

**Public Utilities Committee
Public Works Committee
Joint Meeting**

Tuesday, May 12, 2020

6:00 PM

**McFarland Municipal Center
Community Room**

AGENDA

You are invited to this meeting through a Zoom webinar. The Public is strongly encouraged to watch and participate in these meetings remotely through either the webinar or telephone options listed below.

PLEASE CLICK THE LINK BELOW TO JOIN THE ZOOM WEBINAR:

<https://us02web.zoom.us/j/81661863256>

Or by Telephone:

+1 (929) 205-6099 or +1 (301) 715-8592 or +1 (312) 626-6799 or +1 (669) 900-6833 or +1 (253) 215-8782 or +1 (346) 248-7799

Webinar ID: 816 6186 3256

1. CALL TO ORDER, ROLL CALL.
2. PUBLIC APPEARANCES.
 - a. This is an opportunity for members of the public to address the Village Board. Please remember this is a virtual meeting conducted through the Zoom online meeting platform. Zoom meeting attendees wishing to address the board may do so using the Question and Answer feature within the Zoom online meeting platform. You may state your name, address, and provide your comments to the board for their consideration. Members of the public who are present in person and wish to address the board should fill out a public comment form and turn into the meeting chairperson. Members of the public may speak during public appearances or during their selected agenda item as they designate on the public comment form. Please adhere to the 3-minute time limit. Additionally, you may send your public comments to cassandra.suettinger@mcfarland.wi.us to be included as part of the meeting.
3. BUSINESS.
 - a. Discussion and action to make a recommendation to the Village Board regarding the Preliminary Plat proposed as Rosewood Fields Subdivision by Veridian Homes located on Parcel #028/0610-024-8070-0 and #028/0610-024-9501-0 (Town of Dunn, County Highway AB).
4. ADJOURNMENT.

This meeting notice constitutes an official meeting of the above referenced group and was posted in accordance with all applicable laws related to Open Meetings Law. It is possible that members of and possibly a quorum of members of other governmental bodies of the municipality may be in attendance at the above stated meeting to gather information. No action will be taken by any governmental body at the above stated meeting other than the governmental body specifically referred to above in this notice. Upon reasonable notice, efforts will be made to accommodate the needs of disabled individuals. For additional information or to request this service, contact the McFarland Municipal Center at (608) 838-3153 or cassandra.suettinger@mcfarland.wi.us.



VILLAGE BOARD SUMMARY SHEET

MEETING DATE: Tuesday, May 12, 2020

SECTION: Business

DEPARTMENT: Administration

CONTACT: Andrew Bremer, Comm & Eco Dev Director, Jim Hessling, Public Works Director

AGENDA ITEM: Discussion and action to make a recommendation to the Village Board regarding the Preliminary Plat proposed as Rosewood Fields Subdivision by Veridian Homes located on Parcel #028/0610-024-8070-0 and #028/0610-024-9501-0 (Town of Dunn, County Highway AB).

PREVIOUS ACTION:

January 20th, 2020 Plan Commission pre-application meeting.

April 16th, 2020 Park Committee recommendation to accept proposed Outlot 3 parkland dedication.

ISSUE SUMMARY:

Background and Meeting Purpose

Veridian Homes (VH Rosewood Fields LLC) has petitioned the Village for approval of a preliminary plat (Rosewood Fields) for 36.29 acres of land along CTH AB. Veridian has an option to purchase this property from Utterback Limited Partnership. Concurrent with the preliminary plat approval, Veridian Homes is also petitioning for annexation, land division, and rezoning of the parent parcel. These requests will be reviewed by the Plan Commission and Village Board in May.

Plats are approved in a two step fashion with the preliminary plat phase allowing the applicant an opportunity to obtain design input and answer initial questions regarding general plat design, prior to having to incur additional expenses in the preparation of the final plat. The purpose of the May 12th joint Public Works and Public Utility meeting is to review and provide a recommendation to the Village Board regarding those aspects of the preliminary plat related to roadway and utility layout and design. Assuming the preliminary plat is approved, the applicant will prepare the final plat for review by the Village, including the Public Works and Public Utility committees. Concurrent with the final plat approval a development agreement will be prepared by the Village Attorney specifying construction obligations, sureties, and related matters.

Summary of Proposed Development



The packet includes a copy of the preliminary plat, preliminary engineering designs, and preliminary stormwater management report. The packet also includes a copy of the rezoning submittal, which includes several exhibits that further illustrate the land use plan. The preliminary plat consists of 117 residential lots, of which 107 will be for single family units and 10 will be for twin units (two attached dwellings separated by zero lot line). Twenty four (24) of the single family lots would have their driveways accessed by a private alley (Outlot 2) to be maintained by the Rosewood Fields Homeowners Association.

The preliminary plat includes 138,198 square feet (3.2 acres) of land dedicated as public park space (Outlot 3). There is an additional 7.6 acres of wetland, stormwater, and passive open space in Outlots 1, 4 & 5. A proposed off-road trail would run through Outlots 1, 3, and 4, from Prairie Wood Drive to the railroad crossing at CTH AB. Future development of lands south of the railroad would provide continued off-road connections to the Lower Yahara River Trail. The proposed neighborhood park and trail will be developed as part of Phase 1 of the subdivision development. Build-out of all lots is anticipated to occur over a 5-6 year period based on market conditions.

Consistency with Village Land Use Plan

Included in the Rosewood Fields Zoning Submittal.pdf is a copy of the Village's East Side Neighborhood Growth Area Concept Development Plan, marked Exhibit C. This plan was adopted in 2008 and incorporated into the Village's 2017 Comprehensive Plan. The area of the preliminary plat is outlined on the map. The concept plan as developed in 2008, identified the property for Traditional Residential Development, with a minimum of 4 units per acre; proposed net density is 4.7 units per acre. The neighborhood plan further identified the continuation of Tuscobia Trail to CTH AB, connectivity of new local streets to connect to undeveloped adjacent lands to the north, and the provision of park and stormwater management areas along the south side of Tuscobia Trail and on the west side of the property adjacent to the existing Park View Estates subdivision. The preliminary plat is generally consistent with the Village's land use plan.

Consistency with Village Subdivision Ordinances (Transportation Facilities)

Section 56-139(w) of the Village's Subdivision Ordinance requires right-of-way widths for collector streets of 70 feet, local streets of 60 feet, and alleys of 24 feet. The preliminary plat provides for a 66 foot wide ROW along CTH AB. This would be expanded to 70 feet, requiring an additional two (2) feet of ROW dedication by Veridian; the remaining two (2) feet would be provided on the other side of CTH AB if and when those lands were subdivided. The local roads are planned with a 60-foot ROW and the alley with a 26-foot ROW, both of which meet the Village subdivision ordinance requirements. Exhibit K of the Rosewood Fields Zoning Submittal.pdf includes a cross section of the ROW designs for the proposed alley and local roadways, including the provision of 5-foot sidewalks along both sides of all local roads.

Consistency with Village Subdivision Ordinances (Utilities)

The packet includes a copy of the draft Rosewood Fields Preliminary Engineering Plan and



Preliminary Stormwater Management Plan. The Village Engineer has reviewed these documents and provided a letter outlining recommend conditions of approval to address compliance with Village requirements and best management practices. Addressing these comments will be part of the scope of the developer's efforts prior to submittal of the final plat, final engineering plan, and final stormwater management plan.

FINANCIAL/BUDGET IMPACT:

VILLAGE PLAN REFERENCE:

Concurrent with the final plat approval a development agreement will be prepared by the Village Attorney specifying construction obligations, sureties, and related matters.

ORDINANCE REFERENCE:

BOARD, COMMISSION OR COMMITTEE RECOMMENDATION:

Recommend approval of the proposed Rosewood Fields Preliminary Plat with those conditions as provided in the Village Engineer's Rosewood Fields Development - Zoning Submittal Review letter dated May 7, 2020.

ATTACHMENTS:

1. Rosewood Fields Development - Zoning Submittal Review ltr_05.07.20
2. 02 - Rosewood Fields Preliminary Plat 2020.04.07
3. 07 - Rosewood Fields Preliminary Engineering 2020.04.07(reduced)
4. 08 - Rosewood Prelim SWMP 2020.04.07(reduced)
5. 15 - Rosewood Fields Zoning Submittal (April 7. 2020) update (reduced)
6. 12 - Utterback CSM 2020.04.07

May 7, 2020

Mr. Andrew Bremer, AICP
Community & Economic Development Director
Village of McFarland
5915 Milwaukee Street
P.O. Box 110
McFarland, WI 53558

Subject: Rosewood Fields Development – Zoning Submittal Review

Dear Andrew:

We have received the proposed plans included in the April 7, 2020 Zoning Submittal for proposed new residential development slightly south of CTH MN, north of the railroad tracks and west of CTH AB for a project called Rosewood Field. The preliminary plans and stormwater management report have been reviewed from a public works perspective. Our comments are shown below, organized by the appropriate document and/or drawing sheet number.

General Items

The project will receive sanitary sewer service via existing sewers in Tuscobia Trail and Devil's Lake Way. The sewer connection to Devil's Lake Way will need to be extended approximately 2,100 feet to reach the Rosewood Fields site, as was contemplated in the "2000 East Basin Capacity Study" and more recently in the "2018 East Basin Utility Service Study". The sewers and pump stations downstream of this development will be able to accommodate the development, but certainly have a finite amount of remaining capacity. The 2018 study outlines that once approximately 480 more homes are added (after the 117 homes included in Rosewood Fields) significant upgrades will be needed at Lift Station #2. This timeline will be accelerated if Lift Station #5 needs to be re-routed south.

The project will receive water service via existing mains at Praire Wood Drive and Tuscobia Trail. We are also recommending that the main at Tuscobia Trail be upsized to continue that trunk line of the Village system to the east and CTH AB.

Preliminary Engineering Plans

Sheet 2

- Some more detail should be provided showing how the stormwater moves from the west end of Tuscobia Trail towards the railroad tracks.
- There is some concern about preserving as many quality trees when possible. It is recommended to survey the location of existing trees along the west property line of Outlot 1 and identify those that may need removal as part of the construction grading for Outlot 1.

Sheet 3

- The proposed right-of-way width is 60 feet, consistent with Village minimum standards and also recent residential streets. This will allow for on-street parking on both sides of the street and ample (7.5 foot) terrace space for tree plantings, if desired.

Sheet 4

- The route shown for proposed sanitary sewer interceptor may change slightly, depending on the interceptor final design. The change would likely only move the “north-south” section from Prairie Wood Drive to Vintage Birch Way to provide better cover for the pipe.
- Depending on the Village’s (and developer’s) desired schedule, the Village may need to construct the interceptor prior to the developer’s phasing.

Sheet 6

- We recommend requiring some water main along the CTH AB corridor to continue Village practice of extending water mains along new development frontage. This allows for much better looping in the future, providing better fire protection and fewer outages in the event of a needed repair.
- The main on Tuscobia Trail should be upsized to 12-inch diameter to continue this trunk line out to CTH AB.

Sheet 8, 11, 15, 16, & 17

- Each tee intersection will need to have fully accessible sidewalk ramps on each leg. In the past, this has created some issues with driveway locations on the “through” side of the tee. Driveway locations should be shown to address this issue.

Sheet 12

- Temporary street dead-ends should include a hammerhead turnaround.

Sheet 14

- The alley entrance onto the street should have a flare, like a commercial driveway.

Certified Survey Map & Preliminary Plat

We recommend at least a 40 foot easement to the Village be included on the south side and east side of Lot 3 and the east side of Lot 2 (at least up to Tuscobia Trail). This will accommodate both the interceptor sewer route coming from Devil’s Lake Way, and a path for recreation and future sewer maintenance.

Additional dedication along CTH AB may be required by the Dane County Highway Department to accommodate the necessary turn/acceleration/deceleration lanes. At a minimum, the CSM (Lots 1, 2, and 3) and preliminary plat should be revised to include a minimum 36 feet of right-of-way dedication from the center line of CTH AB.

Preliminary Stormwater Management Plan

The stormwater management design as proposed will meet the Village, County, and State performance standards, however there are several important items that will be needed prior to recommending Village approval:

- Inlet sizing/spacing calculations must be provided to ensure the street surface is not inundated.

- An exhibit showing the extent of overland water flow during a 100-year storm with all storm sewers plugged must be provided to ensure water does not enter private properties.
- Calculations must be provided for the final pond designs to demonstrate that the water levels in the 100-year storm are at least 2 feet below all existing and future building openings
- We have some concerns about the proposed 0.55% slope in an area shown as “West Bypass Channel.” This is where water from existing lands to the north and west are conveyed past this development. Slopes that flat are often difficult to mow because of shallow standing water. That channel should be at least 0.75% slope, and/or be provided with a structural bottom (concrete, open pavers, etc.).
- The developer should include some cross-sections of the “West Bypass Channel”, including the existing homes and yards along Peninsula Way to show their relative locations (horizontal and vertical) to the water in the channel and the ponds during various storms.

Please feel free to contact us with any questions or comments regarding this review.

Very truly yours,
TOWN & COUNTRY ENGINEERING, INC.



Brian R. Berquist, P.E.
President

cc: Mr. Jim Hessling, Director of Public Works, Village of McFarland (5915 Milwaukee Street, P.O. Box 110, McFarland, WI 53558)

Mr. Matthew Schuenke, Administrator, Village of McFarland (5915 Milwaukee Street, P.O. Box 110, McFarland, WI 53558)

Mr. Dan Day, Donofrio, Kottke & Associates, Inc. (7530 Westward Way, Madison, WI 53717)

BRB:sai

J:\JOB#S\McFarland\MC-171-M6 Veridian-Utterback Development\Admin\Review Letter.docx

SURVEYOR'S CERTIFICATE

I, Brett T. Stoffregan, Registered Land Surveyor, S-2742, hereby certify that this preliminary plat is a true and correct representation of all the adjacent existing land divisions and of the boundary of the preliminary plat and features and that I have fully complied with the Village of McFarland Subdivision Ordinance.

Dated this 7th day of April, 2020.

Brett T. Stoffregan
Brett T. Stoffregan, Professional Land Surveyor, S-2742
MADISON, WISCONSIN



LEGAL DESCRIPTION

A parcel of land located in the NE1/4 of the SE1/4 and the SE1/4 of the SE1/4 of Section 2, T6N, R10E, Village of McFarland, Dane County, Wisconsin to-wit:
Commencing at the East 1/4 corner of said Section 2; thence S02°07'30"W 586.21 feet along the East line of said SE1/4; thence N87°52'30"W, 34.21 feet to the point of beginning; thence S02°14'16"W, 973.22 feet; thence N77°25'35"W, 1291.46 feet; thence N02°55'02"E, 1186.37 feet; thence N86°00'55"E, 736.08 feet; thence S29°04'23"W, 9.53 feet; thence S44°25'02"E, 501.30 feet; thence S42°38'44"E, 242.81 feet to the point of beginning.
Containing 1,580,872 square feet square feet (36.292 acres).

to be known as

Lot 2, Certified Survey Map No. _____, recorded in Volume _____ of Certified Survey Maps on pages _____ as Document Number _____, Dane County Registry, located in the Village of McFarland, Dane County, Wisconsin.

NOTES

1. Zoning: Existing - FP-35
Proposed - Planned Development
2. All intersection radii are 15' unless noted.
3. Outlot designation:
1 - Dedicated to the public for storm water management and conveyance
2 - Private alley to be owned and maintained by the Rosewood Fields Neighborhood Association
3 - Dedicated to the public for park purposes
4 - Dedicated to the public for storm water management and open space. Public sanitary sewer easement over entire outlot.
5 - Private open space. Public storm water drainage easement over entire outlot.
4. Owner:
Ufferback Limited Partnership
c/o Wayne Ufferback
4627 Prairie Fire Ct.
DeForest, WI 53532
Subdivider:
Village of Rosewood Fields LLC
6801 South Towne Drive
Madison, WI 53713
Planner:
Vandewalle & Assoc.
120 E Lakeside St.
Madison, WI 53715

LEGEND

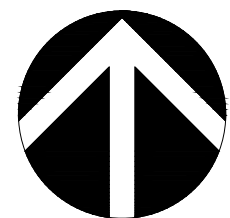
- FOUND 1" IRON PIPE
- FOUND 1-1/4" REBAR
- FOUND 3/4" REBAR
- PLACED 3/4"x18" REBAR (WT=1.5 LBS/FT)
- SS SS SANITARY SEWER
- W W WATER MAIN
- G G GAS MAIN
- DHE DHE OVERHEAD ELECTRIC
- RAILROAD TRACKS
- MANHOLE
- POWER POLE
- RAILROAD CROSSING SIGNAL
- HYDRANT
- SOIL BORING
- 870- EXISTING CONTOUR
- () "RECORDED AS" INFORMATION



PRELIMINARY PLAT

ROSEWOOD FIELDS

LOCATED IN THE NE1/4 OF THE SE1/4 AND THE SE1/4 OF THE SE1/4 OF SECTION 2, T6N, R10E, VILLAGE OF MCFARLAND, DANE COUNTY, WISCONSIN



WISCONSIN COORDINATE
REFERENCE SYSTEMS (WISCRS)
DANE ZONE NAD83(2011)

SCALE: 1"= 100'



DATE: 04-07-20

REVISED:

FN: 19-07-114

Sheet Number:

1 of 1

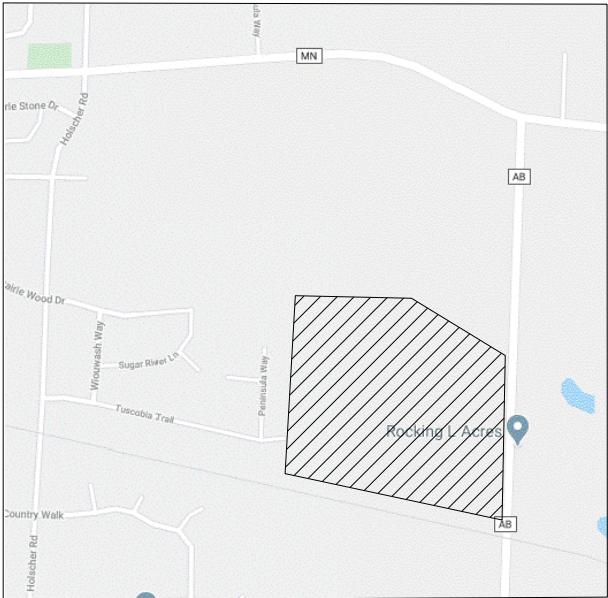
D'ONOFIO KOTHE AND ASSOCIATES, INC.

7530 Westward Way, Madison, WI 53717
Phone: 608.833.7550 • Fax: 608.833.1089
YOUR NATURAL RESOURCE FOR LAND DEVELOPMENT

ROSEWOOD FIELDS

PRELIMINARY ENGINEERING

VILLAGE OF MCFARLAND
DANE COUNTY, WISCONSIN



PROJECT LOCATION


D'ONOFRIO KOTTKE AND ASSOCIATES, INC.
7530 Westward Way, Madison, WI 53717
Phone: 608.833.7530 • Fax: 608.833.1089
YOUR NATURAL RESOURCE FOR LAND DEVELOPMENT

FN: 19-04-113

ISSUE DATE: 04/07/20

SHEET 1 of 18



D'ONOFRIO KOTTKE AND ASSOCIATES, INC.
7530 Westward Way, Madison, WI 53717
Phone: 608.833.7530 • Fax: 608.833.1089
YOUR NATURAL RESOURCE FOR LAND DEVELOPMENT

COVER SHEET

ROSEWOOD FIELDS

VILLAGE OF MCFARLAND

DATE: 04/07/20
REVISED:

DRAWN BY: KWB

FN: 19-04-113

Sheet Number:
1 of 18

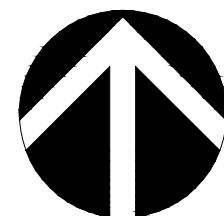
EROSION CONTROL MEASURES WILL
BE DESIGNED AND IMPLEMENTED ON
A PHASE BY PHASE BASIS



OVERALL GRADING PLAN

ROSEWOOD FIELDS

VILLAGE OF MC FARLAND



SCALE: 1"= 80'
(PAGE SIZE: 22x34)



DATE: 04/07/20
REVISED:

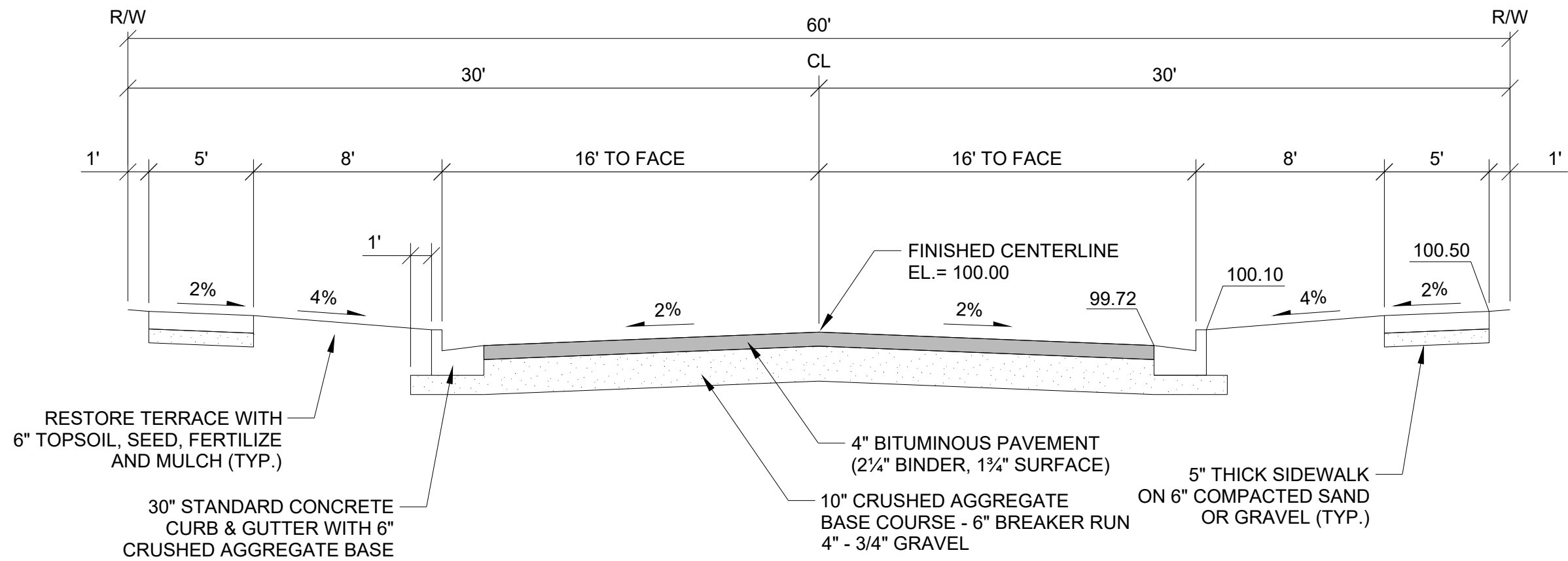
DRAWN BY: KWB

FN: 19-04-113

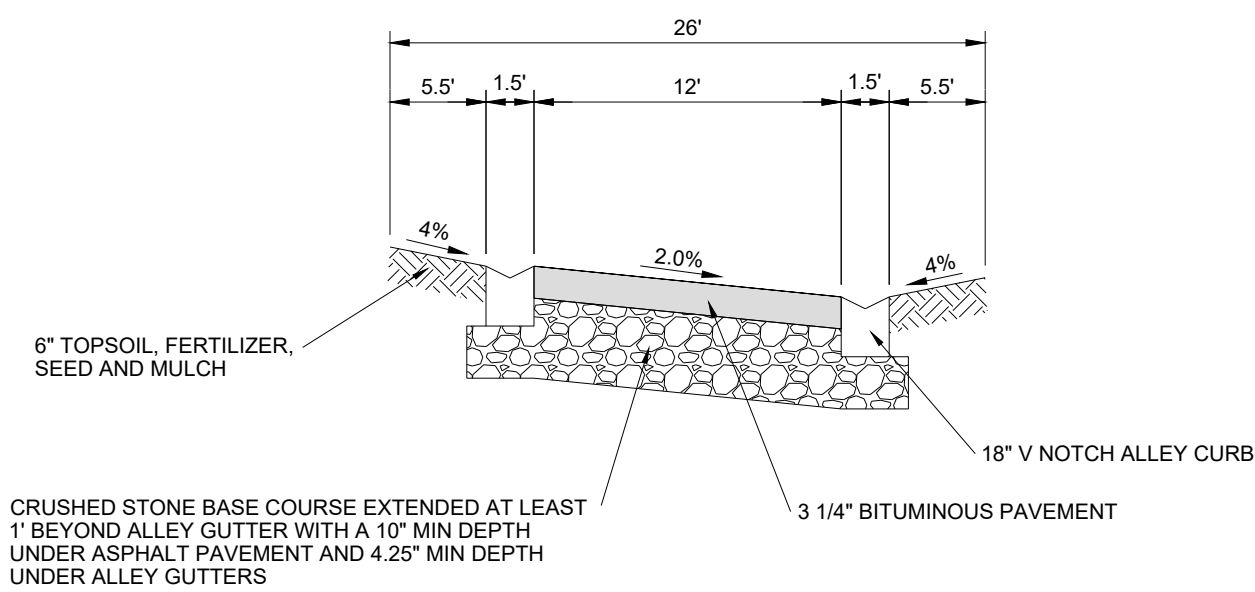
Sheet Number:

2 of 18

D'ONOFRIO KOTTKE AND ASSOCIATES, INC.
7530 Westward Way, Madison, WI 53717
Phone: 608.833.7530 • Fax: 608.833.1089
YOUR NATURAL RESOURCE FOR LAND DEVELOPMENT



TYPICAL FINISHED SECTION - 60' R.O.W.



TYPICAL ALLEY SECTION

DETAILS - TYPICAL SECTIONS

ROSEWOOD FIELDS

VILLAGE OF MC FARLAND

DATE: 04/07/20
REVISED:

DRAWN BY: KWB

FN: 19-04-113

Sheet Number:

3 of 18

SANITARY SEWER TO BE
8" EXCEPT AS NOTED

CONNECT TO EXISTING SANITARY
SEWER MANHOLE IN TUSCOBIA TRAIL

EXISTING GAS PIPELINE

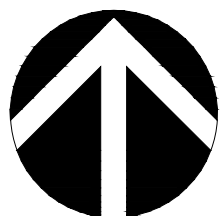
PROPOSED 10" SANITARY INTERCEPTOR

VILLAGE OF MCFARLAND TO
CONSTRUCT INTERCEPTOR SOUTH OF
ROSEWOOD FIELDS PLAT. CONNECT
TO THIS PROPOSED INTERCEPTOR

UTILITY SCHEMATIC - SANITARY SEWER

ROSEWOOD FIELDS

VILLAGE OF MCFARLAND



SCALE: 1"= 80'
(PAGE SIZE: 22x34)

DATE: 04/07/20
REVISED:

DRAWN BY: KWB

FN: 19-04-113

Sheet Number:

4 of 18

STORM SEWER SIZING TO BE
DETERMINED FOR FINAL
ENGINEERING DESIGN

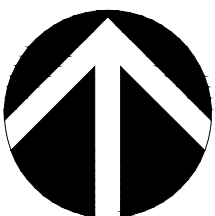


D'ONOFRIO KOTTKE AND ASSOCIATES, INC.
7530 Westward Way, Madison, WI 53717
Phone: 608.833.7530 • Fax: 608.833.1089
YOUR NATURAL RESOURCE FOR LAND DEVELOPMENT

UTILITY SCHEMATIC - STORM SEWER

ROSEWOOD FIELDS

VILLAGE OF MC FARLAND



SCALE: 1"= 80'
(PAGE SIZE: 22x34)



DATE: 04/07/20
REVISED:

DRAWN BY: KWB

FN: 19-04-113

Sheet Number:

5 of 18

WATER MAIN TO BE 8"

CONNECT TO EXISTING WATER
MAIN IN PRAIRIE WOOD DRIVE

CONNECT TO EXISTING WATER
MAIN IN TUSCOBIA TRAIL

EXISTING GAS PIPELINE

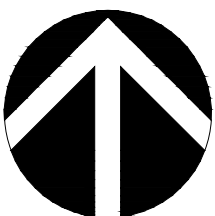


D'ONOFRIO KOTTKE AND ASSOCIATES, INC.
7530 Westward Way, Madison, WI 53717
Phone: 608.833.7530 • Fax: 608.833.1089
YOUR NATURAL RESOURCE FOR LAND DEVELOPMENT

UTILITY SCHEMATIC - WATER MAIN

ROSEWOOD FIELDS

VILLAGE OF MC FARLAND



SCALE: 1"= 80'
(PAGE SIZE: 22x34)

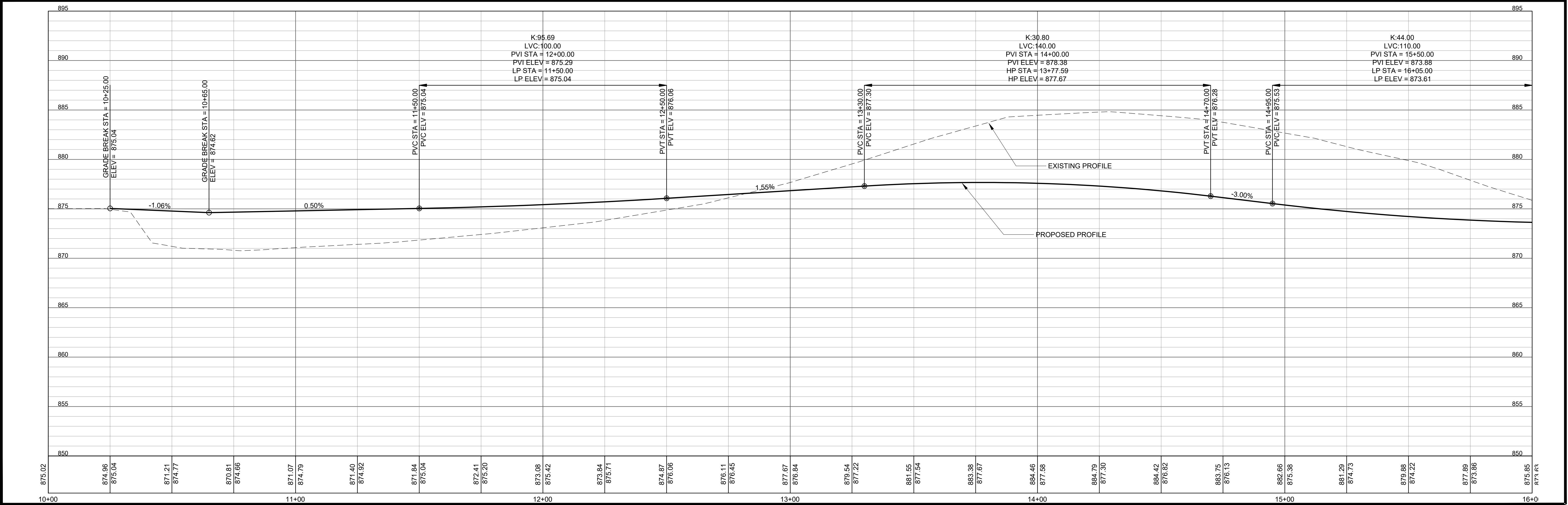
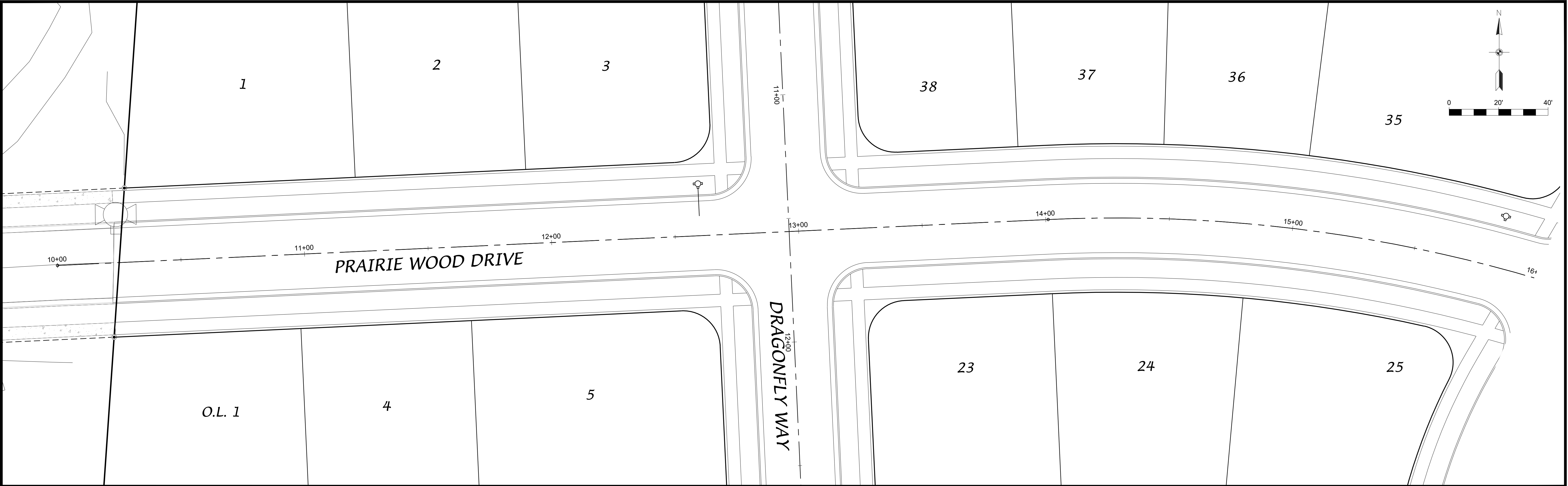


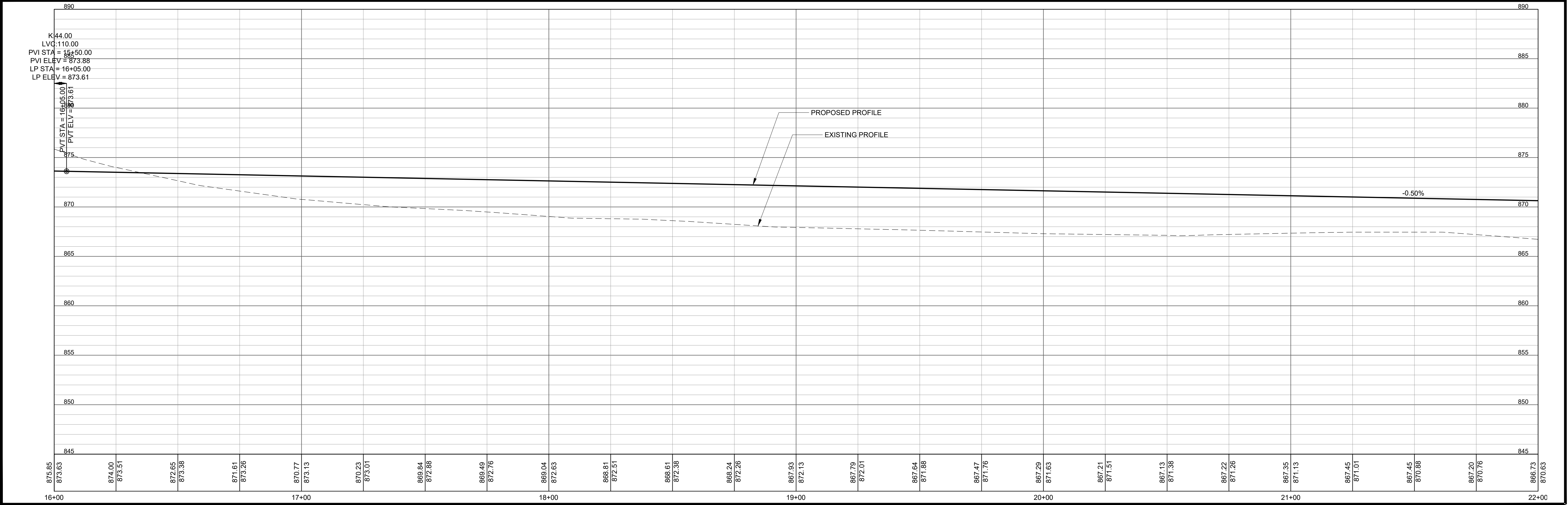
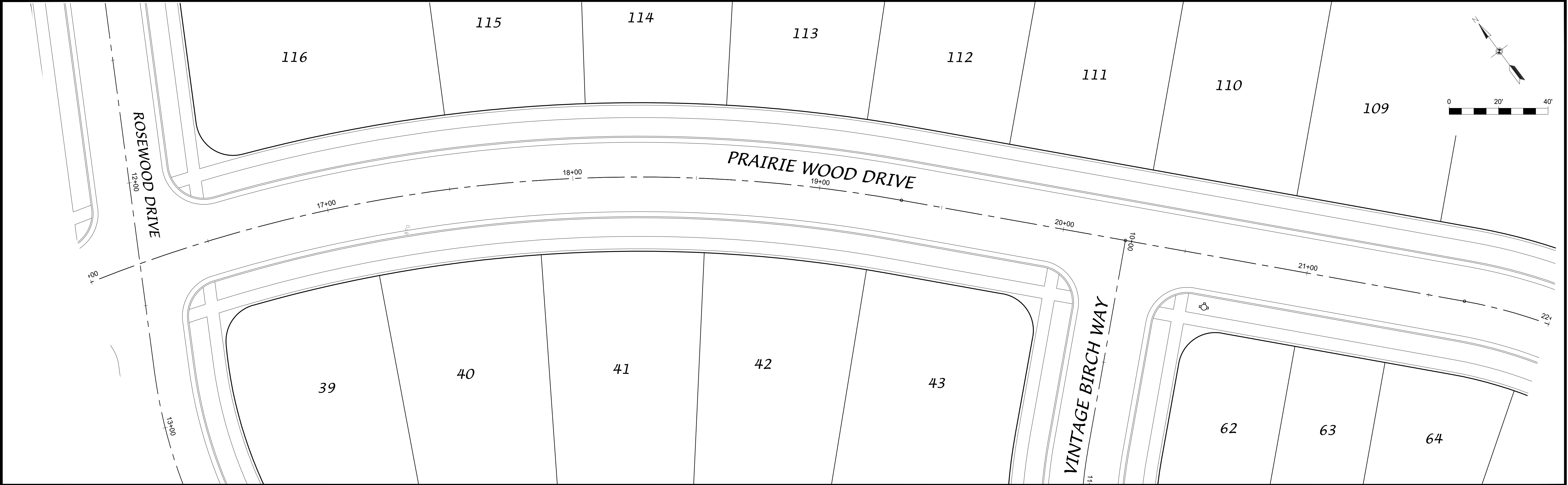
DATE: 04/07/20
REVISED:

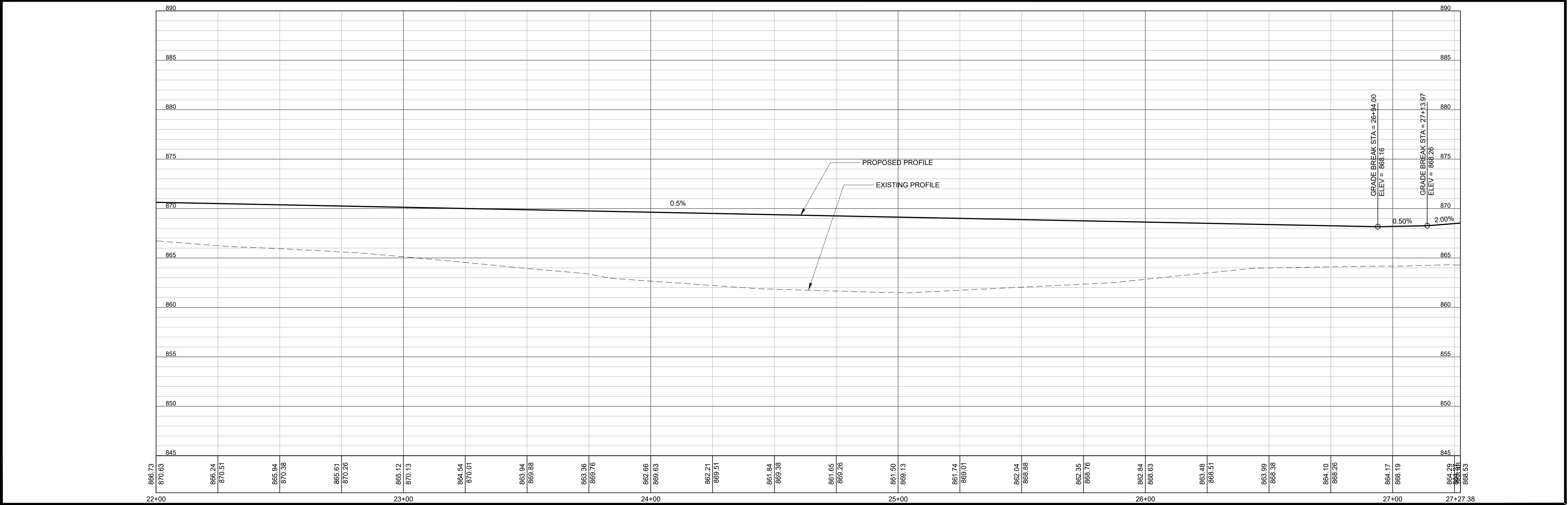
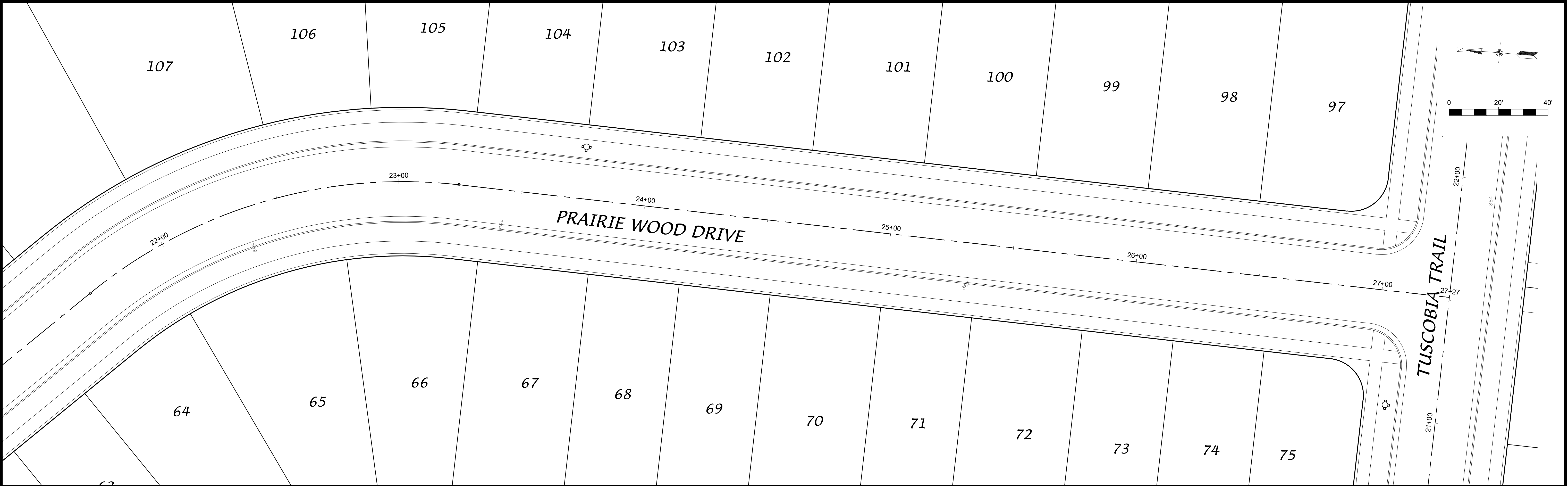
DRAWN BY: KWB

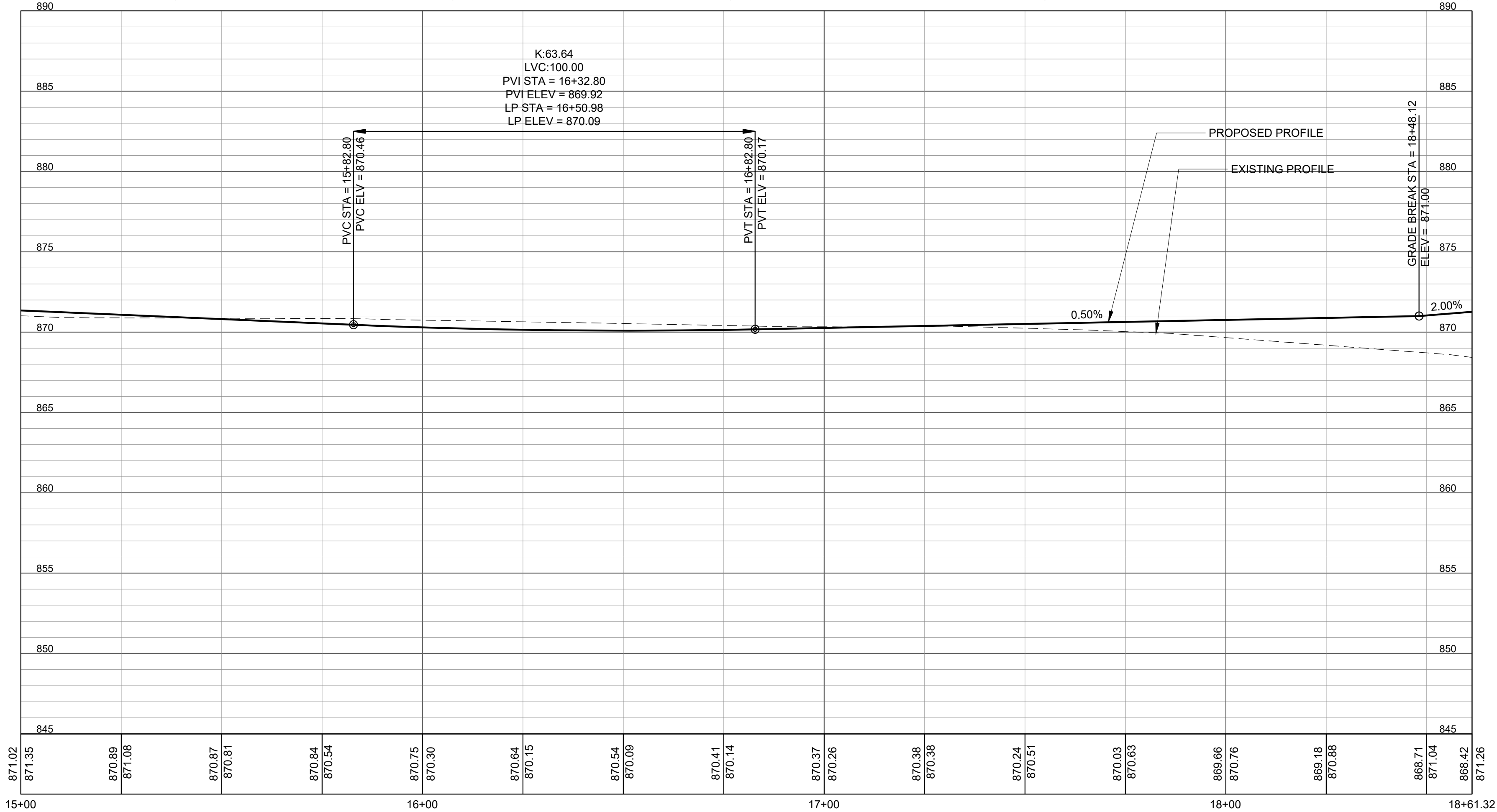
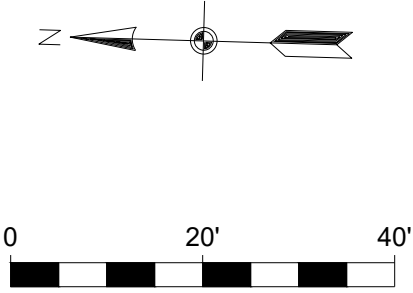
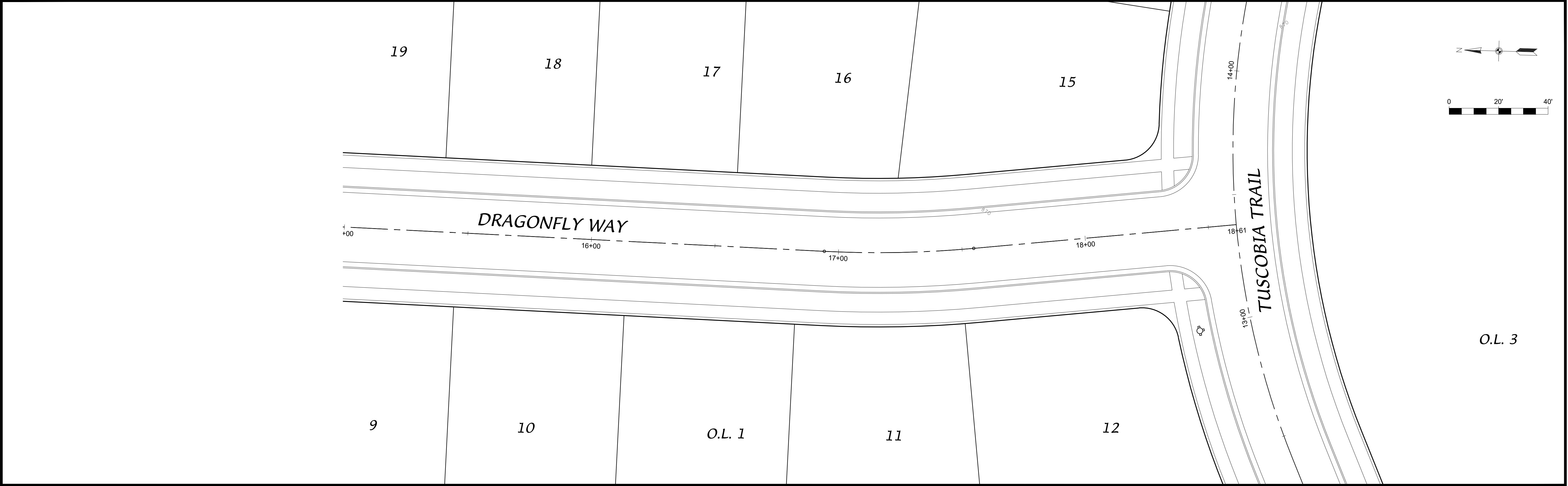
FN: 19-04-113

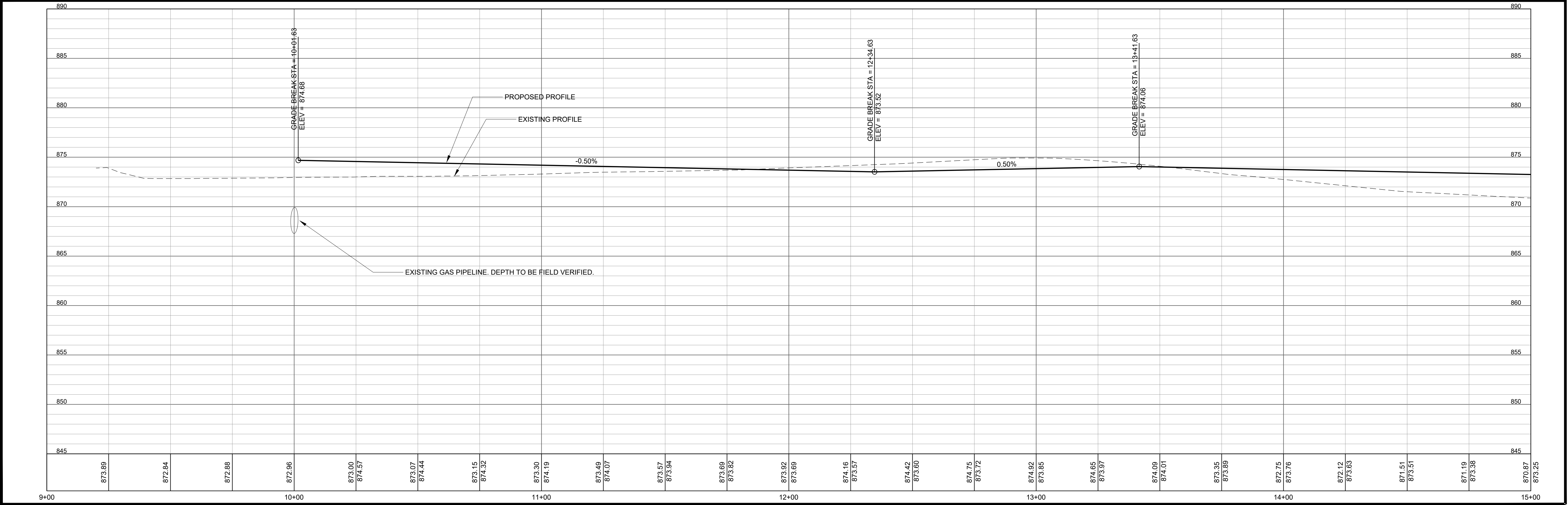
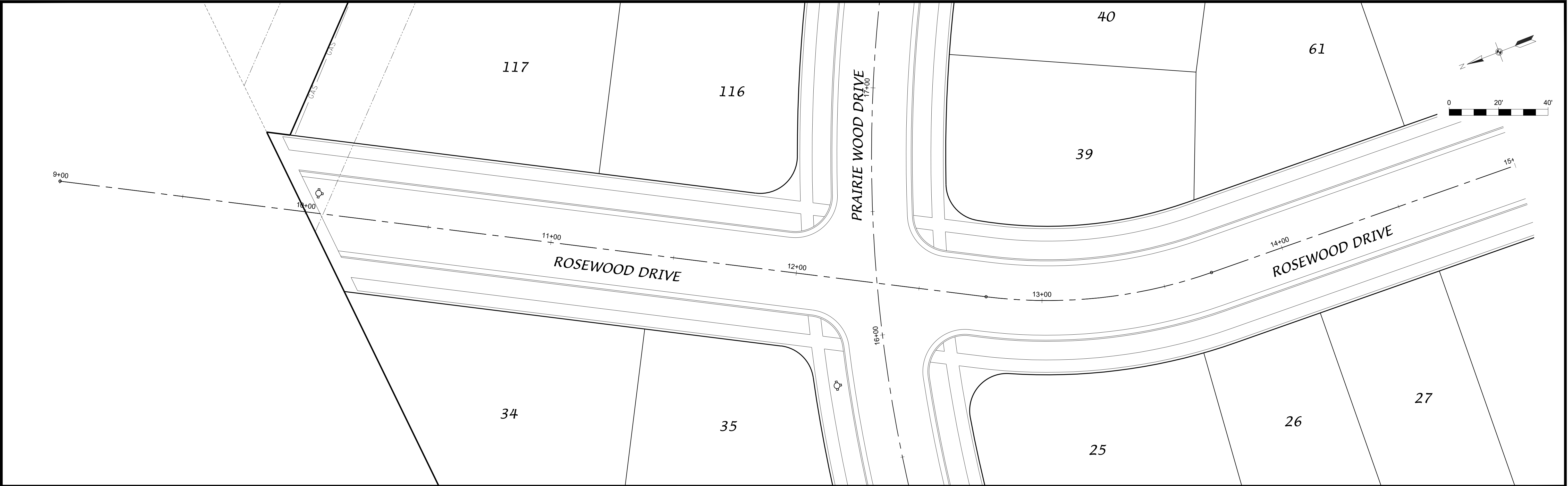
Sheet Number:
6 of 18

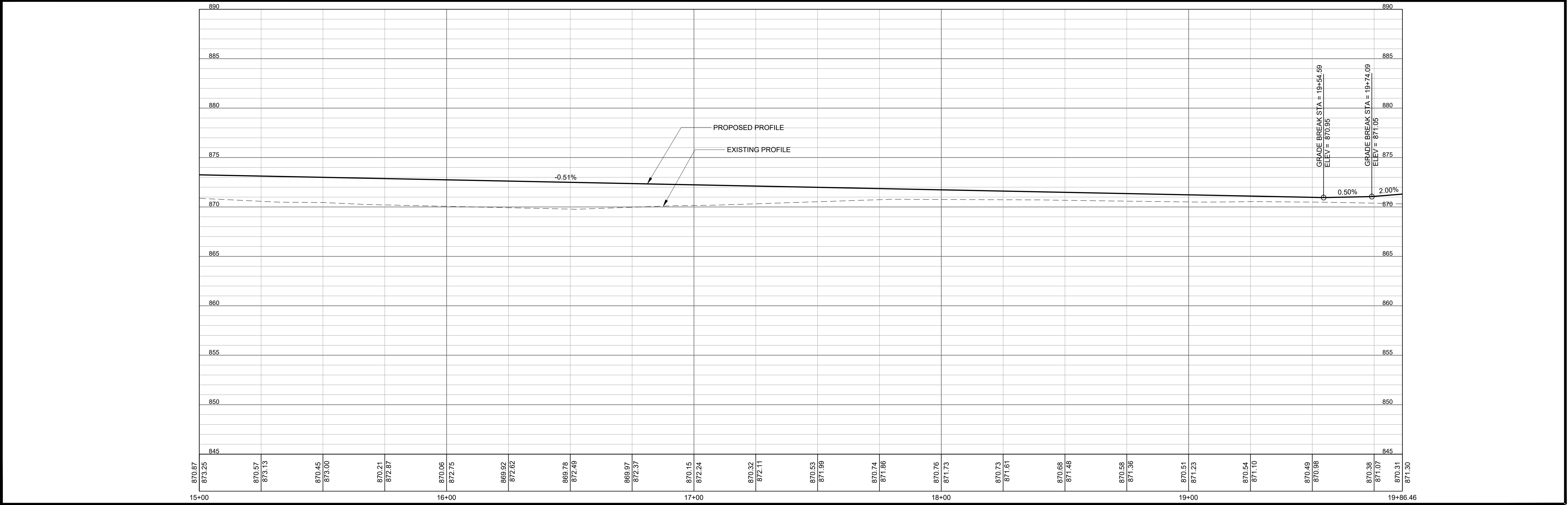
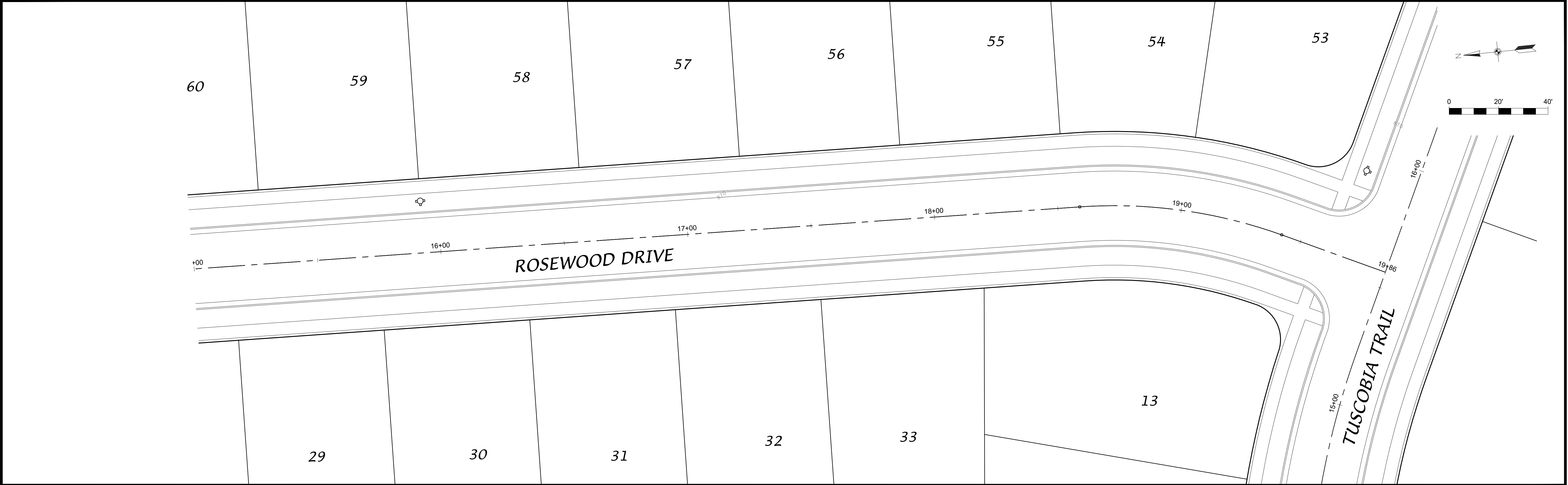


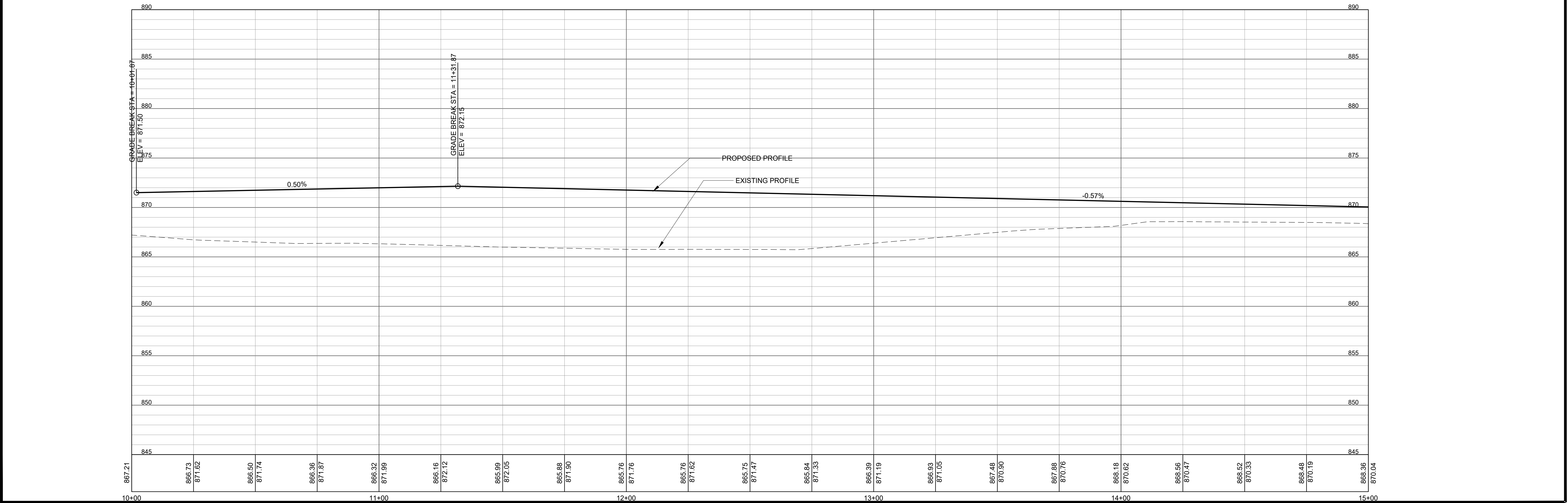
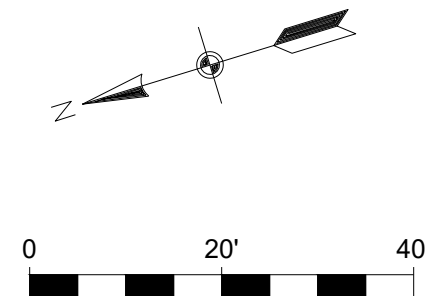
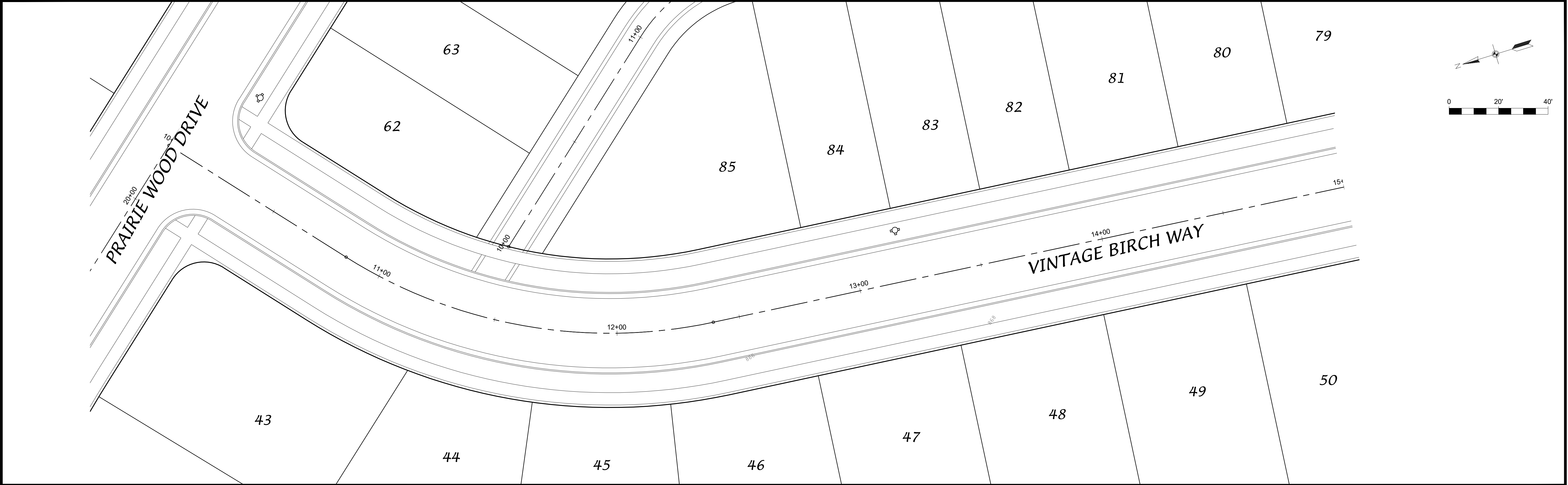


