

Drainage Report

Mesenbrink Subdivison

Mesenbrink Construction

October 2024

Submitted by:

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Certification

Drainage Report

For

Mesenbrink Development

Mesenbrink Construction
0M1.128460

October 2024

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision, and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

By:



Alec Pietz, P.E.
License No. 59617

Date: 10-15-2024

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I. INTRODUCTION

Mesenbrink Construction is set to develop the Mesenbrink Subdivision property in Mankato. This project includes an extension of Hoffman Road and will consist of a mixture of residential densities and some retail area. Bolton & Menk has designed the Hoffman Road/public improvements as well as what is being referred to as the “North and South Single-Family PUD”—which are residential areas on either side of Hoffman. The mixed land has been designed as needed for stormwater applications, with design of those locations to be finalized when acquisition of those parcels occurs. This report serves to detail the proposed stormwater management design of all of those areas, the entire Mesenbrink Subdivision.

Boundaries of the project consist of: County Highway 12/586th Avenue to the west, 211th Lane to the south and east, and Unnamed Lake ID #07007100 to the north.

II. ANALYSIS

To understand the drainage conditions of the project area and guide the proposed stormwater management design, a hydrologic and hydraulic model was developed using Autodesk’s Storm & Sanitary Analysis (SSA). SSA uses the Soil Conservation Service (SCS) Technical Release (TR-20) methodology to route watershed runoff through the system using a rainfall hydrograph. NOAA Atlas 14 rainfall depths were used along with the NRCS’s MSE 3, 24-hour rainfall distribution. The rainfall depths used for the 2, 10, and 100-Year rainfall events were 2.87”, 4.28” and 7.20”, respectively. Time of concentrations were calculated using the NRCS’s TR-55 methodology. Drainage areas were delineated using a combination of LiDAR data and survey data where available. Soil types within the project area are dominated by clay loams characterized by the hydrological soil group type D.

III. EXISTING CONDITIONS

Currently, land use in the project area is all straight-row cropland. During smaller rainfall events, much of the runoff within the project area sits in low points in the cropland. During large rainfall events, runoff from the site flows primarily to the north into the Unnamed Lake—with a small percentage flowing to the west and south into the ditch on the east side of County Highway 12/586th Avenue. There is also runoff towards the two homestead properties southeast of the site, that runoff eventually crosses under 211th Lane via an existing culvert. See *Existing Drainage Area Map* in Appendix A for more detail, including the drainage areas and flow directions. As part of the project, a Hydraulic Analysis was completed and submitted to the MNDNR. A copy of that report can be found in Appendix C.

IV. PROPOSED DESIGN

Mesenbrink Subdivision’s proposed stormwater management system has been designed to meet the MPCA’s NPDES Construction Stormwater Permit requirements and the City of Mankato Grading Manual design standards. Along with the necessary catch basins and storm sewer, the proposed stormwater management system will also include two wet sedimentation basins connected via a submerged pipe—allowing them to function hydraulically as a single basin. An existing gas line runs through the project area and is the reason for two smaller basins as opposed to a single, larger basin. Those two basins are labeled as “Pond A” and “Pond B”. The proposed project has one primary outfall: a 30” outlet from Pond B. See *Proposed Drainage Area Map* in Appendix A for more site detail.

A. Water Quality Requirements

The proposed project has been designed to meet the more stringent water quality requirements of the City of Mankato Grading Manual Sec. 3.2.4.2.B., which states a permanent stormwater treatment basin is required for treatment of 1.1" of runoff over the new impervious surfaces. This exceeds the 1" requirement of the MPCA NPDES Construction Stormwater Permit. This requirement will be met through the construction of two wet sedimentation basins with a combined water quality volume (WQv) sufficient to meet this standard.

Table 1 shows the change in impervious surfaces for the proposed project.

Table 1 – Impervious Calculation			
	Existing Area (ac)	Proposed Area (ac)	Difference (ac)
Public Improvements	0.0	3.6	+3.6
North Single-Family PUD	0.0	5.0	+5.0
South Single-Family PUD	0.0	2.2	+7.9
Future Concept Area	0.0	14.8	+15.8
TOTAL Impervious	0.0	32.3	+32.3

Based on these values, the project will be required to treat 2.96 ac-ft (~128,950 cf) of runoff. This treatment volume accounts for the total treatment required by each section of the development.

B. Storm Sewer & Catch Basin Design

Storm sewer and catch basins were designed based on the guidance provided in the City of Mankato Grading Manual. Storm sewer has been sized based on two different design storm events. For the residential streets, the 5-Year rainfall event was selected—while storm sewer along Hoffman Road was designed for the 10-Year rainfall event per the manual's guidance. All inlets have been designed per Grading Manual Sec. 3.2.3.2.a, in which a single 12-foot driving lane must be maintained free from inundation for every two driving lanes on a roadway for the 10-year rainfall event. Additionally, the 2-Year 24-hour storm with frozen ground was analyzed to be sure the design still provided adequate performance during spring snowmelt conditions.

C. Wet Sedimentation Basins

Two wet sedimentation basins have been designed as part of the project. The first, denoted as "Pond A" within the plans, serves approximately the western half of the Hoffman Road extension and the future mixed-use areas. Its drainage area is approximately 28.3 acres.

Denoted as "Pond B" within the plans, the second basin will serve both of the residential areas, along with the remainder of Hoffman Road that is not served by Pond A. All runoff generated to Pond A will also route through Pond B. Both basins are designed per the MPCA NPDES Construction Stormwater Permit and the City of Mankato Grading Manual. The pond outlet control structure was designed to be skimming so that floatables such as oil and trash will be trapped within the pond, and contains orifices for rate control. The proposed basins have been designed to provide enough storage and rate control as to not cause an increase in high-water levels (HWLs) to the Unnamed Lake.

D. Water Quality Provided

Table 2 below shows the designed water quality volume provided for each Pond. The combined water quality worksheet can be found in Appendix B.

Table 2 – Water Quality Summary				
BASIN	BOTTOM (ft)	NWL (ft)	WQ ELEVATION (ft)	WQv AVAILABLE (ac-ft)
Pond A	1001.0	1005.5	1006.81	11.41
Pond B	999.0	1005.5	1006.81	7.07
TOTAL WQv Avail.				18.48
TOTAL WQv Req.				2.96

The WQv available far exceeds the required amount because the basins also must meet stringent requirements for minimum overtopping into the Unnamed Lake event via the emergency overflows (EOFs).

V. MODEL RESULTS

Table 3 below shows the pre- and post-construction discharge rates to the Unnamed Lake.

Table 3 – Discharge Rates (CFS) to Unnamed Lake #07007100			
	2-YEAR (2.87")	10-YEAR (4.28")	100-YEAR (7.20")
Existing	35.1	61.7	128.6
Proposed	6.8	9.2	22.6
Difference	-28.3	-52.5	-106.0

Table 4 below shows the proposed design reduces total discharge rates leaving the site for all rainfall events.

Table 4 – Total Project Discharge Rates (CFS)			
	2-YEAR (2.87")	10-YEAR (4.28")	100-YEAR (7.20")*
Existing	45.7	83.8	175.6
Proposed	38.4	66.3	142.4
Difference	-7.3	-17.5	-33.2

Table 5 below shows the HWL results for the proposed basins.

