Application for Amendment

Application under the *Agricultural Operation Practices Act* to amend a permit for a confined feeding operation, manure collection area and/or manure storage facility(ies). ("Permit" means an NRCB-issued or grandfathered approval, registration, or authorization, including a grandfathered municipal development permit.)

NRCB USE ONLY	NRCB Application number	Date Stamp
☒ Approval ☐ Registration ☐ Authorization Amendment	RA23022A	NRCB APPLICATION 30 OCT 2024 RECEIVED

CONTACT INFORMATION

Applicant Information

Name:	Corporate Name (if applicable)	
Mitchel Kroetsch		
Address: (Street/P.O. Box) Box 132		
City/Town: Bawlf	Province: Alberta	Postal Code: T0B 0J0

Agent consent *(if applicable)*

I, Mitchel Kroetsch, hereby give consent for Envirowest Engineering
(name of applicant) *(name of agent and company)*

to act on my behalf or as my agent for this application.

Signed this 09 day of October, 24.

[redacted]
Signature of Applicant

LOCATION OF DEVELOPMENT

Which permit do you wish to amend? (List permit number and issuing agency.)	RA23022
Legal Land Description(s)	(Qtr-Sec-Twp-Rg-W Mer) NW-15-42-16 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 herein and acknowledge that the information provided in this application is true to the best of my knowledge.

October 9, 2024
Date of signing

[redacted]
Signature

Envirowest Engineering
Corporate name (if applicable)

Emily Low
Print name

Application for Amendment – contd.

AMENDMENT INFORMATION REQUIREMENTS

Instructions:
For each part of your permit that you would like amended, please detail what change you would like made and why, and how your proposed change will meet the AOPA requirements. You may attach additional pages to this form to provide this information.

Please note that an approval officer may require a page (or pages) of the Part 2 application forms to be completed as part of this application for amendment, depending on what changes are proposed.

An amendment to Catch Basin 1 and Catch Basin 2 are provided in the attached report as well as additional assessment details.

A summary is as follows:

Catch Basin 1 (south): 53m x 51m x 2.7 meters

Catch Basin 2 (north): 46 m x 40.5 m x 2.7 meters

Depth to water table was determined to be 3.69 m and 3.96 m, respectively.

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	Application number	Legal land description
☐ Approval ☐ Registration ☐ Authorization ☑ Amendment	RA23022A	NW 15-42-16 W4M

APPLICATION DISCLOSURE

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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.

_____	Emily Jocelyn Low -- P. Eng. - APEGA _____ Digitally signed by Emily Jocelyn Low -- P. Eng. - APEGA Date: 2024.10.17 14:46:18 -06'00'
Date of signing	Signature
Envirowest Engineering	_____
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)
Feedlot pens and alleys AO Note: This was already permitted under RA23022	208 m x 502 m
Catch Basin 1 AO Note: Amended dimensions	53 m x 51 m x 2.7 m
Catch Basin 2 AO Note: Amended dimensions	46 m x 40.5 m x 2.7 m

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

Existing facilities	Dimensions (m) (length, width, and depth)	NRCB USE ONLY
N/A		

NRCB USE ONLY

AO Note: The site was originally permitted in August, 2024 under RA23022. No CFO facilities existed prior to then. The feedlot pens, listed as "proposed facilities" are currently under construction.

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)

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 Spring 2024

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**
Feeders		2500	2500
Finishers		2500	2500
AO Note: No proposed change to previously permitted livestock numbers in RA23022			

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)

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) In Process

Signed this ____ day of _____, 20____. Emily Jocelyn Low -- P. Eng. - APEGA
Digitally signed by Emily Jocelyn Low -- P. Eng. - APEGA
Date: 2024.10.17 14:46:33 -06'00'
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 _____

Signed this ____ day of _____, 20___. _____
Signature of Applicant or Agent

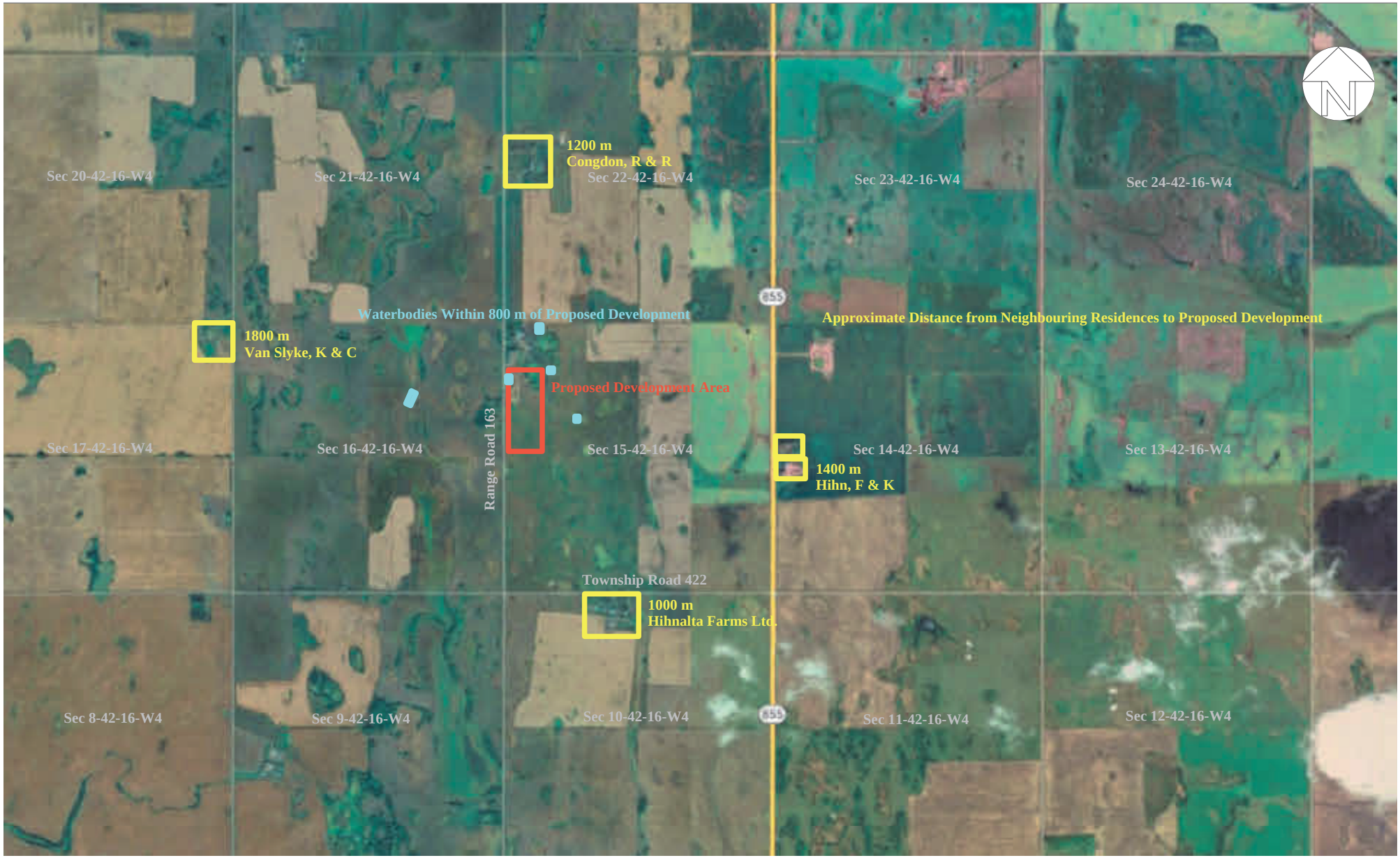
OPTION 4: Uncertain if *Water Act* licence is needed; acknowledgement of risk (for existing CFOs only)

1. At this time, I (we) do not know whether a new water licence is needed from 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



ENVIROWEST ENGINEERING

Title:

Detailed Site Layout Plan
Part II Technical Requirements
Mitchel Kroetsch
NW-15-042-16-W4M
Flagstaff County, Alberta

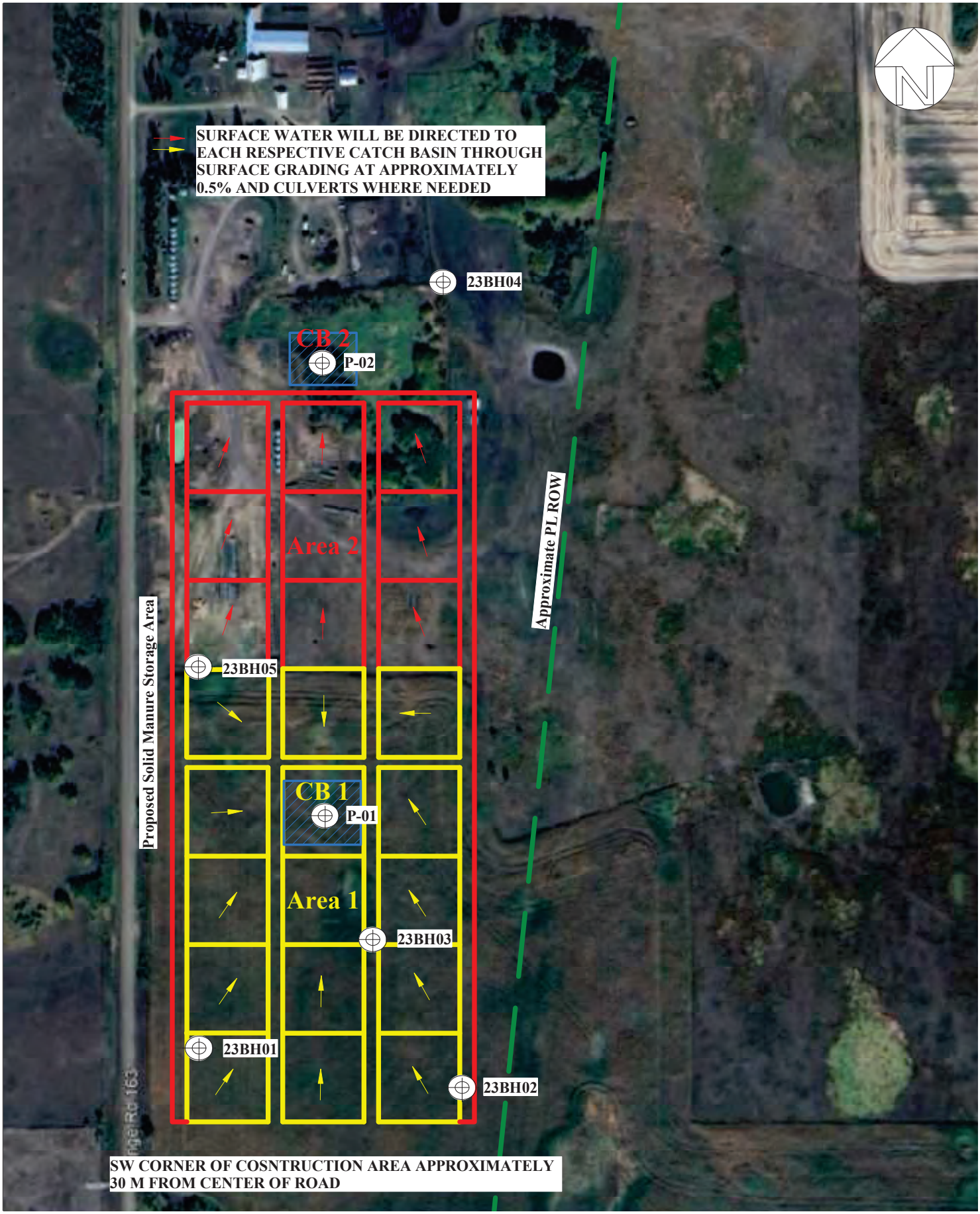
Project No: 2304-43021	**Date:** March 12, 2024	**Figure No.:** 1.0
Scale:	**Prepared By:** L. Predy	
Image Source: Google Earth Pro (2022)		

