

Technical Document LA24044

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
<input type="checkbox"/> Approval <input type="checkbox"/> Registration <input checked="" type="checkbox"/> Authorization <input type="checkbox"/> Amendment	<u>LA24044</u>	<u>NW 6-11-21 W4M</u>

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.

Oct 7, 2024

Date of signing



Signature

Henk Vander Veen Dairy Ltd

Corporate name (if applicable)

Richard Van der Veen

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)
Manure storage room attached to layer barn	
4 pens 3. Clarified with applicant during site visit that dimensions are same as listed on pg 13 Catch basin AO note: 'Part 2 Application' email received from applicant Oct. 21 with catch basin information	total dimensions 91 m x 104 m 300ft x 300ft. 30m x 45m x 4m deep

Existing facilities: list ALL existing confined feeding operation facilities and their dimensions		
Existing facilities	Dimensions (m) (length, width, and depth)	NRCB USE ONLY
see next page		

NRCB USE ONLY

Barn 1: 63 m x 21 m
Barn 2: 61 m x 21 m
Calf shelter: 37 m x 22 m
Dry cow pens: 51 m x 47 m
Feeder pens: 74 m x 41 m
Loafing barn: 61 m x 20 m and 47 m x 11 m (L-shape)

Catch basin – 30 m x 30 m x 5 m

Earthen liquid manure storage (EMS) (converted from a dugout) – 130 m x 43 m x 5 m –
already constructed

Dairy barn expansion – 65 m x 23 m – **already constructed**

Feedlot pens - 83 m x 47 m and 82 m x 41 m – **already constructed**

▷ A0 note: catch basin permitted in LA17071B but
not constructed

Above facilities listed in LA17071B

Existing facilities and dimensions were assessed and are as listed (see page 5):

Loafing barn (L-shaped): 63 m x 20 m and 22 m x 11 m
Barn 1 and barn 2: 138 m x 23 m total dimensions
Calf shelter: 37 m x 11 m
Calf pen: 43 m x 40 m
Dry cow pen: 50 m x 41 m
Bred heifer pen: 43 m x 41 m
Yearling heifer pen: 41 m x 41 m
Beef feeder pen: 65 m x 50 m
EMS: 130 m 43 m x 5 m



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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

Adding 4 pens that were demolished for dairy expansion.
And digging drainage lagoon.

Construction completion date for proposed facilities Jan 2026

Additional information

[Empty box for 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
No proposed change in livestock numbers			
Currently permitted for 375 milking cows	(plus associated dries and replacements)		and 500 beef feeders

Untitled Map

Write a description for your map.

Legend

Feedlot pens
(91 m x 104 m) Catch basin
(35 m x 40 m x 4 m)