Table 5 – HWLs of Proposed Basins			
Basin	2-YEAR (2.87")	10-YEAR (4.28")	100-YEAR (7.20")
	HWL (ft)	HWL (ft)	HWL (ft)
Pond A	1007.8	1009.4	1011.7
Pond B	1007.8	1009.4	1011.6

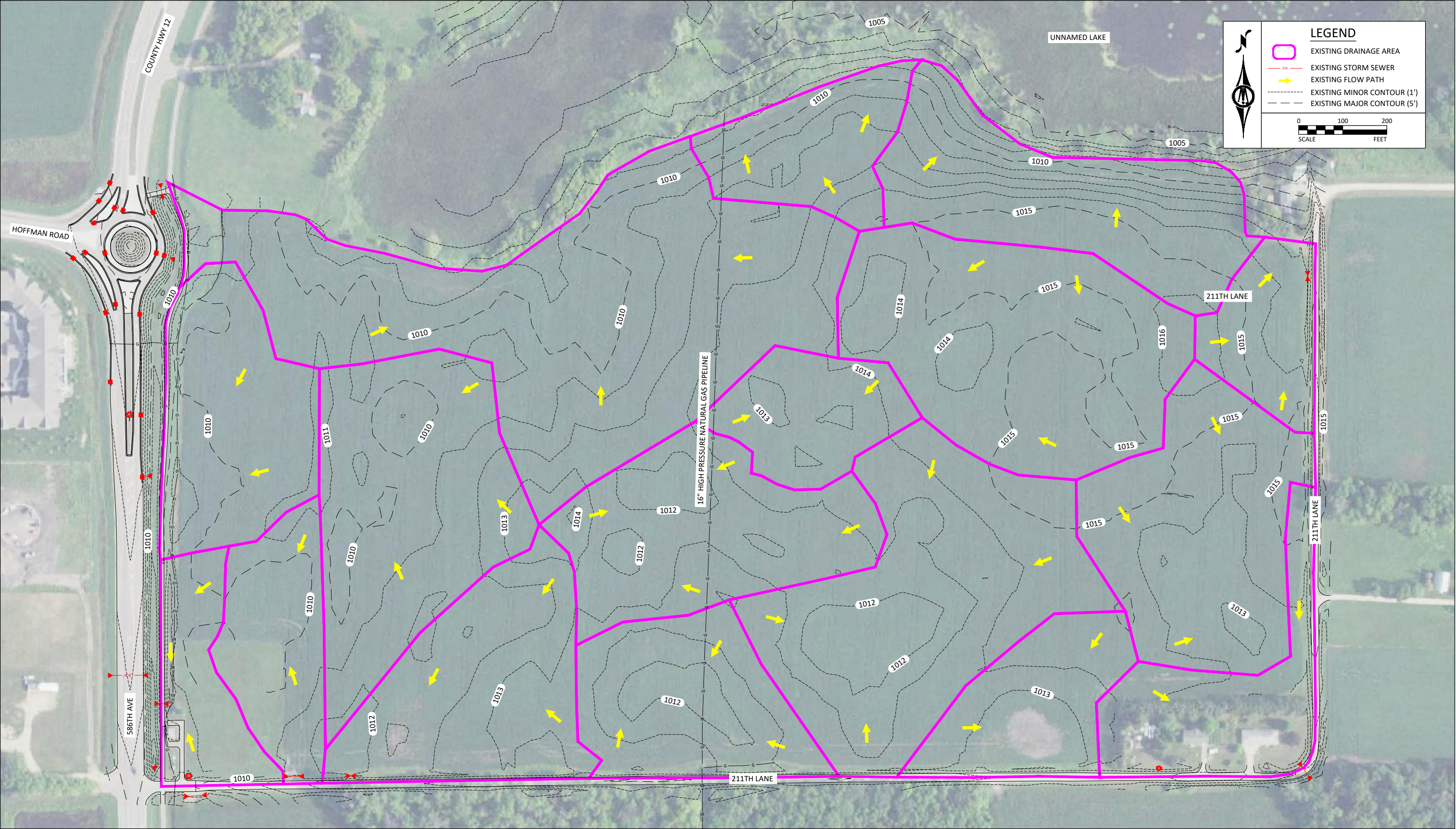
VI. SUMMARY

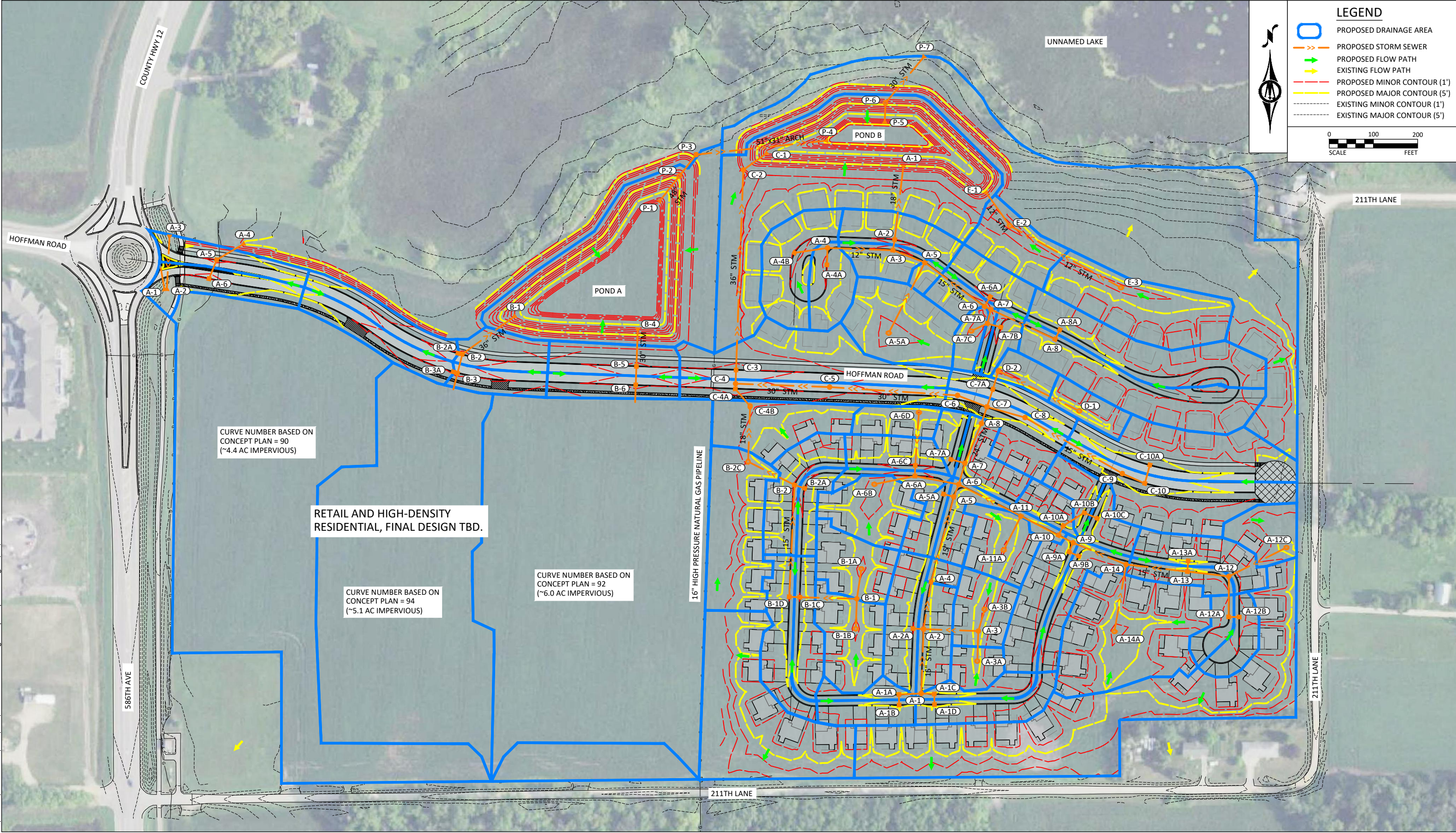
The goal of the Mesenbrink Subdivision is to continue to provide growth in the City of Mankato through various types of needs, thus includes opportunities for multiple types of housing as well as business. As has been discussed in this report, its storm sewer system has been designed to properly manage the stormwater runoff that the subdivision will produce, which includes minimizing the effects on the DNR managed area that the water will ultimately outlet to. Drainage patterns overall will remain relatively unchanged while also providing drainage capacity once the project is completed. The proposed design meets the MPCA NPDES Construction Stormwater Permit and the Mankato Grading manual requirements and all impacted wetlands will be mitigated for.

This report is being provided along with the proposed construction plans for the project. Please refer to the plan for additional design details.