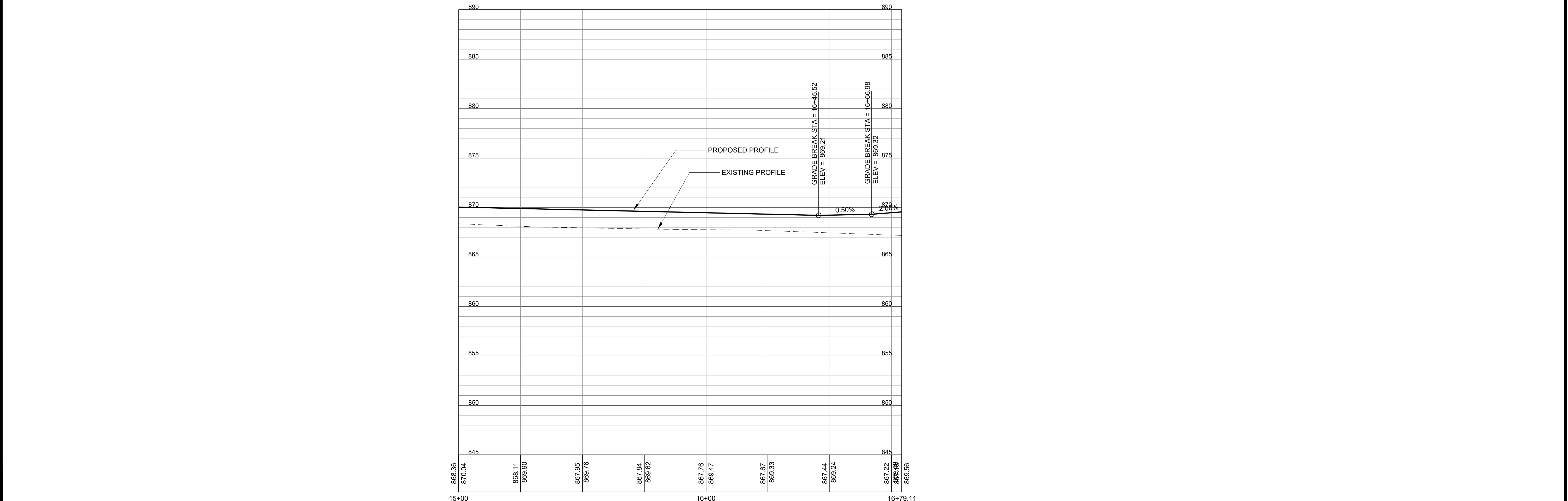
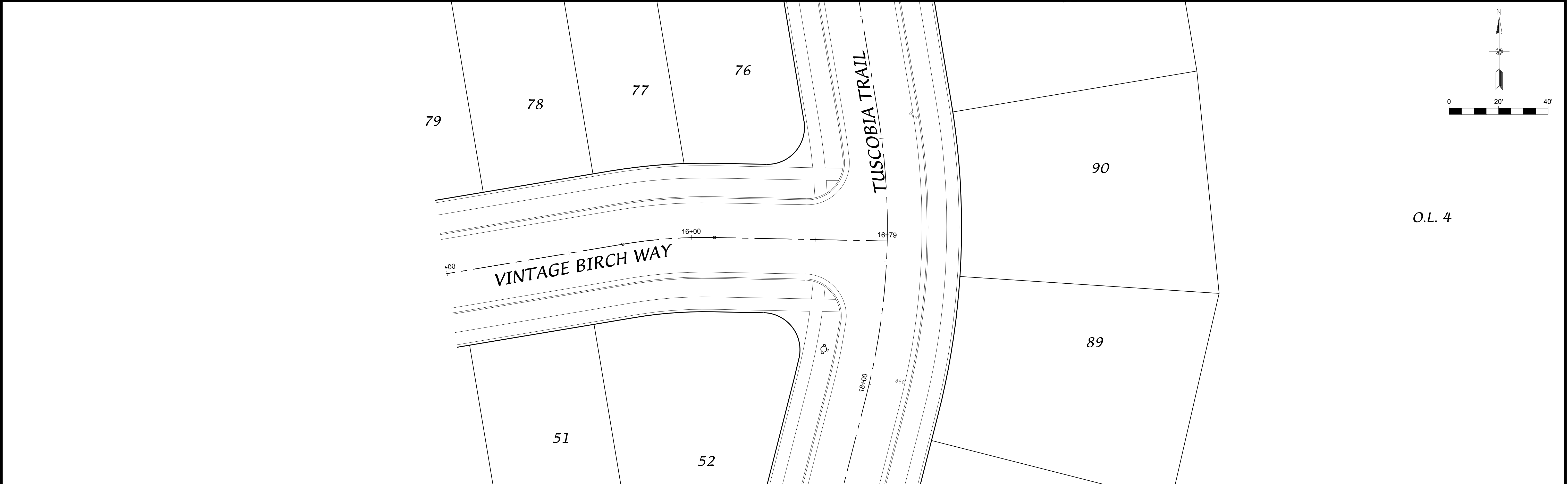


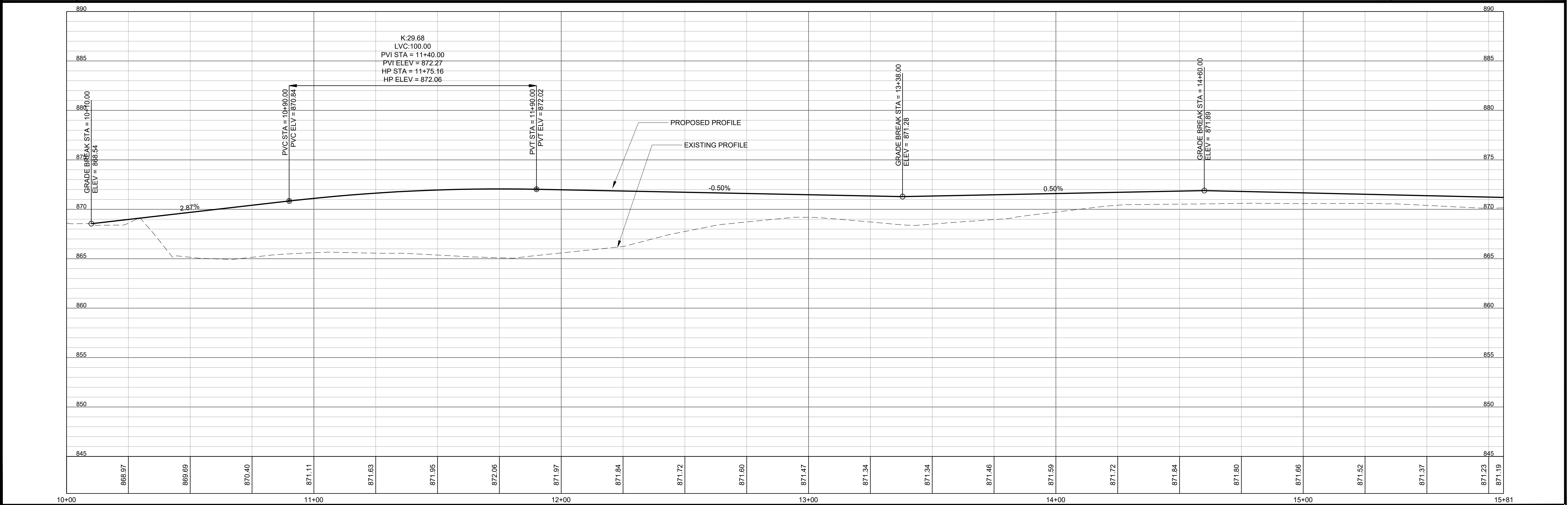
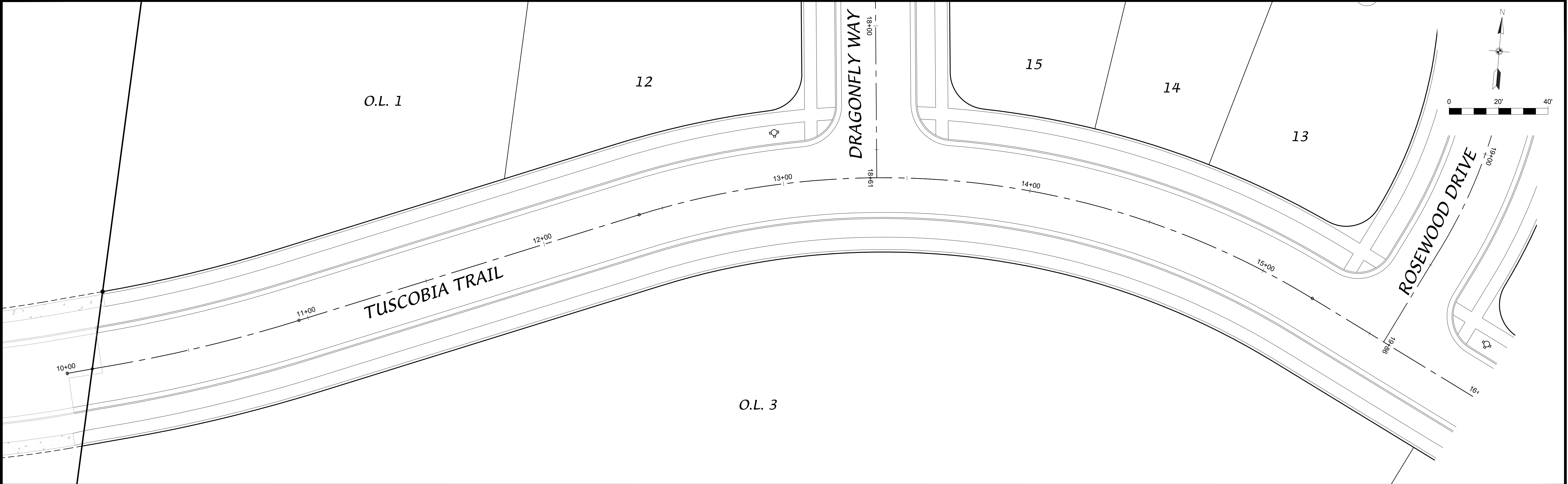


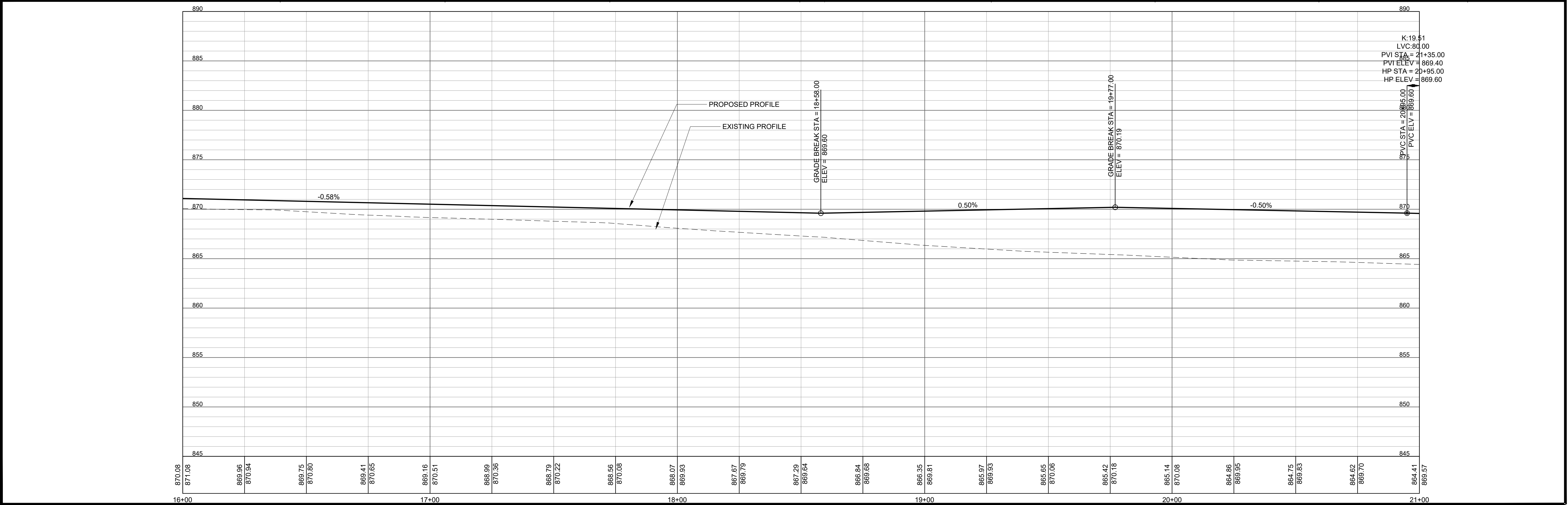
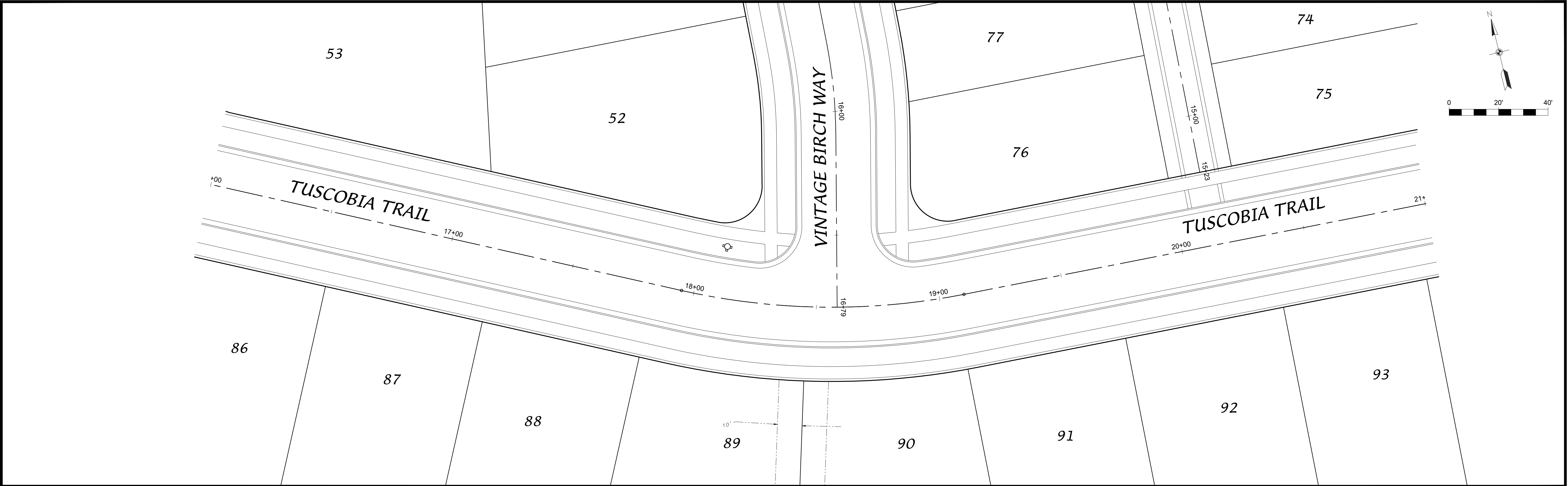


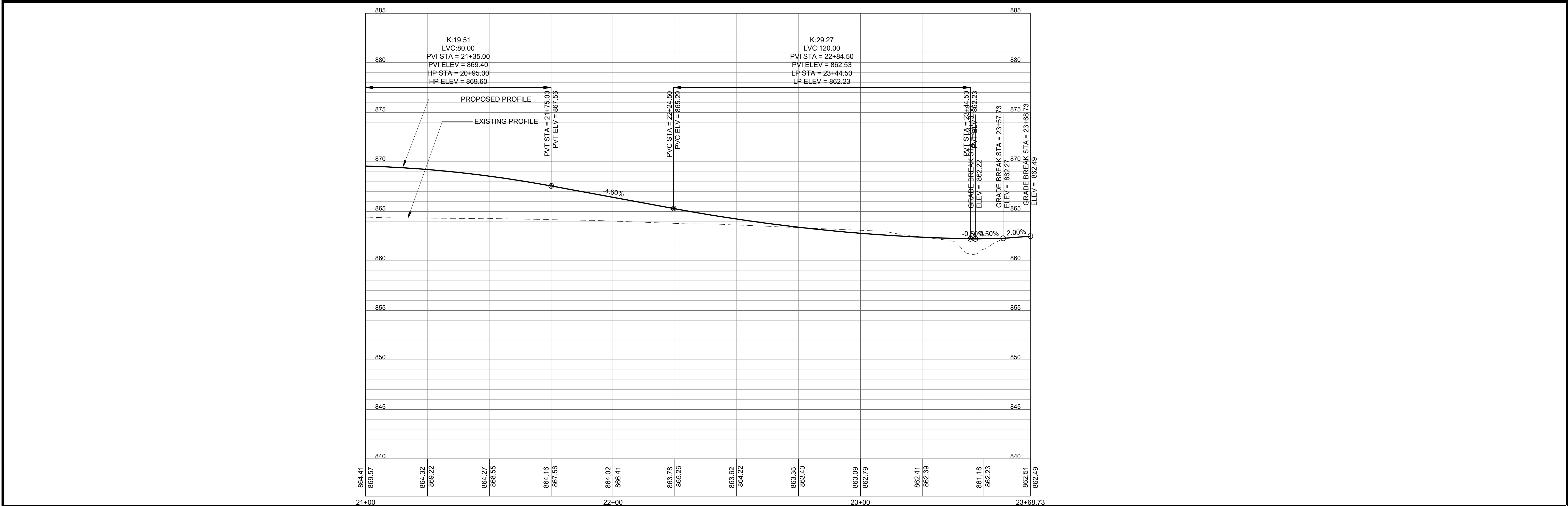
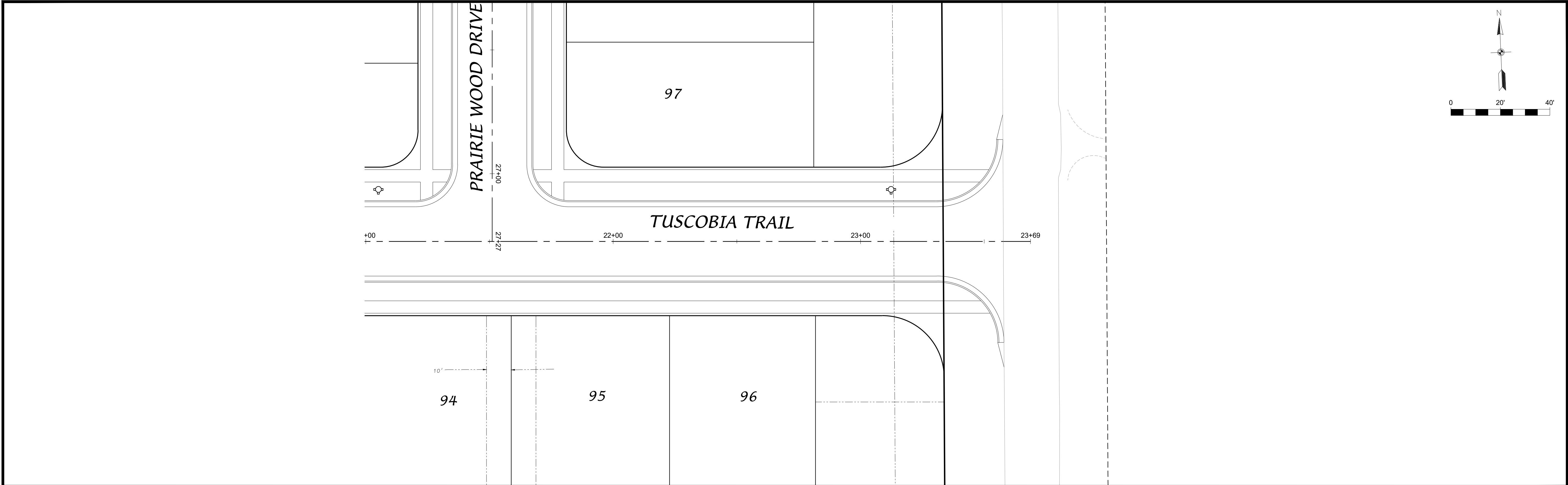












**ROSEWOOD FIELDS
VILLAGE OF MCFARLAND
COUNTY HWY AB
DANE COUNTY, WISCONSIN**

PRELIMINARY STORM WATER MANAGEMENT REPORT

OWNER

**VH Rosewood Fields, LLC
c/o Chris Ehlers
6801 South Towne Drive
Madison, WI 53713**

April 7, 2020

PREPARED BY

**D'Onofrio, Kottke & Associates, Inc.
7530 Westward Way
Madison, Wisconsin 53717
608.833.7530**

FN: 19-04-113

TABLE OF CONTENTS

Introduction.....	Page 3
Standards & Results.....	Page 4
Storm Water Management Measures	Page 6
Peak Flow Comparison Chart.....	Page 7
Conclusions.....	Page 7

EXHIBITS

1. Site Location Map
2. Site Soils Map
3. Existing Drainage Plan
4. Proposed Drainage Plan
5. Detention/Infiltration Basin Layout
6. Aerial Photo
7. USGS Map
8. Wetland Indicator Map

APPENDICES

- A. Detention Pond & Infiltration Basin Details
- B. Sediment Reduction Calculations
- C. Infiltration Design
- D. Hydrocad Output
- E. Soils Report
- F. Wetland Report
- G. Draft Maintenance Agreement

INTRODUCTION

The intent of this report is to provide details on how the proposed “Rosewood Fields” residential plat will be developed so that it is constructed in accordance with applicable storm water management standards.

The proposed development is approximately a 36 acre residential plat located in the Village of McFarland. The site is located to the east of the Park View Estates plat, north of the Wisconsin and Southern railroad tracks and west of County Hwy AB in the NE $\frac{1}{4}$ of the SE $\frac{1}{4}$ of Section 2 Township 06N, Range 10E. More specifically parcel number 0610-024-8070-0. A project location map can be found in Exhibit #1.

The existing layout of the site consists mostly of agricultural tilled land with surface water generally draining to the south and east sides of the site and eventually out of the plat. The drainage is split by a ridge running through the middle of the site from the north to south. In developed conditions the plat will create single family lots, 2-stormwater outlots and open space/parkland. The runoff from the plat will mostly be routed to wet detention/infiltration basin systems for stormwater treatment prior to leaving the site. The soil conditions on site consist of hydrologic soil group type B soils, with some type C soils. A site soils map can be found in Exhibit #2.

The proposed future improvements for this plat require land disturbing activity in excess of one acre and the future cumulative addition of 20,000 square feet of impervious surface area. Therefore, according to the Village of McFarland and State of Wisconsin ordinances, the site requires storm water management approvals and permits.

STANDARDS & RESULTS

The proposed development requires the following storm water management performance standards.

Sediment Control

Standard: Reduce, to the maximum extent practical, total suspended solids load leaving the site by eighty percent (80%) based on the average annual rainfall.

Design Results: Sediment from the site will be reduced by 80% by routing the site runoff through two wet detention basin/infiltration basin systems prior to leaving the site. A minimum of 60% of the sediment will be removed by the wet detention basins prior to entering the infiltration basins. WinSLAMM was used to model the sediment load reduction. The basin system was sized to compensate for any stormwater that drains directly offsite. See appendix B for sediment reduction calculations.

Temperature Control

Standard: For development of sites within thermally sensitive areas, provisions and practices to reduce the temperature of the storm water runoff shall be included.

Design Results: The proposed site does not fall within a defined thermally sensitive area.

Runoff Rate Control

Standard: For new developments, storm water management practices shall be designed and implemented to maintain post-development peak runoff discharge rates at predevelopment rates for the 1, 2, 10, 25 and 100 year-24 hour design storm events.

Design Results: The proposed detention basin system was designed to maintain the development's existing peak runoff rates for the 1, 2, 10, 25 and 100 year- 24 hour storm events. The peak flow comparison chart for the site can be found in the stormwater management measures section of this report and the HydroCAD output can be found within Appendix D. The soil curve number for the post development lawn areas has been dropped by a soil class to 71.

The existing and proposed runoff curve numbers used for this development are as follows:

Description	CN
Existing Type B Soil	58
Existing Type C Soil	71
Impervious Area	98
Proposed 60% Impervious Residential	87
Proposed 70% Impervious Residential	90
Proposed Park Area/ Assumed 10% Impervious	74
Proposed 10% Impervious Lightly Disturbed Areas	62

Along with analyzing the plat drainage information, the offsite stormwater draining through and around the site was also included in the model.

Infiltration

Standard: For new developments, design practices to infiltrate sufficient runoff volume so the post-development infiltration volume shall be at least 90% of the predevelopment infiltration volume.

Design Results: The proposed development was designed to meet the 90% stayon requirement for the plat through two infiltration basins. The infiltration basins were sized using WinSLAMM modeling software. A minimum of 60% sediment reduction will occur in the proposed wet detention basin cells prior to entering the designed infiltration basins. The basin system was sized to compensate for any stormwater that drains directly offsite. The infiltration design calculations can be found in Appendix C.

STORM WATER MANAGEMENT MEASURES

The proposed plat was modeled as five drainage areas in developed conditions and as two drainage areas in pre-developed conditions. The stormwater from the site will be treated by routing runoff to two wet detention/infiltration basin systems located at the west and southeast sides of the plat. Peak flow, sediment reduction, and stayon requirements will be met for the entire plat with this system.

HydroCAD Stormwater Modeling software has been used to analyze the stormwater runoff characteristics for the development. HydroCAD uses the TR-55 methodology for determining peak discharge rates. The model output shows the runoff leaving the site in existing and proposed conditions. The site was designed to utilize two combination wet detention basin and infiltration basin systems prior to leaving the site in proposed conditions. In these systems, the wet detention chamber in each basin will limit flow into the infiltration basin chamber for the 1yr-24hr storm event to remove sediment before entering the infiltration basin. During larger storms, the two chambers in the basin systems will act as one basin to limit peak flow from the site (see basin details in Appendix A). The detention and infiltration basins were modeled dynamically to better represent the elevations of the two chambers working together. The peak flow results from the stormwater modeling and basin design are shown in the chart on the next page. The chart shows the proposed results from each individual drainage area along with a comparison of the overall existing and proposed peak flows leaving at the edge of the site. The detention basin system will maintain the combined existing peak runoff rates leaving the plat on south, east and overall for the 1, 2, 10, 25 and 100 year- 24 hour storm events.

The offsite west, northeast and north drainage areas were also included in this model to show how the offsite water will be routed through the site. A bypass channel was sized to route this offsite water around the west side of the site, through two culverts under Tuscobia Trail and eventually to the south where it flows in existing conditions.

Infiltration modeling for the site was calculated using WinSLAMM software and meets the 90% predevelopment standard per the ordinance. The infiltration basins will be implemented when at a minimum 75% of the plat area draining to the basin is complete. WinSLAMM was also used to perform the sediment reduction calculations for the proposed basin system. Appendix B contains the calculation results. The stormwater management system will provide 80% sediment removal for the plat.

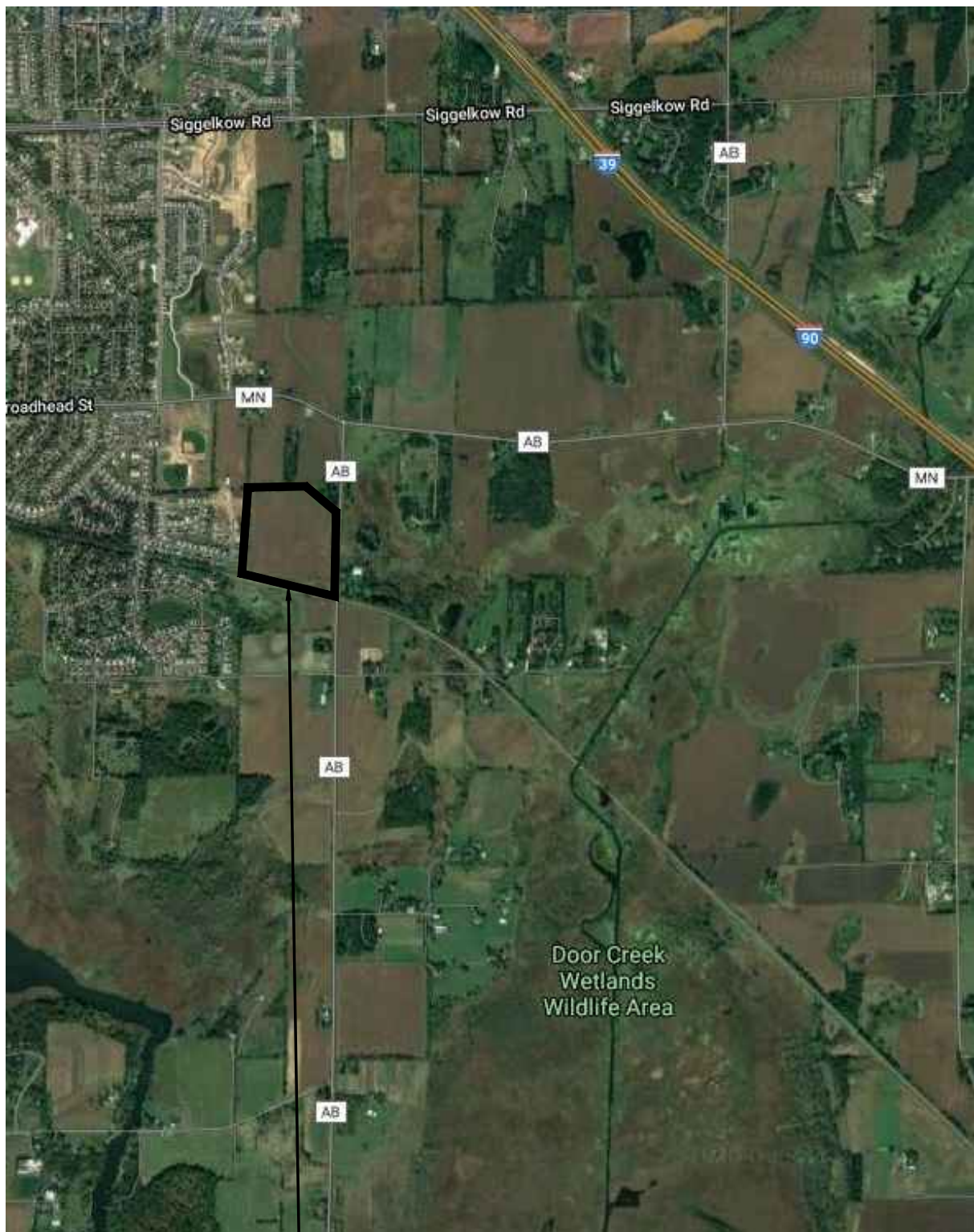
PEAK FLOW COMPARISION CHART

24-HR STORM EVENT (PEAK FLOW IN CFS)-PEAK FLOW COMPARISION					
	1YR	2YR	10YR	25YR	100YR
TOTAL EXISTING COMBINED FLOW THOUGH SITE	4.35	9.71	45.73	83.98	166.65
TOTAL PROPOSED COMBINED FLOW WITH BASIN TREATMENT	2.75	6.00	31.79	62.21	120.58
TOTAL PROPOSED COMBINED FLOW WITHOUT DETENTION	46.73	57.96	103.66	143.23	221.56
TOTAL EXISTING FLOW LEAVING SOUTH SIDE OF SITE	3.09	7.09	34.57	64.14	128.47
TOTAL PROPOSED/TREATED FLOW LEAVING SOUTH SIDE OF SITE	2.29	5.03	28.75	56.78	110.42
TOTAL EXISTING FLOW LEAVING EAST SIDE OF SITE	1.53	3.22	13.7	24.07	45.72
TOTAL PROPOSED FLOW LEAVING EAST SIDE OF SITE	1.07	2.09	7.66	12.86	23.52
OFFSITE FLOWS					
EXISTING WEST OFFSITE DRAINAGE	0.4	0.97	5.42	10.27	20.81
EXISTING NW OFFSITE DRAINAGE	1.34	3.2	16.34	30.61	61.96
EXISTING N OFFSITE DRAINAGE	0.59	1	2.96	4.7	8.21
EXISTING NE OFFSITE DRAINAGE	0.86	1.72	6.22	10.39	18.89
FLOW TO WEST BYPASS CHANNEL	1.76	4.07	20.54	38.53	78.16
PRO FLOWS DIRECTLY OFFSITE					
PRO SOUTH DIRECTLY OFFSITE	0.66	1.22	4.24	7.11	13.05
PRO EAST DIRECTLY OFFSITE	0.29	0.55	1.94	3.24	5.94
WEST WET DETENTION BASIN: OUTLET = 867.0, TOP OF BERM = 871.0					
PROPOSED FLOW INTO DETENTION	13.72	17.15	30.36	40.49	58.97
ROUTED DETENTION	0.44	0.50	4.06	11.59	22.22
ELEVATION	868.26	868.58	869.19	869.44	870.12
WEST INFILTRATION BASIN: BOTTOM = 866.0, OUTLET = 867.0, TOP OF BERM = 871.0					
ROUTED INFILTRATION OFFSITE	0.41	0.47	2.86	6.21	9.09
ELEVATION	867.27	867.30	867.88	868.77	870.10
EAST WET DETENTION BASIN: OUTLET = 862.0, TOP OF BERM = 866.0					
PROPOSED FLOW INTO DETENTION	33.13	40.59	67.99	88.35	124.79
ROUTED DETENTION	1.85	2.11	16.76	25.39	58.85
ELEVATION	863.55	863.9	864.5	864.97	865.63
EAST INFILTRATION BASIN: BOTTOM = 861.0, OUTLET = 862.0, TOP OF BERM = 866.0					
ROUTED INFILTRATION OFFSITE	1.56	1.82	8.24	10.85	19.36
ELEVATION	862.54	862.60	863.64	864.35	865.58

CONCLUSIONS

As the results indicate, the storm water management system for the proposed development meets the Village of McFarland and State of Wisconsin Ordinances. The peak flow, sediment control and infiltration requirements will be met for this site at the time of development.

EXHIBITS



PROJECT LOCATION

LOCATION MAP

ROSEWOOD FIELDS

VILLAGE OF MCFARLAND, WISCONSIN

D'ONOFRIO KOTTKE AND ASSOCIATES, INC.

7530 Westward Way, Madison, WI 53717

Phone: 608.833.7530 • Fax: 608.833.1089

YOUR NATURAL RESOURCE FOR LAND DEVELOPMENT

DRAWN BY: GVP

EXHIBIT 1



SOILS MAP

ROSEWOOD FIELDS

VILLAGE OF MCFARLAND, WISCONSIN

D'ONOFRIO KOTTKE AND ASSOCIATES, INC.

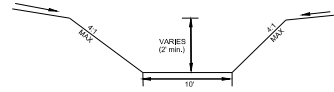
7530 Westward Way, Madison, WI 53717
Phone: 608.833.7530 • Fax: 608.833.1089

YOUR NATURAL RESOURCE FOR LAND DEVELOPMENT

DRAWN BY: GVP

EXHIBIT 2

OFFSITE WEST AND NORTHWEST TO BE ROUTED THROUGH THE SITE DOWNSTREAM OF SITE STORMWATER CONTROLS



WEST BYPASS CHANNEL
SECTION @ 0.55%
NOT TO SCALE

WEST BYPASS CHANNEL

PROPOSED WEST DETENTION BASIN

TOP OF POND BERM - 871.00, AREA = 32,596 SQFT
TOP OF WET POND/OUTLET - 867.00, AREA = 15,467 SQFT
BOTTOM OF WET POND - 865.00

WEST DETENTION BASIN OUTLET STRUCTURES:
ROUTED TO INFILTRATION BASIN:
48" STANDPIPE
RIM = 869.00
W/4" ORIFICE @ 867.00
18" OUTLET PIPE @ 866.00
30' EQUALIZATION BERM @ 869.75

WEST INFILTRATION BASIN OUTLET STRUCTURES:
1-15" CULVERTS @ 867.00
5' OVERFLOW WEIR @ 870.00
8" CAPPED EMERGENCY DRAIN(DAYLIGHT) @ 866.00

PROPOSED WEST INFILTRATION BASIN W/ 12"
DEPRESSION ZONE
3,624 SQFT @ 866.00
10,466 SQFT (TOP OF BERM) @ 871.00

2 - 36" CULVERTS WITH ENDSECTIONS
UPSTREAM INV = 966.00
DOWNSTREAM INV = 965.00

PROPOSED EAST INFILTRATION BASIN W/ 12"
DEPRESSION ZONE
8,400 SQFT @ 861.00
19,855 SQFT (TOP OF BERM) @ 866.00

INFILTRATION BASIN OUTLET STRUCTURES:
1-18" CULVERTS @ 862.00
8" CAPPED EMERGENCY DRAIN(DAYLIGHT) @ 861.00
4' OVERFLOW WEIR @ 865.00

PROPOSED EAST DETENTION BASIN
TOP OF POND BERM - 866.00, AREA = 50,568 SQFT
TOP OF WET POND/OUTLET - 862.00, AREA = 30,928 SQFT
BOTTOM OF WET POND - 856.00

EAST DETENTION BASIN OUTLET STRUCTURES
ROUTED TO INFILTRATION BASIN:
48" STANDPIPE
RIM = 864.00
W/8" ORIFICE @ 862.00
24" OUTLET PIPE @ 861.00
20' EQUALIZATION BERM @ 864.75



DETENTION/INFILTRATION BASIN LAYOUT
ROSEWOOD FIELDS
COUNTY HWY AB
VILLAGE OF MCFAIRLAND, WISCONSIN



0 100

DATE: 04/07/20
REVISED:

DRAWN BY: GYP

FN: 19-04-113

Sheet Number:

Exhibit 5



AERIAL MAP

UTTERBACK PROPERTY

VILLAGE OF MCFARLAND, WISCONSIN

D'ONOFRIO KOTTKE AND ASSOCIATES, INC.

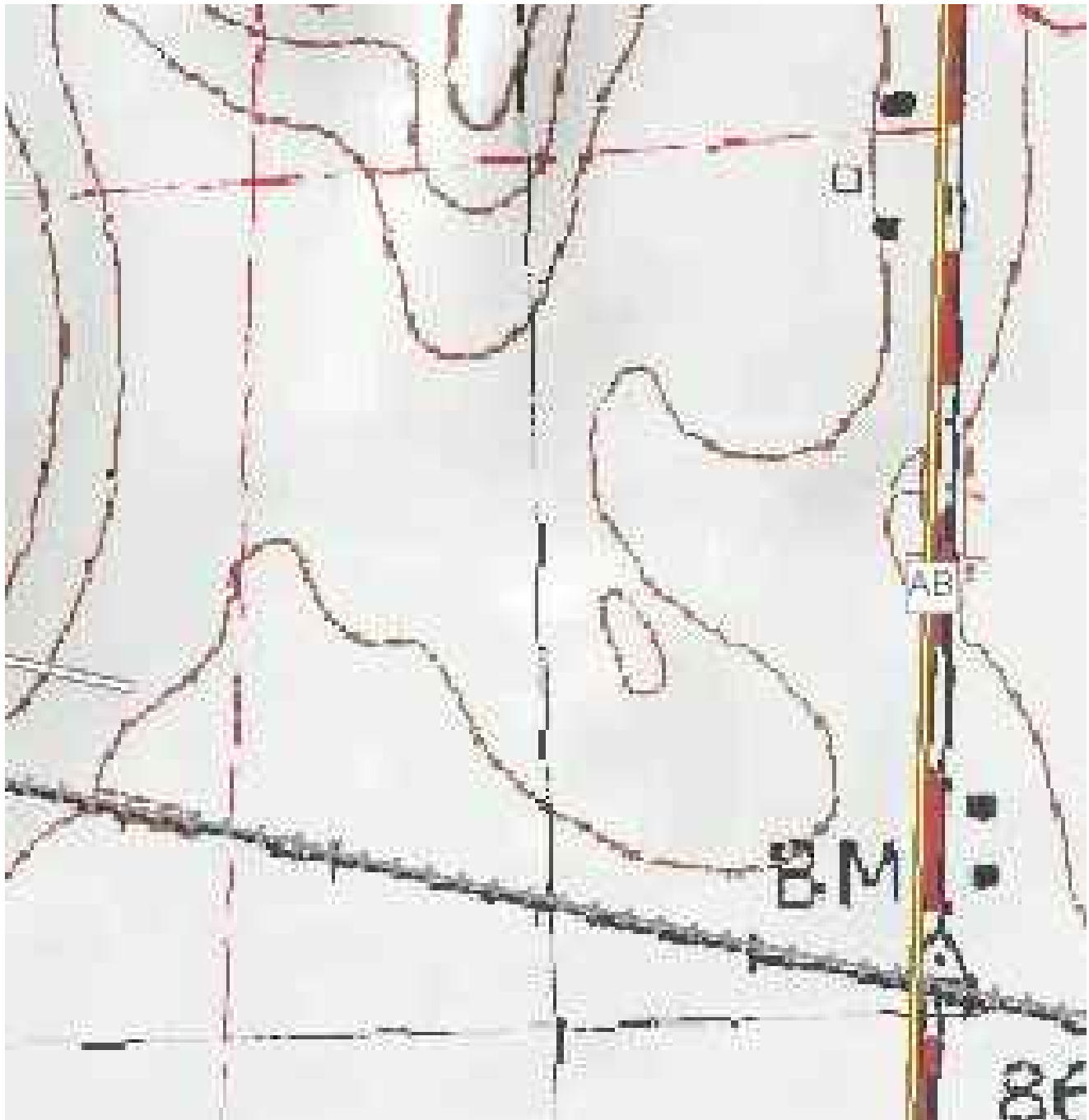
7530 Westward Way, Madison, WI 53717

Phone: 608.833.7530 • Fax: 608.833.1089

YOUR NATURAL RESOURCE FOR LAND DEVELOPMENT

DRAWN BY: GVP

EXHIBIT 6



USGS MAP

ROSEWOOD FIELDS

VILLAGE OF MCFARLAND, WISCONSIN

D'ONOFRIO KOTTKE AND ASSOCIATES, INC.

7530 Westward Way, Madison, WI 53717
Phone: 608.833.7530 • Fax: 608.833.1089

YOUR NATURAL RESOURCE FOR LAND DEVELOPMENT

DRAWN BY: GVP

EXHIBIT 7



D'ONOFRIO KOTTKE AND ASSOCIATES, INC.

7530 Westward Way, Madison, WI 53717

Phone: 608.833.7530 • Fax: 608.833.1089

YOUR NATURAL RESOURCE FOR LAND DEVELOPMENT

WETLAND INDICATOR MAP

ROSEWOOD FIELDS

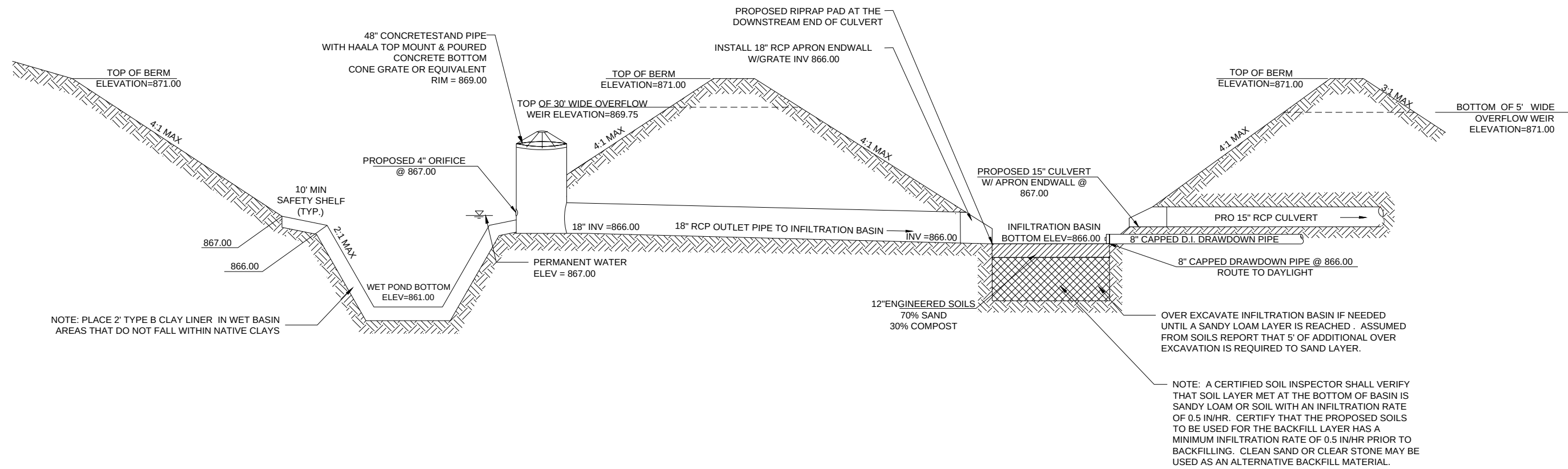
VILLAGE OF MCFARLAND, WISCONSIN

DRAWN BY: GVP

EXHIBIT 8

APPENDIX A

DETENTION POND & INFILTRATION BASIN DETAILS



PROFILE VIEW

PROPOSED WEST WET DETENTION BASIN & INFILTRATION BASIN

NOT TO SCALE

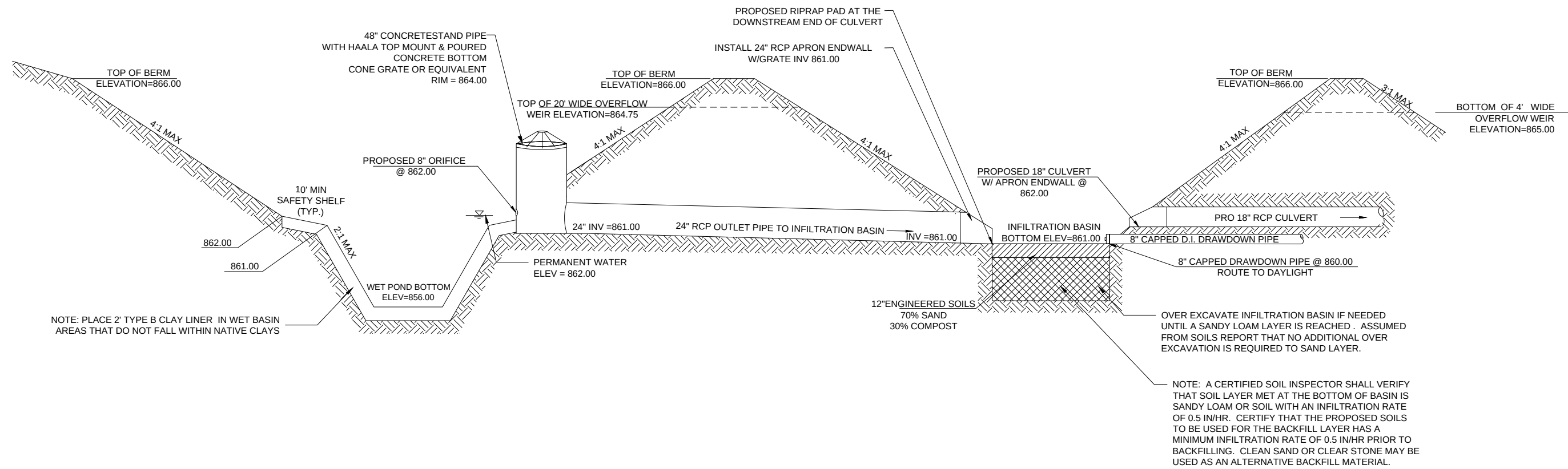
DATE: 04/03/20
REVISED:

DRAWN BY: GVP

FN: 19-04-113

Sheet Number:

APP A-1



PROFILE VIEW

PROPOSED EAST WET DETENTION BASIN & INFILTRATION BASIN

NOT TO SCALE

APPENDIX B

SEDIMENT REDUCTION CALCULATIONS

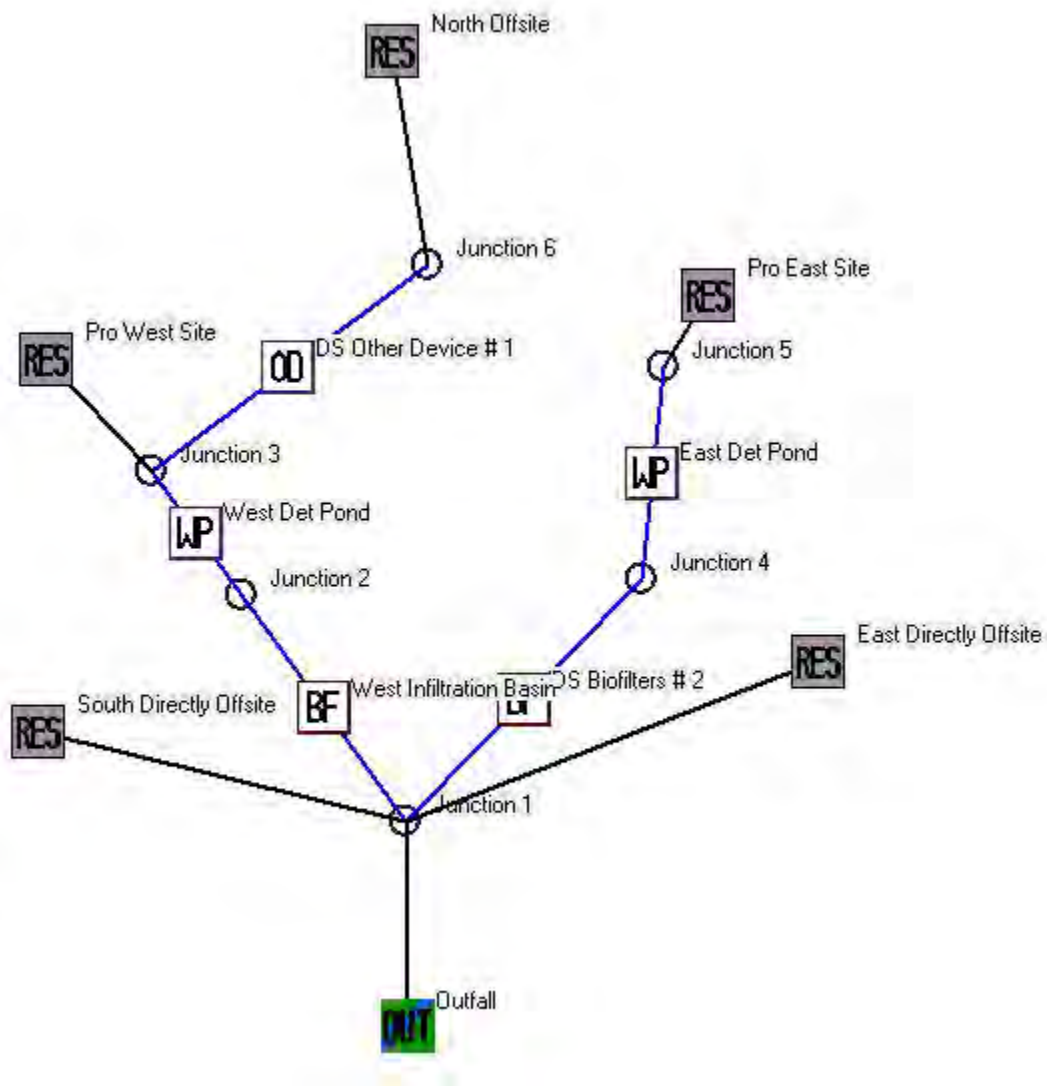
DETENTION BASIN SEDIMENTATION REDUCTION CALCULATIONS (WINSLAMM)

WinSlamm Design

The following WinSlamm design shows that 80% of sediment is being removed from the proposed site

Total site sediment reduction in developed conditions = 83.56%

Model Schematic:



Model Input Information:

Data file name: U:\User\1904113\Engineering\SWMP\Sed Pro Utterback Slamm.mdb
WinSLAMM Version 10.4.1
Rain file name: C:\WinSLAMM Files\Rain Files\WisReg - Madison WI 1981.RAN
Particulate Solids Concentration file name: C:\WinSLAMM Files\v10.1 WI_AVG01.pscx
Runoff Coefficient file name: C:\WinSLAMM Files\WI_SL06 Dec06.rsvx
Residential Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Institutional Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Commercial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Industrial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Other Urban Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Freeway Street Delivery file name: C:\WinSLAMM Files\Freeway Dec06.std
Apply Street Delivery Files to Adjust the After Event Load Street Dirt Mass Balance: False
Pollutant Relative Concentration file name: C:\WinSLAMM Files\WI_GEO03.ppdpx
Source Area PSD and Peak to Average Flow Ratio File: C:\WinSLAMM Files\NURP Source Area PSD Files.csv
Cost Data file name:
Seed for random number generator: -42
Study period starting date: 01/01/81 Study period ending date: 12/31/81
Start of Winter Season: 12/02 End of Winter Season: 03/12
Date: 04-02-2020 Time: 16:41:46
Site information:

LU# 1 - Residential: Pro West Site Total area (ac): 8.500
1 - Roofs 1: 1.190 ac. Pitched Disconnected Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
2 - Roofs 2: 0.610 ac. Pitched Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
25 - Driveways 1: 0.790 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
31 - Sidewalks 1: 0.230 ac. Disconnected Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
37 - Streets 1: 1.010 ac. Intermediate Street Length = 0.768 curb-mi Street Width (assuming two curb-mi per street mile) = 21.69922 ft
Default St. Dirt Accum. Annual Winter Load = 2500 lbs Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
45 - Large Landscaped Areas 1: 4.180 ac. Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
70 - Water Body Areas: 0.490 ac. Source Area PSD File:

LU# 2 - Residential: Pro East Site Total area (ac): 18.700
1 - Roofs 1: 3.390 ac. Pitched Disconnected Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
2 - Roofs 2: 1.740 ac. Pitched Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
25 - Driveways 1: 2.260 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
31 - Sidewalks 1: 0.150 ac. Disconnected Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
37 - Streets 1: 2.870 ac. Intermediate Street Length = 1.713 curb-mi Street Width (assuming two curb-mi per street mile) = 27.64448 ft
Default St. Dirt Accum. Annual Winter Load = 2500 lbs Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
45 - Large Landscaped Areas 1: 7.390 ac. Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
70 - Water Body Areas: 0.900 ac. Source Area PSD File:

LU# 3 - Residential: South Directly Offsite Total area (ac): 6.600
1 - Roofs 1: 0.050 ac. Pitched Disconnected Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
2 - Roofs 2: 0.030 ac. Pitched Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
31 - Sidewalks 1: 0.620 ac. Disconnected Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
37 - Streets 1: 0.040 ac. Intermediate Street Length = 0.044 curb-mi Street Width (assuming two curb-mi per street mile) = 15 ft
Default St. Dirt Accum. Annual Winter Load = 2500 lbs Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
45 - Large Landscaped Areas 1: 5.860 ac. Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

LU# 4 - Residential: East Directly Offsite Total area (ac): 2.500
31 - Sidewalks 1: 0.240 ac. Disconnected Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
37 - Streets 1: 0.070 ac. Intermediate Street Length = 0.044 curb-mi Street Width (assuming two curb-mi per street mile) = 26.25 ft
Default St. Dirt Accum. Annual Winter Load = 2500 lbs Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
45 - Large Landscaped Areas 1: 2.190 ac. Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

LU# 5 - Residential: North Offsite Total area (ac): 2.900
45 - Large Landscaped Areas 1: 2.900 ac. Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

Control Practice 1: Wet Detention Pond CP# 1 (DS) - West Det Pond
Particle Size Distribution file name: Not needed - calculated by program
Initial stage elevation (ft): 6
Peak to Average Flow Ratio: 3.8
Maximum flow allowed into pond (cfs): No maximum value entered
Outlet Characteristics:

- Outlet type: Orifice 1
1. Orifice diameter (ft): 0.33
 2. Number of orifices: 1
 3. Invert elevation above datum (ft): 6
- Outlet type: Broad Crested Weir
1. Weir crest length (ft): 30
 2. Weir crest width (ft): 10
 3. Height from datum to bottom of weir opening: 7.75
- Outlet type: Vertical Stand Pipe
1. Stand pipe diameter (ft): 4
 2. Stand pipe height above datum (ft): 7

Pond stage and surface area

Entry Number	Stage (ft)	Pond Area (acres)	Natural Seepage (in/hr)	Other Outflow (cfs)
0	0.00	0.0000	0.00	0.00
1	0.10	0.0195	0.00	0.00
2	1.00	0.0344	0.00	0.00
3	2.00	0.0569	0.00	0.00
4	3.00	0.0894	0.00	0.00
5	4.00	0.1220	0.00	0.00
6	5.00	0.1560	0.00	0.00
7	6.00	0.3550	0.00	0.00
8	7.00	0.4490	0.00	0.00
9	8.00	0.5470	0.00	0.00
10	9.00	0.6460	0.00	0.00
11	10.00	0.7480	0.00	0.00

Control Practice 2: Biofilter CP# 1 (DS) - West Infiltration Basin

1. Top area (square feet) = 10466
2. Bottom area (square feet) = 3624
3. Depth (ft): 5
4. Biofilter width (ft) - for Cost Purposes Only: 10
5. Infiltration rate (in/hr) = 0.5
6. Random infiltration rate generation? No
7. Infiltration rate fraction (side): 0.1
8. Infiltration rate fraction (bottom): 1
9. Depth of biofilter that is rock filled (ft) 0
10. Porosity of rock filled volume = 0
11. Engineered soil infiltration rate: 0
12. Engineered soil depth (ft) = 0
13. Engineered soil porosity = 0
14. Percent solids reduction due to flow through engineered soil = 0
15. Biofilter peak to average flow ratio = 3.8
16. Number of biofiltration control devices = 1
17. Particle size distribution file: Not needed - calculated by program
18. Initial water surface elevation (ft): 0

Soil Data Soil Type Fraction in Eng. Soil

Biofilter Outlet/Discharge Characteristics:

- Outlet type: Broad Crested Weir
1. Weir crest length (ft): 5
 2. Weir crest width (ft): 10
 3. Height of datum to bottom of weir opening: 4
- Outlet type: Surface Discharge Pipe
1. Surface discharge pipe outlet diameter (ft): 1.25
 2. Pipe invert elevation above datum (ft): 1
 3. Number of surface pipe outlets: 1

Control Practice 3: Wet Detention Pond CP# 2 (DS) - East Det Pond

Particle Size Distribution file name: Not needed - calculated by program

Initial stage elevation (ft): 6

Peak to Average Flow Ratio: 3.8

Maximum flow allowed into pond (cfs): No maximum value entered

Outlet Characteristics:

- Outlet type: Orifice 1
1. Orifice diameter (ft): 0.67
 2. Number of orifices: 1
 3. Invert elevation above datum (ft): 6
- Outlet type: Broad Crested Weir
1. Weir crest length (ft): 20
 2. Weir crest width (ft): 10
 3. Height from datum to bottom of weir opening: 8.75
- Outlet type: Vertical Stand Pipe
1. Stand pipe diameter (ft): 4
 2. Stand pipe height above datum (ft): 8

Pond stage and surface area

Entry Number	Stage (ft)	Pond Area (acres)	Natural Seepage (in/hr)	Other Outflow (cfs)
0	0.00	0.0000	0.00	0.00
1	0.10	0.2030	0.00	0.00
2	1.00	0.2380	0.00	0.00
3	2.00	0.2750	0.00	0.00
4	3.00	0.3130	0.00	0.00
5	4.00	0.3520	0.00	0.00
6	5.00	0.3900	0.00	0.00
7	6.00	0.7100	0.00	0.00
8	7.00	0.8190	0.00	0.00
9	8.00	0.9310	0.00	0.00
10	9.00	1.0440	0.00	0.00
11	10.00	1.1610	0.00	0.00

Control Practice 4: Biofilter CP# 2 (DS) - DS Biofilters # 2

1. Top area (square feet) = 19855
2. Bottom area (square feet) = 8400
3. Depth (ft): 5
4. Biofilter width (ft) - for Cost Purposes Only: 10
5. Infiltration rate (in/hr) = 0.5
6. Random infiltration rate generation? No
7. Infiltration rate fraction (side): 1
8. Infiltration rate fraction (bottom): 1
9. Depth of biofilter that is rock filled (ft) 0
10. Porosity of rock filled volume = 0
11. Engineered soil infiltration rate: 0
12. Engineered soil depth (ft) = 0
13. Engineered soil porosity = 0
14. Percent solids reduction due to flow through engineered soil = 0
15. Biofilter peak to average flow ratio = 3.8
16. Number of biofiltration control devices = 1
17. Particle size distribution file: Not needed - calculated by program
18. Initial water surface elevation (ft): 0

Soil Data Soil Type Fraction in Eng. Soil

Biofilter Outlet/Discharge Characteristics:

Outlet type: Broad Crested Weir

1. Weir crest length (ft): 10
2. Weir crest width (ft): 10
3. Height of datum to bottom of weir opening: 4

Outlet type: Surface Discharge Pipe

1. Surface discharge pipe outlet diameter (ft): 1.5
2. Pipe invert elevation above datum (ft): 1
3. Number of surface pipe outlets: 1

Control Practice 5: Other Device CP# 1 (DS) - DS Other Device # 1

- Fraction of drainage area served by device (ac) = 1.00
 Particulate Concentration reduction fraction = 1.00
 Filterable Concentration reduction fraction = 0.00
 Runoff volume reduction fraction = 0

Output Sediment Reduction:

File Name:
U:\User\1904113\Engineering\SW\MP\Sed Pro Utterback Slamm.mdb

Outfall Output Summary

	Runoff Volume (cu. ft.)	Percent Runoff Reduction	Runoff Coefficient (Rv)	Particulate Solids Conc. (mg/L)	Particulate Solids Yield (lbs)	Percent Particulate Solids Reduction
Total of All Land Uses without Controls	1.130E+06		0.25	135.9	9588	
Outfall Total with Controls	488981	56.73 %	0.11	51.62	1576	83.56 %
Current File Output: Annualized Total After Outfall Controls	490324	Years in Model Run:	1.00		1580	

Total Area Modeled (ac)
39.200

Total Control Practice Costs

Capital Cost	N/A
Land Cost	N/A
Annual Maintenance Cost	N/A
Present Value of All Costs	N/A
Annualized Value of All Costs	N/A

Receiving Water Impacts Due To Stormwater Runoff (CWP Impervious Cover Model)

	Calculated Rv	Approximate Urban Stream Classification
Without Controls	0.25	Poor
With Controls	0.11	Good

Total site sediment reduction in developed conditions = 83.56%

Data File: U:\User\1904113\Eng\slamm.mdb							
Rain File: WisReg - Madison WI							
Date: 04-02-20 Time: 4:43:38 PM							
Site Description:							
Col. #:	2	4	5	6	7	8	9
Control Practice No.	Control Practice Type	Total Inflow Volume (cf)	Total Outflow Volume (cf)	Percent Volume Reduction	Total Influent Load (lbs)	Total Effluent Load (lbs)	Percent Load Reduction
1	Wet Detention Pond	310884	311720	-0.269	2521	332.0	86.83
2	Biofilter	311720	115685	62.89	332.0	152.1	54.19
3	Wet Detention Pond	750693	752823	-0.284	5899	1091	81.51
4	Biofilter	752823	304609	59.54	1091	513.1	52.97
5	Other Device	18203	18203	0	258.0	0	100.0

The chart above shows that over 60% sediment reduction will occur prior to the infiltration basins.

APPENDIX C

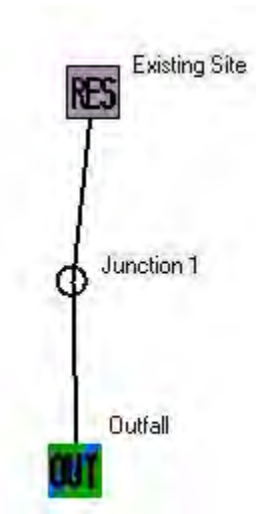
INFILTRATION DESIGN

INFILTRATION SIZING FOR THE PROPOSED PLAT

Methodology: To meet infiltration requirements, the following will show that the infiltration design will meet stayon requirements for the site. To establish the infiltration requirements, the site was modeled using WinSLAMM in existing conditions to establish an existing stayon value first. A target stayon value was established as 90% of the existing value per the ordinance. As shown in the following calculations; The site will meet the required infiltration performance standard in developed conditions

WinSLAMM Model to Establish Stayon Requirements

Model Schematic:



Model Input Information:

Data file name: U:\User\1904113\Engineering\SWMP\Ex Utterback Slamm.mdb
WinSLAMM Version 10.4.1
Rain file name: C:\WinSLAMM Files\Rain Files\WisReg - Madison WI 1981.RAN
Particulate Solids Concentration file name: C:\WinSLAMM Files\v10.1 WI_AVG01.pscx
Runoff Coefficient file name: C:\WinSLAMM Files\WI_SL06 Dec06.rsvx
Residential Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Institutional Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Commercial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Industrial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Other Urban Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Freeway Street Delivery file name: C:\WinSLAMM Files\Freeway Dec06.std
Apply Street Delivery Files to Adjust the After Event Load Street Dirt Mass Balance: False
Pollutant Relative Concentration file name: C:\WinSLAMM Files\WI_GEO03.ppd
Source Area PSD and Peak to Average Flow Ratio File: C:\WinSLAMM Files\NURP Source Area PSD Files.csv
Cost Data file name:
Seed for random number generator: -42
Study period starting date: 01/01/81 Study period ending date: 12/31/81
Start of Winter Season: 12/02 End of Winter Season: 03/12
Date: 04-02-2020 Time: 16:48:49
Site information:

LU# 1 - Residential: Existing Site Total area (ac): 36.300
45 - Large Landscaped Areas 1: 36.300 ac. Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

Output Existing Stayon From Plat:

Data File: U:\User\1904113\Engineering\SW\MP\Ex Utterback Slamm.mdb					
Rain File: WisReg - Madison WI 1981.RAN					
Date: 04-02-20 Time: 4:50:34 PM					
Site Description:					
Runoff Volume Total (cf) at the Outfall					
Rain Number	Start Date	Rain Total (in)	Outfall Total (cf)	Rv	Total Losses (in.)
73	08/28/81	0.04	0	0.000	0.04
74	08/31/81	0.03	0	0.000	0.03
75	08/31/81	1.52	10760	0.054	1.44
76	09/07/81	0.89	5048	0.043	0.85
77	09/11/81	0.08	0	0.000	0.08
78	09/16/81	0.03	0	0.000	0.03
79	09/21/81	0.45	1398	0.024	0.44
80	09/24/81	0.90	5117	0.043	0.86
81	09/26/81	0.12	0	0.000	0.12
82	09/28/81	0.10	0	0.000	0.10
83	09/29/81	0.16	0	0.000	0.16
84	09/30/81	0.36	825.6	0.017	0.35
85	10/01/81	0.01	0	0.000	0.01
86	10/04/81	0.15	0	0.000	0.15
87	10/05/81	0.04	0	0.000	0.04
88	10/05/81	0.02	0	0.000	0.02
89	10/09/81	0.14	0	0.000	0.14
90	10/13/81	1.20	8238	0.052	1.14
91	10/15/81	0.02	0	0.000	0.02
92	10/17/81	0.95	5464	0.044	0.91
93	10/18/81	0.06	0	0.000	0.06
94	10/21/81	0.06	0	0.000	0.06
95	10/21/81	0.01	0	0.000	0.01
96	10/24/81	0.01	0	0.000	0.01
97	10/31/81	0.01	0	0.000	0.01
98	11/05/81	0.04	0	0.000	0.04
99	11/15/81	0.07	0	0.000	0.07
100	11/18/81	0.05	0	0.000	0.05
101	11/19/81	0.26	230.8	0.007	0.26
102	11/23/81	0.18	0	0.000	0.18
103	11/25/81	0.89	5048	0.043	0.85
104	11/30/81	0.37	900.6	0.018	0.36
105	12/03/81	-	-	-	-
106	12/14/81	-	-	-	-
107	12/20/81	-	-	-	-
108	12/26/81	-	-	-	-
109	12/31/81	-	-	-	-
Minimum:		0.00	0	0.000	0.01
Maximum:		2.59	68256	0.200	2.07
Average:		0.26	2090	0.012	0.25
Total:		28.81	227858		27.09

The plat has **27.09** inches of stayon in existing conditions. 90% of 27.09 inches = **24.4 inches of stayon required** to meet stayon requirements for the plat.

