948
How Location Obtained
Map

Elevation m
How Elevation Obtained
Not Obtained

Drilling Information

Method of Drilling
Drilled

Proposed Well Use
Domestic

Type of Work
Chemistry

Formation Log

Measurement in Metric

Depth from ground level (m)	Water Bearing	Lithology Description

Yield Test Summary

Measurement in Metric

Recommended Pump Rate L/min

Test Date	Water Removal Rate (L/min)	Static Water Level (m)

Well Completion

Measurement in Metric

Total Depth Drilled	Finished Well Depth	Start Date	End Date
12.19 m			

Borehole

Diameter (cm)	From (m)	To (m)
0.00	0.00	12.19

Surface Casing (if applicable)

Size OD 0.00 cm
Wall Thickness 0.000 cm
Bottom at 0.00 m

Well Casing/Liner

Size OD 0.00 cm
Wall Thickness 0.000 cm
Top at 0.00 m
Bottom at 0.00 m

Perforations

From (m)	To (m)	Diameter or Slot Width (cm)	Slot Length (cm)	Hole or Slot Interval(cm)

Perforated by

Annular Seal

Placed from 0.00 m to 0.00 m
Amount

Other Seals

Type	At (m)

Screen Type

Size OD 0.00 cm

From (m)	To (m)	Slot Size (cm)

Attachment
Top Fittings Bottom Fittings

Pack

Type Grain Size
Amount

Contractor Certification

Name of Journeyman responsible for drilling/construction of well
UNKNOWN NA DRILLER

Certification No
1

Company Name
UNKNOWN DRILLER

Copy of Well report provided to owner Date approval holder signed

Water Well Drilling Report

View in Imperial | Export to Excel

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GOWN ID

GIC Well ID 276704
GoA Well Tag No.
Drilling Company Well ID
Date Report Received 1970/02/17

Well Identification and Location

Measurement in Metric

Owner Name	Address	Town	Province	Country	Postal Code
MCKELVIO, RICHARD	PONOKA				

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	SW	1	44	25	4				

Measured from Boundary of
m from
m from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 52.759782 Longitude -113.504948
How Location Obtained
Map

Elevation m
How Elevation Obtained
Not Obtained

Additional Information

Measurement in Metric

Distance From Top of Casing to Ground Level cm
Is Artesian Flow
Rate L/min
Is Flow Control Installed
Describe

Recommended Pump Rate L/min
Recommended Pump Intake Depth (From TOC) m
Pump Installed
Depth m
Type
Make
H.P.
Model (Output Rating)

Did you Encounter Saline Water (>4000 ppm TDS)
Depth m
Well Disinfected Upon Completion
Gas
Depth m
Geophysical Log Taken
Submitted to ESRD

Sample Collected for Potability
Submitted to ESRD Yes

Additional Comments on Well

Yield Test

Taken From Ground Level | Measurement in Metric

Test Date	Start Time	Static Water Level
		m

Method of Water Removal

Type
Removal Rate L/min
Depth Withdrawn From m

If water removal period was < 2 hours, explain why

Water Diverted for Drilling

Water Source	Amount Taken	Diversion Date & Time
	L	

Contractor Certification

Name of Journeyman responsible for drilling/construction of well
UNKNOWN NA DRILLER

Certification No
1

Company Name
UNKNOWN DRILLER

Copy of Well report provided to owner
Date approval holder signed

Printed on 5/3/2021 11:00:19 AM

Water Well Drilling Report

View in Imperial | Export to Excel

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GOWN ID

GIC Well ID 276716
GoA Well Tag No.
Drilling Company Well ID
Date Report Received

Well Identification and Location

Measurement in Metric

Owner Name	Address	Town	Province	Country	Postal Code
BRAEBURN STOCK FARMS	MENAIK				

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	SW	1	44	25	4				

Measured from Boundary of
m from
m from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 52.759782 Longitude -113.504948
How Location Obtained
Map

Elevation 800.10 m
How Elevation Obtained
Estimated

Drilling Information

Method of Drilling
Rotary

Type of Work
New Well

Proposed Well Use
Domestic

Formation Log

Measurement in Metric

Depth from ground level (m)	Water Bearing	Lithology Description
0.91		Clay
2.44		Gravel
4.57		Clay
21.95		Gravel
28.96		Clay
37.19		Gravel
41.15		Blue Clay
52.43		Black Shale
57.91		Black Stoney Shale & Sandy Stringers
64.01	Yes	Water Bearing Sand & Sandstone