Please feel free to contact me with any questions or comments about this report at Alec.Pietz@Bolton-Menk.com or by phone at (507) 766-3283.

Appendix A: Figures





Appendix B: Water Quality Spreadsheet & Subbasin Table



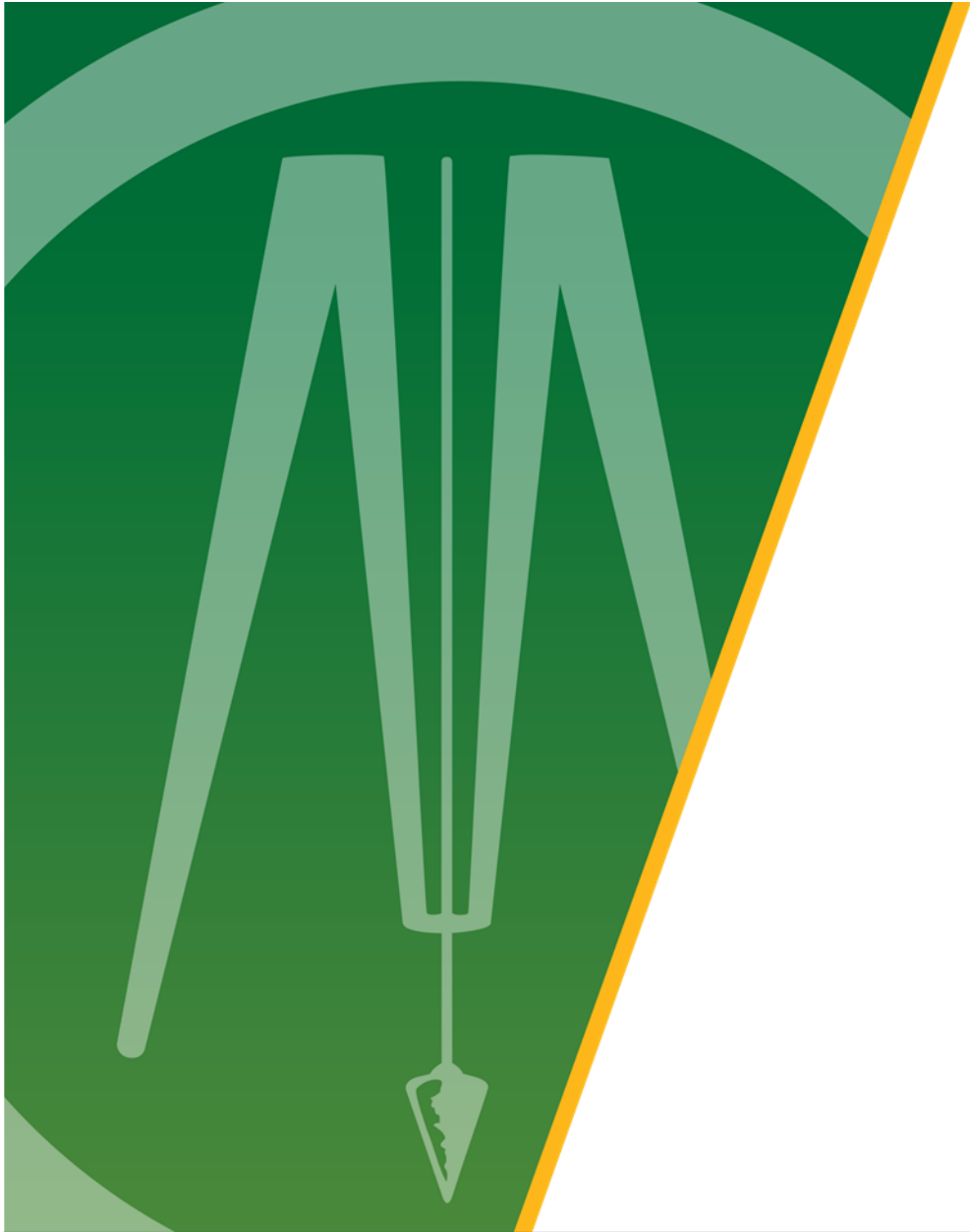
POND A & B COMBINED

Area Flowing to Proposed Basin	74.86 ac
Newly constructed impervious area =	32.30 ac
Required Water Quality Volume (WQV)= (1.1" over new impervious area)	2.96 ac-ft
Designed WQV =	18.48 ac-ft
Water surface elevation at WQV bounce =	1006.81 ft
Surface area at WQV bounce =	2.41 ac
Allowable Water Quality Release Rate =	13.65 cfs
Designed Water Quality Release Rate = (From hydraulic modeling)	5.10 cfs
Required Volume Below Outlet (dead storage) = (1800 CF Per Acre of Drainage Area)	3.09 ac-ft
Designed Volume Below Outlet (dead storage) =	6.74 ac-ft

	ELEV. (FT)	AREA (AC)	VOLUME (AC-FT)	AREA (SQ-FT)
	1013.5	0.00	0.00	
	1013.0	3.87	29.37	168363
	1012.0	3.61	25.64	157327
	1011.0	3.37	22.15	146623
	1010.0	3.13	18.90	136211
	1009.0	2.89	15.89	126103
	1008.0	2.67	13.11	116282
	1007.0	2.45	10.55	106761
	1006.0	2.24	8.20	97538
NWL	1005.50	1.96	7.15	85549
SAFETY BENCH	1005.0	1.87	6.19	81445
	1004.0	1.42	4.55	61723
	1003.0	1.29	3.19	56356
	1002.0	1.18	1.96	51305
	1001.0	1.07	0.84	46564
	1000.0	0.21	0.19	9258
	999.0	0.18	0.00	7716

Mesenbrink Construction Mesenbrink Subdivision BMI Project No. 0M1.128460.000			
Subbasin Details			
INLET	AREA (AC)	CURVE NUMBER	TIME OF CONCENTRATION (MIN.)
A-10 (SOUTH)	0.08	89.41	07
A-10A (SOUTH)	0.23	89.44	08
A-10B (SOUTH)	0.26	89.12	13
A-10C (SOUTH)	0.25	90.49	13
A-12A (SOUTH)	0.20	91.92	08
A-12B (SOUTH)	0.30	90.31	08
A-13 (SOUTH)	0.26	90.41	08
A-13A (SOUTH)	0.51	88.73	13
A-1A (SOUTH)	0.16	89.28	08
A-1B (SOUTH)	0.29	89.30	13
A-1C (SOUTH)	0.21	88.45	08
A-1D (SOUTH)	0.43	89.33	13
A-2 (NORTH)	0.46	88.91	13
A-2 (SOUTH)	0.41	89.14	13
A-2A (SOUTH)	0.53	88.87	13
A-3 (NORTH)	0.28	89.77	13
A-4 (SOUTH)	0.09	89.47	13
A-4A (NORTH)	0.40	89.78	16
A-4B (NORTH)	0.71	89.03	15
A-5	0.39	90.51	07
A-5 (NORTH)	0.09	89.55	07
A-5 (SOUTH)	0.33	90.33	08
A-5A (SOUTH)	0.21	90.07	08
A-6	0.52	88.96	07
A-6 (NORTH)	0.20	89.74	08
A-6A (NORTH)	0.36	88.83	13
A-6A (SOUTH)	0.19	91.01	07
A-6C (SOUTH)	0.38	89.02	13
A-7 (SOUTH)	0.40	89.46	13
A-7A (NORTH)	0.06	94.47	07
A-7A (SOUTH)	0.17	90.20	07
A-7B (NORTH)	0.18	91.40	08
A-8 (NORTH)	1.12	89.26	13
A-8A (NORTH)	1.06	89.40	13
A-9A (SOUTH)	0.58	88.91	13
A-9B (SOUTH)	0.41	90.49	13
B-1C (SOUTH)	0.42	89.89	13
B-1D (SOUTH)	0.55	89.18	13
B-2	0.37	87.28	07
B-2 (SOUTH)	0.56	88.75	13
B-2A	0.38	92.78	07
B-2A (SOUTH)	0.24	90.67	07
B-3	0.28	90.36	07
B-3A	0.46	90.89	07
B-5	0.48	88.33	07
B-6	0.36	89.40	07
C-11	1.08	91.07	13
C-11A	1.10	90.80	13
C-4	1.21	90.49	21
C-5A	0.65	90.21	09
C-8	0.55	90.98	13
C-8A	0.33	92.50	07

