Planning Memorandum

To: Sunfish Lake Planning Commission

From: Tom Ramler-Olson, AICP, City Planner

Date: July 7, 2021
City Planning Commission Meeting July 15, 2021

Re: 100 Windy Hill Road – Major Site Plan Review and Variance
WSB Project No. 017767-000

GENERAL INFORMATION

Applicant:	Tom Flint, Alexander Design Group
Property Owner:	Joseph and Madeline Mauer
Project Location:	100 Windy Hill Road – PID 380380006013
Existing Land Use / Zoning:	Single-Family Residential; Zoned R-1 within Shoreland Overlay District
Surrounding Land Use / Zoning:	North: Sunfish Lake East: Wetland South: Residential; Zoned Single-Family Residential District, R-1 with Shoreland Overlay West: Residential; Zoned Single-Family Residential District, R-1 with Shoreland Overlay
Comprehensive Plan:	The City of Sunfish Lake (2040) Comprehensive Plan guides this property for Rural Residential land use.

Deadline for Agency Action:		
	Application Date:	06-08-2021
	60 Days:	08-07-2021
	Extension Letter Mailed:	N/A
	120 Days:	10-06-2021

CONSIDERATIONS RELATED TO THE REQUEST

1. Overview.

Tom Flint, Alexander Design Group ("applicant"), has applied on behalf of Joseph and Madeline Mauer ("property owner") for a major site and building plan review and variance to facilitate construction of a single-family home at the property 100 Windy Hill Road ("subject property").

New structures require the review and approval of a major site and building plan. The applicant is also requesting a variance of three feet to the maximum height allowed for a

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principal structure on a residential lot, which would allow the home to have a height of 33 feet where the maximum is 30 feet.

Site and Building Plan Review and variance requests require a public hearing, and review and recommendation by the Planning Commission, followed by review and consideration by the City Council.

2. General Zoning Review

The proposed structure would be located in the north central portion of the subject site. The grade changes significantly from the private drive off Windy Hill Road to the edge of the wetland it abuts with the steeper portions closer to the wetland. The proposed is located to take advantage of the existing grading and flatter portions of the site; however, some grading is proposed to accommodate the residence, which includes a lower-level walkout design oriented towards Sunfish Lake. Stormwater management facilities are proposed at various locations around the home, including several infiltration basins located around the home and on both sides of the driveway entrance. The City Engineer has reviewed the stormwater management, erosion control, and site grading plan and found that said plans conform to ordinance requirements.

Below is a summary table of the dimensional requirements for lots and structures in the R-1 and Shoreland Overlay District.

	R-1 Minimum Requirement	Shoreland Overlay Requirement	Proposed
Buildable Area	2.5 ac	2.5 ac	11.11 ac gross More than 2.5 ac buildable
Lot Width at Building Setback	200 feet	200 feet	495 feet
Lot Width at OHWM		150 feet	>470 feet
Minimum Building Setback: Front	100 feet		198 feet
Minimum Building Setback: Side	50 feet		West: 95 ft. South: 73 ft.
Minimum Building Setback: Rear	50 feet		200 feet
Building setback from OHWM		200 feet	200 feet
Maximum Building Height	30 feet or 2.5 Stories		**33'-0"**
Maximum Building Area	10% of lot area		3.1%
Lot Coverage		30% maximum	6.4%
Septic setback from OHWM		150 feet	360 feet

***Variance requested to exceed the maximum for principal structures on residential lots*

Architectural Design / Building Materials. The design of the proposed structure features many traditional residential architectural elements, including gable ends along the front of the structure, front entry porch, hipped roofs, dormers, consistent window design, and walkout basement level along the rear side of the home. Building materials include cedar shakes for the siding and roof; stone veneer adorns the lower portion of the home's exterior. These materials are consistent with the surrounding residential context and are allowed by the Zoning Ordinance. A pool house is located northeast of the home and is connected to it via an underground hallway. It also features the same design and materials as the home. Between the pool house and home is a swimming and patio.

Building Height. The applicant has provided elevation drawings of the proposed home, which indicate the average grade elevation of 953 feet and show the requested height of the home measured from that elevation. The home is proposed to have a height of 33 feet. According to the Ordinance, no building structure shall exceed two and a half stories or 30 feet in height above average existing grade. The applicant is requesting a variance to that maximum height. That request is evaluated later in this report.

Vehicular Access. A driveway comes off an access road beginning at the southeast corner of the parcel from Windy Hill Road to a proposed attached garage and a circular drive at the entry of the home. The driveway area will be graded such that slopes do not exceed 12 percent. A culvert is located under the driveway before approaching the circular drive. Areas will be graded at both ends of the culvert to retain and infiltrate stormwater.