Proposed Infiltration Design:

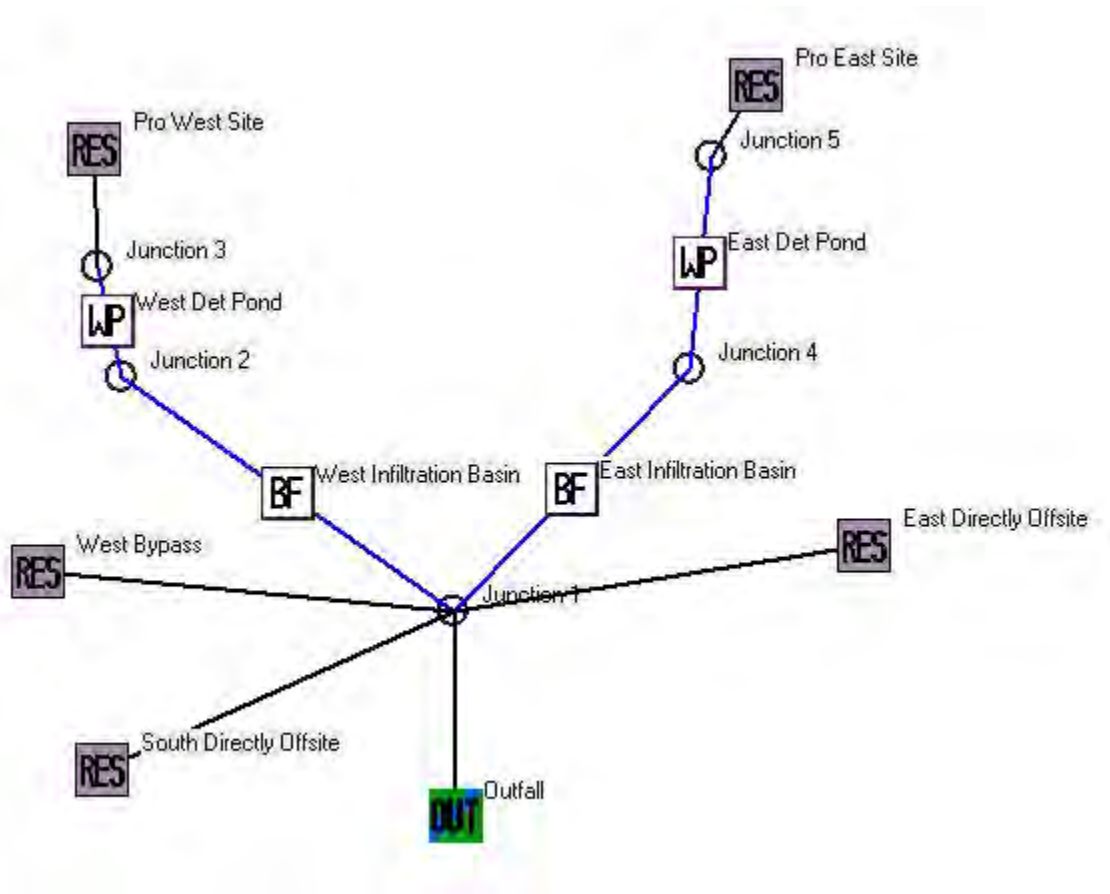
Proposed Site Infiltration Design:

Stayon Required = 24.4 inches

Note: Assume 0.5 in/hr infiltration can be attained

WinSlamm Design

Model Schematic:



Model Input Information:

Data file name: U:\User\1904113\Engineering\SWMP\Pro Utterback Slamm.mdb

WinSLAMM Version 10.4.1

Rain file name: C:\WinSLAMM Files\Rain Files\WisReg - Madison WI 1981.RAN

Particulate Solids Concentration file name: C:\WinSLAMM Files\v10.1 WI_AVG01.pscx

Runoff Coefficient file name: C:\WinSLAMM Files\WI_SL06 Dec06.rsvx

Residential Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std

Institutional Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std

Commercial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std

Industrial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std

Other Urban Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std

Freeway Street Delivery file name: C:\WinSLAMM Files\Freeway Dec06.std

Apply Street Delivery Files to Adjust the After Event Load Street Dirt Mass Balance: False

Pollutant Relative Concentration file name: C:\WinSLAMM Files\WI_GEO03.ppdx

Source Area PSD and Peak to Average Flow Ratio File: C:\WinSLAMM Files\NURP Source Area PSD Files.csv

Cost Data file name:

Seed for random number generator: -42
 Study period starting date: 01/01/81 Study period ending date: 12/31/81
 Start of Winter Season: 12/02 End of Winter Season: 03/12
 Date: 04-02-2020 Time: 16:56:40
 Site information:

LU# 1 - Residential: Pro West Site Total area (ac): 7.400
 1 - Roofs 1: 1.190 ac. Pitched Disconnected Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
 2 - Roofs 2: 0.610 ac. Pitched Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
 25 - Driveways 1: 0.790 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
 31 - Sidewalks 1: 0.120 ac. Disconnected Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
 37 - Streets 1: 1.010 ac. Intermediate Street Length = 0.768 curb-mi Street Width (assuming two curb-mi per street mile) = 21.69922 ft
 Default St. Dirt Accum. Annual Winter Load = 2500 lbs Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
 45 - Large Landscaped Areas 1: 3.190 ac. Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
 70 - Water Body Areas: 0.490 ac. Source Area PSD File:

LU# 2 - Residential: Pro East Site Total area (ac): 18.700
 1 - Roofs 1: 3.390 ac. Pitched Disconnected Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
 2 - Roofs 2: 1.740 ac. Pitched Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
 25 - Driveways 1: 2.260 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
 31 - Sidewalks 1: 0.150 ac. Disconnected Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
 37 - Streets 1: 2.870 ac. Intermediate Street Length = 1.713 curb-mi Street Width (assuming two curb-mi per street mile) = 27.64448 ft
 Default St. Dirt Accum. Annual Winter Load = 2500 lbs Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
 45 - Large Landscaped Areas 1: 7.390 ac. Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
 70 - Water Body Areas: 0.900 ac. Source Area PSD File:

LU# 3 - Residential: South Directly Offsite Total area (ac): 6.600
 1 - Roofs 1: 0.050 ac. Pitched Disconnected Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
 2 - Roofs 2: 0.030 ac. Pitched Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
 31 - Sidewalks 1: 0.620 ac. Disconnected Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
 37 - Streets 1: 0.040 ac. Intermediate Street Length = 0.044 curb-mi Street Width (assuming two curb-mi per street mile) = 15 ft
 Default St. Dirt Accum. Annual Winter Load = 2500 lbs Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
 45 - Large Landscaped Areas 1: 5.860 ac. Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

LU# 4 - Residential: East Directly Offsite Total area (ac): 2.500
 31 - Sidewalks 1: 0.240 ac. Disconnected Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
 37 - Streets 1: 0.070 ac. Intermediate Street Length = 0.044 curb-mi Street Width (assuming two curb-mi per street mile) = 26.25 ft
 Default St. Dirt Accum. Annual Winter Load = 2500 lbs Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
 45 - Large Landscaped Areas 1: 2.190 ac. Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

LU# 5 - Residential: West Bypass Total area (ac): 1.100
 31 - Sidewalks 1: 0.110 ac. Disconnected Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
 45 - Large Landscaped Areas 1: 0.990 ac. Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

Control Practice 1: Wet Detention Pond CP# 1 (DS) - West Det Pond
 Particle Size Distribution file name: Not needed - calculated by program

Initial stage elevation (ft): 6
 Peak to Average Flow Ratio: 3.8
 Maximum flow allowed into pond (cfs): No maximum value entered

Outlet Characteristics:

Outlet type: Orifice 1

1. Orifice diameter (ft): 0.33
2. Number of orifices: 1
3. Invert elevation above datum (ft): 6

Outlet type: Broad Crested Weir

1. Weir crest length (ft): 30
2. Weir crest width (ft): 10
3. Height from datum to bottom of weir opening: 7.75

Outlet type: Vertical Stand Pipe

1. Stand pipe diameter (ft): 4
2. Stand pipe height above datum (ft): 7

Pond stage and surface area

Entry Number	Stage (ft)	Pond Area (acres)	Natural Seepage (in/hr)	Other Outflow (cfs)
0	0.00	0.0000	0.00	0.00
1	0.10	0.0190	0.00	0.00
2	1.00	0.0340	0.00	0.00

3	2.00	0.0560	0.00	0.00
4	3.00	0.0890	0.00	0.00
5	4.00	0.1220	0.00	0.00
6	5.00	0.1560	0.00	0.00
7	6.00	0.3550	0.00	0.00
8	7.00	0.4490	0.00	0.00
9	8.00	0.5470	0.00	0.00
10	9.00	0.6460	0.00	0.00
11	10.00	0.7480	0.00	0.00

Control Practice 2: Biofilter CP# 1 (DS) - West Infiltration Basin

1. Top area (square feet) = 10466
2. Bottom area (square feet) = 3624
3. Depth (ft): 5
4. Biofilter width (ft) - for Cost Purposes Only: 10
5. Infiltration rate (in/hr) = 0.5
6. Random infiltration rate generation? No
7. Infiltration rate fraction (side): 0.1
8. Infiltration rate fraction (bottom): 1
9. Depth of biofilter that is rock filled (ft) 0
10. Porosity of rock filled volume = 0
11. Engineered soil infiltration rate: 0
12. Engineered soil depth (ft) = 0
13. Engineered soil porosity = 0
14. Percent solids reduction due to flow through engineered soil = 0
15. Biofilter peak to average flow ratio = 3.8
16. Number of biofiltration control devices = 1
17. Particle size distribution file: Not needed - calculated by program
18. Initial water surface elevation (ft): 0

Soil Data Soil Type Fraction in Eng. Soil

Biofilter Outlet/Discharge Characteristics:

Outlet type: Broad Crested Weir

1. Weir crest length (ft): 5
2. Weir crest width (ft): 10
3. Height of datum to bottom of weir opening: 4

Outlet type: Surface Discharge Pipe

1. Surface discharge pipe outlet diameter (ft): 1.25
2. Pipe invert elevation above datum (ft): 1
3. Number of surface pipe outlets: 1

Control Practice 3: Wet Detention Pond CP# 2 (DS) - East Det Pond

Particle Size Distribution file name: Not needed - calculated by program

Initial stage elevation (ft): 6

Peak to Average Flow Ratio: 3.8

Maximum flow allowed into pond (cfs): No maximum value entered

Outlet Characteristics:

Outlet type: Orifice 1

1. Orifice diameter (ft): 0.67
2. Number of orifices: 1
3. Invert elevation above datum (ft): 6

Outlet type: Broad Crested Weir

1. Weir crest length (ft): 20
2. Weir crest width (ft): 10
3. Height from datum to bottom of weir opening: 8.75

Outlet type: Vertical Stand Pipe

1. Stand pipe diameter (ft): 4
2. Stand pipe height above datum (ft): 8

Pond stage and surface area

Entry Number	Stage (ft)	Pond Area (acres)	Natural Seepage (in/hr)	Other Outflow (cfs)
0	0.00	0.0000	0.00	0.00
1	0.10	0.2030	0.00	0.00
2	1.00	0.2380	0.00	0.00
3	2.00	0.2750	0.00	0.00
4	3.00	0.3130	0.00	0.00
5	4.00	0.3520	0.00	0.00
6	5.00	0.3900	0.00	0.00
7	6.00	0.7100	0.00	0.00
8	7.00	0.8190	0.00	0.00
9	8.00	0.9310	0.00	0.00
10	9.00	1.0440	0.00	0.00
11	10.00	1.1610	0.00	0.00

Control Practice 4: Biofilter CP# 2 (DS) - East Infiltration Basin

1. Top area (square feet) = 19855
2. Bottom area (square feet) = 8400
3. Depth (ft): 5
4. Biofilter width (ft) - for Cost Purposes Only: 10
5. Infiltration rate (in/hr) = 0.5
6. Random infiltration rate generation? No
7. Infiltration rate fraction (side): 1
8. Infiltration rate fraction (bottom): 1
9. Depth of biofilter that is rock filled (ft) 0
10. Porosity of rock filled volume = 0
11. Engineered soil infiltration rate: 0
12. Engineered soil depth (ft) = 0
13. Engineered soil porosity = 0
14. Percent solids reduction due to flow through engineered soil = 0
15. Biofilter peak to average flow ratio = 3.8
16. Number of biofiltration control devices = 1
17. Particle size distribution file: Not needed - calculated by program
18. Initial water surface elevation (ft): 0

Soil Data Soil Type Fraction in Eng. Soil

Biofilter Outlet/Discharge Characteristics:

Outlet type: Broad Crested Weir

1. Weir crest length (ft): 10
2. Weir crest width (ft): 10
3. Height of datum to bottom of weir opening: 4

Outlet type: Surface Discharge Pipe

1. Surface discharge pipe outlet diameter (ft): 1.5
2. Pipe invert elevation above datum (ft): 1
3. Number of surface pipe outlets: 1

Proposed Infiltration Design:

Data File: U:\User\1904113\Engineering\SWMP\Pro Utterback Slamm.mdb					
Rain File: WisReg - Madison WI 1981.RAN					
Date: 04-02-20 Time: 4:59:15 PM					
Site Description:					
Runoff Volume Total (cf) at the Outfall					
Rain Number	Start Date	Rain Total (in)	Outfall Total (cf)	Rv	Total Losses (in.)
73	08/28/81	0.04	99.17	0.019	0.04
74	08/31/81	0.03	0.6224	0.000	0.03
75	08/31/81	1.52	34950	0.174	1.25
76	09/07/81	0.89	11971	0.102	0.80
77	09/11/81	0.08	21.02	0.002	0.08
78	09/16/81	0.03	0.6224	0.000	0.03
79	09/21/81	0.45	575.2	0.010	0.45
80	09/24/81	0.90	7729	0.065	0.84
81	09/26/81	0.12	40.53	0.003	0.12
82	09/28/81	0.10	30.18	0.002	0.10
83	09/29/81	0.16	55.90	0.003	0.16
84	09/30/81	0.36	370.6	0.008	0.36
85	10/01/81	0.01	0.06915	0.000	0.01
86	10/04/81	0.15	51.97	0.003	0.15
87	10/05/81	0.04	7.682	0.001	0.04
88	10/05/81	0.02	0.2766	0.000	0.02
89	10/09/81	0.14	48.10	0.003	0.14
90	10/13/81	1.20	27507	0.174	0.99
91	10/15/81	0.02	0.2766	0.000	0.02
92	10/17/81	0.95	19095	0.153	0.81
93	10/18/81	0.06	526.3	0.067	0.06
94	10/21/81	0.06	13.64	0.002	0.06
95	10/21/81	0.01	0.06915	0.000	0.01
96	10/24/81	0.01	0.06915	0.000	0.01
97	10/31/81	0.01	0.06915	0.000	0.01
98	11/05/81	0.04	7.682	0.001	0.04
99	11/15/81	0.07	17.14	0.002	0.07
100	11/18/81	0.05	10.48	0.002	0.05
101	11/19/81	0.26	161.0	0.005	0.26
102	11/23/81	0.18	63.94	0.003	0.18
103	11/25/81	0.89	7125	0.061	0.84
104	11/30/81	0.37	396.0	0.008	0.37
105	12/03/81	-	-	-	-
106	12/14/81	-	-	-	-
107	12/20/81	-	-	-	-
108	12/26/81	-	-	-	-
109	12/31/81	-	-	-	-
Minimum:		0.00	0	0.000	0.01
Maximum:		2.59	114005	0.334	1.72
Average:		0.26	4344	0.026	0.23
Total:		28.81	473485		25.23

25.2 inches of stayon attained on the site in proposed conditions. This exceeds 24.4 inches required in developed conditions

Note: DNR conservation practice standard 1003 states that ponding depth must infiltrate within the maximum allowable draw down period of 24 hours. From the DNR's technical note for sizing infiltration basins, drawdown time is calculated as a function of depression zone vs. infiltration rate.

$\text{Depth}/\text{kd} = \text{Drawdown Time}$

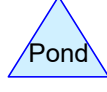
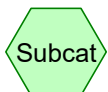
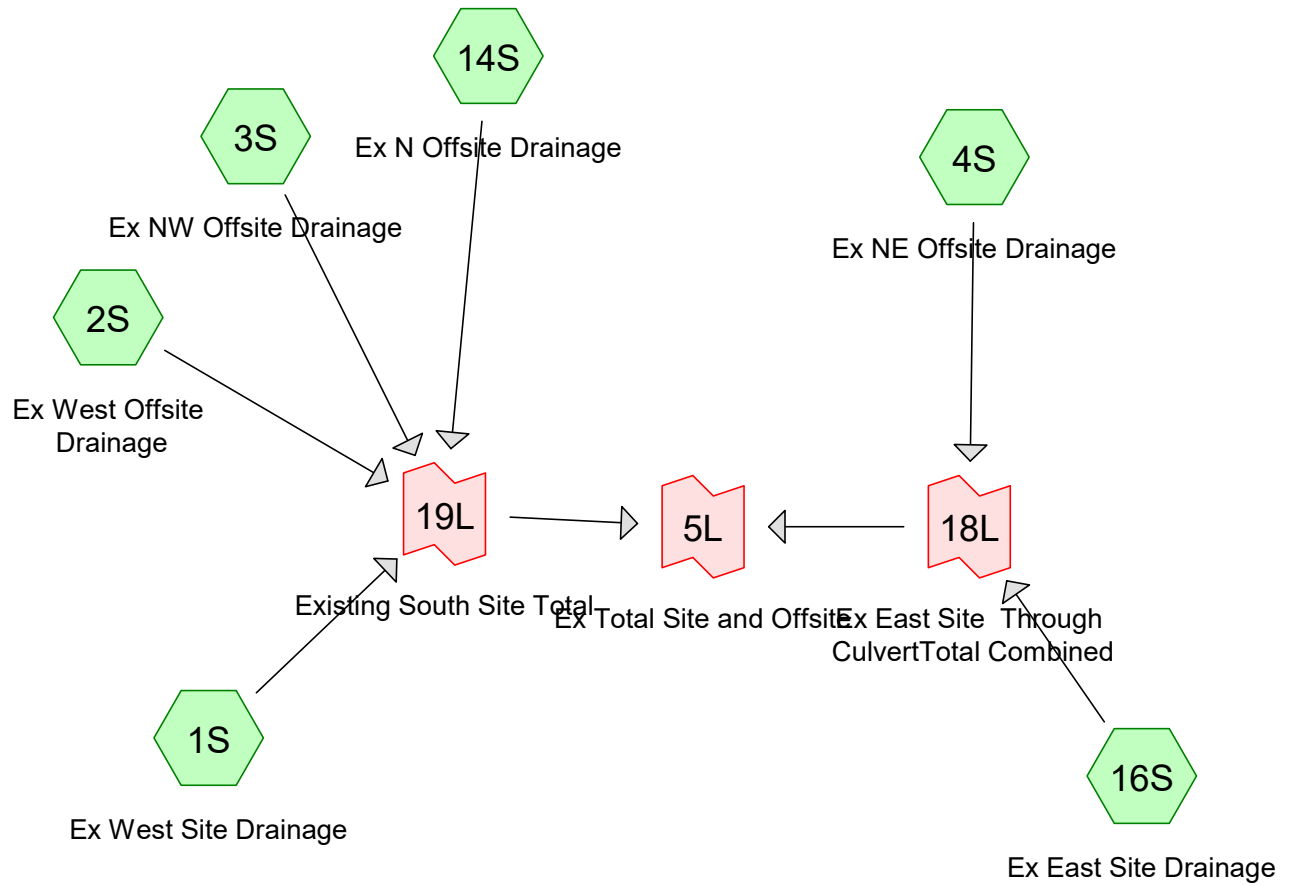
12" is maximum depression zone, and 0.5in/hr is the minimum infiltration rate within the infiltration basin.

$12'' \text{ depression zone}/0.50 \text{ in/hr} = 24 \text{ hours}$ is the maximum drawdown after rainfall event.

APPENDIX D

HYDROCAD OUTPUT

Existing Hydrocad



Routing Diagram for 1904113 prelim SWMP
 Prepared by HP Inc., Printed 4/2/2020
 HydroCAD® 10.00-25 s/n 02063 © 2019 HydroCAD Software Solutions LLC

1904113 prelim SWMP

Prepared by HP Inc.

HydroCAD® 10.00-25 s/n 02063 © 2019 HydroCAD Software Solutions LLC

MSE 24-hr 4 1yr 24hr Rainfall=2.49"

Printed 4/2/2020

Page 2

Summary for Subcatchment 1S: Ex West Site Drainage

Runoff = 1.12 cfs @ 12.65 hrs, Volume= 0.292 af, Depth= 0.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 1yr 24hr Rainfall=2.49"

Area (ac)	CN	Description
* 21.400	58	Type B Soils
* 1.900	71	Type C Soils
23.300	59	Weighted Average
23.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.4	300	0.0600	0.35		Sheet Flow, Sheet
					Range n= 0.130 P2= 2.84"
9.4	1,000	0.0140	1.77		Shallow Concentrated Flow, Shallow
					Grassed Waterway Kv= 15.0 fps
1.1	300	0.0100	4.71	94.24	Channel Flow, Channel
					Area= 20.0 sf Perim= 14.0' r= 1.43' n= 0.040
24.9	1,600	Total			

Summary for Subcatchment 2S: Ex West Offsite Drainage

Runoff = 0.40 cfs @ 12.62 hrs, Volume= 0.111 af, Depth= 0.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 1yr 24hr Rainfall=2.49"

Area (ac)	CN	Description
* 10.200	58	Type B Soils
10.200		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.4	300	0.0600	0.35		Sheet Flow, Sheet
					Range n= 0.130 P2= 2.84"
2.4	400	0.0350	2.81		Shallow Concentrated Flow, Shallow
					Grassed Waterway Kv= 15.0 fps
3.9	1,100	0.0100	4.71	94.24	Channel Flow, Channel
					Area= 20.0 sf Perim= 14.0' r= 1.43' n= 0.040
20.7	1,800	Total			

1904113 prelim SWMP

Prepared by HP Inc.

HydroCAD® 10.00-25 s/n 02063 © 2019 HydroCAD Software Solutions LLC

MSE 24-hr 4 1yr 24hr Rainfall=2.49"

Printed 4/2/2020

Page 3

Summary for Subcatchment 3S: Ex NW Offsite Drainage

Runoff = 1.34 cfs @ 12.85 hrs, Volume= 0.432 af, Depth= 0.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 1yr 24hr Rainfall=2.49"

Area (ac)	CN	Description
* 39.300	58	Type B Soils
* 0.300	71	Type C Soils
39.600	58	Weighted Average
39.600		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.0	300	0.0167	0.21		Sheet Flow, Sheet
					Range n= 0.130 P2= 2.84"
8.3	1,000	0.0180	2.01		Shallow Concentrated Flow, Shallow
					Grassed Waterway Kv= 15.0 fps
1.0	1,100	0.0100	18.85	376.98	Channel Flow, Channel
					Area= 20.0 sf Perim= 14.0' r= 1.43' n= 0.010
33.3	2,400	Total			

Summary for Subcatchment 4S: Ex NE Offsite Drainage

Runoff = 0.86 cfs @ 12.31 hrs, Volume= 0.122 af, Depth= 0.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 1yr 24hr Rainfall=2.49"

Area (ac)	CN	Description
* 3.600	58	Type B Soils
* 2.500	71	Type C Soils
6.100	63	Weighted Average
6.100		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.7	300	0.1000	0.43		Sheet Flow, Sheet
					Range n= 0.130 P2= 2.84"
2.2	200	0.0100	1.50		Shallow Concentrated Flow, Shallow
					Grassed Waterway Kv= 15.0 fps
13.9	500	Total			

1904113 prelim SWMP

Prepared by HP Inc.

HydroCAD® 10.00-25 s/n 02063 © 2019 HydroCAD Software Solutions LLC

MSE 24-hr 4 1yr 24hr Rainfall=2.49"

Printed 4/2/2020

Page 4

Summary for Subcatchment 14S: Ex N Offsite Drainage

Runoff = 0.59 cfs @ 12.40 hrs, Volume= 0.078 af, Depth= 0.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 1yr 24hr Rainfall=2.49"

Area (ac)	CN	Description
* 1.200	58	Type B Soils
* 1.700	71	Type C Soils
2.900	66	Weighted Average
2.900		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.9	300	0.0267	0.25		Sheet Flow, Sheet
					Range n= 0.130 P2= 2.84"
1.1	200	0.0400	3.00		Shallow Concentrated Flow, Shallow
					Grassed Waterway Kv= 15.0 fps
21.0	500	Total			

Summary for Subcatchment 16S: Ex East Site Drainage

Runoff = 0.84 cfs @ 12.54 hrs, Volume= 0.185 af, Depth= 0.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 1yr 24hr Rainfall=2.49"

Area (ac)	CN	Description
* 11.400	58	Type B Soils
* 1.600	71	Type C Soils
13.000	60	Weighted Average
13.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.3	300	0.0733	0.38		Sheet Flow, Sheet
					Range n= 0.130 P2= 2.84"
6.6	700	0.0140	1.77		Shallow Concentrated Flow, Shallow
					Grassed Waterway Kv= 15.0 fps
0.7	200	0.0100	4.71	94.24	Channel Flow, Channel
					Area= 20.0 sf Perim= 14.0' r= 1.43' n= 0.040
20.6	1,200	Total			

Summary for Link 5L: Ex Total Site and Offsite

Inflow Area = 95.100 ac, 0.00% Impervious, Inflow Depth = 0.15" for 1yr 24hr event
Inflow = 4.35 cfs @ 12.63 hrs, Volume= 1.221 af
Primary = 4.35 cfs @ 12.63 hrs, Volume= 1.221 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs

Summary for Link 18L: Ex East Site Through CulvertTotal Combined

Inflow Area = 19.100 ac, 0.00% Impervious, Inflow Depth = 0.19" for 1yr 24hr event
Inflow = 1.53 cfs @ 12.45 hrs, Volume= 0.308 af
Primary = 1.53 cfs @ 12.45 hrs, Volume= 0.308 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs

Summary for Link 19L: Existing South Site Total

Inflow Area = 76.000 ac, 0.00% Impervious, Inflow Depth = 0.14" for 1yr 24hr event
Inflow = 3.09 cfs @ 12.71 hrs, Volume= 0.914 af
Primary = 3.09 cfs @ 12.71 hrs, Volume= 0.914 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs

1904113 prelim SWMP

Prepared by HP Inc.

HydroCAD® 10.00-25 s/n 02063 © 2019 HydroCAD Software Solutions LLC

MSE 24-hr 4 2yr 24hr Rainfall=2.84"

Printed 4/2/2020

Page 6

Summary for Subcatchment 1S: Ex West Site Drainage

Runoff = 2.56 cfs @ 12.53 hrs, Volume= 0.486 af, Depth= 0.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 2yr 24hr Rainfall=2.84"

Area (ac)	CN	Description
* 21.400	58	Type B Soils
* 1.900	71	Type C Soils
23.300	59	Weighted Average
23.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.4	300	0.0600	0.35		Sheet Flow, Sheet
					Range n= 0.130 P2= 2.84"
9.4	1,000	0.0140	1.77		Shallow Concentrated Flow, Shallow
					Grassed Waterway Kv= 15.0 fps
1.1	300	0.0100	4.71	94.24	Channel Flow, Channel
					Area= 20.0 sf Perim= 14.0' r= 1.43' n= 0.040
24.9	1,600	Total			

Summary for Subcatchment 2S: Ex West Offsite Drainage

Runoff = 0.97 cfs @ 12.49 hrs, Volume= 0.191 af, Depth= 0.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 2yr 24hr Rainfall=2.84"

Area (ac)	CN	Description
* 10.200	58	Type B Soils
10.200		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.4	300	0.0600	0.35		Sheet Flow, Sheet
					Range n= 0.130 P2= 2.84"
2.4	400	0.0350	2.81		Shallow Concentrated Flow, Shallow
					Grassed Waterway Kv= 15.0 fps
3.9	1,100	0.0100	4.71	94.24	Channel Flow, Channel
					Area= 20.0 sf Perim= 14.0' r= 1.43' n= 0.040
20.7	1,800	Total			

1904113 prelim SWMP

Prepared by HP Inc.

HydroCAD® 10.00-25 s/n 02063 © 2019 HydroCAD Software Solutions LLC

MSE 24-hr 4 2yr 24hr Rainfall=2.84"

Printed 4/2/2020

Page 7

Summary for Subcatchment 3S: Ex NW Offsite Drainage

Runoff = 3.20 cfs @ 12.70 hrs, Volume= 0.740 af, Depth= 0.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 2yr 24hr Rainfall=2.84"

Area (ac)	CN	Description
* 39.300	58	Type B Soils
* 0.300	71	Type C Soils
39.600	58	Weighted Average
39.600		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.0	300	0.0167	0.21		Sheet Flow, Sheet
					Range n= 0.130 P2= 2.84"
8.3	1,000	0.0180	2.01		Shallow Concentrated Flow, Shallow
					Grassed Waterway Kv= 15.0 fps
1.0	1,100	0.0100	18.85	376.98	Channel Flow, Channel
					Area= 20.0 sf Perim= 14.0' r= 1.43' n= 0.010
33.3	2,400	Total			

Summary for Subcatchment 4S: Ex NE Offsite Drainage

Runoff = 1.72 cfs @ 12.28 hrs, Volume= 0.187 af, Depth= 0.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 2yr 24hr Rainfall=2.84"

Area (ac)	CN	Description
* 3.600	58	Type B Soils
* 2.500	71	Type C Soils
6.100	63	Weighted Average
6.100		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.7	300	0.1000	0.43		Sheet Flow, Sheet
					Range n= 0.130 P2= 2.84"
2.2	200	0.0100	1.50		Shallow Concentrated Flow, Shallow
					Grassed Waterway Kv= 15.0 fps
13.9	500	Total			

1904113 prelim SWMP

Prepared by HP Inc.

HydroCAD® 10.00-25 s/n 02063 © 2019 HydroCAD Software Solutions LLC

MSE 24-hr 4 2yr 24hr Rainfall=2.84"

Printed 4/2/2020

Page 8

Summary for Subcatchment 14S: Ex N Offsite Drainage

Runoff = 1.00 cfs @ 12.37 hrs, Volume= 0.114 af, Depth= 0.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 2yr 24hr Rainfall=2.84"

Area (ac)	CN	Description
* 1.200	58	Type B Soils
* 1.700	71	Type C Soils
2.900	66	Weighted Average
2.900		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.9	300	0.0267	0.25		Sheet Flow, Sheet
					Range n= 0.130 P2= 2.84"
1.1	200	0.0400	3.00		Shallow Concentrated Flow, Shallow
					Grassed Waterway Kv= 15.0 fps
21.0	500	Total			

Summary for Subcatchment 16S: Ex East Site Drainage

Runoff = 1.85 cfs @ 12.43 hrs, Volume= 0.301 af, Depth= 0.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 2yr 24hr Rainfall=2.84"

Area (ac)	CN	Description
* 11.400	58	Type B Soils
* 1.600	71	Type C Soils
13.000	60	Weighted Average
13.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.3	300	0.0733	0.38		Sheet Flow, Sheet
					Range n= 0.130 P2= 2.84"
6.6	700	0.0140	1.77		Shallow Concentrated Flow, Shallow
					Grassed Waterway Kv= 15.0 fps
0.7	200	0.0100	4.71	94.24	Channel Flow, Channel
					Area= 20.0 sf Perim= 14.0' r= 1.43' n= 0.040
20.6	1,200	Total			

Summary for Link 5L: Ex Total Site and Offsite

Inflow Area = 95.100 ac, 0.00% Impervious, Inflow Depth = 0.25" for 2yr 24hr event
Inflow = 9.71 cfs @ 12.54 hrs, Volume= 2.019 af
Primary = 9.71 cfs @ 12.54 hrs, Volume= 2.019 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs

Summary for Link 18L: Ex East Site Through CulvertTotal Combined

Inflow Area = 19.100 ac, 0.00% Impervious, Inflow Depth = 0.31" for 2yr 24hr event
Inflow = 3.22 cfs @ 12.37 hrs, Volume= 0.488 af
Primary = 3.22 cfs @ 12.37 hrs, Volume= 0.488 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs

Summary for Link 19L: Existing South Site Total

Inflow Area = 76.000 ac, 0.00% Impervious, Inflow Depth = 0.24" for 2yr 24hr event
Inflow = 7.09 cfs @ 12.60 hrs, Volume= 1.531 af
Primary = 7.09 cfs @ 12.60 hrs, Volume= 1.531 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs

Summary for Subcatchment 1S: Ex West Site Drainage

Runoff = 12.44 cfs @ 12.42 hrs, Volume= 1.467 af, Depth= 0.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 10yr 24hr Rainfall=4.09"

Area (ac)	CN	Description
* 21.400	58	Type B Soils
* 1.900	71	Type C Soils
23.300	59	Weighted Average
23.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.4	300	0.0600	0.35		Sheet Flow, Sheet Range n= 0.130 P2= 2.84"
9.4	1,000	0.0140	1.77		Shallow Concentrated Flow, Shallow Grassed Waterway Kv= 15.0 fps
1.1	300	0.0100	4.71	94.24	Channel Flow, Channel Area= 20.0 sf Perim= 14.0' r= 1.43' n= 0.040
24.9	1,600	Total			

Summary for Subcatchment 2S: Ex West Offsite Drainage

Runoff = 5.42 cfs @ 12.36 hrs, Volume= 0.600 af, Depth= 0.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 10yr 24hr Rainfall=4.09"

Area (ac)	CN	Description
* 10.200	58	Type B Soils
10.200		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.4	300	0.0600	0.35		Sheet Flow, Sheet Range n= 0.130 P2= 2.84"
2.4	400	0.0350	2.81		Shallow Concentrated Flow, Shallow Grassed Waterway Kv= 15.0 fps
3.9	1,100	0.0100	4.71	94.24	Channel Flow, Channel Area= 20.0 sf Perim= 14.0' r= 1.43' n= 0.040
20.7	1,800	Total			

1904113 prelim SWMP

Prepared by HP Inc.

HydroCAD® 10.00-25 s/n 02063 © 2019 HydroCAD Software Solutions LLC

MSE 24-hr 4 10yr 24hr Rainfall=4.09"

Printed 4/2/2020

Page 11

Summary for Subcatchment 3S: Ex NW Offsite Drainage

Runoff = 16.34 cfs @ 12.56 hrs, Volume= 2.330 af, Depth= 0.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 10yr 24hr Rainfall=4.09"

Area (ac)	CN	Description
* 39.300	58	Type B Soils
* 0.300	71	Type C Soils
39.600	58	Weighted Average
39.600		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.0	300	0.0167	0.21		Sheet Flow, Sheet
					Range n= 0.130 P2= 2.84"
8.3	1,000	0.0180	2.01		Shallow Concentrated Flow, Shallow
					Grassed Waterway Kv= 15.0 fps
1.0	1,100	0.0100	18.85	376.98	Channel Flow, Channel
					Area= 20.0 sf Perim= 14.0' r= 1.43' n= 0.010
33.3	2,400	Total			

Summary for Subcatchment 4S: Ex NE Offsite Drainage

Runoff = 6.22 cfs @ 12.24 hrs, Volume= 0.492 af, Depth= 0.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 10yr 24hr Rainfall=4.09"

Area (ac)	CN	Description
* 3.600	58	Type B Soils
* 2.500	71	Type C Soils
6.100	63	Weighted Average
6.100		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.7	300	0.1000	0.43		Sheet Flow, Sheet
					Range n= 0.130 P2= 2.84"
2.2	200	0.0100	1.50		Shallow Concentrated Flow, Shallow
					Grassed Waterway Kv= 15.0 fps
13.9	500	Total			

1904113 prelim SWMP

MSE 24-hr 4 10yr 24hr Rainfall=4.09"

Prepared by HP Inc.

Printed 4/2/2020

HydroCAD® 10.00-25 s/n 02063 © 2019 HydroCAD Software Solutions LLC

Page 12

Summary for Subcatchment 14S: Ex N Offsite Drainage

Runoff = 2.96 cfs @ 12.34 hrs, Volume= 0.276 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 10yr 24hr Rainfall=4.09"

Area (ac)	CN	Description
* 1.200	58	Type B Soils
* 1.700	71	Type C Soils
2.900	66	Weighted Average
2.900		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.9	300	0.0267	0.25		Sheet Flow, Sheet
					Range n= 0.130 P2= 2.84"
1.1	200	0.0400	3.00		Shallow Concentrated Flow, Shallow
					Grassed Waterway Kv= 15.0 fps
21.0	500	Total			

Summary for Subcatchment 16S: Ex East Site Drainage

Runoff = 8.43 cfs @ 12.35 hrs, Volume= 0.874 af, Depth= 0.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 10yr 24hr Rainfall=4.09"

Area (ac)	CN	Description
* 11.400	58	Type B Soils
* 1.600	71	Type C Soils
13.000	60	Weighted Average
13.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.3	300	0.0733	0.38		Sheet Flow, Sheet
					Range n= 0.130 P2= 2.84"
6.6	700	0.0140	1.77		Shallow Concentrated Flow, Shallow
					Grassed Waterway Kv= 15.0 fps
0.7	200	0.0100	4.71	94.24	Channel Flow, Channel
					Area= 20.0 sf Perim= 14.0' r= 1.43' n= 0.040
20.6	1,200	Total			

Summary for Link 5L: Ex Total Site and Offsite

Inflow Area = 95.100 ac, 0.00% Impervious, Inflow Depth = 0.76" for 10yr 24hr event
Inflow = 45.73 cfs @ 12.42 hrs, Volume= 6.038 af
Primary = 45.73 cfs @ 12.42 hrs, Volume= 6.038 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs

Summary for Link 18L: Ex East Site Through CulvertTotal Combined

Inflow Area = 19.100 ac, 0.00% Impervious, Inflow Depth = 0.86" for 10yr 24hr event
Inflow = 13.70 cfs @ 12.30 hrs, Volume= 1.365 af
Primary = 13.70 cfs @ 12.30 hrs, Volume= 1.365 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs

Summary for Link 19L: Existing South Site Total

Inflow Area = 76.000 ac, 0.00% Impervious, Inflow Depth = 0.74" for 10yr 24hr event
Inflow = 34.57 cfs @ 12.46 hrs, Volume= 4.673 af
Primary = 34.57 cfs @ 12.46 hrs, Volume= 4.673 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs

Summary for Subcatchment 1S: Ex West Site Drainage

Runoff = 22.79 cfs @ 12.40 hrs, Volume= 2.408 af, Depth= 1.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 25yr 24hr Rainfall=5.01"

Area (ac)	CN	Description
* 21.400	58	Type B Soils
* 1.900	71	Type C Soils
23.300	59	Weighted Average
23.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.4	300	0.0600	0.35		Sheet Flow, Sheet Range n= 0.130 P2= 2.84"
9.4	1,000	0.0140	1.77		Shallow Concentrated Flow, Shallow Grassed Waterway Kv= 15.0 fps
1.1	300	0.0100	4.71	94.24	Channel Flow, Channel Area= 20.0 sf Perim= 14.0' r= 1.43' n= 0.040
24.9	1,600	Total			

Summary for Subcatchment 2S: Ex West Offsite Drainage

Runoff = 10.27 cfs @ 12.34 hrs, Volume= 0.998 af, Depth= 1.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 25yr 24hr Rainfall=5.01"

Area (ac)	CN	Description
* 10.200	58	Type B Soils
10.200		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.4	300	0.0600	0.35		Sheet Flow, Sheet Range n= 0.130 P2= 2.84"
2.4	400	0.0350	2.81		Shallow Concentrated Flow, Shallow Grassed Waterway Kv= 15.0 fps
3.9	1,100	0.0100	4.71	94.24	Channel Flow, Channel Area= 20.0 sf Perim= 14.0' r= 1.43' n= 0.040
20.7	1,800	Total			

Summary for Subcatchment 3S: Ex NW Offsite Drainage

Runoff = 30.61 cfs @ 12.53 hrs, Volume= 3.875 af, Depth= 1.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 25yr 24hr Rainfall=5.01"

Area (ac)	CN	Description
* 39.300	58	Type B Soils
* 0.300	71	Type C Soils
39.600	58	Weighted Average
39.600		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.0	300	0.0167	0.21		Sheet Flow, Sheet
					Range n= 0.130 P2= 2.84"
8.3	1,000	0.0180	2.01		Shallow Concentrated Flow, Shallow
					Grassed Waterway Kv= 15.0 fps
1.0	1,100	0.0100	18.85	376.98	Channel Flow, Channel
					Area= 20.0 sf Perim= 14.0' r= 1.43' n= 0.010
33.3	2,400	Total			

Summary for Subcatchment 4S: Ex NE Offsite Drainage

Runoff = 10.39 cfs @ 12.23 hrs, Volume= 0.770 af, Depth= 1.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 25yr 24hr Rainfall=5.01"

Area (ac)	CN	Description
* 3.600	58	Type B Soils
* 2.500	71	Type C Soils
6.100	63	Weighted Average
6.100		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.7	300	0.1000	0.43		Sheet Flow, Sheet
					Range n= 0.130 P2= 2.84"
2.2	200	0.0100	1.50		Shallow Concentrated Flow, Shallow
					Grassed Waterway Kv= 15.0 fps
13.9	500	Total			

Summary for Subcatchment 14S: Ex N Offsite Drainage

Runoff = 4.70 cfs @ 12.33 hrs, Volume= 0.419 af, Depth= 1.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 25yr 24hr Rainfall=5.01"

Area (ac)	CN	Description
* 1.200	58	Type B Soils
* 1.700	71	Type C Soils
2.900	66	Weighted Average
2.900		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.9	300	0.0267	0.25		Sheet Flow, Sheet
					Range n= 0.130 P2= 2.84"
1.1	200	0.0400	3.00		Shallow Concentrated Flow, Shallow
					Grassed Waterway Kv= 15.0 fps
21.0	500	Total			

Summary for Subcatchment 16S: Ex East Site Drainage

Runoff = 15.08 cfs @ 12.33 hrs, Volume= 1.416 af, Depth= 1.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 25yr 24hr Rainfall=5.01"

Area (ac)	CN	Description
* 11.400	58	Type B Soils
* 1.600	71	Type C Soils
13.000	60	Weighted Average
13.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.3	300	0.0733	0.38		Sheet Flow, Sheet
					Range n= 0.130 P2= 2.84"
6.6	700	0.0140	1.77		Shallow Concentrated Flow, Shallow
					Grassed Waterway Kv= 15.0 fps
0.7	200	0.0100	4.71	94.24	Channel Flow, Channel
					Area= 20.0 sf Perim= 14.0' r= 1.43' n= 0.040
20.6	1,200	Total			

Summary for Link 5L: Ex Total Site and Offsite

Inflow Area = 95.100 ac, 0.00% Impervious, Inflow Depth = 1.25" for 25yr 24hr event
Inflow = 83.98 cfs @ 12.40 hrs, Volume= 9.886 af
Primary = 83.98 cfs @ 12.40 hrs, Volume= 9.886 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs

Summary for Link 18L: Ex East Site Through CulvertTotal Combined

Inflow Area = 19.100 ac, 0.00% Impervious, Inflow Depth = 1.37" for 25yr 24hr event
Inflow = 24.07 cfs @ 12.29 hrs, Volume= 2.186 af
Primary = 24.07 cfs @ 12.29 hrs, Volume= 2.186 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs

Summary for Link 19L: Existing South Site Total

Inflow Area = 76.000 ac, 0.00% Impervious, Inflow Depth = 1.22" for 25yr 24hr event
Inflow = 64.14 cfs @ 12.43 hrs, Volume= 7.700 af
Primary = 64.14 cfs @ 12.43 hrs, Volume= 7.700 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs

Summary for Subcatchment 1S: Ex West Site Drainage

Runoff = 45.16 cfs @ 12.38 hrs, Volume= 4.413 af, Depth= 2.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 100yr 24hr Rainfall=6.66"

Area (ac)	CN	Description
* 21.400	58	Type B Soils
* 1.900	71	Type C Soils
23.300	59	Weighted Average
23.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.4	300	0.0600	0.35		Sheet Flow, Sheet Range n= 0.130 P2= 2.84"
9.4	1,000	0.0140	1.77		Shallow Concentrated Flow, Shallow Grassed Waterway Kv= 15.0 fps
1.1	300	0.0100	4.71	94.24	Channel Flow, Channel Area= 20.0 sf Perim= 14.0' r= 1.43' n= 0.040
24.9	1,600	Total			

Summary for Subcatchment 2S: Ex West Offsite Drainage

Runoff = 20.81 cfs @ 12.32 hrs, Volume= 1.854 af, Depth= 2.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 100yr 24hr Rainfall=6.66"

Area (ac)	CN	Description
* 10.200	58	Type B Soils
10.200		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.4	300	0.0600	0.35		Sheet Flow, Sheet Range n= 0.130 P2= 2.84"
2.4	400	0.0350	2.81		Shallow Concentrated Flow, Shallow Grassed Waterway Kv= 15.0 fps
3.9	1,100	0.0100	4.71	94.24	Channel Flow, Channel Area= 20.0 sf Perim= 14.0' r= 1.43' n= 0.040
20.7	1,800	Total			

1904113 prelim SWMP

Prepared by HP Inc.

HydroCAD® 10.00-25 s/n 02063 © 2019 HydroCAD Software Solutions LLC

MSE 24-hr 4 100yr 24hr Rainfall=6.66"

Printed 4/2/2020

Page 19

Summary for Subcatchment 3S: Ex NW Offsite Drainage

Runoff = 61.96 cfs @ 12.50 hrs, Volume= 7.198 af, Depth= 2.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 100yr 24hr Rainfall=6.66"

Area (ac)	CN	Description
* 39.300	58	Type B Soils
* 0.300	71	Type C Soils
39.600	58	Weighted Average
39.600		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.0	300	0.0167	0.21		Sheet Flow, Sheet
					Range n= 0.130 P2= 2.84"
8.3	1,000	0.0180	2.01		Shallow Concentrated Flow, Shallow
					Grassed Waterway Kv= 15.0 fps
1.0	1,100	0.0100	18.85	376.98	Channel Flow, Channel
					Area= 20.0 sf Perim= 14.0' r= 1.43' n= 0.010
33.3	2,400	Total			

Summary for Subcatchment 4S: Ex NE Offsite Drainage

Runoff = 18.89 cfs @ 12.23 hrs, Volume= 1.347 af, Depth= 2.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 100yr 24hr Rainfall=6.66"

Area (ac)	CN	Description
* 3.600	58	Type B Soils
* 2.500	71	Type C Soils
6.100	63	Weighted Average
6.100		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.7	300	0.1000	0.43		Sheet Flow, Sheet
					Range n= 0.130 P2= 2.84"
2.2	200	0.0100	1.50		Shallow Concentrated Flow, Shallow
					Grassed Waterway Kv= 15.0 fps
13.9	500	Total			

Summary for Subcatchment 14S: Ex N Offsite Drainage

Runoff = 8.21 cfs @ 12.32 hrs, Volume= 0.710 af, Depth= 2.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 100yr 24hr Rainfall=6.66"

Area (ac)	CN	Description
* 1.200	58	Type B Soils
* 1.700	71	Type C Soils
2.900	66	Weighted Average
2.900		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.9	300	0.0267	0.25		Sheet Flow, Sheet
					Range n= 0.130 P2= 2.84"
1.1	200	0.0400	3.00		Shallow Concentrated Flow, Shallow
					Grassed Waterway Kv= 15.0 fps
21.0	500	Total			

Summary for Subcatchment 16S: Ex East Site Drainage

Runoff = 29.14 cfs @ 12.32 hrs, Volume= 2.563 af, Depth= 2.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 100yr 24hr Rainfall=6.66"

Area (ac)	CN	Description
* 11.400	58	Type B Soils
* 1.600	71	Type C Soils
13.000	60	Weighted Average
13.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.3	300	0.0733	0.38		Sheet Flow, Sheet
					Range n= 0.130 P2= 2.84"
6.6	700	0.0140	1.77		Shallow Concentrated Flow, Shallow
					Grassed Waterway Kv= 15.0 fps
0.7	200	0.0100	4.71	94.24	Channel Flow, Channel
					Area= 20.0 sf Perim= 14.0' r= 1.43' n= 0.040
20.6	1,200	Total			

Summary for Link 5L: Ex Total Site and Offsite

Inflow Area = 95.100 ac, 0.00% Impervious, Inflow Depth = 2.28" for 100yr 24hr event
Inflow = 166.65 cfs @ 12.38 hrs, Volume= 18.085 af
Primary = 166.65 cfs @ 12.38 hrs, Volume= 18.085 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs

Summary for Link 18L: Ex East Site Through CulvertTotal Combined

Inflow Area = 19.100 ac, 0.00% Impervious, Inflow Depth = 2.46" for 100yr 24hr event
Inflow = 45.72 cfs @ 12.28 hrs, Volume= 3.910 af
Primary = 45.72 cfs @ 12.28 hrs, Volume= 3.910 af, Atten= 0%, Lag= 0.0 min

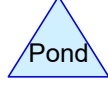
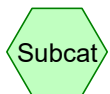
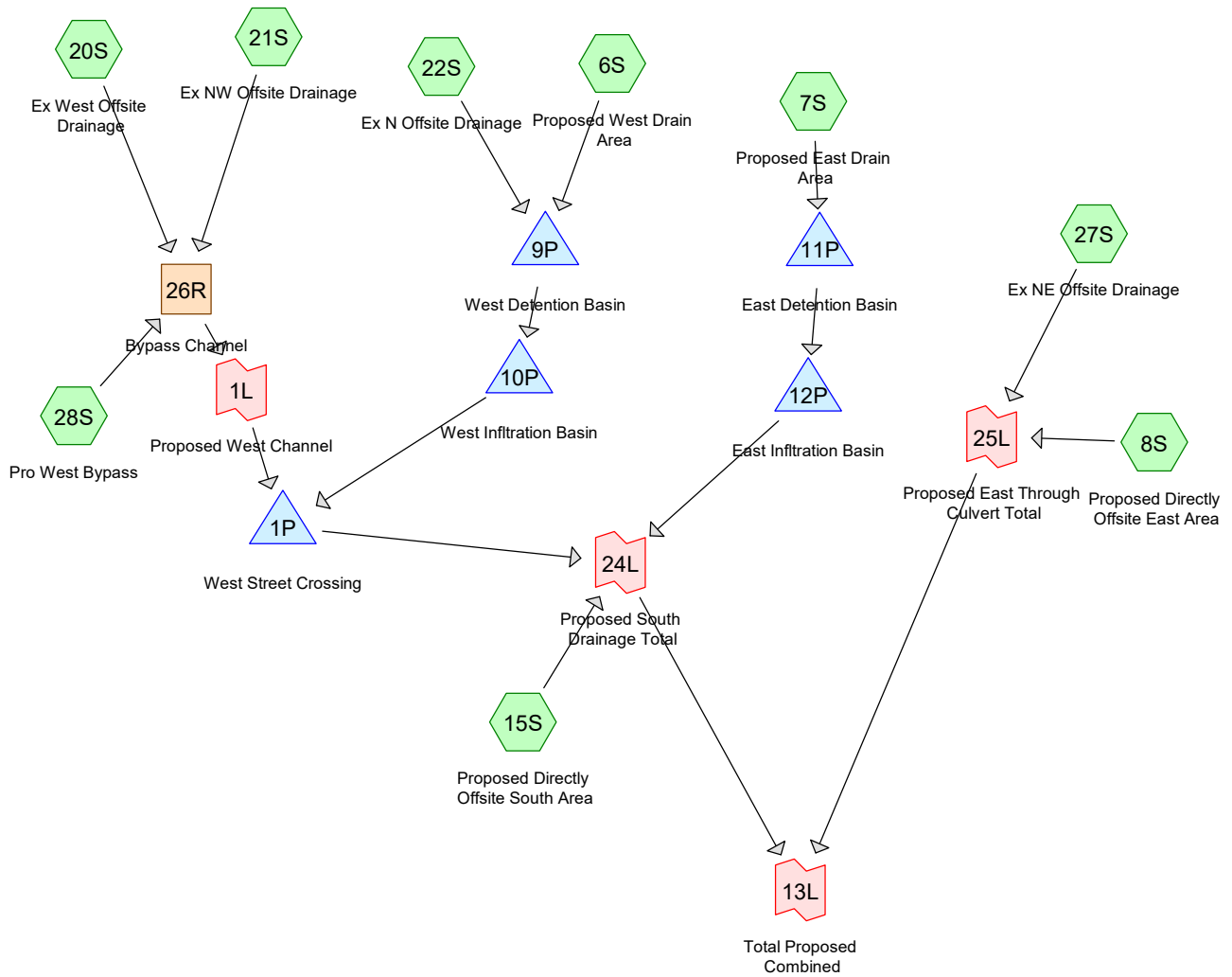
Primary outflow = Inflow, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs

Summary for Link 19L: Existing South Site Total

Inflow Area = 76.000 ac, 0.00% Impervious, Inflow Depth = 2.24" for 100yr 24hr event
Inflow = 128.47 cfs @ 12.41 hrs, Volume= 14.176 af
Primary = 128.47 cfs @ 12.41 hrs, Volume= 14.176 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs

Proposed Hydrocad



Routing Diagram for 1904113 prelim SWMP

Prepared by HP Inc., Printed 4/7/2020

HydroCAD® 10.00-25 s/n 02063 © 2019 HydroCAD Software Solutions LLC

1904113 prelim SWMP

Prepared by HP Inc.

HydroCAD® 10.00-25 s/n 02063 © 2019 HydroCAD Software Solutions LLC

MSE 24-hr 4 1yr 24hr Rainfall=2.49"

Printed 4/7/2020

Page 2

Summary for Subcatchment 6S: Proposed West Drain Area

Runoff = 13.63 cfs @ 12.14 hrs, Volume= 0.722 af, Depth= 1.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 1yr 24hr Rainfall=2.49"

Area (ac)	CN	Description
* 6.000	87	55% Impervious Residential
* 1.200	74	10% Impervious OL Area
* 0.200	98	Wet Basin
7.400	85	Weighted Average
7.200		97.30% Pervious Area
0.200		2.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	100	0.0800	0.31		Sheet Flow, Sheet
					Range n= 0.130 P2= 2.84"
0.3	100	0.0600	4.97		Shallow Concentrated Flow, Shallow
					Paved Kv= 20.3 fps
0.9	550	0.0180	9.66	30.35	Pipe Channel, Pipe
					24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'
					n= 0.013
6.5	750	Total			

Summary for Subcatchment 7S: Proposed East Drain Area

Runoff = 33.13 cfs @ 12.18 hrs, Volume= 2.030 af, Depth= 1.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 1yr 24hr Rainfall=2.49"

Area (ac)	CN	Description
* 12.900	87	60% Impervious Residential
* 3.600	90	70% Impervious Residential
* 1.500	74	10% Impervious OL
* 0.700	98	Wet Basin
18.700	87	Weighted Average
18.000		96.26% Pervious Area
0.700		3.74% Impervious Area

1904113 prelim SWMP

Prepared by HP Inc.

HydroCAD® 10.00-25 s/n 02063 © 2019 HydroCAD Software Solutions LLC

MSE 24-hr 4 1yr 24hr Rainfall=2.49"

Printed 4/7/2020

Page 3

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	150	0.0800	0.34		Sheet Flow, Sheet Range n= 0.130 P2= 2.84"
0.3	100	0.0600	4.97		Shallow Concentrated Flow, Shallow Paved Kv= 20.3 fps
2.3	1,200	0.0150	8.82	27.71	Pipe Channel, Pipe 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
10.0	1,450	Total			

Summary for Subcatchment 8S: Proposed Directly Offsite East Area

Runoff = 0.29 cfs @ 12.49 hrs, Volume= 0.050 af, Depth= 0.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 1yr 24hr Rainfall=2.49"

Area (ac)	CN	Description
* 2.400	62	10% Impervious Lightly Disturbed/Restored
* 0.100	90	70% Imp ROW area
2.500	63	Weighted Average
2.500		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.3	200	0.0100	0.16		Sheet Flow, Sheet Range n= 0.130 P2= 2.84"
2.3	400	0.0200	2.87		Shallow Concentrated Flow, Shallow Paved Kv= 20.3 fps
23.6	600	Total			

Summary for Subcatchment 15S: Proposed Directly Offsite South Area

Runoff = 0.66 cfs @ 12.64 hrs, Volume= 0.132 af, Depth= 0.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 1yr 24hr Rainfall=2.49"

Area (ac)	CN	Description
* 6.200	62	10% Impervious Lightly Disturbed/Restored
* 0.200	82	40% Imp yard area
* 0.200	90	70% Imp ROW area
6.600	63	Weighted Average
6.600		100.00% Pervious Area

1904113 prelim SWMP

Prepared by HP Inc.

HydroCAD® 10.00-25 s/n 02063 © 2019 HydroCAD Software Solutions LLC

MSE 24-hr 4 1yr 24hr Rainfall=2.49"

Printed 4/7/2020

Page 4

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
29.5	300	0.0100	0.17		Sheet Flow, Sheet Range n= 0.130 P2= 2.84"
3.3	400	0.0100	2.03		Shallow Concentrated Flow, Shallow Paved Kv= 20.3 fps
32.8	700	Total			

Summary for Subcatchment 20S: Ex West Offsite Drainage

Runoff = 0.40 cfs @ 12.62 hrs, Volume= 0.111 af, Depth= 0.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 1yr 24hr Rainfall=2.49"

Area (ac)	CN	Description
* 10.200	58	Type B Soils
10.200		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.4	300	0.0600	0.35		Sheet Flow, Sheet Range n= 0.130 P2= 2.84"
2.4	400	0.0350	2.81		Shallow Concentrated Flow, Shallow Grassed Waterway Kv= 15.0 fps
3.9	1,100	0.0100	4.71	94.24	Channel Flow, Channel Area= 20.0 sf Perim= 14.0' r= 1.43' n= 0.040
20.7	1,800	Total			

Summary for Subcatchment 21S: Ex NW Offsite Drainage

Runoff = 1.34 cfs @ 12.85 hrs, Volume= 0.432 af, Depth= 0.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 1yr 24hr Rainfall=2.49"

Area (ac)	CN	Description
* 39.300	58	Type B Soils
* 0.300	71	Type C Soils
39.600	58	Weighted Average
39.600		100.00% Pervious Area

1904113 prelim SWMP

Prepared by HP Inc.

HydroCAD® 10.00-25 s/n 02063 © 2019 HydroCAD Software Solutions LLC

MSE 24-hr 4 1yr 24hr Rainfall=2.49"

Printed 4/7/2020

Page 5

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.0	300	0.0167	0.21		Sheet Flow, Sheet Range n= 0.130 P2= 2.84"
8.3	1,000	0.0180	2.01		Shallow Concentrated Flow, Shallow Grassed Waterway Kv= 15.0 fps
1.0	1,100	0.0100	18.85	376.98	Channel Flow, Channel Area= 20.0 sf Perim= 14.0' r= 1.43' n= 0.010
33.3	2,400	Total			

Summary for Subcatchment 22S: Ex N Offsite Drainage

Runoff = 0.59 cfs @ 12.40 hrs, Volume= 0.078 af, Depth= 0.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 1yr 24hr Rainfall=2.49"

Area (ac)	CN	Description
* 1.200	58	Type B Soils
* 1.700	71	Type C Soils
2.900	66	Weighted Average
2.900		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.9	300	0.0267	0.25		Sheet Flow, Sheet Range n= 0.130 P2= 2.84"
1.1	200	0.0400	3.00		Shallow Concentrated Flow, Shallow Grassed Waterway Kv= 15.0 fps
21.0	500	Total			

Summary for Subcatchment 27S: Ex NE Offsite Drainage

Runoff = 0.86 cfs @ 12.31 hrs, Volume= 0.122 af, Depth= 0.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 1yr 24hr Rainfall=2.49"

Area (ac)	CN	Description
* 3.600	58	Type B Soils
* 2.500	71	Type C Soils
6.100	63	Weighted Average
6.100		100.00% Pervious Area

1904113 prelim SWMP

Prepared by HP Inc.

HydroCAD® 10.00-25 s/n 02063 © 2019 HydroCAD Software Solutions LLC

MSE 24-hr 4 1yr 24hr Rainfall=2.49"

Printed 4/7/2020

Page 6

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.7	300	0.1000	0.43		Sheet Flow, Sheet
					Range n= 0.130 P2= 2.84"
2.2	200	0.0100	1.50		Shallow Concentrated Flow, Shallow
					Grassed Waterway Kv= 15.0 fps
13.9	500	Total			

Summary for Subcatchment 28S: Pro West Bypass

Runoff = 1.00 cfs @ 12.14 hrs, Volume= 0.055 af, Depth= 0.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 1yr 24hr Rainfall=2.49"

Area (ac)	CN	Description
* 1.100	74	OL Area 10% Imp
1.100		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, TC

Summary for Reach 26R: Bypass ChannelInflow Area = 50.900 ac, 0.00% Impervious, Inflow Depth = 0.14" for 1yr 24hr event
Inflow = 1.82 cfs @ 12.81 hrs, Volume= 0.599 af
Outflow = 1.76 cfs @ 12.98 hrs, Volume= 0.599 af, Atten= 3%, Lag= 10.1 minRouting by Dyn-Stor-Ind method, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs / 2
Max. Velocity= 0.86 fps, Min. Travel Time= 10.6 min
Avg. Velocity = 0.42 fps, Avg. Travel Time= 21.6 min

Peak Storage= 1,121 cf @ 12.98 hrs

Average Depth at Peak Storage= 0.19'

Bank-Full Depth= 2.00' Flow Area= 36.0 sf, Capacity= 121.18 cfs

10.00' x 2.00' deep channel, n= 0.040
Side Slope Z-value= 4.0 '/' Top Width= 26.00'
Length= 550.0' Slope= 0.0055 '/'
Inlet Invert= 869.00', Outlet Invert= 866.00'

Summary for Pond 1P: West Street Crossing

Inflow Area = 61.200 ac, 0.33% Impervious, Inflow Depth = 0.21" for 1yr 24hr event
 Inflow = 1.76 cfs @ 12.98 hrs, Volume= 1.063 af
 Outflow = 1.75 cfs @ 13.06 hrs, Volume= 1.063 af, Atten= 1%, Lag= 5.3 min
 Primary = 1.75 cfs @ 13.06 hrs, Volume= 1.063 af

Routing by Dyn-Stor-Ind method, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs / 2
 Peak Elev= 866.34' @ 13.06 hrs Surf.Area= 2,432 sf Storage= 663 cf

Plug-Flow detention time= 10.8 min calculated for 1.062 af (100% of inflow)
 Center-of-Mass det. time= 10.3 min (1,243.0 - 1,232.6)

Volume	Invert	Avail.Storage	Storage Description
#1	866.00'	22,843 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
866.00	1,479	0	0
867.00	4,287	2,883	2,883
868.00	9,984	7,136	10,019
869.00	15,664	12,824	22,843

Device	Routing	Invert	Outlet Devices
#1	Primary	866.00'	36.0" Round Culvert X 2.00 L= 110.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 866.00' / 865.00' S= 0.0091 ' / Cc= 0.900 n= 0.013, Flow Area= 7.07 sf

Primary OutFlow Max=1.75 cfs @ 13.06 hrs HW=866.34' TW=0.00' (Dynamic Tailwater)
 ↑ **1=Culvert** (Inlet Controls 1.75 cfs @ 1.98 fps)

Summary for Pond 9P: West Detention Basin

Inflow Area = 10.300 ac, 1.94% Impervious, Inflow Depth = 0.93" for 1yr 24hr event
 Inflow = 13.72 cfs @ 12.14 hrs, Volume= 0.800 af
 Outflow = 0.44 cfs @ 15.14 hrs, Volume= 0.756 af, Atten= 97%, Lag= 180.2 min
 Primary = 0.44 cfs @ 15.14 hrs, Volume= 0.756 af

Routing by Dyn-Stor-Ind method, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs / 2
 Peak Elev= 868.26' @ 15.14 hrs Surf.Area= 20,686 sf Storage= 22,708 cf

Plug-Flow detention time= 669.3 min calculated for 0.756 af (94% of inflow)
 Center-of-Mass det. time= 642.1 min (1,473.4 - 831.3)

Volume	Invert	Avail.Storage	Storage Description
#1	867.00'	95,625 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

1904113 prelim SWMP

Prepared by HP Inc.

HydroCAD® 10.00-25 s/n 02063 © 2019 HydroCAD Software Solutions LLC

MSE 24-hr 4 1yr 24hr Rainfall=2.49"

Printed 4/7/2020

Page 8

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
867.00	15,467	0	0
868.00	19,599	17,533	17,533
869.00	23,831	21,715	39,248
870.00	28,163	25,997	65,245
871.00	32,596	30,380	95,625

Device	Routing	Invert	Outlet Devices
#1	Primary	866.00'	18.0" Round Culvert L= 50.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 866.00' / 866.00' S= 0.0000 ' S= 0.0000 ' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	867.00'	4.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	869.00'	48.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Primary	869.75'	30.0' long x 10.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=0.44 cfs @ 15.14 hrs HW=868.26' TW=866.96' (Dynamic Tailwater)

- 1=Culvert (Passes 0.44 cfs of 7.94 cfs potential flow)
 2=Orifice/Grate (Orifice Controls 0.44 cfs @ 5.03 fps)
 3=Orifice/Grate (Controls 0.00 cfs)
 4=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond 10P: West Infiltration Basin

Inflow Area = 10.300 ac, 1.94% Impervious, Inflow Depth > 0.88" for 1yr 24hr event
 Inflow = 0.44 cfs @ 15.14 hrs, Volume= 0.756 af
 Outflow = 0.41 cfs @ 18.56 hrs, Volume= 0.661 af, Atten= 8%, Lag= 205.4 min
 Discarded = 0.07 cfs @ 18.56 hrs, Volume= 0.197 af
 Primary = 0.34 cfs @ 18.56 hrs, Volume= 0.464 af

Routing by Dyn-Stor-Ind method, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs / 2

Peak Elev= 867.27' @ 18.56 hrs Surf.Area= 5,085 sf Storage= 5,517 cf

Plug-Flow detention time= 288.3 min calculated for 0.661 af (87% of inflow)

Center-of-Mass det. time= 155.9 min (1,629.3 - 1,473.4)

Volume	Invert	Avail.Storage	Storage Description
#1	866.00'	34,052 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
866.00	3,624	0	0
867.00	4,745	4,185	4,185
868.00	6,000	5,373	9,557
869.00	7,386	6,693	16,250
870.00	8,876	8,131	24,381
871.00	10,466	9,671	34,052

1904113 prelim SWMP

Prepared by HP Inc.