Yield Test Summary

Measurement in Metric

Recommended Pump Rate 0.00 L/min

Test Date	Water Removal Rate (L/min)	Static Water Level (m)
1972/01/01	36.37	20.73

Well Completion

Measurement in Metric

Total Depth Drilled	Finished Well Depth	Start Date	End Date
64.01 m			1972/01/01

Borehole

Diameter (cm)	From (m)	To (m)
0.00	0.00	64.01

Surface Casing (if applicable)
Galvanized Steel
Size OD 11.43 cm
Wall Thickness 0.000 cm
Bottom at 57.91 m

Well Casing/Liner
Size OD 0.00 cm
Wall Thickness 0.000 cm
Top at 0.00 m
Bottom at 0.00 m

Perforations

From (m)	To (m)	Diameter or Slot Width (cm)	Slot Length (cm)	Hole or Slot Interval(cm)

Perforated by

Annular Seal Driven
Placed from 0.00 m to 0.00 m
Amount

Other Seals

Type	At (m)

Screen Type
Size OD 0.00 cm

From (m)	To (m)	Slot Size (cm)

Attachment
Top Fittings
Bottom Fittings

Pack
Type
Grain Size
Amount

Contractor Certification

Name of Journeyman responsible for drilling/construction of well
UNKNOWN NA DRILLER

Certification No
1

Company Name
WARNKE BROS

Copy of Well report provided to owner
Date approval holder signed

Water Well Drilling Report

View in Imperial | Export to Excel

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GIC Well ID 276716
GoA Well Tag No.
Drilling Company Well ID
Date Report Received

GOWN ID

Well Identification and Location

Measurement in Metric

Owner Name	Address	Town	Province	Country	Postal Code
BRAEBURN STOCK FARMS	MENAIK				

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	SW	1	44	25	4				

Measured from Boundary of
m from
m from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 52.759782 Longitude -113.504948
How Location Obtained
Map

Elevation 800.10 m
How Elevation Obtained
Estimated

Additional Information

Measurement in Metric

Distance From Top of Casing to Ground Level cm
Is Artesian Flow
Rate L/min
Is Flow Control Installed
Describe

Recommended Pump Rate 0.00 L/min
Recommended Pump Intake Depth (From TOC) 0.00 m
Pump Installed
Depth m
Type
Make
H.P.
Model (Output Rating)

Did you Encounter Saline Water (>4000 ppm TDS)
Depth m
Gas
Depth m
Well Disinfected Upon Completion
Geophysical Log Taken
Submitted to ESRD
Sample Collected for Potability
Submitted to ESRD Yes

Additional Comments on Well
DRILLER REPORTS SOFT WATER.

Yield Test

Taken From Ground Level
Depth to water level
Measurement in Metric

Test Date	Start Time	Static Water Level
1972/01/01	12:00 AM	20.73 m

Pumping (m)	Elapsed Time Minutes:Sec	Recovery (m)

Method of Water Removal
Type Pump
Removal Rate 36.37 L/min
Depth Withdrawn From 0.00 m

If water removal period was < 2 hours, explain why

Water Diverted for Drilling

Water Source	Amount Taken	Diversion Date & Time
	L	

Contractor Certification

Name of Journeyman responsible for drilling/construction of well
UNKNOWN NA DRILLER

Certification No
1

Company Name
WARNKE BROS

Copy of Well report provided to owner
Date approval holder signed

Printed on 5/3/2021 11:00:03 AM

Water Well Drilling Report

View in Imperial | Export to Excel

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GOWN ID

GIC Well ID 2088326
GoA Well Tag No.
Drilling Company Well ID
Date Report Received 2009/12/16

Well Identification and Location

Measurement in Metric

Owner Name	Address	Town	Province	Country	Postal Code
MCKELVIE, CURTIS	BOX 17 SITE 1 RR 2	PONOKA	ALBERTA	CANADA	T4J 1R2

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	SW	1	44	25	4				

Measured from Boundary of
m from
m from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 52.763880 Longitude -113.499530
How Location Obtained
Hand held autonomous GPS 20-30m