ENVIROWEST ENGINEERING

Title:

Detailed Site Layout Plan
Part II Technical Requirements
Mitchel Kroetsch
NW-15-042-16-W4M
Flagstaff County, Alberta

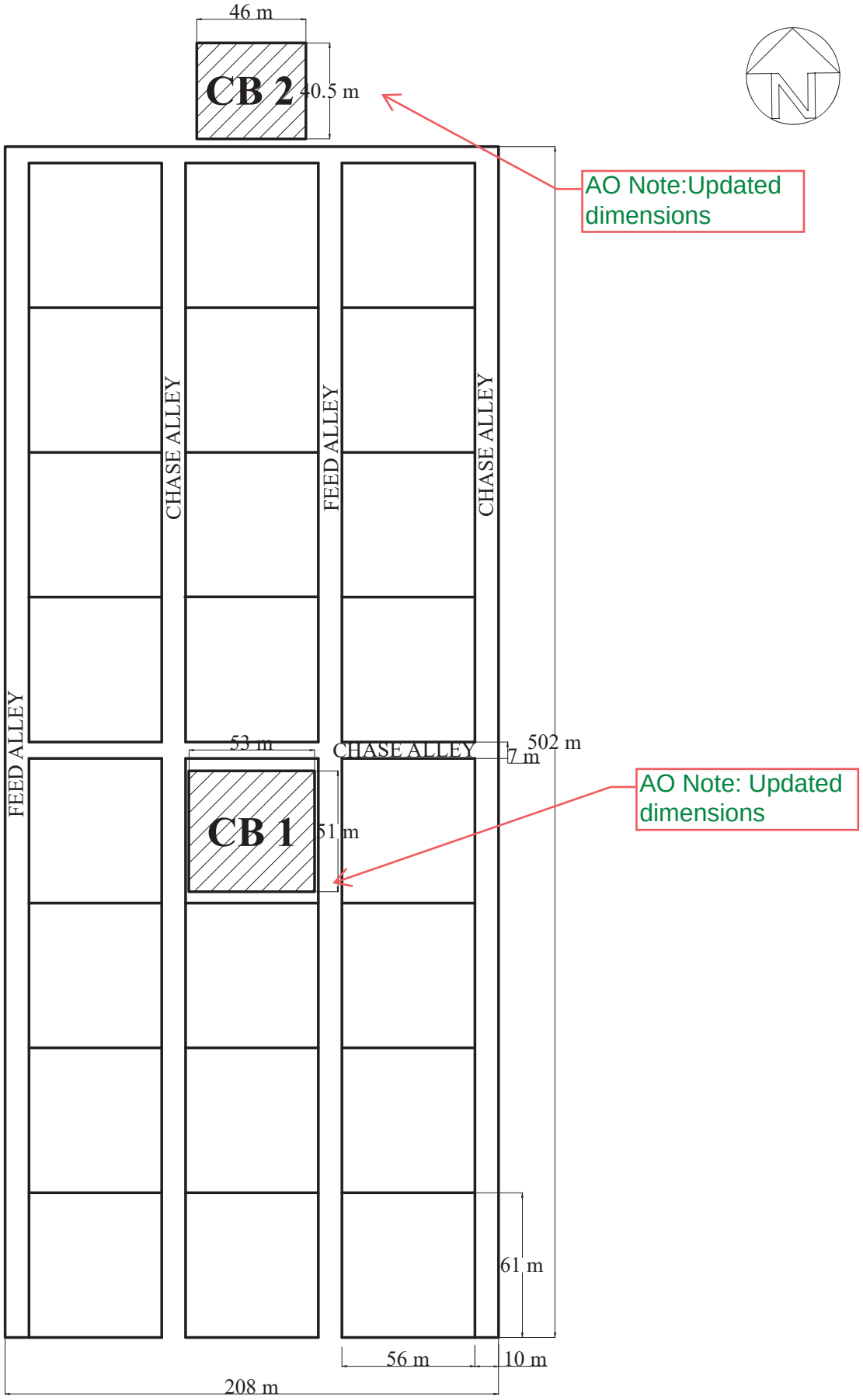
Project No: 2304-43021	**Date:** March 12, 2024	**Figure No.:** 2.0
Scale:	**Prepared By:** L. Predy	
Image Source: Google Earth Pro (2022)		



ENVIROWEST ENGINEERING

Title: Borehole Locations and Proposed Surface Water Flow
Site and Soil Assessment
NW-15-42-16 W4M
Flagstaff County, Alberta

Project No: 2304-43021	**Date:** October 17, 2024	**Figure No.:** 2.0
Scale: 1:3500	**Prepared By:** E. Low	
Image Source: Google Earth Pro (2022)		



ENVIROWEST ENGINEERING

Title:

Site Plan
Site and Soil Assessment
NW-15-42-16 W4M
Flagstaff County, Alberta

Project No: 2304-43021	**Date:** October 9, 2024	**Figure No.:** 3.0
Scale:	**Prepared By:** E. Low	
Image Source:		

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)

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: _____ **Proposed 1:** Feedlot Pens + Catch Basin 1

Proposed 2: Catch Basin 2 **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	Confirmed
Surface water information	How many springs are within 100 m of the manure storage facility or manure collection area?		0	0		☒ YES ☐ NO ☐ YES with exemption	No springs observed during site visit
	How many water wells are within 100 m of the manure storage facility or manure collection area?		0	0		☒ YES ☐ NO ☐ YES with exemption	No water wells observed within 100 m of proposed facilities. New well >100 m from proposed
	What is the shortest distance from the manure collection or storage facility to a surface water body? (e.g., lake, creek, slough, seasonal)		Existing dugout is within	60		☒ YES ☐ NO ☐ YES with exemption	39 m to dugout from pens; Closest common body of water is ephemeral creek, >1100 m east
Groundwater information	What is the depth to the water table?		3.69 m	3.96 m		☒ YES ☐ NO ☐ YES with exemption	Water table levels confirmed by piezometer; see engineer's report
	What is the depth to the groundwater resource/aquifer you draw water from?		64-73	64-73		☒ YES ☐ NO ☐ YES with exemption	UGR identified at 60.06 m in WW 105363

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

There is an existing dugout within the west boundary of the proposed pen construction area. This dugout will be bermed to ensure it is not impacted.

AO note: Two dugouts exist close to the CFO facilities. Neither are common bodies of water. The applicant has advised that the dugout to the west of the pens has been filled in. The east dugout is approximately 39 m east of the feedlot pens.

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)

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**
Hihnalta Farms Ltd.	NW-10-42-16-W4	1000	Ag	1	1000 m		Yes
R & R Congdon	NW-22-42-16-W4	1200	Ag	1	1095 m		Yes
F & K Hihn	NW-14-42-16-W4	1400	Ag	1	1485 m		Yes
F & K Hihn	SW-14-42-16-W4	1400	Ag	1	1430 m		Yes
K & C Van Slyke	NE-17-42-16-W4	1800	Ag	1	1780 m		Yes

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)**
See attached					
			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)

Name of Landowners	Land Location	Acres	Soil Zone
Barbara and Colin Kroetsch	SW-3-43-16-W4	117	Black
Barbara and Colin Kroetsch	SE-31-43-16-W4	110	Black
Barbara and Colin Kroetsch	SW-31-43-16-W4	148	Black
Barbara and Colin Kroetsch	NE-24-43-17-W4	130	Black
Betty and Debbie Henderson	E½-29-41-16-W4	264	Black
Betty and Debbie Henderson	SW-29-41-16-W4	150	Black
Betty and Debbie Henderson	SE-30-41-16-W4	150	Black
Lorraine J Henderson	NE-26-41-16-W4	155	Black
Lorraine J Henderson	NE-27-41-16-W4	143	Black
Lorraine J Henderson	SW-6-42-15-W4	147	Black

AO Note: The applicant has provided 1,514 ac of land with black soil

LANDOWNER CONSENT

For the purpose of manure spreading

Date: JANUARY 7, 2024

I BARBARA KROETSCH COLIN KROETSCH (Name) of HEISLER (Town/City) Alberta

Do herby give consent for Mitchel Kroetsch to spread feedlot manure on the following lands:

Legal Land Description	Acres Available
SW 3-43-16 w4	117
SE 31-43-16 w4	110
SW-31-43-16 w4	148
NE-24-43-17 w4	130

This agreement shall remain in effect continuously for 10 (Number) years.

Land Owner BARBARA KROETSCH COLIN KROETSCH (Print name) [redacted] (Signature)

Feedlot Owner Mitchel Kruetsch (Print name) [redacted] (Signature)

LANDOWNER CONSENT

For the purpose of manure spreading

Date: Feb 15/2024

I Betty + Debbie Henderson (Name) of FORESTBURG (Town/City) Alberta

Do herby give consent for Mitchel Kroetsch to spread feedlot manure on the following lands:

Legal Land Description	Acres Available
E½ 29-41-16-4	264
SW 29-41-16-4	150
SE 30-41-16-4	150

This agreement shall remain in effect continuously for 10 (Number) years.

Land Owner DEBBIE HENDERSON BETTY HENDERSON (Print name) [redacted] (Signature)

Feedlot Owner Mitchel Kroetsch (Print name) [redacted] (Signature)

LANDOWNER CONSENT

For the purpose of manure spreading

Date: January 10, 2024

I, Lorraine J Henderson (Name) of Forestburg (Town/City) Alberta

Do herby give consent for Mitchel Kroetsch to spread feedlot manure on the following lands:

Legal Land Description	Acres Available
NE 26 041 16 4	155
NE 27 041 16 4	143
SW 6 042 15 4	147

This agreement shall remain in effect continuously for 5 (Number) years.

Land Owner Lorraine Henderson (Print name) [redacted] (Signature)

Feedlot Owner Mitchel Kroetsch (Print name) [redacted] (Signature)

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): Aerial photography

Margin of error (if applicable): +/- 5 m

Requirements (m): Category 1: 624 m Category 2: 831 m Category 3: 1039 m Category 4: 1663 m

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: 791 ac black soil

Land base listed: 1514 ac

Area not suitable: already accounted for

Available area 1514 ac 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

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: 105363 296831 New 2024 well (now has ID 2029931)

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:

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

April 24, 2024	
January 29, 2025	

CORRESPONDENCE WITH MUNICIPALITIES AND REFERRAL AGENCIES

Date deeming letters sent: November 13, 2024

Municipality: Flagstaff County

☒ 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: Signalta Resources, Phoenix Gas, Nova Chemicals ☐ N/A

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

Other: TC Energy ☐ N/A

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

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
Catch basin 1 (new dimensions)	Low	Low	RA23022A
Catch basin 2 (new dimensions)	Low	Low	RA23022A

ERST for **existing** facilities ("Existing" indicates facilities that were permitted but not yet constructed)

Facility	Groundwater score	Surface water score	File number
Feedlot pens	Low	Low	RA23022

ERST related comments:

Catch basins 1 and 2 were reassessed with the updated dimensions and depths.