HydroCAD® 10.00-25 s/n 02063 © 2019 HydroCAD Software Solutions LLC

MSE 24-hr 4 1yr 24hr Rainfall=2.49"

Printed 4/7/2020

Page 9

Device	Routing	Invert	Outlet Devices
#1	Discarded	866.00'	0.500 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 860.00'
#2	Primary	867.00'	15.0" Round Culvert L= 50.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 867.00' / 866.50' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#3	Primary	870.00'	5.0' long x 10.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.07 cfs @ 18.56 hrs HW=867.27' (Free Discharge)↑**1=Exfiltration** (Controls 0.07 cfs)**Primary OutFlow** Max=0.34 cfs @ 18.56 hrs HW=867.27' TW=866.23' (Dynamic Tailwater)↑**2=Culvert** (Barrel Controls 0.34 cfs @ 2.59 fps)↑**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)**Summary for Pond 11P: East Detention Basin**

Inflow Area = 18.700 ac, 3.74% Impervious, Inflow Depth = 1.30" for 1yr 24hr event
 Inflow = 33.13 cfs @ 12.18 hrs, Volume= 2.030 af
 Outflow = 1.85 cfs @ 13.66 hrs, Volume= 1.953 af, Atten= 94%, Lag= 89.0 min
 Primary = 1.85 cfs @ 13.66 hrs, Volume= 1.953 af

Routing by Dyn-Stor-Ind method, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs / 2
 Peak Elev= 863.55' @ 13.66 hrs Surf.Area= 38,370 sf Storage= 53,718 cf

Plug-Flow detention time= 447.3 min calculated for 1.953 af (96% of inflow)
 Center-of-Mass det. time= 427.0 min (1,246.9 - 819.9)

Volume	Invert	Avail.Storage	Storage Description
#1	862.00'	162,500 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
862.00	30,928	0	0
863.00	35,693	33,311	33,311
864.00	40,550	38,122	71,432
865.00	45,509	43,030	114,462
866.00	50,568	48,039	162,500

Device	Routing	Invert	Outlet Devices
#1	Primary	861.00'	24.0" Round Culvert L= 50.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 861.00' / 861.00' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	862.00'	8.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	864.00'	48.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

1904113 prelim SWMP

Prepared by HP Inc.

HydroCAD® 10.00-25 s/n 02063 © 2019 HydroCAD Software Solutions LLC

MSE 24-hr 4 1yr 24hr Rainfall=2.49"

Printed 4/7/2020

Page 10

#4 Primary 864.75' **20.0' long x 10.0' breadth Broad-Crested Rectangular Weir**
 Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=1.85 cfs @ 13.66 hrs HW=863.55' TW=861.97' (Dynamic Tailwater)

1=Culvert (Passes 1.85 cfs of 13.93 cfs potential flow)
 2=Orifice/Grate (Orifice Controls 1.85 cfs @ 5.31 fps)
 3=Orifice/Grate (Controls 0.00 cfs)
 4=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond 12P: East Infiltration Basin

Inflow Area = 18.700 ac, 3.74% Impervious, Inflow Depth > 1.25" for 1yr 24hr event
 Inflow = 1.85 cfs @ 13.66 hrs, Volume= 1.953 af
 Outflow = 1.56 cfs @ 16.50 hrs, Volume= 1.778 af, Atten= 16%, Lag= 170.3 min
 Discarded = 0.16 cfs @ 16.50 hrs, Volume= 0.447 af
 Primary = 1.39 cfs @ 16.50 hrs, Volume= 1.331 af

Routing by Dyn-Stor-Ind method, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs / 2
 Peak Elev= 862.54' @ 16.50 hrs Surf.Area= 11,691 sf Storage= 15,484 cf

Plug-Flow detention time= 254.6 min calculated for 1.777 af (91% of inflow)
 Center-of-Mass det. time= 161.8 min (1,408.7 - 1,246.9)

Volume	Invert	Avail.Storage	Storage Description
#1	861.00'	69,661 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
861.00	8,400	0	0
862.00	10,501	9,451	9,451
863.00	12,689	11,595	21,046
864.00	14,977	13,833	34,879
865.00	17,366	16,172	51,050
866.00	19,855	18,611	69,661

Device	Routing	Invert	Outlet Devices
#1	Discarded	861.00'	0.500 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 855.00'
#2	Primary	862.00'	18.0" Round Culvert L= 50.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 862.00' / 861.50' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#3	Primary	865.00'	4.0' long x 10.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.16 cfs @ 16.50 hrs HW=862.54' (Free Discharge)

↑**1=Exfiltration** (Controls 0.16 cfs)

Primary OutFlow Max=1.39 cfs @ 16.50 hrs HW=862.54' TW=0.00' (Dynamic Tailwater)

↑**2=Culvert** (Barrel Controls 1.39 cfs @ 3.58 fps)

↑**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Link 1L: Proposed West Channel

Inflow Area = 50.900 ac, 0.00% Impervious, Inflow Depth = 0.14" for 1yr 24hr event
Inflow = 1.76 cfs @ 12.98 hrs, Volume= 0.599 af
Primary = 1.76 cfs @ 12.98 hrs, Volume= 0.599 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs

Summary for Link 13L: Total Proposed Combined

Inflow Area = 95.100 ac, 0.95% Impervious, Inflow Depth > 0.34" for 1yr 24hr event
Inflow = 2.75 cfs @ 12.92 hrs, Volume= 2.699 af
Primary = 2.75 cfs @ 12.92 hrs, Volume= 2.699 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs

Summary for Link 24L: Proposed South Drainage Total

Inflow Area = 86.500 ac, 1.04% Impervious, Inflow Depth > 0.35" for 1yr 24hr event
Inflow = 2.29 cfs @ 17.08 hrs, Volume= 2.526 af
Primary = 2.29 cfs @ 17.08 hrs, Volume= 2.526 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs

Summary for Link 25L: Proposed East Through Culvert Total

Inflow Area = 8.600 ac, 0.00% Impervious, Inflow Depth = 0.24" for 1yr 24hr event
Inflow = 1.07 cfs @ 12.35 hrs, Volume= 0.173 af
Primary = 1.07 cfs @ 12.35 hrs, Volume= 0.173 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs

1904113 prelim SWMP

Prepared by HP Inc.

HydroCAD® 10.00-25 s/n 02063 © 2019 HydroCAD Software Solutions LLC

MSE 24-hr 4 2yr 24hr Rainfall=2.84"

Printed 4/7/2020

Page 12

Summary for Subcatchment 6S: Proposed West Drain Area

Runoff = 16.92 cfs @ 12.14 hrs, Volume= 0.897 af, Depth= 1.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 2yr 24hr Rainfall=2.84"

Area (ac)	CN	Description
* 6.000	87	55% Impervious Residential
* 1.200	74	10% Impervious OL Area
* 0.200	98	Wet Basin
7.400	85	Weighted Average
7.200		97.30% Pervious Area
0.200		2.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	100	0.0800	0.31		Sheet Flow, Sheet
					Range n= 0.130 P2= 2.84"
0.3	100	0.0600	4.97		Shallow Concentrated Flow, Shallow
					Paved Kv= 20.3 fps
0.9	550	0.0180	9.66	30.35	Pipe Channel, Pipe
					24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'
					n= 0.013
6.5	750	Total			

Summary for Subcatchment 7S: Proposed East Drain Area

Runoff = 40.59 cfs @ 12.18 hrs, Volume= 2.494 af, Depth= 1.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 2yr 24hr Rainfall=2.84"

Area (ac)	CN	Description
* 12.900	87	60% Impervious Residential
* 3.600	90	70% Impervious Residential
* 1.500	74	10% Impervious OL
* 0.700	98	Wet Basin
18.700	87	Weighted Average
18.000		96.26% Pervious Area
0.700		3.74% Impervious Area

1904113 prelim SWMP

Prepared by HP Inc.

HydroCAD® 10.00-25 s/n 02063 © 2019 HydroCAD Software Solutions LLC

MSE 24-hr 4 2yr 24hr Rainfall=2.84"

Printed 4/7/2020

Page 13

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	150	0.0800	0.34		Sheet Flow, Sheet Range n= 0.130 P2= 2.84"
0.3	100	0.0600	4.97		Shallow Concentrated Flow, Shallow Paved Kv= 20.3 fps
2.3	1,200	0.0150	8.82	27.71	Pipe Channel, Pipe 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
10.0	1,450	Total			

Summary for Subcatchment 8S: Proposed Directly Offsite East Area

Runoff = 0.55 cfs @ 12.44 hrs, Volume= 0.077 af, Depth= 0.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 2yr 24hr Rainfall=2.84"

Area (ac)	CN	Description
* 2.400	62	10% Impervious Lightly Disturbed/Restored
* 0.100	90	70% Imp ROW area
2.500	63	Weighted Average
2.500		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.3	200	0.0100	0.16		Sheet Flow, Sheet Range n= 0.130 P2= 2.84"
2.3	400	0.0200	2.87		Shallow Concentrated Flow, Shallow Paved Kv= 20.3 fps
23.6	600	Total			

Summary for Subcatchment 15S: Proposed Directly Offsite South Area

Runoff = 1.22 cfs @ 12.59 hrs, Volume= 0.202 af, Depth= 0.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 2yr 24hr Rainfall=2.84"

Area (ac)	CN	Description
* 6.200	62	10% Impervious Lightly Disturbed/Restored
* 0.200	82	40% Imp yard area
* 0.200	90	70% Imp ROW area
6.600	63	Weighted Average
6.600		100.00% Pervious Area

1904113 prelim SWMP

Prepared by HP Inc.

HydroCAD® 10.00-25 s/n 02063 © 2019 HydroCAD Software Solutions LLC

MSE 24-hr 4 2yr 24hr Rainfall=2.84"

Printed 4/7/2020

Page 14

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
29.5	300	0.0100	0.17		Sheet Flow, Sheet Range n= 0.130 P2= 2.84"
3.3	400	0.0100	2.03		Shallow Concentrated Flow, Shallow Paved Kv= 20.3 fps
32.8	700	Total			

Summary for Subcatchment 20S: Ex West Offsite Drainage

Runoff = 0.97 cfs @ 12.49 hrs, Volume= 0.191 af, Depth= 0.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 2yr 24hr Rainfall=2.84"

Area (ac)	CN	Description
* 10.200	58	Type B Soils
10.200		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.4	300	0.0600	0.35		Sheet Flow, Sheet Range n= 0.130 P2= 2.84"
2.4	400	0.0350	2.81		Shallow Concentrated Flow, Shallow Grassed Waterway Kv= 15.0 fps
3.9	1,100	0.0100	4.71	94.24	Channel Flow, Channel Area= 20.0 sf Perim= 14.0' r= 1.43' n= 0.040
20.7	1,800	Total			

Summary for Subcatchment 21S: Ex NW Offsite Drainage

Runoff = 3.20 cfs @ 12.70 hrs, Volume= 0.740 af, Depth= 0.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 2yr 24hr Rainfall=2.84"

Area (ac)	CN	Description
* 39.300	58	Type B Soils
* 0.300	71	Type C Soils
39.600	58	Weighted Average
39.600		100.00% Pervious Area

1904113 prelim SWMP

Prepared by HP Inc.

HydroCAD® 10.00-25 s/n 02063 © 2019 HydroCAD Software Solutions LLC

MSE 24-hr 4 2yr 24hr Rainfall=2.84"

Printed 4/7/2020

Page 15

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.0	300	0.0167	0.21		Sheet Flow, Sheet Range n= 0.130 P2= 2.84"
8.3	1,000	0.0180	2.01		Shallow Concentrated Flow, Shallow Grassed Waterway Kv= 15.0 fps
1.0	1,100	0.0100	18.85	376.98	Channel Flow, Channel Area= 20.0 sf Perim= 14.0' r= 1.43' n= 0.010
33.3	2,400	Total			

Summary for Subcatchment 22S: Ex N Offsite Drainage

Runoff = 1.00 cfs @ 12.37 hrs, Volume= 0.114 af, Depth= 0.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 2yr 24hr Rainfall=2.84"

Area (ac)	CN	Description
* 1.200	58	Type B Soils
* 1.700	71	Type C Soils
2.900	66	Weighted Average
2.900		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.9	300	0.0267	0.25		Sheet Flow, Sheet Range n= 0.130 P2= 2.84"
1.1	200	0.0400	3.00		Shallow Concentrated Flow, Shallow Grassed Waterway Kv= 15.0 fps
21.0	500	Total			

Summary for Subcatchment 27S: Ex NE Offsite Drainage

Runoff = 1.72 cfs @ 12.28 hrs, Volume= 0.187 af, Depth= 0.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 2yr 24hr Rainfall=2.84"

Area (ac)	CN	Description
* 3.600	58	Type B Soils
* 2.500	71	Type C Soils
6.100	63	Weighted Average
6.100		100.00% Pervious Area

1904113 prelim SWMP

Prepared by HP Inc.

HydroCAD® 10.00-25 s/n 02063 © 2019 HydroCAD Software Solutions LLC

MSE 24-hr 4 2yr 24hr Rainfall=2.84"

Printed 4/7/2020

Page 16

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.7	300	0.1000	0.43		Sheet Flow, Sheet
					Range n= 0.130 P2= 2.84"
2.2	200	0.0100	1.50		Shallow Concentrated Flow, Shallow
					Grassed Waterway Kv= 15.0 fps
13.9	500	Total			

Summary for Subcatchment 28S: Pro West Bypass

Runoff = 1.38 cfs @ 12.14 hrs, Volume= 0.074 af, Depth= 0.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 2yr 24hr Rainfall=2.84"

Area (ac)	CN	Description
* 1.100	74	OL Area 10% Imp
1.100		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, TC

Summary for Reach 26R: Bypass ChannelInflow Area = 50.900 ac, 0.00% Impervious, Inflow Depth = 0.24" for 2yr 24hr event
Inflow = 4.22 cfs @ 12.66 hrs, Volume= 1.005 af
Outflow = 4.07 cfs @ 12.76 hrs, Volume= 1.005 af, Atten= 4%, Lag= 5.7 minRouting by Dyn-Stor-Ind method, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs / 2
Max. Velocity= 1.17 fps, Min. Travel Time= 7.8 min
Avg. Velocity = 0.49 fps, Avg. Travel Time= 18.9 min

Peak Storage= 1,916 cf @ 12.76 hrs

Average Depth at Peak Storage= 0.31'

Bank-Full Depth= 2.00' Flow Area= 36.0 sf, Capacity= 121.18 cfs

10.00' x 2.00' deep channel, n= 0.040
Side Slope Z-value= 4.0 '/' Top Width= 26.00'
Length= 550.0' Slope= 0.0055 '/'
Inlet Invert= 869.00', Outlet Invert= 866.00'

1904113 prelim SWMP

Prepared by HP Inc.

HydroCAD® 10.00-25 s/n 02063 © 2019 HydroCAD Software Solutions LLC

MSE 24-hr 4 2yr 24hr Rainfall=2.84"

Printed 4/7/2020

Page 17

Summary for Pond 1P: West Street Crossing

Inflow Area = 61.200 ac, 0.33% Impervious, Inflow Depth > 0.32" for 2yr 24hr event
 Inflow = 4.07 cfs @ 12.76 hrs, Volume= 1.651 af
 Outflow = 4.02 cfs @ 12.82 hrs, Volume= 1.649 af, Atten= 1%, Lag= 3.8 min
 Primary = 4.02 cfs @ 12.82 hrs, Volume= 1.649 af

Routing by Dyn-Stor-Ind method, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs / 2
 Peak Elev= 866.52' @ 12.82 hrs Surf.Area= 2,938 sf Storage= 1,147 cf

Plug-Flow detention time= 9.1 min calculated for 1.648 af (100% of inflow)
 Center-of-Mass det. time= 7.6 min (1,224.1 - 1,216.4)

Volume	Invert	Avail.Storage	Storage Description
#1	866.00'	22,843 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
866.00	1,479	0	0
867.00	4,287	2,883	2,883
868.00	9,984	7,136	10,019
869.00	15,664	12,824	22,843

Device	Routing	Invert	Outlet Devices
#1	Primary	866.00'	36.0" Round Culvert X 2.00 L= 110.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 866.00' / 865.00' S= 0.0091 '/' Cc= 0.900 n= 0.013, Flow Area= 7.07 sf

Primary OutFlow Max=4.02 cfs @ 12.82 hrs HW=866.52' TW=0.00' (Dynamic Tailwater)
 ↑ **1=Culvert** (Inlet Controls 4.02 cfs @ 2.45 fps)

Summary for Pond 9P: West Detention Basin

Inflow Area = 10.300 ac, 1.94% Impervious, Inflow Depth = 1.18" for 2yr 24hr event
 Inflow = 17.15 cfs @ 12.14 hrs, Volume= 1.011 af
 Outflow = 0.50 cfs @ 15.21 hrs, Volume= 0.950 af, Atten= 97%, Lag= 184.5 min
 Primary = 0.50 cfs @ 15.21 hrs, Volume= 0.950 af

Routing by Dyn-Stor-Ind method, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs / 2
 Peak Elev= 868.58' @ 15.21 hrs Surf.Area= 22,045 sf Storage= 29,569 cf

Plug-Flow detention time= 742.3 min calculated for 0.950 af (94% of inflow)
 Center-of-Mass det. time= 711.9 min (1,538.3 - 826.4)

Volume	Invert	Avail.Storage	Storage Description
#1	867.00'	95,625 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

1904113 prelim SWMP

Prepared by HP Inc.

HydroCAD® 10.00-25 s/n 02063 © 2019 HydroCAD Software Solutions LLC

MSE 24-hr 4 2yr 24hr Rainfall=2.84"

Printed 4/7/2020

Page 18

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
867.00	15,467	0	0
868.00	19,599	17,533	17,533
869.00	23,831	21,715	39,248
870.00	28,163	25,997	65,245
871.00	32,596	30,380	95,625

Device	Routing	Invert	Outlet Devices
#1	Primary	866.00'	18.0" Round Culvert L= 50.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 866.00' / 866.00' S= 0.0000 ' S= 0.0000 ' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	867.00'	4.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	869.00'	48.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Primary	869.75'	30.0' long x 10.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=0.50 cfs @ 15.21 hrs HW=868.58' TW=867.12' (Dynamic Tailwater)

- 1=Culvert (Passes 0.50 cfs of 9.48 cfs potential flow)
 2=Orifice/Grate (Orifice Controls 0.50 cfs @ 5.72 fps)
 3=Orifice/Grate (Controls 0.00 cfs)
 4=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond 10P: West Infiltration Basin

Inflow Area = 10.300 ac, 1.94% Impervious, Inflow Depth > 1.11" for 2yr 24hr event
 Inflow = 0.50 cfs @ 15.21 hrs, Volume= 0.950 af
 Outflow = 0.47 cfs @ 18.20 hrs, Volume= 0.847 af, Atten= 6%, Lag= 179.1 min
 Discarded = 0.07 cfs @ 18.20 hrs, Volume= 0.201 af
 Primary = 0.40 cfs @ 18.20 hrs, Volume= 0.645 af

Routing by Dyn-Stor-Ind method, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs / 2

Peak Elev= 867.30' @ 18.20 hrs Surf.Area= 5,117 sf Storage= 5,645 cf

Plug-Flow detention time= 250.6 min calculated for 0.846 af (89% of inflow)

Center-of-Mass det. time= 129.0 min (1,667.3 - 1,538.3)

Volume	Invert	Avail.Storage	Storage Description
#1	866.00'	34,052 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
866.00	3,624	0	0
867.00	4,745	4,185	4,185
868.00	6,000	5,373	9,557
869.00	7,386	6,693	16,250
870.00	8,876	8,131	24,381
871.00	10,466	9,671	34,052

1904113 prelim SWMP

Prepared by HP Inc.

HydroCAD® 10.00-25 s/n 02063 © 2019 HydroCAD Software Solutions LLC

MSE 24-hr 4 2yr 24hr Rainfall=2.84"

Printed 4/7/2020

Page 19

Device	Routing	Invert	Outlet Devices
#1	Discarded	866.00'	0.500 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 860.00'
#2	Primary	867.00'	15.0" Round Culvert L= 50.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 867.00' / 866.50' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#3	Primary	870.00'	5.0' long x 10.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.07 cfs @ 18.20 hrs HW=867.30' (Free Discharge)↑ **1=Exfiltration** (Controls 0.07 cfs)**Primary OutFlow** Max=0.40 cfs @ 18.20 hrs HW=867.30' TW=866.27' (Dynamic Tailwater)↑ **2=Culvert** (Barrel Controls 0.40 cfs @ 2.71 fps)↑ **3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)**Summary for Pond 11P: East Detention Basin**

Inflow Area = 18.700 ac, 3.74% Impervious, Inflow Depth = 1.60" for 2yr 24hr event
 Inflow = 40.59 cfs @ 12.18 hrs, Volume= 2.494 af
 Outflow = 2.11 cfs @ 13.68 hrs, Volume= 2.409 af, Atten= 95%, Lag= 90.3 min
 Primary = 2.11 cfs @ 13.68 hrs, Volume= 2.409 af

Routing by Dyn-Stor-Ind method, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs / 2
 Peak Elev= 863.90' @ 13.68 hrs Surf.Area= 40,085 sf Storage= 67,574 cf

Plug-Flow detention time= 476.8 min calculated for 2.407 af (97% of inflow)
 Center-of-Mass det. time= 459.0 min (1,274.0 - 815.0)

Volume	Invert	Avail.Storage	Storage Description
#1	862.00'	162,500 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
862.00	30,928	0	0
863.00	35,693	33,311	33,311
864.00	40,550	38,122	71,432
865.00	45,509	43,030	114,462
866.00	50,568	48,039	162,500

Device	Routing	Invert	Outlet Devices
#1	Primary	861.00'	24.0" Round Culvert L= 50.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 861.00' / 861.00' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	862.00'	8.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	864.00'	48.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

1904113 prelim SWMP

Prepared by HP Inc.

HydroCAD® 10.00-25 s/n 02063 © 2019 HydroCAD Software Solutions LLC

MSE 24-hr 4 2yr 24hr Rainfall=2.84"

Printed 4/7/2020

Page 20

#4 Primary 864.75' **20.0' long x 10.0' breadth Broad-Crested Rectangular Weir**
 Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=2.11 cfs @ 13.68 hrs HW=863.90' TW=862.15' (Dynamic Tailwater)

1=Culvert (Passes 2.11 cfs of 16.45 cfs potential flow)
 2=Orifice/Grate (Orifice Controls 2.11 cfs @ 6.03 fps)
 3=Orifice/Grate (Controls 0.00 cfs)
 4=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond 12P: East Infiltration Basin

Inflow Area = 18.700 ac, 3.74% Impervious, Inflow Depth > 1.55" for 2yr 24hr event
 Inflow = 2.11 cfs @ 13.68 hrs, Volume= 2.409 af
 Outflow = 1.82 cfs @ 16.32 hrs, Volume= 2.216 af, Atten= 14%, Lag= 158.3 min
 Discarded = 0.17 cfs @ 16.32 hrs, Volume= 0.458 af
 Primary = 1.65 cfs @ 16.32 hrs, Volume= 1.759 af

Routing by Dyn-Stor-Ind method, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs / 2
 Peak Elev= 862.60' @ 16.32 hrs Surf.Area= 11,811 sf Storage= 16,128 cf

Plug-Flow detention time= 219.2 min calculated for 2.215 af (92% of inflow)
 Center-of-Mass det. time= 135.0 min (1,409.0 - 1,274.0)

Volume	Invert	Avail.Storage	Storage Description
#1	861.00'	69,661 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
861.00	8,400	0	0
862.00	10,501	9,451	9,451
863.00	12,689	11,595	21,046
864.00	14,977	13,833	34,879
865.00	17,366	16,172	51,050
866.00	19,855	18,611	69,661

Device	Routing	Invert	Outlet Devices
#1	Discarded	861.00'	0.500 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 855.00'
#2	Primary	862.00'	18.0" Round Culvert L= 50.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 862.00' / 861.50' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#3	Primary	865.00'	4.0' long x 10.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.17 cfs @ 16.32 hrs HW=862.60' (Free Discharge)

↑ **1=Exfiltration** (Controls 0.17 cfs)

Primary OutFlow Max=1.65 cfs @ 16.32 hrs HW=862.60' TW=0.00' (Dynamic Tailwater)

↑ **2=Culvert** (Barrel Controls 1.65 cfs @ 3.72 fps)

↑ **3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Link 1L: Proposed West Channel

Inflow Area = 50.900 ac, 0.00% Impervious, Inflow Depth = 0.24" for 2yr 24hr event
Inflow = 4.07 cfs @ 12.76 hrs, Volume= 1.005 af
Primary = 4.07 cfs @ 12.76 hrs, Volume= 1.005 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs

Summary for Link 13L: Total Proposed Combined

Inflow Area = 95.100 ac, 0.95% Impervious, Inflow Depth > 0.49" for 2yr 24hr event
Inflow = 6.00 cfs @ 12.73 hrs, Volume= 3.874 af
Primary = 6.00 cfs @ 12.73 hrs, Volume= 3.874 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs

Summary for Link 24L: Proposed South Drainage Total

Inflow Area = 86.500 ac, 1.04% Impervious, Inflow Depth > 0.50" for 2yr 24hr event
Inflow = 5.03 cfs @ 12.78 hrs, Volume= 3.610 af
Primary = 5.03 cfs @ 12.78 hrs, Volume= 3.610 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs

Summary for Link 25L: Proposed East Through Culvert Total

Inflow Area = 8.600 ac, 0.00% Impervious, Inflow Depth = 0.37" for 2yr 24hr event
Inflow = 2.09 cfs @ 12.30 hrs, Volume= 0.264 af
Primary = 2.09 cfs @ 12.30 hrs, Volume= 0.264 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs

1904113 prelim SWMP

MSE 24-hr 4 10yr 24hr Rainfall=4.09"

Prepared by HP Inc.

Printed 4/7/2020

HydroCAD® 10.00-25 s/n 02063 © 2019 HydroCAD Software Solutions LLC

Page 22

Summary for Subcatchment 6S: Proposed West Drain Area

Runoff = 29.12 cfs @ 12.14 hrs, Volume= 1.565 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 10yr 24hr Rainfall=4.09"

Area (ac)	CN	Description
* 6.000	87	55% Impervious Residential
* 1.200	74	10% Impervious OL Area
* 0.200	98	Wet Basin
7.400	85	Weighted Average
7.200		97.30% Pervious Area
0.200		2.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	100	0.0800	0.31		Sheet Flow, Sheet
					Range n= 0.130 P2= 2.84"
0.3	100	0.0600	4.97		Shallow Concentrated Flow, Shallow
					Paved Kv= 20.3 fps
0.9	550	0.0180	9.66	30.35	Pipe Channel, Pipe
					24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'
					n= 0.013
6.5	750	Total			

Summary for Subcatchment 7S: Proposed East Drain Area

Runoff = 67.99 cfs @ 12.17 hrs, Volume= 4.238 af, Depth= 2.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 10yr 24hr Rainfall=4.09"

Area (ac)	CN	Description
* 12.900	87	60% Impervious Residential
* 3.600	90	70% Impervious Residential
* 1.500	74	10% Impervious OL
* 0.700	98	Wet Basin
18.700	87	Weighted Average
18.000		96.26% Pervious Area
0.700		3.74% Impervious Area

1904113 prelim SWMP

MSE 24-hr 4 10yr 24hr Rainfall=4.09"

Prepared by HP Inc.

Printed 4/7/2020

HydroCAD® 10.00-25 s/n 02063 © 2019 HydroCAD Software Solutions LLC

Page 23

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	150	0.0800	0.34		Sheet Flow, Sheet Range n= 0.130 P2= 2.84"
0.3	100	0.0600	4.97		Shallow Concentrated Flow, Shallow Paved Kv= 20.3 fps
2.3	1,200	0.0150	8.82	27.71	Pipe Channel, Pipe 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
10.0	1,450	Total			

Summary for Subcatchment 8S: Proposed Directly Offsite East Area

Runoff = 1.94 cfs @ 12.38 hrs, Volume= 0.201 af, Depth= 0.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 10yr 24hr Rainfall=4.09"

Area (ac)	CN	Description
* 2.400	62	10% Impervious Lightly Disturbed/Restored
* 0.100	90	70% Imp ROW area
2.500	63	Weighted Average
2.500		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.3	200	0.0100	0.16		Sheet Flow, Sheet Range n= 0.130 P2= 2.84"
2.3	400	0.0200	2.87		Shallow Concentrated Flow, Shallow Paved Kv= 20.3 fps
23.6	600	Total			

Summary for Subcatchment 15S: Proposed Directly Offsite South Area

Runoff = 4.24 cfs @ 12.51 hrs, Volume= 0.532 af, Depth= 0.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 10yr 24hr Rainfall=4.09"

Area (ac)	CN	Description
* 6.200	62	10% Impervious Lightly Disturbed/Restored
* 0.200	82	40% Imp yard area
* 0.200	90	70% Imp ROW area
6.600	63	Weighted Average
6.600		100.00% Pervious Area

1904113 prelim SWMP

MSE 24-hr 4 10yr 24hr Rainfall=4.09"

Prepared by HP Inc.

Printed 4/7/2020

HydroCAD® 10.00-25 s/n 02063 © 2019 HydroCAD Software Solutions LLC

Page 24

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
29.5	300	0.0100	0.17		Sheet Flow, Sheet Range n= 0.130 P2= 2.84"
3.3	400	0.0100	2.03		Shallow Concentrated Flow, Shallow Paved Kv= 20.3 fps
32.8	700	Total			

Summary for Subcatchment 20S: Ex West Offsite Drainage

Runoff = 5.42 cfs @ 12.36 hrs, Volume= 0.600 af, Depth= 0.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 10yr 24hr Rainfall=4.09"

Area (ac)	CN	Description
* 10.200	58	Type B Soils
10.200		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.4	300	0.0600	0.35		Sheet Flow, Sheet Range n= 0.130 P2= 2.84"
2.4	400	0.0350	2.81		Shallow Concentrated Flow, Shallow Grassed Waterway Kv= 15.0 fps
3.9	1,100	0.0100	4.71	94.24	Channel Flow, Channel Area= 20.0 sf Perim= 14.0' r= 1.43' n= 0.040
20.7	1,800	Total			

Summary for Subcatchment 21S: Ex NW Offsite Drainage

Runoff = 16.34 cfs @ 12.56 hrs, Volume= 2.330 af, Depth= 0.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 10yr 24hr Rainfall=4.09"

Area (ac)	CN	Description
* 39.300	58	Type B Soils
* 0.300	71	Type C Soils
39.600	58	Weighted Average
39.600		100.00% Pervious Area

1904113 prelim SWMP

Prepared by HP Inc.

HydroCAD® 10.00-25 s/n 02063 © 2019 HydroCAD Software Solutions LLC

MSE 24-hr 4 10yr 24hr Rainfall=4.09"

Printed 4/7/2020

Page 25

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.0	300	0.0167	0.21		Sheet Flow, Sheet Range n= 0.130 P2= 2.84"
8.3	1,000	0.0180	2.01		Shallow Concentrated Flow, Shallow Grassed Waterway Kv= 15.0 fps
1.0	1,100	0.0100	18.85	376.98	Channel Flow, Channel Area= 20.0 sf Perim= 14.0' r= 1.43' n= 0.010
33.3	2,400	Total			

Summary for Subcatchment 22S: Ex N Offsite Drainage

Runoff = 2.96 cfs @ 12.34 hrs, Volume= 0.276 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 10yr 24hr Rainfall=4.09"

Area (ac)	CN	Description
* 1.200	58	Type B Soils
* 1.700	71	Type C Soils
2.900	66	Weighted Average
2.900		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.9	300	0.0267	0.25		Sheet Flow, Sheet Range n= 0.130 P2= 2.84"
1.1	200	0.0400	3.00		Shallow Concentrated Flow, Shallow Grassed Waterway Kv= 15.0 fps
21.0	500	Total			

Summary for Subcatchment 27S: Ex NE Offsite Drainage

Runoff = 6.22 cfs @ 12.24 hrs, Volume= 0.492 af, Depth= 0.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 10yr 24hr Rainfall=4.09"

Area (ac)	CN	Description
* 3.600	58	Type B Soils
* 2.500	71	Type C Soils
6.100	63	Weighted Average
6.100		100.00% Pervious Area

1904113 prelim SWMP

MSE 24-hr 4 10yr 24hr Rainfall=4.09"

Prepared by HP Inc.

Printed 4/7/2020

HydroCAD® 10.00-25 s/n 02063 © 2019 HydroCAD Software Solutions LLC

Page 26

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.7	300	0.1000	0.43		Sheet Flow, Sheet Range n= 0.130 P2= 2.84"
2.2	200	0.0100	1.50		Shallow Concentrated Flow, Shallow Grassed Waterway Kv= 15.0 fps
13.9	500	Total			

Summary for Subcatchment 28S: Pro West Bypass

Runoff = 2.94 cfs @ 12.13 hrs, Volume= 0.152 af, Depth= 1.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 10yr 24hr Rainfall=4.09"

Area (ac)	CN	Description
* 1.100	74	OL Area 10% Imp
1.100		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, TC

Summary for Reach 26R: Bypass ChannelInflow Area = 50.900 ac, 0.00% Impervious, Inflow Depth = 0.73" for 10yr 24hr event
Inflow = 20.89 cfs @ 12.52 hrs, Volume= 3.083 af
Outflow = 20.54 cfs @ 12.58 hrs, Volume= 3.083 af, Atten= 2%, Lag= 3.3 minRouting by Dyn-Stor-Ind method, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs / 2
Max. Velocity= 2.00 fps, Min. Travel Time= 4.6 min
Avg. Velocity = 0.64 fps, Avg. Travel Time= 14.3 minPeak Storage= 5,640 cf @ 12.58 hrs
Average Depth at Peak Storage= 0.78'
Bank-Full Depth= 2.00' Flow Area= 36.0 sf, Capacity= 121.18 cfs10.00' x 2.00' deep channel, n= 0.040
Side Slope Z-value= 4.0 '/' Top Width= 26.00'
Length= 550.0' Slope= 0.0055 '/'
Inlet Invert= 869.00', Outlet Invert= 866.00'

1904113 prelim SWMP

MSE 24-hr 4 10yr 24hr Rainfall=4.09"

Prepared by HP Inc.

Printed 4/7/2020

HydroCAD® 10.00-25 s/n 02063 © 2019 HydroCAD Software Solutions LLC

Page 27

Summary for Pond 1P: West Street Crossing

Inflow Area = 61.200 ac, 0.33% Impervious, Inflow Depth > 0.88" for 10yr 24hr event
 Inflow = 20.54 cfs @ 12.58 hrs, Volume= 4.473 af
 Outflow = 20.19 cfs @ 12.63 hrs, Volume= 4.469 af, Atten= 2%, Lag= 3.3 min
 Primary = 20.19 cfs @ 12.63 hrs, Volume= 4.469 af

Routing by Dyn-Stor-Ind method, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs / 2
 Peak Elev= 867.23' @ 12.63 hrs Surf.Area= 5,580 sf Storage= 4,002 cf

Plug-Flow detention time= 5.7 min calculated for 4.466 af (100% of inflow)
 Center-of-Mass det. time= 4.3 min (1,069.0 - 1,064.7)

Volume	Invert	Avail.Storage	Storage Description
#1	866.00'	22,843 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
866.00	1,479	0	0
867.00	4,287	2,883	2,883
868.00	9,984	7,136	10,019
869.00	15,664	12,824	22,843

Device	Routing	Invert	Outlet Devices
#1	Primary	866.00'	36.0" Round Culvert X 2.00 L= 110.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 866.00' / 865.00' S= 0.0091 ' / Cc= 0.900 n= 0.013, Flow Area= 7.07 sf

Primary OutFlow Max=20.17 cfs @ 12.63 hrs HW=867.23' TW=0.00' (Dynamic Tailwater)
 ↑ **1=Culvert** (Barrel Controls 20.17 cfs @ 5.49 fps)

Summary for Pond 9P: West Detention Basin

Inflow Area = 10.300 ac, 1.94% Impervious, Inflow Depth = 2.14" for 10yr 24hr event
 Inflow = 30.36 cfs @ 12.14 hrs, Volume= 1.841 af
 Outflow = 4.06 cfs @ 12.77 hrs, Volume= 1.718 af, Atten= 87%, Lag= 37.8 min
 Primary = 4.06 cfs @ 12.77 hrs, Volume= 1.718 af

Routing by Dyn-Stor-Ind method, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs / 2
 Peak Elev= 869.19' @ 12.78 hrs Surf.Area= 24,665 sf Storage= 43,914 cf

Plug-Flow detention time= 616.5 min calculated for 1.718 af (93% of inflow)
 Center-of-Mass det. time= 583.2 min (1,397.0 - 813.8)

Volume	Invert	Avail.Storage	Storage Description
#1	867.00'	95,625 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

1904113 prelim SWMP

MSE 24-hr 4 10yr 24hr Rainfall=4.09"

Prepared by HP Inc.

Printed 4/7/2020

HydroCAD® 10.00-25 s/n 02063 © 2019 HydroCAD Software Solutions LLC

Page 28

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
867.00	15,467	0	0
868.00	19,599	17,533	17,533
869.00	23,831	21,715	39,248
870.00	28,163	25,997	65,245
871.00	32,596	30,380	95,625

Device	Routing	Invert	Outlet Devices
#1	Primary	866.00'	18.0" Round Culvert L= 50.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 866.00' / 866.00' S= 0.0000 ' S= 0.0000 ' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	867.00'	4.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	869.00'	48.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Primary	869.75'	30.0' long x 10.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=4.06 cfs @ 12.77 hrs HW=869.19' TW=867.17' (Dynamic Tailwater)

- 1=Culvert (Passes 4.06 cfs of 11.87 cfs potential flow)
 2=Orifice/Grate (Orifice Controls 0.60 cfs @ 6.84 fps)
 3=Orifice/Grate (Weir Controls 3.47 cfs @ 1.43 fps)
 4=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond 10P: West Infiltration Basin

Inflow Area = 10.300 ac, 1.94% Impervious, Inflow Depth > 2.00" for 10yr 24hr event
 Inflow = 4.06 cfs @ 12.77 hrs, Volume= 1.718 af
 Outflow = 2.86 cfs @ 13.45 hrs, Volume= 1.604 af, Atten= 30%, Lag= 41.1 min
 Discarded = 0.08 cfs @ 13.45 hrs, Volume= 0.214 af
 Primary = 2.78 cfs @ 13.45 hrs, Volume= 1.390 af

Routing by Dyn-Stor-Ind method, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs / 2

Peak Elev= 867.88' @ 13.45 hrs Surf.Area= 5,851 sf Storage= 8,855 cf

Plug-Flow detention time= 159.8 min calculated for 1.603 af (93% of inflow)

Center-of-Mass det. time= 68.8 min (1,465.8 - 1,397.0)

Volume	Invert	Avail.Storage	Storage Description
#1	866.00'	34,052 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
866.00	3,624	0	0
867.00	4,745	4,185	4,185
868.00	6,000	5,373	9,557
869.00	7,386	6,693	16,250
870.00	8,876	8,131	24,381
871.00	10,466	9,671	34,052

1904113 prelim SWMP

Prepared by HP Inc.

HydroCAD® 10.00-25 s/n 02063 © 2019 HydroCAD Software Solutions LLC

MSE 24-hr 4 10yr 24hr Rainfall=4.09"

Printed 4/7/2020

Page 29

Device	Routing	Invert	Outlet Devices
#1	Discarded	866.00'	0.500 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 860.00'
#2	Primary	867.00'	15.0" Round Culvert L= 50.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 867.00' / 866.50' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#3	Primary	870.00'	5.0' long x 10.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.08 cfs @ 13.45 hrs HW=867.88' (Free Discharge)↑**1=Exfiltration** (Controls 0.08 cfs)**Primary OutFlow** Max=2.78 cfs @ 13.45 hrs HW=867.88' TW=866.87' (Dynamic Tailwater)↑**2=Culvert** (Barrel Controls 2.78 cfs @ 4.21 fps)↑**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)**Summary for Pond 11P: East Detention Basin**

Inflow Area = 18.700 ac, 3.74% Impervious, Inflow Depth = 2.72" for 10yr 24hr event
 Inflow = 67.99 cfs @ 12.17 hrs, Volume= 4.238 af
 Outflow = 16.76 cfs @ 12.49 hrs, Volume= 4.142 af, Atten= 75%, Lag= 18.8 min
 Primary = 16.76 cfs @ 12.49 hrs, Volume= 4.142 af

Routing by Dyn-Stor-Ind method, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs / 2
 Peak Elev= 864.50' @ 12.50 hrs Surf.Area= 43,015 sf Storage= 92,201 cf

Plug-Flow detention time= 360.7 min calculated for 4.139 af (98% of inflow)
 Center-of-Mass det. time= 348.4 min (1,150.9 - 802.5)

Volume	Invert	Avail.Storage	Storage Description
#1	862.00'	162,500 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
862.00	30,928	0	0
863.00	35,693	33,311	33,311
864.00	40,550	38,122	71,432
865.00	45,509	43,030	114,462
866.00	50,568	48,039	162,500

Device	Routing	Invert	Outlet Devices
#1	Primary	861.00'	24.0" Round Culvert L= 50.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 861.00' / 861.00' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	862.00'	8.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	864.00'	48.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

1904113 prelim SWMP

MSE 24-hr 4 10yr 24hr Rainfall=4.09"

Prepared by HP Inc.

Printed 4/7/2020

HydroCAD® 10.00-25 s/n 02063 © 2019 HydroCAD Software Solutions LLC

Page 30

#4 Primary 864.75' **20.0' long x 10.0' breadth Broad-Crested Rectangular Weir**
 Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=16.75 cfs @ 12.49 hrs HW=864.50' TW=862.49' (Dynamic Tailwater)

1=Culvert (Passes 16.75 cfs of 21.17 cfs potential flow)
 2=Orifice/Grate (Orifice Controls 2.38 cfs @ 6.81 fps)
 3=Orifice/Grate (Weir Controls 14.37 cfs @ 2.30 fps)
 4=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond 12P: East Infiltration Basin

Inflow Area = 18.700 ac, 3.74% Impervious, Inflow Depth > 2.66" for 10yr 24hr event
 Inflow = 16.76 cfs @ 12.49 hrs, Volume= 4.142 af
 Outflow = 8.24 cfs @ 13.21 hrs, Volume= 3.934 af, Atten= 51%, Lag= 43.4 min
 Discarded = 0.22 cfs @ 13.21 hrs, Volume= 0.489 af
 Primary = 8.02 cfs @ 13.21 hrs, Volume= 3.445 af

Routing by Dyn-Stor-Ind method, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs / 2
 Peak Elev= 863.64' @ 13.21 hrs Surf.Area= 14,163 sf Storage= 29,692 cf

Plug-Flow detention time= 147.0 min calculated for 3.934 af (95% of inflow)
 Center-of-Mass det. time= 85.2 min (1,236.1 - 1,150.9)

Volume	Invert	Avail.Storage	Storage Description
#1	861.00'	69,661 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
861.00	8,400	0	0
862.00	10,501	9,451	9,451
863.00	12,689	11,595	21,046
864.00	14,977	13,833	34,879
865.00	17,366	16,172	51,050
866.00	19,855	18,611	69,661

Device	Routing	Invert	Outlet Devices
#1	Discarded	861.00'	0.500 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 855.00'
#2	Primary	862.00'	18.0" Round Culvert L= 50.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 862.00' / 861.50' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#3	Primary	865.00'	4.0' long x 10.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.22 cfs @ 13.21 hrs HW=863.64' (Free Discharge)

↑**1=Exfiltration** (Controls 0.22 cfs)

Primary OutFlow Max=8.02 cfs @ 13.21 hrs HW=863.64' TW=0.00' (Dynamic Tailwater)

↑**2=Culvert** (Barrel Controls 8.02 cfs @ 5.16 fps)

↑**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Link 1L: Proposed West Channel

Inflow Area = 50.900 ac, 0.00% Impervious, Inflow Depth = 0.73" for 10yr 24hr event
Inflow = 20.54 cfs @ 12.58 hrs, Volume= 3.083 af
Primary = 20.54 cfs @ 12.58 hrs, Volume= 3.083 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs

Summary for Link 13L: Total Proposed Combined

Inflow Area = 95.100 ac, 0.95% Impervious, Inflow Depth > 1.15" for 10yr 24hr event
Inflow = 31.79 cfs @ 12.65 hrs, Volume= 9.139 af
Primary = 31.79 cfs @ 12.65 hrs, Volume= 9.139 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs

Summary for Link 24L: Proposed South Drainage Total

Inflow Area = 86.500 ac, 1.04% Impervious, Inflow Depth > 1.17" for 10yr 24hr event
Inflow = 28.75 cfs @ 12.68 hrs, Volume= 8.446 af
Primary = 28.75 cfs @ 12.68 hrs, Volume= 8.446 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs

Summary for Link 25L: Proposed East Through Culvert Total

Inflow Area = 8.600 ac, 0.00% Impervious, Inflow Depth = 0.97" for 10yr 24hr event
Inflow = 7.66 cfs @ 12.26 hrs, Volume= 0.693 af
Primary = 7.66 cfs @ 12.26 hrs, Volume= 0.693 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs

Summary for Subcatchment 6S: Proposed West Drain Area

Runoff = 38.28 cfs @ 12.13 hrs, Volume= 2.083 af, Depth= 3.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 25yr 24hr Rainfall=5.01"

Area (ac)	CN	Description
* 6.000	87	55% Impervious Residential
* 1.200	74	10% Impervious OL Area
* 0.200	98	Wet Basin
7.400	85	Weighted Average
7.200		97.30% Pervious Area
0.200		2.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	100	0.0800	0.31		Sheet Flow, Sheet
					Range n= 0.130 P2= 2.84"
0.3	100	0.0600	4.97		Shallow Concentrated Flow, Shallow
					Paved Kv= 20.3 fps
0.9	550	0.0180	9.66	30.35	Pipe Channel, Pipe
					24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'
					n= 0.013
6.5	750	Total			

Summary for Subcatchment 7S: Proposed East Drain Area

Runoff = 88.35 cfs @ 12.17 hrs, Volume= 5.574 af, Depth= 3.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 25yr 24hr Rainfall=5.01"

Area (ac)	CN	Description
* 12.900	87	60% Impervious Residential
* 3.600	90	70% Impervious Residential
* 1.500	74	10% Impervious OL
* 0.700	98	Wet Basin
18.700	87	Weighted Average
18.000		96.26% Pervious Area
0.700		3.74% Impervious Area

1904113 prelim SWMP

MSE 24-hr 4 25yr 24hr Rainfall=5.01"

Prepared by HP Inc.

Printed 4/7/2020

HydroCAD® 10.00-25 s/n 02063 © 2019 HydroCAD Software Solutions LLC

Page 33

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	150	0.0800	0.34		Sheet Flow, Sheet Range n= 0.130 P2= 2.84"
0.3	100	0.0600	4.97		Shallow Concentrated Flow, Shallow Paved Kv= 20.3 fps
2.3	1,200	0.0150	8.82	27.71	Pipe Channel, Pipe 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
10.0	1,450	Total			

Summary for Subcatchment 8S: Proposed Directly Offsite East Area

Runoff = 3.24 cfs @ 12.37 hrs, Volume= 0.316 af, Depth= 1.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 25yr 24hr Rainfall=5.01"

Area (ac)	CN	Description
* 2.400	62	10% Impervious Lightly Disturbed/Restored
* 0.100	90	70% Imp ROW area
2.500	63	Weighted Average
2.500		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.3	200	0.0100	0.16		Sheet Flow, Sheet Range n= 0.130 P2= 2.84"
2.3	400	0.0200	2.87		Shallow Concentrated Flow, Shallow Paved Kv= 20.3 fps
23.6	600	Total			

Summary for Subcatchment 15S: Proposed Directly Offsite South Area

Runoff = 7.11 cfs @ 12.50 hrs, Volume= 0.833 af, Depth= 1.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 25yr 24hr Rainfall=5.01"

Area (ac)	CN	Description
* 6.200	62	10% Impervious Lightly Disturbed/Restored
* 0.200	82	40% Imp yard area
* 0.200	90	70% Imp ROW area
6.600	63	Weighted Average
6.600		100.00% Pervious Area

1904113 prelim SWMP

MSE 24-hr 4 25yr 24hr Rainfall=5.01"

Prepared by HP Inc.

Printed 4/7/2020

HydroCAD® 10.00-25 s/n 02063 © 2019 HydroCAD Software Solutions LLC

Page 34

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
29.5	300	0.0100	0.17		Sheet Flow, Sheet Range n= 0.130 P2= 2.84"
3.3	400	0.0100	2.03		Shallow Concentrated Flow, Shallow Paved Kv= 20.3 fps
32.8	700	Total			

Summary for Subcatchment 20S: Ex West Offsite Drainage

Runoff = 10.27 cfs @ 12.34 hrs, Volume= 0.998 af, Depth= 1.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 25yr 24hr Rainfall=5.01"

Area (ac)	CN	Description
* 10.200	58	Type B Soils
10.200		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.4	300	0.0600	0.35		Sheet Flow, Sheet Range n= 0.130 P2= 2.84"
2.4	400	0.0350	2.81		Shallow Concentrated Flow, Shallow Grassed Waterway Kv= 15.0 fps
3.9	1,100	0.0100	4.71	94.24	Channel Flow, Channel Area= 20.0 sf Perim= 14.0' r= 1.43' n= 0.040
20.7	1,800	Total			

Summary for Subcatchment 21S: Ex NW Offsite Drainage

Runoff = 30.61 cfs @ 12.53 hrs, Volume= 3.875 af, Depth= 1.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 25yr 24hr Rainfall=5.01"

Area (ac)	CN	Description
* 39.300	58	Type B Soils
* 0.300	71	Type C Soils
39.600	58	Weighted Average
39.600		100.00% Pervious Area

1904113 prelim SWMP

MSE 24-hr 4 25yr 24hr Rainfall=5.01"

Prepared by HP Inc.

Printed 4/7/2020

HydroCAD® 10.00-25 s/n 02063 © 2019 HydroCAD Software Solutions LLC

Page 35

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.0	300	0.0167	0.21		Sheet Flow, Sheet Range n= 0.130 P2= 2.84"
8.3	1,000	0.0180	2.01		Shallow Concentrated Flow, Shallow Grassed Waterway Kv= 15.0 fps
1.0	1,100	0.0100	18.85	376.98	Channel Flow, Channel Area= 20.0 sf Perim= 14.0' r= 1.43' n= 0.010
33.3	2,400	Total			

Summary for Subcatchment 22S: Ex N Offsite Drainage

Runoff = 4.70 cfs @ 12.33 hrs, Volume= 0.419 af, Depth= 1.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 25yr 24hr Rainfall=5.01"

Area (ac)	CN	Description
* 1.200	58	Type B Soils
* 1.700	71	Type C Soils
2.900	66	Weighted Average
2.900		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.9	300	0.0267	0.25		Sheet Flow, Sheet Range n= 0.130 P2= 2.84"
1.1	200	0.0400	3.00		Shallow Concentrated Flow, Shallow Grassed Waterway Kv= 15.0 fps
21.0	500	Total			

Summary for Subcatchment 27S: Ex NE Offsite Drainage

Runoff = 10.39 cfs @ 12.23 hrs, Volume= 0.770 af, Depth= 1.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 25yr 24hr Rainfall=5.01"

Area (ac)	CN	Description
* 3.600	58	Type B Soils
* 2.500	71	Type C Soils
6.100	63	Weighted Average
6.100		100.00% Pervious Area

1904113 prelim SWMP

MSE 24-hr 4 25yr 24hr Rainfall=5.01"

Prepared by HP Inc.

Printed 4/7/2020

HydroCAD® 10.00-25 s/n 02063 © 2019 HydroCAD Software Solutions LLC

Page 36

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.7	300	0.1000	0.43		Sheet Flow, Sheet
					Range n= 0.130 P2= 2.84"
2.2	200	0.0100	1.50		Shallow Concentrated Flow, Shallow
					Grassed Waterway Kv= 15.0 fps
13.9	500	Total			

Summary for Subcatchment 28S: Pro West Bypass

Runoff = 4.21 cfs @ 12.13 hrs, Volume= 0.217 af, Depth= 2.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 25yr 24hr Rainfall=5.01"

Area (ac)	CN	Description
* 1.100	74	OL Area 10% Imp
1.100		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, TC

Summary for Reach 26R: Bypass Channel

Inflow Area = 50.900 ac, 0.00% Impervious, Inflow Depth = 1.20" for 25yr 24hr event
 Inflow = 39.04 cfs @ 12.48 hrs, Volume= 5.091 af
 Outflow = 38.53 cfs @ 12.53 hrs, Volume= 5.091 af, Atten= 1%, Lag= 3.3 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs / 2
 Max. Velocity= 2.43 fps, Min. Travel Time= 3.8 min
 Avg. Velocity= 0.72 fps, Avg. Travel Time= 12.8 min

Peak Storage= 8,733 cf @ 12.53 hrs
 Average Depth at Peak Storage= 1.10'
 Bank-Full Depth= 2.00' Flow Area= 36.0 sf, Capacity= 121.18 cfs

10.00' x 2.00' deep channel, n= 0.040
 Side Slope Z-value= 4.0 '/' Top Width= 26.00'
 Length= 550.0' Slope= 0.0055 '/'
 Inlet Invert= 869.00', Outlet Invert= 866.00'



1904113 prelim SWMP

MSE 24-hr 4 25yr 24hr Rainfall=5.01"

Prepared by HP Inc.

Printed 4/7/2020

HydroCAD® 10.00-25 s/n 02063 © 2019 HydroCAD Software Solutions LLC

Page 37

Summary for Pond 1P: West Street Crossing

Inflow Area = 61.200 ac, 0.33% Impervious, Inflow Depth > 1.40" for 25yr 24hr event
 Inflow = 42.31 cfs @ 12.56 hrs, Volume= 7.121 af
 Outflow = 41.13 cfs @ 12.64 hrs, Volume= 7.118 af, Atten= 3%, Lag= 4.3 min
 Primary = 41.13 cfs @ 12.64 hrs, Volume= 7.118 af

Routing by Dyn-Stor-Ind method, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs / 2
 Peak Elev= 867.87' @ 12.64 hrs Surf.Area= 9,241 sf Storage= 8,765 cf

Plug-Flow detention time= 4.9 min calculated for 7.113 af (100% of inflow)
 Center-of-Mass det. time= 3.9 min (994.4 - 990.5)

Volume	Invert	Avail.Storage	Storage Description
#1	866.00'	22,843 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
866.00	1,479	0	0
867.00	4,287	2,883	2,883
868.00	9,984	7,136	10,019
869.00	15,664	12,824	22,843

Device	Routing	Invert	Outlet Devices
#1	Primary	866.00'	36.0" Round Culvert X 2.00 L= 110.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 866.00' / 865.00' S= 0.0091 ' / Cc= 0.900 n= 0.013, Flow Area= 7.07 sf

Primary OutFlow Max=41.11 cfs @ 12.64 hrs HW=867.87' TW=0.00' (Dynamic Tailwater)
 ↑**1=Culvert** (Barrel Controls 41.11 cfs @ 6.34 fps)

Summary for Pond 9P: West Detention Basin

Inflow Area = 10.300 ac, 1.94% Impervious, Inflow Depth = 2.91" for 25yr 24hr event
 Inflow = 40.49 cfs @ 12.14 hrs, Volume= 2.502 af
 Outflow = 11.59 cfs @ 12.38 hrs, Volume= 2.367 af, Atten= 71%, Lag= 14.5 min
 Primary = 11.59 cfs @ 12.38 hrs, Volume= 2.367 af

Routing by Dyn-Stor-Ind method, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs / 2
 Peak Elev= 869.44' @ 12.53 hrs Surf.Area= 25,744 sf Storage= 50,194 cf

Plug-Flow detention time= 467.6 min calculated for 2.367 af (95% of inflow)
 Center-of-Mass det. time= 439.8 min (1,247.2 - 807.3)

Volume	Invert	Avail.Storage	Storage Description
#1	867.00'	95,625 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

1904113 prelim SWMP

MSE 24-hr 4 25yr 24hr Rainfall=5.01"

Prepared by HP Inc.

Printed 4/7/2020

HydroCAD® 10.00-25 s/n 02063 © 2019 HydroCAD Software Solutions LLC

Page 38

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
867.00	15,467	0	0
868.00	19,599	17,533	17,533
869.00	23,831	21,715	39,248
870.00	28,163	25,997	65,245
871.00	32,596	30,380	95,625

Device	Routing	Invert	Outlet Devices
#1	Primary	866.00'	18.0" Round Culvert L= 50.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 866.00' / 866.00' S= 0.0000 ' S= 0.0000 ' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	867.00'	4.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	869.00'	48.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Primary	869.75'	30.0' long x 10.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=11.66 cfs @ 12.38 hrs HW=869.42' TW=867.48' (Dynamic Tailwater)

- 1=Culvert (Passes 11.66 cfs of 11.85 cfs potential flow)
 2=Orifice/Grate (Orifice Controls 0.59 cfs @ 6.71 fps)
 3=Orifice/Grate (Weir Controls 11.08 cfs @ 2.11 fps)
 4=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond 10P: West Infiltration Basin

Inflow Area = 10.300 ac, 1.94% Impervious, Inflow Depth > 2.76" for 25yr 24hr event
 Inflow = 11.59 cfs @ 12.38 hrs, Volume= 2.367 af
 Outflow = 6.21 cfs @ 13.11 hrs, Volume= 2.252 af, Atten= 46%, Lag= 44.1 min
 Discarded = 0.11 cfs @ 13.11 hrs, Volume= 0.222 af
 Primary = 6.10 cfs @ 13.11 hrs, Volume= 2.030 af

Routing by Dyn-Stor-Ind method, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs / 2

Peak Elev= 868.77' @ 13.11 hrs Surf.Area= 7,071 sf Storage= 14,605 cf

Plug-Flow detention time= 122.7 min calculated for 2.252 af (95% of inflow)

Center-of-Mass det. time= 49.3 min (1,296.5 - 1,247.2)

Volume	Invert	Avail.Storage	Storage Description
#1	866.00'	34,052 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
866.00	3,624	0	0
867.00	4,745	4,185	4,185
868.00	6,000	5,373	9,557
869.00	7,386	6,693	16,250
870.00	8,876	8,131	24,381
871.00	10,466	9,671	34,052

1904113 prelim SWMP

MSE 24-hr 4 25yr 24hr Rainfall=5.01"

Prepared by HP Inc.

Printed 4/7/2020

HydroCAD® 10.00-25 s/n 02063 © 2019 HydroCAD Software Solutions LLC

Page 39

Device	Routing	Invert	Outlet Devices
#1	Discarded	866.00'	0.500 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 860.00'
#2	Primary	867.00'	15.0" Round Culvert L= 50.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 867.00' / 866.50' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#3	Primary	870.00'	5.0' long x 10.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.11 cfs @ 13.11 hrs HW=868.77' (Free Discharge)↑**1=Exfiltration** (Controls 0.11 cfs)**Primary OutFlow** Max=6.10 cfs @ 13.11 hrs HW=868.77' TW=867.38' (Dynamic Tailwater)↑**2=Culvert** (Barrel Controls 6.10 cfs @ 4.97 fps)↑**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)**Summary for Pond 11P: East Detention Basin**

Inflow Area = 18.700 ac, 3.74% Impervious, Inflow Depth = 3.58" for 25yr 24hr event
 Inflow = 88.35 cfs @ 12.17 hrs, Volume= 5.574 af
 Outflow = 25.39 cfs @ 12.36 hrs, Volume= 5.472 af, Atten= 71%, Lag= 11.1 min
 Primary = 25.39 cfs @ 12.36 hrs, Volume= 5.472 af

Routing by Dyn-Stor-Ind method, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs / 2
 Peak Elev= 864.97' @ 12.47 hrs Surf.Area= 45,376 sf Storage= 113,247 cf

Plug-Flow detention time= 308.2 min calculated for 5.472 af (98% of inflow)
 Center-of-Mass det. time= 297.5 min (1,093.5 - 796.0)

Volume	Invert	Avail.Storage	Storage Description
#1	862.00'	162,500 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
862.00	30,928	0	0
863.00	35,693	33,311	33,311
864.00	40,550	38,122	71,432
865.00	45,509	43,030	114,462
866.00	50,568	48,039	162,500

Device	Routing	Invert	Outlet Devices
#1	Primary	861.00'	24.0" Round Culvert L= 50.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 861.00' / 861.00' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	862.00'	8.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	864.00'	48.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

1904113 prelim SWMP

MSE 24-hr 4 25yr 24hr Rainfall=5.01"

Prepared by HP Inc.

Printed 4/7/2020

HydroCAD® 10.00-25 s/n 02063 © 2019 HydroCAD Software Solutions LLC

Page 40

#4 Primary 864.75' **20.0' long x 10.0' breadth Broad-Crested Rectangular Weir**
 Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=25.38 cfs @ 12.36 hrs HW=864.93' TW=862.91' (Dynamic Tailwater)

1=Culvert (Inlet Controls 21.53 cfs @ 6.85 fps)
 2=Orifice/Grate (Passes < 2.39 cfs potential flow)
 3=Orifice/Grate (Passes < 36.93 cfs potential flow)
 4=Broad-Crested Rectangular Weir (Weir Controls 3.84 cfs @ 1.06 fps)

Summary for Pond 12P: East Infiltration Basin

Inflow Area = 18.700 ac, 3.74% Impervious, Inflow Depth > 3.51" for 25yr 24hr event
 Inflow = 25.39 cfs @ 12.36 hrs, Volume= 5.472 af
 Outflow = 10.85 cfs @ 13.10 hrs, Volume= 5.259 af, Atten= 57%, Lag= 44.7 min
 Discarded = 0.26 cfs @ 13.10 hrs, Volume= 0.511 af
 Primary = 10.59 cfs @ 13.10 hrs, Volume= 4.748 af

Routing by Dyn-Stor-Ind method, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs / 2
 Peak Elev= 864.35' @ 13.10 hrs Surf.Area= 15,806 sf Storage= 40,219 cf

Plug-Flow detention time= 122.9 min calculated for 5.255 af (96% of inflow)
 Center-of-Mass det. time= 72.3 min (1,165.8 - 1,093.5)

Volume	Invert	Avail.Storage	Storage Description
#1	861.00'	69,661 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
861.00	8,400	0	0
862.00	10,501	9,451	9,451
863.00	12,689	11,595	21,046
864.00	14,977	13,833	34,879
865.00	17,366	16,172	51,050
866.00	19,855	18,611	69,661

Device	Routing	Invert	Outlet Devices
#1	Discarded	861.00'	0.500 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 855.00'
#2	Primary	862.00'	18.0" Round Culvert L= 50.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 862.00' / 861.50' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#3	Primary	865.00'	4.0' long x 10.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.26 cfs @ 13.10 hrs HW=864.35' (Free Discharge)

↑**1=Exfiltration** (Controls 0.26 cfs)

Primary OutFlow Max=10.59 cfs @ 13.10 hrs HW=864.35' TW=0.00' (Dynamic Tailwater)

↑**2=Culvert** (Barrel Controls 10.59 cfs @ 5.99 fps)

↑**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Link 1L: Proposed West Channel

Inflow Area = 50.900 ac, 0.00% Impervious, Inflow Depth = 1.20" for 25yr 24hr event
Inflow = 38.53 cfs @ 12.53 hrs, Volume= 5.091 af
Primary = 38.53 cfs @ 12.53 hrs, Volume= 5.091 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs

Summary for Link 13L: Total Proposed Combined

Inflow Area = 95.100 ac, 0.95% Impervious, Inflow Depth > 1.74" for 25yr 24hr event
Inflow = 62.21 cfs @ 12.60 hrs, Volume= 13.785 af
Primary = 62.21 cfs @ 12.60 hrs, Volume= 13.785 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs

Summary for Link 24L: Proposed South Drainage Total

Inflow Area = 86.500 ac, 1.04% Impervious, Inflow Depth > 1.76" for 25yr 24hr event
Inflow = 56.78 cfs @ 12.62 hrs, Volume= 12.699 af
Primary = 56.78 cfs @ 12.62 hrs, Volume= 12.699 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs

Summary for Link 25L: Proposed East Through Culvert Total

Inflow Area = 8.600 ac, 0.00% Impervious, Inflow Depth = 1.52" for 25yr 24hr event
Inflow = 12.86 cfs @ 12.25 hrs, Volume= 1.086 af
Primary = 12.86 cfs @ 12.25 hrs, Volume= 1.086 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs

Summary for Subcatchment 6S: Proposed West Drain Area

Runoff = 54.75 cfs @ 12.13 hrs, Volume= 3.039 af, Depth= 4.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 100yr 24hr Rainfall=6.66"

Area (ac)	CN	Description
* 6.000	87	55% Impervious Residential
* 1.200	74	10% Impervious OL Area
* 0.200	98	Wet Basin
7.400	85	Weighted Average
7.200		97.30% Pervious Area
0.200		2.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	100	0.0800	0.31		Sheet Flow, Sheet
					Range n= 0.130 P2= 2.84"
0.3	100	0.0600	4.97		Shallow Concentrated Flow, Shallow
					Paved Kv= 20.3 fps
0.9	550	0.0180	9.66	30.35	Pipe Channel, Pipe
					24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'
					n= 0.013
6.5	750	Total			

Summary for Subcatchment 7S: Proposed East Drain Area

Runoff = 124.79 cfs @ 12.17 hrs, Volume= 8.027 af, Depth= 5.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 100yr 24hr Rainfall=6.66"

Area (ac)	CN	Description
* 12.900	87	60% Impervious Residential
* 3.600	90	70% Impervious Residential
* 1.500	74	10% Impervious OL
* 0.700	98	Wet Basin
18.700	87	Weighted Average
18.000		96.26% Pervious Area
0.700		3.74% Impervious Area

1904113 prelim SWMP

MSE 24-hr 4 100yr 24hr Rainfall=6.66"

Prepared by HP Inc.

