


**To:** Lower Rum River Water Management Organization  
**From:** Barr Engineering Company   
**Date:** September 12, 2020  
**Re:** Permit #2019-20: Meadows at Petersen Farms- Phase 2: Andover

We have received plans and a LRRWMO permit application for Phase 2 of the Meadows at Petersen Farms development a 46-lot single family development located north of 165<sup>th</sup> Avenue at 7<sup>th</sup> Avenue N.W. in Andover. The 99-acre parcel is currently open space.

The project will add 11.1 acres (482,533 square feet) of new impervious area to the site. The storm water management plan indicates that 13 basins are to be constructed, 11 that have been designed as bioretention facilities (providing volume retention, water quality treatment and rate control) with 2 providing rate control, and water quality management (Basins 32 and 181) for the project area.

The Braun geotechnical report identifies the underlying soils generally as poorly graded sand (SP) with lenses of clayey sand (SC) at varying depths. Groundwater encountered varies from depths of 1 foot to 14 feet below the ground surface (862.5 M.S.L. to elevations higher than 884 M.S.L.). A conservative infiltration rate of 0.45 inches/hour was used by the applicant for the SP underlying soils. This assumes that within areas identified for infiltration should a lens of the clayey sand be encountered this material would be removed and replaced with free draining (sand) material.

The site has been subdivided into 3 drainage basins – north, south and east. The following table summarizes the existing and proposed discharges for the 2-, 10-, and 100-year frequency storm events leaving each of the drainage basins:

Frequency	Existing Discharge – North Drainage Basin c.f.s.	Proposed Discharge – North Drainage Basin c.f.s
2-Year	1.6	1.1
10-Year	16.1	11.6
100-Year	78.5	65.9

Frequency	Existing Discharge South Drainage Basin - c.f.s.	Proposed Discharge South Drainage Basin - c.f.s
2-Year	<1.0	<1.0
10-Year	<1.0	<1.0
100-Year	<1.0	<1.0

Frequency	Existing Discharge East Drainage Basin - c.f.s.	Proposed Discharge East Drainage Basin - c.f.s
2-Year	35.5	34.2
10-Year	63.3	58.2
100-Year	167.6	118.1

A volume retention of 40,208 cubic feet is required from the 482,501 square feet of proposed impervious area. As stated, the on-site underlying soils have been classified as poorly graded sand (SP). With an infiltration rate of 0.45 inches/hour (a conservative infiltration rate for this soil type according to the Minnesota Stormwater Manual), an area of 22,338 square feet is required within the bioretention basins allowing a draw-down within 48 hours. From the HydroCAD modeling submitted, the 13 bioretention facilities are to provide a retention volume of 104,694 cubic feet (40,208 cubic feet required) with an area of 105,136 square feet (22,338 square feet required). This volume and area are at a depth to the outlet of the basins or 1.8 feet (whichever is less) allowing for the drawdown of the retention volume within 48 hours assuming an infiltration rate of 0.45 inches/hour.

LRRWMO water quality criteria requires an annual removal efficiency of 90% for total suspended solids (TSS) and 60% of total phosphorous (TP) for the project. The following table shows the relationship of removal efficiency provided within each drainage basin and pounds removed per year of TSS and TP.

Basin	Annual Removal Efficiency TP - %	Removal of TP in lbs./year	Annual Removal Efficiency TSS - %	Removal of TSS in lbs./year
North	100	6.78	100	1,231
South	76	15.00	91	3,237
East	98	9.00	98	1,635

The attachment to this review memorandum provides an overall comparison of the low floor and low opening elevation(s) for each proposed structure to, 1) the flood elevation of a riparian basin, 2) the emergency overflow elevation for a riparian basin and 3) groundwater. LRRWMO criteria requires a minimum separation of 2 feet between the calculated 100-year frequency flood elevation of a basin and the finished floor elevation of an adjacent structure. For 8 proposed structures, the Low Floor Elevation Assessment has been used for compliance with LRRWMO requirements. In summary for the overall site;

- the LRRWMO criteria for the low floor elevation of a structure being two feet above the 100-year frequency flood elevation of a riparian stormwater basin is met.
- In instances where the Low Floor Elevation Assessment has been used, enough distance is provided between a proposed structure and a riparian basin for the draw down of the retention volume not having a direct impact on the structure.
- the low opening of the proposed structures is greater than two feet above the surface overflow from a riparian basin. The exception is Lot 7, Block 2. Additional information is required showing that 2 foot of separation will be provided between the opening elevation for the structure shown and the overflow elevation from Basin 57.