No changes were proposed to the feedlot pens; therefore they were not rescored as part of this application

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 105363
GoA Well Tag No.
Drilling Company Well ID
Date Report Received 1982/09/01

Well Identification and Location

Measurement in Metric

Owner Name	Address	Town	Province	Country	Postal Code
KROETCH, COLIN	HEISLER				

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	NW	15	42	16	4				

Measured from Boundary of
m from
m from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 52.619687 Longitude -112.229984
How Location Obtained
Map

Elevation m
How Elevation Obtained
Not Obtained

Drilling Information

Method of Drilling
Rotary

Proposed Well Use
Domestic

Type of Work
New Well

Formation Log

Measurement in Metric

Depth from ground level (m)	Water Bearing	Lithology Description
3.05		Brown Clay
4.57		Coal
41.15		Gray Shale
41.76		Coal
60.05		Gray Shale
64.31		Blue Sand

Yield Test Summary

Measurement in Metric

Recommended Pump Rate 27.28 L/min

Test Date	Water Removal Rate (L/min)	Static Water Level (m)
1982/06/21	27.28	23.16

Well Completion

Measurement in Metric

Total Depth Drilled	Finished Well Depth	Start Date	End Date
64.31 m		1982/06/18	1982/06/21

Borehole

Diameter (cm)	From (m)	To (m)
0.00	0.00	64.31

Surface Casing (if applicable)
Steel
Size OD : 11.43 cm
Wall Thickness : 0.396 cm
Bottom at : 61.26 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 61.26 m
Amount

Other Seals

Type	At (m)

Screen Type Stainless Steel
Size OD : 7.95 cm

From (m)	To (m)	Slot Size (cm)
61.57	64.31	0.018

Attachment Attached To Riser
Top Fittings Neoprene (Figure K)
Bottom Fittings Bail

Pack
Type Natural
Grain Size
Amount

Contractor Certification

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

Certification No
1

Company Name
LOSNESS DRILLING (1975) LTD.

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 105363
GoA Well Tag No.
Drilling Company Well ID
Date Report Received 1982/09/01

Well Identification and Location

Measurement in Metric

Owner Name	Address	Town	Province	Country	Postal Code
KROETCH, COLIN	HEISLER				

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	NW	15	42	16	4				

Measured from Boundary of
m from
m from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 52.619687 Longitude -112.229984
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 27.28 L/min
Recommended Pump Intake Depth (From TOC) 59.74 m
Pump Installed Yes
Type SUB
Depth m
Make
H.P. .5
Model (Output Rating)

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

Sample Collected for Potability
Submitted to ESRD

Additional Comments on Well

Yield Test

Taken From Ground Level
Measurement in Metric

Test Date 1982/06/21
Start Time 12:00 AM
Static Water Level 23.16 m

Depth to water level

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

Method of Water Removal

Type Bailer & Pump
Removal Rate 27.28 L/min
Depth Withdrawn From 54.25 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
LOSNESS DRILLING (1975) LTD.

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 296831
GoA Well Tag No.
Drilling Company Well ID
Date Report Received 2001/08/16

Well Identification and Location

Measurement in Metric

Owner Name	Address	Town	Province	Country	Postal Code
KROCTCH, COLIN	HEISLER				T0B 2A0

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	13	15	42	16	4				

Measured from Boundary of
396.24 m from North
198.12 m from West

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 52.619742 Longitude -112.233001

How Location Obtained
Map

Elevation m

How Elevation Obtained
Not Obtained

Drilling Information

Method of Drilling
Rotary

Proposed Well Use
Domestic

Type of Work
New Well

Formation Log

Measurement in Metric

Depth from ground level (m)	Water Bearing	Lithology Description
3.35		Brown Clay & Boulders
17.07		Gray Clay
22.56		Light Gray Shale
41.15		Gray Shale
43.59		Brown Shale & Coal
61.87		Brown Shale
71.32		Blue Sandstone
72.54		Gray Shale
73.15		Rocks

Yield Test Summary

Measurement in Metric

Recommended Pump Rate 45.46 L/min

Test Date	Water Removal Rate (L/min)	Static Water Level (m)
2001/07/20	68.19	26.46

Well Completion

Measurement in Metric

Total Depth Drilled	Finished Well Depth	Start Date	End Date
73.15 m		2001/07/17	2001/07/20

Borehole

Diameter (cm)	From (m)	To (m)
0.00	0.00	73.15

Surface Casing (if applicable)
Plastic
Size OD : 12.70 cm
Wall Thickness : 0.953 cm
Bottom at : 68.28 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 Bentonite Chips/Tablets
Placed from 0.00 m to 64.01 m
Amount

Other Seals

Type	At (m)

Screen Type Stainless Steel
Size OD : 12.70 cm

From (m)	To (m)	Slot Size (cm)
68.28	71.32	0.038

Attachment Attached To Casing
Top Fittings Packer
Bottom Fittings Plug

Pack
Type Artificial
Grain Size 10-20
Amount 12.00 Bags

Contractor Certification

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

Certification No
1

Company Name
LOSNESS DRILLING (1975) LTD.

Copy of Well report provided to owner

Date approval holder signed

Water Well Drilling Report

View in Imperial | Export to Excel

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GOWN ID

GIC Well ID 296831
GoA Well Tag No.
Drilling Company Well ID
Date Report Received 2001/08/16

Well Identification and Location

Measurement in Metric

Owner Name	Address	Town	Province	Country	Postal Code
KROCTCH, COLIN	HEISLER				T0B 2A0

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	13	15	42	16	4				

Measured from Boundary of
396.24 m from North
198.12 m from West

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 52.619742 Longitude -112.233001
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 45.46 L/min
Recommended Pump Intake Depth (From TOC) 67.06 m
Pump Installed Yes Depth m
Type SUB Make GOULDS H.P. 1
Model (Output Rating)

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

Additional Comments on Well

DRILLER REPORTS DISTANCE FROM TOP OF CASING TO GROUND LEVEL: 1.5'. HARDNESS 2 GRAINS, IRON .05 PPM, PH 7.8. WELL CHLORINATED. WATER HAULED FROM LOSNESS SHOP 4000 GALS IN 3 DAYS.

Yield Test

Taken From Ground Level
Depth to water level

Measurement in Metric

Test Date	Start Time	Static Water Level
2001/07/20	12:00 AM	26.46 m

Method of Water Removal

Type Pump
Removal Rate 68.19 L/min
Depth Withdrawn From 67.06 m

If water removal period was < 2 hours, explain why

Pumping (m)	Elapsed Time Minutes:Sec	Recovery (m)
26.47	0:00	46.09
31.93	1:00	41.04
35.21	2:00	37.37
37.57	3:00	34.75
39.25	4:00	32.96
40.48	5:00	31.64
41.46	6:00	30.66
42.16	7:00	29.95
42.64	8:00	29.43
43.03	9:00	28.79
43.32	10:00	28.65
43.75	12:00	28.32
44.06	14:00	28.14
44.30	16:00	28.02
44.53	20:00	27.86
44.82	25:00	27.71
44.97	30:00	27.63
45.26	35:00	27.56
45.38	40:00	27.50
45.60	50:00	27.40
45.80	60:00	27.32
45.98	75:00	27.24
46.01	90:00	27.17
46.05	105:00	27.12
46.09	120:00	27.08

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
LOSNESS DRILLING (1975) LTD.

Copy of Well report provided to owner

Date approval holder signed

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)

SOLID MANURE, COMPOST, & COMPOSTING MATERIALS: Barns, feedlots, & storage facilities - Naturally occurring protective layer

(complete a copy of this section for EACH barn, feedlot, and storage facility for solid manure, composting materials, or compost with a naturally occurring protective layer for the liner)

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

1. Solid Manure Storage Area (AO note, this is the feedlot pen area)
2. _____

AO Note: No changes proposed; these pens were permitted in RA23022

Manure storage capacity

	Length (m)	Width (m)	Depth below ground level (m)	NRCB USE ONLY Estimated storage capacity (m^3)
1.	502	208	0.4	
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

The south portion of the solid manure storage area, Area 1 (as shown on Figure 2.0), will be contoured so as to direct impacted runoff to Catch Basin 1. Area 2 will be contoured so as to direct impacted runoff to Catch Basin 2. Redirection and the construction of berms around the Catch Basins will prevent unimpacted runoff from entering.

Naturally occurring protective layer details

Thickness of naturally occurring protective layer	2.3 - 3.0 _____(m)	Provide details (as required) A minimum of 0.4 m thickness is required to provide a sufficient protective barrier.	
Soil texture	53 _____% sand	17 _____% silt	29 _____% clay
Hydraulic conductivity - naturally occurring protective layer	Depth and type of soil tested 1.75 - 2.6 mbgs Sandy Clay Loam	Hydraulic conductivity (cm/s) 2.163 x 10^-7 cm/s	Describe test standard used Slug test using AQTESOLV Bouwer-Rice method for

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

NRCB USE ONLY

Requirements met: ☐ YES ☐ NO

Condition required: ☐ YES ☐ NO

Report attached: ☐ 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)

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

See attached Amended Envirowest Engineering Report (October 2024)

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.	53	51	2.7	2.7	3:1	3:1	4:1	3,972 cubic metres
2.	46	40.5	2.7	2.7	3:1	3:1	4:1	2,506 cubic metres
							TOTAL CAPACITY	

Synthetic liner details

	Thickness and type of liner material	Provide liner material details (as required)
Synthetic liner	40 mil HDPE	

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

Condition in RA23022

Liner protection

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

A liner thickness of 40 mil of HDPE will be used to protect from erosion on the bottom and inside walls. The exterior walls (where applicable) will be soil covered.

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

Barriers will be placed around the catch basin to avoid any physical damage to the liner.

NRCB USE ONLY

Requirements met: ☒ YES ☐ NO

Condition required: ☒ YES ☐ NO

Condition in RA23022

Catch Basin Storage Volume Calculator

Construction Dimensions of Catch Basin

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

Overall Dimensions of Catch Basin			Catch Basin Dimensions
Total Length*[4]	53.0	m	174 ft
Total Width*[4]	51.0	m	167 ft
Total Depth*[4]	2.7	m	9 ft
Design Capacity Depth	*2.19*	m	7 ft
End Slope*[4]	3	run:rise	3 run:rise
Side Slope*[4]	3	run:rise	3 run:rise
Length of Bottom	36.9	m	121 ft
Width of Bottom	34.9	m	114 ft
Capacity @ top of Bank	*5,247*	m^3	*Capacity (@tob)* *185,296* ft^3 *1,154,176 Imp. Gal.*

Design Capacity of Catch Basin (freeboard level)			Design Capacity (freeboard level)
Length (design capacity depth)	50.0	m	164 ft
Width (design capacity depth)	48.0	m	157 ft
Total Depth	*2.7*	m	*9 ft*
Design Capacity Depth	2.19	m	7 ft
End Slope	3	run:rise	3 run:rise
Side Slope	3	run:rise	3 run:rise
Design Capacity (freeboard level)	**3,972**	**m^3**	**140,269 ft^3**
			873,715 Imp. Gal.
level)	*2,400*	m^2	*25,833* ft^2

CFO Name [1]	Kroetsch (CB1)
Land Location [1]	NW 15-42-16 W4

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	1	64,896	64,896.0
7			0.0
8			0.0
9			0.0
10			0.0
		Total Area (m^2)	**64,896**

Rainfall (Select Town [3])