Lighting. Exterior lighting of homes or property is allowed as necessary for safety purposes provided the impact on surrounding properties is minimized and complies with Section 1216.06 of the Zoning Ordinance. The applicant has plans showing exterior sconces at various locations attached to the side of the home and path lights lining walkways close to the home. These path lights are 2 feet in height and covered to cast light downward. The location of these path lights are shown in Sheet L2.1 of the Landscape Plan. According to the Ordinance, all lights which cast any light on residential property or over public water shall not exceed one-foot candle (meter reading) as measured from the edge of water abutting the subject property. Upon installation, all lighting shall adhere to this additional requirement.

Grading, Drainage, and Erosion Control. The home is being located in the center of the property. The lot has existing grades that from the center of the lot slope down to Sunfish Lake on the north part of the property, toward the wetland on the east, and south toward the south entry of the property. The project will require some modification of existing site grades.

Plans submitted by the applicant show a proposed impervious cover amount of 6.4 percent, which complies with the 30 percent maximum for lots within the Shoreland Overlay District.

The applicant has a stormwater pollution prevention plan intended to control potential erosion and sediment movement commonly associated with construction on sensitive sites. Proposed erosion mitigation measures include stabilization of all exposed soil areas, stabilization mats on steep slopes, silt perimeter erosion control, a temporary sediment basin, and an on-site stormwater management system consisting of infiltration basins and an underground infiltration pipe gallery.

The applicant is proposing to fill an on-site wetland and replace with banking credits. This review is part of a separate process through the Wetland Conservation Act (WCA). Construction will not be permitted to begin prior to final approval through WCA.

The City Engineer has reviewed plans submitted by the applicant and provided comments in the memos dated June 30, 2021, and July 6, 2021. As a condition of major site plan approval, the applicant must adhere to any follow up recommendations from the City Engineer.

Landscaping and Tree Preservation. The applicant has provided an existing tree inventory as well as a landscaping plan. The total number of trees on site is 594. Of that amount, the applicant has identified 493 that will be saved. A number of those saved trees will be surrounded a 4-foot-high protective barrier during construction. Plans also show the removal of 83 trees in the area of the proposed building, driveway and septic area, as well as other areas of the parcel. Each removed tree will be replaced 1:1 and the locations of those

replacements are provided on the Landscape Plan. The schedule of replacement trees is provided on Sheet L3.2. Shrubs and perennials are also included in the proposed landscaping on the property. The City Forester has reviewed the proposed plans and tree inventory and approves of what is shown.

Screening. The property is well screened from houses to the east and west. As shown on the landscape plan, extra plantings are proposed in those directions to provide additional screening. Shrubs and perennials are planned along long stretches of the home's exterior, which will soften the home's appearance on the landscape.

Well and Septic. Well and septic locations are identified on the development plans. Primary and secondary septic locations are shown, each located on one side of the driveway in the area of the parcel. A well location is shown northeast of the proposed home. No comment on the plans were provided by the City's septic inspector. Prior to issuance of a building permit, the applicant must demonstrate to the City that a septic permit has been attained for the system that staff has reviewed and recommended for approval.

Fire Safety. The Fire Chief was provided a set of site and building plans and did not offer any comments or concerns.

DNR Approval. Minnesota DNR area Hydrologist Taylor Huinker was notified of the proposed request. The Hydrologist did not offer any further comments or express concerns.

3. Ordinance Authority

SECTION 1206.2 PROCEDURES provides the process for review of a variance request which requires public notice and notification, a public hearing, and review and recommendation by the Planning Commission, followed by review and consideration by the City Council.

SECTION 1208.03.B. MAJOR SITE PLAN APPROVAL PROCEDURES provides the process for review of a major site and building plan which requires public notice and notification, a public hearing, and review and recommendation by the Planning Commission, followed by review and consideration by the City Council.

4. Variance

The Planning Commission, as its basis of recommendation, and the City Council, as its basis for decision on land use matters, shall evaluate requests for deviations from the literal provisions of the Zoning Ordinance in instances where compliance with the requirements of this Ordinance would cause practical difficulties because of circumstances unique to the individual property under consideration. Criteria used to evaluate variance requests are described in Section 1206.01.C. Requests must satisfy each criterion in order to receive Staff's recommendation of approval. Those criteria are listed below with staff's comments provided in *italics*.

The applicant believes the project meets the criteria as the variance request will not:

a. Impair an adequate supply of light and air to adjacent property.

   The applicant has located the proposed home so that no light or air is blocked from any adjacent property.

b. Unreasonably increase the congestion in the public street.

The proposed height will not increase traffic in the area.

c. Have the effect of allowing any district uses prohibited therein, permit a lesser degree of flood protection than the flood protection elevation for the particular area, or permit standards which are lower than those required by State law.