A minimum 3-foot separation between the bottom of an infiltration facility and groundwater is required. The following table shows the relationship of groundwater and the bottom elevation of a proposed bioretention basins.

Basin	Groundwater elevation M.S.L.	Infiltration Basin Bottom Elevation M.S.L.	Separation feet
51	873.3	886.7	13.4
52	880.5	885.7	5.2
115	884.5	890.0	5.5
111	886.5	898.0	11.5
141	872.2	881.0	3.8
34	873.7	877.0	3.3
38	873.7	877.0	3.3
122	877.2	881.0	3.8
57	880.5	888.0	7.5
163	880.5	896.6	16.1
12*		886.0	

\*The depth to groundwater will be determined in the field prior to the basin construction

The Wetland Conservation Act (WCA) issues associated with the project were approved by the LRRWMO at the August 21, 2020 meeting.

Silt fence is shown to be constructed at the limits of construction, erosion control check dams and a rock construction entrance is to be provided for erosion control.

It is our recommendation that the LRRWMO approve of the permit for this project subject to the following conditions:

1. Erosion control measures need to be installed prior to the commencement of construction.
2. Upon completion of construction and restoration of disturbed areas, the permit applicant is responsible for the removal of all erosion control measures installed throughout the construction site.
3. To minimize the potential of material from leaving the site and being tracked onto the roadway, a rock filter construction entrance being a minimum of two feet in height and having side slopes of 4:1 must be constructed at the entryway onto the site. The rock construction entrance will provide an erosion control facility and also enable construction traffic to enter the site.
4. Street sweeping must be undertaken and completed on an as needed basis.
5. Compliance with the storm water management requirements of the Lower Rum River Watershed Management Organization are to be administered for this project by the City of Andover.
6. Compliance with the City of Andover's comments on the storm water management plan for the project.
7. A revised plan showing that 2 feet of separation will be provided between the opening elevation on the proposed structure on Lot 7, Block 2 and the overflow elevation from Basin 57.
8. Verification that a minimum separation of 3 feet will be proposed between the bottom elevation of bioretention #12 and groundwater. If the required separation cannot be provided, revised plans must be submitted and approved by the LRRWMO for any basin modification.
9. In all cases where the doing by the permittee of anything authorized by this permit shall involve the taking, using, or damaging of any property, rights or interests of any other person or persons, or of any publicly owned lands or improvements or interests, the permittee; before proceeding; shall obtain the written consent of all persons, agencies, or authorities concerned, and shall acquire all necessary property rights and interest.

**The permit for the project will not be issued until Conditions 6 and 7 have been satisfied. Condition 8 needs to be satisfied during the initial stages of grading operations.**

