Technical Document LA24034

Part 2 — Technical Requirements

NRCB Natural Resources Conservation Board

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

NRCB USE ONLY	Application number	Legal land description
☒ Approval ☐ Registration ☐ Authorization ☐ Amendment	LA24034	NE 22-8-25 W4M

APPLICATION DISCLOSURE

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

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

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

15/07/2024
Date of signing

[redacted]
Signature

VAN DRIEL FARMS LTD.
Corporate name (if applicable)

PIETER VAN DRIEL.
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)
2 extra pens. (already constructed)	2 x 136 x 320 (2 pens 41.5x97.5m each) corrected dimensions will be: 40mx 25mx2.5m deep (1016 m³)
1 CATCH BASIN (#5) (already constructed but with smaller dimensions)	30m x 25m x 2.5m (696m³)
Increasing Catch Basin #4 by 5m to the total dimensions of 25m x 40m x 3m deep (1116m³)	

The application also includes permission to use an already constructed concrete manure transfer pit (6.1 m x 4.27 m x 1.83 m deep). See page below.

E: operation facilities and their dimensions

E:	Dimensions (m) (length, width, and depth)	NRCB USE ONLY

NRCB USE ONLY

See page 4 for existing facilities

Last updated February 26, 2021

Part 2 — Technical Requirements

NRCB Natural Resources Conservation Board

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

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

WE MADE A CONCRETE RUN OFF PIT TO REPLACE DIRT PIT

Construction completion date for proposed facilities AUGUST-20, 2025

Additional information

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

Livestock category and type (Available in the Schedule 2 of the Part 2 Matters Regulation)	**Permitted number**	***Proposed increase or decrease in number (if applicable)***	**Total**
No changes to what was proposed in Part 1: 5000 beef feeders + 1000 beef finishers			

Last updated February 26, 2021

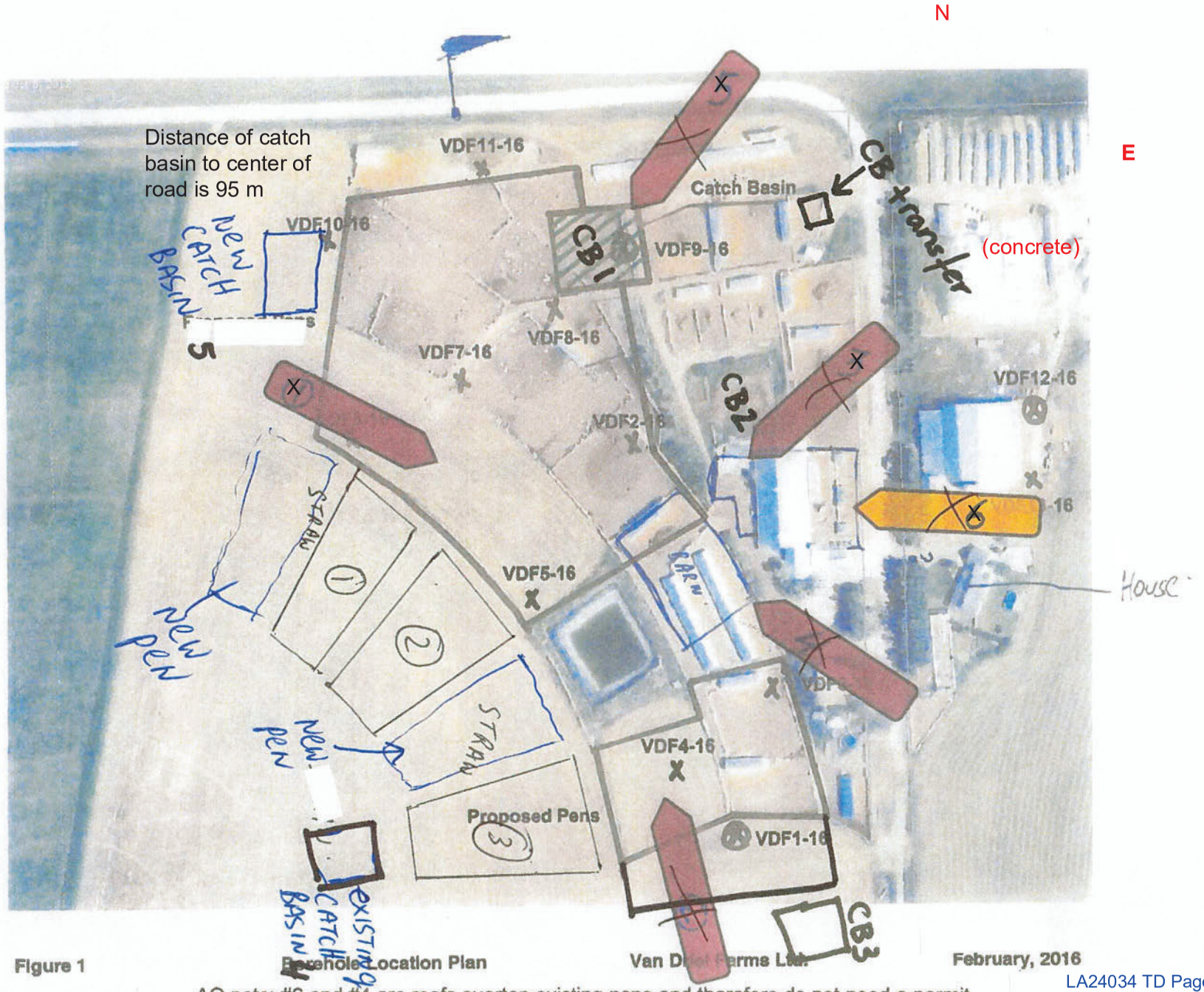
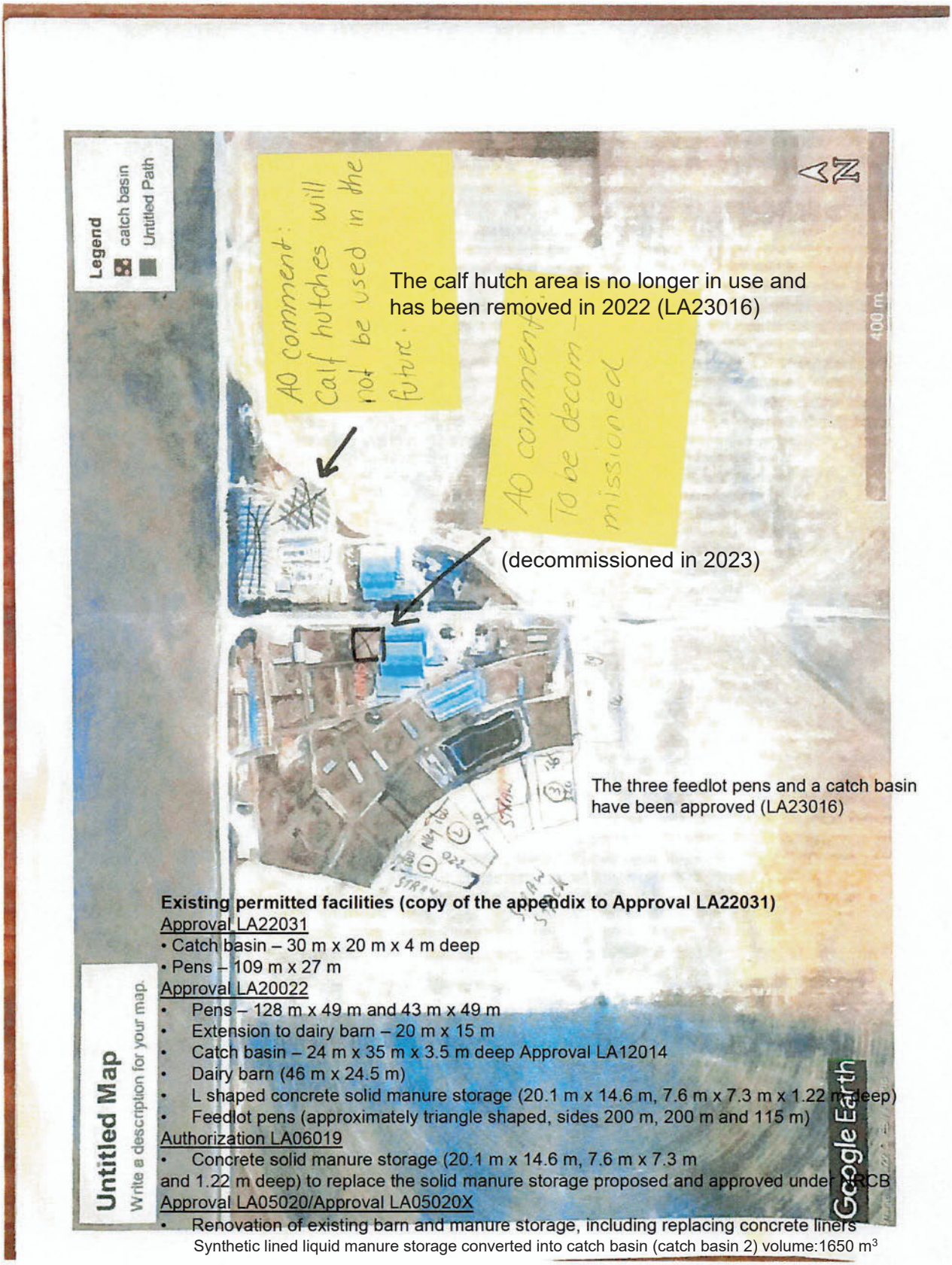


Figure 1 Borehole Location Plan Van Diest Farms Ltd. February, 2016

AO note: #6 and #4 are roofs overtop existing pens and therefore do not need a permit.