The proposed use is permitted within the R-1 district and Shoreland Overlay. The home has been sited and designed to comply with the required floor protection elevation for the area. It will not permit standards which are lower than those required by State law.

d. Increase the danger of fire or endanger the public safety.

The proposed height will not increase the danger of fire or endanger public safety.

e. Unreasonably diminish or impair established property values within the neighborhood, or in any way be contrary to the intent of this Title.

The project is expected to increase the property value of the subject parcel and will conform to the quality of development within the neighborhood.

f. Violate the intent and purpose of the Comprehensive Plan.

The Comprehensive Plan supports low-impact residential projects such what the applicant has proposed. The project is not expected to violate the intent or purpose of the Comprehensive Plan.

A variance from the terms of this Ordinance shall not be granted unless it can be demonstrated that:

a. Practical difficulties will result if the variance is denied due to the existence of special conditions and circumstances which are peculiar to the land, structure, or building involved and which are not applicable to other lands, structures or buildings in the same district.

1) Special conditions may include exceptional topographic or water conditions or, in the case of an existing lot or parcel of record, narrowness, shallowness, insufficient area or shape of the property.

2) Practical difficulties caused by the special conditions and circumstances may not be solely economic in nature, if a reasonable use of the property exists under the terms of this Title.

3) Special conditions and circumstances causing practical difficulties shall not be a result of lot size or building location when the lot qualifies as a buildable parcel.

While the size of the lot and the location of the proposed home meet ordinance requirements, there is some topographic change within the buildable part of the lot that would require excessive grading and removal of trees from a heavily forested lot for the proposed home to meet the height restrictions for a principal structure. By pulling the building three feet higher above the average grade elevation, less grading will be necessary and approximately 21 trees will be saved. These saved trees will not only maintain the natural features of the site, but also preserve the natural buffer they offer as they are located between the proposed improvements and neighboring properties.

b. Compliance with the requirements of the provisions of this Ordinance would deprive the applicant of rights commonly enjoyed by other properties in the same district under the terms of this Ordinance or deny the applicant the ability to put the property in question to a reasonable use and the proposed variance permits the owner to use the property in a reasonable manner.

The applicant is proposing a height that reduces disturbances from grading and removal of trees, which is imposed by the topography of the lot. The variance allows the property owners to use the property in a similar manner as other properties that exhibit similar topographic changes, which is a common condition for lakeshore properties and others around the City. The preservation of trees and reducing the risks to the quality of water bodies is a goal of the City and is encouraged by its policies.

c. The special conditions and circumstances causing the practical difficulties do not result from the actions of the applicant.

The existing natural conditions on the property coupled with maintaining the required setbacks from the ordinary high water mark and property lines are circumstances causing the practical difficulties. The variance allows the proposal to maintain those setbacks and preserve natural features for the benefit and enjoyment of both the property owners and their neighbors.

d. Granting the variance request will not confer on the applicant any special privilege that is denied by this Ordinance to other lands, structures or buildings in the same district under the same conditions.

The proposed project is to allow a 3-foot deviation in height to reduce grading and saving trees on a heavily forested lot. Preservation practices like this are encouraged by the City through its policies and development standards that all projects are evaluated against. The variance does not grant any special privileges.

e. The request is not a use variance.

The request is a height variance, not a use variance.

f. The variance requested is the minimum variance necessary to accomplish the intended purpose of the applicant.

The variance is to allow an additional 3 feet of height above the average grade to allow the applicant to construct a home that works with the existing topography that reduces the amount of disturbance to the landscape and saves trees that would otherwise be removed by complying with the height restriction.

g. The request does not create an inconvenience to neighboring properties and uses.

The variance is not expected to inconvenience neighboring properties and disrupt those owners' use of their property.

h. The variance requested is in harmony with the purpose and intent of the Ordinance.

The restriction on building heights is one standard intended to establish a residential district with low-density single family detached residential dwelling units and directly related, complementary uses. The request does not conflict with this purpose.

i. The variance requested is consistent with the Comprehensive Plan.

The request complies with the guided land use described in the City's Comprehensive Plan and also advances goals related to environmental preservation.

j. The variance requested will not alter the essential character of the locality.

The variance will maintain the established low-density residential character in the immediate area.

5. Site Plan Review Criteria

The Planning Commission, as its basis of recommendation, and the City Council, as its basis for decision on major projects, shall evaluate the effects of the proposed site and building plans. This review shall include, but is not limited to the following, with staff's comments provided in *italics*:

A. Whether the proposed improvements are compatible and in harmony with the existing structures in the surrounding community.

The project proposes the construction of a detached single-family structure. The architectural design and placement of the structure is compatible with surrounding residences. The improvements comply with the applicable setback, yard, and lot coverage requirements. Should the variance for height be approved, the improvements will also meet that building standard.