Pyiami Drain

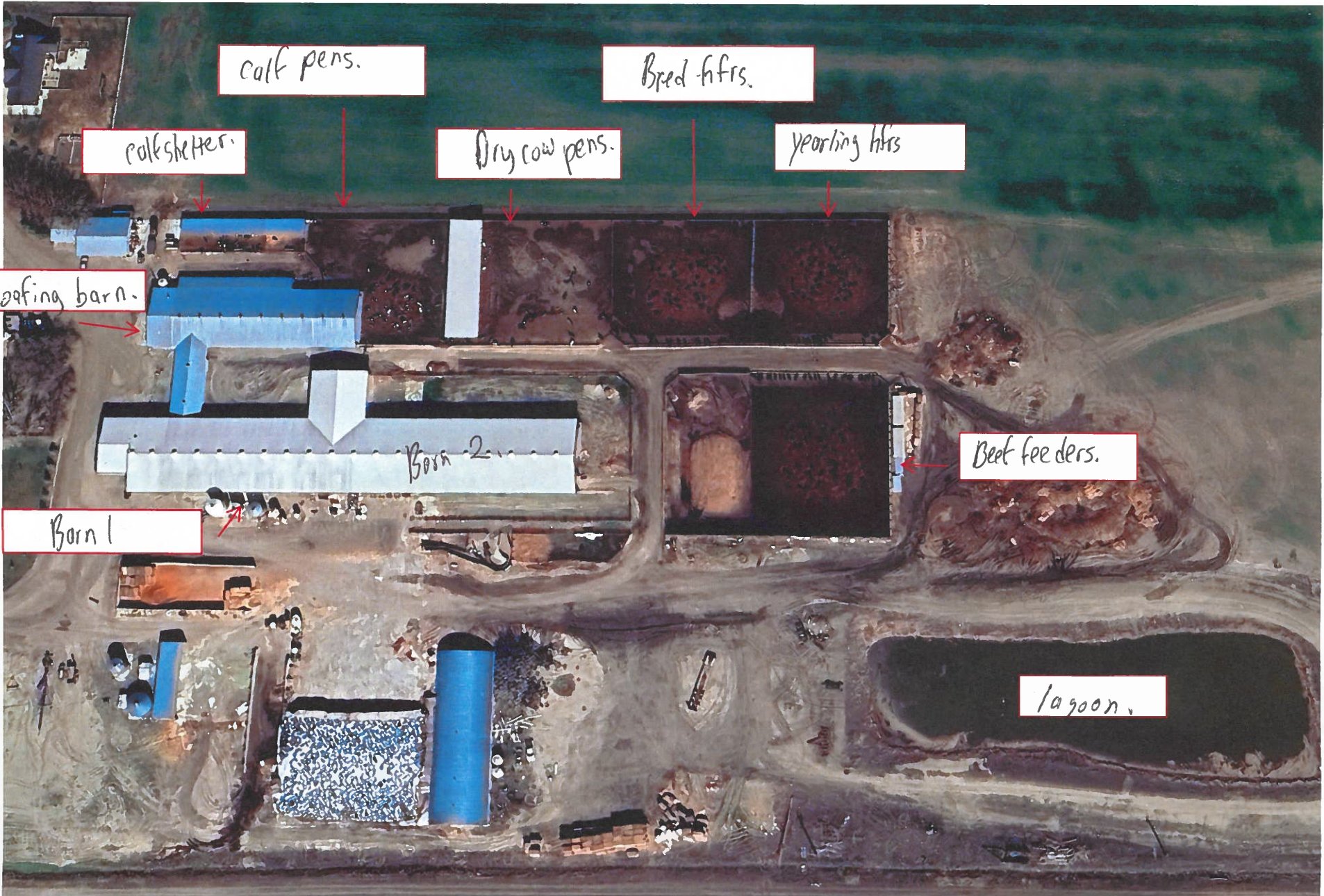
Google Earth

Image © 2024 Airbus

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calf pens.

Bred hfrs.

calf shelter.

Dry cow pens.

yearling hfrs

loafing barn.

Barn 1

Beet feeders.

Barn 2

lagoon.

Google Earth



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

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 appli

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 ___ day of _____, 20__

Signature of Applicant or Agent

OPTION 3: Additional water licence not required

1. I (we) declare that the CFO will not need a new licence from AEP under the *Water Act* for the development or activity proposed in this AOPA application.

Signed this 7 day of October, 2024.

Signature of Applicant or Agent

[LNID responded to the application stating that the applicant has conveyance agreements that provide sufficient water](#)

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

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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: Replacement pens. Proposed 1: catch basin.
 Proposed 2: 4 new feedlot pens. Proposed 3: _____

Facility and environmental risk information		Facilities				NRCB USE ONLY	
		Existing	Proposed 1	Proposed 2	Proposed 3	Meets requirements	Comments
Flood plain information	What is the elevation of the floor of the lowest manure storage or collection facility above the 1:25 year flood plain or the highest known flood level?	<input checked="" type="checkbox"/> > 1 m <input type="checkbox"/> ≤ 1 m	<input checked="" type="checkbox"/> > 1 m <input type="checkbox"/> ≤ 1 m	<input checked="" type="checkbox"/> > 1 m <input type="checkbox"/> ≤ 1 m	<input checked="" type="checkbox"/> > 1 m <input type="checkbox"/> ≤ 1 m	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> YES with exemption	CFO is not within a flood plain
	Surface water information	How many springs are within 100 m of the manure storage facility or manure collection area?	None	None	None	None	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> YES with exemption
	How many water wells are within 100 m of the manure storage facility or manure collection area?	None	None	None.		<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> YES with exemption	No water wells on property
	What is the shortest distance from the manure collection or storage facility to a surface water body? (e.g., lake, creek, slough, seasonal)	177m.	50m.	70m.		<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> YES with exemption	The catch basin is proposed to be 50m away from Pyami drain; pens will be 80m away
Groundwater information	What is the depth to the water table?		6.5M	6.5M.		<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> YES with exemption	Confirmed
	What is the depth to the groundwater resource/aquifer you draw water from?	50M	50M	50M.		<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> YES with exemption	49.38 m (Water well ID 221690, 1.5 km NE)