Killam 90

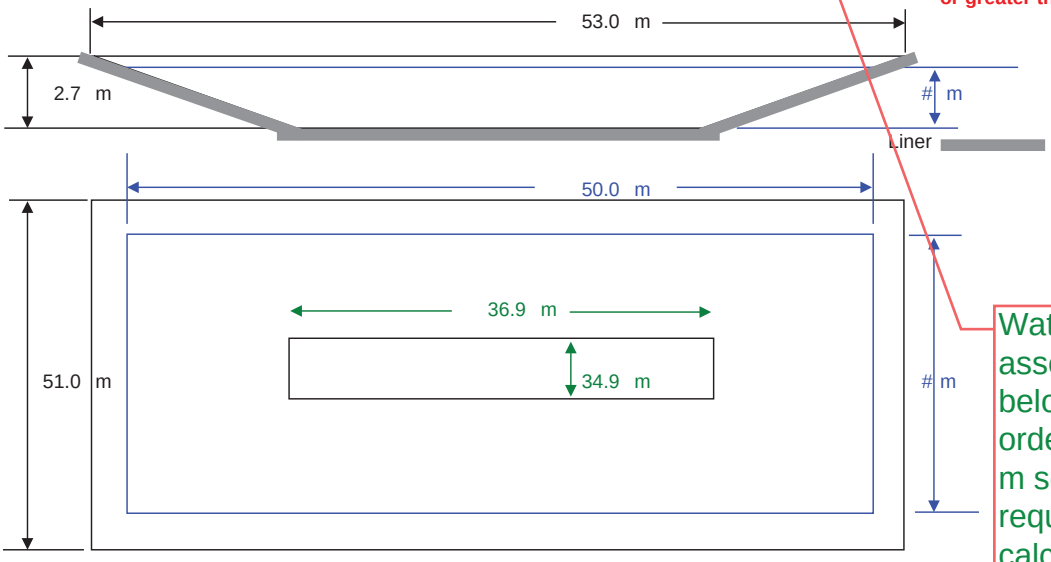
AOPA Design Rainfall **90 mm**

Minimum Catchbasin Storage Volume Required

3,796 m^3 ** **134069.17 ft^3**

835094.44 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

Area contributing to runoff calculated by engineer in section 5.3 of her report.

Water table was assessed at 3.69 m below grade. In order to meet the 1 m setback requirement, I calculated the capacity using 2.69 m of depth. Due to rounding, this appears as 2.7 m.

Catch Basin Storage Volume Calculator

Construction Dimensions of Catch Basin

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

CFO Name [1]	Kroetsch (CB2)
Land Location [1]	NW 15-42-16 W4M

Overall Dimensions of Catch Basin			Catch Basin Dimensions	
Total Length*[4]	46.0	m	151	ft
Total Width*[4]	40.5	m	133	ft
Total Depth*[4]	2.7	m	9	ft
Design Capacity Depth	*2.20*	m	7	ft
End Slope*[4]	3	run:rise	3	run:rise
Side Slope*[4]	3	run:rise	3	run:rise
Length of Bottom	29.8	m	98	ft
Width of Bottom	24.3	m	80	ft
			Capacity (@tob)	
Capacity @ top of Bank	*3,375*	m^3	*119,171*	ft^3
			742,295	*Imp. Gal.*

Design Capacity of Catch Basin (freeboard level)			Design Capacity (freeboard level)	
Length (design capacity depth)	43.0	m	141	ft
Width (design capacity depth)	37.5	m	123	ft
Total Depth	*2.7*	m	*9*	ft
Design Capacity Depth	2.20	m	7	ft
End Slope	3	run:rise	3	run:rise
Side Slope	3	run:rise	3	run:rise
Design Capacity (freeboard level)	**2,506**	**m^3**	**88,513**	**ft^3**
			551,334	**Imp. Gal.**
level)	*1,613*	m^2	*17,357*	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	1	39,520	39,520.0
7			0.0
8			0.0
9			0.0
10			0.0
		Total Area (m^2)	**39,520**

Rainfall (Select Town [3])

Killam 90

AOPA Design Rainfall **90 mm**

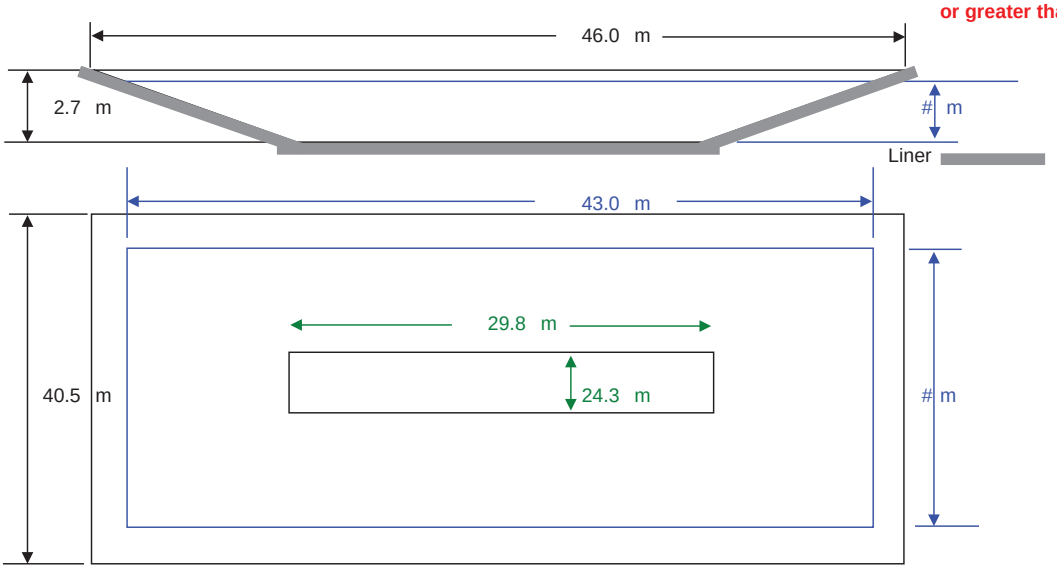
Minimum Catchbasin Storage Volume Required

2,312 m^3 ** **81644.684 ft^3**

508551.1 Imp. Gal.

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

Area contributing to runoff calculated by engineer in section 5.3 of her report.



Lines in Black - Overall catch basin dimensions

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

NTS - Not To Scale

ENVIROWEST
ENGINEERING

SITE AND SOIL ASSESSMENT

Mitchel Kroetsch
NW-15-42-16-W4M

Flagstaff County, Alberta

Site and Soil Assessment - Amended
NW-15-42-16-W4M
Flagstaff County, Alberta

Prepared For: Mitchel Kroetsch

Prepared By: Envirowest Engineering
Box 4248, Ponoka, AB, T4J 1R6
(403) 783-8229

Report Date: October 30, 2024

Project Number: 2304-43021

Private and Confidential

Table of Contents

List of Tables

Appendices

1.0 Introduction and Scope of Work

Envirowest Engineering (Envirowest) was retained by Mitchel Kroetsch to conduct a Site and Soil Assessment for the proposed construction of a solid manure storage facility and two catch basins for a proposed 5000 head feedlot, composed of 2500 finishers and 2500 feeders.

The assessment was completed to determine conditions beneath the proposed construction areas and assess soil properties for construction of the proposed facilities. The operation, herein referred to as "the Site," is located on NW-15-42-16-W4M in Flagstaff County, as shown on Figure 1.0.

The assessment has been completed in accordance with the standards and regulations associated with the amended Agricultural Operation Practices Act (2022) 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 depths between 3.0 and 6.0 metres below ground surface (mbgs) on May 2, 2023. The boreholes were completed in the areas proposed for solid manure storage and a catch basin. One borehole was completed as a groundwater monitoring well to allow for in-situ hydraulic conductivity testing, which was completed on May 30, 2023.

Soil samples were collected from the strata beneath the proposed solid manure storage and catch basin locations and submitted to an accredited third-party laboratory for analysis of soil properties.

2.0 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. Borehole logs and well completion details can be found in Appendix B.

Table 1: Soil Properties Results

Parameter	23BH01-01	23BH03-01	23BH05-01
Sample Depth (m)	1.2	2.1	1.75 – 2.6
Particle Size (%clay)	33	34	29
Particle Size (%sand)	39	37	53
Particle Size (%silt)	27	28	17
Texture Class	Clay Loam	Clay Loam	Sandy Clay Loam
Hydraulic Conductivity (field)	-	-	2.16×10^{-7} cm/s

The monitoring well installed at borehole 23BH05 (23MW01) was sufficiently hydrated prior to completing the in-situ hydraulic conductivity testing. The in-situ hydraulic conductivity test was completed on May 30, 2023. The monitoring well was placed to assess the material below surface, and was screened from 2.1 to 3.0 meters below ground surface (mbgs) with bentonite filling the annulus below the screen from 3.0 to 4.5 mbgs.

The initial depth to water was measured in the well. A volume of water was then removed from the well and the change in depth measured over time to assess hydraulic conductivity of the clay strata. It is assumed (as per AGDEX 096-01) that all flow occurs under saturated conditions. The depth was measured every 30 seconds for 10 minutes and every 5 minutes for thirty minutes. The results of the test were analyzed as a slug test using AQTESOLV Bouwer-Rice method for unconfined wells. The results of the assessment were an in-situ hydraulic conductivity of 2.16×10^{-7} cm/sec in monitoring well 23MW01.

A water table defined by saturated soils was not encountered during the assessment to a maximum depth of 6.0 mbgs. It was concluded based on the field assessment that a standard water table is not present (ie. not a perched water table) within the scope of construction, therefore delineation was not required.

On September 27, 2024 a piezometer was installed at the location of each catch basin using a track hoe and installed at minimum 1.0 meters below the initial proposed catch basin depth. A log for each piezometer (P-01, P-02) are included in the borehole logs and locations can be found on the attached figures. Depth to water table was measured on October 7, 2024.

3.0 Liner Assessments

3.1 Natural Barrier Assessment (Solid Manure Storage)

Based on the information obtained it was determined that the native clay within the proposed area of construction for solid manure storage was found to range in thickness from 2.3 to 3.0 meters, generally at surface. Along the south portion of Area 1 contains approximately 0.8 meters of overburden. The proposed solid manure storage area is approximately 208 m x 502 m, as shown on Figure 2.0. The layout and dimensions are shown on Figure 3.0.

Minimum Required Liner Depth for a natural barrier for solid manure storage:

$$\frac{2 \text{ m}}{1 \times 10^{-6} \text{ cm/sec}} = \frac{\mathbf{X} \text{ m}}{2.16 \times 10^{-7} \text{ cm/sec}}$$

$$\mathbf{X} = 0.4 \text{ m}$$

A minimum of **0.5** meters of native clay is required to be present to provide a sufficient protective barrier and structural stability through erosion such as use during operations and freeze/thaw cycles. It is found that there is sufficient protection across the proposed solid manure storage area.

3.2 Natural Barrier Assessment (Catch Basins)

Based on the information obtained it was determined that the native clay within the proposed area of construction was found to range in thickness from 2.3 to 3.0 meters, generally at surface. The catch basin designs are shown on Figure 2.0.

Minimum Required Liner Thickness for Catch Basin:

$$\frac{5 \text{ m}}{1 \times 10^{-6} \text{ cm/sec}} = \frac{\mathbf{X} \text{ m}}{2.16 \times 10^{-7} \text{ cm/sec}}$$

$$\mathbf{X} = 1.1 \text{ m}$$

A minimum of 1.1 meters of native clay is required to provide a sufficient protective liner. It is found that there is sufficient protection across the assessed and at the proposed catch basin locations.