Elevation 800.00 m
How Elevation Obtained
Hand held autonomous GPS 20-30m

Drilling Information

Method of Drilling
Rotary - Air

Type of Work
New Well

Proposed Well Use
Stock

Formation Log

Measurement in Metric

Depth from ground level (m)	Water Bearing	Lithology Description
3.35		Brown Clay
16.46		Gray Clay
20.42		Gravel
21.34		Gray Sandstone
26.52		Gray Shale
35.05	Yes	Sand & Gravel
37.49		Gray Sandstone
60.05		Gray Shale
67.06	Yes	Gray Sandstone

Yield Test Summary

Measurement in Metric

Recommended Pump Rate 136.38 L/min

Test Date	Water Removal Rate (L/min)	Static Water Level (m)
2009/10/03	454.61	32.14

Well Completion

Measurement in Metric

Total Depth Drilled	Finished Well Depth	Start Date	End Date
67.06 m	67.06 m	2009/10/03	2009/10/04

Borehole

Diameter (cm)	From (m)	To (m)
22.23	0.00	6.10
17.15	6.10	56.39
13.02	56.39	67.06

Surface Casing (if applicable)
Steel
Size OD 16.84 cm
Wall Thickness 0.478 cm
Bottom at 56.39 m

Well Casing/Liner
Plastic
Size OD 11.43 cm
Wall Thickness 0.602 cm
Top at 54.86 m
Bottom at 67.06 m

Perforations

From (m)	To (m)	Diameter or Slot Width (cm)	Slot Length (cm)	Hole or Slot Interval(cm)
60.96	67.06	0.064		27.94

Perforated by Saw

Annular Seal Bentonite Slurry
Placed from 0.00 m to 56.39 m
Amount 300.00 Pounds

Other Seals

Type	At (m)
Drive Shoe	56.39
Driven	0.00

Screen Type
Size OD cm

From (m)	To (m)	Slot Size (cm)

Attachment
Top Fittings
Bottom Fittings

Pack
Type
Grain Size
Amount

Contractor Certification

Name of Journeyman responsible for drilling/construction of well
MICHAEL SCHMIDT

Certification No
90316A

Company Name
DARCY'S DRILLING SERVICES LTD.

Copy of Well report provided to owner
Yes

Date approval holder signed
2009/10/22

Water Well Drilling Report

View in Imperial | Export to Excel

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GOWN ID

GIC Well ID 2088326
GoA Well Tag No.
Drilling Company Well ID
Date Report Received 2009/12/16

Well Identification and Location

Measurement in Metric

Owner Name	Address	Town	Province	Country	Postal Code
MCKELVIE, CURTIS	BOX 17 SITE 1 RR 2	PONOKA	ALBERTA	CANADA	T4J 1R2

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	SW	1	44	25	4				

Measured from Boundary of
m from
m from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 52.763880 Longitude -113.499530
How Location Obtained
Hand held autonomous GPS 20-30m

Elevation 800.00 m
How Elevation Obtained
Hand held autonomous GPS 20-30m

Additional Information

Measurement in Metric

Distance From Top of Casing to Ground Level 69.01 cm
Is Artesian Flow
Rate L/min
Is Flow Control Installed
Describe

Recommended Pump Rate 136.38 L/min
Recommended Pump Intake Depth (From TOC) 48.77 m
Pump Installed Yes
Depth 48.77 m
Type Submersible
Make Goulds
H.P. 1.5
Model (Output Rating)

Did you Encounter Saline Water (>4000 ppm TDS)
Depth m
Gas
Depth m
Well Disinfected Upon Completion Yes
Geophysical Log Taken
Submitted to ESRD
Sample Collected for Potability
Submitted to ESRD

Additional Comments on Well
PUMP INSTALLED: 18GS.

Yield Test

Taken From Top of Casing
Depth to water level

Measurement in Metric

Test Date 2009/10/03
Start Time 9:00 AM
Static Water Level 32.14 m

Method of Water Removal
Type Air
Removal Rate 454.61 L/min
Depth Withdrawn From 67.07 m

If water removal period was < 2 hours, explain why

Pumping (m)	Elapsed Time Minutes:Sec	Recovery (m)
32.14	0:00	67.07
	1:00	33.41
	2:00	32.74
	3:00	32.67
	4:00	32.64
	5:00	32.61
	6:00	32.58

Water Diverted for Drilling

Water Source	Amount Taken		Diversion Date & Time
TOWN OF PONOKA	6819.14	L	2009/10/02 7:00 AM

Contractor Certification

Name of Journeyman responsible for drilling/construction of well
MICHAEL SCHMIDT

Certification No
90316A

Company Name
DARCY'S DRILLING SERVICES LTD.