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

Carina-Whishack@nrcb.ca

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NRCB USE ONLY			
ENVIRONMENTAL RISK SCREENING INFORMATION			
ERST for <u>proposed</u> facilities			
Facility	Groundwater score	Surface water score	File number
Catch basin	Low	Low	LA24044
Feedlot pens	Low	Low	LA24044
ERST for <u>existing</u> facilities			
Facility	Groundwater score	Surface water score	File number
EMS	Low	Low	LA17071
constructed pens	Low	Low	LA17071
Dairy barn expansion	Low	Low	LA17071
Dairy barn (solid system)	Low	Low	LA17071
All outside pens	Low	Low	LA17071
In-barn pit	Low	Low	LA17071
ERST related comments:			
<p>New facilities that meet or exceed AOPA requirements are presumed to be low risk to groundwater and surface water</p>			

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NRCB USE ONLY

WATER WELL AND SURFACE WATER INFORMATION

Well IDs: 221690 (located 1.5km NE of CFO)

WW 112836 located on NW6-11-21-W4 is a structure test hole

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:

Pyiami drain located 50 m east of proposed catch basin and 80 m east of proposed feedlot pens

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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
Heug Dairy	6-11-21 NE	638M.	Rural Ag	1	638 m	NA	Yes
Scholten Farms	1-11-22 NE	558M.	Rural Ag	1	570 m	NA	Yes
De kok.	6-11-21 SW.	831.	Rural Ag	1	823 m	NA	Yes
Wilma VanderVeen.	7-11-21 - NW.	696.	Rural Ag	1	706 m	NA	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)
N/A for authorizations					
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)

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NRCB USE ONLY

MINIMUM DISTANCE SEPARATION

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

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

Requirements (m): Category 1: 488 m Category 2: 651 m Category 3: 813 m Category 4: 1301 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: _____ NA for authorizations

Land base listed: _____

Area not suitable: _____

Available area: _____

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 LA17071

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NRCB USE ONLY

ALL SIGNATURES IN FILE

YES NO

DATES OF APPROVAL OFFICER SITE VISITS

November 5, 2024	

CORRESPONDENCE WITH MUNICIPALITIES AND REFERRAL AGENCIES

Date deeming letters sent: October 22, 2024

Municipality: Lethbridge 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: LNID N/A

letter sent response received written/email verbal no comments received

Other: ATCO Gas and Pipelines N/A

letter sent response received written/email verbal no comments received

Lethbridge North County Potable Water Coop Letter sent No comments received

Fortis Alberta Letter sent No comments received

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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. Feedlot pens.
2. _____

Manure storage capacity

	Length (m)	Width (m)	Depth below ground level (m)	NRCB USE ONLY Estimated storage capacity (m ³)
1.	300ft.	340ft (91m x 104m)	0	
2.				
TOTAL CAPACITY				

Feedlot pens are considered 9 months of storage

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

Catch basin.