Appendix C: Supporting Documents



Hydraulic Analysis for Unnamed Lake ID #07007100

Mesenbrink Development

City of Mankato, Minnesota
May 2024

Submitted by:
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**BOLTON
& MENK**

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Certification

Hydraulic Analysis

For

Unnamed Lake #07007100

Mesenbrink Development
City of Mankato, MN
Blue Earth County

OM1.128460

~~December 2023~~
May 2024

PROFESSIONAL ENGINEER

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision, and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

Signature: 
Typed or Printed Name: Roberta Cronquist
Date: 5/29/2024 License Number: 52570

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I. Project Background

The proposed Mesenbrink development is located directly east of County State Aid Highway No. 12/586th Ave and north & west of 211th Lane. The project is proposing to convert approximately 105 acres of agricultural land to mixed residential/retail, high density residential, and medium density residential land uses. The development will include the construction of new roadways and full utilities including sanitary sewer, watermain, and storm sewer. The newly platted parcels are being developed in conformance with City of Mankato zoning codes and will be annexed into the City of Mankato.

The Mesenbrink development project is proposing an increase of 29.7 acres of impervious area. Two large wet ponds are proposed to meet water quality and rate control requirements set by the City of Mankato and the NPDES Stormwater Construction Permit. This memo serves to provide a hydraulic analysis of the Unnamed Lake #07007100, referred to as Unnamed Lake in this report, which serves as the stormwater outlet for both ponds in this development.

Unnamed Lake is approximately 100 acres in size and is recognized as a Minnesota Public Water by the MNDNR. Unnamed Lake discharges south through Blue Earth County Ditch No. 12 and meanders south and west through the City of Mankato and eventually discharges to the Le Sueur River. The SCS TR-20 hydrology method was utilized in XPSWMM Version 2020.1 (x64) for the following analysis. XPSWMM models were developed for the historic, existing, and proposed conditions to analyze the cumulative impacts of development. NOAA Atlas 14 rainfalls for Mankato, Minnesota were used to develop rainfall events.

II. Vicinity Map

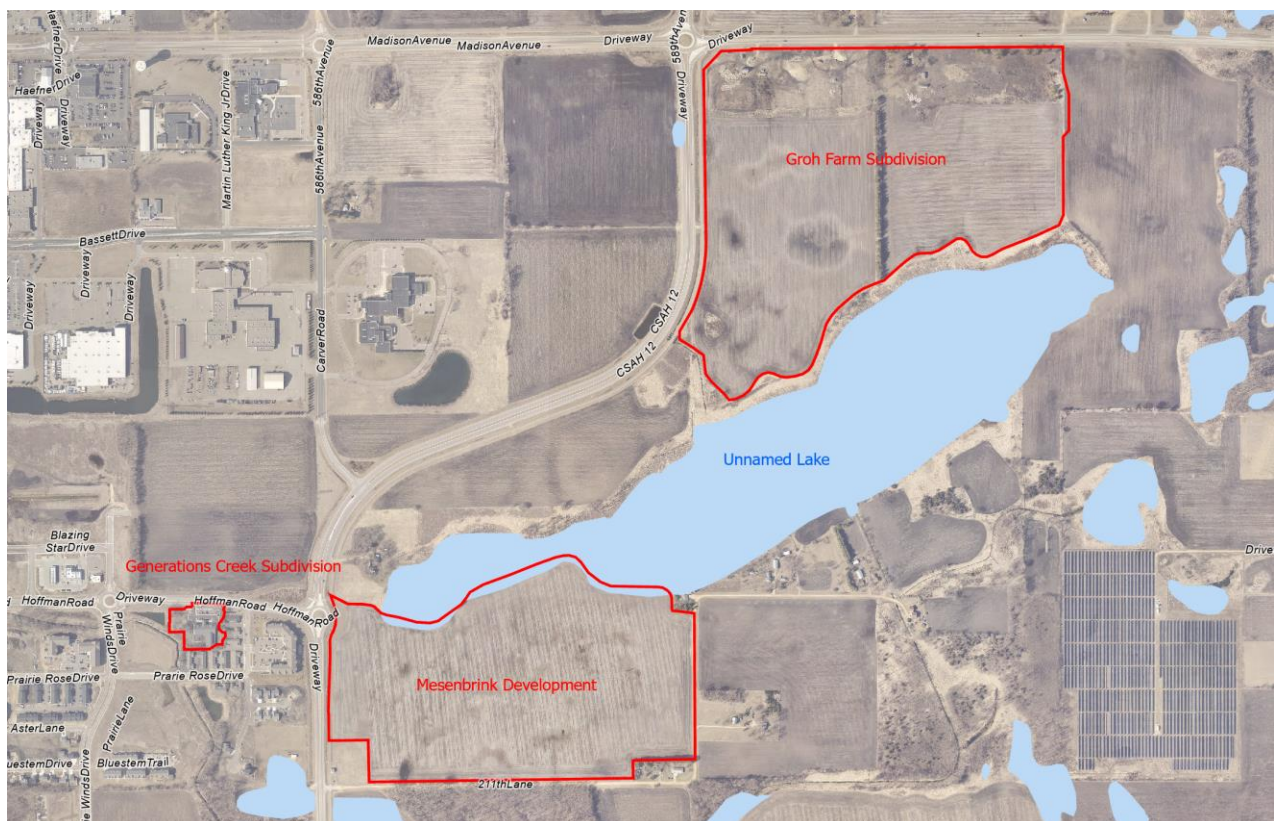


Figure 1: Vicinity Map
(not to scale)

III. Historical Model

Unnamed Lake has a drainage areas of approximately 1.7 square miles, or 1,090 acres. This drainage area consists of row crops, rural housing, a solar farm, and undeveloped space. The historical model reflects surface water conveyance and landuse types entering Unnamed Lake from prior to 2020. The entire drainage area to Unnamed Lake was included in the model to fully identify proposed impacts to Unnamed Lake.

Existing conditions models for each of the development area were used to build the historical XPSWMM model. These have all been previously submitted to and approved by the MNDNR. See Appendix D for the existing models that were utilized for this study.

Unnamed Lake was surveyed by the MNDNR in 2013 and an additional western node was added to the PWI. This location was included in the modeling as storage capacity underneath the OHWL elevation of 1004.6 feet. Unnamed Lake, its watershed outside of the three project boundaries, and County Ditch No. 12 remained unchanged throughout the models.

The main outlet for Unnamed Lake is County Ditch No. 12. The upstream section from Unnamed Lake to Highway 22 was included in the model to effectively model tailwater impacts. Several culvert crossings were included in the model from the Mankato GIS database, Bolton & Menk surveys, various as built plans, and published MNDNR reports online. All data links and references are attached in Appendix C.

For each model a 5, 10, 25, 50, 100, and 500-year storm event was modeled for 24, 48, and 72-hour rainfall events. A Huff Distribution was utilized to determine rainfall distributions for each of the previously listed events (Huff, 1990). See Appendix A for water surface elevations at Unnamed Lake and at road crossings along County Ditch No. 12 from Unnamed Lake to Highway 22. The Atlas 14 Rainfall Precipitation Depth estimates used for the storms can be seen in Table 1.