B. Whether the proposed improvements preserve the character and nature of the surrounding community, including the natural landscape and woodland characteristics of the community.

The entire property is heavily wooded, and the improvements have been designed and sited to preserve many trees around the areas to be disturbed. The trees that are planned for removal will be replaced, one-for-one. A tree inventory of this site was submitted and reviewed by the City Forester. Also, the proposal preserves some of the lot's natural grading to create a home that is compatible with design featured in other nearby homes.

C. Whether the proposed improvements are not constructed of unsightly, improper or unsuitable materials.

Building materials are include cedar shakes for the siding and roof and stone veneer along the lower portion of the home's exterior. The design also includes stone lintels along lower-level windows.

D. Whether the proposed improvements will not materially adversely affect any natural resources in the community, except when there is no feasible and prudent alternative to the proposed location of the improvements. For purposes of this clause, "natural resources" shall include, but not be limited to, all mineral, animal, botanical, air, water, land, timber, soil, quietude, recreational, historical, scenic and aesthetic resources.

The project is not expected to adversely impact any of the above noted natural resources.

E. Whether the proposed site and improvements shall have an appearance that will not have an adverse effect upon adjacent residential properties.

The architecture of the proposed residence is traditional with entry porch, hipped roof, gable ends, and ribbon windows. The building complies with the applicable exterior material and setback requirements. Accordingly, the appearance is not likely to have an adverse effect on adjacent properties.

F. Whether the proposed site improvement complies with drainage requirements, as provided in Section 1216.04 of this Ordinance.

Drainage plans were reviewed by the City Engineer. The proposed improvements would comply with requirements regarding engineering, stormwater management, and site grading.

G. Whether the proposed site and improvements are consistent with the purposes of this Ordinance and the Property Owner Reference & Development Guide Manual, as established by City Council resolution.

The proposed improvements comply with the general provisions of the R-1 District, Shoreland Overlay District, and other applicable design and performance standards.

RECOMMENDATION

Based on the foregoing considerations and applicable ordinances, staff recommends conditional approval of the site and building plan and variance subject to the following findings of fact and conditions of approval:

Findings of Fact:

1. The location of the subject property is as follows:

   100 WINDY HILL ROAD
   SUNFISH LAKE, MN 55077

2. The planning report dated July 8, 2021, prepared by WSB is incorporated herein by reference.

3. The Applicant submitted applications for a major site and building plan review and a variance request.

4. Requests for major site and building plan review and variances require Planning Commission review and City Council approval.

5. Notices for public hearings regarding requests on lots within the Shoreland Overlay district must be sent to the Department of Natural Resources.

6. The Sunfish Lake Planning Commission reviewed the applicant's request for major site and building plan and variance approval at the July 15, 2021, Planning Commission meeting.

7. Upon review of the planning report and application information, the Planning Commission found that the proposed site and building plan and variance meet Ordinance requirements. The following findings support the Planning Commission's recommendation for approval:

   Principal Structure Height Variance:

   a. Practical difficulties result from unique topography within the building area and restrictions imposed by setbacks from the ordinary high water mark and lot lines. The applicants have sited and design the home to work as much as possible with existing grades, which would be compromised with lower building height. Additional difficulties arise from preserving trees around the site of the improvements that would need to be removed because of damage that would come from more excavation than what is proposed.

   b. The applicants propose to use the parcel in a reasonable manner. They are proposing a permitted single-family residential use and wish to construct a home that will be of the same quality as other homes in the area, yet reflective of the scale of the parcel. The proposed height will reasonably site the building so it does not risk needing more grading than what is proposed and removing trees that add screening between the proposed structure and its neighbors.

   c. The applicant's request is consistent with the intent of the City's Comprehensive Plan and Zoning Ordinance by proposing a home which, with the exception of the building height, meets design and performance requirements of the City.

   d. Given the approval of the variance, the home is not anticipated to impact the character of the locality. While the proposed home is designed to be larger than most, its site is also very large and the site design maintains existing landscape features and vegetation to mitigate the size of improvements as viewed from outside the parcel. Also, the home has been designed and sited in such so as to reduce the grading and removal of trees than otherwise necessary.

   Major Site and Building Plans:

   a. The proposed improvements meet R-1 and Shoreland Overlay District requirements and standards.

   b. The proposed development addresses Ordinance requirements pertaining to grading, drainage and stormwater management, landscaping, and screening.

   c. The proposed home meets Ordinance requirements pertaining to building size, and material use (with the exception of the height which the applicant is seeking a variance from City Council).

   d. The development meets other applicable Zoning Ordinance criteria.