4.0 Conclusions

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

Solid Manure Storage Area

The native soils were determined to present properties that will provide sufficient protection for a solid manure storage area as a natural barrier. Contouring of the proposed solid manure storage area to direct surface water flow to the catch basins should be done with caution so as to not remove this protective barrier. This is discussed further in Section 5.0.

Catch Basins

The native soils in the area of the proposed catch basins were found to provide sufficient protection for use as a natural barrier however, it is not found to be feasible to construct a catch basin using a natural barrier. The minimum depth of clay within the area is 2.3 mbgs, the required liner depth is 1.1 meters with 0.5 meters of freeboard (1.6 meters). This allows for a catch basin volume depth of 0.7 meters. As it will be required to have culverts to facilitate redirection of impacted run off, it is recommended to use a synthetic liner for both catch basins.

5.0 Design and Construction Considerations

5.1 Solid Manure Storage

The south portion of Area 1 (solid manure storage) may be cut to be regraded, should this occur do not remove more than 1.7 meters of clay below the overburden (approximately 2.5 meters) (as measured from the south boundary of the pens). This is to maintain the minimum protective barrier as well as 0.5% slope towards the catch basin.

Regrading and fill of Area 2 should be completed to maintain 0.5% slope towards catch basin 2. This can be achieved through an overall slope or slope within the pens with redirection of runoff towards catch basin 2.

A Figure presenting the elevations and proposed site plan is attached.

5.2 Catch Basin Sizing – Catch Basin 1

Surface Run-off Area

The proposed area of contributing run-off for Catch Basin 1 (referred to as Area 1, as shown on Figure 2.0), is conservatively 64,896 m^2. The size of the catch basin is recommended to have a total storage capacity of 3,890 m^3, based on Killam precipitation data.

Area 1 is required to be contoured to direct 'impacted' runoff towards the catch basin. Unimpacted runoff should be prevented from entering the catch basin through berms or surface contouring.

The depth to water table was found to be 3.69 meters.

The storage capacity required for Catch Basin 1 is 3,890 m^3 and will have the following specifications:

- To provide the required capacity, the catch basin should be 53 m in length x 51 m in width. The overall depth has been designed as 2.7 m. The overall capacity of the catch basin will be 5,260 m^3, which accounts for the required 0.5 m of freeboard, and provides a storage capacity of 3,985 m^3. The sizing is based on an inside end and side wall slope of 3:1 (run/rise).
- The bottom of the liner must be not less than 1.0 m above the top of the shallow groundwater level at the time of construction.
- The overall depth of 2.7 m will be achieved through a below grade depth of 2.7 m. Above-grade dykes may be needed to redirect unimpacted surface flow. The outside dyke walls should be completed to a slope of 4:1. The crest of the dyke should be sloped slightly outward to direct rainfall away from the storage facility.

5.3 Catch Basin Sizing – Catch Basin 2

Surface Run-off Area

The proposed area of contributing run-off for Catch Basin 2 (referred to as Area 2, as shown on Figure 2.0), is conservatively 39,520 m^2. The size of the catch basin is recommended to have a total storage capacity of 2,461 m^3, based on Killam precipitation data.

Area 2 is required to be contoured to direct 'impacted' runoff towards the catch basin. Unimpacted runoff should be prevented from entering the catch basin through berms or redirection.

The depth to water table was found to be 3.96 meters.

The storage capacity required for Catch Basin 2 is 2,461 m^3 and will have the following specifications:

- To provide the required capacity, the catch basin should be 46 m in length x 40.5 m in width. The overall depth has been designed as 2.7 m. The overall capacity of the catch basin will be 3,375 m^3, which accounts for the required 0.5 m of freeboard, and provides a storage capacity of 2,506 m^3. The sizing is based on an inside end and side wall slope of 3:1 (run/rise).
- The bottom of the liner must be not less than 1.0 m above the shallow groundwater level at the time of construction.
- The overall depth of 2.7 m will be achieved through a below grade depth of 2.7 m. Above-grade dykes may be needed to redirect unimpacted surface flow. The outside dyke walls should be completed to a slope of 4:1. The crest of the dyke should be sloped slightly outward to direct rainfall away from the storage facility.

Catch Basin Construction

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 catch basin and the exposure to degradation, a HDPE liner is recommended as no soil covering is required. A thickness of 40 mil is suggested to reduce the potential for liner damage.

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.

6.0 Closure

Envirowest Engineering is pleased to submit the report to Mitchel Kroetsch. 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.

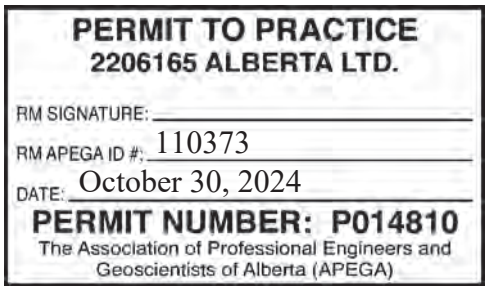
We trust that this report meets your present needs. Please feel free to contact the undersigned with any questions or should you require additional information.

Respectfully submitted,

October 30, 2024

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

Reviewed by:
Leah Predy, P.Ag.
Envirowest Engineering



2206165 Alberta Ltd. o/a Envirowest Engineering
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).

Leah Predy, B.A., B.Sc., P.Ag., is a Professional Agrologist with Envirowest Engineering and has approximately 5 years of experience in the environmental field, both in field data collection and report preparation for environmental assessments, monitoring, and remediation, as well as agricultural projects. Prior to her employment with Envirowest Engineering, Leah had five years of experience managing rangelands and navigating legislation and regulations as a Rangeland Agrologist with the Government of Alberta. She is a Professional Agrologist in Alberta (Alberta Institute of Agrologists).

8.0 References

GOA (Government of Alberta). (November 2022). Agricultural Operation Practices Act and Regulations. Edmonton, AB: Author.

GOA (Government of Alberta). (December 2020). Agricultural Operation Practices Act: Standards and Administration Regulation. Edmonton, AB: Author.

Environmental Assessment Report – General Conditions

1.0 Use of Report

This report pertains to a specific site, a specific development, and a specific scope of work. It is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site or proposed development would necessitate a supplementary assessment.

This report and the assessments and recommendations contained in it are intended for the sole use of Envirowest Engineering's (Envirowest's) client. Envirowest does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than Envirowest's client (hereunder referred to as the "Client") or an approved agent of the Client. Any unauthorized use of or reliance on the report is at the sole risk of the user.

This report is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of Envirowest. The Client agrees that it shall use the report for its own internal purposes and it shall not provide the report to another party other than an approved agent.

2.0 Limitation of Report

This report is based solely on the conditions that existed on site at the time of Envirowest's investigation. The Client, and any other parties using this report with the express written consent of the Client and Envirowest, acknowledge that conditions affecting the environmental assessment of the site can vary with time and that the conclusions and recommendations set out in this report are time sensitive.

The Client, and any other party using this report with the express written consent of the Client and Envirowest, also acknowledge that the conclusions and recommendations set out in this report are based on limited observations and testing on the subject site and that conditions may vary across the site which, in turn, could affect the conclusions and recommendations made.

The Client acknowledges that Envirowest is neither qualified to, nor is it making, any recommendations with respect to the purchase, sale, investment or development of the site, the decisions on which are the sole responsibility of the Client.

3.0 Information Provided to Envirowest by Others

During the performance of the work and the preparation of this report, Envirowest may have relied on information provided by persons other than the Client. While Envirowest endeavours to verify the accuracy of such information when instructed to do so by the Client, Envirowest accepts no responsibility for the accuracy or the reliability of such information that may affect the report.

4.0 Limitation of Liability

The Client recognizes that property containing contaminants and hazardous wastes creates a high risk of claims brought by third parties arising from the presence of those materials. In consideration of these risks, and in consideration of Envirowest providing the services requested, the Client agrees that Envirowest's liability shall be limited as follows:

(1) With respect to any claims brought against Envirowest by the Client for damages of any kind whatsoever, including without limitation, incidental, consequential, exemplary or punitive, for any reason whatsoever arising out of the provision or failure to provide services hereunder the amount of such claim and the extent of Envirowest's liability shall be limited to the amount of fees paid by the Client to Envirowest under this Agreement.

(2) With respect to claims brought by third parties arising out of the presence of contaminants or hazardous wastes on the subject site, the Client agrees to indemnify, defend, and hold harmless Envirowest from and against any and all claim or claims, action or actions, demands, damages, penalties, fines, losses, costs and expenses of every nature and kind whatsoever, including solicitor-client costs, arising or alleged to arise either in whole or part out of services provided by Envirowest.

5.0 Disclosure of Information by Client

The Client agrees to fully cooperate with Envirowest with respect to the provision of all available information on the past, present, and proposed conditions on the site, including historical information respecting the use of the site. The Client acknowledges that in order for Envirowest to properly provide the service, Envirowest requires and shall rely upon the full disclosure and accuracy of any and all such information.

6.0 Standard of Care

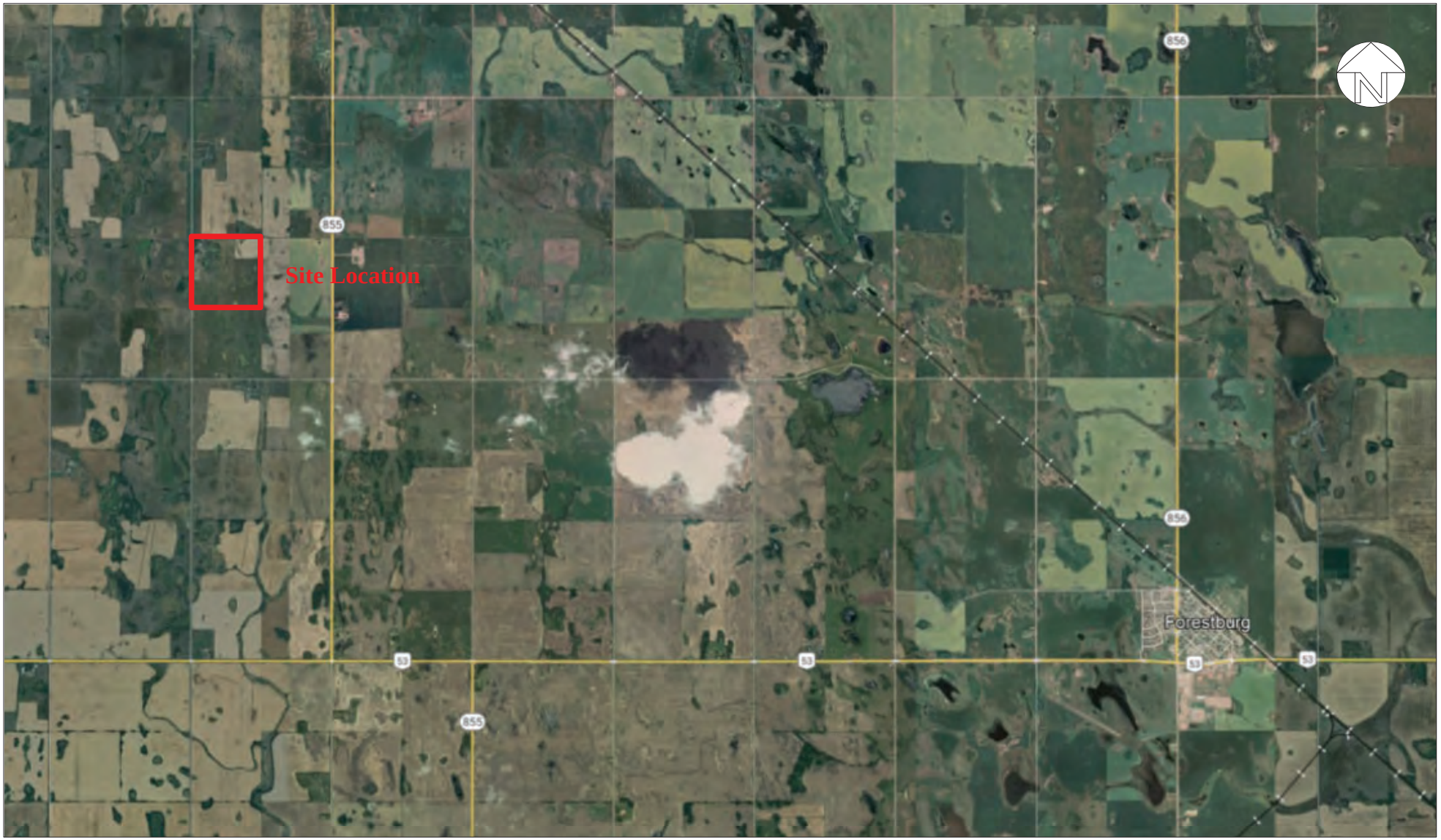
Services performed by Envirowest for this report have been conducted in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions in the jurisdiction in which the services are provided. Engineering and scientific judgment have been applied in developing the conclusions and/or recommendations provided in this report. No warranty or guarantee, express or implied, is made concerning the test results, comments, recommendations, or any other portion of this report.