Printed 4/7/2020

HydroCAD® 10.00-25 s/n 02063 © 2019 HydroCAD Software Solutions LLC

Page 43

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	150	0.0800	0.34		Sheet Flow, Sheet Range n= 0.130 P2= 2.84"
0.3	100	0.0600	4.97		Shallow Concentrated Flow, Shallow Paved Kv= 20.3 fps
2.3	1,200	0.0150	8.82	27.71	Pipe Channel, Pipe 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
10.0	1,450	Total			

Summary for Subcatchment 8S: Proposed Directly Offsite East Area

Runoff = 5.94 cfs @ 12.35 hrs, Volume= 0.552 af, Depth= 2.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 100yr 24hr Rainfall=6.66"

Area (ac)	CN	Description
* 2.400	62	10% Impervious Lightly Disturbed/Restored
* 0.100	90	70% Imp ROW area
2.500	63	Weighted Average
2.500		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.3	200	0.0100	0.16		Sheet Flow, Sheet Range n= 0.130 P2= 2.84"
2.3	400	0.0200	2.87		Shallow Concentrated Flow, Shallow Paved Kv= 20.3 fps
23.6	600	Total			

Summary for Subcatchment 15S: Proposed Directly Offsite South Area

Runoff = 13.05 cfs @ 12.48 hrs, Volume= 1.457 af, Depth= 2.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 100yr 24hr Rainfall=6.66"

Area (ac)	CN	Description
* 6.200	62	10% Impervious Lightly Disturbed/Restored
* 0.200	82	40% Imp yard area
* 0.200	90	70% Imp ROW area
6.600	63	Weighted Average
6.600		100.00% Pervious Area

1904113 prelim SWMP

MSE 24-hr 4 100yr 24hr Rainfall=6.66"

Prepared by HP Inc.

Printed 4/7/2020

HydroCAD® 10.00-25 s/n 02063 © 2019 HydroCAD Software Solutions LLC

Page 44

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
29.5	300	0.0100	0.17		Sheet Flow, Sheet Range n= 0.130 P2= 2.84"
3.3	400	0.0100	2.03		Shallow Concentrated Flow, Shallow Paved Kv= 20.3 fps
32.8	700	Total			

Summary for Subcatchment 20S: Ex West Offsite Drainage

Runoff = 20.81 cfs @ 12.32 hrs, Volume= 1.854 af, Depth= 2.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 100yr 24hr Rainfall=6.66"

Area (ac)	CN	Description
* 10.200	58	Type B Soils
10.200		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.4	300	0.0600	0.35		Sheet Flow, Sheet Range n= 0.130 P2= 2.84"
2.4	400	0.0350	2.81		Shallow Concentrated Flow, Shallow Grassed Waterway Kv= 15.0 fps
3.9	1,100	0.0100	4.71	94.24	Channel Flow, Channel Area= 20.0 sf Perim= 14.0' r= 1.43' n= 0.040
20.7	1,800	Total			

Summary for Subcatchment 21S: Ex NW Offsite Drainage

Runoff = 61.96 cfs @ 12.50 hrs, Volume= 7.198 af, Depth= 2.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 100yr 24hr Rainfall=6.66"

Area (ac)	CN	Description
* 39.300	58	Type B Soils
* 0.300	71	Type C Soils
39.600	58	Weighted Average
39.600		100.00% Pervious Area

1904113 prelim SWMP

MSE 24-hr 4 100yr 24hr Rainfall=6.66"

Prepared by HP Inc.

Printed 4/7/2020

HydroCAD® 10.00-25 s/n 02063 © 2019 HydroCAD Software Solutions LLC

Page 45

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.0	300	0.0167	0.21		Sheet Flow, Sheet Range n= 0.130 P2= 2.84"
8.3	1,000	0.0180	2.01		Shallow Concentrated Flow, Shallow Grassed Waterway Kv= 15.0 fps
1.0	1,100	0.0100	18.85	376.98	Channel Flow, Channel Area= 20.0 sf Perim= 14.0' r= 1.43' n= 0.010
33.3	2,400	Total			

Summary for Subcatchment 22S: Ex N Offsite Drainage

Runoff = 8.21 cfs @ 12.32 hrs, Volume= 0.710 af, Depth= 2.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 100yr 24hr Rainfall=6.66"

Area (ac)	CN	Description
* 1.200	58	Type B Soils
* 1.700	71	Type C Soils
2.900	66	Weighted Average
2.900		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.9	300	0.0267	0.25		Sheet Flow, Sheet Range n= 0.130 P2= 2.84"
1.1	200	0.0400	3.00		Shallow Concentrated Flow, Shallow Grassed Waterway Kv= 15.0 fps
21.0	500	Total			

Summary for Subcatchment 27S: Ex NE Offsite Drainage

Runoff = 18.89 cfs @ 12.23 hrs, Volume= 1.347 af, Depth= 2.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 100yr 24hr Rainfall=6.66"

Area (ac)	CN	Description
* 3.600	58	Type B Soils
* 2.500	71	Type C Soils
6.100	63	Weighted Average
6.100		100.00% Pervious Area

1904113 prelim SWMP

MSE 24-hr 4 100yr 24hr Rainfall=6.66"

Prepared by HP Inc.

Printed 4/7/2020

HydroCAD® 10.00-25 s/n 02063 © 2019 HydroCAD Software Solutions LLC

Page 46

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.7	300	0.1000	0.43		Sheet Flow, Sheet
					Range n= 0.130 P2= 2.84"
2.2	200	0.0100	1.50		Shallow Concentrated Flow, Shallow
					Grassed Waterway Kv= 15.0 fps
13.9	500	Total			

Summary for Subcatchment 28S: Pro West Bypass

Runoff = 6.60 cfs @ 12.13 hrs, Volume= 0.343 af, Depth= 3.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs
MSE 24-hr 4 100yr 24hr Rainfall=6.66"

Area (ac)	CN	Description
* 1.100	74	OL Area 10% Imp
1.100		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, TC

Summary for Reach 26R: Bypass Channel

Inflow Area = 50.900 ac, 0.00% Impervious, Inflow Depth = 2.21" for 100yr 24hr event

Inflow = 78.97 cfs @ 12.45 hrs, Volume= 9.395 af

Outflow = 78.16 cfs @ 12.49 hrs, Volume= 9.395 af, Atten= 1%, Lag= 2.4 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs / 2

Max. Velocity= 2.98 fps, Min. Travel Time= 3.1 min

Avg. Velocity = 0.82 fps, Avg. Travel Time= 11.2 min

Peak Storage= 14,431 cf @ 12.49 hrs

Average Depth at Peak Storage= 1.60'

Bank-Full Depth= 2.00' Flow Area= 36.0 sf, Capacity= 121.18 cfs

10.00' x 2.00' deep channel, n= 0.040

Side Slope Z-value= 4.0 '/' Top Width= 26.00'

Length= 550.0' Slope= 0.0055 '/'

Inlet Invert= 869.00', Outlet Invert= 866.00'



1904113 prelim SWMP

MSE 24-hr 4 100yr 24hr Rainfall=6.66"

Prepared by HP Inc.

Printed 4/7/2020

HydroCAD® 10.00-25 s/n 02063 © 2019 HydroCAD Software Solutions LLC

Page 47

Summary for Pond 1P: West Street Crossing

Inflow Area = 61.200 ac, 0.33% Impervious, Inflow Depth > 2.48" for 100yr 24hr event
 Inflow = 84.32 cfs @ 12.49 hrs, Volume= 12.645 af
 Outflow = 79.60 cfs @ 12.60 hrs, Volume= 12.641 af, Atten= 6%, Lag= 6.5 min
 Primary = 79.60 cfs @ 12.60 hrs, Volume= 12.641 af

Routing by Dyn-Stor-Ind method, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs / 2
 Peak Elev= 868.91' @ 12.60 hrs Surf.Area= 15,142 sf Storage= 21,427 cf

Plug-Flow detention time= 4.4 min calculated for 12.633 af (100% of inflow)
 Center-of-Mass det. time= 3.9 min (937.4 - 933.5)

Volume	Invert	Avail.Storage	Storage Description
#1	866.00'	22,843 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
866.00	1,479	0	0
867.00	4,287	2,883	2,883
868.00	9,984	7,136	10,019
869.00	15,664	12,824	22,843

Device	Routing	Invert	Outlet Devices
#1	Primary	866.00'	36.0" Round Culvert X 2.00 L= 110.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 866.00' / 865.00' S= 0.0091 ' / Cc= 0.900 n= 0.013, Flow Area= 7.07 sf

Primary OutFlow Max=79.55 cfs @ 12.60 hrs HW=868.91' TW=0.00' (Dynamic Tailwater)
 ↑ **1=Culvert** (Barrel Controls 79.55 cfs @ 7.23 fps)

Summary for Pond 9P: West Detention Basin

Inflow Area = 10.300 ac, 1.94% Impervious, Inflow Depth = 4.37" for 100yr 24hr event
 Inflow = 58.97 cfs @ 12.14 hrs, Volume= 3.749 af
 Outflow = 22.22 cfs @ 12.31 hrs, Volume= 3.603 af, Atten= 62%, Lag= 10.5 min
 Primary = 22.22 cfs @ 12.31 hrs, Volume= 3.603 af

Routing by Dyn-Stor-Ind method, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs / 2
 Peak Elev= 870.12' @ 12.79 hrs Surf.Area= 28,716 sf Storage= 68,795 cf

Plug-Flow detention time= 338.2 min calculated for 3.603 af (96% of inflow)
 Center-of-Mass det. time= 317.1 min (1,115.9 - 798.8)

Volume	Invert	Avail.Storage	Storage Description
#1	867.00'	95,625 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

1904113 prelim SWMP

MSE 24-hr 4 100yr 24hr Rainfall=6.66"

Prepared by HP Inc.

Printed 4/7/2020

HydroCAD® 10.00-25 s/n 02063 © 2019 HydroCAD Software Solutions LLC

Page 48

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
867.00	15,467	0	0
868.00	19,599	17,533	17,533
869.00	23,831	21,715	39,248
870.00	28,163	25,997	65,245
871.00	32,596	30,380	95,625

Device	Routing	Invert	Outlet Devices
#1	Primary	866.00'	18.0" Round Culvert L= 50.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 866.00' / 866.00' S= 0.0000 ' S= 0.0000 ' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	867.00'	4.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	869.00'	48.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Primary	869.75'	30.0' long x 10.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=22.22 cfs @ 12.31 hrs HW=870.05' TW=868.70' (Dynamic Tailwater)

- 1=Culvert (Inlet Controls 9.89 cfs @ 5.60 fps)
 2=Orifice/Grate (Passes < 0.49 cfs potential flow)
 3=Orifice/Grate (Passes < 44.09 cfs potential flow)
 4=Broad-Crested Rectangular Weir (Weir Controls 12.33 cfs @ 1.38 fps)

Summary for Pond 10P: West Infiltration Basin

Inflow Area = 10.300 ac, 1.94% Impervious, Inflow Depth > 4.20" for 100yr 24hr event
 Inflow = 22.22 cfs @ 12.31 hrs, Volume= 3.603 af
 Outflow = 9.09 cfs @ 13.33 hrs, Volume= 3.488 af, Atten= 59%, Lag= 61.1 min
 Discarded = 0.15 cfs @ 12.82 hrs, Volume= 0.238 af
 Primary = 8.94 cfs @ 13.33 hrs, Volume= 3.249 af

Routing by Dyn-Stor-Ind method, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs / 2

Peak Elev= 870.10' @ 12.82 hrs Surf.Area= 9,034 sf Storage= 25,273 cf

Plug-Flow detention time= 93.5 min calculated for 3.488 af (97% of inflow)

Center-of-Mass det. time= 41.2 min (1,157.1 - 1,115.9)

Volume	Invert	Avail.Storage	Storage Description
#1	866.00'	34,052 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
866.00	3,624	0	0
867.00	4,745	4,185	4,185
868.00	6,000	5,373	9,557
869.00	7,386	6,693	16,250
870.00	8,876	8,131	24,381
871.00	10,466	9,671	34,052

1904113 prelim SWMP

MSE 24-hr 4 100yr 24hr Rainfall=6.66"

Prepared by HP Inc.

Printed 4/7/2020

HydroCAD® 10.00-25 s/n 02063 © 2019 HydroCAD Software Solutions LLC

Page 49

Device	Routing	Invert	Outlet Devices
#1	Discarded	866.00'	0.500 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 860.00'
#2	Primary	867.00'	15.0" Round Culvert L= 50.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 867.00' / 866.50' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#3	Primary	870.00'	5.0' long x 10.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.15 cfs @ 12.82 hrs HW=870.10' (Free Discharge)↑**1=Exfiltration** (Controls 0.15 cfs)**Primary OutFlow** Max=8.94 cfs @ 13.33 hrs HW=869.95' TW=867.66' (Dynamic Tailwater)↑**2=Culvert** (Inlet Controls 8.94 cfs @ 7.28 fps)↑**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)**Summary for Pond 11P: East Detention Basin**

Inflow Area = 18.700 ac, 3.74% Impervious, Inflow Depth = 5.15" for 100yr 24hr event
 Inflow = 124.79 cfs @ 12.17 hrs, Volume= 8.027 af
 Outflow = 58.85 cfs @ 12.29 hrs, Volume= 7.919 af, Atten= 53%, Lag= 7.3 min
 Primary = 58.85 cfs @ 12.29 hrs, Volume= 7.919 af

Routing by Dyn-Stor-Ind method, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs / 2
 Peak Elev= 865.63' @ 12.62 hrs Surf.Area= 48,684 sf Storage= 144,018 cf

Plug-Flow detention time= 253.7 min calculated for 7.919 af (99% of inflow)
 Center-of-Mass det. time= 245.5 min (1,033.0 - 787.5)

Volume	Invert	Avail.Storage	Storage Description
#1	862.00'	162,500 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
862.00	30,928	0	0
863.00	35,693	33,311	33,311
864.00	40,550	38,122	71,432
865.00	45,509	43,030	114,462
866.00	50,568	48,039	162,500

Device	Routing	Invert	Outlet Devices
#1	Primary	861.00'	24.0" Round Culvert L= 50.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 861.00' / 861.00' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	862.00'	8.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	864.00'	48.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

1904113 prelim SWMP

MSE 24-hr 4 100yr 24hr Rainfall=6.66"

Prepared by HP Inc.

Printed 4/7/2020

HydroCAD® 10.00-25 s/n 02063 © 2019 HydroCAD Software Solutions LLC

Page 50

#4 Primary 864.75' **20.0' long x 10.0' breadth Broad-Crested Rectangular Weir**
 Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=58.59 cfs @ 12.29 hrs HW=865.58' TW=864.21' (Dynamic Tailwater)

1=Culvert (Inlet Controls 17.69 cfs @ 5.63 fps)
 2=Orifice/Grate (Passes < 1.97 cfs potential flow)
 3=Orifice/Grate (Passes < 70.78 cfs potential flow)
 4=Broad-Crested Rectangular Weir (Weir Controls 40.89 cfs @ 2.45 fps)

Summary for Pond 12P: East Infiltration Basin

Inflow Area = 18.700 ac, 3.74% Impervious, Inflow Depth > 5.08" for 100yr 24hr event
 Inflow = 58.85 cfs @ 12.29 hrs, Volume= 7.919 af
 Outflow = 19.36 cfs @ 12.67 hrs, Volume= 7.699 af, Atten= 67%, Lag= 22.4 min
 Discarded = 0.33 cfs @ 12.67 hrs, Volume= 0.550 af
 Primary = 19.04 cfs @ 12.67 hrs, Volume= 7.149 af

Routing by Dyn-Stor-Ind method, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs / 2
 Peak Elev= 865.58' @ 12.67 hrs Surf.Area= 18,806 sf Storage= 61,513 cf

Plug-Flow detention time= 101.8 min calculated for 7.699 af (97% of inflow)
 Center-of-Mass det. time= 63.1 min (1,096.2 - 1,033.0)

Volume	Invert	Avail.Storage	Storage Description
#1	861.00'	69,661 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
861.00	8,400	0	0
862.00	10,501	9,451	9,451
863.00	12,689	11,595	21,046
864.00	14,977	13,833	34,879
865.00	17,366	16,172	51,050
866.00	19,855	18,611	69,661

Device	Routing	Invert	Outlet Devices
#1	Discarded	861.00'	0.500 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 855.00'
#2	Primary	862.00'	18.0" Round Culvert L= 50.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 862.00' / 861.50' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#3	Primary	865.00'	4.0' long x 10.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.33 cfs @ 12.67 hrs HW=865.58' (Free Discharge)

↑ **1=Exfiltration** (Controls 0.33 cfs)

Primary OutFlow Max=19.03 cfs @ 12.67 hrs HW=865.58' TW=0.00' (Dynamic Tailwater)

↑ **2=Culvert** (Inlet Controls 14.31 cfs @ 8.10 fps)

↑ **3=Broad-Crested Rectangular Weir** (Weir Controls 4.72 cfs @ 2.04 fps)

Summary for Link 1L: Proposed West Channel

Inflow Area = 50.900 ac, 0.00% Impervious, Inflow Depth = 2.21" for 100yr 24hr event
Inflow = 78.16 cfs @ 12.49 hrs, Volume= 9.395 af
Primary = 78.16 cfs @ 12.49 hrs, Volume= 9.395 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs

Summary for Link 13L: Total Proposed Combined

Inflow Area = 95.100 ac, 0.95% Impervious, Inflow Depth > 2.92" for 100yr 24hr event
Inflow = 120.58 cfs @ 12.55 hrs, Volume= 23.145 af
Primary = 120.58 cfs @ 12.55 hrs, Volume= 23.145 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs

Summary for Link 24L: Proposed South Drainage Total

Inflow Area = 86.500 ac, 1.04% Impervious, Inflow Depth > 2.95" for 100yr 24hr event
Inflow = 110.42 cfs @ 12.59 hrs, Volume= 21.247 af
Primary = 110.42 cfs @ 12.59 hrs, Volume= 21.247 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs

Summary for Link 25L: Proposed East Through Culvert Total

Inflow Area = 8.600 ac, 0.00% Impervious, Inflow Depth = 2.65" for 100yr 24hr event
Inflow = 23.52 cfs @ 12.24 hrs, Volume= 1.899 af
Primary = 23.52 cfs @ 12.24 hrs, Volume= 1.899 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-48.01 hrs, dt= 0.03 hrs

APPENDIX E

SOILS REPORT



Construction • Geotechnical
Consulting Engineering/Testing

January 6, 2020
C19482

Mr. Chris Ehlers
VH Acquisitions, LLC
6801 South Towne Drive
Madison, WI 53713

Re: Geotechnical Exploration Report
Proposed Residential Development
Utterback Property – CTH AB
Town of Dunn, Dane County, Wisconsin

Dear Mr. Ehlers:

Construction • Geotechnical Consultants, Inc. (CGC) has completed the subsurface exploration program for the above-referenced project. The purpose of this exploration program was to evaluate the subsurface conditions within proposed roadways and stormwater management areas and to provide geotechnical recommendations regarding site preparation, utility and pavement design/construction. Preliminary stormwater and residential foundation design recommendations are also included. We are sending you an electronic copy of this report, and we can mail a paper copy upon request. An electronic copy is also being sent to Mr. Dan Day at D'Onofrio Kottke and Associates.

PROJECT AND SITE DESCRIPTIONS

We understand a residential development is proposed for an approximately 54-acre site on the west side of CTH AB, about 1,500 ft south of the intersection with CTH MN, in the Town of Dunn, Dane County, Wisconsin. The project area, which is currently farmland, is to be annexed into the Village of McFarland. Based on publicly-available topographic data (DCiMap, 1-ft contour lines), existing site grades generally slope from north-central parts of the site down towards the southeast, with current ground surface elevations ranging from about EL 896 to 862 ft. The site is bounded by railroad tracks to the south, and a lowland area is present to the south of the tracks, with lowest ground surface elevations in that area near EL 859 to 860 ft, based on DCiMap 1-ft contour lines.

Although in the early planning stages, we understand the project will include the construction of roads, utilities, stormwater management areas and, ultimately, single family homes. Proposed site grading information was not available at the time of this evaluation.

Mr. Chris Ehlers
VH Acquisitions, LLC
January 6, 2020
Page 2

SUBSURFACE CONDITIONS

Subsurface conditions for this study were explored by drilling 17 Standard Penetration Test (SPT) soil borings to planned depths between 15 and 20 ft below current site grades at locations selected and field-staked by D'Onofrio Kottke personnel, who also surveyed the ground surface elevations at the boring locations. The borings were conducted on December 11 and 12, 2019 by GeoServe (under subcontract to CGC), using a track-mounted (ATV) Geoprobe 7822DT rotary drill rig equipped with hollow stem augers and an automatic SPT hammer. Note that auger and split-spoon refusal occurred in Boring 15 at about 12.5 ft below the ground surface on apparent bedrock. The specific procedures used for drilling and sampling are described in Appendix A, and the boring locations are shown in plan on the Soil Boring Location Exhibit presented in Appendix B.

The subsurface profiles at the boring locations varied to some degree across the site, but the following strata were generally encountered (in descending order):

- About 12 to 36 in. of **topsoil**; followed by
- About 2 to 5.5 ft of generally stiff to very stiff **lean clay** and **sandy lean clay**, typically softening somewhat with depth or grading to loose to medium dense **clayey sand**; over
- Very loose to very dense **sand and gravel** strata, containing variable amounts of fines and scattered cobbles/boulders, to the maximum depths explored in the majority of the borings; except where
- Loose to medium dense **silt** and **silty to clayey sand** or medium stiff to very stiff **lean to silty clay** layers were present towards the bottom of Borings 5, 15, 16 and 17; underlain by
- Very dense, **probable highly weathered to weathered sandy dolomite bedrock** to the level of auger/split-spoon refusal in Boring 15.

Natural moisture contents in representative samples from the shallow lean clay layers ranged from 22.9% to 29.8%, while sandier lean clay specimens were determined to have natural moisture contents of 12.0% to 18.2%. A sample obtained from the deeper cohesive/fine-grained soils encountered in Boring 15 was tested for its liquid and plastic (Atterberg) limits to aid in its classification, with a liquid limit of 17% and a plasticity index of 1 corresponding to USCS classification of low-plasticity silt (ML). Based on natural moisture contents, pocket penetrometer readings (q_p ; an estimate of the unconfined compressive strength of cohesive soils) and SPT blow counts (N-values), the on-site cohesive and fine-grained soils should generally be considered slightly to moderately compressible.

In addition, particle size distribution (gradation) was determined on a sand sample from Boring 13. With a P200 ('fines') content of 3.5%, the sample classifies as poorly-graded sand (SP) and fine sand (FS) per the USCS and USDA classification systems, respectively.

Mr. Chris Ehlers
VH Acquisitions, LLC
January 6, 2020
Page 3

Note that occasional organic seams were found to be interbedded with the sand soils in Borings 15 and 17.

As mentioned above, probable highly weathered to weathered sandy dolomite bedrock was encountered below a depth of about 10.5 ft in Boring 15 (corresponding to approximately EL 853.6 ft), extending to the level of auger and split-spoon refusal on probable harder/more competent bedrock at about 12.5 ft below the ground surface (corresponding to approximately EL 851.6 ft). In addition, the clay soils encountered in Boring 5 below a depth of about 19 ft and the clayey/silty sand below about 13 ft in Boring 17 were classified as possible highly weathered/decomposed bedrock. It must be noted that the sampling procedure can disturb/degrade weathered bedrock, making it difficult to determine the depth to bedrock in some areas.

Groundwater was encountered in the majority of the borings during and upon the completion of drilling at depths between about 4 and 13 ft, corresponding to approximately EL 855 to 863 ft, with the average groundwater level at about EL 859 ft. Groundwater levels were also measured in Borings 13, 16 and 17 about one day after the completion of drilling, at which point the water was observed about 2.0 to 6.0 ft below current site grades, corresponding to approximately EL 859.2 to 861.3 ft. Note that the average groundwater level observed during drilling and the longer-term groundwater readings in Borings 13, 16 and 17 correspond fairly well with ground surface elevations in the lowland area south of the railroad tracks. Water levels can be expected to fluctuate based on seasonal variations in precipitation, infiltration, evapotranspiration, the levels in nearby waterbodies, as well as other factors. A more detailed description of the site soil and groundwater conditions is presented on the boring logs attached in Appendix B, which also contain the laboratory test results (including Particle Size Distribution Test Report), and on the WDSPS Soil and Site Evaluation – Storm form contained in Appendix F.

According to the United States Department of Agriculture – Natural Resources Conservation Service (USDA-NRCS) *Web Soil Survey*, eight soil series are identified within the development area. Two major soil series, which constitute about three-quarters of the site, are Kegonsa silt loam (KeB; approximately 42% of area) and Plano silt loam (PoB; approximately 33% of area). Minor soils include Dodge silt loam (DnB) in the north and northeast, Grays silt loam (GsB) in the east, Kidder soils (KrD2) in the north-central portions (near the high point), Sable silty clay loam (SaA) and Elburn silty loam (EgA) in the south to southwest as well as Colwood silt loam (Co) in an isolated area at the eastern perimeter of the development area.

The vast majority of the site's soils (Kegonsa, Plano, Dodge and Kidder) are described as well-drained soils that formed from loess over loamy and/or gravelly/sandy outwash on outwash plains, or from glacial till or loess over loamy till on drumlins and moraines. A typical profile involves finer-grained soils, such as clay loam, silty clay loam, sandy clay loam, silt loam and loam, followed by coarser-grained soils like sandy loam, gravelly sandy loam, stratified gravelly sand and gravelly coarse sand. As an exception, the soil series Grays silt loam, formed from silty alluvium over stratified silt and fine sand lacustrine deposits on lake plains, typically involves silt loam and silty

Mr. Chris Ehlers
VH Acquisitions, LLC
January 6, 2020
Page 4

clay loam over very fine sandy loam to silt loam. In areas mapped as Kegonsa silt loam, Plano silt loam, Dodge silt loam, Grays silt loam and Kidder soils, the seasonally high groundwater table is expected to remain more than 80 in. below the ground surface.

In contrast to the soils described in the previous paragraph, the soil series Sable silty clay loam, Elburn silt loam and Colwood silt loam, mapped in small southern to southwestern and eastern sections of the site, are described as somewhat poorly-drained to poorly-drained soils that formed from loess on swales, loess over sandy and gravelly outwash on till plains, and from loamy glaciolacustrine deposits over stratified silt and fine sand glaciolacustrine deposits on lakebeds. Fairly deep finer-grained deposits (silty clay loam and silt loam) are common in areas mapped as Sable silty clay loam, with silty clay loam, sandy clay loam and silt loam over stratified very fine sand to silt, sandy loam and very gravelly coarse sand typically encountered in areas mapped as Elburn silt loam and Colwood silt loam. Where Sable silty clay loam, Elburn silt loam and Colwood silt loam are present, the seasonally high groundwater table should generally be expected within 0 to 12 in. of the ground surface, and frequent ponding may occur in areas mapped as Sable silty clay loam and Colwood silt loam.

The Soil Map for this site, which was generated by the USDA-NRCS *Web Soil Survey*, is attached in Appendix B. The soil profiles in the borings were in general agreement with the profiles from the soil mapping.

DISCUSSION AND RECOMMENDATIONS

Subject to the limitations discussed below and based on the subsurface exploration program, it is our opinion that this site is generally suitable for construction. However, some excavation below subgrade (EBS or undercutting/replacement) will likely be required during site grading and roadway construction, based on the presence of near-surface clay soils. In addition, some undercutting/replacement of marginal clay and/or clayey sand may be required below residential floor slabs and foundations, as well as utility inverts/structures in some portions of the site depending on structure and utility grades. Furthermore, bedrock excavation could potentially also be required during utility construction and building excavations in isolated portions of the site depending on utility and structure grades. Additionally, shallow groundwater and/or perched zones may impact utility and basement excavations in portions of the site, and groundwater levels should be considered when establishing basement grades.

Our recommendations for site preparation, roadway and utility design/construction are presented in the following subsections, along with preliminary stormwater infiltration and residential building design and construction considerations. Additional information regarding the conclusions and recommendations presented in this report is discussed in Appendix C.

Mr. Chris Ehlers
VH Acquisitions, LLC
January 6, 2020
Page 5

1. Site Preparation

We recommend that topsoil and vegetation be stripped at least 10 ft beyond the construction limits in areas to receive fill and where building and roadway construction is planned. The topsoil can be stockpiled on-site and later re-used as fill in landscape areas. Topsoil thicknesses typically ranged between 12 and 36 in. in the borings, but variable topsoil thicknesses should be expected between and beyond boring locations due to past agricultural activities. Trees and root zones should be removed in conjunction with topsoil stripping.

After topsoil removal, the exposed soils are generally expected to consist of stiff to very stiff clay. Granular soils exposed in areas at-grade or requiring fill (if any) should be recompacted with a vibratory smooth-drum roller, and cohesive/fine-grained subgrade soils should be statically compacted (without vibration) and then proof-rolled with a piece of heavy rubber-tire construction equipment, such as a loaded scraper or tri-axle dump truck, to check for soft/yielding areas. If soft/unstable clay soils are encountered, an attempt could be made to dry/recompact the cohesive soils to develop a stable subgrade, which will likely be the most economical alternative to improve marginal subgrade soils, but this approach will likely require more time than other alternatives and is also highly weather dependent. Several cycles of discing, drying and recompaction may be required during extended periods of favorable weather (i.e., dry, warm and windy conditions) before a firm subgrade is developed. If drying/recompaction is not effective or the construction schedule or weather does not allow for drying/recompaction, the unsuitable soils can be undercut and replaced with suitable backfill compacted to at least 95% compaction based on modified Proctor methods (ASTM D1557). As an alternative, soft subgrade soils could be stabilized using coarse aggregate (e.g., 3-in. dense graded base, select crushed material, etc.) that is compacted into the subgrade until deflection ceases. Similarly, loose sands that do not improve with compaction should be undercut and replaced with suitable granular backfill. Note that some of the shallow clay soils encountered in the borings exhibited fairly high natural moisture contents, and zones of lower- to moderate strength clay and clayey sand were also encountered, so we anticipate that some undercutting/stabilization or discing/recompacting will be required, which could be fairly widespread depending on the time of the year when grading occurs. *We therefore recommend that the project budget include a generous contingency for undercutting/stabilization or discing/recompacting during site preparation (or roadway subgrade preparation if not addressed earlier in the project).*

After a stable subgrade has been developed, fill placement to establish site grades may then proceed. To the extent practical, we recommend using granular soils (i.e., sand and/or gravel, including on-site materials if selectively excavated and stockpiled) as fill in building areas, as well as within the upper several feet of roadways as these soils are generally easier to place and compact compared to cohesive/fine-grained soils, particularly in adverse weather conditions. It is our opinion that clay and silt soils excavated on-site are best used in landscaping, or potentially in lower portions of roadway embankments assuming that moisture conditioning will be completed to facilitate proper compaction. Moisture conditioning (drying) may require several cycles of discing and recompaction in order to develop adequate compaction, which could delay construction progress. Fill/backfill

Mr. Chris Ehlers
VH Acquisitions, LLC
January 6, 2020
Page 6

should be placed in accordance with the Recommended Compacted Fill Specifications presented in Appendix D. *Where placement of several feet of fill will be required to establish site grades (i.e., more than about 5 ft above existing), a time delay between fill placement and beginning roadway and/or residential construction should be considered to allow the slightly to moderately compressible cohesive and fine-grained soils generally encountered on this site to consolidate and settle under the weight of the new fill, with a delay time of about one to three months typically being adequate.* We can provide additional details once the grading plan is developed, if needed.

As discussed above, possible/probable bedrock was encountered in isolated borings, and the depth and consistency of bedrock should be expected to vary across the site. As a general “rule of thumb”, it has been our experience that excavation to the level of auger refusal in soil borings can typically be accomplished using conventional earthwork equipment and techniques, including a narrow bucket and ripping tooth. Excavations that extend below the level of auger refusal typically require special bedrock removal techniques, such as chiseling with an excavator-mounted rock chipper, blasting, etc. Rock excavation considerations are contained in Appendix E. *We recommend that a unit rate for rock excavation be established in the bidding documents. Note that rock excavation should be clearly defined in the project specifications.* It should also be noted that mass excavation with scrapers may not be able to extend into weathered bedrock to the same extent as using a large excavator (with appropriate bucket) and haul trucks. *Supplemental test pits are recommended to further explore the depth and consistency of the bedrock where deeper cuts are anticipated and the soil borings indicate the presence of bedrock.*

2. Roadway Pavement Design

The shallow cohesive soils encountered across the site are expected to control the pavement design, as we anticipate that the pavement subgrades (near existing site grades) will generally consist of stiff to very stiff clay soils, which could potentially also be used to raised site grades in some areas. Standard earthwork-related techniques that should be used during roadway construction after topsoil stripping include proof-rolling, undercutting/stabilization (excavation below subgrade – EBS) and compaction control of fill/backfill, as discussed in the Site Preparation section of this report.

Based on the borings, the shallow soil conditions in the borings generally appear suitable for pavement support. *However, because of the potential for shallow marginal clays (to clayey sands) at or below existing site grades/pavement subgrade levels, especially in southern, lower portions of the site, we recommend including a generous contingency for undercutting and stabilization with 3-in. dense graded base (or other coarse aggregate) in the project budget.* If long, continuous sections of soft/unstable soils are encountered, biaxial geogrid (e.g., Tensar Type 1 (BX 1100) or equivalent) or woven geotextile fabric (e.g., Mirafi 600X or equivalent) can be used to reduce the undercut depth and provide additional stabilization. It has been our experience that clay or silt soils with pocket penetrometer readings of less than about 1.5 tsf will likely require undercutting after proof-rolling, as described above. If roadway grades will be raised above existing grade, and well-compacted fill is

Mr. Chris Ehlers
VH Acquisitions, LLC
January 6, 2020
Page 7

placed above a firm subgrade during general site grading, the need for undercutting/stabilization will likely be reduced.

Based on the soil conditions encountered in the borings and assuming that on-site clays may be used to raise grade in some roadway areas, the pavement design will be controlled by the cohesive soils, and the following parameters should be used to develop the design pavement sections, which are based on a firm or adequately stabilized subgrade being developed:

USCS Soil Classification	CL
AASHTO Classification	A-6
Frost Group Index	F-3
Design Group Index	12
Soil Support Value	4.2
Subgrade Modulus, k (pci)	150

These design parameters are based on the following assumptions:

1. The subgrade has been closely monitored.
2. The subgrade has been thoroughly and adequately compacted.
3. Wet zones have been dried, drained or removed.
4. Pockets of dissimilar material have been removed, replaced or mixed to achieve a homogeneous subgrade.
5. Adequate subgrade drainage has been achieved.

(Reference: WisDOT *Geotechnical Manual*)

Assuming traffic volumes of up to 100 cars and less than 5 trucks per day per design lane (i.e., Traffic Class II according to Wisconsin Asphalt Pavement Association (WAPA) recommendations for low-volume roadways and subdivision streets), a typical pavement section per WDOT Standard Specifications and following WAPA recommendations is 3.5 to 4.0 in. of asphalt pavement over 8 to 12 in. of compacted aggregate base course. Alternative pavement designs for different traffic count data (e.g., if high truck traffic loads are expected) are also acceptable provided they are based on the given design parameters. *Note that if the upper (surface) asphalt layer will not be installed immediately after the lower (binder) asphalt layer and construction traffic will travel on only the lower layer, consideration should be given to increasing the lower asphalt layer thickness to improve the durability of the lower layer.*

3. Utility Construction

Based on the available soil and groundwater information, it appears that utility construction can proceed using traditional open-cut methods. Dewatering may be required in some portions of the site, especially where shallow groundwater was encountered in the borings (predominantly southern, lower parts of the site) and the soil mapping indicates that the seasonal high water table may be

Mr. Chris Ehlers
VH Acquisitions, LLC
January 6, 2020
Page 8

within 1 ft of the ground surface during wet periods (southern/southwestern and eastern areas). Rock excavation may potentially also be required in some areas, depending on utility locations and depths. It is expected that excavation sidewalls will be sloped back for relatively shallow installations (i.e., less than 4 ft in depth) and that a trench shield and/or internal bracing will be used for deeper excavations. The following are our recommendations regarding trench excavation, dewatering, and backfilling:

- Excavation: Open cuts should be sloped and/or braced in accordance with OSHA guidelines. The softer clays, sand and gravel with low “fines” content (denoted as SP/SP-SM and GP/GP-GM on the boring logs), as well as loose sands with higher silt content (SM and SC) are generally classified as OSHA “Type C” soils, and slopes of 1.5H:1V or flatter are expected to be at least temporarily stable. At least medium stiff clays and denser silty to clayey sand soils above the water table are generally classified as OSHA “Type B” soils where slopes of 1H:1V are expected to be temporarily stable. Note that flatter side slopes may also be required where perched water is present that destabilizes the side slopes. *The appropriate utility trench excavation side slopes should be determined by a competent person completing the earthwork in accordance with OSHA slope guidelines.* Due to the presence of weak and marginal clays, clayey to silty sand and sand strata in some of the borings, a stone stabilization layer consisting of 6 to 12 in. of compacted crushed stone may be required below the bedding layer in some areas to adequately support utility piping, depending on utility grades.
- Dewatering: Groundwater was encountered at depths between about 2 and 13 ft below existing site grades. In addition, the soil mapping indicates that seasonally elevated groundwater may be within 1 ft of the ground surface in some portions of the site. Therefore, depending on the location and depth of the utility, as well as the time of year construction occurs, some dewatering may be required. In general, groundwater drawdowns of less than about 1 to 2 ft can typically be achieved using submersible pumps operating from filtered sump pits, which can also be used to remove seepage or precipitation. If groundwater drawdowns exceed about 2 ft, dewatering with vacuum well points or deep wells may be required. Dewatering means and methods are the responsibility of the utility contractor.
- Rock Removal: Possible/probable bedrock was encountered in isolated borings, as previously discussed. The depth to bedrock should be expected to vary across the site. Although rock excavation considerations were included in the Site Preparation section of this report, bedrock removal in narrow utility trenches will likely be more difficult than in mass cut areas, as it may be more difficult to locate and exploit fractures and weak zones in the bedrock. Rock excavation considerations are contained in Appendix E, and we recommend that a unit rate for rock excavation be established in the bidding documents for utility excavations. Supplemental test pits

Mr. Chris Ehlers
VH Acquisitions, LLC
January 6, 2020
Page 9

are recommended to further explore the depth and consistency of the bedrock along proposed utility alignments where possible/probable bedrock was encountered in the soil borings.

- **Backfilling:** Excavation backfilling may proceed using the following guidelines:
 - Although clayey and silty excavation spoils may be used to backfill the utility trenches above the pipe and associated granular bedding material, to the extent possible, we recommend that granular soils be used as backfill below paved areas because sand/gravel soils are relatively easy to place and compact in most weather conditions compared to cohesive soils. Silt and clay soils will likely require moisture conditioning prior to placement and compaction, which could delay construction progress. Granular soils containing cobbles and boulders should not be used in direct contact with utility lines.
 - Backfill material should be placed in accordance with Appendix D guidelines or applicable municipal requirements.
 - Compaction recommendations:
 - Within 10 ft of buildings: 95% modified Proctor (ASTM D1557);
 - Depths greater than 3 ft below grade in pavement areas: 90% modified Proctor;
 - Final 3 ft in pavement areas: 95% modified Proctor; and
 - Landscape areas: 85% modified Proctor.

4. Preliminary Stormwater Infiltration Potential

We understand that stormwater management areas are currently being considered in southern portions of the site near Borings 13, 16 and 17.

The subsurface conditions encountered in the southernmost Borings B-16 and B-17 were fairly consistent and included about 12 in. of topsoil, followed by lower-permeability clay loam and sandy clay loam strata, which were underlain, below a depth of about 6.5 ft, by more permeable fine sand and sand layers. However, groundwater was encountered during drilling at the bottom of the lower-permeability soils, and the shallow clay soils generally exhibited redoximorphic features (redox or mottling) and low-chroma/high-value (gray) dominant color, indicating the level of past saturation from perched water, periodically infiltrating surface water or seasonally elevated groundwater. About one day after the completion of Borings B-16 and B-17, the groundwater had stabilized at about 2.0 to 2.5 ft below current site grades in these boreholes. Therefore, it is our opinion that the area near Borings B-16 and B-17 is not suitable for infiltrating significant quantities of stormwater.

Mr. Chris Ehlers
 VH Acquisitions, LLC
 January 6, 2020
 Page 10

In Boring B-13, performed slightly further north and at a higher elevation, the shallow topsoil was underlain by lower-permeability sandy clay loam to a depth of about 3 ft, followed by more permeable granular strata to the maximum depth explored. Groundwater in this boring was encountered at a depth of about 8 ft during drilling and about 6 ft below the ground surface upon the completion of drilling. Provided the bottom of the infiltration system near B-13 extends through the lower-permeability soils (or lower-permeability soils are undercut below the bottom of the infiltration system and replaced with appropriate sandier soils) and adequate separation from groundwater can be achieved, it is our opinion that some stormwater infiltration in this area may potentially be feasible.

A gradation performed on a representative sand sample obtained above the apparent groundwater table in Boring B-13 showed a P200 content of 3.5%, and the particle size distribution test report is included in Appendix B. Per NR151, it may be necessary to include at least a 3-ft soil layer with a minimum of 20% fines or a 5-ft thick layer with a minimum of 10% fines below the bottom of the infiltration system to act as a filtering layer before the infiltrating stormwater reaches the groundwater table. *The inclusion of a filtering layer with higher fines content may control the infiltration rate of the infiltration system.*

As the soil conditions vary across the site, the Boring Logs and WDSPS Soil and Site Evaluation – Storm form attached in Appendices B and F, respectively, should be consulted for a description of the soil conditions at each boring location. Variability in the soil conditions should be expected across the site and within stormwater basins that could result in a wide range of undercut depths to reach soil suitable for the design infiltration rate.

Infiltration Potential: The following is a *preliminary* summary of the estimated infiltration rates for the soils encountered in Borings B-13, B-16 and B-17, per Table 2 of the WDNR Conservation Practice Standard 1002, *Site Evaluation for Storm Water Infiltration*. The estimated infiltration rates are as follows:

• Clay loam (CL)	0.03 in./hr
• Silty clay loam (SiCL)	0.04 in./hr
• Sandy clay loam (SCL)	0.11 in./hr
• Silt loam (SiL)	0.13 in./hr
• Fine sandy loam (FSL)	0.50 in./hr
• Gravelly sandy loam (GRSL)	0.50 in./hr
• Fine sand (FS)	0.50 in./hr
• Sand (S)	3.60 in./hr
• Extremely gravelly sand (XGRS)	3.60 in./hr

Note that the infiltration rates should be considered very approximate since they are merely based on soil texture and do not account for in-place soil density and other factors, which will affect the infiltration rate. We recommend that the soils at and

Mr. Chris Ehlers
VH Acquisitions, LLC
January 6, 2020
Page 11

several feet below the bottom of stormwater management systems be checked by a geotechnical engineer or certified soil tester *in conjunction with the basin designer* to document that the soils are appropriate for the design infiltration rate or recommend remedial measures, if necessary. The Wisconsin Department of Safety and Professional Services Soil and Site Evaluation – Storm form for Borings B-13, B-16 and B-17 is contained in Appendix F.

It must be cautioned that the results of the soil borings have limitations with regard to the evaluation of the on-site stormwater infiltration potential as actual soil horizon transitions may vary from those shown on the boring logs and infiltration form. The reviewing agency may require test pits be excavated at a later date prior to finalizing the stormwater design. *The results of the test pits may require revisions to the stormwater management design if the design has been based solely on the soil borings.*

Groundwater: Groundwater was encountered in the southernmost Stormwater Borings B-16 and B-17, about one day after the completion of drilling, at about 2.0 to 2.5 ft. In addition, the soil mapping indicates that the seasonally high groundwater table may be within 1 ft of the ground surface in southern to southwestern (and isolated eastern) portions of the site. Furthermore, redoximorphic features and low-chroma/high-value dominant color, which are indicative of the level of previous saturation from perched water, periodically infiltrating surface water or seasonally elevated groundwater, were generally noted in the cohesive soils. Slightly deeper groundwater levels were observed in Boring B-13, performed further north and at a higher ground surface elevation compared to B-16 and B-17. At the completion of B-13, the groundwater level was observed at about 6 ft below the ground surface.

Bedrock: Apparent bedrock was not encountered in the Stormwater Borings B-13 and B-16, but the soils below a depth of about 13 ft in B-17 were classified as possible highly weathered bedrock, and possible/probable bedrock was also encountered in isolated other borings performed on this site. The depth of bedrock should therefore be expected to vary across the site.

During construction, appropriate erosion control should be provided to prevent eroded soil from contaminating the stormwater management areas. Where appropriate, the stormwater system design should include pretreatment to remove fine-grained soils (silt/clay) and clogging materials (oils/greases) from stormwater prior to entering the infiltration areas. Additionally, a regular maintenance plan should be developed to remove silt/clay soils and clogging materials that may accumulate in the bottom of the stormwater management area over time. Failure to adequately control fine-grained soils and clogging materials from entering the infiltration area or failure to regularly remove fine-grained soils and clogging materials that accumulate at the base of the stormwater infiltration system will likely cause the stormwater management system to fail.

Mr. Chris Ehlers
VH Acquisitions, LLC
January 6, 2020
Page 12

Additionally, it is important that the soils in the bottom of the infiltration systems do not become compacted during construction or measures are taken to mitigate soils that are compacted during construction. Refer to WDNR Conservation Practice Standards 1002, 1003 and 1004, as well as NR151 for additional information.

5. Preliminary Foundation Design

Depending on building elevations, a combination of cohesive, fine-grained and granular soils could be encountered at foundation grades. If site grades are raised, footings may also bear on compacted granular fill, in which case it is important that the existing soils be carefully checked (including shallow test pits) to document the existing soils are suitable for building support prior to new fill placement. Bedrock excavation may potentially also be required for footing and basement excavations in isolated locations, depending on building grades.

It is our opinion that residential structures can generally be supported on conventional spread footing foundations bearing on suitable natural soils and engineered fill. Based on the range of soil conditions encountered, a bearing pressure in the range of 1,000 psf to 3,000 psf appears to be applicable over most of the site. However, depending on building locations and grades, some undercutting below footings (and floor slabs) due to lower-strength and marginal soils should generally be expected. The soil conditions in southern portions of the site generally appear to be the weakest and most compressible, which may potentially be problematic for building support, but fairly shallow undercutting will likely also be required in other portions of the site to develop suitable foundation and floor slab subgrades. There were also areas where denser sand/silt and harder clay were encountered, and higher bearing pressures could potentially be used.

Since residential structure loads are generally light, for preliminary design purposes, we recommend assuming an allowable bearing pressure of 1,500 psf, with the understanding that undercutting below footings could be required in various locations, depending on building and foundation grades. *Note that dewatering may potentially be required during basement, undercutting and backfilling operations, depending on building location and elevations, as well as the time of year construction occurs. We recommend that careful consideration be given to establishing basement grades where groundwater was encountered. Longer-term water level readings in monitoring wells may prove helpful in this determination. To the extent possible, we recommend establishing basement grade several feet above the seasonal high groundwater level to reduce the potential for dewatering being required below basements.*

The following parameters should be used for *preliminary* foundation design:

- Maximum net allowable bearing pressure: 1,500 psf
- Minimum foundation widths:
 - Continuous wall footings: 18 in.

Mr. Chris Ehlers
VH Acquisitions, LLC
January 6, 2020
Page 13

- Column pad footings: 30 in.
- Minimum footing depths:
 - Exterior/perimeter footings: 4 ft
 - Interior footings: no minimum requirement

Undercutting below footing grade will be required where loose or disturbed sand/silt soils or clay with q_p -readings of less than 0.75 tsf are encountered at or slightly below footing grade. As discussed above, some undercutting below footing grade should be expected, and an allowance for this operation should be included in the project budget. *Where medium stiff clays (i.e., pocket penetrometer readings of less than 1 tsf) are encountered that are especially susceptible to disturbance from construction traffic or weather, we recommend placing a 6-in. layer of clear stone below the footings immediately after excavation to act as a working platform.* Where undercutting is required, the base of the undercut excavation should be widened beyond the footing edges at least 0.5 ft in each direction for each foot of undercut depth for stress distribution purposes. Foundation grades above the water table can be restored with granular backfill compacted to at least 95% compaction (modified Proctor – ASTM D1557) or 3-in. dense graded base that is placed in maximum loose lifts of 12 in. and thoroughly compacted with a large vibratory compactor until deflection ceases. Below the water table, undercut excavations should be backfilled with crushed clear stone that is placed in loose lifts of 12 in. or less, which are subsequently compacted with a large vibratory plate compactor or excavator-mounted hoe-pack until deflection ceases. Where the total clear stone layer thickness exceeds 12 in., the clear stone should be wrapped in non-woven geotextile fabric (e.g. Mirafi 160N or equivalent) to prevent migration of fines into the void spaces of the clear stone.

Since the subsurface conditions vary across the site, CGC should be present during footing excavations to check whether subgrades are satisfactory for the design bearing pressure and to advise on corrective measures, where necessary. We recommend using a smooth-edged backhoe bucket for footing and undercut excavations in soil. A bucket with teeth is acceptable where excavation occurs in weathered bedrock, provided loosened rock is removed from the bottom of the excavation. Additionally, granular soils exposed at footing grade that are above the water table and not susceptible to disturbance from vibrations should be recompacted with a large vibratory plate compactor or an excavator-mounted hoe-pack prior to formwork/concrete placement to densify soils loosened during the excavation process. Soils potentially susceptible to disturbance from compaction (e.g., silty or clayey soils or granular soils close to or below the water table) should be hand trimmed and/or stabilized with clear stone, as appropriate. Provided the foundation design/construction recommendations discussed above are followed, we estimate that total and differential settlements should be on the order of 1.0 and 0.5 in., respectively.

Based on groundwater observations in the soil borings and indications in the soil mapping that shallow groundwater may be encountered in some portions of the site, a sub-floor dewatering system with sump pump may potentially be required for some residential structures to prevent groundwater

Mr. Chris Ehlers
VH Acquisitions, LLC
January 6, 2020
Page 14

from entering the lower level depending on the location and elevation. Depending on basement grades, seasonal dewatering could be fairly significant, and we recommend that careful consideration be given to establishing basement grades where groundwater was encountered. To the extent possible, we recommend establishing basement grade several feet above the seasonal high groundwater level to reduce the potential for dewatering being required below basements. Longer-term water level readings in monitoring wells may prove helpful in determining seasonally high groundwater levels, and we can provide additional information and recommendations if needed.

CONSTRUCTION CONSIDERATIONS

Due to variations in weather, construction methods and other factors, specific construction problems are difficult to predict. Soil related difficulties that could be encountered on the site are discussed below:

- Earthwork construction during the late fall through early spring could be complicated as a result of wet weather and freezing temperatures. During cold weather, exposed subgrades should be protected from freezing before and after footing construction. Fill should never be placed while frozen or on frozen ground.
- If the construction schedule requires that construction proceed during adverse weather, typically encountered during fall through spring, the contingency for undercutting disturbed soils should be increased.
- To the extent practical, traffic should be avoided on prepared subgrades to minimize further disturbance.
- Excavations extending greater than 4 ft in depth below the existing ground surface should be sloped or braced in accordance with current OSHA standards.
- Based on the soil mapping and water observations in the soil borings, groundwater infiltration into some utility, basement and footing excavations may occur, especially during wet seasons. Dewatering using submersible pumps operating from filtered sump pits, vacuum well points or deep wells may be required for groundwater control, as previously discussed, which should be evaluated by the contractor.
- The depth to bedrock is expected to vary across the site. In addition to potential bedrock removal during building excavations, some bedrock excavation may be required during utility construction. Supplemental test pits can be excavated to better determine if bedrock excavation may be required. See the Site Preparation and Utility Construction sections of the report, as well as Appendix E for additional information regarding rock excavation.

Mr. Chris Ehlers
VH Acquisitions, LLC
January 6, 2020
Page 15

RECOMMENDED CONSTRUCTION MONITORING

The quality of the residential building pads and pavement subgrades will largely be determined by the level of care exercised during site development. To check that earthwork and foundation construction proceeds in accordance with our recommendations, the following operations should be monitored by CGC:

- Topsoil stripping/removal and subgrade proof-rolling;
- Fill/backfill placement and compaction;
- Foundation excavation and subgrade preparation; and
- Concrete placement.

FOLLOW-UP EXPLORATION PROGRAMS

The exploration program described in this report is preliminary in nature and is not intended to provide sufficient detail on subsurface conditions for each individual lot or stormwater management area. Due to the variability in soil and bedrock conditions, especially the potential for undercutting of soft/loose soils below footing grade of some residential structures, shallow groundwater as well as possible bedrock excavation during utility and residential building construction, follow-up exploration by test pits or borings is recommended to provide lot-specific geotechnical recommendations. *Note that stormwater infiltration potential estimations based on soil borings are considered preliminary, and test pits will likely need to be performed in proposed stormwater management areas to develop final design infiltration rates. If the stormwater design is based on the soil borings performed during the subsurface exploration program summarized in this report, revisions to the design may be required depending on the findings in the test pits.* We can provide specific recommendations and a proposal for the additional geotechnical work at the appropriate time.

* * * * *



Mr. Chris Ehlers
VH Acquisitions, LLC
January 6, 2020
Page 16

It has been a pleasure to serve you on this project. If you have any questions or need additional consultation, please contact us.

Sincerely,

CGC, Inc.

A blue ink signature of Tim F. Gassenheimer, written in a cursive style.

Tim F. Gassenheimer, EIT, CST
Staff Engineer

A blue ink signature of Ryan J. Portman, written in a cursive style.

Ryan J. Portman, PE, CST
Consulting Professional

Encl: Appendix A - Field Exploration
Appendix B - Soil Boring Location Exhibit
Logs of Test Borings (17)
Particle Size Distribution Test Report (1)
Log of Test Boring-General Notes
Unified Soil Classification System
Web Soil Survey Map and Legend (3 Pages)
Appendix C - Document Qualifications
Appendix D - Recommended Compacted Fill Specifications
Appendix E - Rock Excavation Considerations
Appendix F - WDSPS Soil and Site Evaluation – Storm Forms (3 Borings)

Cc: Mr. Dan Day, D'Onofrio Kottke and Associates

APPENDIX A
FIELD EXPLORATION

APPENDIX A

FIELD EXPLORATION

Subsurface conditions for this study were explored by drilling 17 Standard Penetration Test (SPT) soil borings to planned depths between 15 and 20 ft below current site grades at locations selected and field-staked by D'Onofrio Kottke personnel, who also surveyed the ground surface elevations at the boring locations. The borings were conducted on December 11 and 12, 2019 by GeoServe (under subcontract to CGC), using a track-mounted (ATV) Geoprobe 7822DT rotary drill rig equipped with hollow stem augers and an automatic SPT hammer. Note that auger and split-spoon refusal occurred in Boring 15 at about 12.5 ft below the ground surface on apparent bedrock.

Soil samples were generally obtained at 2.5-foot intervals to a depth of 10 ft and at 5-ft intervals thereafter. As an exception, the borings located in or near proposed stormwater management areas were sampled at 2.5-foot intervals to the final depth. The soil samples were obtained in general accordance with specifications for standard penetration testing, ASTM D 1586. The specific procedures used for drilling and sampling are described below.

1. Boring Procedures between Samples

The boring is extended downward, between samples, by a hollow stem auger.

2. Standard Penetration Test and Split-Barrel Sampling of Soils
(ASTM Designation: D 1586)

This method consists of driving a 2-inch outside diameter split-barrel sampler using a 140-pound weight falling freely through a distance of 30 inches. The sampler is first seated 6 inches into the material to be sampled and then driven 12 inches. The number of blows required to drive the sampler the final 12 inches is recorded on the log of borings and is known as the Standard Penetration Resistance. Recovered samples are first classified as to texture by the driller.

During the field exploration, the driller visually classified the soil and prepared a field log. *Field screening of the soil samples for possible environmental contaminants was not conducted by the driller, as environmental site assessment activities is beyond CGC's work scope.* Water level observations were made in each boring during and after drilling and are shown at the bottom of each boring log. Upon completion of drilling, the boreholes were backfilled in accordance with WDNR regulations, and the soil samples were delivered to our laboratory for visual classification and laboratory testing. The soils were visually classified by a geotechnical engineer using the Unified Soil Classification System. The final logs prepared by the engineer, including the laboratory test results, along with a Soil Boring Location Exhibit and a description of the Unified Soil Classification System are presented in Appendix B.

APPENDIX B

SOIL BORING LOCATION EXHIBIT

LOGS OF TEST BORINGS (17)

PARTICLE SIZE DISTRIBUTION TEST REPORT (1)

LOG OF TEST BORING-GENERAL NOTES

UNIFIED SOIL CLASSIFICATION SYSTEM

WEB SOIL SURVEY MAP AND LEGEND (3 PAGES)



LOG OF TEST BORING

Project **Proposed Residential Development**
Utterback Property - CTH AB
Location **Town of Dunn, Dane County, Wisconsin**

Boring No. **1**
Surface Elevation (ft) **872.72**
Job No. **C19482**
Sheet **1** of **1**

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks		SOIL PROPERTIES				
No.	TYPE	Rec (in.)	Moist	N			Depth (ft)	qu (qa) (tsf)	W	LL	PL
						12± in. TOPSOIL (OL)					
1		18	M	7		Very Stiff, Brown/Gray (Lightly Mottled) Lean CLAY, Trace Sand (CL)	(2.5-3.25)	24.3			
2		18	M	4		Stiff, Brown Lean CLAY, Trace Sand (CL)	(1.0-1.75)	29.8			
					5						
3		18	M	29		Medium Dense to Very Dense, Tan Fine to Coarse SAND and GRAVEL, Trace to Little Silt, Scattered Cobbles/Boulders (SP/SP-SM/GP/GP-GM)					
4		18	M	60		Possible Cobble/Boulder near 9 ft					
					10						
						Medium Dense, Brown Fine to Medium SAND, Some Silt and Gravel, Scattered Cobbles/Boulders (SM)					
5		8	W	16							
					15	End of Boring at 15 ft					
						Borehole Backfilled with Bentonite Chips					
					20						

WATER LEVEL OBSERVATIONS

GENERAL NOTES

While Drilling ☒ 13.0' Upon Completion of Drilling _____
Time After Drilling _____ 10 mins. _____
Depth to Water _____ NW ☒
Depth to Cave in _____ 11.0'

Start 12/12/19 End 12/12/19
Driller GeoServe Chief Eddie Rig Geoprobe
Logger Matt Editor TFG 7822DT
Drill Method 2.25" HSA; Autohammer

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.



LOG OF TEST BORING

Project **Proposed Residential Development**
Utterback Property - CTH AB
 Location **Town of Dunn, Dane County, Wisconsin**

Boring No. **2**
 Surface Elevation (ft) **881.14**
 Job No. **C19482**
 Sheet **1** of **1**

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks		SOIL PROPERTIES					
No.	TYPE	Rec (in.)	Moist	N			Depth (ft)	qu (qa) (tsf)	W	LL	PL	LI
							12± in. TOPSOIL (OL)					
1		18	M	8			Very Stiff, Brown/Gray (Lightly Mottled) Lean CLAY, Trace Sand (CL)	(2.5-4.0)	25.8			
2		4	M	10			Very Stiff, Brown Lean CLAY, Trace Sand (CL)	(2.5)				
					5		Medium Dense, Tan Fine to Coarse SAND and GRAVEL, Trace to Little Silt, Scattered Cobbles/Boulders (SP/SP-SM/GP/GP-GM)					
3		18	M	12			Medium Dense, Brown Fine to Medium SAND, Some Silt and Gravel, Scattered Cobbles/Boulders (SM)					
4		4	M	24								
					10							
												
5		18	M	27			Medium Dense to Very Dense, Tan Fine to Medium SAND, Little to Some Gravel, Little Silt, Scattered Cobbles/Boulders (SP-SM)					
					15							
												
6		12	M	102								
					20							
							End of Boring at 20 ft					
							Borehole Backfilled with Bentonite Chips					

WATER LEVEL OBSERVATIONS

While Drilling ☒ NW Upon Completion of Drilling 10 mins.
 Time After Drilling NW
 Depth to Water 17.0'
 Depth to Cave in

GENERAL NOTES

Start 12/12/19 End 12/12/19
 Driller GeoServe Chief Eddie Rig Geoprobe
 Logger Matt Editor TFG 7822DT
 Drill Method 2.25" HSA; Autohammer

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.



LOG OF TEST BORING

Project **Proposed Residential Development**
Utterback Property - CTH AB
Location **Town of Dunn, Dane County, Wisconsin**

Boring No. **3**
Surface Elevation (ft) **869.74**
Job No. **C19482**
Sheet **1** of **1**

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks		SOIL PROPERTIES						
No.	TYPE	Rec (in.)	Moist	N			Depth (ft)	qu (qa) (tsf)	W	LL	PL	LI	
							12± in. TOPSOIL (OL)						
1		18	M	10			Very Stiff, Brown/Gray (Lightly Mottled) Lean CLAY, Trace Sand (CL)	(3.0-3.25)	25.7				
2		18	M	6			Medium Stiff, Brown Sandy Lean CLAY, Trace Gravel (CL)	(0.75-1.0)	18.2				
3		12	M/W	7	▽		Loose to Medium Dense, Tan Fine to Coarse SAND and GRAVEL, Trace to Little Silt, Scattered Cobbles/Boulders (SP/SP-SM/GP/GP-GM)						
				▼									
4		16	W	28									
5		10	W	13									
End of Boring at 15 ft													
Borehole Backfilled with Bentonite Chips													

WATER LEVEL OBSERVATIONS

While Drilling ∇ **6.5'** Upon Completion of Drilling _____
Time After Drilling _____ **10 mins.**
Depth to Water _____ **8.0'** ∇
Depth to Cave in _____ **9.0'**

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

GENERAL NOTES

Start **12/12/19** End **12/12/19**
Driller **GeoServe Chief** **Eddie** Rig **Geoprobe**
Logger **Matt** Editor **TFG** **7822DT**
Drill Method **2.25" HSA; Autohammer**



LOG OF TEST BORING

Project **Proposed Residential Development**
Utterback Property - CTH AB
Location **Town of Dunn, Dane County, Wisconsin**

Boring No. **4**
Surface Elevation (ft) **867.88**
Job No. **C19482**
Sheet **1** of **1**

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE						VISUAL CLASSIFICATION and Remarks		SOIL PROPERTIES				
No.	TYPE	Rec (in.)	Moist	N	Depth (ft)			qu (qa) (tsf)	W	LL	PL	LI
							12± in. TOPSOIL (OL)					
1		16	M	6			Very Stiff, Brown Lean CLAY, Trace Sand (CL)	(2.5-2.75)	24.4			
2		18	M	20			Medium Dense, Tan Fine to Coarse SAND and GRAVEL, Trace to Little Silt, Scattered Cobbles/Boulders (SP/SP-SM/GP/GP-GM)					
					5							
3		18	W	22			Medium Dense, Tan Fine to Coarse SAND, Little Gravel, Trace Silt (SP)					
4		12	W	18			Medium Dense, Brown Fine to Medium SAND, Some Silt and Gravel, Scattered Cobbles/Boulders (SM)					
					10							
							Medium Dense, Tan/Reddish Brown (Laminated) Silty Fine SAND to Sandy SILT (SM/ML)					
5		16	W	16								
					15							
						End of Boring at 15 ft						
						Borehole Backfilled with Bentonite Chips						
					20							

WATER LEVEL OBSERVATIONS

GENERAL NOTES

While Drilling ∇ **6.5'** Upon Completion of Drilling _____
Time After Drilling _____ **10 mins.**
Depth to Water _____ **8.0'** ∇
Depth to Cave in _____ **8.0'**

Start **12/12/19** End **12/12/19**
Driller **GeoServe Chief Eddie Rig Geoprobe**
Logger **Matt** Editor **TFG** **7822DT**
Drill Method **2.25" HSA; Autohammer**

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.



LOG OF TEST BORING

Project **Proposed Residential Development**
Utterback Property - CTH AB
Location **Town of Dunn, Dane County, Wisconsin**

Boring No. **5**
Surface Elevation (ft) **871.59**
Job No. **C19482**
Sheet **1** of **1**

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks		SOIL PROPERTIES					
No.	TYPE	Rec (in.)	Moist	N			Depth (ft)	qu (qa) (tsf)	W	LL	PL	LI
							12± in. TOPSOIL (OL)					
1		18	M	7			Very Stiff, Brown Lean CLAY, Trace Sand (CL)	(2.5-2.75)	23.3			
							Stiff, Brown Sandy Lean CLAY, Little Gravel (CL)					
2		18	M	6			Loose, Brown Fine to Medium SAND, Little to Some Silt, Trace Gravel (SP-SM/SM)	(1.0-2.0)				
					5		Medium Dense, Tan Fine to Coarse SAND and GRAVEL, Trace to Little Silt, Scattered Cobbles/Boulders (SP/SP-SM/GP/GP-GM)					
3		12	M	24			Loose to Very Dense, Brown Fine to Medium SAND, Some Silt, Little to Some Gravel, Scattered Cobbles/Boulders (SM)					
												
4		12	W	7								
					10							
												
5		16	W	81			Probable Cobble/Boulder near 14 ft					
					15		Medium Dense to Very Dense, Tan Fine SAND, Trace to Little Silt (SP/SP-SM)					
							Very Stiff, Reddish Brown Lean to Silty CLAY, Trace Gravel (CL/CL-ML - Possible Highly Weathered/Decomposed Bedrock)	(2.75-3.5)				
6		18	W	95			End of Boring at 20 ft					
					20		Borehole Backfilled with Bentonite Chips					

WATER LEVEL OBSERVATIONS

GENERAL NOTES

While Drilling ∇ **8.5'** Upon Completion of Drilling _____
Time After Drilling _____ **10 mins.**
Depth to Water _____ **11.0'** ∇
Depth to Cave in _____ **14.0'**

Start **12/12/19** End **12/12/19**
Driller **GeoServe Chief** **Eddie** Rig **Geoprobe**
Logger **Matt** Editor **TFG** **7822DT**
Drill Method **2.25" HSA; Autohammer**

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.