Conditions of Approval:

1. Construction shall occur in substantial conformance with the plans presented at the July 15, 2021, Planning Commission meeting.
2. Compliance with the City Engineer's memos dated June 30, 2021, and July 6, 2021.
3. Exterior lighting shall not exceed one (1) foot candle (meter reading) as measured at the property line.

4. The applicant must obtain a septic permit prior to issuance of building permits.
5. The applicant must obtain all other permits as may be required.
6. The applicant shall comply with all applicable federal, state, and local laws, rules and ordinances.
7. The applicant must adhere to and remain in compliance with the requirements of the Resolution approving their requests, applicable performance standards, and such other requirements as may apply.
8. All conditions of the site plan review and variance must be complied with, shall run with the land, and shall not in any way be affected by the subsequent sale, lease or other change from current ownership of the Property.
9. The Resolution approving the applicant's requests is subject to the condition that all representations, written and oral, made by the applicant and its agents and representatives to the City contained in and concerning the applicant's application for the site plan review and variance must have been true, complete and accurate at the time they were made, and that they remain true and accurate for the duration of the development.
10. By undertaking the activities approved by the requests, the applicant agrees to all conditions.

Subject Site

CITY OF *Sunfish Lake* MINNESOTA

Planning Commission Findings of Fact & Recommendation
(Approval)

Applicant's Name: Tom Flint, Alexander Design Group, on behalf of owner, Joseph and Madeline Mauer

Request: The applicant requests City approval of a major site and building plan to construct a new home at 100 Windy Hill Road and a variance for the home to exceed the maximum height of a principal structure on a residential lot

Planning Commission Meeting Date: July 15, 2021

Findings of Fact: Based on review of the application and evidence received, the Sunfish Lake Planning Commission now makes the following findings of fact and recommendation:

1. The location of the subject property is as follows:

   100 WINDY HILL ROAD
   SUNFISH LAKE, MN 55117

2. The planning report dated July 8, 2021 prepared by WSB is incorporated herein by reference.

3. The Applicant submitted applications for a major site and building plan review and a variance request.

4. Requests for major site and building plan review and variances require Planning Commission review and City Council approval.

5. Notices for public hearings regarding requests on lots within the Shoreland Overlay district must be sent to the Department of Natural Resources.

6. The Sunfish Lake Planning Commission reviewed the applicant's request for major site and building plan and variance approval at the July 15, 2021, Planning Commission meeting.

7. Upon review of the planning report and application information, the Planning Commission found that the proposed site and building plan and variance meet Ordinance requirements. The following findings support the Planning Commission's recommendation for approval:

   Principal Structure Height Variance:

a. Practical difficulties result from unique topography within the building area and restrictions imposed by setbacks from the ordinary high water mark and lot lines. The applicants have sited and design the home to work as much as possible with existing grades, which would be compromised with lower building height. Additional difficulties arise from preserving trees around the site of the improvements that would need to be removed because of damage that would come from more excavation than what is proposed.

b. The applicants propose to use the parcel in a reasonable manner. They are proposing a permitted single-family residential use and wish to construct a home that will be of the same quality as other homes in the area, yet reflective of the scale of the parcel. The proposed height will reasonably site the building so it does not risk needing more grading than what is proposed and removing trees that add screening between the proposed structure and its neighbors.

c. The applicant's request is consistent with the intent of the City's Comprehensive Plan and Zoning Ordinance by proposing a home which, with the exception of the building height, meets design and performance requirements of the City.

d. Given the approval of the variance, the home is not anticipated to impact the character of the locality. While the proposed home is designed to be larger than most, its site is also very large and the site design maintains existing landscape features and vegetation to mitigate the size of improvements as viewed from outside the parcel. Also, the home has been designed and sited in such so as to reduce the grading and removal of trees than otherwise necessary.

Major Site and Building Plans:

a. The proposed improvements meet R-1 and Shoreland Overlay District requirements and standards.

b. The proposed development addresses Ordinance requirements pertaining to grading, drainage and stormwater management, landscaping, and screening.

c. The proposed home meets Ordinance requirements pertaining to building size, and material use (with the exception of the height which the applicant is seeking a variance from City Council).

d. The development meets other applicable Zoning Ordinance criteria.