Existing permitted facilities (copy of the appendix to Approval LA22031)

Approval LA22031

- Catch basin – 30 m x 20 m x 4 m deep
- Pens – 109 m x 27 m

Approval LA20022

- Pens – 128 m x 49 m and 43 m x 49 m
- Extension to dairy barn – 20 m x 15 m
- Catch basin – 24 m x 35 m x 3.5 m deep Approval LA12014
- Dairy barn (46 m x 24.5 m)
- L shaped concrete solid manure storage (20.1 m x 14.6 m, 7.6 m x 7.3 m x 1.22 m deep)
- Feedlot pens (approximately triangle shaped, sides 200 m, 200 m and 115 m)

Authorization LA06019

- Concrete solid manure storage (20.1 m x 14.6 m, 7.6 m x 7.3 m and 1.22 m deep) to replace the solid manure storage proposed and approved under RCB

Approval LA05020/Approval LA05020X

- Renovation of existing barn and manure storage, including replacing concrete liners

Synthetic lined liquid manure storage converted into catch basin (catch basin 2) volume:1650 m^3

Part 2 — Technical Requirements

NRCB Natural Resources Conservation Board

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

DECLARATION AND ACKNOWLEDGMENT OF APPLICANT CONCERNING *WATER ACT* LICENCE
issued by Alberta Environment and Protected Areas (EPA) for a confined feeding operation (CFO)
Date and sign one of the following four options

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

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

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

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

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

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

OPTION 3: Additional water licence not required

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

Signed this 15 day of July, 2024. [redacted]
Signature of Applicant or Agent

Last updated September 11, 2023

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

Part 2 — Technical Requirements

NRCB Natural Resources Conservation Board

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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: existing pens **Proposed 1:** new pens

Proposed 2: new catch basin **Proposed 3:**

Facility and environmental risk information		Facilities				NRCB USE ONLY	
		Existing	Proposed 1	Proposed 2	Proposed 3	Meets requirements	Comments
Flood plain information	What is the elevation of the floor of the lowest manure storage or collection facility above the 1:25 year flood plain or the highest known flood level?	☑ > 1 m ☐ ≤ 1 m	☒ > 1 m ☐ ≤ 1 m	☐ > 1 m ☐ ≤ 1 m	☐ > 1 m ☐ ≤ 1 m	☒ YES ☐ NO ☐ YES with exemption	not located in flood plain
Surface water information	How many springs are within 100 m of the manure storage facility or manure collection area?	0	0	0		☒ YES ☐ NO ☐ YES with exemption	none observed during site visit or reported in EPA database
	How many water wells are within 100 m of the manure storage facility or manure collection area?	0	0	0		☒ YES ☐ NO ☐ YES with exemption	none observed during site visit or reported in EPA database
	What is the shortest distance from the manure collection or storage facility to a surface water body? (e.g., lake, creek, slough, seasonal)	560M	>500 m	>500 m		☒ YES ☐ NO ☐ YES with exemption	463 m to unnamed creek to the north
Groundwater information	What is the depth to the water table?	NO WATER	>7.5 m	>4 m		☒ YES ☐ NO ☐ YES with exemption	see drilling report attached
	What is the depth to the groundwater resource/aquifer you draw water from?	NO GROUND WATER - BUT DUGOUT WITH LINER		No UGR		☒ YES ☐ NO ☐ YES with exemption	no wells within 400 m fo CFO

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

Last updated February 26, 2021

Part 2 — Technical Requirements

NRCB Natural Resources Conservation Board

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

NRCB USE ONLY

ENVIRONMENTAL RISK SCREENING INFORMATION

ERST for **proposed** facilities See Decision Summary LA24034 for details

Facility	Groundwater score	Surface water score	File number

ERST for **existing** facilities all facilities were scored and determined to pose a low risk to groundwater and surface water

Facility	Groundwater score	Surface water score	File number

ERST related comments:

Part 2 — Technical Requirements

NRCB Natural Resources Conservation Board

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

NRCB USE ONLY

WATER WELL AND SURFACE WATER INFORMATION

Well IDs: Well 1250098 - decommissioned; Well 1250099 - decommissioned

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

NRCB Natural Resources Conservation Board

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

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

			NRCB USE ONLY				
Neighbour name(s)	**Legal land description**	**Distance (m)**	**Zoning (LUB) category**	**MDS category (1-4)**	**Distance (m)**	**Waiver attached (if required)**	**Meets regulations**
Hank van Hierden	SE 22-8-25 W4	800	RG	1	699 m		yes
Stan Mc Nab	NE 25-8-25 W4	2000	RG	1	2.3 km		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)**
in an email sent August 21, 2024: Davan Farms					
	N1/2 21-8-25	280 acres	irrigated	241 acres irrigated	Yes
Van Driel Farms	W4 N1/2	140 ha	irrigated	N1/2 23: 250 acres irrigated	
	23-8-25 NE	60 ha	irrigated	NE 22: 108 acres irrigated	
	22-8-25 (NE22-8-25 W4)				
	Also available is the NW 22-8-25 with 121 acres irrigated (Additional info sent October 23, 2024)		Total	720 acres irrigated	

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

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

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

Additional information (attach any additional information as required)

Part 2 — Technical Requirements

NRCB Natural Resources Conservation Board

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NRCB USE ONLY

MINIMUM DISTANCE SEPARATION

Methods used to determine distance (if applicable): google earth

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

Requirements (m): Category 1: 616 m Category 2: 821 m Category 3: 1027 m Category 4: 1643 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: 647 acres irrigated

Land base listed: 720 acres irrigated

Area not suitable: already subtracted

Available area 720 acres irrigated Requirement met: ☒ YES ☐ NO

Land spreading agreements required: ☒ YES ☐ NO attached

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 LA03038

DOUG/AMANDA VAN HIERDEN
DAVAN FARMS LTD
FORT MACLEOD.

MONDAY Aug 19
2024.

Hereby give PERMISSION TO VAN DRIEL FARMS
TO SPREAD MANURE ON OUR IRRIGATED FIELDS.
NE 21-8-25 W4 AND NW 21-8-25 W4. BOTH 160 ACRES.

THANKS
DOUG VAN HIERDEN
FORT MACLEOD.

[redacted]

Name
Address
Legal Land Location

MDS Spreadsheet based on 2006 AOPA Regulations

Category of Livestock	Type of Livestock	Factor A	Technology Factor	MU	LSU Factor	Number of Animals	LSU
Beef	Cows/Finishers (900+ lbs)	0.700	0.700	0.910	0.446	1,000	445.9
	Feeders (450 - 900 lbs)	0.700	0.700	0.500	0.245	5,000	1,225.0
	Feeder Calves (<550 lbs)	0.700	0.700	0.275	0.135		-
	Other						-
Dairy (*count lactating cows only)	*Free Stall – Lactating Cows with all associated dries, heifers, and calves	0.800	1.100	2.000	1.760		-
	*Free Stall – Lactating cows with Dry Cows only	0.800	1.100	1.640	1.443		-
	Free Stall – Lactating Cows only	0.800	1.100	1.400	1.232		-
	Tie Stall – Lactating cows only	0.800	1.000	1.400	1.120		-
	Loose Housing – Lactating cows only	0.800	1.000	1.400	1.120		-
	Dry Cow (Solid manure)	0.800	0.700	1.000	0.560		-
	Dry Cow (Liquid manure)						
	Replacements – Bred Heifers (Breeding to Calving)	0.800	0.700	0.875	0.490		-
	Replacements - Growing Heifers (350 lbs to breeding)	0.800	0.700	0.525	0.294		-
	Calves (< 350 lbs)	0.800	0.700	0.200	0.112		-
	Other						-
Swine Liquid (*count sows only)	Farrow to finish *	2.000	1.100	1.780	3.916		-
	Farrow to wean *	2.000	1.100	0.670	1.474		-
	Farrow only *	2.000	1.100	0.530	1.166		-
	Feeders/Boars	2.000	1.100	0.200	0.440		-
	Growers/Roasters	2.000	1.100	0.118	0.260		-
	Weaners	2.000	1.100	0.055	0.121		-
	Other						-
Swine Solid (*Count sows only)	Farrow to finish *	2.000	0.800	1.780	2.848		-
	Farrow to wean *	2.000	0.800	0.670	1.072		-
	Farrow only *	2.000	0.800	0.530	0.848		-
	Feeders/Boars	2.000	0.800	0.200	0.320		-
	Growers/Roasters	2.000	0.800	0.118	0.189		-
	Weaners	2.000	0.800	0.055	0.088		-
							-
Poultry	Chicken - Breeders - Solid	1.000	0.700	0.010	0.007		-
	Chicken - Layers - Liquid (includes associated pullets)	2.000	1.100	0.008	0.018		-
	Chicken - Layers - (Belt Cage)	2.000	0.700	0.008	0.011		-
	Chicken - Layers - (Deep Pit)	2.000	0.700	0.008	0.011		-
	Chicken - Pullets/Broilers	1.000	0.700	0.002	0.001		-
	Turkey - Toms/Breeders	1.000	0.700	0.020	0.014		-
	Turkey - Hens (light)	1.000	0.700	0.013	0.009		-
	Turkey - Broilers	1.000	0.700	0.010	0.007		-
	Ducks	1.000	0.700	0.010	0.007		-
	Geese	1.000	0.700	0.020	0.014		-
	Other						-
Horses	PMU	0.650	0.700	1.000	0.455		-
	Feeders > 750 lbs	0.650	0.700	1.000	0.455		-
	Foals < 750 lbs	0.650	0.700	0.300	0.137		-
	Mules	0.600	0.700	1.000	0.420		-
	Donkeys	0.600	0.700	0.670	0.281		-
	Other						-
Sheep	Ewes/Rams	0.600	0.700	0.200	0.084		-
	Ewes with lambs	0.600	0.700	0.250	0.105		-
	Lambs	0.600	0.700	0.050	0.021		-
	Feeders	0.600	0.700	0.100	0.042		-
	Other						-
Goats	Meat/Milk (per Ewe)	0.700	0.700	0.170	0.083		-
	Nannies/Billies	0.700	0.700	0.140	0.069		-
	Feeders	0.700	0.700	0.077	0.038		-
	Other						-
Bison	Bison	0.600	0.700	1.000	0.420		-
	Other						-
Cervid	Elk	0.600	0.700	0.600	0.252		-
	Deer	0.600	0.700	0.200	0.084		-
	Other						-
Wild Boar	Feeders	2.000	0.800	0.140	0.224		-
	Sow (farrowing)	2.000	0.800	0.371	0.594		-
	Other						-
					Total		1,670.9