Copy of Well report provided to owner
Yes

Date approval holder signed
2009/10/22

Jeff Froese
NRCB Approval Officer
Red Deer, AB
jeff.froese@nrcb.ca

RE: Curtis McKelvie
Application RA21030
W ½ 1-44-25 W4

July 15, 2022

Hi Jeff,

Thank you for your July 14, 2022 email requesting that I calculate the capacity of a triangular catch basin with surface dimensions of 62m x 44m x 2.1m deep, with side slopes of 3:1 (horizontal to vertical).

Assumption

After reviewing the aerial photograph of the catch basin (Figure 1) you supplied, I assumed that the junction of side a (62m) and side b (44m) is a right angle.

Figure 1. Triangular catch basin aerial photograph

Calculations

The volume was calculated using an iterative method in a computer spreadsheet. A printout of the spreadsheet results is attached in Appendix A. The catch basin depth was divided into 21 "slices" with a thickness of 0.1m each, matching the total depth of 2.1m.

Adjacent slice volumes were added together to determine the usable, freeboard and top of bank volumes of the catch basin. (Table 1)

The volume of each slice was determined by multiplying the slice thickness by the area of the slice midway (mid-slice area) through the slice thickness. Because the area of top of each slice is larger than the area of the bottom of the same slice, the mid-slice area was used.

The mid-slice area was determined by Equation 1.

Equation 1. Area = 0.5 x side a x side b

The mid-slice length (side a and side b) of the top slice (0.0m to 0.1m) was determined by Equation 2.

Equation 2. Length = top side length – (2 x slope x slice thickness / 2)

The mid-slice length of the other slices was determined by equation 3.

Equation 3. Length = mid-slice length of previous slice – (2 x slope x slice thickness)

The mid-slice length decreased by 0.6m consistently for each deeper slice for both side a and side b. A consistent decrease is expected because the side slope is constant.

Results

The volumes of the triangular catch basin were calculated as:

Table 1. Triangular catch basin volumes

Volume description	Depth range (m)	Volume (m3)
Usable	0.5 to 2.1	1576
Freeboard	0.0 to 0.5	643
Top of bank	0.0 to 2.1	2219

If you have any questions, please contact me.

[redacted]

Scott Cunningham, P.Eng., P.Ag.
NRCB Environmental Specialist
Red Deer
scott.cunningham@nrcb.ca

Appendix A

McKelvie
RA21030
W 1/2 1-44-26 W4
Volume of triangular catch basin

Slope (h:v) 3
Side a (top) = 62
Side b (top) = 44

Top of slice from surface (m)	Bottom of slice from surface (m)	Thickness of slice (m)	Mid-slice Side a (m)	Mid-slice Side b (m)	Mid-slice area (m2) 0.5*a*b	Slice volume (m3) Area x thickness	Volume m3	
0.0	0.1	0.1	61.7	43.7	1348	135		
0.1	0.2	0.1	61.1	43.1	1317	132		
0.2	0.3	0.1	60.5	42.5	1286	129		
0.3	0.4	0.1	59.9	41.9	1255	125		
0.4	0.5	0.1	59.3	41.3	1225	122	643	m3 freeboard volume (0.0m to 0.5m)
0.5	0.6	0.1	58.7	40.7	1195	119		
0.6	0.7	0.1	58.1	40.1	1165	116		
0.7	0.8	0.1	57.5	39.5	1136	114		
0.8	0.9	0.1	56.9	38.9	1107	111		
0.9	1.0	0.1	56.3	38.3	1078	108		
1.0	1.1	0.1	55.7	37.7	1050	105		
1.1	1.2	0.1	55.1	37.1	1022	102		
1.2	1.3	0.1	54.5	36.5	995	99		
1.3	1.4	0.1	53.9	35.9	968	97		
1.4	1.5	0.1	53.3	35.3	941	94		
1.5	1.6	0.1	52.7	34.7	914	91		
1.6	1.7	0.1	52.1	34.1	888	89		
1.7	1.8	0.1	51.5	33.5	863	86		
1.8	1.9	0.1	50.9	32.9	837	84		
1.9	2.0	0.1	50.3	32.3	812	81		
2.0	2.1	0.1	49.7	31.7	788	79	1576	m3 usable volume (0.5m to 2.1m)
				Top of bank volume (m3) =		2219		