Naturally occurring protective layer details

Thickness of naturally occurring protective layer	<u>1.6</u> (m)	Provide details (as required)	
Soil texture	<u>34</u> % sand	<u>30</u> % silt	<u>36</u> % clay
Hydraulic conductivity - naturally occurring protective layer	Depth and type of soil tested	Hydraulic conductivity (cm/s)	Describe test standard used
		<u>2.6×10^{-9}</u>	<u>falling head.</u>

Additional information (attach copies of soil test reports)

NRCB USE ONLY

Requirements met: YES NO

Condition required: YES NO

Report attached: YES NO

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

NRCB USE ONLY

Nine month manure storage volume requirements met: YES YES With STMS NO

Depth to water table: 6.5 m Requirements met: YES NO

Depth to uppermost groundwater resource: 49.38 m Requirements met: YES NO

ERST completed: see ERST page for details

Surface water control systems

Requirements met: YES NO Details/comments:

Runoff from the proposed feedlot pens will be directed into the proposed catch basin east of the pens

Naturally occurring protective layer details

Layer specification comments (e.g. sand lenses; layering uniform or irregular; number and location of boreholes):

5 boreholes drilled for the proposed feedlot pens and catch basin. Lacustrine silty clay overlying clay till at all boreholes

See engineering report attached

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RUNOFF CONTROL CATCH BASIN: Naturally occurring protective layer

(complete a copy of this section for EACH proposed runoff control catch basin with a naturally occurring protective layer)

Facility description / name (as indicated on site plan)

1. Catch basin
2. _____
3. _____

Determination of runoff area

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

[See attached drilling report](#)

Catch basin capacity

	Length (m)	Width (m)	Total depth (m)	Depth below ground level (m)	Slope run:rise			NRCB USE ONLY Calculated storage capacity (excl. 0.5 m freeboard) (m ³)
					Inside end walls	Inside side walls	Outside walls	
1.	<u>30</u>	<u>45</u>	<u>4</u>	<u>4</u>	<u>3-1</u>	<u>3-1</u>		<u>1948 m3</u>
2.								
3.								
TOTAL CAPACITY								<u>1948 m3</u>

Naturally occurring protective layer details

Thickness of naturally occurring protective layer	<u>3.1</u> (m)	Provide details (as required)		
Soil texture	<u>40</u> % sand	<u>26</u> % silt	<u>34</u> % clay	
Hydraulic conductivity - naturally occurring protective layer	Depth and type of soil tested	Hydraulic conductivity (cm/s)	Describe test standard used	
		<u>7.5 x 10⁻⁹</u>	<u>falling head.</u>	

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

If soil info differs per facility include additional soils page.

NRCB USE ONLY	
Requirements met:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
Condition required:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
Report attached:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO

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RUNOFF CONTROL CATCH BASIN: Naturally occurring protective layer (cont.)

NRCB USE ONLY

Catch basin calculator. Total volume @ freeboard level: 1948 m3 Runoff capacity requirements met: YES NO

Calculation of the volume attached: YES NO

Depth to water table: 6.5 m Requirements met: YES NO

Depth to uppermost groundwater resource: 49.38 m Requirements met: YES NO

ERST completed: See ERST page for details

Protective layer specification comments (e.g. sand lenses; layering uniform or irregular; number and location of boreholes):

5 boreholes drilled for the proposed feedlot pens and catch basin. Lacustrine silty clay overlying clay till at all boreholes

See engineering report attached

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

Catch Basin Storage Volume Calculator

Construction Dimensions of Catch Basin

* Only cells in blue can be changed.

Overall Dimensions of Catch Basin

Total Length* ₄	30.0 m
Total Width* ₄	45.0 m
Total Depth* ₄	4.0 m
Design Capacity Depth	3.50 m
End Slope* ₄	3 run:rise
Side Slope* ₄	3 run:rise
Length of Bottom	6.0 m
Width of Bottom	21.0 m

Capacity @ top of Bank 2,568 m³

Design Capacity of Catch Basin (freeboard level)

Length (design capacity depth)	27.0 m
Width (design capacity depth)	42.0 m
Total Depth	4.0 m
Design Capacity Depth	3.50 m
End Slope	3 run:rise
Side Slope	3 run:rise

Design Capacity (freeboard level) 1,948 m³

(level) 1,134 m²

Catch Basin Dimensions

98 ft
148 ft
13 ft
11 ft
3 run:rise
3 run:rise
20 ft
69 ft

Capacity (@top)
90,688 ft³
564,881 Imp. Gal.