For New Operations

Dispersion Factor: 1

Category	Odour Objective	Distance Feet	Distance Metres
1	41.04	2,021	616
2	54.72	2,695	821
3	68.4	3,368	1,027
4	109.44	5,389	1,643

For Expanding Operations

Dispersion Factor: 1
Expansion Factor: 0.77

Category	Odour Objective	Distance Feet	Distance Metres
1	41.04	1,556	474
2	54.72	2,075	632
3	68.40	2,594	791
4	109.44	4,150	1,265

Name	0
Address	0
Legal Land	
Location	0

Landbase Requirements (hectares) based on 2006 AOPA requirements

Category of Livestock	Type of Livestock	Number of Animals	Dark Brown & Brown (ha)	Grey Wooded (ha)	Black (ha)	Irrigated (ha)
Beef	Cows/Finishers (900+ lbs)	1000	125	104	78	62
	Feeders (450 - 900 lbs)	5000	400	335	250	200
	Feeder Calves (<550 lbs)	0	-	-	-	-
	Other	0				
Dairy (*count lactating cows only)	*Free Stall – Lactating Cows with all associated dries, heifers, and calves	0	0	0	0	0
	*Free Stall – Lactating cows with Dry Cows only	0	-	-	-	-
	Free Stall – Lactating Cows only	0	-	-	-	-
	Tie Stall – Lactating cows only	0	-	-	0	0
	Loose Housing – Lactating cows only	0	-	-	-	-
	Dry Cow (Solid manure)	0	-	-	-	-
	Dry Cow (Liquid manure)	0	-	-	-	-
	Replacements – Bred Heifers (Breeding to Calving)	0	-	-	-	-
	Replacements - Growing Heifers (350 lbs to breeding)	0	-	-	-	-
	Calves (< 350 lbs)	0	-	-	-	-
	Other	0				
Swine Liquid (*count sows only)	Farrow to finish *	0	-	0	-	-
	Farrow to wean *	0	-	-	-	-
	Farrow only *	0	-	-	-	-
	Feeders/Boars	0	-	0	0	0
	Growers/Roasters	0	-	-	-	-
	Weaners	0	-	-	-	-
	Other	0				
Swine Solid (*Count sows only)	Farrow to finish *	0	-	-	-	-
	Farrow to wean *	0	-	-	-	-
	Farrow only *	0	-	-	-	-
	Feeders/Boars	0	-	-	-	-
	Growers/Roasters	0	-	-	-	-
	Weaners	0	-	-	-	-
		0				
Poultry	Chicken - Breeders - Solid	0	-	-	-	-
	Chicken - Layers - Liquid (includes associated pullets)	0	-	0	0	0
	Chicken - Layers - (Belt Cage)	0	-	-	-	-
	Chicken - Layers - (Deep Pit)	0	-	-	-	-
	Chicken - Pullets/Broilers	0	-	0	0	0
	Turkey - Toms/Breeders	0	0	0	0	0
	Turkey - Hens (light)	0	-	-	-	-
	Turkey - Broilers	0	-	-	-	-
	Ducks	0	0	0	0	0
	Geese	0	0	0	0	0
	Other	0				
Horses	PMU	0	0	0	0	0
	Feeders > 750 lbs	0	-	0	-	-
	Foals < 750 lbs	0	-	-	-	-
	Mules	0	-	-	-	-
	Donkeys	0	-	-	-	-
	Other	0				
Sheep	Ewes/Rams	0	-	0	0	0
	Ewes with lambs	0	-	-	-	-
	Lambs	0	-	-	-	-
	Feeders	0	-	-	-	-
	Other	0				
Goats	Meat/Milk (per Ewe)	0	0	0	0	0
	Nannies/Billies	0	-	-	-	-
	Feeders	0	-	-	-	-
	Other	0				
Bison	Bison	0	0	0	0	0
	Other	0				
Cervid	Elk	0	0	0	0	0
	Deer	0	0	0	0	0
	Other	0				
Wild Boar	Feeders	0	-	0	0	0
	Sow (farrowing)	0	-	-	-	-
	Other	0				
	Total Hectares		525.0	439.0	328.0	262.0
	Total Acres		1297.3	1084.8	810.5	647.4

Part 2 — Technical Requirements

NRCB Natural Resources Conservation Board

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

NRCB USE ONLY

ALL SIGNATURES IN FILE ☒ YES ☐ NO

DATES OF APPROVAL OFFICER SITE VISITS

18/10/2024	

CORRESPONDENCE WITH MUNICIPALITIES AND REFERRAL AGENCIES

Date deeming letters sent: August 28, 2024

Municipality: MD of Willow Creek

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

Alberta Health Services: NA

☐ 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: Blood Tribe ☐ 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

The application was also sent to Atco Gas who is a ROW on this land. No response was received

Part 2 — Technical Requirements

NRCB Natural Resources Conservation Board

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

SOLID MANURE, COMPOST, & COMPOSTING MATERIALS: Barns, feedlots, & storage facilities - 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 new (x 2)
2.

Manure storage capacity

	Length (m)	Width (m)	Depth below ground level (m)	**NRCB USE ONLY** Estimated storage capacity (m^3)
1.	97	41	0	
2.				
			TOTAL CAPACITY	9 month

☑ 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

Runoff control catch basins 4 and 5

Naturally occurring protective layer details

Thickness of naturally occurring protective layer	> 6 m (m)	Provide details (as required) see engineering report attached	
Soil texture	% sand	% silt	% clay
Hydraulic conductivity - naturally occurring protective layer	Depth and type of soil tested: 6.2 m Fine sand loam	Hydraulic conductivity (cm/s): 1x10E-7	Describe test standard used: Falling Head

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

NRCB USE ONLY

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

Last updated February 26, 2021

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: below 6.2 m Requirements met: ☒ YES ☐ NO

Depth to uppermost groundwater resource: below 6.2 m Requirements met: ☒ YES ☐ NO

ERST completed: ☒ see ERST page for details

Surface water control systems

Requirements met: ☒ YES ☐ NO Details/comments:

Runoff captured in catch basins 4 and 5

Naturally occurring protective layer details

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

Uniform layering of firm, very fine sandy loam to a depth of 9.2 m. Free water was only encountered in one borehole at a depth of 7.5 m located in the vicinity of the calf shelter to the north east of the CFO.

Part 2 — Technical Requirements

NRCB Natural Resources Conservation Board

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

LIQUID MANURE STORAGE: Concrete or steel tank (required to be engineered)

*(complete a copy of this section for **EACH** proposed concrete or steel tank for liquid manure)*

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

1. FARM MANURE PIT
2. (concrete runoff transfer pit)

Manure storage capacity

	Dimensions (or length and width / diameter) (m)	Depth (m)	Depth below ground level (m)	NRCB USE ONLY	
				Calculated storage capacity (excl. 0.3 m freeboard) (m^3)	Filled in lower ¼? Y/N
1.	6.096 M	4.27	1,83 M		
2.					

Surface water control systems

Describe the run-on and runoff control system

THIS IS RUN OFF FROM CORRALS WHICH WE gonna pump IN OTHER Lagoon.

Concrete or steel tank details

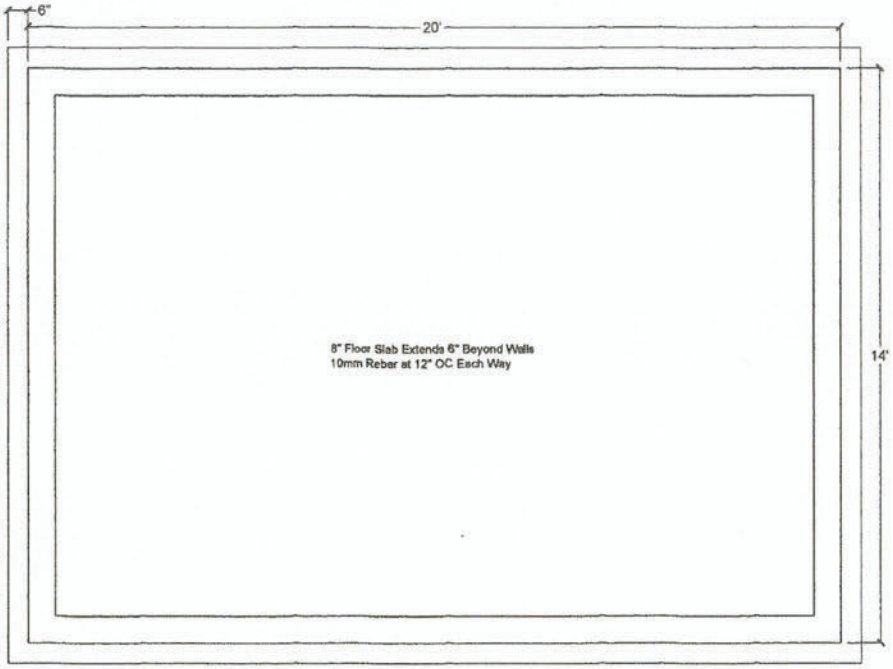
Manure tank floor	Concrete thickness: 8 inch	Method of sulphate protection:
	Concrete strength: 32 MPA	Concrete reinforcement size and spacing: 10MM Rebar 12" EACH WAY

Manure storage tank walls: provide details on the construction of the proposed manure storage tank walls

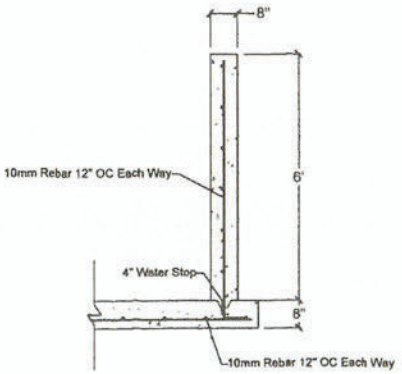
The constructed transfer pit for manure contaminated runoff meets the liner requirements for catch basins assumed to be equivalent to a category B (liquid manure - shallow pits) Technical Guideline 096-93 Non-engineered concrete liners for manure collection and storage areas.