Table 1: Atlas 14 Precipitation Depths

Precipitation Depths for Mankato, MN (IN)						
Frequency	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
24-HR	3.61	4.29	5.34	6.24	7.21	9.79
48-HR	3.94	4.61	5.67	6.60	7.62	10.40
72-HR	4.24	4.92	6.00	6.93	7.96	10.70

IV. Existing Model

The existing XPSWMM model reflects landuse conditions as of December 2023. Full-buildout conditions of the Groh Farm and Generations Creek Subdivisions located northeast and due west, respectively, of Unnamed Lake were included in place of their existing models. Both models were left intact as they have gone through previous permitting applications with the MNDNR. Outfall conveyances were slightly edited to establish logical connections to Unnamed Lake. The Groh Farm and Generations Creek Subdivision altered land uses from primarily row crops to single family residential, multi-residential, and commercial land uses. As expected, the high water surface elevation in Unnamed Lake rose slightly with the impervious increases.

V. Proposed Modeling

The proposed model reflects the full buildout plans of the Mesenbrink Development southwest of Unnamed Lake. The Mesenbrink Development will alter 105 acres of land from row crops to single family residential, multi-residential, and commercial land uses.

Two proposed wet ponds will provide water quality treatment and rate control on the north side of the development and discharge to Unnamed Lake. The two ponds will provide adequate storage and rate control for the City of Mankato and NPDES rules. The pond outlets are designed to have a minimal grading impact to Unnamed Lake by discharging near the OHWL elevation and boundary.

VI. Model Results

The model results indicated a general increase in the bounce of Unnamed Lake from the historical model to the existing and proposed model. In the 24-hour, 100-year storm the water surface elevation goes from 1007.16 in the historical model to 1007.29 in the existing and 1007.53 in the proposed. The raised water surface elevations are consistent with impervious area increases. The models are increasingly varied with larger storm events.

Table 2: Unnamed Lake Water Level Changes

Unnamed Lake Water Level Changes									
Frequency	5-yr			10-yr			100-yr		
Condition	Existing	Proposed	Change	Existing	Proposed	Change	Existing	Proposed	Change
24-HR	1005.80	1005.93	0.13	1006.09	1006.24	0.15	1007.29	1007.53	0.24
48-HR	1005.90	1006.04	0.14	1006.15	1006.32	0.16	1007.31	1007.56	0.25
72-HR	1005.90	1006.33	0.44	1006.14	1006.65	0.51	1007.23	1008.03	0.79

See Appendix A for an expanded table of water level impacts and storm events listed in the Unnamed Lake Water Surface Elevation Comparison Table.

VII. Summary

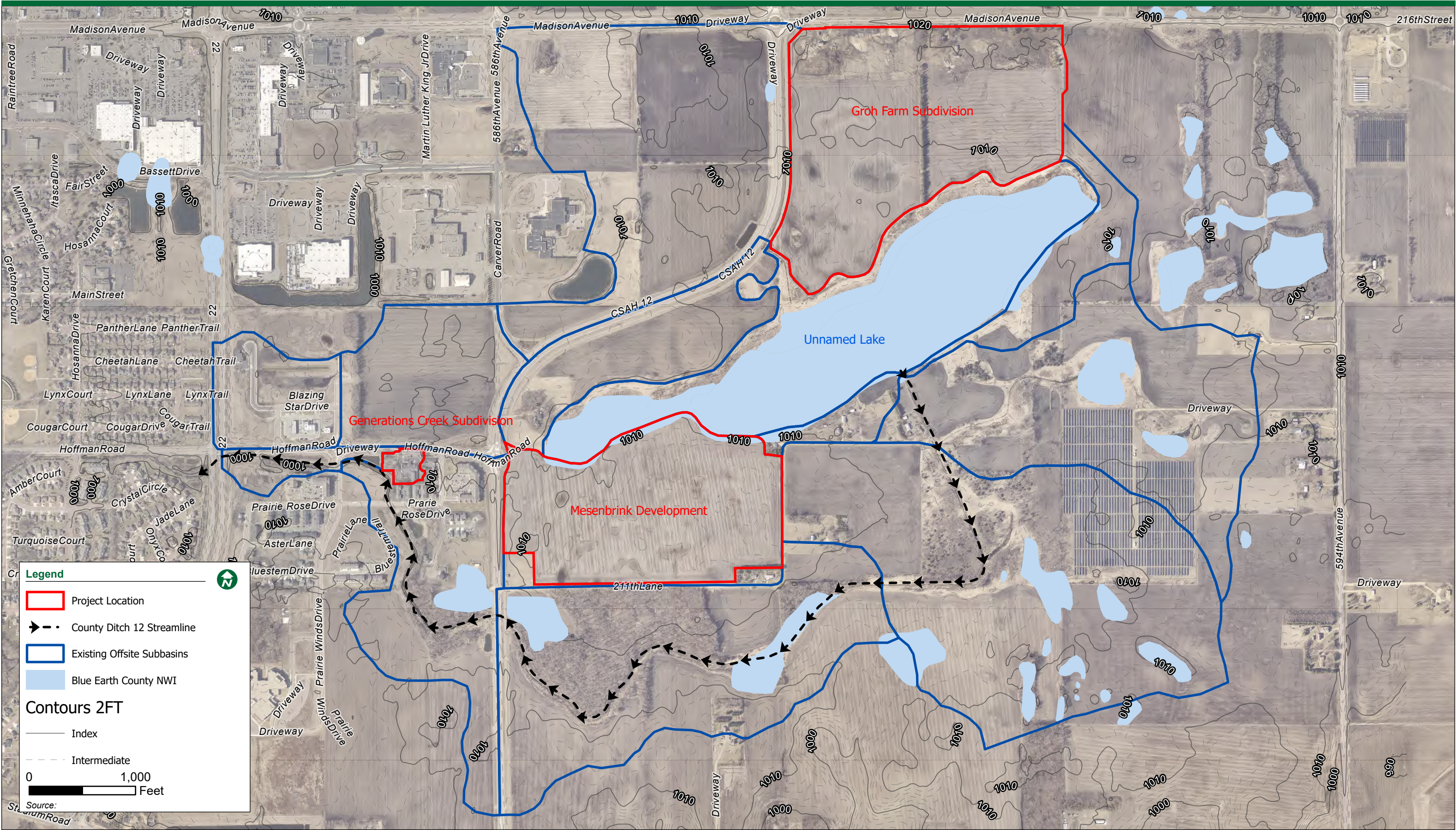
The Mesenbrink Development will increase the 24-hour, 100-year rainfall event high water level of Unnamed Lake by 0.24 feet. This is an expected impact from an addition of 29.7 acres of impervious surface. This impact is expected to be negligible on the overall system given the size and capacity of the lake and outlet channel. The City of Mankato Construction Storm Water Rules and the NPDES Construction Storm Water Permit rules for water quality treatment and rate control are being met through the use of two well designed wet ponds on the north side of the property.