Design Capacity (freeboard level)

89 ft
138 ft
13 ft
11 ft
3 run:rise
3 run:rise

68,784 ft³
428,445 Imp. Gal.
12,206 ft²

CFO Name ₁ Vander Veen Dairy
Land Location ₁

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	43	40	1,720.0
7	50	41	2,050.0
8	82	41	3,362.0
9	65	50	3,250.0
10	91	104	9,464.0
Total Area (m ²)			19,846

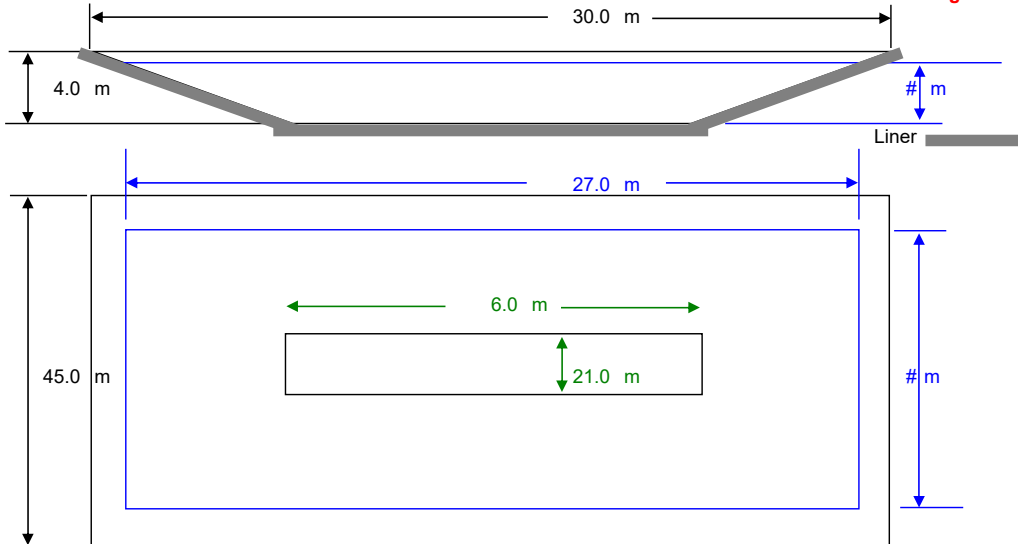
Rainfall (Select Town ₃)

Picture Butte 85
AOPA Design Rainfall 85 mm

Minimum Catchbasin Storage Volume Required

1,012 m³ ** 35743.5987 ft³
222640.907 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

Type text here

3 October 2024

J Lobbezoo Engineering & Consulting Services Ltd.
PO Box 96, Monarch, AB T0L1M0

JLECS File: P24060

Henk Vander Veen Dairy Ltd.
PO Box 557
Picture Butte, AB T0K 1V0

Attention: Mr. Richard Vander Veen

**Re: Geotechnical Review and Evaluation
NRCB Permitting of Proposed Pens and Catch Basin
NW-06-011-21-W4M, near Picture Butte, Alberta**

As requested, J Lobbezoo Engineering & Consulting Services Ltd. (JLECS) has carried out a geotechnical review and evaluation of the above-captioned site relative to the required protection of the groundwater resource, as required by the Agricultural Operation Practices Act, AB Reg. 267/2001 (hereinafter referred to as "AOPA"). This letter describes the site soil conditions to support a permit application related to a proposed pen expansion and a new catch basin to be constructed east of the existing pens and farmyard at the above-captioned site (refer to Figure 1, attached).

In order to demonstrate the suitability of the naturally existing soils for consideration as a naturally occurring protective layer to the groundwater, five boreholes were advanced at the site on September 9, 2024. The boreholes were advanced at the approximate locations denoted as VV1-24 to VV5-24 on Figure 1, attached.

The boreholes were advanced by a truck-mounted drill rig owned and operated by Chilako Drilling Services and extended to depths of 3.0 m to 9.2 m below the existing grade. The boreholes were logged by Larry Delong of Chilako Drilling Services.

In general, the natural mineral soils encountered in the boreholes consisted of up to about 2 m of lacustrine silty clay overlying clay till to the termination depths of all five boreholes. Neither free groundwater nor a groundwater resource (as defined by the AOPA) were encountered within the 9.2 m investigation depth at this site.