Last updated February 26, 2021

Floor Plan



Typical Section



General Notes

No.	Revision/Issue	Date

FRAMCON CONSTRUCTION LTD.

PVD Farm

Project	PVD Farm
Date	07/08/2023
Scale	1:16

O'Sullivan's Concrete Ltd.
177 PO Box 177
Fort Macleod AB T0L 0Z0
accounting@osullivansconcrete.com
GST/HST Registration No.: 719049900RT0001

INVOICE

BILL TO
FramCon Construction Ltd
Box 745
Fort Macleod Ab T0L 0Z0

INVOICE	1929
DATE	14/08/2023
TERMS	Net 30
DUE DATE	13/09/2023

DATE	ACTIVITY	DESCRIPTION	TAX	QTY	RATE	AMOUNT
11/08/2023	F.M-32 MPA W/FLY ASH	32 MPA W/FLY ASH	GST	7	[redacted]	
	FUEL SURCHARGE	FUEL SURCHARGE - PER M3	GST	7		
	ENVIRO	Enviro Fee- Per M3	GST	7		
		S of Macleod Peter Van Driel				

SUBTOTAL	[redacted]
GST @ 5%	
TOTAL	
BALANCE DUE	

TAX SUMMARY

RATE	TAX
GST @ 5%	[redacted]

Please Make Payment to O'Sullivan's Concrete Ltd.

We appreciate your business. Please find your invoice details here. Feel free to contact us if you have any questions.

E-Transfers are accepted to accounting@osullivansconcrete.com
please include invoice number in memo.

Have a great day!
O'Sullivan's Concrete Ltd.
Page 1 of 1

Part 2 — Technical Requirements

NRCB Natural Resources Conservation Board

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

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 5
2. Extension of Catch Basin 4 (final
3. dimensions)

Determination of runoff area

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

see calculator below

Catch basin capacity

	Length (m)	Width (m)	Total depth (m)	Depth below ground level (m)	Slope run:rise			NRCB USE ONLY
					Inside end walls	Inside side walls	Outside walls	Calculated storage capacity (excl. 0.5 m freeboard) (m^3)
1.	~~30~~ 40	~~26~~ 25 m	2.5	2.5	3:1	3:1		1,016 m^3
2.	40	25	3	3	3:1	3:1		1,116 m^3
3.								
							TOTAL CAPACITY	

Naturally occurring protective layer details

Thickness of naturally occurring protective layer	3.5 (m)	Provide details (as required) see eng report attached	
Soil texture	_____% sand	_____% silt	_____% clay
Hydraulic conductivity - naturally occurring protective layer	Depth and type of soil tested: 6.2 m Find sand - loam	Hydraulic conductivity (cm/s): 1x10 E-7 cm/sec	Describe test standard used: Falling Head

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: ☒ YES ☐ NO

Condition required: ☒ YES ☐ NO

Report attached: ☒ YES ☐ NO

Catch Basin Storage Volume Calculator

Construction Dimensions of Catch Basin

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

CFO Name [1]	(Enter CFO Name Here)
Land Location [1]	1-1-4-W5

Overall Dimensions of Catch Basin			Catch Basin Dimensions
Total Length*[4]	40.0	m	131 ft
Total Width*[4]	25.0	m	82 ft
Total Depth*[4]	2.5	m	8 ft
Design Capacity Depth	*2.00*	m	7 ft
End Slope*[4]	3	run:rise	3 run:rise
Side Slope*[4]	3	run:rise	3 run:rise
Length of Bottom	25.0	m	82 ft
Width of Bottom	10.0	m	33 ft
			Capacity (@tob)
Capacity @ top of Bank	*1,469*	m^3	*51,868* ft^3
			323,080 Imp. Gal.

Design Capacity of Catch Basin (freeboard level)			Design Capacity (freeboard level)
Length (design capacity depth)	37.0	m	121 ft
Width (design capacity depth)	22.0	m	72 ft
Total Depth	*2.5*	m	*8* ft
Design Capacity Depth	2.00	m	7 ft
End Slope	3	run:rise	3 run:rise
Side Slope	3	run:rise	3 run:rise
Design Capacity (freeboard level)	**1,016**	m^3	35,880 ft^3
			223,489 Imp. Gal.
level)	*814*	m^2	*8,762* 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			0.0
7			0.0
8			0.0
9			0.0
10			0.0
		Total Area (m^2)	**0**

Rainfall (Select Town [3])

Bassano 85

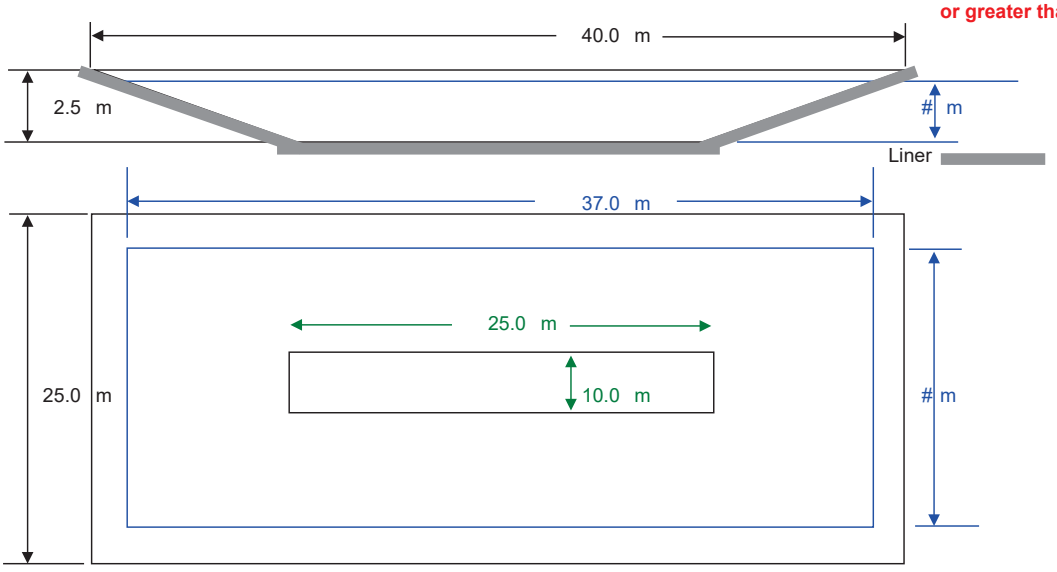
AOPA Design Rainfall 85 mm

Minimum Catchbasin Storage Volume Required

0 m^3 ** | **0 ft^3**

0 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

Catch Basin Storage Volume Calculator

Extension of catch basin 4

Construction Dimensions of Catch Basin

* Only cells in blue can be changed.

Overall Dimensions of Catch Basin			Catch Basin Dimensions
Total Length*4	25.0	m	82 ft
Total Width*4	40.0	m	131 ft
Total Depth*4	3.0	m	10 ft
Design Capacity Depth	*2.50*	m	8 ft
End Slope*4	3	run:rise	3 run:rise
Side Slope*4	3	run:rise	3 run:rise
Length of Bottom	7.0	m	23 ft
Width of Bottom	22.0	m	72 ft
Capacity @ top of Bank	*1,569*	*m³*	*Capacity (@top)* 55,409 ft³ 345,132 Imp. Gal

Design Capacity of Catch Basin (freeboard level)			Design Capacity (freeboard level)
Length (design capacity depth)	22.0	m	72 ft
Width (design capacity depth)	37.0	m	121 ft
Total Depth	*3.0*	m	10 ft
Design Capacity Depth	2.50	m	8 ft
End Slope	3	run:rise	3 run:rise
Side Slope	3	run:rise	3 run:rise
Design Capacity (freeboard level)	**1,116**	**m³**	39,420 ft³
			245,541 Imp. Gal.
level)	*814*	*m²*	8,762 ft²

CFO Name 1: (Enter CFO Name Here)

Land Location 1: 1-1-4-W5

Paved Runoff Catchment Area(s)

Area 2	Length (m)	Width (m)	Area (m²)
1			0.0
2			0.0
3			0.0
4			0.0
5			0.0
		Total Area (m²)	0

Unpaved Runoff Catchment Area(s)

Area 2	Length (m)	Width (m)	Area (m²)
6	97	41	3,977.0
7	97	41	3,977.0
8	97	41	3,977.0
9	97	41	3,977.0
10			0.0
		Total Area (m²)	15,908

Rainfall (Select Town 3)