LOG OF TEST BORING

Project **Proposed Residential Development**
Utterback Property - CTH AB
 Location **Town of Dunn, Dane County, Wisconsin**

Boring No. **6**
 Surface Elevation (ft) **866.29**
 Job No. **C19482**
 Sheet **1** of **1**

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks		SOIL PROPERTIES					
No.	TYPE	Rec (in.)	Moist	N			Depth (ft)	qu (qa) (tsf)	W	LL	PL	LI
							12± in. TOPSOIL (OL)					
1		12	M	6			Very Stiff, Brown Lean CLAY, Trace Sand (CL)	(2.0-2.5)	23.0			
2		16	M/W	3			Very Loose, Brown Fine to Medium SAND, Some Silt, Trace Gravel (SM)					
					5							
3		18	W	12			Medium Dense, Tan Fine to Coarse SAND, Little Gravel, Trace Silt (SP)					
4		18	W	6			Loose, Brown Fine to Medium SAND, Trace Silt and Gravel (SP)					
					10							
							Medium Dense, Grayish Brown Fine to Coarse SAND, Little Gravel, Trace Silt (SP)					
5		18	W	12								
					15							
							End of Boring at 15 ft					
							Borehole Backfilled with Bentonite Chips					
					20							

WATER LEVEL OBSERVATIONS

While Drilling ∇ **6.5'** Upon Completion of Drilling _____
 Time After Drilling _____ **10 mins.**
 Depth to Water _____ **6.0'** ∇
 Depth to Cave in _____ **7.0'**

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

GENERAL NOTES

Start **12/12/19** End **12/12/19**
 Driller **GeoServe Chief** **Eddie** Rig **Geoprobe**
 Logger **Matt** Editor **TFG** **7822DT**
 Drill Method **2.25" HSA; Autohammer**



LOG OF TEST BORING

Project **Proposed Residential Development**
Utterback Property - CTH AB
 Location **Town of Dunn, Dane County, Wisconsin**

Boring No. **7**
 Surface Elevation (ft) **866.34**
 Job No. **C19482**
 Sheet **1** of **1**

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks		SOIL PROPERTIES				
No.	TYPE	Rec (in.)	Moist	N			Depth (ft)	qu (qa) (tsf)	W	LL	PL
						12± in. TOPSOIL (OL)					
1		16	M	6		Very Stiff, Brown Lean CLAY, Trace Sand (CL)	(2.25-2.5)	24.0			
2		10	M/W	4		Soft, Brown Sandy Lean CLAY, Trace Gravel (CL)	(0.25-0.5)	17.5			
3		12	W	3		Very Loose, Brown Fine to Medium SAND, Little Silt, Trace Gravel (SP-SM)					
4		12	W	5		Loose, Tan Fine SAND, Little to Some Silt (SP-SM/SM)					
5		12	W	24		Medium Dense, Brown Fine to Medium SAND, Some Silt and Gravel, Scattered Cobbles/Boulders (SM)					
						End of Boring at 15 ft					
						Borehole Backfilled with Bentonite Chips					

WATER LEVEL OBSERVATIONS

GENERAL NOTES

While Drilling 6.5' Upon Completion of Drilling 10 mins.
 Time After Drilling 6.0'
 Depth to Water 7.0'
 Depth to Cave in

Start 12/11/19 End 12/11/19
 Driller GeoServe Chief Eddie Rig Geoprobe
 Logger Matt Editor TFG 7822DT
 Drill Method 2.25" HSA; Autohammer

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.



LOG OF TEST BORING

Project **Proposed Residential Development**
Utterback Property - CTH AB
 Location **Town of Dunn, Dane County, Wisconsin**

Boring No. **8**
 Surface Elevation (ft) **865.92**
 Job No. **C19482**
 Sheet **1** of **1**

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks		SOIL PROPERTIES					
No.	TYPE	Rec (in.)	Moist	N			Depth (ft)	qu (qa) (tsf)	W	LL	PL	LI
							12± in. TOPSOIL (OL)					
1		12	M	4			Stiff to Very Stiff, Brown Lean CLAY, Trace Sand (CL)	(2.0)	25.9			
2		16	M	5			Stiff to Very Stiff, Gray/Brown (Mottled) Lean CLAY, Trace Sand (CL)	(1.75-3.0)	26.7			
					5							
3		12	W	20			Medium Dense, Tan Gravelly Fine to Coarse SAND, Trace Silt, Scattered Cobbles/Boulders (SP)					
4		12	W	15			Medium Dense, Tan Fine to Medium SAND, Some Gravel, Trace to Little Silt (SP/SP-SM)					
					10							
							Medium Dense, Brown Fine to Medium SAND, Some Silt and Gravel, Scattered Cobbles/Boulders (SM)					
5		16	W	12								
					15							
						End of Boring at 15 ft						
						Borehole Backfilled with Bentonite Chips						
					20							

WATER LEVEL OBSERVATIONS

While Drilling ☒ **6.5'** Upon Completion of Drilling **10 mins.**
 Time After Drilling **6.0'**
 Depth to Water **7.0'**
 Depth to Cave in

GENERAL NOTES

Start **12/12/19** End **12/12/19**
 Driller **GeoServe Chief** **Eddie** Rig **Geoprobe**
 Logger **Matt** Editor **TFG** **7822DT**
 Drill Method **2.25" HSA; Autohammer**

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.



LOG OF TEST BORING

Project **Proposed Residential Development**
Utterback Property - CTH AB
Location **Town of Dunn, Dane County, Wisconsin**

Boring No. **9**
Surface Elevation (ft) **870.51**
Job No. **C19482**
Sheet **1** of **1**

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks		SOIL PROPERTIES					
No.	TYPE	Rec (in.)	Moist	N			Depth (ft)	qu (qa) (tsf)	W	LL	PL	LI
							12± in. TOPSOIL (OL)					
1		16	M	7			Very Stiff, Brown Lean CLAY, Trace Sand (CL)	(3.25-3.5)	23.4			
2		18	M	18			Medium Dense, Tan Fine to Coarse SAND, Some Gravel, Trace Silt, Scattered Cobbles/Boulders (SP)					
3		18	M	90	5		Dense to Very Dense, Tan Fine to Coarse SAND and GRAVEL, Trace to Little Silt, Scattered to Numerous Cobbles/Boulders (SP/SP-SM/GP/GP-GM) Probable Cobble/Boulder near 6.5 ft					
4		0	M	34	10		No Recovery from 8.5 to 10 ft (Sample 4) - Sample Collected from Drill Cuttings					
5		12	W	10	15		Medium Dense to Dense, Brown Fine to Medium SAND, Some Silt and Gravel, Scattered Cobbles/Boulders (SM)					
6		18	W	45	20		Possible Cobble/Boulder near 19 ft					
							End of Boring at 20 ft					
							Borehole Backfilled with Bentonite Chips					

WATER LEVEL OBSERVATIONS

While Drilling ☒ 13.0' Upon Completion of Drilling _____
Time After Drilling _____ 10 mins.
Depth to Water _____ 11.0' ☒
Depth to Cave in _____ 11.0'

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

GENERAL NOTES

Start 12/12/19 End 12/12/19
Driller GeoServe Chief Eddie Rig Geoprobe
Logger Matt Editor TFG 7822DT
Drill Method 2.25" HSA; Autohammer



LOG OF TEST BORING

Project **Proposed Residential Development**
Utterback Property - CTH AB
 Location **Town of Dunn, Dane County, Wisconsin**

Boring No. **10**
 Surface Elevation (ft) **868.32**
 Job No. **C19482**
 Sheet **1** of **1**

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks		SOIL PROPERTIES						
No.	TYPE	Rec (in.)	Moist	N			Depth (ft)	qu (qa) (tsf)	W	LL	PL	LI	
							12± in. TOPSOIL (OL)						
1		18	M	8			Very Stiff, Brown Lean CLAY, Trace Sand (CL)	(2.75-3.0)	23.7				
2		18	M	9									
					5		Loose, Tan Fine to Coarse SAND, Some Gravel, Trace Silt, Scattered Cobbles/Boulders (SP)						
3		18	M	40			Medium Dense to Dense, Tan Fine to Coarse SAND and GRAVEL, Trace to Little Silt, Scattered Cobbles/Boulders (SP/SP-SM/GP/GP-GM) Possible Cobble/Boulder near 6.5 ft						
4		18	W	18									
					10		Loose to Medium Dense, Tan Fine to Coarse SAND, Trace Silt and Gravel (SP)						
5		12	W	10									
					15		End of Boring at 15 ft						
							Borehole Backfilled with Bentonite Chips						
					20								

WATER LEVEL OBSERVATIONS

While Drilling ☒ **8.0'** Upon Completion of Drilling _____
 Time After Drilling _____ **10 mins.**
 Depth to Water _____ **8.0'** ▼
 Depth to Cave in _____ **8.0'**

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

GENERAL NOTES

Start **12/12/19** End **12/12/19**
 Driller **GeoServe Chief** **Eddie** Rig **Geoprobe**
 Logger **Matt** Editor **TFG** **7822DT**
 Drill Method **2.25" HSA; Autohammer**



LOG OF TEST BORING

Project **Proposed Residential Development**
Utterback Property - CTH AB
Location **Town of Dunn, Dane County, Wisconsin**

Boring No. **11**
Surface Elevation (ft) **862.88**
Job No. **C19482**
Sheet **1** of **1**

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks		SOIL PROPERTIES				
No.	TYPE	Rec (in.)	Moist	N			Depth (ft)	qu (qa) (tsf)	W	LL	PL
						 12± in. TOPSOIL (OL)					
1		6	M	6		 Stiff, Brown/Gray (Lightly Mottled) Sandy Lean CLAY (CL)	(1.75-2.0)	12.0			
						Loose to Medium Dense, Brown Clayey Fine to Medium SAND (SC)					
2		12	M/W	18							
						 Medium Dense, Tan Fine to Coarse SAND, Little Gravel, Trace Silt (SP)					
					5						
3		16	W	17		 Medium Dense, Grayish Brown Gravelly Fine to Coarse SAND, Trace to Little Silt, Scattered Cobbles/Boulders (SP/SP-SM)					
4		10	W	10		 Loose, Gray to Brown Fine to Coarse SAND, Little Gravel, Trace Silt (SP)					
					10						
5		18	W	9							
					15						
End of Boring at 15 ft											
Borehole Backfilled with Bentonite Chips											
					20						

WATER LEVEL OBSERVATIONS

GENERAL NOTES

While Drilling ☒ 6.0' Upon Completion of Drilling _____
Time After Drilling _____ 10 mins. _____
Depth to Water _____ 6.0' ☒
Depth to Cave in _____ 6.0' _____

Start 12/11/19 End 12/11/19
Driller GeoServe Chief Eddie Rig Geoprobe
Logger Matt Editor TFG 7822DT
Drill Method 2.25" HSA; Autohammer

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.



LOG OF TEST BORING

Project **Proposed Residential Development**
Utterback Property - CTH AB
Location **Town of Dunn, Dane County, Wisconsin**

Boring No. **12**
Surface Elevation (ft) **863.41**
Job No. **C19482**
Sheet **1** of **1**

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	TYPE	Rec (in.)	Moist	N	Depth (ft)	qu (qa) (tsf)	W	LL	PL	LI
					18± in. TOPSOIL (OL)					
1		18	M	5	Stiff, Gray/Brown (Lightly Mottled) Lean CLAY, Trace to Little Sand (CL)	(1.0-1.25)	28.2			
2		18	M	7	Stiff, Light Gray/Brown (Mottled) Lean CLAY, Little Sand (CL)	(1.25-1.75)				
3		18	W	4	Loose, Brown Fine to Medium SAND, Trace Silt and Gravel (SP)					
4		18	W	36	Dense, Grayish Brown Gravelly Fine to Coarse SAND, Little Silt, Scattered Cobbles/Boulders (SP-SM)					
5		12	W	19	Medium Dense, Brown Fine to Medium SAND, Some Silt and Gravel, Scattered Cobbles/Boulders (SM)					
					End of Boring at 15 ft Borehole Backfilled with Bentonite Chips					

WATER LEVEL OBSERVATIONS

GENERAL NOTES

While Drilling ∇ **6.5'** Upon Completion of Drilling _____
Time After Drilling _____ **10 mins.**
Depth to Water _____ **4.0'** ∇
Depth to Cave in _____ **8.0'**

Start **12/11/19** End **12/11/19**
Driller **GeoServe Chief** **Eddie** Rig **Geoprobe**
Logger **Matt** Editor **TFG** **7822DT**
Drill Method **2.25" HSA; Autohammer**

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

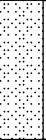


LOG OF TEST BORING

Project **Proposed Residential Development**
Utterback Property - CTH AB
Location **Town of Dunn, Dane County, Wisconsin**

Boring No. **13**
Surface Elevation (ft) **867.25**
Job No. **C19482**
Sheet **1** of **1**

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks		SOIL PROPERTIES				
No.	TYPE	Rec (in.)	Moist	N			Depth (ft)	qu (qa) (tsf)	W	LL	PL
						 12± in. TOPSOIL (OL)					
1		12	M	5		 Stiff/Loose, Brown to Yellowish Brown Sandy Lean CLAY to Clayey Fine SAND, Trace Gravel (CL/SC) <i>USDA: 10YR 5/3, 5/4 Sandy Clay Loam</i>	(1.0-1.5)	14.7			
2		16	M	12		 Medium Dense, Very Pale Brown Fine to Medium SAND, Trace Silt and Gravel (SP) <i>USDA: 10YR 7/3 Fine Sand</i>		4.5			
					5	P200 (Sample 2 - 3.5 to 5 ft): 3.5%					
3		18	M/W	19		 Medium Dense, Pale Brown Sandy Fine to Coarse GRAVEL, Trace Silt, Scattered Cobbles/Boulders (GP) <i>USDA: 10YR 6/3 Extremely Gravelly Sand</i>					
4		16	W	4		 Very Loose to Loose, Pale Brown Fine to Medium SAND, Little Gravel, Trace Silt (SP) <i>USDA: 10YR 6/3 Sand</i>					
					10						
5		18	W	11		 Medium Dense, Pale Brown Silty Fine SAND, Trace Gravel (SM) <i>USDA: 10YR 6/3 Fine Sandy Loam</i>					
6		18	W	15		 Medium Dense, Pale Brown Fine Sand, Trace Silt and Gravel, Scattered Silt Seams (SP) <i>USDA: 10YR 6/3 Fine Sand, Silt Loam Seams</i>					
					15						
						End of Boring at 15 ft					
						Borehole Backfilled with Bentonite Chips					
					20						

WATER LEVEL OBSERVATIONS

GENERAL NOTES

While Drilling ☒ 8.0' Upon Completion of Drilling _____
Time After Drilling _____ 1 Day _____ 10 mins. _____
Depth to Water _____ NW _____ 6.0' ☒
Depth to Cave in _____ 6.0' _____ 6.0' _____

Start 12/11/19 End 12/11/19
Driller GeoServe Chief Eddie Rig Geoprobe
Logger Matt Editor TFG 7822DT
Drill Method 2.25" HSA; Autohammer

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.



LOG OF TEST BORING

Project Proposed Residential Development
Utterback Property - CTH AB
 Location Town of Dunn, Dane County, Wisconsin

Boring No. 14
 Surface Elevation (ft) 866.81
 Job No. C19482
 Sheet 1 of 1

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks		SOIL PROPERTIES					
No.	TYPE	Rec (in.)	Moist	N			Depth (ft)	qu (qa) (tsf)	W	LL	PL	LI
							12± in. TOPSOIL (OL)					
1		14	M	7			Very Stiff, Brown Lean CLAY, Trace Sand (CL)	(2.75-3.0)	24.0			
2		18	M/W	3								
					5		Very Loose, Brown Fine to Medium SAND, Little to Some Silt, Trace Gravel (SP-SM/SM)					
3		12	W	5			Loose, Grayish Brown Gravelly Fine to Coarse SAND, Little Silt, Scattered Cobbles/Boulders (SP-SM)					
4		12	W	3			Very Loose, Brown Fine to Medium SAND, Trace Silt and Gravel (SP)					
					10							
							Loose to Medium Dense, Tan Silty Fine SAND, Scattered Lean Clay Seams (SM)					
5		18	W	10								
					15		End of Boring at 15 ft					
							Borehole Backfilled with Bentonite Chips					
					20							

WATER LEVEL OBSERVATIONS

GENERAL NOTES

While Drilling 7.0' Upon Completion of Drilling 10 mins.
 Time After Drilling 6.0'
 Depth to Water 6.0'
 Depth to Cave in 6.0'

Start 12/11/19 End 12/11/19
 Driller GeoServe Chief Eddie Rig Geoprobe
 Logger Matt Editor TFG 7822DT
 Drill Method 2.25" HSA; Autohammer

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.



LOG OF TEST BORING

Project **Proposed Residential Development**
Utterback Property - CTH AB
 Location **Town of Dunn, Dane County, Wisconsin**

Boring No. **15**
 Surface Elevation (ft) **864.13**
 Job No. **C19482**
 Sheet **1** of **1**

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	TYPE	Rec (in.)	Moist	N	Depth (ft)	qu (qa) (tsf)	W	LL	PL	LI
					12± in. TOPSOIL (OL)					
1		18	M	6	Stiff, Brown Lean CLAY, Trace Sand (CL)	(1.75-2.0)	25.6			
2		12	M	4	Soft, Gray/Brown (Mottled) Lean CLAY to Sandy Lean CLAY, Trace Gravel (CL)	(0.25-0.5)	22.9			
3		18	M/W	23	Medium Dense, Tan Fine to Medium SAND, Little Gravel, Trace Silt, Scattered Organic Seams (SP)					
4		18	W	5	Loose, Brown SILT to Clayey SILT, Trace to Little Sand (ML)	(0.5-1.5)	21.3	17	16	
5		4	W	99/4"	Very Dense, Brown to Gray Clayey to Silty Fine to Coarse SAND, Some Gravel (SC/SM - Probable Highly Weathered to Weathered Sandy Dolomite Bedrock)					
6		0	-	99/0"	End of Boring/Auger and Split-Spoon Refusal on Apparent Sandy Dolomite Bedrock at 12.5 ft					
					Borehole Backfilled with Bentonite Chips					

WATER LEVEL OBSERVATIONS

GENERAL NOTES

While Drilling ☒ 7.0' Upon Completion of Drilling _____
 Time After Drilling _____ 10 mins. _____
 Depth to Water _____ 6.0' ☒
 Depth to Cave in _____ 6.0' _____

Start 12/11/19 End 12/11/19
 Driller GeoServe Chief Eddie Rig Geoprobe
 Logger Matt Editor TFG 7822DT
 Drill Method 2.25" HSA; Autohammer

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.



LOG OF TEST BORING

Project **Proposed Residential Development**
Utterback Property - CTH AB
 Location **Town of Dunn, Dane County, Wisconsin**

Boring No. **16**
 Surface Elevation (ft) **861.45**
 Job No. **C19482**
 Sheet **1** of **1**

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks		SOIL PROPERTIES					
No.	TYPE	Rec (in.)	Moist	N			Depth (ft)	qu (qa) (tsf)	W	LL	PL	LI
							12± in. TOPSOIL (OL)					
1		12	M/W	3	▼		Medium Stiff to Stiff, Black to Very Dark Grayish Brown Organic to Silty CLAY, Little to Some Sand (OL/CL-ML - Probable Lower Horizon Topsoil in Upper Part of Layer)	(0.75-1.25)				
2		18	M	6			USDA: 10YR 2/1 to 3/2 Clay Loam Stiff, Gray/Light Olive Brown (Mottled) Sandy Lean CLAY, Trace Gravel (CL) USDA: 2.5Y 5/1 (Redox: c2d 2.5Y 5/3) Sandy Clay Loam	(1.5-1.75)				
3		18	W	12	▽		Medium Dense, Pale Brown Fine to Medium SAND, Little Gravel, Trace Silt (SP) USDA: 10YR 6/3 Sand					
4		18	W	18			Medium Dense, Pale Brown Fine Sand, Trace Silt and Gravel (SP) USDA: 10YR 6/3 Fine Sand					
5		18	W	11			Medium Dense, Fine Layers of Light Yellowish Brown Silty Fine SAND, Light Brown SILT and Brown Lean CLAY (SM/ML/CL) USDA: Stratified 10YR 6/4 Fine Sandy Loam, 7.5YR 6/3 Silt Loam and 7.5YR 5/4 Silty Clay Loam					
6		18	W	11			Medium Stiff to Very Stiff, Light Brown Lean to Silty CLAY, Trace Sand (CL/CL-ML) USDA: 7.5YR 6/3 Silty Clay Loam	(0.75-2.5)				
							End of Boring at 15 ft					
							Borehole Backfilled with Bentonite Chips					

WATER LEVEL OBSERVATIONS

While Drilling ☒ 6.5' Upon Completion of Drilling _____
 Time After Drilling _____ 1 Day _____ 10 mins. _____
 Depth to Water _____ 2.0' _____ 6.0' ▼
 Depth to Cave in _____ 4.0' _____ 6.0' _____

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

GENERAL NOTES

Start 12/11/19 End 12/11/19
 Driller GeoServe Chief Eddie Rig Geoprobe
 Logger Matt Editor TFG 7822DT
 Drill Method 2.25" HSA; Autohammer



LOG OF TEST BORING

Project **Proposed Residential Development**
Utterback Property - CTH AB
 Location **Town of Dunn, Dane County, Wisconsin**

Boring No. **17**
 Surface Elevation (ft) **861.70**
 Job No. **C19482**
 Sheet **1** of **1**

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	TYPE	Rec (in.)	Moist	N		qu (qa) (tsf)	W	LL	PL	LI
					12± in. TOPSOIL (OL)					
1		18	M	5	Stiff, Gray/Brown (Lightly Mottled) Sandy Lean CLAY, Trace Gravel (CL) USDA: 10YR 5/1 (Redox: c1f 10YR 5/3) Sandy Clay Loam	(1.25-1.5)				
2		18	M	4	Medium Stiff to Stiff, Gray/Yellowish Brown (Mottled) Lean CLAY, Trace to Little Sand (CL) USDA: 5Y 6/1 (Redox: c2d 10YR 5/4) Clay Loam	(0.75-1.5)				
3		18	W	11	Medium Dense, Pale Brown Fine Sand, Trace Silt and Gravel, Scattered Silt and Organic to Silty Clay Seams (SP) USDA: 10YR 6/3 Fine Sand, Silt Loam and Silty Clay Loam Seams					
4		18	W	17						
5		18	W	5	Stiff to Very Stiff, Light Brown/Brown (Laminated) Lean to Silty CLAY, Trace Sand (CL/CL-ML) USDA: 7.5YR 6/3, 5/4 Silty Clay Loam	(1.25-2.5)				
6		8	W	50/2"	Very Dense, Gray Clayey to Silty Fine to Coarse SAND, Some Gravel, Scattered Cobbles/Boulders (SC/SM - Possible Highly Weathered Bedrock) USDA: 7.5YR 6/1 Gravelly Sandy Loam Probable Cobble/Boulder near 14 ft					
					End of Boring at 15 ft					
					Borehole Backfilled with Bentonite Chips					

WATER LEVEL OBSERVATIONS

While Drilling ∇ **6.5'** Upon Completion of Drilling _____
 Time After Drilling **1 Day** **10 mins.**
 Depth to Water **2.5'** **6.0'** ∇
 Depth to Cave in **5.0'** **7.0'**

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

GENERAL NOTES

Start **12/11/19** End **12/11/19**
 Driller **GeoServe Chief** **Eddie** Rig **Geoprobe**
 Logger **Matt** Editor **TFG** **7822DT**
 Drill Method **2.25" HSA; Autohammer**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.5	0.9	5.3	89.8	3.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8	100.0		
#4	99.5		
#8	98.8		
#10	98.6		
#16	97.9		
#30	96.7		
#40	93.3		
#50	77.8		
#80	16.4		
#100	8.0		
#200	3.5		

* (no specification provided)

Material Description
Brown Fine to Medium Sand, Trace Silt and Gravel

Atterberg Limits
 PL= LL= PI=

Coefficients
 D₉₀= 0.3687 D₈₅= 0.3303 D₆₀= 0.2573
 D₅₀= 0.2391 D₃₀= 0.2057 D₁₅= 0.1764
 D₁₀= 0.1599 C_u= 1.61 C_c= 1.03

Classification
 USCS= SP AASHTO=

Remarks
 USDA: Fine Sand

Sample Number: Boring 13

Depth: 3.5 to 5 ft

Date: 12/27/19



Client: VH Acquisitions, LLC
 Project: Utterback Property Residential Development

Project No: C19482

Figure

Tested By: DRW

Checked By: TFG

LOG OF TEST BORING General Notes

DESCRIPTIVE SOIL CLASSIFICATION

Grain Size Terminology

Soil Fraction	Particle Size	U.S. Standard Sieve Size
Boulders	Larger than 12"	Larger than 12"
Cobbles	3" to 12"	3" to 12"
Gravel: Coarse.....	¾" to 3"	¾" to 3"
Fine	4.76 mm to ¾"	#4 to ¾"
Sand: Coarse.....	2.00 mm to 4.76 mm.....	#10 to #4
Medium	0.42 to mm to 2.00 mm	#40 to #10
Fine	0.074 mm to 0.42 mm.....	#200 to #40
Silt.....	0.005 mm to 0.074 mm.....	Smaller than #200
Clay.....	Smaller than 0.005 mm.....	Smaller than #200

Plasticity characteristics differentiate between silt and clay.

General Terminology

Physical Characteristics
Color, moisture, grain shape, fineness, etc.
Major Constituents
Clay, silt, sand, gravel
Structure
Laminated, varved, fibrous, stratified,
cemented, fissured, etc.
Geologic Origin
Glacial, alluvial, eolian, residual, etc.

Relative Density

Term	"N" Value
Very Loose.....	0 - 4
Loose.....	4 - 10
Medium Dense.....	10 - 30
Dense.....	30 - 50
Very Dense.....	Over 50

Relative Proportions Of Cohesionless Soils

Proportional Term	Defining Range by Percentage of Weight
Trace.....	0% - 5%
Little	5% - 12%
Some.....	12% - 35%
And	35% - 50%

Consistency

Term	q _u -tons/sq. ft
Very Soft.....	0.0 to 0.25
Soft.....	0.25 to 0.50
Medium.....	0.50 to 1.0
Stiff.....	1.0 to 2.0
Very Stiff.....	2.0 to 4.0
Hard.....	Over 4.0

Organic Content by Combustion Method

Soil Description	Loss on Ignition
Non Organic.....	Less than 4%
Organic Silt/Clay.....	4 - 12%
Sedimentary Peat.....	12% - 50%
Fibrous and Woody Peat...	More than 50%

Plasticity

Term	Plastic Index
None to Slight.....	0 - 4
Slight.....	5 - 7
Medium.....	8 - 22
High to Very High ..	Over 22

The penetration resistance, N, is the summation of the number of blows required to effect two successive 6" penetrations of the 2" split-barrel sampler. The sampler is driven with a 140 lb. weight falling 30" and is seated to a depth of 6" before commencing the standard penetration test.

SYMBOLS

Drilling and Sampling

CS – Continuous Sampling
RC – Rock Coring: Size AW, BW, NW, 2"W
RQD – Rock Quality Designation
RB – Rock Bit/Roller Bit
FT – Fish Tail
DC – Drove Casing
C – Casing: Size 2 ½", NW, 4", HW
CW – Clear Water
DM – Drilling Mud
HSA – Hollow Stem Auger
FA – Flight Auger
HA – Hand Auger
COA – Clean-Out Auger
SS – 2" Dia. Split-Barrel Sample
2ST – 2" Dia. Thin-Walled Tube Sample
3ST – 3" Dia. Thin-Walled Tube Sample
PT – 3" Dia. Piston Tube Sample
AS – Auger Sample
WS – Wash Sample
PTS – Peat Sample
PS – Pitcher Sample
NR – No Recovery
S – Sounding
PMT – Borehole Pressuremeter Test
VS – Vane Shear Test
WPT – Water Pressure Test

Laboratory Tests

q_a – Penetrometer Reading, tons/sq ft
q_a – Unconfined Strength, tons/sq ft
W – Moisture Content, %
LL – Liquid Limit, %
PL – Plastic Limit, %
SL – Shrinkage Limit, %
LI – Loss on Ignition
D – Dry Unit Weight, lbs/cu ft
pH – Measure of Soil Alkalinity or Acidity
FS – Free Swell, %

Water Level Measurement

▽ - Water Level at Time Shown
NW – No Water Encountered
WD – While Drilling
BCR – Before Casing Removal
ACR – After Casing Removal
CW – Cave and Wet
CM – Caved and Moist

Note: Water level measurements shown on the boring logs represent conditions at the time indicated and may not reflect static levels, especially in cohesive soils.

Unified Soil Classification System

UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART

COARSE-GRAINED SOILS

(more than 50% of material is larger than No. 200 sieve size)

GRAVELS More than 50% of coarse fraction larger than No. 4 sieve size	Clean Gravels (Less than 5% fines)		
		GW	Well-graded gravels, gravel-sand mixtures, little or no fines
		GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines
	Gravels with fines (More than 12% fines)		
		GM	Silty gravels, gravel-sand-silt mixtures
SANDS 50% or more of coarse fraction smaller than No. 4 sieve size		GC	Clayey gravels, gravel-sand-clay mixtures
	Clean Sands (Less than 5% fines)		
		SW	Well-graded sands, gravelly sands, little or no fines
		SP	Poorly graded sands, gravelly sands, little or no fines
	Sands with fines (More than 12% fines)		
		SM	Silty sands, sand-silt mixtures
		SC	Clayey sands, sand-clay mixtures

FINE-GRAINED SOILS

(50% or more of material is smaller than No. 200 sieve size.)

SILTS AND CLAYS Liquid limit less than 50%		ML Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
		CL Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
		OL Organic silts and organic silty clays of low plasticity
SILTS AND CLAYS Liquid limit 50% or greater		MH Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
		CH Inorganic clays of high plasticity, fat clays
		OH Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS		PT Peat and other highly organic soils

LABORATORY CLASSIFICATION CRITERIA

GW $C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{D_{30}}{D_{10} \times D_{60}}$ between 1 and 3

GP Not meeting all gradation requirements for GW

GM	Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
GC	Atterberg limits above "A" line or P.I. greater than 7	

SW $C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{D_{30}}{D_{10} \times D_{60}}$ between 1 and 3

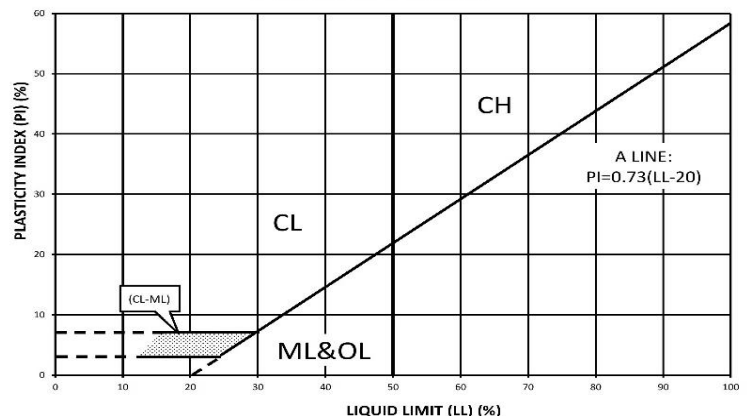
SP Not meeting all gradation requirements for GW

SM	Atterberg limits below "A" line or P.I. less than 4	Limits plotting in shaded zone with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
SC	Atterberg limits above "A" line with P.I. greater than 7	

Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows:

Less than 5 percent GW, GP, SW, SP
More than 12 percent GM, GC, SM, SC
5 to 12 percent Borderline cases requiring dual symbols

PLASTICITY CHART



Soil Map—Dane County, Wisconsin
(Utterback Property)



MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

Background



Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Dane County, Wisconsin

Survey Area Data: Version 18, Sep 10, 2019

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Data not available.

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Co	Colwood silt loam, 0 to 2 percent slopes	0.1	0.2%
DnB	Dodge silt loam, 2 to 6 percent slopes	4.4	11.3%
EgA	Elburn silt loam, gravelly substratum, 0 to 3 percent slopes	0.3	0.9%
GsB	Grays silt loam, 2 to 6 percent slopes	3.4	8.7%
KeB	Kegonsa silt loam, 2 to 6 percent slopes	16.7	42.3%
KrD2	Kidder soils, 10 to 20 percent slopes, eroded	0.8	2.0%
PoB	Plano silt loam, gravelly substratum, 2 to 6 percent slopes	13.0	33.1%
SaA	Sable silty clay loam, 0 to 2 percent slopes	0.6	1.6%
Totals for Area of Interest		39.4	100.0%

APPENDIX C

DOCUMENT QUALIFICATIONS

APPENDIX C

DOCUMENT QUALIFICATIONS

I. GENERAL RECOMMENDATIONS/LIMITATIONS

CGC, Inc. should be provided the opportunity for a general review of the final design and specifications to confirm that earthwork and foundation requirements have been properly interpreted in the design and specifications. CGC should be retained to provide soil engineering services during excavation and subgrade preparation. This will allow us to observe that construction proceeds in compliance with the design concepts, specifications and recommendations, and also will allow design changes to be made in the event that subsurface conditions differ from those anticipated prior to the start of construction. CGC does not assume responsibility for compliance with the recommendations in this report unless we are retained to provide construction testing and observation services.

This report has been prepared in accordance with generally accepted soil and foundation engineering practices and no other warranties are expressed or implied. The opinions and recommendations submitted in this report are based on interpretation of the subsurface information revealed by the test borings indicated on the location plan. The report does not reflect potential variations in subsurface conditions between or beyond these borings. Therefore, variations in soil conditions can be expected between the boring locations and fluctuations of groundwater levels may occur with time. The nature and extent of the variations may not become evident until construction.

II. IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL ENGINEERING REPORT

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes. While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. *No one except you* should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one - not even you* - should apply the report for any purpose or project except the one originally contemplated.

READ THE FULL REPORT

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A GEOTECHNICAL ENGINEERING REPORT IS BASED ON A UNIQUE SET OF PROJECT-SPECIFIC FACTORS

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, *do not rely on a geotechnical engineering report* that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes - even minor ones - and request an assessment of their impact. *CGC cannot accept responsibility or liability for problems that occur because our reports do not consider developments of which we were not informed.*

SUBSURFACE CONDITIONS CAN CHANGE

A geotechnical engineering report is based on conditions that existed at the time the geotechnical engineer performed the study. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

MOST GEOTECHNICAL FINDINGS ARE PROFESSIONAL OPINION

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgement to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ - sometimes significantly - from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most

effective method of managing the risks associated with unanticipated conditions.

A REPORT'S RECOMMENDATIONS ARE NOT FINAL

Do not over-rely on the confirmation-dependent recommendations included in your report. *Those confirmation-dependent recommendations are not final*, because geotechnical engineers develop them principally from judgement and opinion. Geotechnical engineers can finalize their recommendations *only* by observing actual subsurface conditions revealed during construction. *CGC cannot assume responsibility or liability for the report's confirmation-dependent recommendations if we do not perform the geotechnical-construction observation required to confirm the recommendations' applicability.*

A GEOTECHNICAL ENGINEERING REPORT IS SUBJECT TO MISINTERPRETATION

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Constructors can also misinterpret a geotechnical engineering report. Confront that risk by having CGC participate in prebid and preconstruction conferences, and by providing geotechnical construction observation.

DO NOT REDRAW THE ENGINEER'S LOGS

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

GIVE CONSTRUCTORS A COMPLETE REPORT AND GUIDANCE

Some owners and design professionals mistakenly believe they can make constructors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give constructors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise constructors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure constructors have sufficient time* to perform additional study. Only then might you be in a position to give constructors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

READ RESPONSIBILITY PROVISIONS CLOSELY

Some clients, design professionals, and constructors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic

expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineer's responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

ENVIRONMENTAL CONCERNS ARE NOT COVERED

The equipment, techniques, and personnel used to perform an *environmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

OBTAIN PROFESSIONAL ASSISTANCE TO DEAL WITH MOLD

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, many mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; *none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention.* *Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.*

RELY ON YOUR GEOTECHNICAL ENGINEER FOR ADDITIONAL ASSISTANCE

Membership in the Geotechnical Business Council (GBC) of Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk confrontation techniques that can be of genuine benefit for everyone involved with a construction project. Confer with CGC, a member of GBC, for more information.

Modified and reprinted with permission from:

Geotechnical Business Council
of the Geoprofessional Business Association
8811 Colesville Road, Suite G 106
Silver Spring, MD 20910

APPENDIX D

RECOMMENDED COMPACTED FILL SPECIFICATIONS

APPENDIX D

CGC, INC.

RECOMMENDED COMPACTED FILL SPECIFICATIONS

General Fill Materials

Proposed fill shall contain no vegetation, roots, topsoil, peat, ash, wood or any other non-soil material which by decomposition might cause settlement. Also, fill shall never be placed while frozen or on frozen surfaces. Rock, stone or broken concrete greater than 6 in. in the largest dimension shall not be placed within 10 ft of the building area. Fill used greater than 10 ft beyond the building limits shall not contain rock, boulders or concrete pieces greater than a 2 sq ft area and shall not be placed within the final 2 ft of finish subgrade or in designated utility construction areas. Fill containing rock, boulders or concrete pieces should include sufficient finer material to fill voids among the larger fragments.

Special Fill Materials

In certain cases, special fill materials may be required for specific purposes, such as stabilizing subgrades, backfilling undercut excavations or filling behind retaining walls. For reference, WisDOT gradation specifications for various types of granular fill are attached in Table 1.

Placement Method

The approved fill shall be placed, spread and leveled in layers generally not exceeding 10 in. in thickness before compaction. The fill shall be placed at moisture content capable of achieving the desired compaction level. For clay soils or granular soils containing an appreciable amount of cohesive fines, moisture conditioning will likely be required.

It is the Contractor's responsibility to provide all necessary compaction equipment and other grading equipment that may be required to attain the specified compaction. Hand-guided vibratory or tamping compactors will be required whenever fill is placed adjacent to walls, footings, columns or in confined areas.

Compaction Specifications

Maximum dry density and optimum moisture content of the fill soil shall be determined in accordance with modified Proctor methods (ASTM D1557). The recommended field compaction as a percentage of the maximum dry density is shown in Table 2. Note that these compaction guidelines would generally not apply to coarse gravel/stone fill. Instead, a method specification would apply (e.g., compact in thin lifts with a vibratory compactor until no further consolidation is evident).

Testing Procedures

Representative samples of proposed fill shall be submitted to CGC, Inc. for optimum moisture-maximum density determination (ASTM D1557) prior to the start of fill placement. The sample size should be approximately 50 lb.

CGC, Inc. shall be retained to perform field density tests to determine the level of compaction being achieved in the fill. The tests shall generally be conducted on each lift at the beginning of fill placement and at a frequency mutually agreed upon by the project team for the remainder of the project.

Table 1
Gradation of Special Fill Materials

Material	WisDOT Section 311	WisDOT Section 312	WisDOT Section 305			WisDOT Section 209		WisDOT Section 210
	Breaker Run	Select Crushed Material	3-in. Dense Graded Base	1 1/4-in. Dense Graded Base	3/4-in. Dense Graded Base	Grade 1 Granular Backfill	Grade 2 Granular Backfill	Structure Backfill
Sieve Size	Percent Passing by Weight							
6 in.	100							
5 in.		90-100						
3 in.			90-100					100
1 1/2 in.		20-50	60-85					
1 1/4 in.				95-100				
1 in.					100			
3/4 in.			40-65	70-93	95-100			
3/8 in.				42-80	50-90			
No. 4			15-40	25-63	35-70	100 (2)	100 (2)	25-100
No. 10		0-10	10-30	16-48	15-55			
No. 40			5-20	8-28	10-35	75 (2)		
No. 100						15 (2)	30 (2)	
No. 200			2-12	2-12	5-15	8 (2)	15 (2)	15 (2)

Notes:

1. Reference: Wisconsin Department of Transportation *Standard Specifications for Highway and Structure Construction*.
2. Percentage applies to the material passing the No. 4 sieve, not the entire sample.
3. Per WisDOT specifications, both breaker run and select crushed material can include concrete that is 'substantially free of steel, building materials and other deleterious material'.

Table 2
Compaction Guidelines

Area	Percent Compaction (1)	
	Clay/Silt	Sand/Gravel
<u>Within 10 ft of building lines</u>		
Footing bearing soils	93 - 95	95
Under floors, steps and walks		
- Lightly loaded floor slab	90	90
- Heavily loaded floor slab and thicker fill zones	92	95
<u>Beyond 10 ft of building lines</u>		
Under walks and pavements		
- Less than 2 ft below subgrade	92	95
- Greater than 2 ft below subgrade	90	90
Landscaping	85	90

Notes:

1. Based on Modified Proctor Dry Density (ASTM D 1557)

APPENDIX E

ROCK EXCAVATION CONSIDERATIONS

APPENDIX E

ROCK EXCAVATION CONSIDERATIONS

In order to minimize probable "rock" excavation expenses during construction, we suggest that project specifications incorporate the following:

- A. It is assumed that all excavations to levels and dimensions required by the Contract Documents are earth excavation. Earth excavation includes removal and disposal of all materials encountered except rock/sound bedrock which is defined as natural materials which:
 - 1. Cannot be excavated with a minimum 3/4 cubic yard capacity backhoe without drilling and blasting;
 - 2. Cannot be economically removed with a one-tooth ripper on a D8 cat (or equivalent);
 - 3. Requires the use of special equipment such as a pneumatic hammer;
 - 4. Requires the use of explosives (after obtaining written permission of the owner).
- B. Examples of material classified as rock are boulders 1/2 cubic yard or more in volume, bedrock, rock in ledges, and rock-hard cementitious aggregate deposits.
- C. Do not proceed with rock excavation work until architect, engineer and/or testing firm (i.e., CGC) has taken the necessary measures to determine quantity of rock excavation required to complete the work. Measurements will be taken after properly stripped of earth by the contractor. Contractor will be paid the difference between the cost of rock and earth excavation based on an agreed upon unit price established prior to starting rock excavation.

A statement should also be included in the specifications to the effect that: "Stated models of earth excavation equipment are merely for purposes of defining the various excavation categories and are not intended to indicate the brand or type of equipment that is to be used."

APPENDIX F

WISCONSIN DEPARTMENT OF SAFETY & PROFESSIONAL SERVICES SOIL AND SITE EVALUATION – STORM FORM (3 BORINGS)



Attachment 2:

SOIL AND SITE EVALUATION - STORM

In accordance with SPS 382.365, 385, Wis. Adm. Code, and WDNR Standard 1002

Attach a complete site plan on paper not less than 8 1/2 x 11 inches in size. Plan must include, but not limited to: vertical and horizontal reference point (BM), direction and percent of slope, scale or dimensions, north arrow, and BM referenced to nearest road

Please print all information

Personal information you provide may be used for secondary purposes [Privacy Law, s. 15.04(1)(m)]

County	Dane
Parcel I.D.	028/0610-024-8070-0
Reviewed by:	
Date:	

Property Owner Utterback LTD Partnership c/o Wayne Utterback	Property Location Govt. Lot NE 1/4 SE 1/4 S 02 T N 06 R 10 E				
Property Owner's Mail Address 4627 Prairie Fire Ct.	Lot # Block# Subd. Name or CSM #				
City DeForest	State WI	Zip Code 53532	Phone Number	☐ City ☐ Village ☒ Town Dunn	Nearest Road CTH AB
Drainage area sq ft acres	Hydraulic Application Test Method ☒ Morphological Evaluation ☐ Double Ring Infiltrometer ☐ Other: (specify)			Soil Moisture Date of soil borings: USDA-NRCS WETS Value: ☐ Dry = 1; ☐ Normal = 2; ☐ Wet = 3.	
Test site suitable for (check all that apply): ☐ Bioretention; ☐ Subsurface Dispersal System; ☐ Reuse; ☐ Irrigation; ☐ Other					

B-13	#OBS.	☐ Pit ☒ Boring	Ground surface elevation	867.3 ft.	Elevation of limiting factor	861.3 ft. (Groundwater)				
Horizon	Depth in.	Dominant Color Munsell	Redox Description Qu. Sz. Cont. Color	Texture	Structure Gr. Sz. Sh.	Consistence	Boundary	% Rock Frgs.	% Fines	Hydraulic App Rate Inches/Hr
1	0-12	Topsoil (not sampled)								
2	12-36	10YR 5/3, 5/4	none	SCL	2mabk	mfi		<5		0.11
3	36-66	10YR 7/3	none	FS	0sg	ml		1	4	0.50
4	66-96	10YR 6/3	none	XGRS	0sg	ml		65-75		3.60
5	96-126	10YR 6/3	none	S	0sg	ml		<10		3.60
6	126-156	10YR 6/3	none	FSL	2msbk	mfr		<5		0.50
7	156-180	10YR 6/3	none	FS, SiL	0sg	ml		<5		0.13-0.50
Comments: Groundwater was encountered at about 8 ft during drilling and at about 6 ft shortly after the completion of drilling. About one day after the completion of drilling, the borehole had caved-in at about 6 ft, with no groundwater present above this depth. Infiltration potential appears limited based on fairly shallow groundwater.										

B-16	#OBS.	☐ Pit ☒ Boring	Ground surface elevation	861.5 ft.	Elevation of limiting factor	859.5 ft. (Groundwater)				
Horizon	Depth in.	Dominant Color Munsell	Redox Description Qu. Sz. Cont. Color	Texture	Structure Gr. Sz. Sh.	Consistence	Boundary	% Rock Frgs.	% Fines	Hydraulic App Rate Inches/Hr
1	0-12	Topsoil (not sampled)								
2	12-36	10YR 2/1 to 3/2	none	CL	0m	mfi		<5		0.03
3	36-78	2.5Y 5/1	c2d 2.5Y 5/3	SCL	0m	mfi		<5		0.11
4	78-102	10YR 6/3	none	S	0sg	ml		<10		3.60
5	102-126	10YR 6/3	none	FS	0sg	ml		<5		0.50
6	126-156	10YR 6/4, 7.5YR 6/3, 7.5YR 5/4	none	Strat. FSL, SiL, SiCL	variable			<5		0.04
7	156-180	7.5YR 6/3	none	SiCL	0m	mvfi		<5		0.04
Comments: Groundwater was encountered at about 6.5 ft during drilling and at about 6 ft shortly after the completion of drilling. About one day after the completion of drilling, the borehole had caved-in at about 4 ft, with groundwater observed at about 2 ft. Infiltration potential appears very limited based on shallow groundwater.										

Name (Please Print)	Tim F. Gassenheimer	Signature		Credential Number	SP-011900004
Address	129 Milky Way, Madison, WI 53718	Date Evaluation Conducted	December 11, 2019	Telephone Number	(608) 288-4100

B-17

#OBS.

☐ Pit☒ Boring

Ground surface elevation

861.7 ft.

Elevation of limiting factor

860.7 ft. (Redox)

859.2 ft. (Groundwater)

Horizon	Depth in.	Dominant Color Munsell	Redox Description Qu. Sz. Cont. Color	Texture	Structure Gr. Sz. Sh.	Consistence	Boundary	% Rock Frgs.	% Fines	Hydraulic App Rate Inches/Hr
1	0-12	Topsoil (not sampled)								
2	12-36	10YR 5/1	c1f 10YR 5/3	SCL	0m	mfi		<5		0.11
3	36-78	5Y 6/1	c2d 10YR 5/4	CL	0m	mfi		<5		0.03
4	78-126	10YR 6/3	none	FS, SiL/SiCL	0sg	ml		<5		0.04-0.50
5	126-156	7.5YR 6/3, 5/4	none	SiCL	0m	mvfi		<5		0.04
6	156-180	7.5YR 6/1	none	GRSL ⁽¹⁾	1cabk	mfr		20-30		0.50

Comments: Groundwater was encountered at about 6.5 ft during drilling and at about 6 ft shortly after the completion of drilling. About one day after the completion of drilling, the borehole had caved-in at about 5 ft, with groundwater observed at about 2.5 ft.

Infiltration potential appears very limited based on shallow low-chroma/high-value dominant color and redox, as well as groundwater.

⁽¹⁾ Horizon 6 was classified as possible bedrock.

Overall Site Comments: See Comments above and Stormwater Infiltration Potential section in Geotechnical Exploration Report.

APPENDIX F

WETLAND REPORT



Assured Wetland Delineation Report

Utterback Property North

Town of Dunn, Dane County, Wisconsin

December 20, 2019

Project Number: 20190239

Utterback Property North

Town of Bucky, Dane County, Wisconsin

December 20, 2019

Prepared for:

Mr. Chris Ehlers

VH Acquisitions LLC

6801 South Towne Drive

Madison, WI 53713

Prepared by:

Heartland Ecological Group, Inc.

506 Springdale Street

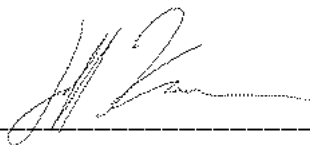
Mount Horeb, WI 53572

608-490-2450

www.heartlandecological.com



Scott Fuchs, Environmental Technician



Jeff Kraemer, Principal

Table of Contents

1.0	Introduction	4
2.0	Methods	5
2.1	Wetlands	5
3.0	Results and Discussion	6
3.1	Desktop Review	6
	Table 1. Summary of NRCS Mapped Soils within the Study Area	7
3.2	Field Review	8
	Table 2. Summary of Wetlands Identified within the Study Area	9
3.3	Other Considerations	10
4.0	Conclusion	11
5.0	References	12

Appendix A | Figures

Appendix B | WETS Analysis

Appendix C | Wetland Determination Data Sheets

Appendix D | Site Photographs

Appendix E | Delineator Qualifications

Appendix F | NAIP Aerial Imagery



1.0 Introduction

Heartland Ecological Group, Inc. (“Heartland”) completed an assured wetland determination and delineation on the Utterback Property North site on September 16, 2019 at the request of VH Acquisitions LLC. Fieldwork was completed by Jeff Kraemer, an assured delineator qualified via the Wisconsin Department of Natural Resources (WDNR) Wetland Delineation Assurance Program (Appendix E, Qualifications). The 39.80-acre site (the “Study Area”) is east of the ends of Tuscobia Trail and Prairie Wood Drive, and west of County Highway AB, in the southeast $\frac{1}{4}$ of Section 2, T6N, R10E, Town of Dunn, Dane County, WI (Figure 1, Appendix A). The purpose of the wetland delineation was to determine the location and extent of wetlands within the Study Area.

One (1) wetland area totaling approximately 1.20 acres was delineated and mapped within the Study Area (Figure 6, Appendix A). Wetlands discussed in this report may be subject to federal regulation under the jurisdiction of the U.S. Army Corps of Engineers (USACE), state regulation under the jurisdiction of the WDNR, and local zoning authorities. Heartland recommends this report be submitted to local authorities, the WDNR, and USACE for final jurisdictional review and concurrence.



2.0 Methods

2.1 Wetlands

Wetlands were determined and delineated using the criteria and methods described in the USACE Wetlands Delineation Manual, T.R. Y-87-1 ("1987 Corps Manual") and the applicable *Regional Supplement to the Corps of Engineers Wetland Delineation Manual*. In addition, the *Guidance for Submittal of Delineation Reports to the St. Paul District USACE and the WDNR* (WDNR, 2015) was followed in completing the wetland delineation and report.

Determinations and delineations utilized available resources including the U.S. Geological Survey's (USGS) *WI 7.5 Minute Series (Topographic) Map* (Figure 2, Appendix A), the Natural Resource Conservation Service's (NRCS) Soil Survey Geographic Database (SSURGO), U.S. Department of Agriculture's (USDA) *Web Soil Survey* (Figure 3, Appendix A), the Wisconsin Department of Natural Resources' *Surface Water Data Viewer's* wetland indicator data layer (Figure 4, Appendix A), the WDNR's *Wisconsin Wetland Inventory* data layer (Figure 5, Appendix A), and aerial imagery available through the USDA Farm Service Agency's (FSA) National Agriculture Imagery Program (NAIP), Google Earth™, and Dane County's interactive mapping. The USGS *National Hydrography Dataset* is included on Figures 2 and 5, Appendix A.

Wetland determinations were completed on-site at sample points, often along transects, using the three (3) criteria (vegetation, soil, and hydrology) approach per the 1987 Corps Manual and the Regional Supplement. Procedures in these sources were followed to demonstrate that, under normal circumstances, wetlands were present or not present based on a predominance of hydrophytic vegetation, hydric soils, and wetland hydrology.

Atypical conditions were encountered within the Study Area due to the presence of agricultural fields including row-cropping and hay fields. Therefore, procedures for managed plant communities in the *Problematic hydrophytic vegetation* section described in Chapter 5 (Difficult Wetland Situations) of the Regional Supplement were used. NAIP imagery were reviewed for evidence of crop stress, saturation, or inundation signatures. Sample point placements for the wetland delineation were partially determined based on such signatures.



Recent weather conditions influence the visibility or presence of certain wetland hydrology indicators. An assessment of recent precipitation patterns helps to determine if climatic/hydrologic conditions were typical when the field investigation was completed. Therefore, a review of the antecedent precipitation in the three (3) months leading up to the field investigation was completed. Using a WETS analysis developed by the NRCS, the amounts of precipitation in these three (3) months were compared to averages and standard deviation thresholds over the past 30 years to generally represent if conditions encountered during the investigation were normal, wet, or dry. Recent precipitation events in the week prior to the investigation were considered while interpreting wetland hydrology indicators. In some cases, the Palmer Drought Index was checked for long-term drought or moist conditions (NOAA, 2018).

The uppermost wetland boundary and sample points were identified and marked with wetland flagging and located with a Global Positioning System (GPS) capable of sub-meter accuracy. In some cases, wetland flagging was not utilized to mark the boundary and the location was only recorded with a GPS unit, particularly in active agricultural areas. The GPS data was then used to map the wetlands using ESRI ArcMap™ 10.6 software.

3.0 Results and Discussion

3.1 Desktop Review

Climatic Conditions

According to the WETS analysis using the previous three (3) months of precipitation data, conditions encountered at the time of the fieldwork were expected to be normal for the time of year (Appendix B). The Palmer Drought Index was checked on line and the long-term conditions at the time of the fieldwork were in the extremely moist range. Fieldwork was completed at the end of the dry-season based on long-term regional hydrology data utilized in the WebWIMP Climatic Water Balance web site.

General Topography and Land Use

The topography within the Study Area was rolling, with various hills, depressions, and slopes, but generally was sloping towards the railway which makes up the southern boundary of the site. A topographic high of approximately 895 feet above mean sea level



(msl) is present along the northern boundary of the site, and a topographic low of approximately 865 feet above msl is present within the depression in the southeast corner of the site (Figures 2 and 6, Appendix A). Land use within the Study Area consists of agricultural row cropping. Surrounding areas are primarily agricultural row cropping and residential homes. General drainage is to the south and east.

Soil Mapping

Soils mapped by the NRCS Soil Survey within the Study Area and their hydric status are summarized in Table 1. Wetlands identified during the field investigation are located primarily within areas mapped as hydric or partially hydric soils including wetland indicator soils (Figures 3 and 4, Appendix A).

Table 1. Summary of NRCS Mapped Soils within the Study Area

Soil symbol: Soil Unit Name	Soil Unit Component	Soil Unit Component Percentage	Landform	Hydric status
Co: Colwood silt loam, 0 to 2 percent slopes	Colwood	80-90	Lakebeds (relict)	Yes
	Pella	5-10	Drainageways	Yes
	Palms	5-10	Depressions	Yes
DnB: Dodge silt loam, 2 to 6 percent slopes	Dodge	80-95	Drumlins	No
	St. Charles	3-10	Drumlins	No
	Mayville	2-7	Drumlins	No
	Lamartine	0-3	Drumlins	No
EgA: Elburn silt loam, gravelly substratum, 0 to 3 percent slopes	Elburn-Gravelly substratum	85-95	Till plains	No
	Sable	2-5	Drainageways	Yes
	Drummer	2-5	Drainageways	Yes
	Mahalasville	2-5	Drainageways	Yes
GsB: Grays silt loam, 2 to 6 percent slopes	Grays	100	Lake plains	No
KeB: Kegonsa silt loam, 2 to 6 percent slopes	Kegonsa	100	Outwash plains	No
KrD2: Kidder soils, 10 to 20 percent slopes, eroded	Kidder-Loam	60	Recessionial moraines, terminal moraines, drumlins	No



Soil symbol: Soil Unit Name	Soil Unit Component	Soil Unit Component Percentage	Landform	Hydric status
	Kidder-Sandy loam	30	Recessional moraines, terminal moraines, drumlins	No
PoB: Plano silt loam, gravelly substratum, 2 to 6 percent slopes	Plano-Gravelly substratum	80-90	Outwash plains	No
	Warsaw	5-10	Outwash plains	No
	Plano-Moderately wet gravelly substratum	5-10	Outwash plains	No
SaA: Sable silty clay loam, 0 to 2 percent slopes	Sable	85-100	Swales	Yes
	Muscature	0-6	Ground moraines	No
	Ipava	0-7	Ground moraines	No
	Buckhart	0-4	Knolls	No
	Elburn	0-3	Outwash plains	No

Wetland Mapping

The Wisconsin Wetlands Inventory (WWI) mapping (Figure 5, Appendix A) does not depict any wetlands within the Study Area.

Aerial Photography

A formal off-site analysis was not completed due to a lack of mapped hydric soils within the Study Area, however available NAIP imagery from 2004 through 2018 (Appendix F) were reviewed to assist in understanding the recent history of the Study Area and to evaluate for general wetland signatures. This imagery showed a consistent use of agricultural row cropping within the Study Area. A depression in the southeast corner of the Study Area featured consistent wetland signatures in the reviewed imagery.

3.2 Field Review

One (1) wetland was identified and delineated within the Study Area based on both the desktop review, including a review of aerial imagery, and a field reconnaissance. Wetland determination data sheets (Appendix C) were completed at two (2) sample points that were



representative of the wetland and upland conditions near the boundary and where potential wetlands may be present based on the desktop review and field reconnaissance. Appendix D provides photographs, typically at the sample point locations of the wetlands and adjacent uplands. The wetland boundary and sample point locations are shown on Figure 6 (Appendix A) and the wetlands are summarized in Table 2 and detailed in the following sections.

Table 2. Summary of Wetlands Identified within the Study Area

Wetland ID	Wetland Description	*Surface Water Connections	*NR151 Protective Area	Acreage (on-site)
W-1	Farmed Wet Meadow	Potentially Isolated	Less susceptible, 10-30 feet	1.20
<i>*Classification based on Heartland's professional opinion. Jurisdictional authority of wetland and waterway protective areas under NR 151 lies with the WDNR. Local zoning authorities may have additional restrictions. USACE has authority for determining federal jurisdiction of wetlands and waterways.</i>				1.20

Wetland 1 (W-1)

Wetland 1 (W-1) is a 1.20-acre wet meadow with a history of being farmed and is located within a depression in the southeastern corner of the Study Area.

Dominant vegetation observed in W-1 included fall panic grass (*Panicum dichotomiflorum*, FACW) and reed canary grass (*Phalaris arundinacea*, FACW).

The Depleted Matrix (F3) hydric soil indicator was observed within W-1, which is inconsistent with the NRCS-mapped Kegonsa silt loam soil type.

The primary wetland hydrology indicators of Surface Water (A1) and High Water Table (A2) were observed within W-1, while secondary indicators included Geomorphic Position (D2) and a positive FAC-Neutral Test (D5).

Wetland W-1 appears to be an isolated depression and its boundaries follow a moderately-defined topographic break. The boundaries were partially determined by the wetland signatures observed during the review of NAIP aerial imagery and located in the field.



3.3 Other Considerations

This report is limited to the identification and delineation of wetlands within the Study Area. Other regulated environmental resources that result in land use restrictions may be present within the Study Area that were not evaluated by Heartland (e.g. navigable waterways, floodplains, cultural resources, and threatened or endangered species).

Wisconsin Act 183 provides exemptions to permitting requirements for certain nonfederal wetlands. Nonfederal wetlands are wetlands that are not subject to federal jurisdiction. Exemptions apply to projects in urban areas with wetland impacts up to 1-acre per parcel. An urban area is defined as an incorporated area; an area within ½ mile of an incorporated area; or an area served by a sewerage system. Exemptions for nonfederal wetlands also apply to projects in rural areas with wetland impacts up to three (3) acres per parcel. Exemptions in rural areas only apply to structures with an agricultural purpose such as buildings, roads, and driveways. The determination of federal and nonfederal wetlands MUST be made by the USACE through an Approved Jurisdictional Determination (AJD). This report may be submitted to the USACE to assist with their determination.

Wis. Adm. Code NR 151 ("NR 151") requires that a "protective area" (buffer) be determined from the Ordinary High-Water Mark (OHWM) of lakes, streams and rivers, or at the delineated boundary of wetlands. Per NR 151.12, the protective area width for "less susceptible" wetlands is determined by using 10% of the average wetland width, no less than 10 feet or more than 30 feet. "Moderately susceptible" wetlands, lakes, and perennial and intermittent streams identified on recent mapping require a protective area width of 50 feet; while "highly susceptible wetlands" are associated with outstanding or exceptional resource waters in areas of special natural resource interest and require protective area width of 75 feet. Table 2 above lists the potential wetland buffers per NR 151 for each wetland identified based on Heartland's professional opinion. Please note that jurisdictional authority on wetland and waterway protective areas under NR 151 lies with the WDNR. Local zoning authorities and regional planning organizations may have additional land use restrictions within or adjacent to wetlands.



4.0 Conclusion

Heartland completed an assured wetland determination and delineation within the Utterback Property North site on September 16, 2019 at the request of VH Acquisitions LLC. Fieldwork was completed by Jeff Kraemer, an assured delineator qualified via the WDNR Wetland Delineation Assurance Program. The Study Area lies in Section 2, T6N, R10E, Town of Dunn, Dane County, WI.

One (1) wetland area was delineated and mapped within the 39.80-acre Study Area. The wetland, which may be classified as a farmed wet meadow, totals approximately 1.20 acres within the Study Area.

Wetlands and waterways discussed in this report may be subject to federal regulation under the jurisdiction of the U.S. Army Corps of Engineers (USACE), state regulation under the jurisdiction of the WDNR, and the local zoning authority. Heartland recommends this report be submitted to the USACE for final jurisdictional review and concurrence. Review by local authorities may be necessary for determination of any applicable zoning and setback restrictions.

Heartland recommends that all applicable regulatory agency reviews and permits are obtained prior to beginning work within the Study Area or within or adjacent to wetlands or waterways. Heartland can assist with evaluating the need for additional environmental reviews, surveys, or regulatory agency coordination in consideration of the proposed activity and land use as requested but is outside of the scope of the wetland delineation.

Experienced and qualified professionals completed the wetland determination and delineation using standard practices and professional judgment. Wetland boundaries may be affected by conditions present within the Study Area at the time of the fieldwork. All final decisions on wetlands and their boundaries are made by the USACE, the WDNR, and/or sometimes a local unit of government. Wetland determination and boundary reviews by regulatory agencies may result in modifications to the findings presented to the Client. These modifications may result from varying conditions between the time the wetland delineation was completed and the time of the review. Factors that may influence the findings may include but not limited to precipitation patterns, drainage modifications, changes or modification to vegetation, and the time of year.



5.0 References

Eggers, S. D., & D. M. Reed. (2014). *Wetland Plants and Plant Communities of Minnesota and Wisconsin* (V. 3.1). U.S. Army Corps of Engineers, Regulatory Branch, St. Paul, MN District. See: <http://www.mvp.usace.army.mil/>.

Environmental Laboratory (1987). *Corps of Engineers Wetlands Delineation Manual*, Tech. Report Y-87-1, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

Lichvar, R.W., D. L. Banks, W. N. Kirchner, and N.C. Melvin. (2016). *The National Wetland Plant List: 2016 wetland ratings*. Phytoneuron 2016-30: 1-17. Published 28 April 2016. ISSN 2153 733X. See: <http://www.phytoneuron.net/>.

Midwestern Regional Climate Center. (2014). *cli-MATE* [climate data access tool]. See: <http://mrcc.isws.illinois.edu/CLIMATE/>.

National Oceanic and Atmospheric Administration (NOAA). (2015) Regional Climate Centers Applied Climate Information System. *WETS table*. See: <http://agacis.rcc-acis.org>.

NOAA National Center for Environmental Information. (2018) *Historic Palmer Drought Indices*. See: <https://www.ncdc.noaa.gov/temp-and-precip/drought/historical-palmers/psi/201512-201601>.

Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture (USDA). (2018). *Soil Survey Geographic (SSURGO) Database*. See: <http://websoilsurvey.nrcs.usda.gov/> or <http://datagateway.nrcs.usda.gov/>.

Soil Survey Staff, Natural Resources Conservation Service, USDA. (2018). *Web Soil Survey*. See: <http://websoilsurvey.nrcs.usda.gov/>.

U.S. Army Corps of Engineers (USACE) and Wisconsin Department of Natural Resources (WDNR). (March 2015). *Guidance for Submittal of Delineation Reports to the St. Paul District Army Corps of Engineers and the Wisconsin Department of Natural Resources*. See: <http://dnr.wi.gov/topic/wetlands/documents/FinalWisconsinDelineationGuidance.pdf>.



USACE. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (Version 2.0)*. (2011). ed. J.S. Wakely, R.W. Lichvar, C.V. Nobel, and J. F. Berkowitz. ERDC/EL TR-12-1. Vicksburg, MS: U.S. Army Engineer Research and Development Center.

USACE St. Paul District & Minnesota Board of Water & Soil Resources. (July 2016). *Guidance for Offsite Hydrology/Wetland Determinations*. See: <http://www.mvp.usace.army.mil/Missions/Regulatory/Delineation/>.

United States Department of Agriculture (USDA), Farm Service Agency (FSA). (2004, 2005, 2006, 2008, 2010, 2013, 2015, 2017, 2018) [Dane County, Wisconsin aerial photographs]. National Agriculture Imagery Program (NAIP). Salt Lake City, UT: Aerial Photography Field Office.

USDA, Natural Resource Conservation Service (NRCS). (2010). *Field Indicators of Hydric Soils in the United States*, Version 8.2. L.M. Vasilas, G.W. Hurt, and C.V. Noble (eds.). USDA, NRCS in cooperation with the National Technical Committee for Hydric Soils.

United States Department of the Interior (USDI) Fish & Wildlife Service – Ecological Services. (2018). *National Wetland Inventory*. See: <https://www.fws.gov/wetlands/>.

USDI, U.S. Geological Survey (USGS). *Wisconsin 7.5 Minute Series (Topographic) Maps*. 1:24,000. Reston, VA.

USDI, USGS. National Hydrography Dataset (NHD) 24K scale data. See: <https://nhd.usgs.gov/>.

Wetland Training Institute, Inc (WTI). (2010). *Pocket guide to hydric soil field indicators*. (Robert J. Pierce, Ed.). (7th ed.). Glenwood, NM: Wetland Training Institute, Inc.

Willmott, C.J. and K. Matsuura. (2016). *Web-Based Water-Budget Interactive Modeling Program (WebWIMP)*. University of Delaware Department of Geography. Newark, DE. See: climate.geog.udel.edu/~wimp/.



VH Acquisitions LLC
Utterback Property North
Project #: 20190239
December 20, 2019

WDNR, Surface Water Data Viewer Interactive Web-mapping Tool. (2018). See:
<https://dnr.wi.gov/topic/surfacewater/swdv/>.