RECOMMENDATION

Based on the foregoing considerations and applicable ordinances, staff recommends conditional approval of the site and building plan and variance subject to the following conditions of approval:

1. Construction shall occur in substantial conformance with the plans presented at the July 15, 2021 Planning Commission meeting.
2. Compliance with the City Engineer's memos dated June 30, 2021, and July 6, 2021.
3. Exterior lighting shall not exceed one (1) foot candle (meter reading) as measured at the property line.
4. The applicant must obtain a septic permit prior to issuance of building permits.
5. The applicant must obtain all other permits as may be required.
6. The applicant shall comply with all applicable federal, state, and local laws, rules and ordinances.
7. The applicant must adhere to and remain in compliance with the requirements of the Resolution approving their requests, applicable performance standards, and such other requirements as may apply.
8. All conditions of the site plan review and variance must be complied with, shall run with the land, and shall not in any way be affected by the subsequent sale, lease or other change from current ownership of the Property.
9. The Resolution approving the applicant's requests is subject to the condition that all representations, written and oral, made by the applicant and its agents and representatives to the City contained in and concerning the applicant's application for the site plan review and variance must have been true, complete and accurate at the time they were made, and that they remain true and accurate for the duration of the development.
10. By undertaking the activities approved by the requests, the applicant agrees to all conditions.

Adopted by the Sunfish Lake Planning Commission this 15th day of July 2021.

City of Sunfish Lake

By: _____
Tom Hendrickson
Planning Commission Chair

ATTEST

_____
Catherine Iago, City Clerk

Memorandum

To: Tom Ramler-Olson, AICP – City Planner

From: Jeff Sandberg, PE – City Engineer
Lydia Ener, PE – Project Engineer
Kendra Fallon, PE – Project Engineer

Date: June 30, 2021

Re: 100 Windy Hill Road – Major Site Plan Review and Variance
City of Sunfish Lake, MN
WSB Project No. 017767-000

Project Background

The Applicant is proposing to construct a new house along with the necessary grading and stormwater management improvements on a parcel of land that currently has a home and a garage that are proposed to be demolished. The following review is only for the engineering, stormwater management, and site grading issues. The building compliance will be handled by the City planners and building officials. Comments are based on the submittal received from the applicant on June 8, 2021 containing plans of the same date.

The following requirements and comments need to be addressed as the project moves forward:

General Notes

1. All retaining walls will need engineered drawings submitted for review by the City of Sunfish Lake Building Official.
2. A NPDES permit will need to be obtained prior to construction and a copy of the permit must be submitted to the City when obtained.

Stormwater Management and Storm Sewer Design

1. Applicant should include information on the sizing of the box culvert proposed below the driveway as this was not included in the HydroCAD modeling.
2. Both infiltration basins should have a defined spillway emergency overflow included with the location and elevation shown on the plans. It appears the eastern basin does not currently have this.
3. The datum used on the plans should be noted. Applicant should confirm the OHWL is listed in the datum the plans are drawn in (current elevation is listed in NAVD29 datum).
4. The 947 contour is shown to bisect the proposed building near the west infiltration basin. Applicant should confirm the low floor elevation of the building is a 948.8.
5. It is recommended the applicant add an additional structure just east of the underground infiltration system and drop the invert of the pipe so that the proposed storm sewer doesn't have a slope of over 10%.

Rate Control

1. The site is currently shown to be meeting rate control, however the applicant must confirm rate control is still met once the modeling updates noted in this memo are made.
2. The existing conditions drainage area map and HydroCAD models should be updated to include delineating to the existing wetland onsite and including that wetland as a ponding

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node in the existing conditions. The wetland outlet should be routed to the runoff reach in the existing conditions model.

3. Applicant should confirm that a 2x multiplier should be applied to the 12" horizontal orifice in the proposed conditions outlet for the West Infiltration Basin. If the multiplier is correct, the applicant should note what this is modeling.
4. Since an impermeable liner is proposed around the sides of the west infiltration basin, exfiltration in the proposed conditions model for the west infiltration basin should only be being applied to the basin bottom surface area (at 944.5).

Volume Control

1. Volume control requirements are currently being met by the two infiltration basins and one underground infiltration system. The applicant must confirm infiltration is feasible in the locations noted (see next comment). If infiltration is not shown to be feasible in those locations, the applicant may need to alter the design in order to meet volume control.
2. The second geotechnical report included (completed by Soil Investigation and Design) shows soil borings 3 and 4 within the proposed west infiltration basin and soil boring 6 located near the proposed east infiltration basin. It should be clarified if the infiltration rates noted on the soil borings are based on in field testing or other data.
    a. Soil borings three, four and six show a layer of clay loam soils (CL-ML) at the depth of the proposed infiltration basins, which is classified as a HSG C soil. MN Stormwater Manual recommends an exfiltration rate of 0.2 in/hr for HSG C soils.
    b. The first geotechnical report shows B soils are present onsite however based on the map provided it appears these soil borings were completed around the existing dwelling which is not near the proposed infiltration basins.

Water Quality

1. The applicant is currently meeting the volume control standard and per the City's Engineering Guidelines the water quality control standard shall be considered satisfied if the volume control standard has been met.
2. The total site impervious noted in the water quality volume table is not equal to sum of the impervious noted in the table and does not match what is called out on the plans. The total site impervious in the water quality volume table should be updated.