Samples of soil collected from the screened zones of boreholes VV3-24 and VV5-24 as well as samples from similar depths at the other boreholes were all subjected to grain size analyses, which was carried out by Down to Earth Laboratories in Lethbridge, Alberta. The lab report is attached, for reference. The results indicate a soil texture breakdown of:

Table 1: Soil Texture Analyses

Borehole/Depth	% Sand	% Silt	% Clay
VV1-24 / 6.0 – 8.0 m	45	25	30
VV2-24 / 7.0 – 8.0 m	25	29	46
VV3-24 / 6.0 – 7.5 m	40	26	34
VV5-24 / 1.5 – 3.0 m	34	30	36
VV6-24 / 1.5 – 3.0 m	42	28	30
Average:	37	28	35

To measure the *in situ* permeability of the subsurface soils, 50 mm diameter PVC monitoring wells were constructed in boreholes VV3-24 and VV5-24. Test well VV3-24 (proposed catch basin) was screened from 4.4 m to 7.5 m depth while test well VV5-24 (proposed pen expansion area) was screened from 1.5 m to 3.1 m depth. Well saturation of the 50 mm diameter monitoring wells was carried out by filling the monitoring well to the top for several consecutive days. After several days of testing, a 24-hour water drop of 0.20 m was determined at VV3-24, and a 24-hour water drop of 0.18 m was determined at VV5-24.

To calculate the permeability of the screened portion of the clay till strata at the test well locations, a modified falling head test (as outlined in the USBR Engineering Geology Field Manual Volume 2 [2001]) was used. The input variables and output data are outlined on the attached In Situ Permeability Test reports. The results of the permeability testing indicate an *in situ* hydraulic conductivity, k_s , of 7.5×10^{-2} cm/s at VV3-24, and an *in situ* hydraulic conductivity, k_s , of 2.6×10^{-8} cm/s at VV5-24.

Using the measured permeability of the clay stratum, the 3.1 m of clay screened at VV3-24 is estimated to represent the equivalent of over 100 m of naturally occurring materials having a hydraulic conductivity of 1×10^{-6} cm/s (the reference standard in AOPA). At VV5-24, the 1.6 m of clay screened is estimated to represent the equivalent of over 60 m of naturally occurring materials having a hydraulic conductivity of 1×10^{-6} cm/s. This represents natural material protection in excess of the minimum requirements outlined by the AOPA for catch basins (minimum 5 m, Section 9.5-b), and pens (minimum 2 m, Section 9.5-c).

Conclusion

Based on the results of the current investigation, permeability testing, and our understanding of the site and proposed development at the site, it is JLECS's opinion that the naturally occurring materials at the site satisfy the AOPA requirements for permitting the proposed catch basin and pen expansion at this location.

We trust that this report satisfies your present requirements. Should you have any questions, please contact the undersigned at your convenience.

Yours truly,

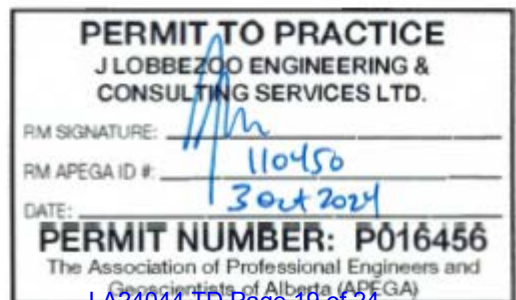
J Lobbezoo Engineering & Consulting Services Ltd.



John Lobbezoo, P.Eng.
Principal Geotechnical Engineer

Attachments

- Figure 1 Borehole Locations
- In Situ Permeability Test Calculations
- Down to Earth Soil Texture Results
- Soil Profile and Parent Material Description, Chilako Drilling Services



VV3-24

In Situ Permeability Test

Modified Falling Head Permeability Equation

$$K_s = \frac{r^2}{2\ell\Delta t} \left[\frac{\sinh^{-1} \frac{\ell}{r_e}}{2} \ln \left[\frac{2H_1 - \ell}{2H_2 - \ell} \right] - \ln \left[\frac{2H_1 H_2 - \ell H_1}{2H_1 H_2 - \ell H_2} \right] \right]$$