LOT BY LOT TABULATION												
Lot	Block	House Type	Garage Floor Elevation	Driveway Grade (%)	Lowest Opening Elevation	Anticipated Lowest Floor Elevation	Lowest Allowable Low Floor	High Water Level (HWL) Elevation	Flood Plain Elevation	Emergency Overflow Elevation	Highest Anticipated Water Table	Back of Curb Elev @ Driveway
1	1	FBWO	891.30	7.30	883.50	883.50	880.99	878.99	N/A	878.94	874.50	882.70
2	1	FBWO	892.00	7.00	883.50	883.50	880.99	878.99	N/A	878.94	874.50	881.00
3	1	FBWO	896.00	8.00	887.50	887.50	880.99	878.99	N/A	878.94	874.50	881.50
4 (2)	1	FBWO	897.00	7.60	888.50	888.50	880.99	878.99	N/A	878.94	874.50	883.30
5 (2)	1	FBWO	899.00	5.50	890.50	890.50	880.94	878.94	N/A	878.94	874.50	889.50
6 (2)	1	FBWO	903.00	3.30	894.50	894.50	890.45	888.45	N/A	888.41	874.50	897.50
7 (2)	1	FBWO	904.50	2.70	896.00	896.00	890.45	888.45	N/A	888.41	873.50	899.80
8 (2,3)	1	FBWO	905.00	3.60	896.50	896.50	901.87	899.87	N/A	899.87	873.50	902.00
9	1	FBWO	911.50	4.90	903.00	903.00	901.87	899.87	N/A	899.87	872.00	907.10
10	1	FBWO	911.50	5.10	903.00	903.00	890.41	888.41	N/A	888.41	872.00	907.00
1	2	FBWO	912.50	7.70	906.00	906.00	870.70	868.70	868.70	N/A	870.00	906.4
2	2	FBWO	913.00	8.00	904.50	904.50	870.70	868.70	868.70	N/A	870.00	907.2
3	2	FBWO	912.80	7.90	904.30	904.30	870.70	868.70	868.70	N/A	870.00	906.7
4	2	FBWO	912.00	8.00	903.50	903.50	872.00	867.40	867.40	N/A	870.00	903.9
5	2	FBLO	909.50	7.70	904.00	901.00	872.00	867.40	867.40	N/A	870.00	902.6
6 (2)	2	FBWO	901.50	4.80	892.50	892.50	872.00	867.40	867.40	N/A	870.00	898.9
7 (2,3)	2	SWO	894.50	2.80	886.00	886.00	891.51	889.51	867.40	889.51	870.00	891.9
8 (2)	2	SLO	901.20	8.00	895.70	892.70	892.19	890.19	867.40	890.19	870.00	892.7
9 (2)	2	SLO	901.00	6.00	896.50	892.50	892.19	890.19	N/A	890.19	872.50	897.3
10 (2)	2	SWO	905.50	7.80	897.00	897.00	891.96	889.96	N/A	889.96	872.50	900.1
11 (2)	2	FBWO	906.60	8.00	898.10	898.10	894.94	892.94	N/A	893.68	872.50	902.2
12 (2)	2	FBWO	905.50	7.90	897.00	897.00	895.68	893.68	N/A	893.68	872.50	900.0
13 (2)	2	SWO	905.50	7.70	897.00	897.00	901.96	889.96	N/A	889.96	872.50	900.2

Distance to Nearest Filtration basin	Ground Water Elevation	Bottom of Adjacent Infiltration Basin	Depth to Ground Water Below Btm of Infiltration Basin	Depth HWL to Btm Infiltration Basin	Appendix 4A. Plot 6 Adjusted Anticipated High Ground Water Level	Nearest Adjacent Infiltration Basin
38.00	872.50	898.00	25.50			Basin #111
130	870.00	888.00	18.00			Basin #57

**NOTE:** DRIVEWAY GRADES ARE BASED ON THE CURRENT PLAN LOCATION OF THE PADS. GRADES SUBJECT TO CHANGE PER PAD LOCATION ADJUSTMENTS. MAXIMUM ALLOWABLE DRIVEWAY GRADE IS 8.0%

NOTE:

- (1) REAR YARD SHORELAND SETBACKS APPLY TO THE FOLLOWING: LOTS 1 THRU 6, AND LOTS 10 THRU 12, BLOCK 3.
- (2) BUILDING HEIGHT RESTRICTIONS (25' MAX) AND IMPERVIOUS SURFACE COVERAGE (25% MAX) APPLY TO THE FOLLOWING: LOTS 4 THRU 8, BLOCK 1, LOTS 6 THRU 13, BLOCK 2, AND LOTS 1 THRU 18, BLOCK 3.
- (3) LOWEST ANTICIPATED FLOOR ELEVATION ESTABLISHED UTILIZING APPENDIX Aa OF THE NINE MILE CREEK WMO TABLES TO DETERMINE INFLUENCE FROM ADJACENT STORM WATER INFILTRATION BASINS.