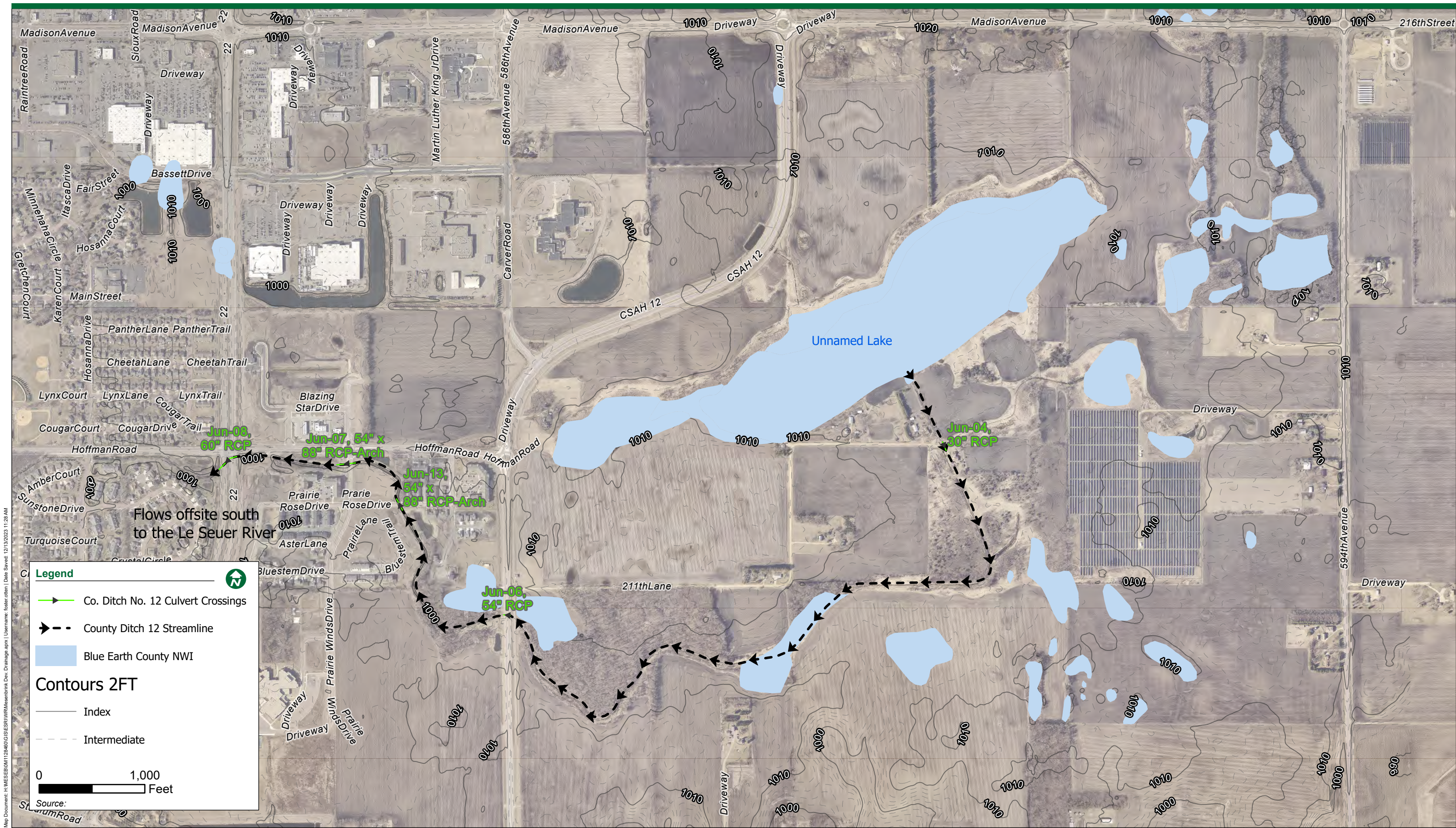
Additional benefits to Unnamed Lake by the Mesenbrink Development include reduction in sediment and fertilizer loading. Fish and waterfowl habitat will not be negatively impacted through the increased water level bounce.

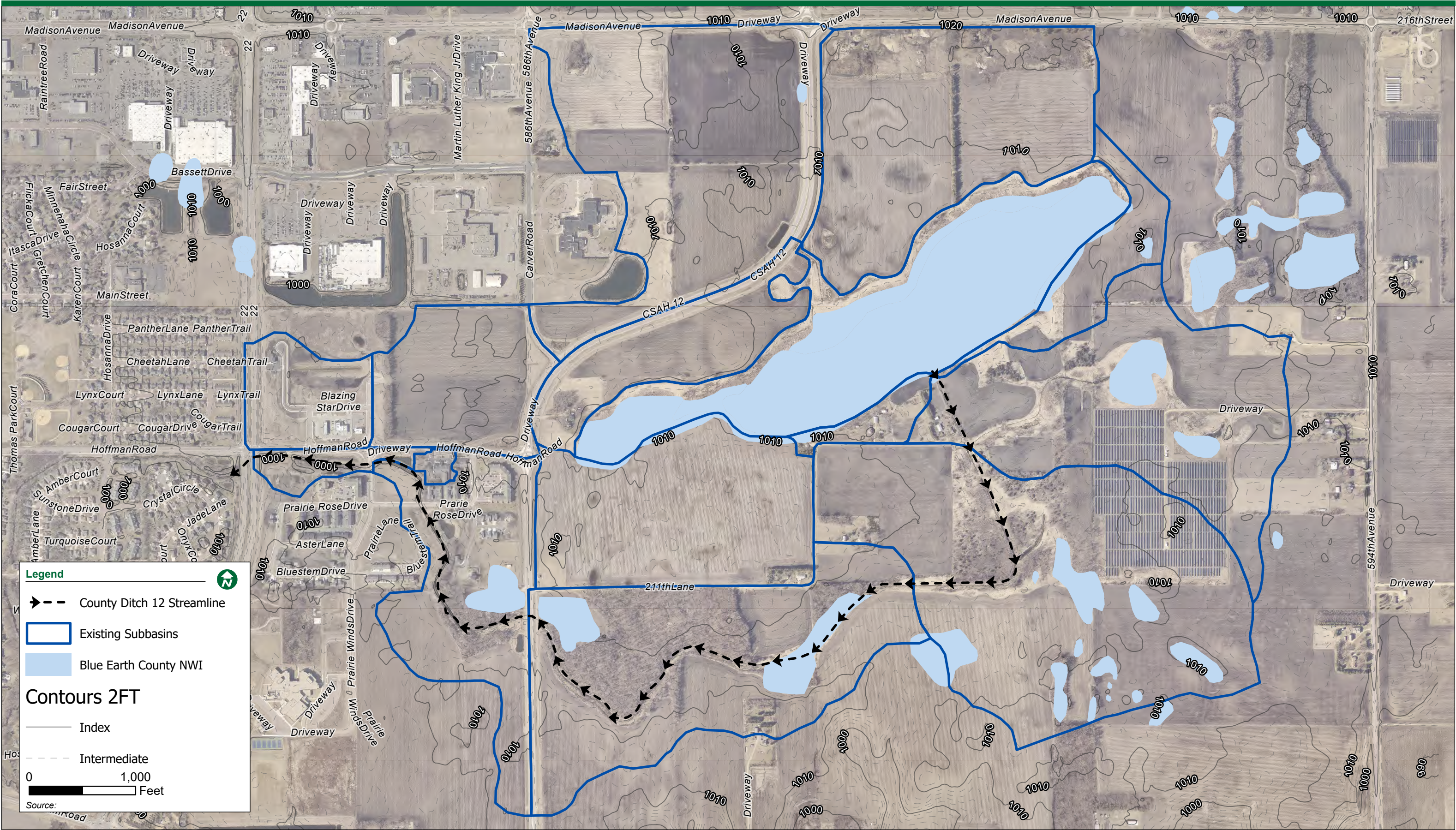
Appendix A: Water Surface Elevation Table