Erosion Control and Restoration

1. Note the proposed location of temporary soil or dirt stockpiles on the plan, and the stabilization methods for the stockpiles.

Wetlands

The applicant is proposing to fill an on-site wetland and replace with banking credits. This review is part of a separate process through the Wetland Conservation Act. Construction will not be permitted to begin prior to final approval through WCA.

Conclusions and Recommendations

Based upon our review of the engineering, stormwater management and site grading for this proposed development, we have determined that the proposed site and grading plans submitted on June 8, 2021 require revisions per the above-noted items in this memorandum. Therefore, we hereby find the proposed plans not to be in accordance with City requirements and recommend denial from an engineering standpoint for this project until these items are addressed.

We are requesting a new set of plans addressing these comments and new drainage calculations be resubmitted to our office prior to approval. We request that the Applicant restate each comment from this memorandum and detail how each comment was addressed.

PIERCE PINI & ASSOCIATES, INC.
9298 Central Avenue NE, Suite 312, Blaine MN 55434
Phone: 763.537.1311 rhonda@piercepini.com

Memorandum

To:	Jeff Sandberg, WSB
From:	Rhonda Pierce, Pierce Pini & Associates, Inc. (PPA)
cc:	Tom Flint, Alexander Design Group
	File
Date:	07.06.2021
Subject:	100 Windy Hill Road – Major Site Plan Review and Variance
	City of Sunfish Lake, MN
	WSB Project No. 017767-000

The following are our responses to the items outlined in the Comments on the submittal received from the applicant on June 8, 2021, containing plans of the same date. Plans and calculations have been revised to address these comments as shown below. PPA responses are shown in ***bold italics***.

General Notes

1. All retaining walls will need engineered drawings submitted for review by the City of Sunfish Lake Building Official. ***PPA Response: The retaining wall design is by the Landscape Architect and engineered drawings will be provided for permit.***

2. A NPDES permit will need to be obtained prior to construction and a copy of the permit must be submitted to the City when obtained. ***PPA Response: The General Contractor will submit a copy of the NPDES permit to the city.***

Stormwater Management and Storm Sewer Design

3. Applicant should include information on the sizing of the box culvert proposed below the driveway as this was not included in the HydoCAD modeling. ***PPA Response: The box culvert has been replaced with a 36" reinforced concrete pipe, see C4.0 Storm Sewer Plan. Pipe sizing calculations are included in the stormwater report. The pipe is purposely oversized to alleviate blockage as this serves as an overland overflow point for the west infiltration basin.***

4. Both infiltration basins should have a defined spillway emergency overflow included with the location and elevation shown on the plans. It appears the eastern basin does not currently have this. ***PPA Response: See sheet C2.1 for emergency overflow route for each basin.***

5. The datum used on the plans should be noted. Applicant should confirm the OHWL is listed in the datum the plans are drawn in (current elevation is listed in NAVD29 datum). ***PPA Response: The datum is indicated on the site survey by Advance Survey and Engineering. See General Note #48 on C0.0.***

6. The 947 contour is shown to bisect the proposed building near the west infiltration basin. Applicant should confirm the low floor elevation of the building is a 948.8. ***PPA Response: There is a portion of the lower level of the house that is above ground. This was shown dashed previously but it indicated by a solid line on the revised plans. The lowest level egress floor elevation is 948.8. See C3.0 for grading.***

7. It is recommended the applicant add an additional structure just east of the underground infiltration system and drop the invert of the pipe so that the proposed storm sewer doesn't have a slope of over 10%. ***PPA Response: Added additional structure Manhole 26. See sheet C4.0 Storm Sewer Plan.***

Rate Control

8. The site is currently shown to be meeting rate control, however the applicant must confirm rate control is still met once the modeling updates noted in this memo are made. ***PPA Response: The modeling updates have been made and rate control is met.***

9. The existing conditions drainage area map and HydroCAD models should be updated to include delineating to the existing wetland onsite and including that wetland as a ponding node in the existing conditions model. ***PPA Response: The Existing Drainage Map and Existing Conditions HydroCAD model have been updated. Both are included in the revised Stormwater Report.***

10. Applicant should confirm that a 2x multiplier should be applied to the 12" horizontal orifice in the proposed conditions outlet for the West Infiltration Basin. If the multiplier is correct, the applicant should note what this is modeling. ***Response: PPA Removed 2X multiplier and noted horizontal orifice as overflow AD 23. See stormwater report and sheet C4.0.***

11. Since an impermeable liner is proposed around the sides of the west infiltration basin, exfiltration in the proposed conditions model for the west infiltration basin should only be being applied to the basin bottom surface area (at 944.5). ***PPA Response: Revised the infiltration as the basin bottom contour. See 3.0 Grading Plan and revised Stormwater Report.***