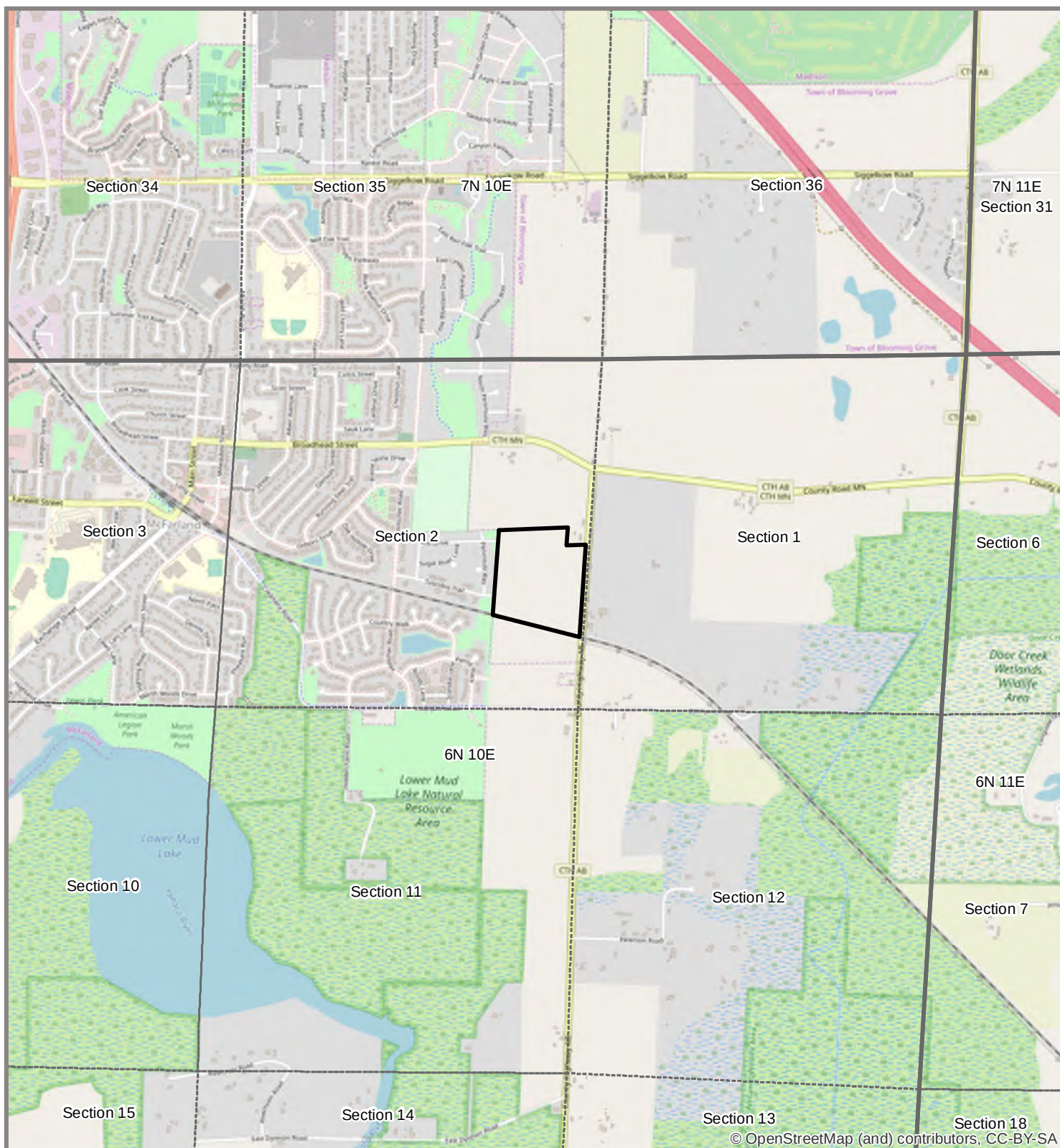
WDNR, Division of Water. (2010). [24k hydrography geospatial data layer]. See:
ftp://dnrftp01.wi.gov/geodata/hydro_24k/.

Woodward, D.E. ed. (1997). *Hydrology Tools for Wetland Determination*, WETS Analysis, Chapter 19. Engineering Field Handbook. USDA, NRCS, Fort Worth, TX.

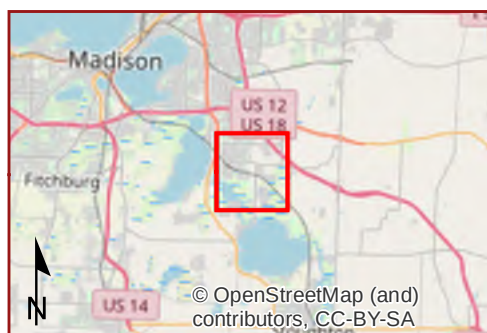


VH Acquisitions LLC
Utterback Property North
Project #: 20190239
December 20, 2019

Appendix A | Figures

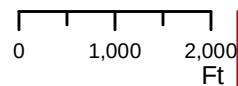


© OpenStreetMap (and) contributors, CC-BY-SA



© OpenStreetMap (and) contributors, CC-BY-SA

- Study Area (39.80 ac)
- Township
- Section



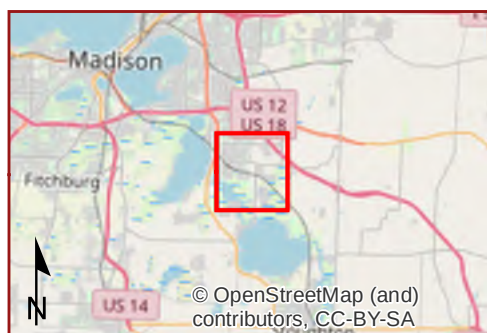
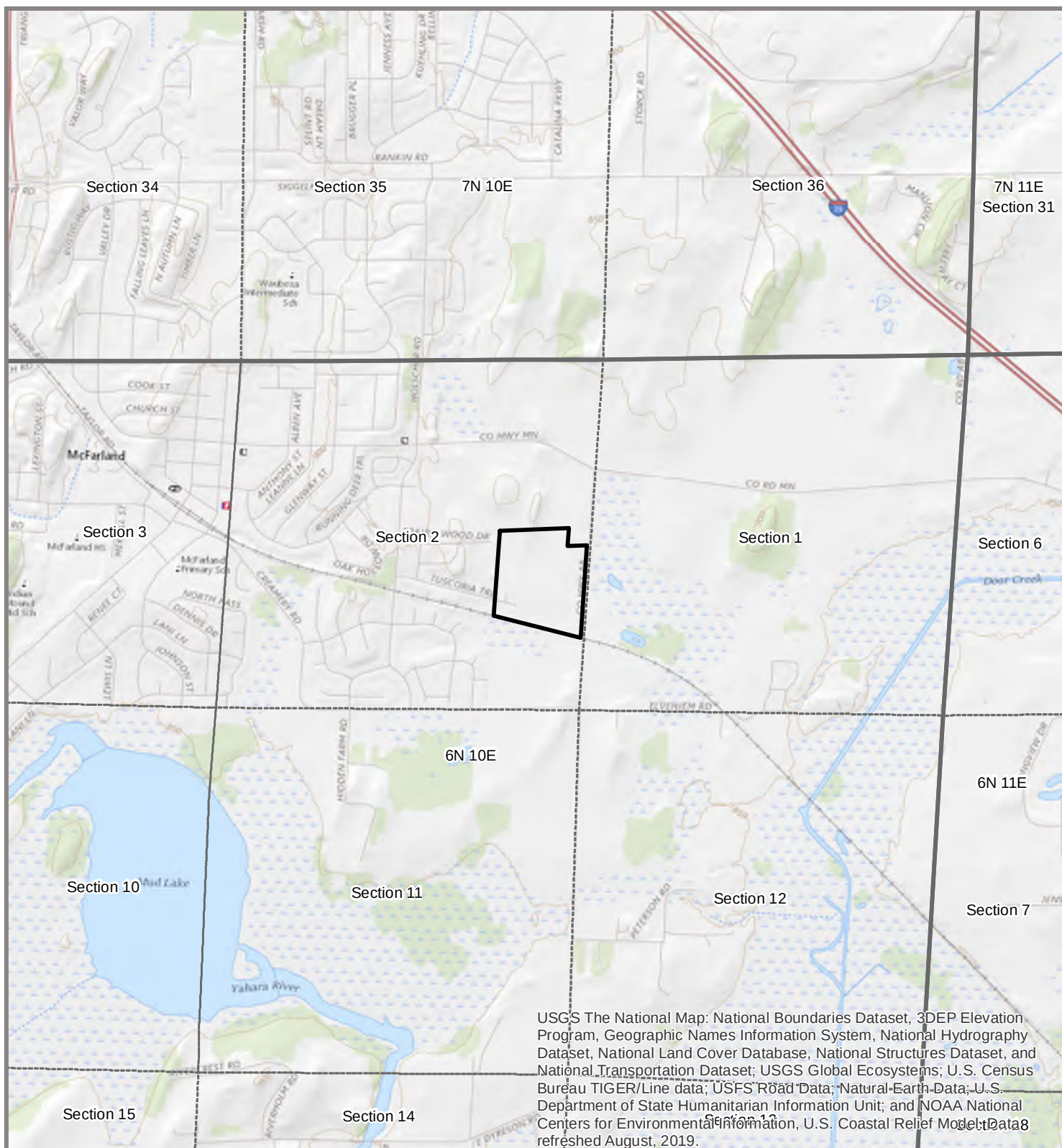
Heartland
ECOLOGICAL GROUP INC

Figure 1. Project Location

Utterback Property North
Project #20190239
T6N, R10E, S02
T Dunn, Dane Co, WI

OpenStreetMap
Data: ESRI

12/17/2019



- Study Area (39.80 ac)
- Township
- Section

0 1,000 2,000
Ft

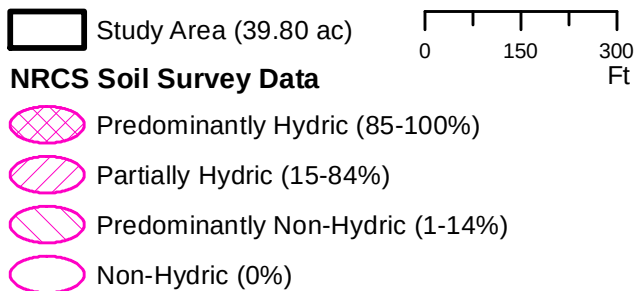
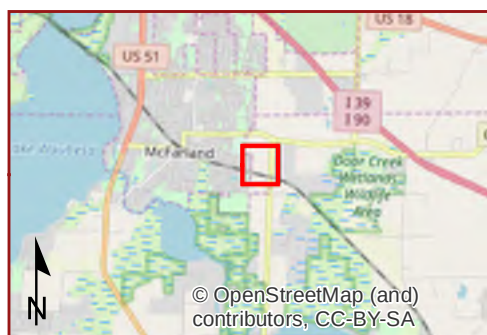
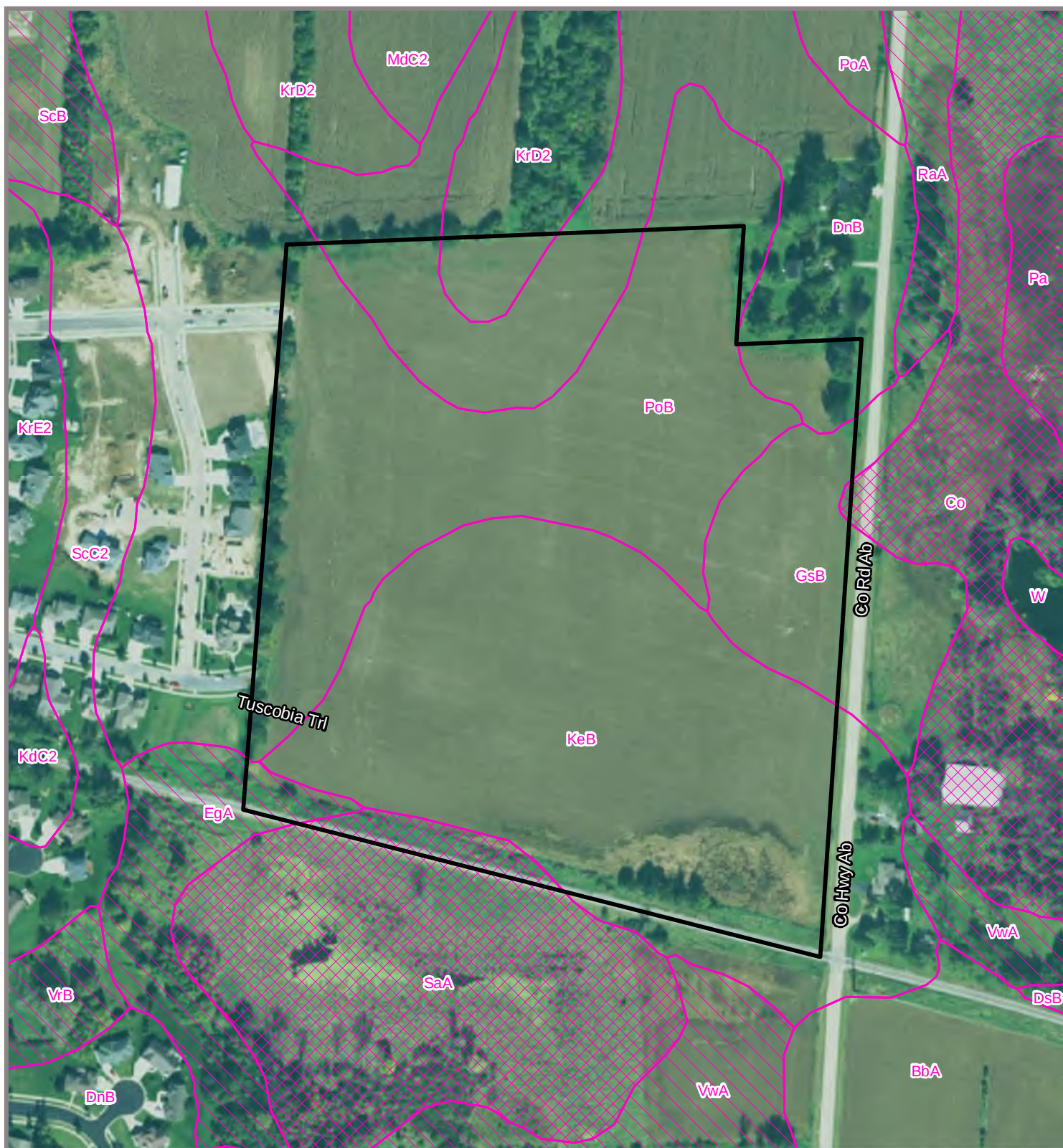
Heartland
ECOLOGICAL GROUP INC

Figure 2. USGS Topography

Utterback Property North
Project #20190239
T6N, R10E, S02
T Dunn, Dane Co, WI

USGS Topo
Data: USGS

12/17/2019



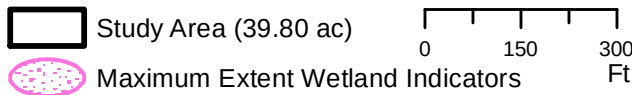
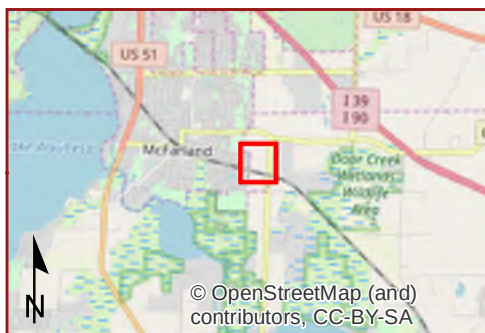
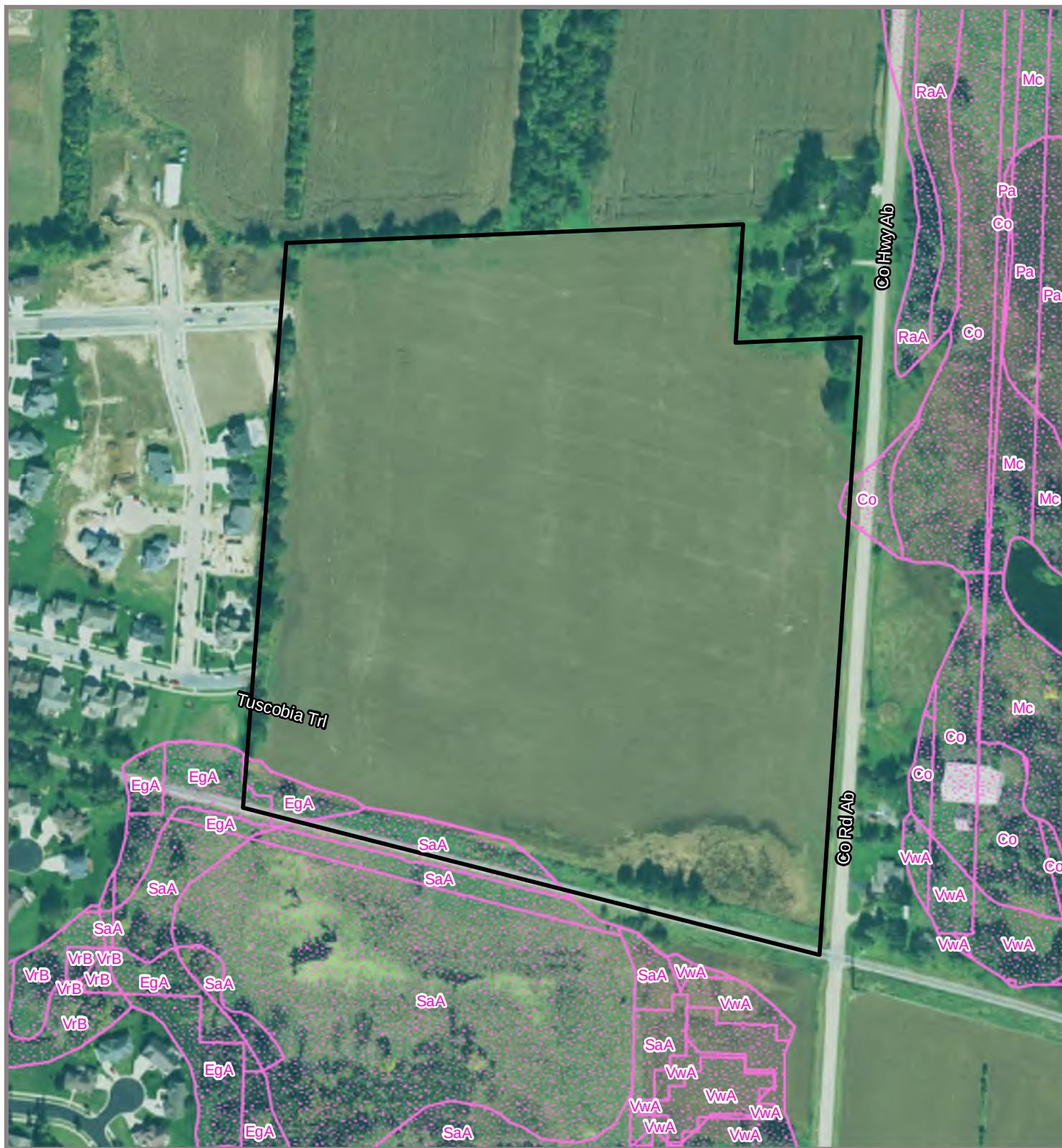
Heartland
ECOLOGICAL GROUP INC

**Figure 3. NRCS
Hydric Soils**

Utterback Property North
Project #20190239
T6N, R10E, S02
T Dunn, Dane Co, WI

2018 NAIP
Data: NRCS

12/17/2019



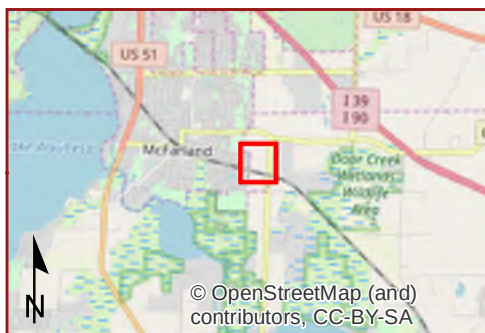
Heartland
ECOLOGICAL GROUP INC

**Figure 4. SWDV
Wetland Indicators**

Utterback Property North
Project #20190239
T6N, R10E, S02
T Dunn, Dane Co, WI

2018 NAIP
Data: WDNR

12/17/2019



- Study Area (39.80 ac)
- WWI Wetlands
- NHD Waterway
- NHD Waterbody

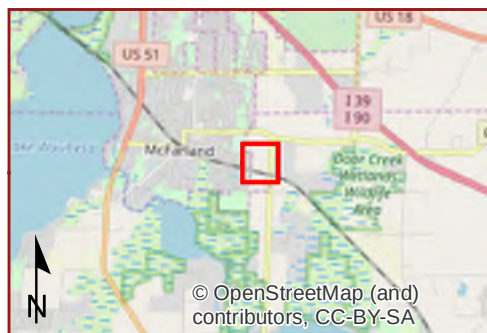
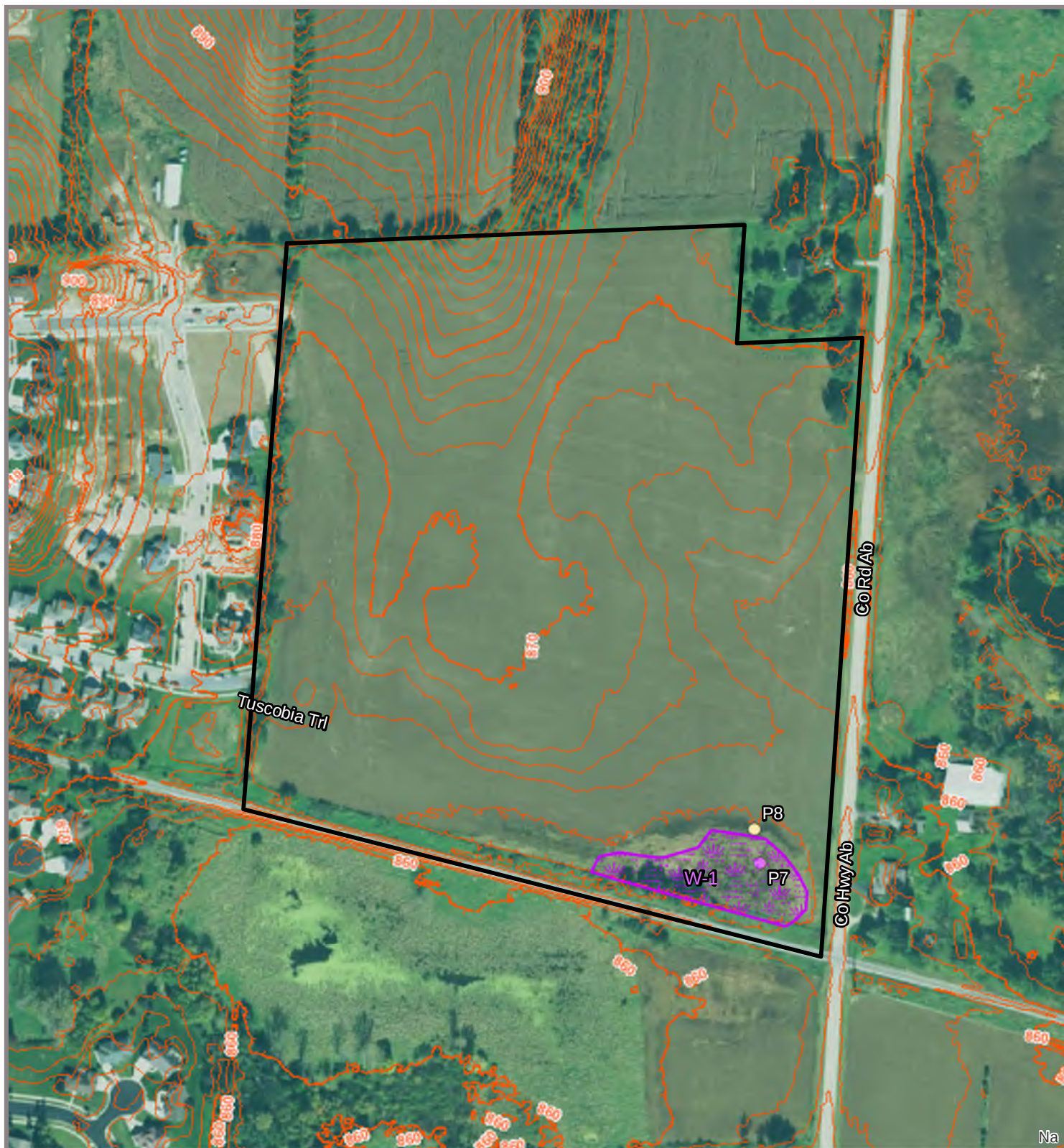
0 150 300
Ft

Heartland
ECOLOGICAL GROUP INC

Figure 5. Wisconsin Wetland Inventory

Utterback Property North
Project #20190239
T6N, R10E, S02
T Dunn, Dane Co, WI

2018 NAIP
Data: USGS, WDNR 12/17/2019



Heartland
ECOLOGICAL GROUP INC

Figure 6. Field Delineated Wetlands

Utterback Property North
Project #20190239
T6N, R10E, S02
T Dunn, Dane Co, WI

2018 NAIP
Data: Dane Co

12/17/2019



VH Acquisitions LLC
Utterback Property North
Project #: 20190239
December 20, 2019

Appendix B | WETS Analysis

WETS Analysis Worksheet

Project Name: Utterback Parcel
 Project Number: 20190239
 Period of interest: June - August 2019
 Station: Dane County Regional Airport
 County: Dane County

Long-term rainfall records (from WETS table)

	Month	3 years in 10 less than	Normal	3 years in 10 greater than
1st month prior:	August	2.61	4.27	5.17
2nd month prior:	July	3.20	4.34	5.10
3rd month prior:	June	3.21	5.27	6.38
Sum =		13.88		

Site determination

Site Rainfall (in)	Condition Dry/Normal*/Wet	Condition** Value	Month Weight	Product
2.85	Normal	2	3	6
5.77	Wet	3	2	6
5.16	Normal	2	1	2
Sum =	13.78		Sum*** =	14

*Normal precipitation with 30% to 70% probability of occurrence

Determination: ☐ Wet
☐ Dry
☒ Normal

**Condition value:

Dry = 1
 Normal = 2
 Wet = 3

***If sum is:

6 to 9 then period has been drier than normal
 10 to 14 then period has been normal
 15 to 18 then period has been wetter than normal

Precipitation data source: Midwest Regional Climate Center, cli-MATE: MRCC Application Tools Environment

Reference: Donald E. Woodward, ed. 1997. *Hydrology Tools for Wetland Determination*, Chapter 19. Engineering Field Handbook. U.S. Department of Agriculture, Natural Resources Conservation Service, Fort Worth, TX.



VH Acquisitions LLC
Utterback Property North
Project #: 20190239
December 20, 2019

Appendix C | Wetland Determination Data Sheets

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Utterback Property City/County: T Dunn/Dane Co Sampling Date: 9/16/2019
 Applicant/Owner: VH Acquisitions LLC State: WI Sampling Point: P7
 Investigator(s): Jeff Kraemer, Heartland Ecological Group Section, Township, Range: T6N, R10E, S02
 Landform (hillside, terrace, etc.): Depression Local relief (concave, convex, none): Concave Slope %: 1 - 3
 Subregion (LRR or MLRA): LRR K Lat: _____ Long: _____ Datum: _____
 Soil Map Unit Name: Kegonsa silt loam (KeB) NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)
 Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____
 Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes <u>X</u> No _____	Is the Sampled Area within a Wetland? Yes <u>X</u> No _____ If yes, optional Wetland Site ID: _____
Hydric Soil Present?	Yes <u>X</u> No _____	
Wetland Hydrology Present?	Yes <u>X</u> No _____	
Remarks: (Explain alternative procedures here or in a separate report.) A WETS analysis was conducted and indicates that climate conditions were normal at the time of the field investigation. Sample point recorded within a farmed wetland depression north of the railway that traverses the Study Area.		

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> ☒ Surface Water (A1) ☐ Water-Stained Leaves (B9) ☒ High Water Table (A2) ☐ Aquatic Fauna (B13) ☐ Saturation (A3) ☐ Marl Deposits (B15) ☐ Water Marks (B1) ☐ Hydrogen Sulfide Odor (C1) ☐ Sediment Deposits (B2) ☐ Oxidized Rhizospheres on Living Roots (C3) ☐ Drift Deposits (B3) ☐ Presence of Reduced Iron (C4) ☐ Algal Mat or Crust (B4) ☐ Recent Iron Reduction in Tilled Soils (C6) ☐ Iron Deposits (B5) ☐ Thin Muck Surface (C7) ☐ Inundation Visible on Aerial Imagery (B7) ☐ Other (Explain in Remarks) ☐ Sparsely Vegetated Concave Surface (B8)		<u>Secondary Indicators (minimum of two required)</u> ☐ Surface Soil Cracks (B6) ☐ Drainage Patterns (B10) ☐ Moss Trim Lines (B16) ☐ Dry-Season Water Table (C2) ☐ Crayfish Burrows (C8) ☐ Saturation Visible on Aerial Imagery (C9) ☐ Stunted or Stressed Plants (D1) ☒ Geomorphic Position (D2) ☐ Shallow Aquitard (D3) ☐ Microtopographic Relief (D4) ☒ FAC-Neutral Test (D5)
Field Observations: Surface Water Present? Yes <u>X</u> No _____ Depth (inches): <u>1</u> Water Table Present? Yes <u>X</u> No _____ Depth (inches): <u>0</u> Saturation Present? Yes <u>X</u> No _____ Depth (inches): <u>0</u> (includes capillary fringe)		Wetland Hydrology Present? Yes <u>X</u> No _____
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:		
Remarks: Depression is mostly inundated with 1-6 inches of water throughout.		

VEGETATION – Use scientific names of plants.

Sampling Point: P7

Tree Stratum (Plot size: <u>30ft</u>)	Absolute % Cover	Dominant Species?	Indicator Status																	
1. _____	_____	_____	_____	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC: <u>2</u> (A) Total Number of Dominant Species Across All Strata: <u>2</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>100.0%</u> (A/B)																
2. _____	_____	_____	_____																	
3. _____	_____	_____	_____																	
4. _____	_____	_____	_____																	
5. _____	_____	_____	_____																	
6. _____	_____	_____	_____																	
7. _____	_____	_____	_____																	
=Total Cover				Prevalence Index worksheet: <table style="width: 100%;"> <tr> <th>Total % Cover of:</th> <th>Multiply by:</th> </tr> <tr> <td>OBL species <u>0</u></td> <td>x 1 = <u>0</u></td> </tr> <tr> <td>FACW species <u>90</u></td> <td>x 2 = <u>180</u></td> </tr> <tr> <td>FAC species <u>0</u></td> <td>x 3 = <u>0</u></td> </tr> <tr> <td>FACU species <u>0</u></td> <td>x 4 = <u>0</u></td> </tr> <tr> <td>UPL species <u>5</u></td> <td>x 5 = <u>25</u></td> </tr> <tr> <td>Column Totals: <u>95</u></td> <td>(A) <u>205</u> (B)</td> </tr> <tr> <td colspan="2" style="text-align: center;">Prevalence Index = B/A = <u>2.16</u></td> </tr> </table>	Total % Cover of:	Multiply by:	OBL species <u>0</u>	x 1 = <u>0</u>	FACW species <u>90</u>	x 2 = <u>180</u>	FAC species <u>0</u>	x 3 = <u>0</u>	FACU species <u>0</u>	x 4 = <u>0</u>	UPL species <u>5</u>	x 5 = <u>25</u>	Column Totals: <u>95</u>	(A) <u>205</u> (B)	Prevalence Index = B/A = <u>2.16</u>	
Total % Cover of:	Multiply by:																			
OBL species <u>0</u>	x 1 = <u>0</u>																			
FACW species <u>90</u>	x 2 = <u>180</u>																			
FAC species <u>0</u>	x 3 = <u>0</u>																			
FACU species <u>0</u>	x 4 = <u>0</u>																			
UPL species <u>5</u>	x 5 = <u>25</u>																			
Column Totals: <u>95</u>	(A) <u>205</u> (B)																			
Prevalence Index = B/A = <u>2.16</u>																				
=Total Cover																				
Sapling/Shrub Stratum (Plot size: <u>15ft</u>)																				
1. _____	_____	_____	_____																	
2. _____	_____	_____	_____																	
3. _____	_____	_____	_____																	
4. _____	_____	_____	_____																	
5. _____	_____	_____	_____																	
6. _____	_____	_____	_____																	
7. _____	_____	_____	_____																	
=Total Cover				Hydrophytic Vegetation Indicators: <u>1</u> - Rapid Test for Hydrophytic Vegetation <u>X</u> 2 - Dominance Test is >50% <u>X</u> 3 - Prevalence Index is ≤3.0 ¹ <u>4</u> - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) <u> </u> Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.																
=Total Cover																				
Herb Stratum (Plot size: <u>5ft</u>)																				
1. <u>Panicum dichotomiflorum</u>	<u>65</u>	<u>Yes</u>	<u>FACW</u>																	
2. <u>Phalaris arundinacea</u>	<u>25</u>	<u>Yes</u>	<u>FACW</u>																	
3. <u>Zea mays</u>	<u>5</u>	<u>No</u>	<u>UPL</u>																	
4. _____	_____	_____	_____																	
5. _____	_____	_____	_____																	
6. _____	_____	_____	_____																	
7. _____	_____	_____	_____																	
8. _____	_____	_____	_____																	
9. _____	_____	_____	_____																	
10. _____	_____	_____	_____																	
11. _____	_____	_____	_____																	
12. _____	_____	_____	_____																	
<u>95</u> =Total Cover																				
Woody Vine Stratum (Plot size: <u>30ft</u>)																				
1. _____	_____	_____	_____																	
2. _____	_____	_____	_____																	
3. _____	_____	_____	_____																	
4. _____	_____	_____	_____																	
=Total Cover				Definitions of Vegetation Strata: Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height. Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall. Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall. Woody vines – All woody vines greater than 3.28 ft in height.																
Hydrophytic Vegetation Present? Yes <u>X</u> No <u> </u>																				

Remarks: (Include photo numbers here or on a separate sheet.)

No crops present / crops not planted this year. The depression appears to not have been farmed for a few years and reed canary grass has become established.

SOIL

Sampling Point P7**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0 - 10	10YR 4/1	90	10YR 5/6	10	C	M	Loamy/Clayey	SiCL
10 - 18	10YR 5/1	85	10YR 5/8	15	C	M	Loamy/Clayey	SiC

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.²Location: PL=Pore Lining, M=Matrix.**Hydric Soil Indicators:**

☐ Histosol (A1)	☐ Polyvalue Below Surface (S8) (LRR R, MLRA 149B)
☐ Histic Epipedon (A2)	☐ Thin Dark Surface (S9) (LRR R, MLRA 149B)
☐ Black Histic (A3)	☐ High Chroma Sands (S11) (LRR K, L)
☐ Hydrogen Sulfide (A4)	☐ Loamy Mucky Mineral (F1) (LRR K, L)
☐ Stratified Layers (A5)	☐ Loamy Gleyed Matrix (F2)
☐ Depleted Below Dark Surface (A11)	☒ Depleted Matrix (F3)
☐ Thick Dark Surface (A12)	☐ Redox Dark Surface (F6)
☐ Sandy Mucky Mineral (S1)	☐ Depleted Dark Surface (F7)
☐ Sandy Gleyed Matrix (S4)	☐ Redox Depressions (F8)
☐ Sandy Redox (S5)	☐ Marl (F10) (LRR K, L)
☐ Stripped Matrix (S6)	
☐ Dark Surface (S7)	

Indicators for Problematic Hydric Soils³:

☐ 2 cm Muck (A10) (LRR K, L, MLRA 149B)
☐ Coast Prairie Redox (A16) (LRR K, L, R)
☐ 5 cm Mucky Peat or Peat (S3) (LRR K, L, R)
☐ Polyvalue Below Surface (S8) (LRR K, L)
☐ Thin Dark Surface (S9) (LRR K, L)
☐ Iron-Manganese Masses (F12) (LRR K, L, R)
☐ Piedmont Floodplain Soils (F19) (MLRA 149B)
☐ Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
☐ Red Parent Material (F21)
☐ Very Shallow Dark Surface (F22)
☐ Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.**Restrictive Layer (if observed):**

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ☒ No ☐

Remarks:

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Utterback Property City/County: T Dunn/Dane Co Sampling Date: 9/16/2019
 Applicant/Owner: VH Acquisitions LLC State: WI Sampling Point: P8
 Investigator(s): Jeff Kraemer, Heartland Ecological Group Section, Township, Range: T6N, R10E, S02
 Landform (hillside, terrace, etc.): Sideslope Local relief (concave, convex, none): None Slope %: 1 - 3
 Subregion (LRR or MLRA): LRR K Lat: _____ Long: _____ Datum: _____
 Soil Map Unit Name: Kegonsa silt loam (KeB) NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)
 Are Vegetation X, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes _____ No X
 Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <u>X</u> No _____	Is the Sampled Area within a Wetland? Yes _____ No <u>X</u> If yes, optional Wetland Site ID: _____
Hydric Soil Present? Yes _____ No <u>X</u>	
Wetland Hydrology Present? Yes _____ No <u>X</u>	
Remarks: (Explain alternative procedures here or in a separate report.) A WETS analysis was conducted and indicates that climate conditions were normal at the time of the field investigation. Sample point recorded within an upland agricultural field planted to corn - not normal circumstances.	

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> _____ Surface Water (A1) _____ Water-Stained Leaves (B9) _____ High Water Table (A2) _____ Aquatic Fauna (B13) _____ Saturation (A3) _____ Marl Deposits (B15) _____ Water Marks (B1) _____ Hydrogen Sulfide Odor (C1) _____ Sediment Deposits (B2) _____ Oxidized Rhizospheres on Living Roots (C3) _____ Drift Deposits (B3) _____ Presence of Reduced Iron (C4) _____ Algal Mat or Crust (B4) _____ Recent Iron Reduction in Tilled Soils (C6) _____ Iron Deposits (B5) _____ Thin Muck Surface (C7) _____ Inundation Visible on Aerial Imagery (B7) _____ Other (Explain in Remarks) _____ Sparsely Vegetated Concave Surface (B8)		<u>Secondary Indicators (minimum of two required)</u> _____ Surface Soil Cracks (B6) _____ Drainage Patterns (B10) _____ Moss Trim Lines (B16) _____ Dry-Season Water Table (C2) _____ Crayfish Burrows (C8) _____ Saturation Visible on Aerial Imagery (C9) _____ Stunted or Stressed Plants (D1) _____ Geomorphic Position (D2) _____ Shallow Aquitard (D3) _____ Microtopographic Relief (D4) <u>X</u> FAC-Neutral Test (D5)
Field Observations: Surface Water Present? Yes _____ No <u>X</u> Depth (inches): _____ Water Table Present? Yes _____ No <u>X</u> Depth (inches): _____ Saturation Present? Yes _____ No <u>X</u> Depth (inches): _____ (includes capillary fringe)		Wetland Hydrology Present? Yes _____ No <u>X</u>
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:		
Remarks: No wetland hydrology indicators observed.		

VEGETATION – Use scientific names of plants.

Sampling Point: P8

Tree Stratum (Plot size: <u>30ft</u>)	Absolute % Cover	Dominant Species?	Indicator Status																	
1. _____	_____	_____	_____	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC: <u>1</u> (A) Total Number of Dominant Species Across All Strata: <u>1</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>100.0%</u> (A/B) Prevalence Index worksheet: <table style="width: 100%;"> <tr> <td style="width: 50%;">Total % Cover of:</td> <td style="width: 50%;">Multiply by:</td> </tr> <tr> <td>OBL species <u>0</u></td> <td>x 1 = <u>0</u></td> </tr> <tr> <td>FACW species <u>3</u></td> <td>x 2 = <u>6</u></td> </tr> <tr> <td>FAC species <u>0</u></td> <td>x 3 = <u>0</u></td> </tr> <tr> <td>FACU species <u>0</u></td> <td>x 4 = <u>0</u></td> </tr> <tr> <td>UPL species <u>0</u></td> <td>x 5 = <u>0</u></td> </tr> <tr> <td>Column Totals: <u>3</u> (A)</td> <td><u>6</u> (B)</td> </tr> <tr> <td colspan="2">Prevalence Index = B/A = <u>2.00</u></td> </tr> </table>	Total % Cover of:	Multiply by:	OBL species <u>0</u>	x 1 = <u>0</u>	FACW species <u>3</u>	x 2 = <u>6</u>	FAC species <u>0</u>	x 3 = <u>0</u>	FACU species <u>0</u>	x 4 = <u>0</u>	UPL species <u>0</u>	x 5 = <u>0</u>	Column Totals: <u>3</u> (A)	<u>6</u> (B)	Prevalence Index = B/A = <u>2.00</u>	
Total % Cover of:	Multiply by:																			
OBL species <u>0</u>	x 1 = <u>0</u>																			
FACW species <u>3</u>	x 2 = <u>6</u>																			
FAC species <u>0</u>	x 3 = <u>0</u>																			
FACU species <u>0</u>	x 4 = <u>0</u>																			
UPL species <u>0</u>	x 5 = <u>0</u>																			
Column Totals: <u>3</u> (A)	<u>6</u> (B)																			
Prevalence Index = B/A = <u>2.00</u>																				
2. _____	_____	_____	_____																	
3. _____	_____	_____	_____																	
4. _____	_____	_____	_____																	
5. _____	_____	_____	_____																	
6. _____	_____	_____	_____																	
7. _____	_____	_____	_____																	
		=Total Cover																		
Sapling/Shrub Stratum (Plot size: <u>15ft</u>)																				
1. _____	_____	_____	_____																	
2. _____	_____	_____	_____																	
3. _____	_____	_____	_____																	
4. _____	_____	_____	_____																	
5. _____	_____	_____	_____																	
6. _____	_____	_____	_____																	
7. _____	_____	_____	_____																	
		=Total Cover																		
Herb Stratum (Plot size: <u>5ft</u>)																				
1. <u>Panicum dichotomiflorum</u>	<u>3</u>	<u>Yes</u>	<u>FACW</u>	Hydrophytic Vegetation Indicators: <u>1</u> - Rapid Test for Hydrophytic Vegetation <u>X</u> 2 - Dominance Test is >50% <u>3</u> - Prevalence Index is ≤3.0 ¹ <u>4</u> - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) <u> </u> Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic. Definitions of Vegetation Strata: Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height. Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall. Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall. Woody vines – All woody vines greater than 3.28 ft in height. Hydrophytic Vegetation Present? Yes <u>X</u> No <u> </u>																
2. _____	_____	_____	_____																	
3. _____	_____	_____	_____																	
4. _____	_____	_____	_____																	
5. _____	_____	_____	_____																	
6. _____	_____	_____	_____																	
7. _____	_____	_____	_____																	
8. _____	_____	_____	_____																	
9. _____	_____	_____	_____																	
10. _____	_____	_____	_____																	
11. _____	_____	_____	_____																	
12. _____	_____	_____	_____																	
		=Total Cover																		
Woody Vine Stratum (Plot size: <u>30ft</u>)																				
1. _____	_____	_____	_____																	
2. _____	_____	_____	_____																	
3. _____	_____	_____	_____																	
4. _____	_____	_____	_____																	
		=Total Cover																		

Remarks: (Include photo numbers here or on a separate sheet.)

The agricultural field is planted with corn, no apparent stress, 85% cover. Few to no agricultural weeds present.

SOIL

Sampling Point P8

[illegible]



VH Acquisitions LLC
Utterback Property North
Project #: 20190239
December 20, 2019

Appendix D | Site Photographs



Photo #1 Sample Point P7

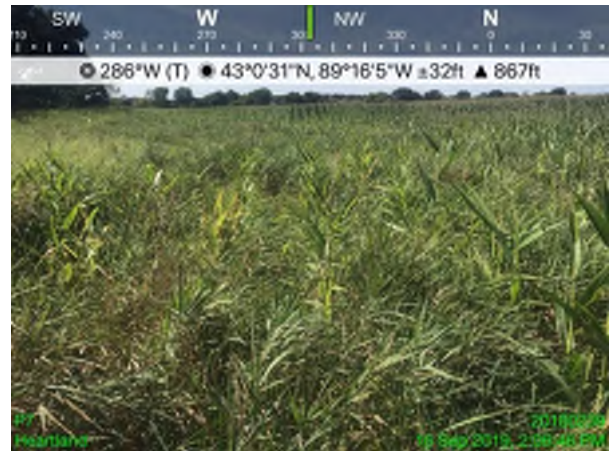


Photo #2 Sample Point P7

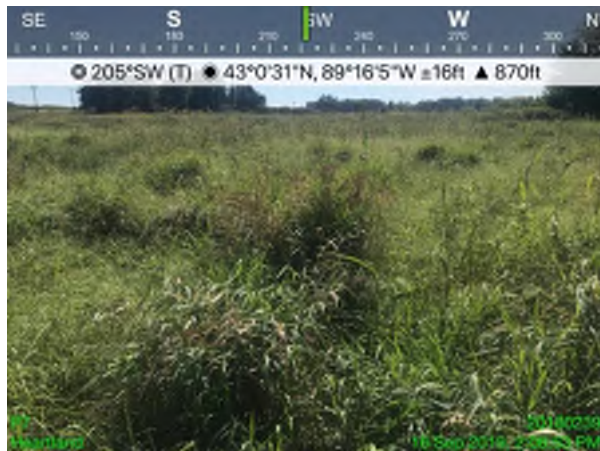


Photo #3 Sample Point P7



Photo #4 Sample Point P7



Photo #5 Sample Point P8



Photo #6 Sample Point P8



Photo #7 Sample Point P8



VH Acquisitions LLC
Utterback Property North
Project #: 20190239
December 20, 2019

Appendix E | Delineator Qualifications



Jeff Kraemer

Principal Scientist

506 Springdale Street

Mount Horeb, WI 53572

jeff@heartlandecological.com

(608) 490-2450

Jeff is the founder of Heartland Ecological Group, Inc. With over 16 years of experience as an environmental consultant, ecological and regulatory policy practitioner, and managing business leader, Jeff provides proven value to clients with his vast experience guiding often complex projects through environmental regulatory and technical challenges applied throughout a diversity of industry sectors. Jeff is recognized by the Wisconsin Department of Natural Resources Wetland Delineation Assurance Program and is the longest standing assured wetland delineator in the state of Wisconsin.

Jeff is a recognized expert in the field of wetland ecology and delineation; wetland restoration and mitigation banking; and regulatory policy and permitting associated with wetlands and waterways. His experience includes: Wetland Determination, Delineation & Functional Assessment; Wetland Restoration, Mitigation, Banking & Monitoring; Botanical / Biological Surveys & Natural Resource Inventories; Rare Species Surveys, Conservation Plans & Monitoring; Habitat Restoration, Wildlife Surveys, SCAT surveys, Environmental Assessments; Local, state, federal permit applications; Expert Witness testimony; and Regulatory permit compliance.

Education

MS, Biological Sciences (Emphasis in Wetland Ecology), University of Wisconsin – Milwaukee, WI, 2003

BS, Biological Sciences (Emphasis in Aquatic Biology) University of Wisconsin – La Crosse, WI, 1999

Regional Supplement Field Practicum
Wetland Training Institute (WTI)
Portage, WI, 2017

Basic and Advanced Wetland Delineation
Training, Continuing Education and Extension,
UW-La Crosse, WI, 2001

Identification of Sedges Workshop,
UW-Milwaukee, Saukville, WI, 2001

Vegetation of Wisconsin Workshop,
UW-Milwaukee, Saukville, WI 2000

Environmental Corridor Delineation Workshop,
Southeastern Wisconsin Regional Planning
Commission (SEWRPC), 2004

Wetland Soils and Hydrology Workshop,
Wetland Training Institute, Toledo, OH, 2003

Critical Methods in Wetland Delineation
University of Wisconsin - La Crosse Continuing
Education and Extension
Madison, WI, 2006 - 2018

Federal Wetland Regulatory Policy Course
Wetlands Training Institute (WTI)
Cottage Grove, WI, 2010

Registrations

Professionally Assured Wetland Delineator,
Wisconsin Department of Natural Resources
(2005-Present)

Wetland Professional in Training (WPIT),
Society of Wetland Scientists Certification
Programs



Project Experience

Energy

Ameren Corporation Transmission Line Projects: LaSalle-Ottawa, LaSalle Co., IL; Wood River Refinery, Madison Co., IL; Rockwood-Big River, Jefferson Co., MO; Saddle Creek 73, Franklin Co., MO.; Havana Rebuild, Mason Co., IL*

Managed support for environmental and GIS services to gain regulatory approvals for various new transmission lines. Provided project support for: transmission line siting; critical issues analysis; route matrices; GIS data acquisition and mapping services, coordination of regulatory agency meetings, completion of field wetland delineations; threatened and endangered species; biological assessment and Section 404 permitting, CPCN approvals; community advisory and public workshop support, and expert witness testimony.

Alliant Energy, Nelson Dewey Power Generation Facility Expansion Project, Cassville, WI

Completed field evaluations and delineations of wetlands in preparation of the National Environmental Policy Act (NEPA) documentation for a proposed expansion of the facility.

Enbridge, Inc., Southern Access Expansion Project, Crude Petroleum Pipeline Project, WI

Completed wetland delineations and habitat assessments along a 343-mile proposed crude petroleum pipeline corridor through Wisconsin as part of Enbridge Energy's Southern Access Expansion Program.

American Transmission Company, Arrowhead to Weston, WI, 345 kV Transmission Line Project

Completed wetland delineations, threatened and endangered plant surveys, and habitat assessments along a 208-mile proposed new electric transmission line.

Midwest Generation, Waukegan Power Generation Facility Expansion Project, Lake County, IL

Completed field evaluations of wetlands and threatened and endangered species in coordination with Section 404 permitting requirements for expansion of the power generation facility.

Commonwealth Edison Co. (ComEd), Prairie Program, Greater Chicago Area, IL

Managed ComEd's Prairie Program for over 10 years that involved nearly 200 acres of prairie restoration and management within their transmission line rights-of-way throughout the greater Chicago area.

Alliant Energy, Hydroelectric Dam, Prairie Du Sac, WI

Conducted purple loosestrife surveys on Lake Wisconsin shorelines and wetlands to develop a purple loosestrife management plan in support of the hydroelectric facility FERC licensing.

Alliant Energy, Edgewater Generation Facility, Sheboygan, WI

Managed and coordinated environmental regulatory process for expansion of existing fly ash disposal facility which required approvals from the USACE and WDNR for wetland impacts associated with the project.

Guardian, Pipeline Wetland Mitigation, Winnebago County, WI

Managed and lead the site selection, design, construction oversight, and long-term monitoring and management of a 30-acre wetland mitigation project consisting of prairie, wetland, and forested wetland restoration. The mitigation successfully compensated for wetland impacts associated with the Guardian gas pipeline construction.



Transportation

Canadian National Railroad, Stanberry Subdivision, Douglas County, WI

Supported CN with gaining approval to construct an approximate 2.5-mile new railroad siding track in Douglas County, WI. Completed wetland delineations and threatened and endangered resources assessments. Completed permit applications and gained approval for approximately 2-acres of wetland impacts and construction of bridges over navigable waterways.

Canadian National Railroad, Hawthorne Hill Phase 2, Douglas County, WI

Supported CN with gaining approval to construct new railroad siding track in Douglas County, WI. Completed assured wetland delineations along six miles of existing track. Completed permit applications for wetland impacts.

Canadian National Railroad, Stone Lake to Big Foot, Washburn County, WI

Completed assured wetland delineations along three miles of existing track and associate wetland delineation reports.

Canadian National Railroad, Nestle to Burlington, Racine County, WI

Completed assured wetland delineations along three miles of existing track and associate wetland delineation reports.

Wisconsin Department of Transportation (WisDOT), Neptune Wetland Mitigation Monitoring, Richland County WI

Completed annual comprehensive vegetation surveys, mapping, performance evaluations, and reporting of a 50-acre wetland mitigation site.

WisDOT, Threatened Plant Species Consultation, Port Wing, WI

Completed comprehensive study of a threatened plant species population in support of STH 13 Reconstruction project including preparation of relocation and monitoring plan, physical relocation of plants, and follow-up annual monitoring.

WisDOT, Wildcat Mountain Wetland Mitigation Monitoring, Vernon County, WI

Completed comprehensive vegetation surveys, mapping, performance evaluations, and reporting of 38-acre wetland mitigation site.

WisDOT, World Dairy Center Wetland Mitigation Bank, Madison, WI

Led the baseline studies, design and approval of an approximate 200-acre compensatory wetland mitigation bank on behalf of the WisDOT. The project involved lengthy stakeholder coordination, detailed hydrology evaluations and assessments, complex wetland determinations. The mitigation plan consisted of restoration of farmed and drained organic soils utilizing drain tile valves to wet meadow, sedge meadow, shallow marsh and mesic prairie.

City of Stoughton, Academy Street Reconstruction, Stoughton, WI

Completed wetland assessments and delineations within the study area of the Academy Street reconstruction project.

City of Tomah, Gopher Avenue Reconstruction, Tomah, WI

Completed wetland assessments and delineations within the project area of the Gopher Avenue reconstruction project.

Residential & Commercial Development

Veridian Homes, Smiths Crossing, Sun Prairie, WI

Completed wetland delineations on the approximate 50-acre portion of the proposed residential development project. Completed wetland permit applications and gained approval for impacts to jurisdictional wetlands. Completed and gained approval for artificial wetland exemptions per WI Act 183.



Hovde Properties, Sprecher Road Property, Madison, WI

Completed wetland delineations on the approximate 100-acre property proposed for residential and commercial development. Completed and gained approval for artificial wetland exemptions per WI Act 183.

Ruedeusch Development and Construction, Packers Avenue Parcel, Madison, WI

Completed wetland delineations on the approximate 30-acre property proposed for development. Completed and gained approval for artificial wetland exemptions per WI Act 183.

Newport Development Corp., Briarwoods Condominiums, Caledonia, WI

Completed wetland delineations on the approximate 10-acre property proposed for development. Completed and gained approval for artificial wetland exemptions per WI Act 183.

William Ryan Homes, West Prairie Village, Sun Prairie, WI

Completed wetland delineations throughout the approximate 80-acre property proposed for development. Completed and gained approval for artificial wetland exemptions per WI Act 183 and NR103.06.

Bielinski Homes, Chapman Property, Mukwonago, WI

Completed wetland delineations throughout the approximate 65-acre property proposed for residential development.

Logistics Property Company, Nelson-Heckel Properties, Kenosha County, WI

Completed wetland delineations throughout the approximate 105-acre property proposed for commercial development.

Country View Estates Development Project, DeForest, WI

Completed wetland delineation/evaluation, wetland permitting, and mitigation planning in support of a 400-acre mixed residential/commercial/recreational development project.

Industrial, Manufacturing & Institutional Facilities

Berlon Industries Expansion Project, Hustisford, WI

Completed wetland delineation/evaluation, wetland permitting, and wetland mitigation planning in support of the expansion of the industrial facility.

Ashley Furniture Industries Expansion Project, Arcadia, WI

Developed and gained WDNR/USACE approval for 35-acre wetland mitigation plan in support of wetland impact application for expansion of the manufacturing facility; Managed the construction of the wetland bank and completed over 10 years of monitoring and management through project close-out.

AllEnergy Proposed Sand Mine, Trempealeau County, WI

Completed wetland delineations, wetland permitting support, and wetland mitigation support for a proposed sand mine in Trempealeau County. The project consisted of over 500 acres of wetland delineation and wetland and waterway permitting associated with a rail spur expansion. Supported community engagement through presentations at various town hall meetings.

Conway Central Express Expansion Wetland Permitting, Franklin, WI

Completed wetland delineation/evaluation, wetland permitting, and wetland mitigation design for expansion of the trucking facility.

Morrison Creek Cranberry Company, Wetland Mitigation Bank Monitoring and Remediation, Oakdale, WI

Completed annual mitigation site monitoring, vegetation surveys, and performance evaluations of 60-



acre mitigation bank site. Completed mitigation remediation management plan for compliance with USACE performance standards.

Northwestern Mutual Campus Facility, Native Landscape Management, Franklin, WI

Managed and coordinated the development of a native landscape plan for the 50 acres of open space surrounding Northwestern Mutual's campus facility. The plan consisted of wetland, woodland, and prairie restoration. Managed and coordinate the implementation of the native landscape installation and long-term management.

Daybreak Foods, Proposed Facility Expansion, Lake Mills, WI

Completed wetland assessment and delineations on over 175 acres of various properties of DayBreak Foods. Provided wetland regulatory guidance to support the expansion of the egg production and processing facilities.

Sinsinawa Dominican Sisters, Grant County, WI

Completed wetland delineations on the 57-acre Sinsinawa Dominican Sisters property in support of a land use planning study.

Government & Non-Government Organizations

City of Fitchburg, Fitchburg Northeast Neighborhood Plan, Fitchburg, WI

Completed wetland mapping and assessment and developed wetland protection standards for the City of Fitchburg's NE Neighborhood Plan.

Lake Koshkonong Wetlands Association, Lake Koshkonong Water Level and Wetland Studies, Lake Koshkonong, WI

Developed and conducted various scientific wetland studies for development of a water level management plan: E. prairie fringed orchid hydrology study; Floodplain forest/hydrology study; Floristic quality assessment/vegetation mapping within 4000 acres of wetlands on behalf of the Lake Koshkonong Wetlands Association.

Richland Center Utilities, New Force Main Project, Richland Center, WI

Supported the planning and approval of a new force main utility corridor on behalf of Richland Center Utilities. Completed wetland delineations and threatened and endangered species assessments along the approximate 3.5-mile project corridor. Completed wetland and waterway permit applications, wetland restoration plans, and completed annual monitoring of restored wetland areas.

Portage Parks Department, Samuelson Fen Restoration, Portage, IN

Developed a restoration plan to restore a degraded 30-acre fen, conducted vegetation surveys, floristic quality assessments and hydrology monitoring.

Badger Prairie Health Care Center Expansion, Verona, WI

Completed wetland delineation/evaluations and wetland permitting in support of the expansion of the healthcare facility.

City of Fitchburg, Native Restoration Support, Fitchburg, WI

Assisted the City of Fitchburg with restoration activities on multiple projects involving incorporating native restoration within various regional stormwater and outlot facilities.

City of Tomah, Proposed Bike Trail Project, Tomah, WI

Completed wetland delineations along an approximate 1-mile proposed bike trail path on behalf of the City of Tomah.

City of Sun Prairie, Sheehan Park, Sun Prairie, WI

Completed wetland delineations throughout the 50-acre Sheehan Park on behalf of the City of Sun Prairie.



City of Madison, Various Projects, Madison, WI

Completed numerous wetland delineations on behalf the City of Madison in support of stormwater improvement and other facility improvement projects.

Private Landowners & Recreational Properties

Erin Hills Golf Course, Washington County, WI

Completed wetland delineations throughout the approximate 200-acre golf course property. Provided wetland regulatory guidance in support of the renovation of Erin Hills in preparation for hosting the 2017 U.S. Open championships.

La Belle Golf Course, The Prestwick Group, Inc., Lac La Belle, WI

Completed wetland delineations throughout the approximate 250-acre golf course property. Provided wetland regulatory guidance in support of the renovation of the La Belle Golf Course.

Big Hollow Wetland Mitigation Bank, Spring Green, WI

Completed wetland delineations on the approximate 200-acre property and evaluated the potential for developing a private wetland mitigation bank. Coordinated detailed hydrology monitoring and modeling to address potential off-site water impacts and support the development of the hydrology restoration plan. Completed the prospectus documents and submittals to the Interagency Review Team. Organized and led public informational meetings, and various stakeholder meetings to address local concerns.

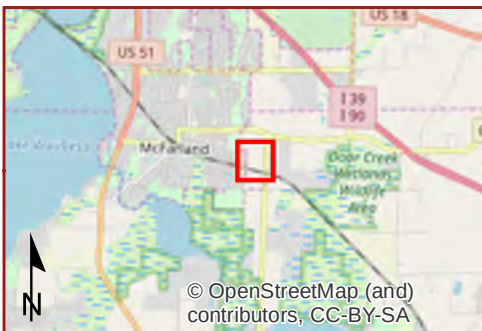
The Farm Golf Course, Cottage Grove, WI

Completed wetland delineations throughout the approximate 100-acre golf course property. Provided wetland regulatory guidance in support of residential development adjacent to the golf course.



VH Acquisitions LLC
Utterback Property North
Project #: 20190239
December 20, 2019

Appendix F | NAIP Aerial Imagery



 Study Area (39.80 ac)

0 150 300
Ft

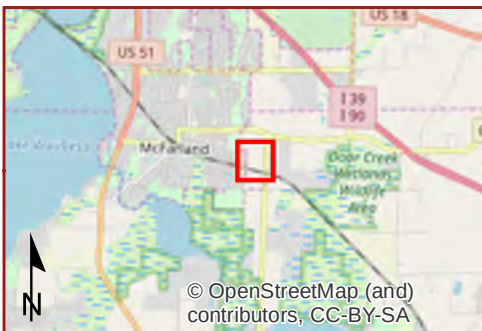
Heartland
ECOLOGICAL GROUP INC

**Appendix: 2004-06-22
NAIP Aerial Imagery**

Utterback Property North
Project #20190239
T6N, R10E, S02
T Dunn, Dane Co, WI

2004 NAIP
Data: USDA

12/17/2019



 Study Area (39.80 ac)

0 150 300
Ft

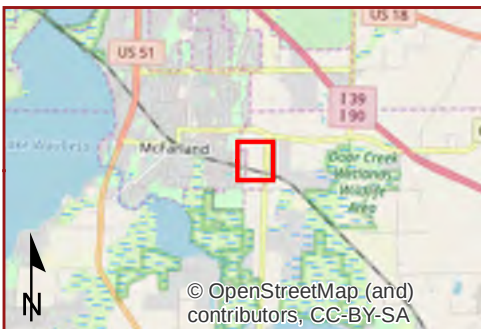
Heartland
ECOLOGICAL GROUP INC

**Appendix: 2005-06-20
NAIP Aerial Imagery**

Utterback Property North
Project #20190239
T6N, R10E, S02
T Dunn, Dane Co, WI

2005 NAIP
Data: USDA

12/17/2019



 Study Area (39.80 ac)

0 150 300
Ft

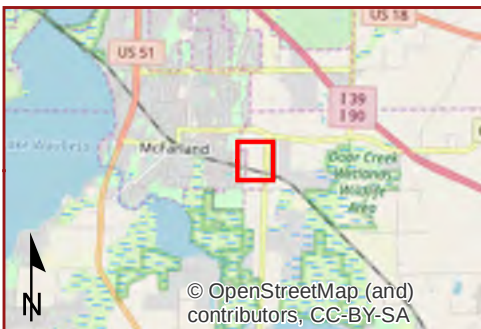
Heartland
ECOLOGICAL GROUP INC

**Appendix: 2006-07-31
NAIP Aerial Imagery**

Utterback Property North
Project #20190239
T6N, R10E, S02
T Dunn, Dane Co, WI

2006 NAIP
Data: USDA

12/17/2019



 Study Area (39.80 ac)

0 150 300
Ft

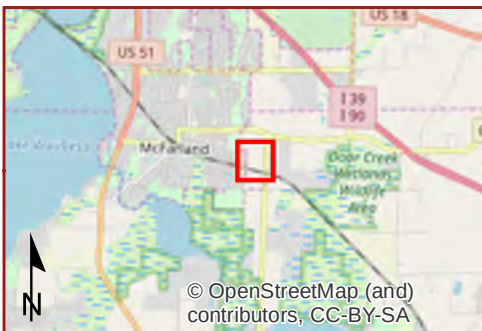
Heartland
ECOLOGICAL GROUP INC

**Appendix: 2008-08-10
NAIP Aerial Imagery**

Utterback Property North
Project #20190239
T6N, R10E, S02
T Dunn, Dane Co, WI

2008 NAIP
Data: USDA

12/17/2019



 Study Area (39.80 ac)

0 150 300
Ft

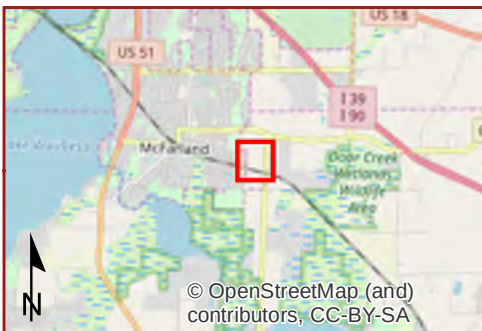
Heartland
ECOLOGICAL GROUP INC

**Appendix: 2010-07-02
NAIP Aerial Imagery**

Utterback Property North
Project #20190239
T6N, R10E, S02
T Dunn, Dane Co, WI

2010 NAIP
Data: USDA

12/17/2019



 Study Area (39.80 ac)

0 150 300
Ft

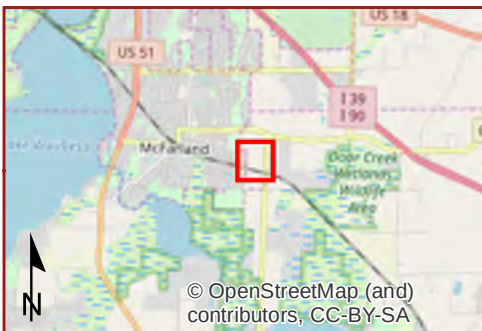
Heartland
ECOLOGICAL GROUP INC

**Appendix: 2013-06-19
NAIP Aerial Imagery**

Utterback Property North
Project #20190239
T6N, R10E, S02
T Dunn, Dane Co, WI

2013 NAIP
Data: USDA

12/17/2019



 Study Area (39.80 ac)

0 150 300
Ft

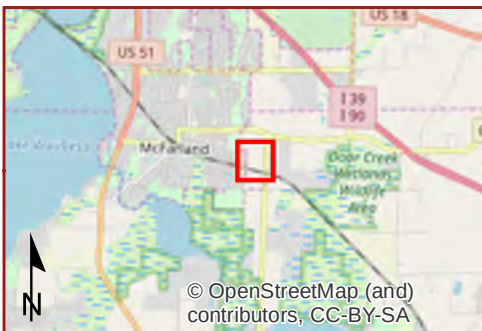
Heartland
ECOLOGICAL GROUP INC

**Appendix: 2015-10-11
NAIP Aerial Imagery**

Utterback Property North
Project #20190239
T6N, R10E, S02
T Dunn, Dane Co, WI

2015 NAIP
Data: USDA

12/17/2019



© OpenStreetMap (and)
contributors, CC-BY-SA

 Study Area (39.80 ac)

0 150 300
Ft

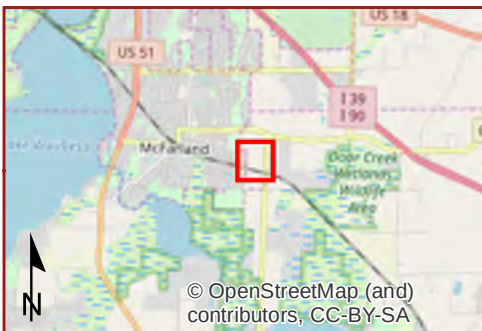
Heartland
ECOLOGICAL GROUP INC

**Appendix: 2017-09-03
NAIP Aerial Imagery**

Utterback Property North
Project #20190239
T6N, R10E, S02
T Dunn, Dane Co, WI

2017 NAIP
Data: USDA

12/17/2019



 Study Area (39.80 ac)

0 150 300
Ft

Heartland
ECOLOGICAL GROUP INC

**Appendix: 2018-10-04
NAIP Aerial Imagery**

Utterback Property North
Project #20190239
T6N, R10E, S02
T Dunn, Dane Co, WI

2018 NAIP
Data: USDA

12/17/2019

APPENDIX G

DRAFT MAINTENANCE AGREEMENT

Maintenance provisions:

Detention Basin

Visual inspection of the detention basin and outlet structure shall be performed, at a minimum annually. The inspections shall include checking for potential problems such as: subsidence, erosion, tree growth in and around the embankment and outfall structure, sediment accumulation, clogging of outfall structure, and damage to the emergency spillway. Problems identified by the inspections shall be repaired as soon as practicable.