LOT BY LOT TABULATION												
Lot	Block	House Type	Garage Floor Elevation	Driveway Grade (%)	Lowest Opening Elevation	Anticipated Lowest Floor Elevation	Lowest Allowable Low Floor	High Water Level (HWL) Elevation	Flood Plain Elevation	Emergency Overflow Elevation	Highest Anticipated Water Table	Back of Curb Elev @ Driveway
1 (1)	3	FBLO	907.50	7.50	902.00	899.00	881.60	879.60	879.60	N/A	876.00	902.40
2 (1)	3	FBLO	907.00	8.00	903.50	898.50	881.60	879.60	879.60	N/A	876.00	901.20
3 (1,3)	3	FB	903.50	6.90	903.30	895.00	881.60	879.60	879.60	N/A	876.00	898.90
4(1)	3	FB	904.50	5.50	904.30	896.00	881.60	879.60	879.60	N/A	876.00	900.90
5(1)	3	FBLO	908.50	7.90	903.00	900.00	881.60	879.60	879.60	N/A	876.00	902.30
6(1)	3	FBLO	906.20	7.70	900.70	897.70	878.00	N/A	N/A	N/A	876.00	900.80
7	3	FBLO	904.00	7.70	898.50	895.50	878.00	N/A	N/A	N/A	876.00	899.00
8 (2)	3	FBWO	899.30	8.00	891.50	891.50	886.63	884.63	N/A	884.63	876.00	894.40
9 (3)	3	LO/SLO	894.20	7.20	888.70	885.70	886.63	884.63	N/A	884.63	876.00	887.20
10 (1)	3	FBWO	893.00	6.00	884.50	884.50	881.60	879.60	879.60	N/A	876.50	889.30
11 (1)	3	FBWO/SLO	892.00	4.80	883.50	883.50	881.60	879.60	879.60	N/A	876.50	889.40
12 (1)	3	FBWO	892.00	3.80	883.50	883.50	881.60	879.60	879.60	N/A	876.50	889.40
13	3	WO/SWO	892.00	7.60	883.50	883.50	881.60	879.60	879.60	N/A	876.50	888.40
14	3	FBWO	892.00	7.30	883.50	883.50	881.60	879.60	879.60	N/A	876.50	888.10
15	3	FBWO	891.30	7.20	883.50	883.50	881.60	879.60	879.60	N/A	876.50	887.10
16(3)	3	WO/SLO	891.00	7.30	885.50	882.50	885.29	883.29	879.60	883.29	874.50	886.10
17 (3)	3	LO/SLO	891.00	7.90	887.50	883.50	885.29	883.29	879.60	883.29	874.50	886.30
18	3	FBLO	891.00	8.00	886.00	883.50	878.00	N/A	N/A	N/A	875.00	886.90
19	3	FB	889.90	7.90	890.80	883.50	882.39	880.39	N/A	880.38	875.00	881.10
20	3	FB	890.60	7.70	891.10	883.50	882.39	880.39	N/A	880.38	874.50	881.30
21	3	FB	890.60	7.90	891.10	883.50	877.50	N/A	N/A	N/A	874.50	881.80
1 (3)	4	FBLO	891.30	7.80	886.50	883.50	882.81	879.81	N/A	881.54	874.50	882.80
2 (3)	4	FBLO	891.30	7.90	886.50	883.50	885.46	882.46	N/A	883.50	874.5	882.2

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45	874.00	896.64	22.64			Basin #163
22	875.00	881.00	6.00	3.63	0.3	Basin #191P
27	874.50	881.00	6.50	2.29	0.3	Basin #122P
34	874.50	881.00	6.50	2.29	0.3	Basin #122P
65	873.00	877.00	4.00	2.81	0.3	Basin #38
36	873.00	877.00	4.00	5.46	0.3	Basin #39

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