Fort Macleod 90

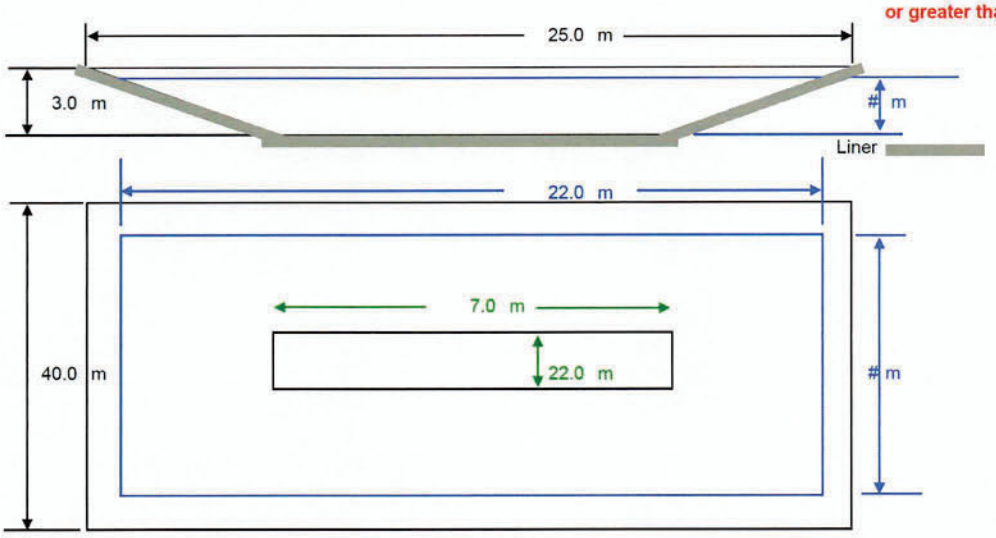
AOPA Design Rainfall 90 mm

Minimum Catchbasin Storage Volume Required

931 m³ ** 32864.465 ft³

204707.26 Imp. Gal.

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



Lines in Black - Overall catch basin dimensions

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

NTS - Not To Scale

Part 2 — Technical Requirements

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

NRCB USE ONLY **RUNOFF CONTROL CATCH BASIN CAPACITY SUMMARY (if applicable)**	
Facility 1	
Name / description: Catch basin 1 + 2	Capacity: 1: 909 m^3 2: 1359 m^3
Facility 2	
Name / description: catch basin 3	Capacity: 3: 504 m^3
Facility 3	
Name / description: catch basin 4 new dimensions	Capacity: 1116 m^3
Facility 4	
Name / description: catch basin 5 (adjusted dimensions)	Capacity: 1016 m^3
TOTAL CAPACITY	4904 m^3
RUNOFF VOLUME FROM CONTRIBUTING AREAS	4013 m^3
MEETS AOPA RUNOFF CONTROL VOLUME REQUIREMENTS	☒ YES ☐ NO

March 29, 2016

Amec Foster Wheeler File: BX30399

Van Driel Farms Ltd.
P.O. Box 2664
Fort Macleod, Alberta T0L 0Z0

Attention: Mr. Peter Van Driel

Re: Geotechnical Review and Evaluation
Proposed Pens and Catch Basin
NE-22-8-25-W4, near Fort Macleod, Alberta

As requested, Amec Foster Wheeler Environment & Infrastructure 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 encompasses the soil conditions associated with a proposed catch basin located near the north side of the existing feed lot, a series of newer pens west of the historical area of pens, a feedlot expansion area to the west, and an existing barn at the east side of the farm yard (see Figure 1).

In order to demonstrate the suitability of the natural clay soils for consideration as a naturally occurring protective layer, a series of boreholes were advanced at the site on February 22, 2016, at the approximate locations illustrated on Figure 1. The boreholes were advanced by a truck-mounted drill rig owned and operated by Chilako Drilling Services, and extended to depths ranging between of about 6 m and 9.2 m below existing grades. These boreholes were logged by Mr. Larry DeLong of Chilako Drilling Services Ltd (see attachments).

In general, the soils encountered within the current test holes included lacustrine silt/loam to silty clay loam soils to the termination depths of each of the boreholes.

In order to demonstrate the permeability of the subsurface soils, 50 mm diameter PVC monitoring wells were constructed in boreholes VDF1-16, VDF9-16, and VDF12-16. Borehole VDF1-16 was screened from 5.5 m to 8.8 m depth, borehole VDF9-16 was screened from 5.4 m to 8.7 m depth, and borehole VDF12-16 was screened from 2.5 m to 5.8 m depth. Well saturation of the 50 mm diameter monitoring wells was carried out by filling the monitoring well to the top of the well for several consecutive days. After three days, the 24 hour water drop in the standpipes ranged between about 0.3 m and 0.5 m at VDF1-16 and VDF12-16, and to a depth of about 2.4 m at VDF9-16. A four hour comparison test was also carried out at VDF9-16, during which time about a 0.5 m drop in the water column was observed during the four hour test period. During the testing, the well locations were protected, and care was taken to ensure that the column of water being monitored in the well was not frozen during the testing.

In order to calculate the permeability of the screened portion of the clay stratum, 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 *In Situ Permeability Test*

Amec Foster Wheeler
Environment & Infrastructure
469 – 40 Street South
Lethbridge, AB, CANADA T1J 4M1
Tel +1 (403) 327-7474
Fax +1 (403) 327-7682
www.amecfw.com

reports, attached. As outlined on the reports, the results of the *in situ* permeability testing indicate a hydraulic conductivity, k_s, in the order of **1.0 x 10^{-8} cm/s** at borehole VDF1-16, **1.0 x 10^{-7} cm/s** at borehole VDF9-16, and **2.8 x 10^{-8} cm/s** at borehole VDF12-16.

Using the measured permeability of the clay stratum, the 3.3 m portion of clay which has been screened at the boreholes has been estimated to represent an equivalent of more than 25 m of naturally occurring materials having a hydraulic conductivity of 1 x 10-6 cm/s. This represents natural material protection in excess of the minimum requirements outlined by the AOPA for a catch basin (minimum 5 m, Section 9.5-b) and for solid manure storage (minimum 2 m, Section 9.5-c).

Conclusion

Based on the results of the current investigation and permeability testing, and our understanding of the site and proposed development at the site, it is Amec Foster Wheeler's opinion that the naturally occurring materials at the site satisfy the requirements for a naturally occurring 'protective layer' for the existing and proposed pens as well as the proposed catch basin, as outlined in the AOPA.

We trust this satisfies your present requirements. If you have questions or require further information or clarification, please don't hesitate to contact the undersigned.

Respectfully submitted,

Amec Foster Wheeler Environment & Infrastructure
A division of Amec Foster Wheeler Americas Ltd.

PROFESSIONAL ENGINEER JOHN LOBBEZOO ALBERTA

March 29, 2016

John Lobbezoo, P.Eng.
Senior Geotechnical Engineer

APEGA Permit: P04546

Attachments:
Figure 1 – Borehole Location Plan
In Situ Permeability Test Calculations – VDF1-16, VDF9-16 (4 hr & 24 hr), and VDF12-16
Soil Profile and Parent Material Description, Chilako Drilling Services (VDF1-16 to VDF13-16)