7.0 Ownership of Instruments of Service

The Client acknowledges that all reports, plans, and data generated by Envirwoest during the performance of the work and other documents prepared by Envirowest are considered its professional work product and shall remain the copyright property of Envirowest.

Appendix A

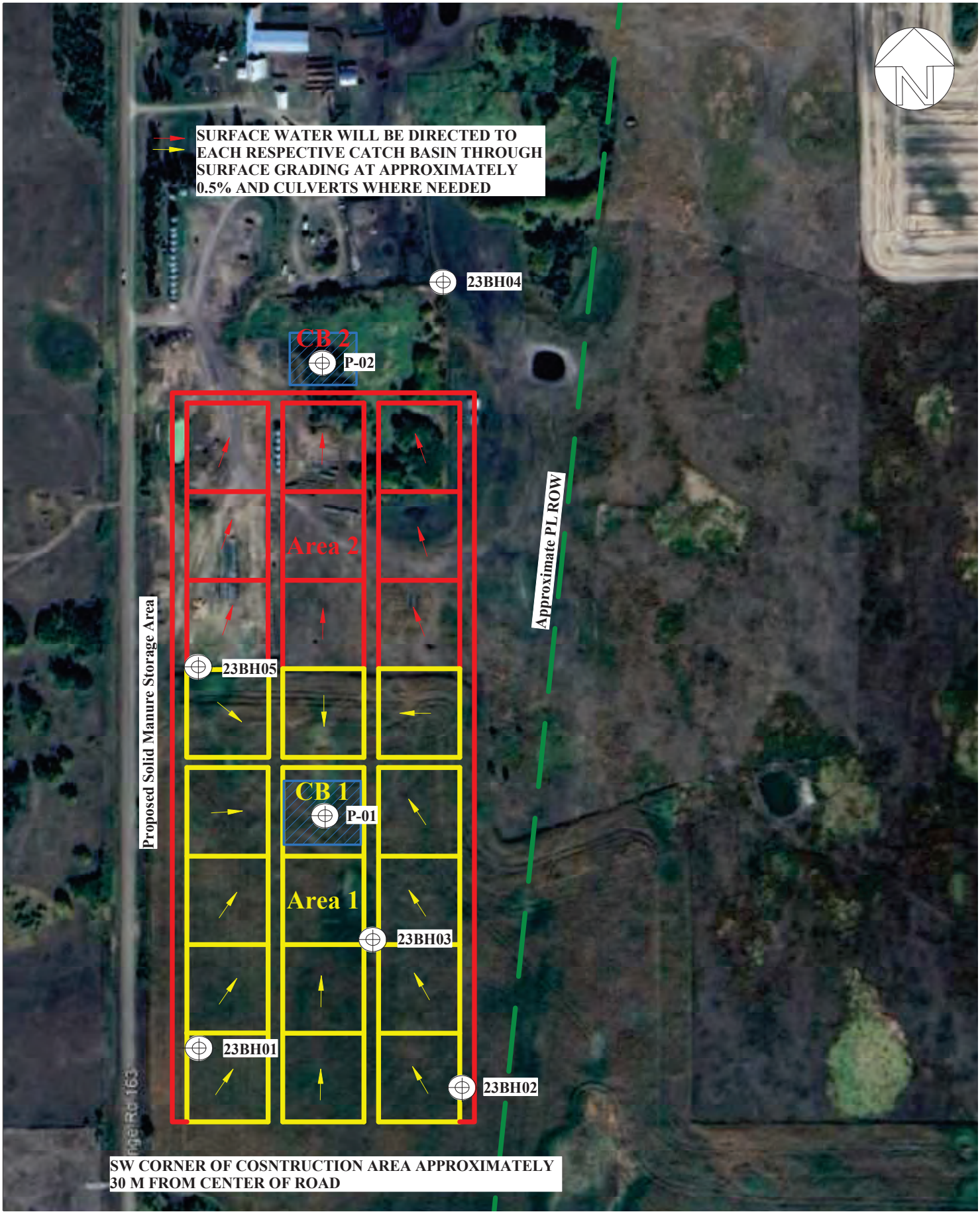
Figures



ENVIROWEST ENGINEERING

Title: Location of Subject Site
Site and Soil Assessment
NW-15-42-16-W4M
Flagstaff County, Alberta

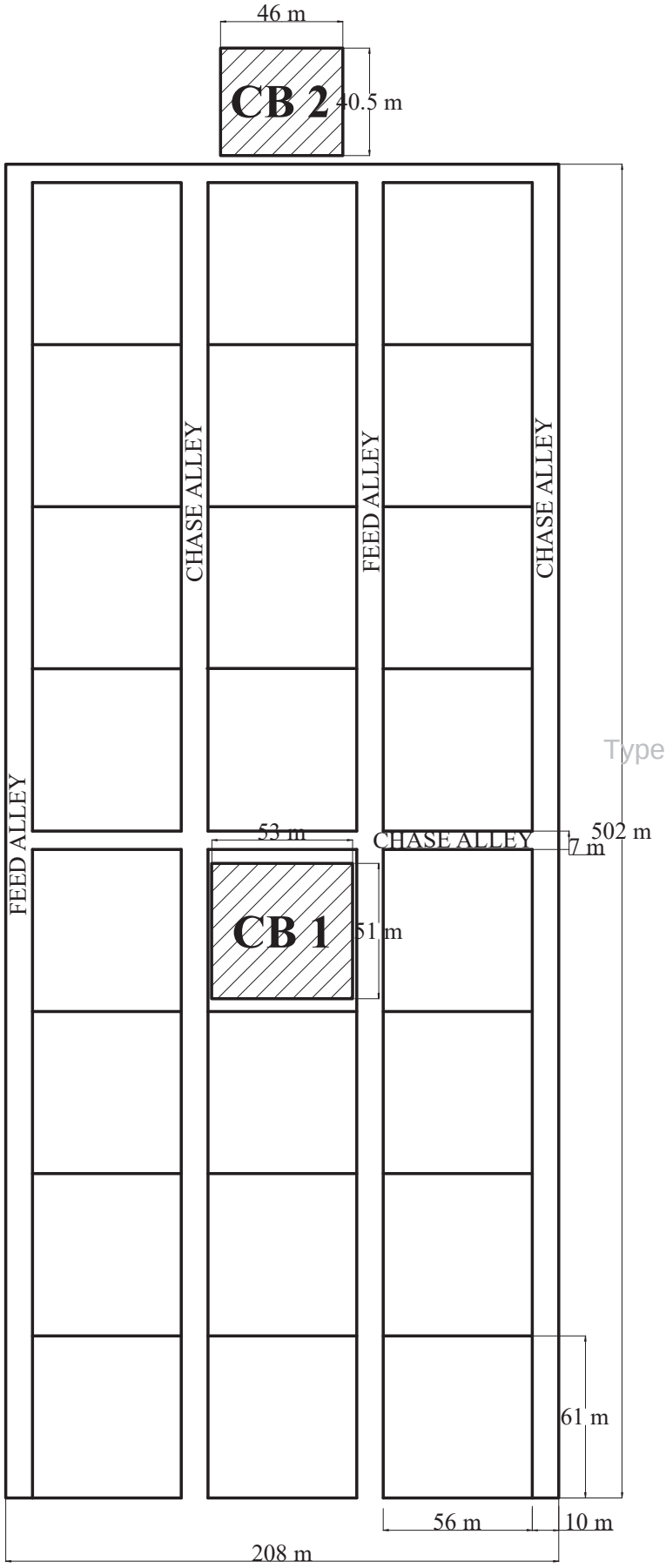
Project No: 2304-43021	**Date:** January 3, 2024
Prepared by: L. Predy	**Drawing No:** 1.0



ENVIROWEST ENGINEERING

Title: Borehole Locations and Proposed Surface Water Flow
Site and Soil Assessment
NW-15-42-16 W4M
Flagstaff County, Alberta

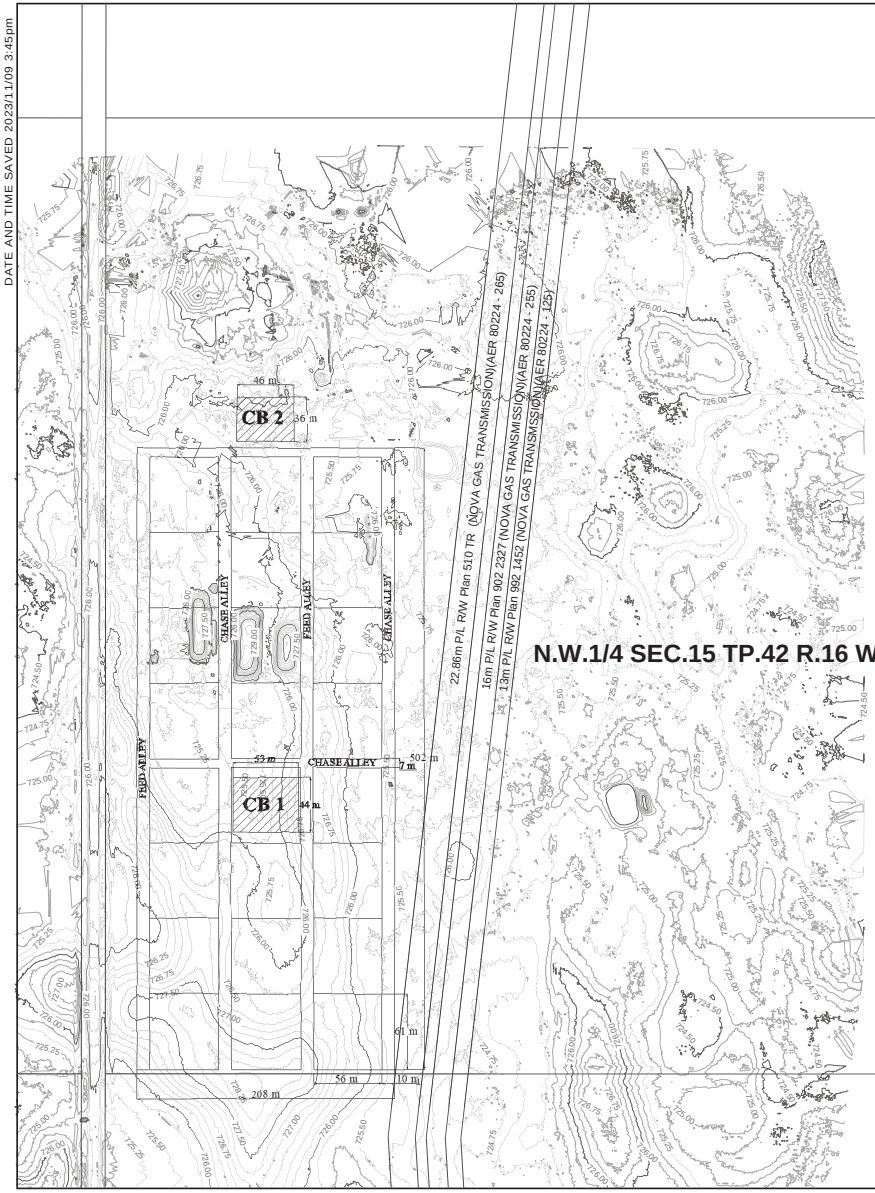
Project No: 2304-43021	**Date:** October 17, 2024	**Figure No.:** 2.0
Scale: 1:3500	**Prepared By:** E. Low	
Image Source: Google Earth Pro (2022)		