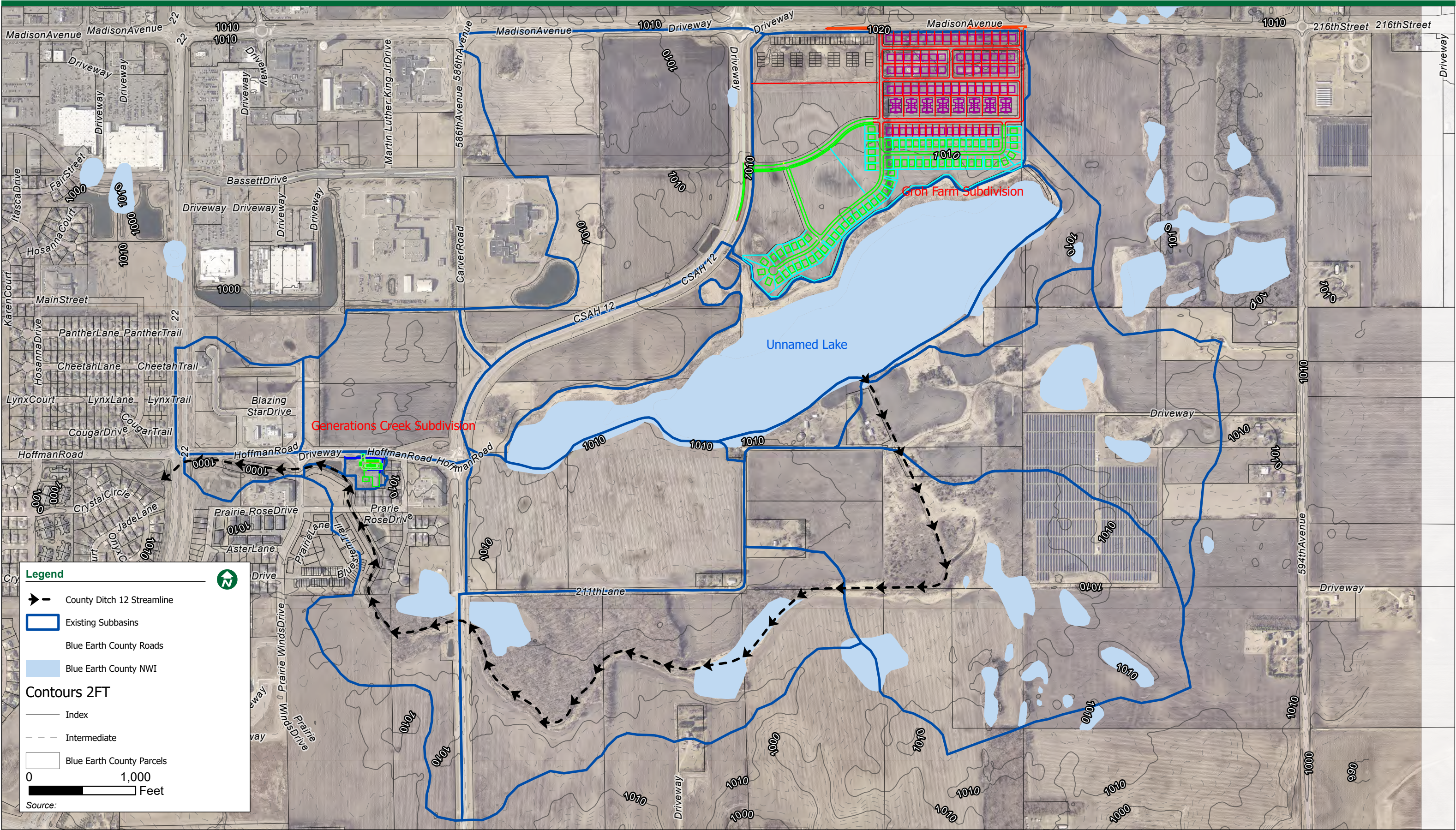
Unnamed Lake Water Surface Elevation Comparison								
Model	Return Frequency	Node	Stor-19	Jun-04	Jun-06	Jun-13	Jun-07	Jun-08
		Location / Crossing	Unnamed Wetland	Field Entrance	CSAH 12	Prairie Rose Drive	Prairie Wing Drive	Highway 22
Historical Model (Pre-2022 Conditions)	24-HR	5-yr	1005.72	1005.57	1002.47	1001.38	1001.00	999.58
		10-yr	1006.00	1005.97	1003.49	1002.02	1001.51	999.91
		25-yr	1006.42	1006.83	1005.01	1002.97	1002.26	1000.34
		50-yr	1006.78	1007.56	1006.21	1003.72	1002.85	1000.63
		100-yr	1007.16	1008.34	1007.41	1004.55	1003.48	1000.91
		500-yr	1008.15	1011.25	1010.33	1006.43	1004.97	1001.54
	48-HR	5-yr	1005.81	1005.67	1002.38	1001.33	1000.96	999.55
		10-yr	1006.05	1005.94	1003.17	1001.81	1001.34	999.81
		25-yr	1006.45	1006.55	1004.40	1002.58	1001.96	1000.17
		50-yr	1006.79	1007.12	1005.42	1003.22	1002.47	1000.45
		100-yr	1007.17	1007.74	1006.50	1003.90	1002.99	1000.71
		500-yr	1008.18	1010.06	1009.09	1005.65	1004.38	1001.32
	72-HR	5-yr	1005.81	1005.51	1001.78	1000.98	1000.68	999.37
		10-yr	1006.05	1005.83	1002.43	1001.39	1001.02	999.62
		25-yr	1006.42	1006.27	1003.43	1002.03	1001.53	999.95
		50-yr	1006.75	1006.61	1004.26	1002.55	1001.96	1000.20
		100-yr	1007.11	1007.02	1005.16	1003.12	1002.41	1000.44
		500-yr	1008.04	1008.42	1007.40	1004.60	1003.56	1000.98
Existing Model (Includes Groh Farm & Generations Creek Subdivisions)	24-HR	5-yr	1005.80	1005.63	1002.48	1001.39	1001.00	999.59
		10-yr	1006.09	1006.02	1003.50	1002.03	1001.51	999.91
		25-yr	1006.52	1006.87	1005.02	1002.97	1002.25	1000.33
		50-yr	1006.89	1007.53	1006.22	1003.72	1002.84	1000.62
		100-yr	1007.29	1008.37	1007.42	1004.55	1003.47	1000.90
		500-yr	1008.31	1011.28	1010.32	1006.42	1004.95	1001.52
	48-HR	5-yr	1005.90	1005.76	1002.41	1001.35	1000.97	999.56
		10-yr	1006.15	1006.04	1003.19	1001.82	1001.34	999.81
		25-yr	1006.56	1006.61	1004.42	1002.59	1001.96	1000.17
		50-yr	1006.92	1007.17	1005.44	1003.23	1002.46	1000.44
		100-yr	1007.31	1007.79	1006.52	1003.90	1002.99	1000.70
		500-yr	1008.35	1010.13	1009.10	1005.65	1004.36	1001.30
	72-HR	5-yr	1005.90	1005.59	1001.81	1000.99	1000.70	999.38
		10-yr	1006.14	1005.91	1002.46	1001.40	1001.03	999.63
		25-yr	1006.53	1006.37	1003.46	1002.04	1001.54	999.96
		50-yr	1006.86	1006.73	1004.30	1002.57	1001.96	1000.20
		100-yr	1007.23	1007.12	1005.19	1003.13	1002.41	1000.44
		500-yr	1008.19	1008.51	1007.43	1004.61	1003.56	1000.98
Proposed Model (Mesenbrink Development)	24-HR	5-yr	1005.93	1005.73	1002.36	1001.31	1000.94	999.54
		10-yr	1006.24	1006.08	1003.36	1001.91	1001.42	999.86
		25-yr	1006.71	1006.90	1004.83	1002.82	1002.14	1000.27
		50-yr	1007.11	1007.55	1006.01	1003.53	1002.70	1000.55
		100-yr	1007.53	1008.34	1007.19	1004.31	1003.29	1000.83
		500-yr	1008.63	1011.20	1009.94	1006.06	1004.70	1001.43
	48-HR	5-yr	1006.04	1005.86	1002.31	1001.27	1000.91	999.51
		10-yr	1006.32	1006.17	1003.07	1001.72	1001.26	999.76
		25-yr	1006.76	1006.68	1004.27	1002.46	1001.85	1000.11
		50-yr	1007.14	1007.23	1005.26	1003.06	1002.34	1000.38
		100-yr	1007.56	1007.83	1006.31	1003.69	1002.84	1000.63
		500-yr	1008.67	1010.09	1008.79	1005.34	1004.14	1001.22
	72-HR	5-yr	1006.33	1009.45	1006.30	1003.40	1002.42	1000.34
		10-yr	1006.65	1011.33	1007.61	1004.23	1003.03	1000.62
		25-yr	1007.16	1014.08	1009.43	1005.32	1003.88	1000.97
		50-yr	1007.58	1015.28	1010.84	1006.13	1004.60	1001.25
		100-yr	1008.03	1016.03	1011.87	1006.81	1005.38	1001.53
		500-yr	1009.14	1017.06	1013.39	1008.37	1007.28	1002.66