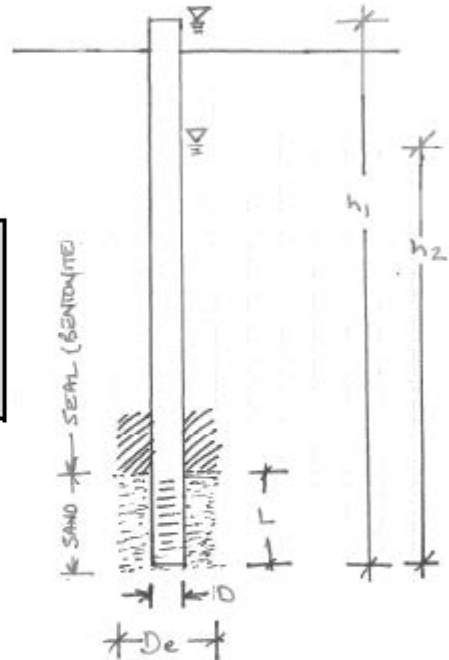
taken from USBR Engineering Geology Field Manual Volume 2 (2001)

VV3-24 - Vander Veen Dairy

JLECS File: P24060

INPUT VARIABLES	Terms	Value	Definition
	D	0.0520	diameter of standpipe (m)
	De	0.1500	diameter of borehole (m)
	L	3.10	length of sand section (m)
	h1	8.10	initial height of water above base of hole (m)
	h2	7.90	final height of water above base of hole (m)
t	24.0	time of test (h)	

$k_s = 7.9E-09$ cm/sec



VV5-24

In Situ Permeability Test

Modified Falling Head Permeability Equation

$$K_s = \frac{r^2}{2\ell\Delta t} \left[\frac{\sinh^{-1} \frac{\ell}{r_c}}{2} \ln \left[\frac{2H_1 - \ell}{2H_2 - \ell} \right] - \ln \left[\frac{2H_1 H_2 - \ell H_2}{2H_1 H_2 - \ell H_1} \right] \right]$$

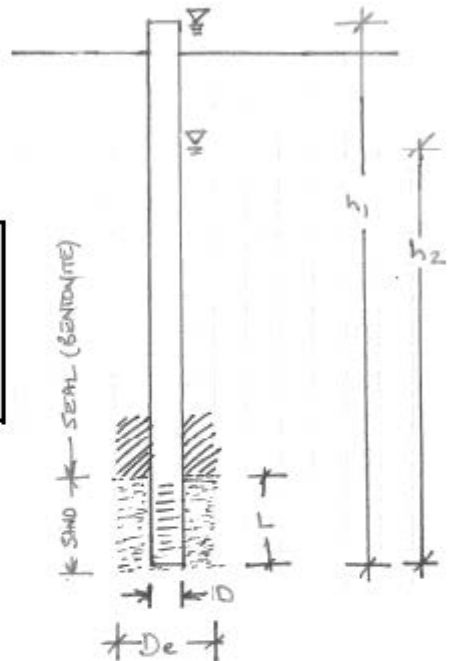
taken from USBR Engineering Geology Field Manual Volume 2 (2001)

VV5-24 - Vander Veen Dairy

JLECS File: P24060

INPUT VARIABLES	Terms	Value	Definition
	D	0.0520	diameter of standpipe (m)
	De	0.1500	diameter of borehole (m)
	L	1.60	length of sand section (m)
	h1	3.70	initial height of water above base of hole (m)
	h2	3.52	final height of water above base of hole (m)
	t	24.0	time of test (h)

$k_s = 2.6E-08$ cm/sec



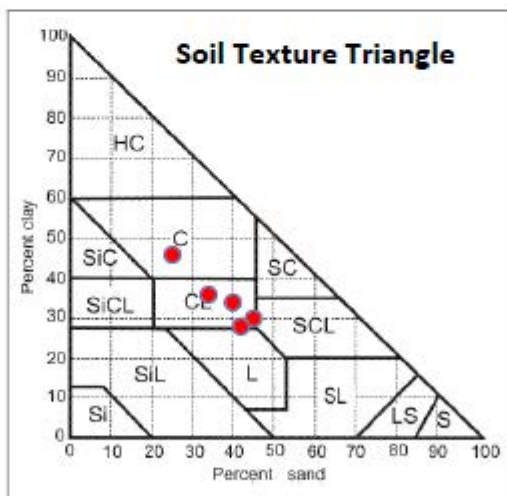


Down To Earth Labs Inc.