Type text here

ENVIROWEST ENGINEERING	**Title:** Site Plan Site and Soil Assessment NW-15-42-16 W4M Flagstaff County, Alberta	**Project No:** 2304-43021 **Scale:** **Image Source:**	**Date:** October 9, 2024 **Prepared By:** E. Low	**Figure No.:** 3.0

DATE AND TIME SAVED 2023/11/09 3:45pm



N

SCALE 1:5000

15
42-16-4

ENVIROWEST ENGINEERING

PLAN showing
DETAIL of CONTOUR MAP

WITHIN NW SEC. 15 TWP. 042 RGE. 16 W4M

NOTE:
CONTOURS WERE DERIVED FROM A DIGITAL SURFACE MODEL CREATED THROUGH PHOTOGRAMMETRY. IN AREAS OF HIGH VEGETATION, TREES OR BUILDINGS, SURFACE MODEL DATA HAS BEEN REMOVED AND RECREATED BY INTERPOLATING VALUES BASED ON SURROUNDING ELEVATIONS.

NOTE:
THE RIGHT OF WAYS WERE TAKEN FROM CADASTRAL MAPPING AND SHOULD BE USED FOR REFERENCE ONLY.

CAUTION:
NO UNDERGROUND AND ABOVE GROUND FACILITIES HAVE BEEN LOCATED AND SHOWN.

SCALE 1:5000

0 62.5 125 250 metres

NOTE:
LAST FIELD UPDATE WAS DONE ON OCTOBER 27, 2023

NO.	DATE	REVISION/ISSUED	REFERENCE DRAWINGS	DRAWING NO.
1	2023/10/27	INITIAL SURVEY		

McElhanney | PROJECT: NW-15-042-16 W4M | AREA: FORESTBURG | CLASS: L | FILE NO.: EE0001FB

COMMENTS:

UPDATING:

PLEASE MARK ANY CHANGES/ERRORS/OMISSIONS ON THE DRAWING. BRIEFLY DESCRIBE IN THE SPACE PROVIDED THE NATURE OF THE CHANGE. PLEASE EMAIL THE ENTIRE DRAWING TO McELHANNEY AT reddeer@mcelhanney.com. YOUR COOPERATION IS APPRECIATED AND WILL ENSURE A SAFER WORKPLACE.

McElhanney
4728-78A Street Close, Red Deer, AB T4P 2J2
(T) 403-346-7555

Water table levels confirmed by piezometer; see d

Appendix B

Borehole Logs

ENVIROWEST ENGINEERING

LOG OF BORING 23BH01

Site and Soil Assessment
NW-15-42-16-W4
Flagstaff County, Alberta
Project Number: 2304-43021

Driller: : Evergreen Drilling
Drilling Method: : Truck Mounted Auger
Drill Date : May 2, 2023
Logged By: : Emily Low, P.Eng.

Depth in Meters	Gastech Reading (ppm) 0 200 400 600 800 1000	VOC Reading	GRAPHIC	DESCRIPTION	Well: Elev.:	Water Level
0.0				SAND, trace clay, light brown, dry		
0.3						
0.5						
0.8				SANDY CLAY, olive brown, compact, damp		
1.0						
1.3						
1.5						
1.8						
2.0						
2.3						
2.5						
2.8						
3.0						
3.3				dark brown		
3.5				SAND, grey , compact		
3.8						
4.0						
4.3						
4.5						

10-17-2024 C:\Users\elow\OneDrive\Desktop\Temporary Drive\Kroetsch Site and Soil Assessment\23BH01.bor

ENVIROWEST ENGINEERING

LOG OF BORING 23BH02

Site and Soil Assessment
NW-15-42-16-W4
Flagstaff County, Alberta
Project Number: 2304-43021

Driller: : Evergreen Drilling
Drilling Method: : Truck Mounted Auger
Drill Date : May 2, 2023
Logged By: : Emily Low, P.Eng.

Well:
Elev.:

Depth in Meters	Gastech Reading (ppm) 0 200 400 600 800 1000	VOC Reading	GRAPHIC	DESCRIPTION	Water Level
0.0 – 0.8				SAND, trace clay, light brown, dry	
0.8 – 3.3				SANDY CLAY, olive brown, compact, damp	
3.3 – 6.0				SAND, grey, damp	

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ENVIROWEST ENGINEERING

LOG OF BORING 23BH03

Site and Soil Assessment
NW-15-42-16-W4
Flagstaff County, Alberta
Project Number: 2304-43021

Driller: : Evergreen Drilling
Drilling Method: : Truck Mounted Auger
Drill Date : May 2, 2023
Logged By: : Emily Low, P.Eng.

Depth in Meters	Gastech Reading (ppm) 0 200 400 600 800 1000	VOC Reading	GRAPHIC	DESCRIPTION	Well: Elev.:	Water Level
0.0				SANDY CLAY, olive brown, compact, damp		
0.3						
0.5						
0.8						
1.0						
1.3						
1.5						
1.8						
2.0						
2.3						
2.5						
2.8				SAND, grey, damp		
3.0						
3.3						
3.5						
3.8						
4.0						
4.3						
4.5						

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ENVIROWEST ENGINEERING

LOG OF BORING 23BH04

Site and Soil Assessment
NW-15-42-16-W4
Flagstaff County, Alberta
Project Number: 2304-43021

Driller: : Evergreen Drilling
Drilling Method: : Truck Mounted Auger
Drill Date : May 2, 2023
Logged By: : Emily Low, P.Eng.

Depth in Meters	Gastech Reading (ppm) 0 200 400 600 800 1000	VOC Reading	GRAPHIC	DESCRIPTION	Well: Elev.:	Water Level
0.0				SANDY CLAY, olive brown, compact, damp		
0.3						
0.5						
0.8						
1.0						
1.3						
1.5						
1.8						
2.0						
2.3				SAND, grey, damp		
2.5						
2.8						
3.0						

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ENVIROWEST ENGINEERING

LOG OF BORING 23BH05

Site and Soil Assessment
NW-15-42-16-W4
Flagstaff County, Alberta
Project Number: 2304-43021

Driller: : Evergreen Drilling
Drilling Method: : Truck Mounted Auger
Drill Date : May 2, 2023
Logged By: : Emily Low, P.Eng.

Depth in Meters	Gastech Reading (ppm) 0 200 400 600 800 1000	VOC Reading	GRAPHIC	DESCRIPTION	Well: 23MW01 Elev.:	Water Level
0.0				SANDY CLAY, olive brown, compact, damp		
0.3						
0.5						
0.8						
1.0					Bentonite	
1.3					Solid	
1.5						
1.8						
2.0						
2.3						
2.5					Sand	
2.8					Screen	
3.0						
3.3						
3.5					Bentonite	
3.8						
4.0						
4.3						
4.5						

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ENVIROWEST ENGINEERING

LOG OF BORING P-01

Site and Soil Assessment
NW-15-42-16-W4
Flagstaff County, Alberta
Project Number: 2304-43021

Driller: : Evergreen Drilling
Drilling Method: : Truck Mounted Auger
Drill Date : September 27, 2024
Logged By: : Emily Low, P.Eng.

Depth in Meters	Gastech Reading (ppm) 0 200 400 600 800 1000	VOC Reading	GRAPHIC	DESCRIPTION	Well: P-01 Elev.:	Water Level
0.0				SANDY CLAY, olive brown, compact, damp		
0.3						
0.5						
0.8						
1.0						
1.3						
1.5						
1.8						
2.0					Solid	
2.3					Native Fill	
2.5						
2.8						
3.0						
3.3						
3.5						
3.8						
4.0					Screen	
4.3						
4.5						

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ENVIROWEST ENGINEERING

LOG OF BORING P-02

Site and Soil Assessment
NW-15-42-16-W4
Flagstaff County, Alberta
Project Number: 2304-43021

Driller: : Evergreen Drilling
Drilling Method: : Truck Mounted Auger
Drill Date : September 27, 2024
Logged By: : Emily Low, P.Eng.

Depth in Meters	Gastech Reading (ppm) 0 200 400 600 800 1000	VOC Reading	GRAPHIC	DESCRIPTION	Well: P-02 Elev.:	Water Level
0.0				SANDY CLAY, olive brown, compact, damp		
0.3						
0.5						
0.8						
1.0						
1.3						
1.5						
1.8						
2.0					Solid	
2.3					Native Fill	
2.5						
2.8						
3.0						
3.3						
3.5						
3.8						
4.0					Screen	
4.3						
4.5						

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Appendix C

Certificates of Analysis

2910 12TH STREET NE
CALGARY, ALBERTA
CANADA T2E 7P7
TEL (403)735-2005
FAX (403)735-2771
http://www.agatlabs.com

CLIENT NAME: ENVIROWEST
BOX 4248, 5118-50th STREET
PONOKA, AB T4J1R6
(403) 783-8229
ATTENTION TO: Emily Low
PROJECT: 43021
AGAT WORK ORDER: 23R060845
SOIL ANALYSIS REVIEWED BY: Thomas Yoo, Report Writer
DATE REPORTED: Aug 26, 2023
PAGES (INCLUDING COVER): 6
VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (403) 735-2005

*Notes

Disclaimer:

- *All work conducted herein has been done using accepted standard protocols, and generally accepted practices and methods. AGAT test methods may incorporate modifications from the specified reference methods to improve performance.*
- *All samples will be disposed of within 30 days after receipt unless a Long Term Storage Agreement is signed and returned. Some specialty analysis may be exempt, please contact your Client Project Manager for details.*
- *AGAT's liability in connection with any delay, performance or non-performance of these services is only to the Client and does not extend to any other third party. Unless expressly agreed otherwise in writing, AGAT's liability is limited to the actual cost of the specific analysis or analyses included in the services.*
- *This Certificate shall not be reproduced except in full, without the written approval of the laboratory.*
- *The test results reported herewith relate only to the samples as received by the laboratory.*
- *Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, warranties of merchantability, fitness for a particular purpose, or non-infringement. AGAT assumes no responsibility for any errors or omissions in the guidelines contained in this document.*
- *All reportable information as specified by ISO/IEC 17025:2017 is available from AGAT Laboratories upon request.*
- *For environmental samples in the Province of Quebec: The analysis is performed on and results apply to samples as received. A temperature above 6°C upon receipt, as indicated in the Sample Reception Notification (SRN), could indicate the integrity of the samples has been compromised if the delay between sampling and submission to the laboratory could not be minimized.*