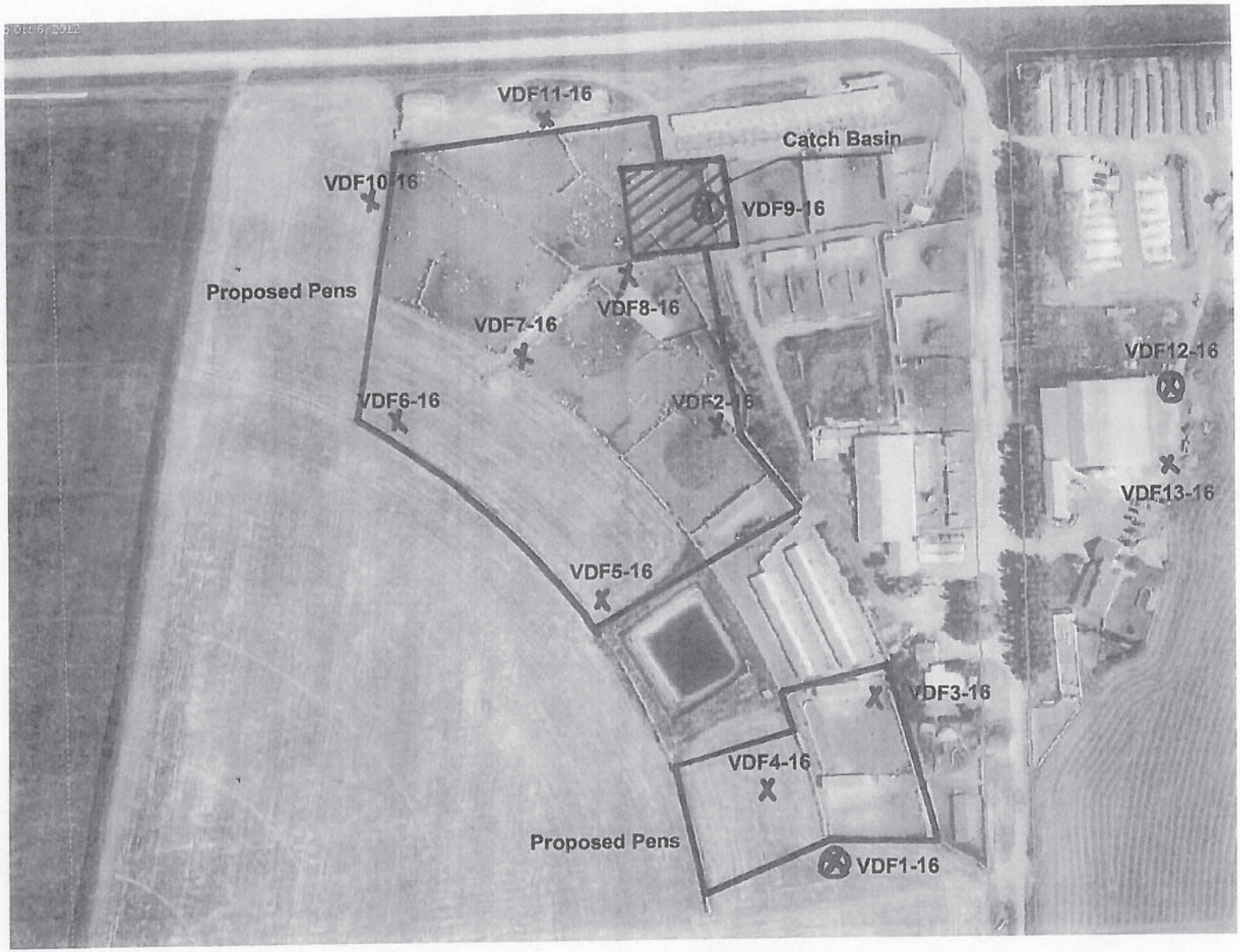


Figure 1 **Borehole Location Plan** **Van Driel Farms Ltd.** **February, 2016**

VDF1-16

In Situ Permeability Test

Modified Falling Head Permeability Equation

$$K_s = \frac{r^2}{2\ell\Delta t}\left[\frac{\sinh^{-1}\frac{\ell}{r_e}}{2}\ln\left[\frac{2H_1-\ell}{2H_2-\ell}\right]-\ln\left[\frac{2H_1H_2-\ell H_2}{2H_1H_2-\ell H_1}\right]\right]$$

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

VDF1-16 - Van Driel Farms Ltd. (South of Proposed Pens)

Amec Foster Wheeler File: BX30399

INPUT VARIABLES	Terms	Value	Definition
	D	0.0520	diameter of standpipe (m)
	De	0.1500	diameter of borehole (m)
	L	3.30	length of sand section (m)
	h1	9.60	initial height of water above base of hole (m)
	h2	9.27	final height of water above base of hole (m)
	t	24.0	time of test (h)

Ks = 1.0E-08 cm/sec

VDF9-16

In Situ Permeability Test

Modified Falling Head Permeability Equation

$$K_s = \frac{r^2}{2\ell\Delta t}\left[\frac{\sinh^{-1}\frac{\ell}{r_e}}{2}\ln\left[\frac{2H_1-\ell}{2H_2-\ell}\right]-\ln\left[\frac{2H_1H_2-\ell H_2}{2H_1H_2-\ell H_1}\right]\right]$$

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

VDF9-16 - Van Driel Farms Ltd. (Proposed Catch Basin Area 1)

Amec Foster Wheeler File: BX30399

INPUT VARIABLES	Terms	Value	Definition
	D	0.0520	diameter of standpipe (m)
	De	0.1500	diameter of borehole (m)
	L	3.30	length of sand section (m)
	h1	9.50	initial height of water above base of hole (m)
	h2	7.06	final height of water above base of hole (m)
	t	24.0	time of test (h)

Ks = 9.0E-08 cm/sec

VDF9-16

In Situ Permeability Test

Modified Falling Head Permeability Equation

$$K_z = \frac{r^2}{2\ell\Delta t}\left[\frac{\sinh^{-1}\frac{\ell}{r_e}}{2}\ln\left[\frac{2H_1-\ell}{2H_2-\ell}\right]-\ln\left[\frac{2H_1H_2-\ell H_2}{2H_1H_2-\ell H_1}\right]\right]$$

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

VDF9-16 - Van Driel Farms Ltd. (Proposed Catch Basin Area 1)

Amec Foster Wheeler File: BX30399

INPUT VARIABLES

Terms	Value	Definition
D	0.0520	diameter of standpipe (m)
De	0.1500	diameter of borehole (m)
L	3.30	length of sand section (m)
h1	9.50	initial height of water above base of hole (m)
h2	8.97	final height of water above base of hole (m)
t	4.0	time of test (h)

Ks = 1.0E-07 cm/sec

VDF12-16

In Situ Permeability Test

Modified Falling Head Permeability Equation

$$K_s = \frac{r^2}{2\ell\Delta t}\left[\frac{\sinh^{-1}\frac{\ell}{r_e}}{2}\ln\left[\frac{2H_1-\ell}{2H_2-\ell}\right]-\ln\left[\frac{2H_1H_2-\ell H_2}{2H_1H_2-\ell H_1}\right]\right]$$

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

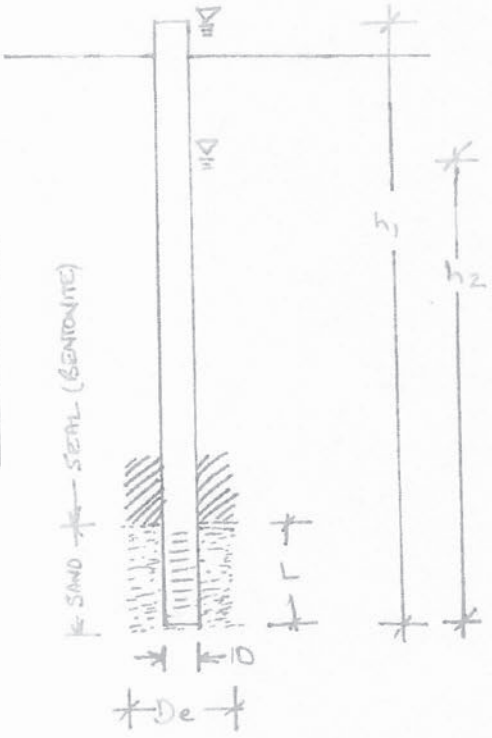
VDF12-16 - Van Driel Farms Ltd. (East barn area)

Amec Foster Wheeler File: BX30399

INPUT VARIABLES

Terms	Value	Definition
D	0.0520	diameter of standpipe (m)
De	0.1500	diameter of borehole (m)
L	3.30	length of sand section (m)
h1	6.40	initial height of water above base of hole (m)
h2	5.87	final height of water above base of hole (m)
t	24.0	time of test (h)

Ks = 2.8E-08 cm/sec



CHILAKO DRILLING SERVICES LTD

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

SOIL PROFILE AND PARENT MATERIAL DESCRIPTION

Site Location: Van Driel Farms Date: 22-Feb-16

Hole #	Location	Depth	Texture	Moisture	Geological	Sample	Remarks
VDF1-16	SE Corner	0-0.3	VFSL	M	Topsoil		
	of Area 4	0.3-6.4	VFSL	SM	Lac		Firm, silty, olive brown
	0334069	6.4-6.7	VFSL	M	Lac		Firm, silty, olive brown
	5504081	6.7-9.2	VFSL	M	Lac	7.0-9.0	Firm, silty, olive brown
							50mm H.C. Well Installed to 8.8m
							Screen: 8.8-5.8m
							Sand: 8.8-5.5m
							Bentonite: 5.5-4.0m
							Stickup: 0.4m
VDF2-16	Area 1	0-4.8	VFSL	M	Lac		Firm, silty, olive brown
	0334041	4.8-6.2	VFSL	M	Lac		Firm, silty, olive brown
	5504281						Increase in silt with depth
VDF3-16	Area 3	0-1.8	VFSL	M	Lac		Firm, silty, olive brown
	0334107	1.8-2.6	SiL	M	Lac		Firm, sandy, olive brown
	5504138	2.6-6.2	VFSL	M	Lac		Firm, silty, olive brown
VDF4-16	Area 4	0-3.0	VFSL	M	Lac		Firm, silty, olive brown
	0333999	3.0-3.5	SiL	M	Lac		Firm, sandy, olive brown
	5504083	3.5-6.2	VFSL	M	Lac		Firm, silty, olive brown
VDF5-16	Area 2	0-0.7	SiL	M	Lac		
	0333985	0.7-2.4	VFSL	M	Lac		Firm, silty, olive brown
	5504280	2.4-3.3	VFSL	VM-Sat	Lac		Soft, silty, olive brown
		3.3-6.2	VFSL	M	Lac		Firm, silty, olive brown
VDF6-16	Area 2	0-0.3	VFSL	M	Lac		Firm, silty, olive brown
	0333878	0.3-6.2	VFSL	M	Lac		Firm, silty, olive brown
	5504302						
VDF7-16	0333947	0-1.6	VFSL	M	Lac		Firm, silty, olive brown
	5504302	1.6-2.5	SiL	VM-Sat	Lac		Soft, sandy, olive brown
		2.5-6.2	VFSL	M	Lac		Firm, silty, olive brown
VDF8-16	0333999	0-4.2	VFSL	M	Lac		
	5504333	4.2-5.2	SiL	M	Lac		Firm, silty, olive brown
		5.2-5.7	SiL-SiCL	M	Lac		Firm, silty, olive brown
		5.7-6.2	VFSL	M	Lac		Firm, silty, olive brown

SOIL PROFILE AND PARENT MATERIAL DESCRIPTION

Site Location: Van Driel Farms Date: 22-Feb-16

Hole #	Location	Depth	Texture	Moisture	Geological	Sample	Remarks
VDF9-16	0334040	0-2.3	VFSL	M	Lac		
	5504368	2.3-2.7	VFSL	M	Lac		Firm, trace gravel, olive brown
		2.7-4.5	VFSL	M	Lac		Firm, silty, olive brown
		4.5-4.9	SiL	M-VM	Lac		
		4.9-6.0	VFSL	M	Lac		
		6.0-9.2	SiL	VM	Lac		6.0-7.5 low plastic, sandy, olive brown
							Free water @7.5m
							50mm H.C. well installed to 8.7m
							Screen: 8.7-5.7m
							Sand: 8.7-5.4m
							Bentonite: 5.4-3.0m
							Stickup: 0.3m
VDF10-16	0333889	0-0.6	VFSL	M	Lac		Silt lenses
	5504369	0.6-6.2	VFSL	M	Lac		
VDF11-16	0333956	0-1.2	VFSL	M	Lac		
	5504403	1.2-1.8	SiL	M	Lac		
		1.8-6.2	VFSL	M	Lac		
VDF12-16	0334241	0-1.6	VFSL	M	Lac		
	5504264	1.6-3.1	VFSL	SM	Lac		
		3.1-6.0	VFSL	M	Lac		4.5-6.0 increase in silt
							50mm H.C. well installed to 5.8m
							Screen: 5.8-2.8m
							Sand: 5.8-2.5m
							Bentonite: 2.5-0.0m
							Stickup: 0.4m
VDF13-16	0334238	0-3.3	VFSL	M	Lac		
	5504237	3.3-6.2	VFSL	M	Lac		Slight increase in silt

All holes, except VDF9-16, were dry upon completion of work.