Sediment accumulations shall be removed by dredging when two (2) foot of siltation has occurred or as directed by the Village of Waunakee. The dredged material shall be removed and disposed of in accordance with NR 347.

The detention basin shall be mowed a minimum of twice per year. Mowing shall maintain a minimum grass height of 6 to 8 inches. Areas of sparse vegetation shall be reseeded. Additional fertilizer shall be applied as needed, per the results of a soil test.

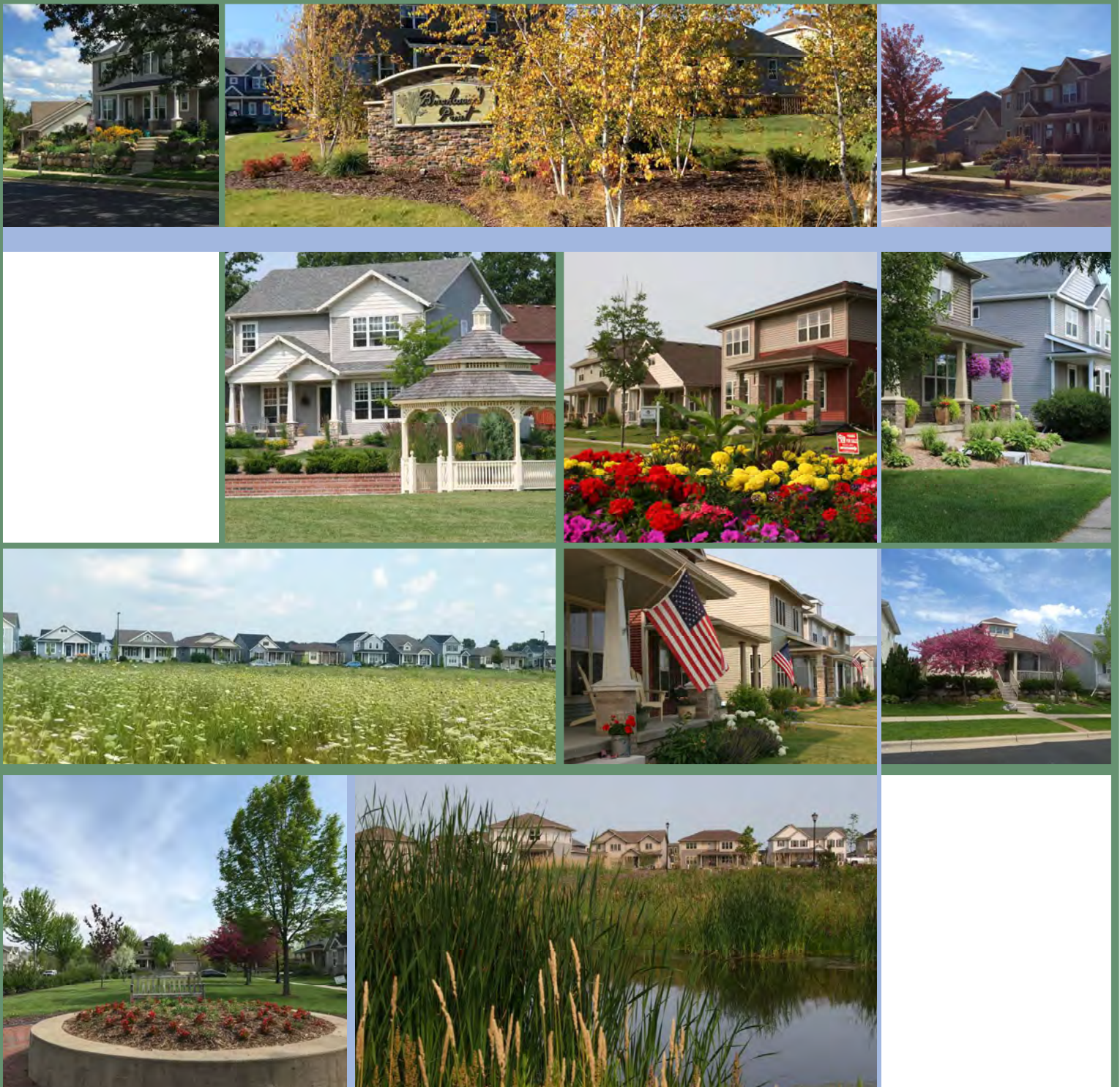
Separate and distinct records shall be maintained by the owner to record the specific activities and costs thereof for the maintenance plan implementation. The records shall include the dates of maintenance visits and the specific work performed. Records shall be kept as required by local, state or federal law.

Infiltration Basin

Visual Inspection of the Infiltration Basin shall be performed, at a minimum, annually.

Maintenance shall be required when system shows standing water beyond 24 hours of rain event. Cleaning shall consist of removal of sediment, two (2) foot undercut, undercut replacement with material consisting of 15-30% compost and 70-85% sand and restoration in-kind.

Restoration of plant material shall be with native plugs or seed mixture tolerant of fluctuating water conditions. If a seed mixture is used steps shall be taken to assure vegetation establishes



ROSEWOOD FIELDS

McFARLAND, WISCONSIN

*PLANNED DEVELOPMENT:
GENERAL PLAN/ DETAILED PLAN*

SUBMITTED: APRIL 6TH, 2020



Intent of Document.....	1
Project Name.....	1
Project Owners.....	1
Contacts.....	1
Existing Conditions	2
Site Information	3
Zoning Request	4
Development Concept.....	7
Proposed Land Use Summary.....	7
Single Family Homes.....	7
Twin Homes	8
Parks and Open Space	8
Definitions	8
Permitted & Accessory Uses.....	8
District Descriptions/ Zoning Text.....	9
Rosewood Fields: District I.....	9
Rosewood Fields: District II	12
Rosewood Fields: District III.....	15
Architectural Standards	18
Open Space	19
Streets.....	20
Mailboxes	20
Phasing.....	20
Homeowner Association	20
Architectural Review Committee.....	21
Exhibits.....	22

INTENT OF DOCUMENT

The intent of this document is to provide the Village of McFarland with a Planned Development General Plan and Detailed Plan that summarizes the components of the proposed Rosewood Fields Neighborhood.

PROJECT NAME

Rosewood Fields

PROJECT OWNERS

Wayne Utterback
4627 Prairie Fire Court
DeForest, WI 53532

CONTACTS

Applicant:

VH Rosewood Fields, LLC.
6801 South Town drive
Madison, WI 53713
Chris Ehlers
Vice President of Land Development
cehlers@veridianhome.com
Phone: 608.226.3038
Fax: 608.235.4701

Design Team:

Engineering:

D'Onofrio Kottke
7530 Westward Way
Madison, WI 53717
Phone: 608.833.7530
Fax: 608.833.1089
Dan Day
dday@donofrio.cc

Planning:

Vandewalle and Associates
120 East Lakeside Street
Madison, Wisconsin 53715
Phone: 608.255.3988
Fax: 608.255.0814
Brian Munson
bmunson@vandewalle.com

EXISTING CONDITIONS

Existing Zoning:

Undeveloped Land A-1

Existing Parcels (PIN):

061002480700

061002495010

Legal Description:

See Exhibit A: Legal Description

Adopted Plans from Village of McFarland Comprehensive PlanFuture Land Use Plan

Project Area: Neighborhood Residential

Adjoining Parcels: Single family residential; Neighborhood residential; DNR
wetlands & potential wetland indicators over undeveloped
lands; park and open space

See Exhibit B: Future Land Use Plan

East Side Neighborhood Plan

Project Area: Traditional Residential

See Exhibit C: East Side Neighborhood Growth Area Plan

Lot Area: 36.3 acres

SITE INFORMATION

Rosewood Fields is located at the eastern gateway of the Village of McFarland along County Highway AB. The land is currently comprised of agricultural fields. The site generally slopes from a high point in the northern part of the site down toward the southern end of the site and to the western frontage along the greenway. A portion of the site is already annexed to the Village and the remainder will be annexed as part of the planning process.

Abutting Uses:

North:	Agricultural
East:	Agricultural
South:	Agricultural
	Rail Road ROW
	Wetlands/ Environmental Corridor
West:	Residential

See Exhibit D: Location Map

See Exhibit E: Existing Conditions



ZONING REQUEST

Planned Development District

General Plan (PDD-GP)

Detailed Plan (PDD-DP)

VARIANCES FROM SUBDIVISION ORDINANCE:

Sec. 56-142. - Lot design standards.

(d) *Corner lots.* Corner lots for residential use shall have a width sufficient to provide a building setback of at least 30 feet from each street.

Request: Corner lot setbacks per proposed districts in PUD

(e) *Access to public streets.* Every lot shall front or abut for a minimum distance of at least 40 feet on a public street. Lots with an access only to private drives or streets shall be permitted only with Village Board approval.

Request: Lot width per proposed districts in PUD and as reflected in plat submittals.

(f) *Lot depth.* Depth of lots shall be a minimum of 100 feet. Excessive depth in relation to width shall be avoided and a proportion of two to one shall be considered a desirable ratio under normal conditions. Depth of lots or parcels reserved or laid out for commercial or industrial use shall be adequate to provide for off-street service and parking required by the use contemplated.

Request: Lot depth per proposed districts in PUD and as reflected in plat submittals.

ZONING REQUEST JUSTIFICATION

The Planned Development District is established to provide a voluntary regulatory framework designed to encourage greater variety and flexibility in land development while achieving substantial compliance with the Village Land Use Plan and basic intent of the zoning ordinance and land uses beneficial to the Village. Such district is also established to promote the maximum benefit from coordinated area site planning, including diversified location of structures and mixed compatible uses, and to provide for safe and efficient systems for pedestrian and vehicular traffic, attractive recreation and landscaped open spaces, and economic design and location of public and private utilities and community facilities. Within this district are allowed the diversification and variation in the bulk and relationship of uses, structures and spaces in developments planned as comprehensive and cohesive unified plans and projects.

CRITERIA FOR APPROVAL

(a) *General requirements.*

(4) *Standards.* The following standards shall apply in the review of all general or detailed plans proposed for the Planned Development District:

- a. The uses proposed in the planned development shall be in general conformance with the Village Comprehensive Plan.

This project area is planned as neighborhood residential in the future land use plan, and as traditional residential in the East Side Neighborhood Growth Area plan. One of the comprehensive plan's initiatives is to encourage neighborhood development on the Village's East side, which is where this project is located. The comprehensive plan encourages a supply of vacant lots, homes for sale, and developable land for housing to maintain a vibrant housing market and enhance affordability. This policy is promoted in the diversity of housing types and price points proposed in Rosewood Fields.

- b. The establishment, maintenance or operation of the uses proposed in the planned development shall not substantially impair or diminish the use, value and enjoyment of other properties within the neighborhood.

The proposed residential neighborhood will be an extension of the surrounding McFarland neighborhoods. It's street network ties into the existing grid, and the new homes will blend easily with the style and scale of the existing homes nearby, while still creating some diversity in housing and lot layout.

- c. Traffic circulation into and within the development shall be designed to minimize traffic congestion and traffic hazards, provide for the accessibility of all uses and buildings and also provide for the safe and convenient movement of both vehicles and pedestrians.

Traffic circulation in the proposed Rosewood Fields neighborhood will minimize traffic congestion and create a safe and attractive pedestrian environment. The street grid from the existing western neighborhood will connect seamlessly into the Rosewood Fields neighborhood, maintaining similar street widths, terrace treatment, and walkable sidewalks throughout the project.

- d. The planned development shall incorporate environmental design considerations, including the preservation of topography, trees and ground cover, streams and natural bodies of waters, and other significant natural features and control of erosion and runoff in accord with the Village Erosion Control and Stormwater Management Ordinances.

This proposed planned development preserves the existing wetland in the southeast area of the site and extends the regional greenway on the west side of the site. There will be two stormwater basins on-site to collect stormwater runoff.

- e. The planned development shall provide for convenient and harmonious groups of buildings, structures and uses; and buildings shall be spaced and sited to ensure adequate safety, light, ventilation and privacy.

This new neighborhood will create diversity in housing within McFarland, while remaining in harmony and cohesion with the surrounding areas.

- f. The following provisions shall apply:

- 1. In a planned development for residential use, adequate open space and recreational areas shall be provided in appropriate locations, and all public and common open spaces shall be designed and located to provide safe and convenient access to residents.

This planned development will provide a blend of park dedication and fee in lieu of dedication. A 3.2 acre public park has been designated in the

southern portion of the site for residents to enjoy. This park location will be easily accessible to all new residents and will provide active and passive recreational options for people of all ages and abilities. On the west side of the site, there is a regional greenway accessible by a trail that runs south into the southern park and then into the existing wetland to the east. This path will connect this development to the neighborhood to the west, and offer more passive recreational activities like dog walking, running or biking. It will also extend a connection to the planned path along county highway AB, creating a seamless regional trail system.

- g. The planned development will not adversely affect the ability of public agencies to provide school or other municipal services.

This area was planned for residential development in the comprehensive plan and in the East side Neighborhood Growth Area plan and is reflected by public agencies providing school and other municipal services.

- h. The width of street rights-of-way, width of paving, width and location of street or other paving, outdoor lighting, location of sewer and water lines, provision for stormwater drainage or other similar environmental engineering considerations shall be based on a determination of the appropriate standards necessary to implement the specific function in the specific situation; provided, however, that in no case shall standards be less than those necessary to ensure the public safety and welfare as determined by the Village.

Environmental engineering considerations have been incorporated into the design to ensure the public health, safety and welfare as determined by the Village. These plans are incorporated into the separate plat submittal documents.

- i. The proponents of a Planned Development District application shall provide evidence satisfactory to the Village Board of its economic feasibility of available adequate financing and that it would not adversely affect the economic prosperity of the Village or the values of surrounding properties.

This planned development is shown as neighborhood residential in the comprehensive plan and in the East Side Neighborhood Growth Area plan. The comprehensive plan encourages the expansion of the range of quality and affordable housing choices for empty nesters, seniors, and the McFarland workforce, while remaining a family-oriented community. This development will be able to do that by providing a diverse range of price points and housing types that will be desirable to a wide range of people.

- j. The proponents of a Planned Development District shall submit a reasonable schedule for the implementation of the development to the satisfaction of the Village Board, including suitable provisions for assurance that each phase could be brought to completion in a manner that would not result in an adverse effect upon the community as a result of termination at that point.

Approving this PDD will create a voluntary framework designed to encourage greater variety and flexibility in land development while complying with the Village Board's time schedule. The comprehensive plan promotes quality, affordable housing for families and older residents within neighborhoods, which is what a PDD helps make possible in Rosewood Fields.

DEVELOPMENT CONCEPT

Rosewood Fields site concept plan provides opportunities for quality, affordable housing for families and older residents that are organized around safety, conservation, recreation, and connections to the broader community. Rosewood Fields creates a seamless connection to the adjoining western McFarland neighborhood, while also respecting the greenway corridor on the west side of the site and extending the community character of The Village of McFarland.



PROPOSED LAND USE SUMMARY

See Exhibit F: Zoning Map

See Exhibit G: Master Plan

See Exhibit H: District Plan



Projected Construction: 2020-2032

Proposed Use:

- 24 Carriage Lane Accessed Single Family Homes
- 83 Street Accessed Single Family Homes
- 10 Flat Site Twins - front
- 10.8 Acres of Parks and Open Space



SINGLE FAMILY HOMES

Single family homes within the project will include both carriage lane accessed, and street accessed configurations that can accommodate a wide range of house types, architectural treatments, landscaping, floor plans and price points. This will create an integrated and diverse neighborhood that also blends easily into the surrounding McFarland neighborhoods. Price points within the single-family format will range from entry level/first time home buyer to move up/missing middle housing options.



TWIN HOMES

Twin homes within the neighborhood include a range of floor plans and configurations with street accessed garages. These homes offer additional price points and housing variety within the neighborhood.

PARKS AND OPEN SPACE

This project preserves and enhances the existing wetland in the southeast corner and the greenway on the west side of the site. A public park, stormwater and a trail will also be added to the overall open space offering a range of passive and active recreational activities and gathering areas to serve the neighborhood.

DEFINITIONS

Lot width: Lot width is measured at the front yard setback and may be wider or narrower at the ROW due to road curvature.

Useable Open Space: Usable open space shall be provided on each lot, devoted in whole or in part to any residential use, as set forth in each district. Such usable open space provided on the ground level shall be in a compact area and having no dimension less than ten feet and having no slope grade greater than ten percent. Required open space may be designed to be part of the individual living units in the form of balconies, porches, patios or decks. Usable open space may count area on adjoining lot if granted as part of a recorded use easement.

PERMITTED & ACCESSORY USES

Primary uses within the proposed districts will be for single family homes or two unit attached single family homes. Additional permitted and accessory uses will be allowed provided per the following:

- *District I & II:* Uses consistent with the R1-B residential district
- *District III:* Use consistent with the R-2 residential district



DISTRICT DESCRIPTIONS/ ZONING TEXT

ROSEWOOD FIELDS: DISTRICT I

General Plan/ Detailed Plan:

Single Family Homes

Carriage Lane Alley accessed garage

See Exhibit G: Master Plan



Description

Carriage lane homes enhance the variety of housing and neighborhood character through the use of single-family home sites served by alleys. These homes are designed with integrated architecture and reduced setbacks which create an unbroken front façade of houses without garages that emphasize a human-based scale and texture in which the pedestrian and front porches become the focus.

Proposed Dwelling Units

24 units



Character Guidelines

- Balconies, entry bays and front entry porches are recommended to enhance the human scale of the public street façade.
- Porches, stoops, and bays are allowed to encroach into the front yard setback to allow for increased porch width and to encourage the inclusion of porches or entry bays onto each house.
- Varied building setbacks are encouraged to create a more organic streetscape in which there are varied building placements along the length of the street.
- As the buildings are moved closer to the street and each other, special attention should be taken to design details, house details, and landscaping to ensure that the public street façade is of proper pedestrian scale.



District I Zoning

Minimum Lot Area	3,500 square feet
Minimum Lot Width (at front yard setback)	37 feet (42 feet corner lots)
Maximum Building Height	35 feet
Minimum Lot Depth	95 feet
Minimum Front Yard Setback	15 feet
Maximum Front Yard Setback	24 feet
Minimum Side Yard Setback	5 feet
Minimum Dwelling Unit Separation	10 feet minimum setback between buildings on adjacent lots
Sum of Side Yards	10 feet minimum
Minimum Corner Lot Side Yard Setback	10 feet from the street side right of way
Minimum Garage Rear Yard Setback	2 foot
Maximum Garage Rear Yard Setback for Exterior Lots (lots adjacent to the street)	4 feet
Minimum Paved Surface Setback	2 feet
Maximum Height of Detached Garage	20 feet
Detached Garage Side Yard Setbacks	5 feet
Required Off-street Parking and Loading	Two off-street parking stalls per lot
Usable Open Space	500 square feet

Permitted Encroachments

Front porches, balconies, stoops, open porches and covered walkways may encroach a maximum of 6' into the front yard setback.

Front Yard Setbacks of 18-20' must utilize 6-8' porch encroachment

Corner lot porches, and bay windows may not encroach the vision triangle. The triangle is defined by: the intersection of the curbs at the corner, and a point 30 feet back along each curb from the corner.

Bay windows and fireplace chases may encroach a maximum of 2' into the side yard

Garden walls or fences shall be no more than 4' in height and will require approval by the Architectural Control Committee. Walls and fences located within the vision triangle shall not exceed 30" in height.

Appropriate Architectural Styles (not limited to):

Victorian

Salt Box

Prairie

Cottage

Four Square

Traditional

Southern Traditional

Shingle

Craftsman

ROSEWOOD FIELDS: DISTRICT II

General Plan/ Detailed Plan:

Single Family Homes

Front-access garage

See Exhibit G: Master Plan

Description

This district's homes offer additional diversity and housing choices in a single-family format. Conventional single-family homes within the neighborhood will span from entry level/first time homebuyer, to market rate, and downsizer opportunities.

Proposed Dwelling Units 83 units

Character Guidelines

- Balconies, entry bays and front entry porches are recommended to enhance the human scale of the public street façade.
- Porches, stoops, and bays are allowed to encroach into the front yard setback to allow for increased porch width and to encourage the inclusion of porches or entry bays onto each house.
- Varied building setbacks are encouraged to create a more organic streetscape in which these are slight variations between buildings along the length of the street.
- As the buildings are moved closer to the street and each other, special attention should be taken to design details, house details, and landscaping to ensure that the public street façade is of proper pedestrian scale.
- The front entry of each house should be oriented towards the public street frontage.
- Garages will be set back a minimum of two feet from the front façade of the house to ensure that the garage does not dominate the façade of the house



District II Zoning

Minimum Lot Area	5,100 square feet
Minimum Lot Width (at front yard setback)	51 feet
Maximum Building Height	35 feet
Minimum Lot Depth	100 feet
Minimum Front Yard Setback	18 feet
Maximum Front Yard Setback	25 feet
Minimum Side Yard Setback	5 feet
Sum of Side Yards	10 feet minimum
Minimum Corner Lot Side Yard Setback	10 feet from the street side right of way
Minimum Rear Yard Setback	20 foot
Garage Setback	20 feet Garage must be setback a minimum of 2' from front façade of the house Side entry garages may be allowed in front of façade There shall not be more than (2) single car width and (1) double car width garage doors per street facing elevation. On street facing facades with a three stall garage, one single width door must be setback on a new façade a minimum of 2' from the double width garage door's façade.
Minimum Paved Surface Setback	2 feet
Bulk Mass	The width of the garage wing shall not exceed 50% of the total structure width
Required Off-street Parking and Loading	Three off-street parking stalls minimum per lot
Usable Open Space	1,000 square feet

Permitted Encroachments

Front porches, balconies, stoops, open porches and covered walkways may encroach a maximum of 6' into the front yard setback.

Corner lot porches, and bay windows may not encroach the vision triangle. The triangle is defined by: the intersection of the curbs at the corner, and a point 30 feet back along each curb from the corner.

Bay windows & fireplace chases may encroach side yard setbacks and will require approval by the Architectural Control Committee.

Garden walls or fences shall be no more than 4' in height and will require approval by the Architectural Control Committee. Walls and fences located within the vision triangle shall not exceed 30" in height.

Decks may encroach up to 10' into rear yard setback

Appropriate Architectural Styles
(not limited to):

Victorian

Salt Box

Prairie

Cottage

Four Square

Traditional

Southern Traditional

Shingle

Craftsman

ROSEWOOD FIELDS: DISTRICT III

General Plan/ Detailed Plan:

Twin homes/zero lot line single family

Street facing garage

Flat site

See Exhibit G: Master Plan

Description

This district's homes offer additional diversity and housing choices in a twinhome format. District III twin homes offer paired attached single-family housing with street accessed garages. This district will offer more affordable housing for a range of different home buyers.

Proposed Dwelling Units 10 units

Character Guidelines

- Balconies, entry bays and front entry porches are recommended to enhance the human scale of the public street façade.
- Porches, stoops, and bays are allowed and encouraged to encroach into the front yard setback to allow for increased porch width and to encourage the inclusion of porches or entry bays onto each house.
- Varied building setbacks are encouraged to create a more organic streetscape in which these are slight variations between buildings along the length of the street.
- As the buildings are moved closer to the street and to each other, special attention should be taken to design details, house details, and landscaping to ensure that the public street façade is of proper pedestrian scale.
- The front entry of each house should be oriented towards the public street frontage.



District III Zoning Text

Minimum Lot Area	9,100 feet for combined twin home 4,550 feet for zero lot line home
Minimum Lot Width (at front yard setback)	91 feet for combined twin home building 45.5 feet for zero lot line home
Maximum Building Height	35 feet
Minimum Lot Depth	100 feet
Maximum Number of Units Per Lot	2 units if paired building 1 unit for zero lot line home
Minimum Front Yard Setback	15 feet
Minimum Side Yard Setback	5 feet (exterior building lot line) 0 feet for zero lot line home sites (party wall)
Sum of Side Yard Setback	10 feet minimum (combined building)
Minimum Corner Lot Side Yard Setback	15 feet from the street side right of way
Minimum Rear Yard Setback	2 feet
Minimum Paved Surface Setback	2 feet
Required Off-Street Parking and Loading	Two off-street parking stalls per unit minimum
Usable Open Space	1,000 square feet per unit

Permitted Encroachments

Front porches, balconies, stoops, open porches and covered walkways may encroach a maximum of 6' into the front yard setback.

At grade patios may encroach up to the paved side yard setback allowance.

Corner lot porches, and bay windows may not encroach the vision triangle. The triangle is defined by: the intersection of the curbs at the corner, and a point 30 feet back along each curb from the corner.

Bay windows and fireplace chases may encroach a maximum of 2' into the side yard

Garden walls or fences shall be no more than 4' in height and will require approval by the Architectural Control Committee. Walls and fences located within the vision triangle shall not exceed 30" in height.

Additional Requirements A minimum one-hour fire rated wall assembly division, separating all areas from the lowest level flush against the underside of the roof, is required between each dwelling unit.

Appropriate Architectural Styles (not limited to):

Victorian

Salt Box

Prairie

Cottage

Four Square

Traditional

Southern Traditional

Shingle

Craftsman

Mid-Century Modern

ARCHITECTURAL STANDARDS

Development of the property will require review and approval by the Architectural Review Committee for Rosewood Fields prior to submittal to the Village of McFarland.

The following additional guidelines will also apply:

Massing

- Awnings, bays, canopies, porches, stoops, towers and windows are encouraged to enhance the building scale.
- Primary façade rooflines are encouraged to be broken with bays, gables, and smaller roof forms to reduce the overall size of roof elements. Pitched or flat roof forms may be allowed, as appropriate to the overall style of the building.
- Building architecture should utilize a tripartite composition with base, middle, and top elements clearly defined with material and façade design changes.
- Façade breaks and wall recessions shall be used to further break up massing of buildings.

Styles

- Each individual building shall select one style of architecture and apply appropriate details, massing, rooflines, façade breaks, colors, and materials on all of the buildings within the project site. Using a variety of architectural styles throughout the neighborhood will create more visual interest and appeal. The buildings should contain variations in materials and colors between buildings to enhance the overall character of the site.
- Appropriate styles:
 - Victorian
 - Salt Box
 - Prairie
 - Cottage
 - Four Square
 - Traditional
 - Southern Traditional
 - Shingle
 - Mid-Century Modern
 - Craftsman

Materials

- Building design shall feature high quality, durable materials in a range of types and colors.
- Appropriate materials:
 - Brick
 - Stone and cast stone
 - Cement board, composite siding, or vinyl siding
 - Wood, composite, vinyl, or cement board shingle siding/ board and batten siding
 - Metal panels
 - Synthetic trim materials

OPEN SPACE

The open space system features about 10.8 acres of park space, stormwater management and open space; roughly 30% of the project. The components of the open space include a new public park and stormwater basins, which connect to the existing wetland and greenway through connections to the planned regional trail system.

Parks	3.2 Acres
Wetlands	1.2 Acres
Stormwater	3.3 Acres
Passive Open Space	3.1 Acres

Dedicated Park 3.2 Acres

See Exhibit I: Parks and Open Space Plan

PAVED TRAILS

The trail system comprises of both sidewalks and a paved trail to accommodate bicycle and pedestrian traffic. All trails will be owned and maintained by the Village.

ENVIRONMENTAL CORRIDOR AND STORMWATER

The greenway in the western portion of the site connects to the regional environmental corridor. The wetland in the southeastern portion of the site is buffered to protect the quality and the integrity of the ecosystem. There will also be two stormwater detention basins designed to not only treat runoff but also to be a part of the open space system and viewed as an amenity with public access via the trail network. All environmental corridor and stormwater will be owned and maintained by the Village.



STREETS

Rosewood Fields features a complete street network, extending west to Prairie Wood Dr and Tuscobia Trail, and east to County Highway AB. Residential collector and local street widths have been used to meet both vehicle and pedestrian needs. Street trees and grass terraces will enhance the pedestrian experience.

The Homeowners Association will be responsible for the maintenance of any planting islands within right-of-way.



See Exhibit J: Street Right-of-Way Width Map

See Exhibit K: Street Cross Sections

MAILBOXES

Per United States Postal Service requirements, cluster mailboxes will be used and placed throughout the neighborhoods in private easements or private outlots. The final CBU locations will be determined on a phase by phase basis and are subject to USPS approval and may be revised as necessary.

The Home Owners Association will be responsible for the maintenance of the CBUs.

See Exhibit L: Conceptual CBU Location Map



PHASING

The neighborhood is projected to be built out in multiple phases over the span of the next 5-6 years. Final phase lines and sequencing will be determined based on market demand

See Exhibit M: Conceptual Phasing Plan

HOMEOWNER ASSOCIATION

Rosewood Fields will be governed by a Homeowners Association. Maintenance responsibilities will be further detailed in the amended covenants and restrictions recorded against each property.

ARCHITECTURAL REVIEW COMMITTEE

The Architectural Review Committee and The Rosewood Fields Covenants and Restrictions Code will be set up to ensure the continued development of high-quality design, architecture and site execution is carried throughout the neighborhood.

Architectural and Landscape plans for any site within Rosewood Fields shall be submitted to the Architectural Review Committee for review and approval prior to the issuance of any Building Permit, or prior to any site improvements.

The Committee will review all submitted plans to ensure the continuation of the distinct architectural character, and landscape quality established within the development. Plans will be reviewed based on the design guidelines as established in the Covenants and Restrictions guide and standards outlined for each zoning district. The Committee will review any future remodeling plans that will change the outward appearance of any structure found within Rosewood Fields. The Committee will not review any re-landscaping plans that take place more than one year after the original landscape plan is installed.

The Committee has the right to enforce all design guidelines and standards found within the Covenants and Restrictions, Design Guidelines, or zoning text. The Committee also retains the right to grant exceptions to the design guidelines and standards based on the merit of exceptional design that may not fall within or meet the technical requirements of the guidelines and standards, but generally accomplished the basic principles and intent of the aforementioned documents. Exceptions may also be made on a case-by-case evaluation of individual site context issues that would inhibit the practical implementation of these guidelines and standards.

The Architectural Review Committee shall initially be appointed by the Developer, and references in this Zoning Text to the Architectural Review Committee shall mean the Developer for such period of time as the Developer remains the only member of the Architectural Review Committee as provided in the Association Bylaws. As long as the Developer is the only member of the Architectural Review Committee, the Developer, acting alone, may exercise all of the rights and ceases to be the sole member of the Architectural Review Committee, the Architectural Review Committee shall thereafter consist of such persons as are elected pursuant to the Bylaws.

EXHIBITS

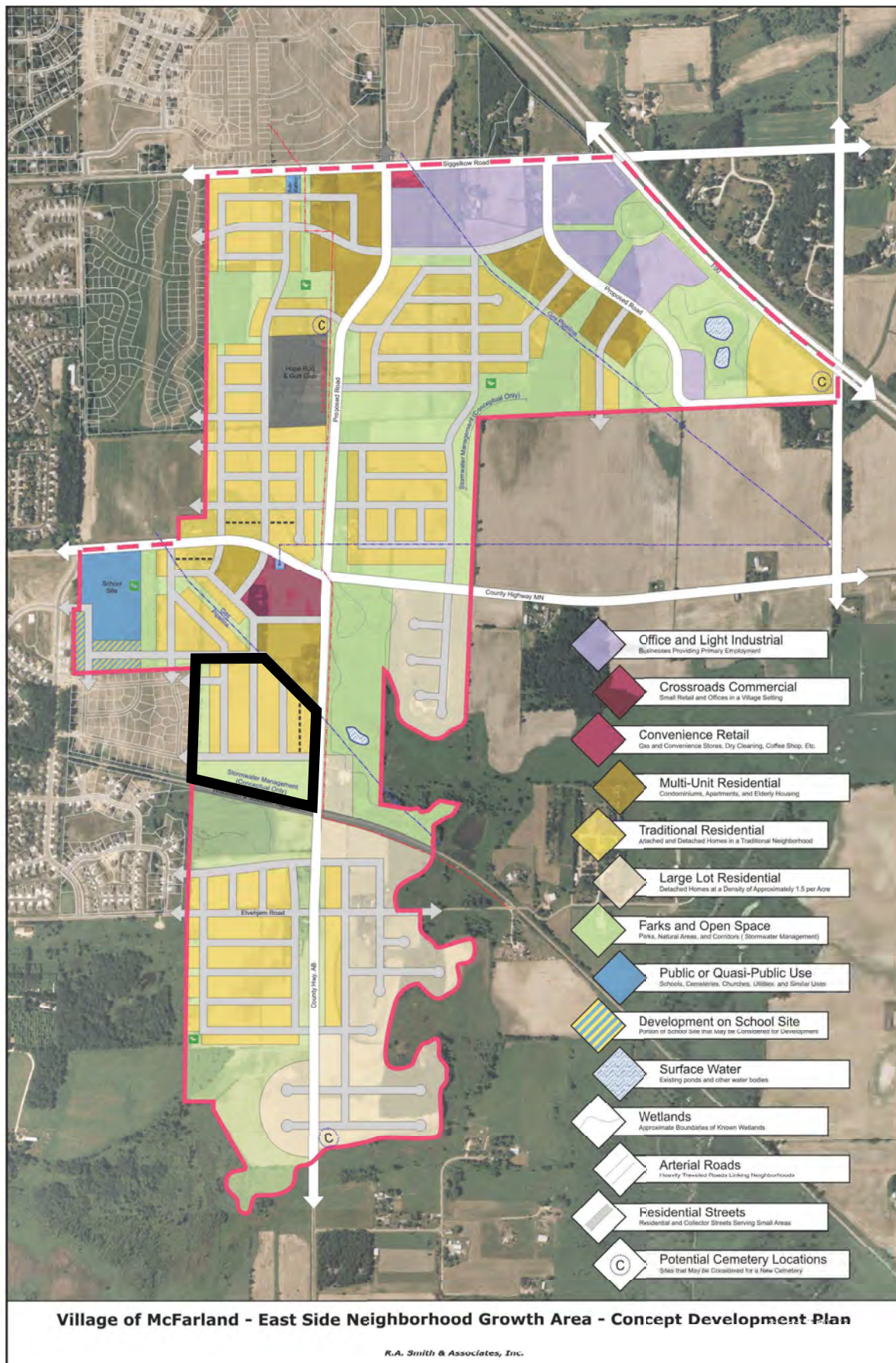
- Exhibit A:** Legal Description
- Exhibit B:** Future Land Use Plan
- Exhibit C:** East Side Neighborhood Growth Area Plan
- Exhibit D:** Location Map
- Exhibit E:** Existing Conditions
- Exhibit F:** Zoning Map
- Exhibit G:** Master Plan
- Exhibit H:** District Plan
- Exhibit I:** Parks & Open Space Plan
- Exhibit J:** Street Right of Way Width Map
- Exhibit K:** Street Cross Sections
- Exhibit L:** Conceptual CBU Location Map
- Exhibit M:** Conceptual Phasing Plan

Exhibit A: Legal DescriptionLot 2 Proposed CSM:

A parcel of land located in the NE1/4 of the SE1/4 and the SE1/4 of the SE1/4 of Section 2, T6N, R10E, Village of McFarland, Dane County, Wisconsin to-wit:

Commencing at the East 1/4 corner of said Section 2; thence S02°07'30"W 258.00 feet along the East line of said SE1/4; thence N87°52'30"W, 34.21 feet to the point of beginning; thence S02°14'16"W, 973.22 feet; thence N77°25'35"W, 1291.46 feet; thence N02°35'02"E, 1186.37 feet; thence N86°00'55"E, 736.08 feet; thence S43°08'26"E, 746.88 feet to the point of beginning.

Containing 1,582,369 square feet square feet (36.326 acres).

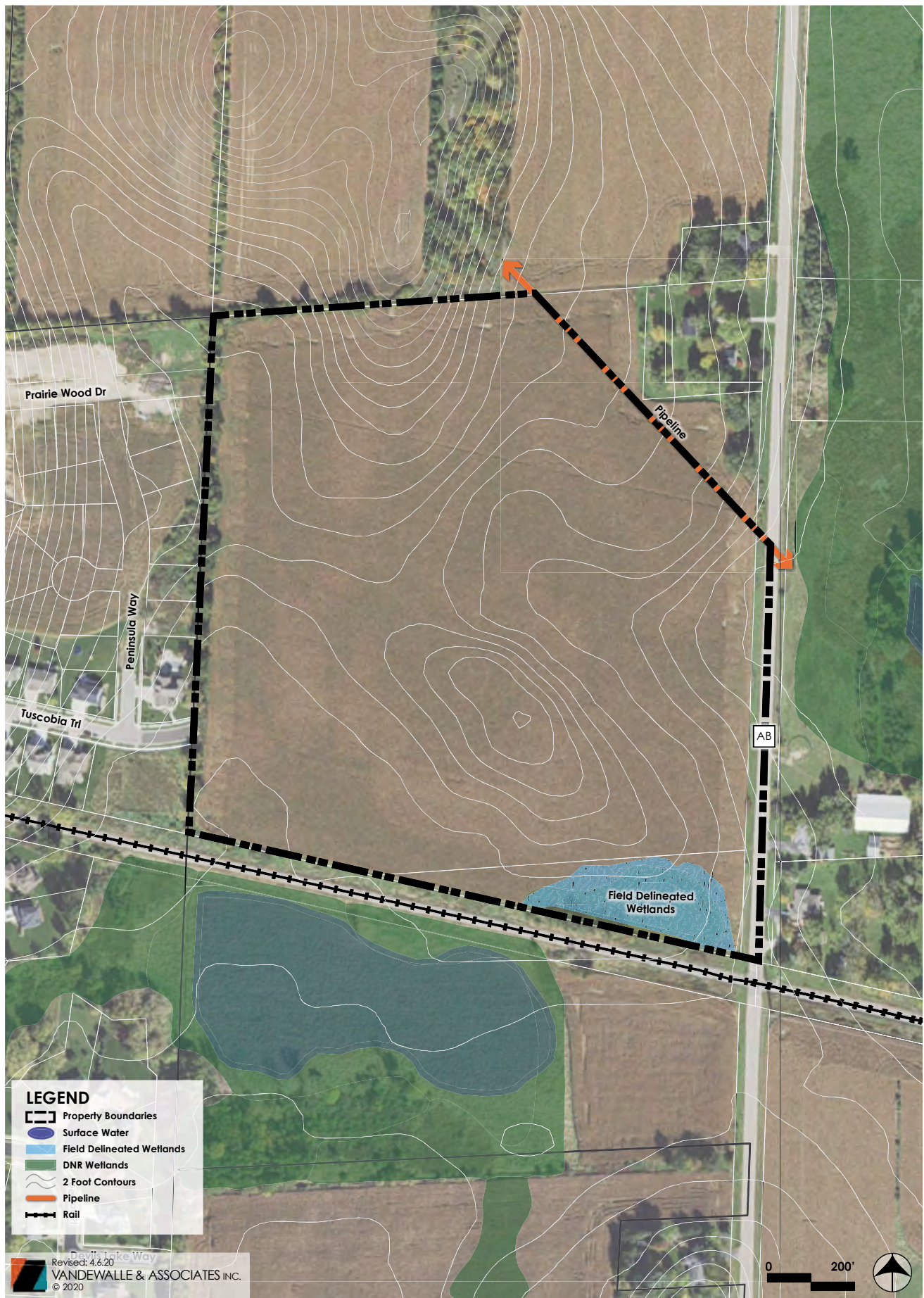




**EXHIBIT D:
LOCATION
MAP**

ROSEWOOD FIELDS
MCFARLAND, WISCONSIN





**EXHIBIT E:
EXISTING
CONDITIONS**

ROSEWOOD FIELDS
MCFARLAND, WISCONSIN



LOT TYPE	UNITS	%
Proposed SF Units		
COTTAGE - 37	17	14.6%
VILLAGE - 45	7	6.0%
VILLAGE - 51	5	4.3%
TERRACE - 59	41	35.0%
MANOR - 65	22	18.8%
ESTATE - 69	15	12.8%
TOTAL	107	91.5%
TWINS	10	8.5%
TOTAL UNITS	117	100%

PARK DEDICATION

DEDICATED PARKS	~3.2 ACRES
STORMWATER MANAGEMENT	~3.3 ACRES



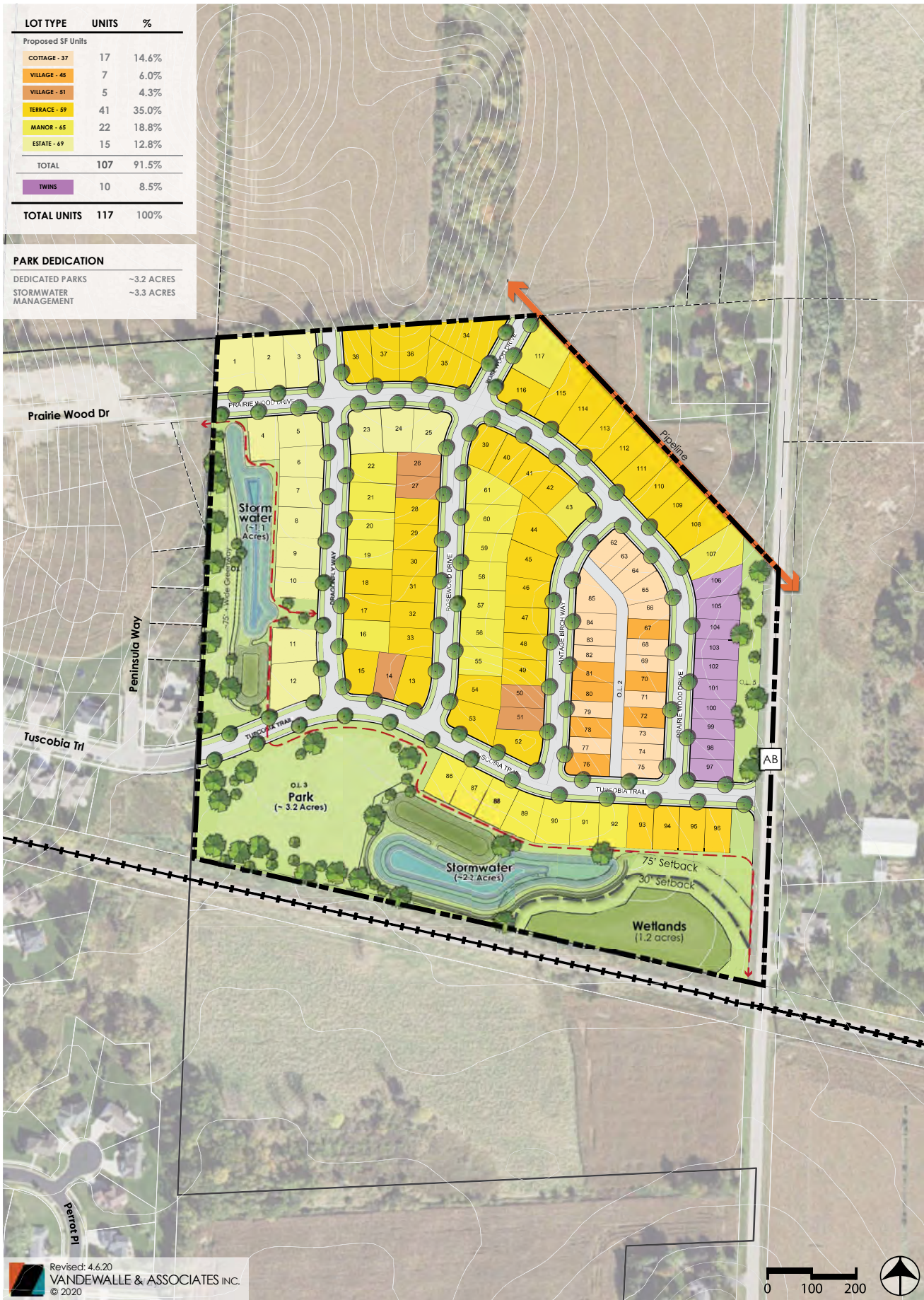
EXHIBIT F: ZONING MAP

ROSEWOOD FIELDS MCFARLAND, WISCONSIN



LOT TYPE	UNITS	%
Proposed SF Units		
COTTAGE - 37	17	14.6%
VILLAGE - 45	7	6.0%
VILLAGE - 51	5	4.3%
TERRACE - 59	41	35.0%
MANOR - 65	22	18.8%
ESTATE - 69	15	12.8%
TOTAL	107	91.5%
TWINS	10	8.5%
TOTAL UNITS	117	100%

PARK DEDICATION	
DEDICATED PARKS	~3.2 ACRES
STORMWATER MANAGEMENT	~3.3 ACRES



Revised: 4.6.20
 VANDEWALLE & ASSOCIATES INC.
 © 2020

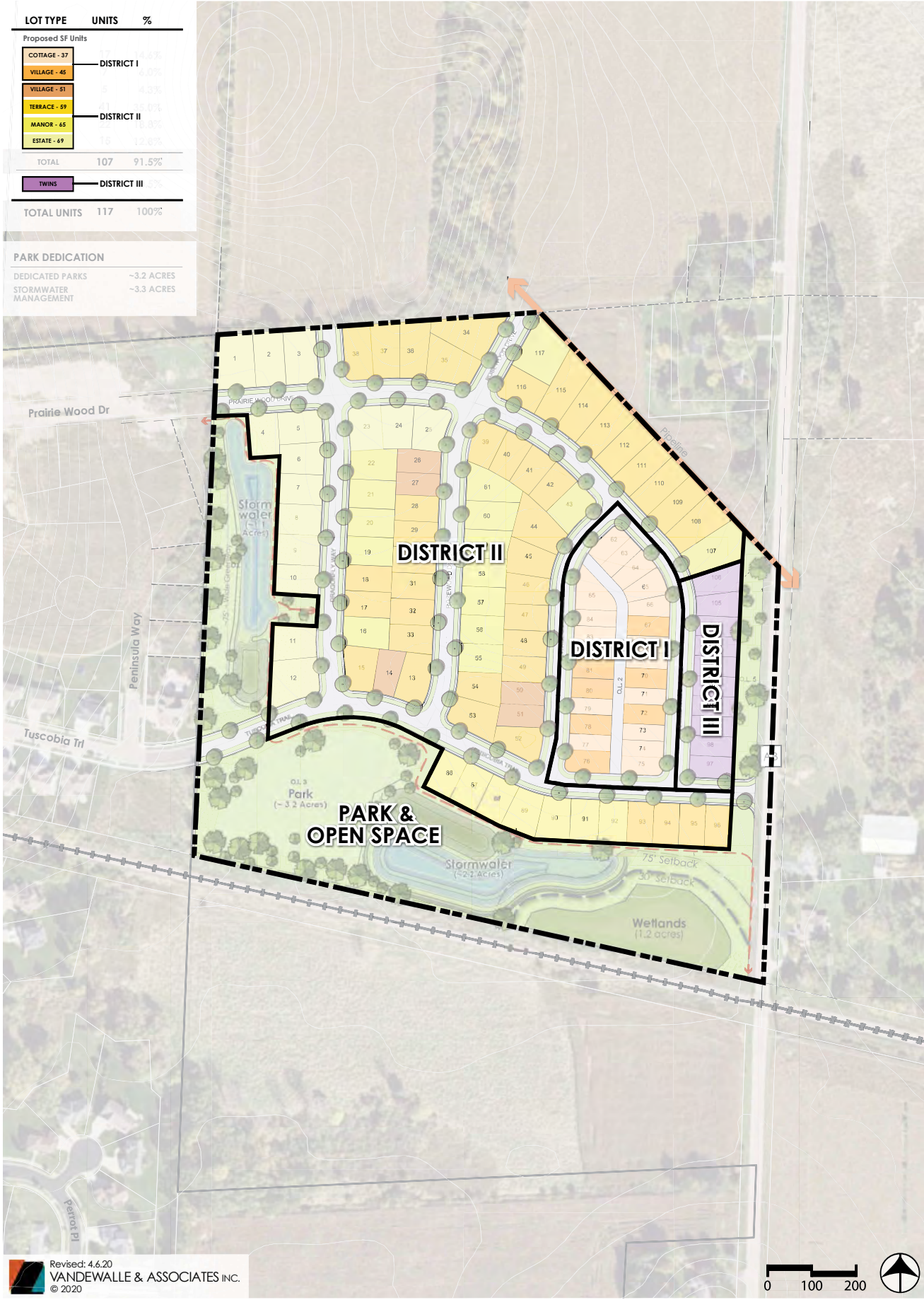
EXHIBIT G:
MASTER
PLAN

ROSEWOOD FIELDS
MCFARLAND, WISCONSIN

VERIDIAN
HOMES

LOT TYPE	UNITS	%
Proposed SF Units		
COTTAGE - 37	17	14.6%
VILLAGE - 45	5	4.0%
VILLAGE - 51	5	4.3%
TERRACE - 59	2	0%
MANOR - 65	2	0.8%
ESTATE - 69	18	12.6%
TOTAL	107	91.5%
TWINS	10	8.5%
TOTAL UNITS	117	100%

PARK DEDICATION	
DEDICATED PARKS	~3.2 ACRES
STORMWATER MANAGEMENT	~3.3 ACRES



Revised: 4.6.20
VANDEWALLE & ASSOCIATES INC.
© 2020

EXHIBIT H:
DISTRICT
PLAN

ROSEWOOD FIELDS

MCFARLAND, WISCONSIN

VERIDIAN
HOMES



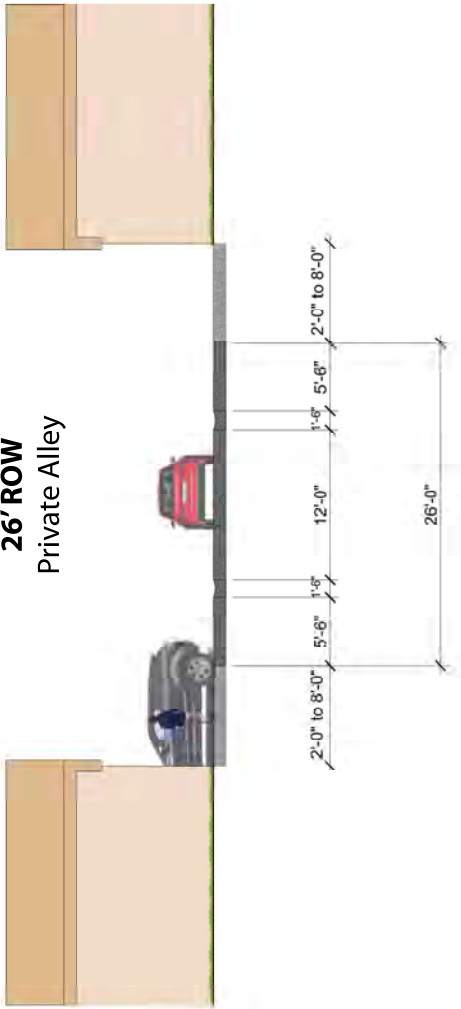
**EXHIBIT I:
PARKS & OPEN
SPACE PLAN**

ROSEWOOD FIELDS
MCFARLAND, WISCONSIN

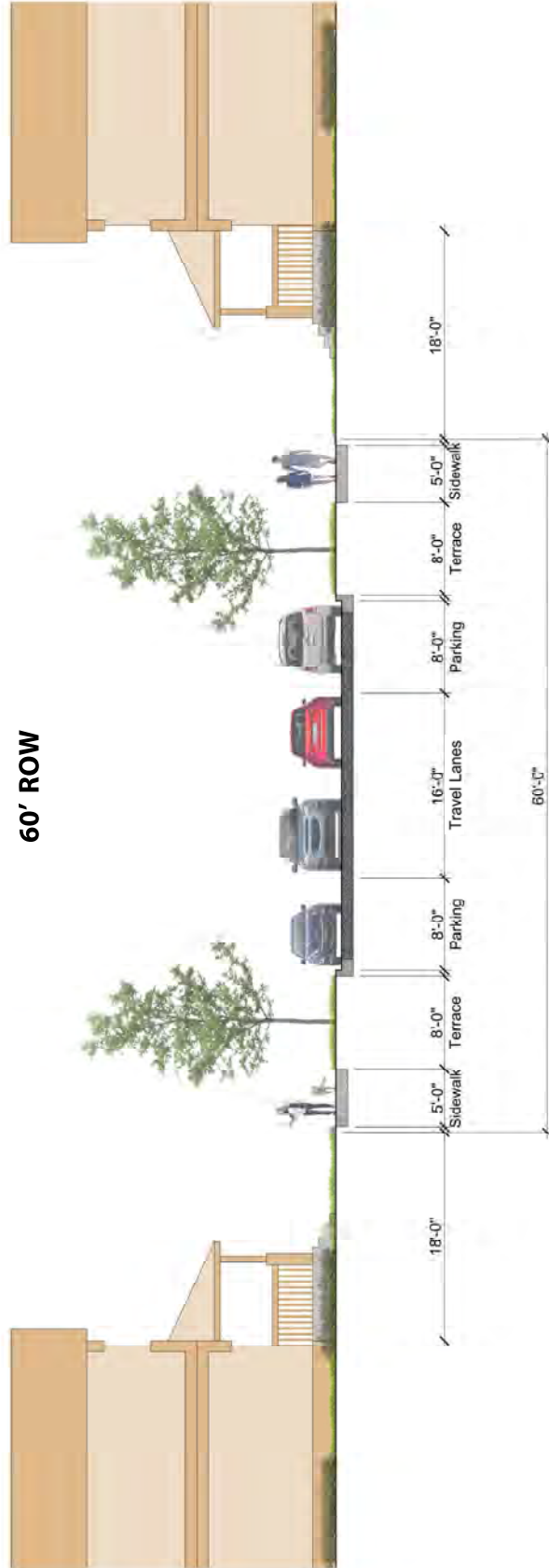




26' ROW
Private Alley



60' ROW



LOT TYPE	UNITS	%
Proposed SF Units		
COTTAGE - 37	17	14.6%
VILLAGE - 45	7	6.0%
VILLAGE - 51	5	4.3%
TERRACE - 59	41	35.0%
MANOR - 65	22	18.8%
ESTATE - 69	15	12.8%
TOTAL	107	91.5%
TWINS	10	8.5%
TOTAL UNITS	117	100%

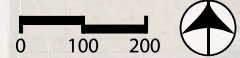
PARK DEDICATION

DEDICATED PARKS	~3.2 ACRES
STORMWATER MANAGEMENT	~3.3 ACRES



Revised: 4.6.20
VANDEWALLE & ASSOCIATES INC.
© 2020

**Note: Subject to review and approval by the postal service (USPS)*



**EXHIBIT L:
CONCEPTUAL
CBU LOCATION
MAP**

ROSEWOOD FIELDS
MCFARLAND, WISCONSIN



LOT TYPE	UNITS	%
Proposed SF Units		
COTTAGE - 37	17	14.6%
VILLAGE - 45	7	6.0%
VILLAGE - 51	5	4.3%
TERRACE - 59	41	35.0%
MANOR - 65	22	18.8%
ESTATE - 69	15	12.8%
TOTAL	107	91.5%
TWINS	10	8.5%
TOTAL UNITS	117	100%

PARK DEDICATION	
DEDICATED PARKS	~3.2 ACRES
STORMWATER MANAGEMENT	~3.3 ACRES

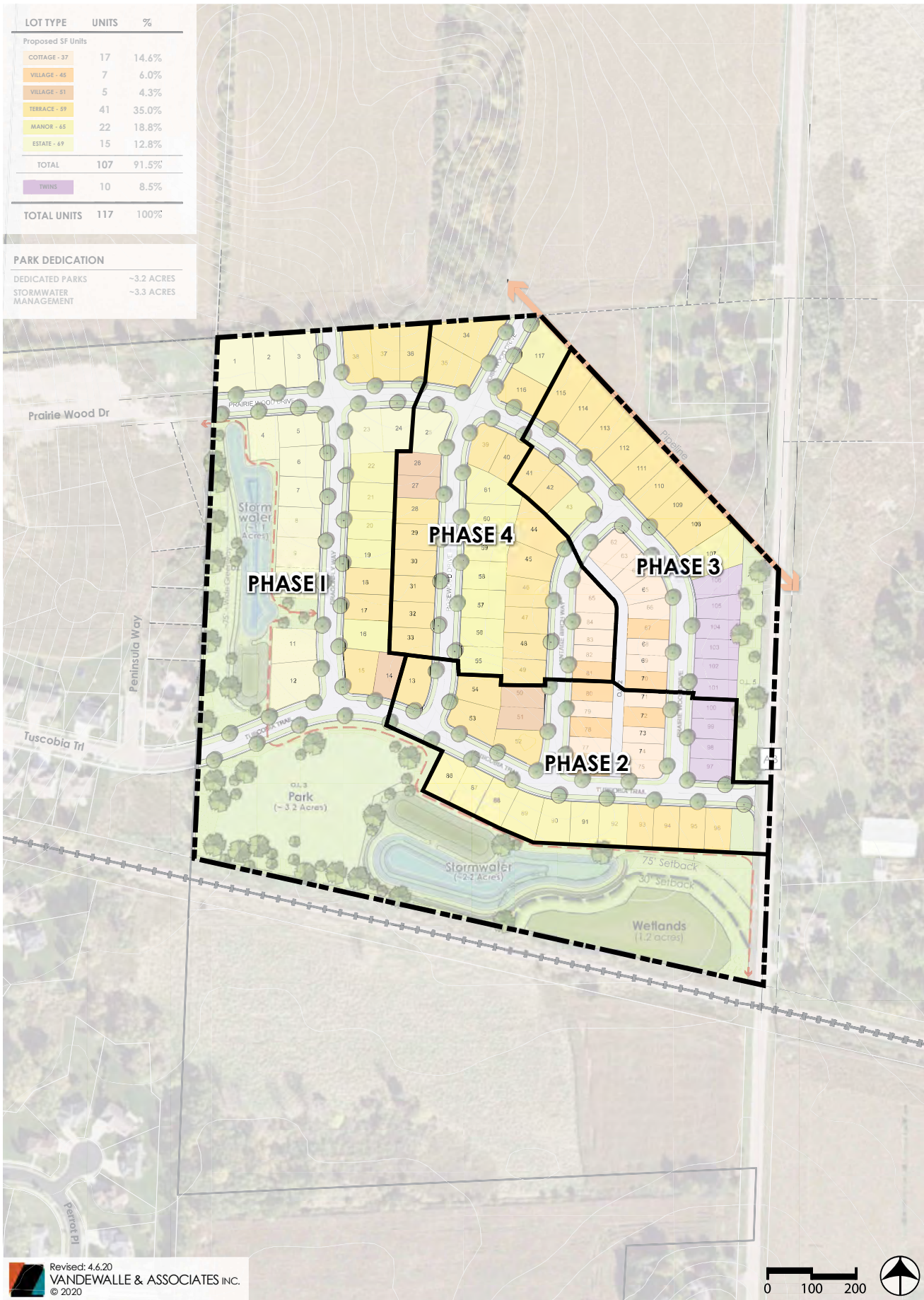


EXHIBIT M:
CONCEPTUAL
PHASING PLAN

ROSEWOOD FIELDS
MCFARLAND, WISCONSIN

VERIDIAN
HOMES

LOCATED IN THE NE1/4 OF THE SE1/4 AND THE SE1/4 OF THE SE1/4
SECTION 2, T6N, R10E, VILLAGE OF McFARLAND, DANE COUNTY, WISCONSIN



- FOUND 3/4" REBAR
 - FOUND 1" IRON PIPE
 - PLACED 3/4"x18" REBAR
WT=1.5LBS/FT
- () RECORDED AS INFORMATION



GRID NORTH
WISCONSIN COORDINATE
REFERENCE SYSTEMS (WISCRS)
DANE ZONE NAD83(2011)
THE EAST LINE OF THE
SE1/4 OF SEC. 2, T6N, R10E
BEARS S02°07'30"W

0 300
Scale 1" = 300'

SHEET 1 OF 3

DATE: April 7, 2020
F.N.: 19-07-114
C.S.M. NO. _____
DOC. NO. _____
VOL. _____ SHEET _____

D'ONOFRIO KOTTKE AND ASSOCIATES, INC.

7530 Westward Way, Madison, WI 53717
Phone: 608.833.7530 • Fax: 608.833.1089

YOUR NATURAL RESOURCE FOR LAND DEVELOPMENT

CERTIFIED SURVEY MAP

LOCATED IN THE NE1/4 OF THE SE1/4 AND THE SE1/4 OF THE SE1/4
SECTION 2, T6N, R10E, VILLAGE OF McFARLAND, DANE COUNTY, WISCONSIN

SURVEYOR'S CERTIFICATE

I, Brett T. Stoffregan, Professional Land Surveyor, S-2742, do hereby certify that this survey is in full compliance with Chapter 236.34 of the Wisconsin Statutes and the Subdivision Regulations of the Village of McFarland, Dane County, Wisconsin and under the direction of the Owners listed below, I have surveyed, divided and mapped the land described herein and that said map is a correct representation of the exterior boundaries of the land surveyed and the division thereof. Said land is described as follows:
Lands located in NE 1/4 of the SE 1/4 and the SE 1/4 of the SE1/4 of Section 2, Township 6 North, Range 10 East, Town of Dunn, Dane County, Wisconsin to-wit:
Commencing at the East 1/4 corner of said Section 2; thence S02°07'30"W, 258.00 feet along the East line of said Southeast 1/4, to the point of beginning; thence continuing S02°07'30"W, 1308.01 feet along said East line, to a point on the Northerly line of right-of-way line of the Wisconsin & Southern Railroad; thence N77°25'35"W, 1328.20 feet along said Northerly line of right-of-way line, to the Southeast corner of Outlot 7, Park View Estates; thence S02°35'02"W, 100.52 feet to a point on the Southerly right-of-way line of the Wisconsin & Southern Railroad; thence S77°25'35"E, 1329.02 feet along said Southerly line to a point on the East line of said SE1/4; thence S02°07'30"W, 360.86 feet along said South line; thence S87°40'23"W, 1316.59 feet to a point of the East line of Outlot 4, Park View Estates; thence N02°35'02"E, 704.10 feet along the East line of said Outlot 4, to a point on Southerly right-of-way line of the Wisconsin & Southern Railroad; thence N02°35'02"E, 100.52 feet to a point on the Northerly right-of-way line of the Wisconsin & Southern Railroad, also being the Southeast corner of Outlot 7, Park View Estates; thence N02°35'02"E, 1186.37 feet along East lines of Outlot 7, Outlot 9, and Lots 73 through 76, Park View Estates, the East line of Lot 1, Certified Survey Map No. 13074, the East right-of-way lines of Tuscobia Trail and Prairie Wood Drive, to a point on the North line of said SE1/4; thence N86°00'55"E, 994.08 feet along said North line; thence S02°07'30"W, 258.00 feet; thence N86°00'55"E, 310.00 feet to the point of beginning. Containing 2,409,321 square feet (51.310 acres).

Dated this _____ day of _____, 2020.

Brett T. Stoffregan, Professional Land Surveyor, S-2742

NOTES

- 1. Surveyed for: VH Rosewood Fields, LLC
6801 South Towne Drive
Madison, WI 53717
- 2. Fieldwork was completed April 3, 2020.



D'ONOFRIO KOTTKE AND ASSOCIATES, INC.
7530 Westward Way, Madison, WI 53717
Phone: 608.833.7530 • Fax: 608.833.1089
YOUR NATURAL RESOURCE FOR LAND DEVELOPMENT

DATE: April 7, 2020
F.N.: 19-07-114
C.S.M. NO. _____
DOC. NO. _____
VOL. _____ SHEET _____

CERTIFIED SURVEY MAP

LOCATED IN THE NE1/4 OF THE SE1/4 AND THE SE1/4 OF THE SE1/4
SECTION 2, T6N, R10E, VILLAGE OF McFARLAND, DANE COUNTY, WISCONSIN

OWNER'S CERTIFICATE

Utterback Limited Partnership, a Wisconsin limited partnership duly organized and existing under and by virtue of the laws of the State of Wisconsin, as owner, does hereby certify that said limited partnership caused the land described on this map to be surveyed, divided, mapped and dedicated as represented on this map.

IN WITNESS WHEREOF, the said Utterback Limited Partnership has caused these presents to be signed this _____ day of _____, 2020.

Utterback Limited Partnership

By: _____

STATE OF WISCONSIN)
COUNTY OF DANE)S.S.

Personally came before me this _____ day of _____, 2020, the above named person(s) to me known to be the person(s) who executed the foregoing instrument and acknowledged the same.

Notary Public, Dane County, Wisconsin
My commission _____

VILLAGE OF McFARLAND APPROVAL CERTIFICATE

This Certified Survey Map and the public roadway dedication shown hereon is hereby acknowledged, accepted and approved for recording by the Village of McFarland,

By: _____ Date: _____
Cassandra Suettinger, Clerk, Village of McFarland

REGISTER OF DEEDS CERTIFICATE

Received for recording this _____ day of _____, 2020 at
_____.M. and recorded in Volume _____ of Certified Survey
Maps on Pages _____ as Document Number _____.

Kristi Chlebowski, Dane County Register of Deeds



D'ONOFRIO KOTTKE AND ASSOCIATES, INC.
7530 Westward Way, Madison, WI 53717
Phone: 608.833.7530 • Fax: 608.833.1089
YOUR NATURAL RESOURCE FOR LAND DEVELOPMENT