AGAT Laboratories

2910 12TH STREET NE
CALGARY, ALBERTA
CANADA T2E 7P7
TEL (403)735-2005
FAX (403)735-2771
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 23R060845

PROJECT: 43021

CLIENT NAME: ENVIROWEST

ATTENTION TO: Emily Low

SAMPLING SITE:

SAMPLED BY:

Particle Size - Texture

DATE RECEIVED: 2023-08-22

DATE REPORTED: 2023-08-26

		SAMPLE DESCRIPTION:		23BH03-01	22BH01-01	22BH05-01
		SAMPLE TYPE:		Soil	Soil	Soil
		DATE SAMPLED:		2023-05-02	2023-05-02	2023-05-02
Parameter	Unit	G / S	RDL	5233994	5233995	5233996
Particle Size Distribution (Sand)	%		2	37	39	53
Particle Size Distribution (Silt)	%		2	28	27	17
Particle Size Distribution (Clay)	%		2	34	33	29
Soil Texture				Clay Loam	Clay Loam	Sandy Clay Loam

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

5233994-5233996 Soil Texture is a calculated parameter. The calculated parameter is non-accredited. The parameters that are components of the calculation are accredited.
% Silt is a calculated parameter. The calculated value is determined by subtracting the percent sand and clay values from 100 percent.

Analysis performed at AGAT Calgary (unless marked by *)

Certified By: [redacted]

2910 12TH STREET NE
CALGARY, ALBERTA
CANADA T2E 7P7
TEL (403)735-2005
FAX (403)735-2771
http://www.agatlabs.com

Quality Assurance

CLIENT NAME: ENVIROWEST

AGAT WORK ORDER: 23R060845

PROJECT: 43021

ATTENTION TO: Emily Low

SAMPLING SITE:

SAMPLED BY:

Soil Analysis

RPT Date: Aug 26, 2023			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Particle Size - Texture															
Particle Size Distribution (Sand)	5235130		25	25	0.2%	< 2	108%	80%	120%						
Particle Size Distribution (Silt)	5235130		39	39	0.0%	< 2	93%	80%	120%						
Particle Size Distribution (Clay)	5235130		35	35	0.1%	< 2	95%	80%	120%						

Comments: Duplicate NA: results are less than 5X the RDL and RDP will not be calculated.

Certified By: [redacted]

2910 12TH STREET NE
CALGARY, ALBERTA
CANADA T2E 7P7
TEL (403)735-2005
FAX (403)735-2771
http://www.agatlabs.com

Method Summary

CLIENT NAME: ENVIROWEST

AGAT WORK ORDER: 23R060845

PROJECT: 43021

ATTENTION TO: Emily Low

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Particle Size Distribution (Sand)	SOIL 0520; SOIL 0110; SOIL 0120	JONES 2001	HYDROMETER
Particle Size Distribution (Silt)	SOIL 0520; SOIL 0110; SOIL 0120	JONES 2001	HYDROMETER
Particle Size Distribution (Clay)	SOIL 0520; SOIL 0110; SOIL 0120	JONES 2001	HYDROMETER

22-AUG '23 PM 3:45

AGAT Laboratories

2910 12 Street NE
Calgary, Alberta T2E 7P7
P: 403-735-2005 • F: 403-735-2771
webearth.agatlabs.com

Laboratory Use Only
Arrival Temperature: N/A
Cooler Quantity: 1
Custody Seal Intact: ☐ Yes ☐ No ☑ N/A
AGAT Job Number: 23R060845

Chain of Custody Record

Emergency Support Services Hotline 1-855-AGAT 245 (1-855-242-8245)

Report Information
Company: Enviowest Engineering
Contact: Emily Law
Address:
Phone: 403-783-8229

Project Information
Client Project #: 43021
Site Location:
Sample By:
AGAT Quote #:
If a quotation number is not provided, client will be billed at standard rates. See terms and conditions of quote for full details.

Invoice To
Same as Report to ☑
Company:
Contact:
Email:
Address
Phone:
PO/CC #:

Report Information
1. Name: Emily Law
Email: elaw@enviowestengineering.ca
2. Name:
Email:
3. Name:
Email:

Requirements (Selection may impact detection limits)

CCME	AB Tier 1	Alberta Surface Water
☐ Agricultural	☐ Agricultural	☐ Chronic
☐ Industrial	☐ Industrial	☐ Acute
☐ Residential/Park	☐ Residential/Park	☐ SK Notice of Site Cond.
☐ Commercial	☐ Commercial	☐ Drinking Water
☐ FWAL	☐ Natural Area	☐ Other:

Is this part of the Alberta SRP program? ☐ YES ☐ NO (If yes, please fill below)
Application Number:
Grant Amount:
Well/Facility/Location ID:
UWI:

Turnaround Time Required (TAT)
Regular TAT: ☑ 5 to 7 Business Days
Rush TAT: ☐ <24 Hours (200%) ☐ Next Business Day (100%) ☐ 2 Business Days (50%) ☐ 3 Business Days(25%)
Date Required:

LABORATORY USE (LAB ID #)	SAMPLE IDENTIFICATION	DEPTH	DATE/TIME SAMPLED	SAMPLE MATRIX	COMMENTS	# OF CONTAINERS: VIALS / JARS	# OF CONTAINERS: BAGS	# OF CONTAINERS: BOTTLES
1	23BH03-01		May 2/23	Soil			1	
2	23BH01-01		↓	↓			1	
3	23BH5-01						1	
4								
5								
6								
7								
8								
9								
10								

Field Filtered (Y/N)	Preserved (Y/N)	Detailed Salinity: ☐ AB ☐ SK ☐ BC ☐ D50	☐ CCME/AB : BTEX/F1-F4 ☐ CCME/AB : BTEX/F1-F2	☐ BC: BTEXS/VPH/EPH ☐ BC: LEPH/HEPH	SK: BTEX/TVH/C11-C22, C23-C60	Soil Metals: ☐ HWS-B ☐ SP-B ☐ Hg ☐ Cr6+	Water Metals: ☐ Dissolved ☐ Total ☐ Hg ☐ Cr6+	Routine Water Chemistry	Landfill: ☐ AB Class 2 ☐ BC ☐ SK	Coliforms: ☐ Total ☐ Fecal ☐ E.coli	Particle Size: ☐ Sieve (75µm) ☒ Texture			Hold For 30 Days No Analysis (Additional Fee)	Long Term Storage - 6 Months	Long Term Storage - 1 Year	Hazardous (Y/N)
											X						
											X						
											X						

Samples Relinquished By (Print Name and Sign):	Date/Time	Samples Received By (Print Name and Sign):	Date/Time
Emily Law [redacted]	May 22/23	[redacted]	Aug 22/23
Samples Relinquished By (Print Name and Sign):	Date/Time	Samples Received By (Print Name and Sign):	Date/Time 11:30
Samples Relinquished By (Print Name and Sign):	Date/Time	Samples Received By (Print [redacted]	Date/Time 8/22/23

Pink Copy - Client
Yellow Copy - AGAT
White Copy - AGAT

Page 1 of 1
N°: AB 180803

Document ID: DIV-50-1507.007
Date Revised: Oct 14, 2021

AGAT Laboratories

SAMPLE INTEGRITY RECEIPT FORM

RECEIVING BASICS - Shipping

Company/Consultant: Enviroweb

Courier: Jenoc Prepaid Collect

Waybill#

Branch: EDM GP FN FM (RD) VAN LYD FSJ EST SASK Other:

If multiple sites were submitted at once: (Yes) ~~No~~ L.C. [redacted]

Custody Seal Intact: Yes No ~~NA~~

TAT: <24hr 24-48hr 48-72hr (Reg) Other

Cooler Quantity: 1 small

TIME SENSITIVE ISSUES - Shipping

ALREADY EXCEEDED HOLD TIME? Yes No

Inorganic Tests (Please Circle): Mibi , BOD , Nitrate/Nitrite , Turbidity , Color , Microtox , Ortho PO4 , Tedlar Bag , Residual Chlorine , Chlorophyll* , Chloroamines*

Earliest Expiry:

Hydrocarbons: Earliest Expiry

SAMPLE INTEGRITY - Shipping

Hazardous Samples: YES (NO) Precaution Taken:

Legal Samples: Yes (No)

International Samples: Yes (No)

Tape Sealed: (Yes) No

Coolant Used: Icepack Bagged Ice Free Ice Free Water (None)

Temperature (Bottles/Jars only) N/A if only Soil Bags Received

FROZEN (Please Circle if samples received Frozen)

1 (Bottle/Jar) ~~NA~~ +___+___=____°C 2(Bottle/Jar)___+___+___=____°C

3 (Bottle/Jar)___+___+___=____°C 4 (Bottle/Jar)___+___+___=____°C

5 (Bottle/Jar)___+___+___=____°C 6 (Bottle/Jar)___+___+___=____°C

7 (Bottle/Jar)___+___+___=____°C 8 (Bottle/Jar)___+___+___=____°C

9 (Bottle/Jar)___+___+___=____°C 10 (Bottle/Jar)___+___+___=____°C

(If more than 10 coolers are received use another sheet of paper and attach)

LOGISTICS USE ONLY

Workorder No: 23R060845

Samples Damaged: Yes No If YES why?

No Bubble Wrap Frozen Courier

Other:

Account Project Manager: have they been notified of the above issues: Yes No

Whom spoken to: Date/Time:

CPM Initial

General Comments:

* Subcontracted Analysis (See CPM)

Date issued: March 11, 2020
Document ID: SR-9505.004

Data Set: Z:\Operations\Client Data\43021 Mitchel Kroetsch\SlugTest.aqt
Date: 08/21/23
Time: 10:37:44

PROJECT INFORMATION

Company: Envirowest Engineering
Client: Kroetsch
Project: 2304-43021
Test Date: May 30, 2023
Test Well: 23MW01(23BH05)

AQUIFER DATA

Saturated Thickness: 2.7 m
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: New Well

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

Initial Displacement: 0.445 m
Static Water Column Height: 1.2 m
Casing Radius: 0.0255 m
Well Radius: 0.075 m
Well Skin Radius: 0.075 m
Screen Length: 1.2 m
Total Well Penetration Depth: 2.4 m

No. of Observations: 25

Observation Data

Time (min)	Displacement (m)	Time (min)	Displacement (m)
0.	0.445	6.5	0.445
0.5	0.445	7.	0.445
1.	0.445	7.5	0.445
1.5	0.445	8.	0.445
2.	0.445	8.5	0.445
2.5	0.445	9.	0.445
3.	0.445	9.5	0.445
3.5	0.445	10.	0.445
4.	0.445	15.	0.445
4.5	0.445	20.	0.445
5.	0.445	25.	0.445
5.5	0.445	30.	0.445
6.	0.445		

SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.119

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	2.163E-7	cm/sec
y0	0.4448	m

T = K*b = 5.841E-5 cm²/sec