Appendix B: GIS Workmaps

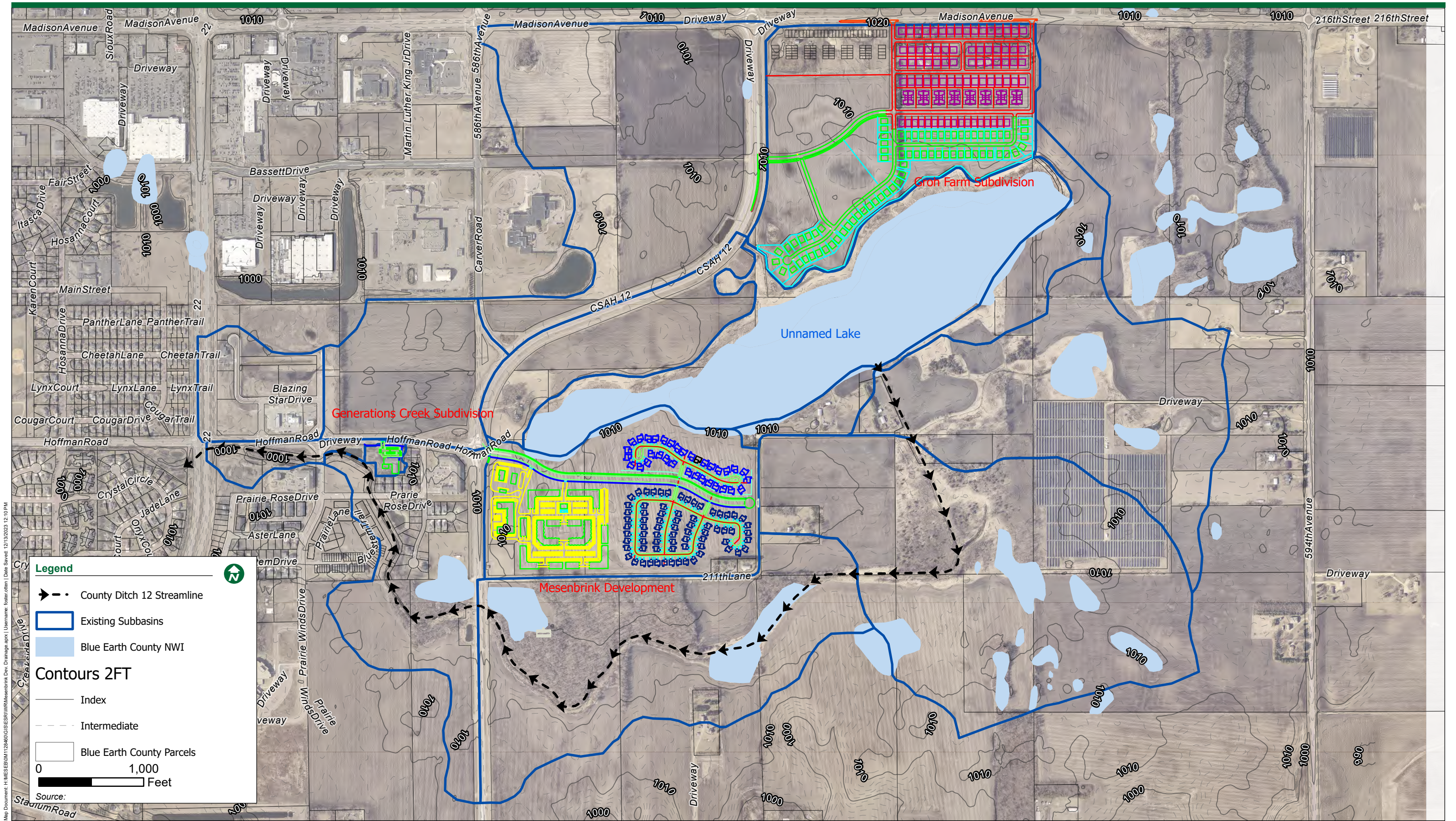






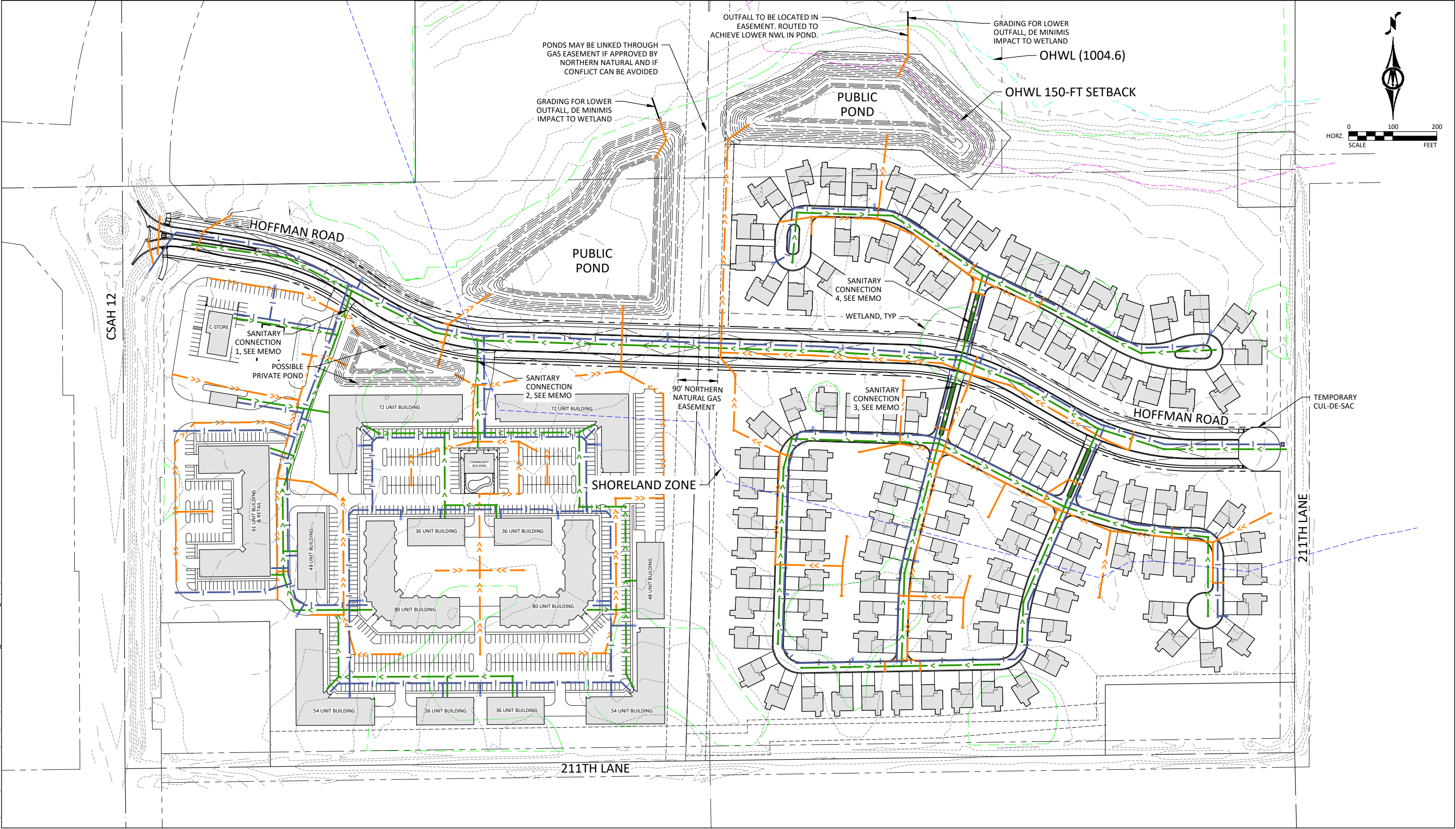


Map Document: H:\MES\EB\01128460\GIS\ESR\WPM\Mesenbrink Dev. Drainage.aprx | User: rjcm | Date Saved: 12/13/2023 11:58 AM



Map Document: H:\MESBRINK\128460\GIS\SSA\WIP\Mesenbrink Dev. Drainage.aprx | User: fester | Date Saved: 12/13/2023 12:10 PM

Appendix C: Supporting Documentation



Appendix D: Digital XPSWMM Modeling Files