March 29, 2016

Amec Foster Wheeler File: BX30399

Van Driel Farms Ltd.
P.O. Box 2664
Fort Macleod, Alberta T0L 0Z0

Attention: Mr. Peter Van Driel

Re: Geotechnical Review and Evaluation
Proposed Pens and Catch Basin
NE-22-8-25-W4, near Fort Macleod, Alberta

As requested, Amec Foster Wheeler Environment & Infrastructure 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 encompasses the soil conditions associated with a proposed catch basin located near the north side of the existing feed lot, a series of newer pens west of the historical area of pens, a feedlot expansion area to the west, and an existing barn at the east side of the farm yard (see Figure 1).

In order to demonstrate the suitability of the natural clay soils for consideration as a naturally occurring protective layer, a series of boreholes were advanced at the site on February 22, 2016, at the approximate locations illustrated on Figure 1. The boreholes were advanced by a truck-mounted drill rig owned and operated by Chilako Drilling Services, and extended to depths ranging between of about 6 m and 9.2 m below existing grades. These boreholes were logged by Mr. Larry DeLong of Chilako Drilling Services Ltd (see attachments).

In general, the soils encountered within the current test holes included lacustrine silt/loam to silty clay loam soils to the termination depths of each of the boreholes.

In order to demonstrate the permeability of the subsurface soils, 50 mm diameter PVC monitoring wells were constructed in boreholes VDF1-16, VDF9-16, and VDF12-16. Borehole VDF1-16 was screened from 5.5 m to 8.8 m depth, borehole VDF9-16 was screened from 5.4 m to 8.7 m depth, and borehole VDF12-16 was screened from 2.5 m to 5.8 m depth. Well saturation of the 50 mm diameter monitoring wells was carried out by filling the monitoring well to the top of the well for several consecutive days. After three days, the 24 hour water drop in the standpipes ranged between about 0.3 m and 0.5 m at VDF1-16 and VDF12-16, and to a depth of about 2.4 m at VDF9-16. A four hour comparison test was also carried out at VDF9-16, during which time about a 0.5 m drop in the water column was observed during the four hour test period. During the testing, the well locations were protected, and care was taken to ensure that the column of water being monitored in the well was not frozen during the testing.

In order to calculate the permeability of the screened portion of the clay stratum, 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 *In Situ Permeability Test*

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reports, attached. As outlined on the reports, the results of the *in situ* permeability testing indicate a hydraulic conductivity, k_s, in the order of **1.0 x 10^{-8} cm/s** at borehole VDF1-16, **1.0 x 10^{-7} cm/s** at borehole VDF9-16, and **2.8 x 10^{-8} cm/s** at borehole VDF12-16.

Using the measured permeability of the clay stratum, the 3.3 m portion of clay which has been screened at the boreholes has been estimated to represent an equivalent of more than 25 m of naturally occurring materials having a hydraulic conductivity of 1 x 10-6 cm/s. This represents natural material protection in excess of the minimum requirements outlined by the AOPA for a catch basin (minimum 5 m, Section 9.5-b) and for solid manure storage (minimum 2 m, Section 9.5-c).

Conclusion

Based on the results of the current investigation and permeability testing, and our understanding of the site and proposed development at the site, it is Amec Foster Wheeler's opinion that the naturally occurring materials at the site satisfy the requirements for a naturally occurring 'protective layer' for the existing and proposed pens as well as the proposed catch basin, as outlined in the AOPA.

We trust this satisfies your present requirements. If you have questions or require further information or clarification, please don't hesitate to contact the undersigned.

Respectfully submitted,

Amec Foster Wheeler Environment & Infrastructure
A division of Amec Foster Wheeler Americas Ltd.

PROFESSIONAL ENGINEER JOHN LOBBEZOO ALBERTA

March 29, 2016

John Lobbezoo, P.Eng.
Senior Geotechnical Engineer

APEGA Permit: P04546

Attachments:
Figure 1 – Borehole Location Plan
In Situ Permeability Test Calculations – VDF1-16, VDF9-16 (4 hr & 24 hr), and VDF12-16
Soil Profile and Parent Material Description, Chilako Drilling Services (VDF1-16 to VDF13-16)

Figure 1 Borehole Location Plan Van Driel Farms Ltd. February, 2016

VDF1-16

In Situ Permeability Test

Modified Falling Head Permeability Equation

$$K_s = \frac{r^2}{2\ell\Delta t}\left[\frac{\sinh^{-1}\frac{\ell}{r_e}}{2}\ln\left[\frac{2H_1-\ell}{2H_2-\ell}\right]-\ln\left[\frac{2H_1H_2-\ell H_2}{2H_1H_2-\ell H_1}\right]\right]$$

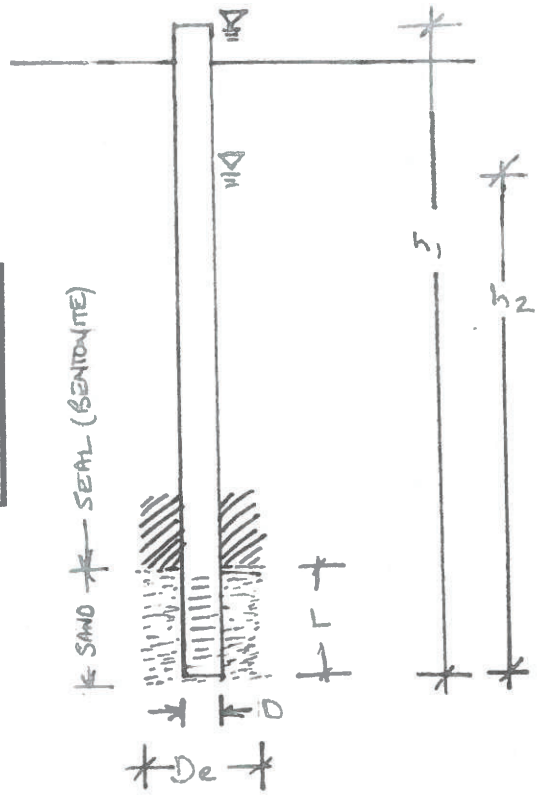
taken from USBR Engineering Geology Field Manual Volume 2 (2001)

VDF1-16 - Van Driel Farms Ltd. (South of Proposed Pens)

Amec Foster Wheeler File: BX30399

INPUT VARIABLES	Terms	Value	Definition
	D	0.0520	diameter of standpipe (m)
	De	0.1500	diameter of borehole (m)
	L	3.30	length of sand section (m)
	h1	9.60	initial height of water above base of hole (m)
	h2	9.27	final height of water above base of hole (m)
	t	24.0	time of test (h)

Ks = 1.0E-08 cm/sec



VDF9-16

In Situ Permeability Test

Modified Falling Head Permeability Equation

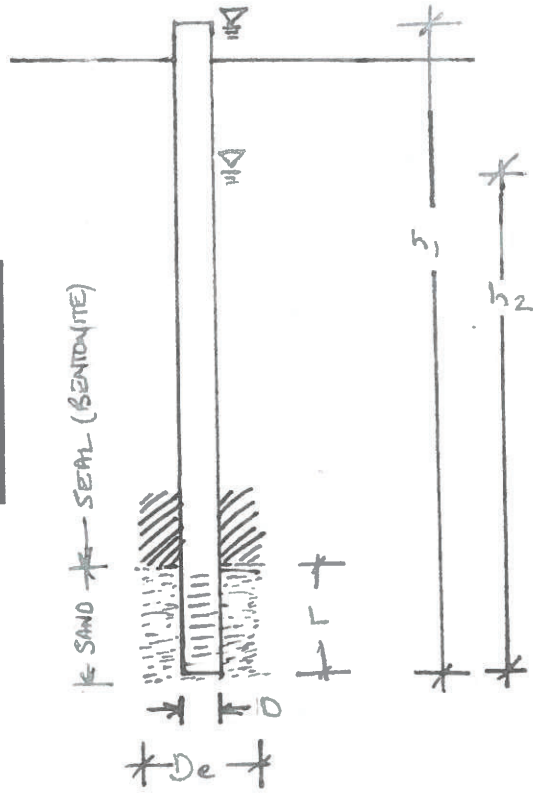
$$K_s = \frac{r^2}{2\ell\Delta t}\left[\frac{\sinh^{-1}\frac{\ell}{r_e}}{2}\ln\left[\frac{2H_1-\ell}{2H_2-\ell}\right]-\ln\left[\frac{2H_1H_2-\ell H_2}{2H_1H_2-\ell H_1}\right]\right]$$

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

VDF9-16 - Van Driel Farms Ltd. (Proposed Catch Basin Area 1)