The Science of Higher Yields

J. Lobbezoo Engineering + Consulting Services Box 96 Monarch, Alberta T0L 1M0	Report #: 187034 Report Date: 2024-09-26 Received: 2024-09-24 Completed: 2024-09-26 Test Done: ST	Project : VanderVeen Dairy PO:	3510 8th Ave North Lethbridge, AB T1H 5C3 403-328-1133 www.downtoearthlabs.com Info@downtoearthlabs.com
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Sample ID:	240924P003	240924P004	240924P005	240924P006	240924P007
Cust. Sample ID:	VV1-24	VV2-24	VV3-24	VV4-24	VV5-24
Analyte Units	6.0-8.0	7.0-8.0	6.0-7.5	1.5-3.0	1.5-3.0
Sand %	45.0	25.0	39.9	33.9	41.9
Silt %	25.0	29.0	26.1	30.1	30.1
Clay %	30.0	46.0	34.0	36.0	28.0
Soil Texture	- Clay Loam	Clay	Clay Loam	Clay Loam	Clay Loam



Raygan Boyce - Chemist



Figure 1: Site Layout & Borehole Locations

CHILAKO DRILLING SERVICES LTD

Box 942 Coaldale, Alberta, T1M 1M8
(403) 345-3710

SOIL PROFILE AND PARENT MATERIAL DESCRIPTION

Site Location: NW6-11-21-W4, Vanderveen Dairy

Date: 09-Sep-24

Hole #	Location	Depth	Texture	Moisture	Geological	Sample	Remarks
VV1-24	0366048	0-0.15	SiCL	SM	Topsoil		
	5527134	0.15-1.8	SiCL-CL	M	Lac		Stiff, med plastic, olive brown
		1.8-4.7	CL	M	Till		Stiff, med plastic, brown, sand lens @ 1.8m
		4.7-9.2	CL	M	Till	6.0-8.0	Stiff, med plastic, yellow brown, oxidized
VV2-24	0366081	0-0.15	SiCL	SM	Topsoil		
	5527137	0.15-2.1	SiCL-CL	M	Lac		Stiff, med plastic, olive brown
		2.1-4.8	CL	M	Till		Stiff, med plastic, brown
		4.8-8.0	CL	M	Till	7.0-8.0	Stiff, med plastic, yellow brown, oxidized
VV3-24	0366048	0-0.15	SiCL	D	Topsoil		
	5527184	0.15-1.4	SiCL-CL	M	Lac		Stiff, med plastic, olive brown
		1.4-4.2	CL	M	Till		Stiff, med plastic, brown
		4.2-7.5	CL	M	Till	6.0-7.5	Stiff, med plastic, yellow brown, oxidized 50mm H.C. Well installed to 7.5m BGS Screen: 7.5-4.5m Sand: 7.5-4.4m Bentonite: 4.4-0.0m Stickup: 0.6m Hole Diameter: 0.15m
VV4-24	0365996	0-0.15	SiCL	SM	Topsoil		
	5527182	0.15-1.5	SiCL-CL	M	Lac		Stiff, med plastic, brown-olive brown
		1.5-3.0	CL	M	Till	1.5-3.0	Stiff, med plastic, brown
VV5-24	0365988	0-0.15	SiCL	M	Lac		Stiff, med plastic, olive brown
	5527140	0.15-3.0	CL	M	Till		Stiff, med plastic, brown 50mm H.C. Well installed to 3.1m BGS Screen: 3.1-1.6m Sand: 3.1-1.5m Bentonite: 1.5-0.0m Stickup: 0.6m Hole Diameter: 0.15m

Legend: L Loam
C Clay
S Sand
Gr. Gravel
Si Silt
F Fine (sand)
VF Very Fine (sand)