Amec Foster Wheeler File: BX30399

INPUT VARIABLES	Terms	Value	Definition
	D	0.0520	diameter of standpipe (m)
	De	0.1500	diameter of borehole (m)
	L	3.30	length of sand section (m)
	h1	9.50	initial height of water above base of hole (m)
	h2	7.06	final height of water above base of hole (m)
	t	24.0	time of test (h)



Ks = 9.0E-08 cm/sec

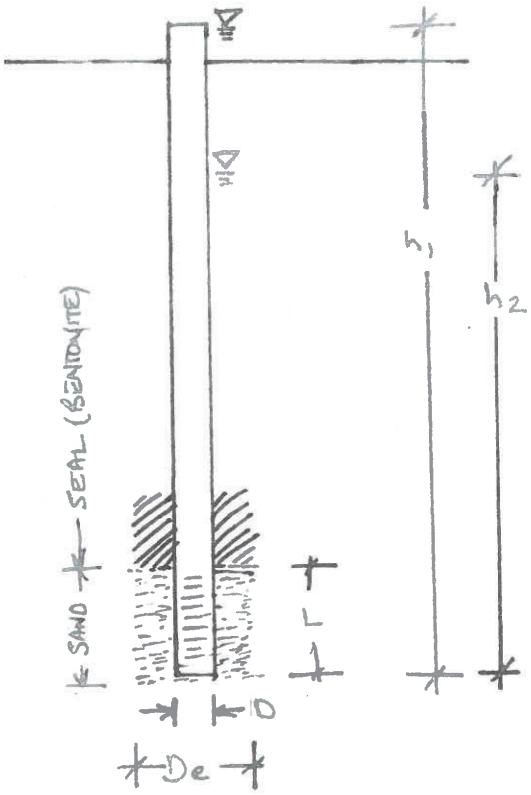
VDF9-16

In Situ Permeability Test

Modified Falling Head Permeability Equation

$$K_s = \frac{r^2}{2\ell\Delta t}\left[\frac{\sinh^{-1}\frac{\ell}{r_e}}{2}\ln\left[\frac{2H_1-\ell}{2H_2-\ell}\right]-\ln\left[\frac{2H_1H_2-\ell H_2}{2H_1H_2-\ell H_1}\right]\right]$$

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



VDF9-16 - Van Driel Farms Ltd. (Proposed Catch Basin Area 1)

Amec Foster Wheeler File: BX30399

INPUT VARIABLES	Terms	Value	Definition
	D	0.0520	diameter of standpipe (m)
	De	0.1500	diameter of borehole (m)
	L	3.30	length of sand section (m)
	h1	9.50	initial height of water above base of hole (m)
	h2	8.97	final height of water above base of hole (m)
	t	4.0	time of test (h)

Ks = 1.0E-07 cm/sec

VDF12-16

In Situ Permeability Test

Modified Falling Head Permeability Equation

$$K_s = \frac{r^2}{2\ell\Delta t}\left[\frac{\sinh^{-1}\frac{\ell}{r_e}}{2}\ln\left[\frac{2H_1-\ell}{2H_2-\ell}\right]-\ln\left[\frac{2H_1H_2-\ell H_2}{2H_1H_2-\ell H_1}\right]\right]$$

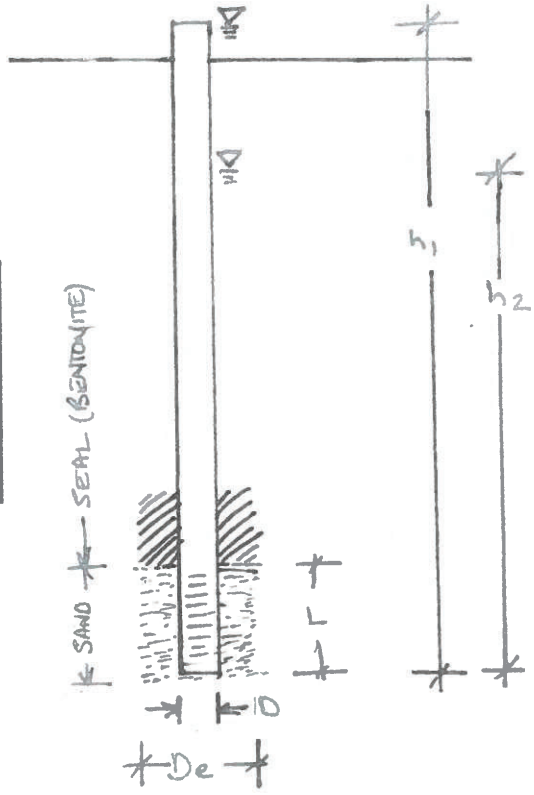
taken from USBR Engineering Geology Field Manual Volume 2 (2001)

VDF12-16 - Van Driel Farms Ltd. (East barn area)

Amec Foster Wheeler File: BX30399

INPUT VARIABLES	Terms	Value	Definition
	D	0.0520	diameter of standpipe (m)
	De	0.1500	diameter of borehole (m)
	L	3.30	length of sand section (m)
	h1	6.40	initial height of water above base of hole (m)
	h2	5.87	final height of water above base of hole (m)
	t	24.0	time of test (h)

Ks = 2.8E-08 cm/sec



CHILAKO DRILLING SERVICES LTD

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

SOIL PROFILE AND PARENT MATERIAL DESCRIPTION

Site Location: Van Driel Farms Date: 22-Feb-16

Hole #	Location	Depth	Texture	Moisture	Geological	Sample	Remarks
VDF1-16	SE Corner	0-0.3	VFSL	M	Topsoil		
	of Area 4	0.3-6.4	VFSL	SM	Lac		Firm, silty, olive brown
	0334069	6.4-6.7	VFSL	M	Lac		Firm, silty, olive brown
	5504081	6.7-9.2	VFSL	M	Lac	7.0-9.0	Firm, silty, olive brown
							50mm H.C. Well Installed to 8.8m
							Screen: 8.8-5.8m
							Sand: 8.8-5.5m
							Bentonite: 5.5-4.0m
							Stickup: 0.4m
VDF2-16	Area 1	0-4.8	VFSL	M	Lac		Firm, silty, olive brown
	0334041	4.8-6.2	VFSL	M	Lac		Firm, silty, olive brown
	5504281						Increase in silt with depth
VDF3-16	Area 3	0-1.8	VFSL	M	Lac		Firm, silty, olive brown
	0334107	1.8-2.6	SiL	M	Lac		Firm, sandy, olive brown
	5504138	2.6-6.2	VFSL	M	Lac		Firm, silty, olive brown
VDF4-16	Area 4	0-3.0	VFSL	M	Lac		Firm, silty, olive brown
	0333999	3.0-3.5	SiL	M	Lac		Firm, sandy, olive brown
	5504083	3.5-6.2	VFSL	M	Lac		Firm, silty, olive brown
VDF5-16	Area 2	0-0.7	SiL	M	Lac		
	0333985	0.7-2.4	VFSL	M	Lac		Firm, silty, olive brown
	5504280	2.4-3.3	VFSL	VM-Sat	Lac		Soft, silty, olive brown
		3.3-6.2	VFSL	M	Lac		Firm, silty, olive brown
VDF6-16	Area 2	0-0.3	VFSL	M	Lac		Firm, silty, olive brown
	0333878	0.3-6.2	VFSL	M	Lac		Firm, silty, olive brown
	5504302						
VDF7-16	0333947	0-1.6	VFSL	M	Lac		Firm, silty, olive brown
	5504302	1.6-2.5	SiL	VM-Sat	Lac		Soft, sandy, olive brown
		2.5-6.2	VFSL	M	Lac		Firm, silty, olive brown
VDF8-16	0333999	0-4.2	VFSL	M	Lac		
	5504333	4.2-5.2	SiL	M	Lac		Firm, silty, olive brown
		5.2-5.7	SiL-SiCL	M	Lac		Firm, silty, olive brown
		5.7-6.2	VFSL	M	Lac		Firm, silty, olive brown

SOIL PROFILE AND PARENT MATERIAL DESCRIPTION

Site Location: Van Driel Farms

Date: 22-Feb-16

Hole #	Location	Depth	Texture	Moisture	Geological	Sample	Remarks
VDF9-16	0334040	0-2.3	VFSL	M	Lac		
	5504368	2.3-2.7	VFSL	M	Lac		Firm, trace gravel, olive brown
		2.7-4.5	VFSL	M	Lac		Firm, silty, olive brown
		4.5-4.9	SiL	M-VM	Lac		
		4.9-6.0	VFSL	M	Lac		
		6.0-9.2	SiL	VM	Lac		6.0-7.5 low plastic, sandy, olive brown
							Free water @7.5m
							50mm H.C. well installed to 8.7m
							Screen: 8.7-5.7m
							Sand: 8.7-5.4m
							Bentonite: 5.4-3.0m
							Stickup: 0.3m
VDF10-16	0333889	0-0.6	VFSL	M	Lac		Silt lenses
	5504369	0.6-6.2	VFSL	M	Lac		
VDF11-16	0333956	0-1.2	VFSL	M	Lac		
	5504403	1.2-1.8	SiL	M	Lac		
		1.8-6.2	VFSL	M	Lac		
VDF12-16	0334241	0-1.6	VFSL	M	Lac		
	5504264	1.6-3.1	VFSL	SM	Lac		
		3.1-6.0	VFSL	M	Lac		4.5-6.0 increase in silt
							50mm H.C. well installed to 5.8m
							Screen: 5.8-2.8m
							Sand: 5.8-2.5m
							Bentonite: 2.5-0.0m
							Stickup: 0.4m
VDF13-16	0334238	0-3.3	VFSL	M	Lac		
	5504237	3.3-6.2	VFSL	M	Lac		Slight increase in silt

All holes, except VDF9-16, were dry upon completion of work.