Volume Control

12. Volume control requirements are currently being met by the two infiltration basins and one underground infiltration system. The applicant must confirm infiltration is feasible in the location noted (see next comment). If infiltration is not shown to be feasible in those locations, the applicant may need to alter the design in order to meet volume control. ***PPA Response: The stormwater system areas have been revised to note that subgrade soils from the bottom of the system to the OHWL will be removed and imported sand backfill installed so areas will infiltrate. The infiltration rate is 0.80 inches/hour for A-type soils. See 4.1 Stormwater Management Plan and revised Stormwater Report.***

13. The second geotechnical report included (completed by Soil Investigation and Design) shows soil borings 3 and 4 within the proposed west infiltration basin and soil boring 6 located near the proposed east infiltration basin. It should be clarified if the infiltration rates noted on the soil borings are based on in field testing or other data. ***PPA Response: See response #12.***

    a. Soil borings three, four and six show a layer of clay loam soils (CL-ML) at the depth of the proposed infiltration basin, which is classified as a HSG C soil. MN Stormwater Manual recommends an exfiltration rate of 0.2 in/hr for HSG C soils. ***PPA Response: See response #12.***

    b. The first geotechnical report shows B soils are present onsite however based on the map provided it appears these soil borings were completed around the existing dwelling which is not near the proposed infiltration basins. ***PPA Response: See response #12.***

Water Quality

14. The applicant is currently meeting the volume control standard and per the City's Engineering Guidelines the water quality control standard shall be considered satisfied if the volume control standard has been met. ***PPA Response: The volume control and water quality standards have been met. See revised Stormwater Report.***

15. The total site impervious noted in the water quality volume table is not equal to sum of the impervious noted in the table and does not match what is called out on the plans. The total site impervious in the water quality volume table should be updated. ***PPA Response: Area calculations have been revised and coordinated.***

Erosion Control and Restoration

16. Note the proposed location of temporary soil or dirt stockpiles on the plan, and the stabilization methods for the stockpiles. ***PPA Response: This is a contractor means and methods item but a temporary stockpile area has been shown on the plans with the proper erosion and sediment controls. See C2.1 Erosion and Sediment Control – Site Layout.***

Wetlands

17. The applicant is proposing to fill an on-site wetland and replace with banking credits. This review is part of a separate process through the Wetland Conservation Act. Construction will not be permitted to begin prior to final approval. ***PPA Response: Noted.***

Conclusions and Recommendations

18. Based upon our review of the engineering, stormwater management and site grading for this proposed development, we have determined that the proposed site and grading plans submitted on June 8, 2021 require revisions per the above-noted items in this memorandum. Therefore, we hereby find the prosed plans not to be in accordance with City requirements and recommend denial from an engineering standpoint for this project until these items are addressed. ***PP Response: Drawings and Stormwater Report have been revised to address comments.***

19. We are requesting a new set of plans addressing these comments and new drainage calculations be resubmitted to our office prior to approval. We request that the Applicant restate each comment from this memorandum and detail how each comment was addressed. ***PPA Response: See Response #18 above.***

Emailed Comment sent 07/01/2021 from Jeff Sandberg to Tom Flint

20. Please have a detailed planting and restoration plan added to the Civil plan for each of the stormwater basins. The plan now states "see the landscape plan", and that plan does not adequately identify plantings in accordance with the detail in the Civil plans. We've had issues recently where the landscaper sods over the infiltration basins, and that is not consistent with MPCA guidelines for infiltration basins. ***PPA Response: This has been revised on Landscape Plan, See L3.0.***

End of Memorandum

Memorandum

To: Tom Ramler-Olson, AICP – City Planner

From: Jeff Sandberg, PE – City Engineer
Lydia Ener, PE – Project Engineer
Kendra Fallon, PE – Project Engineer

Date: July 6, 2021

Re: 100 Windy Hill Road – Major Site Plan Review and Variance
City of Sunfish Lake, MN
WSB Project No. 017767-000

Project Background

The Applicant is proposing to construct a new house along with the necessary grading and stormwater management improvements on a parcel of land that currently has a home and a garage that are proposed to be demolished. The following review is only for the engineering, stormwater management, and site grading issues. The building compliance will be handled by the City planners and building officials. Comments are based on the submittal received from the applicant on July 6, 2021.

The following requirements and comments need to be addressed as the project moves forward:

General Notes

1. All comments have been addressed. Engineering drawings for retaining walls will be required for building permit. A copy of the NPDES permit and wetland permit must be provided by the applicant prior to any earthwork commencing.

Stormwater Management and Storm Sewer Design

1. All previous comments have been addressed and there are no additional comments on the stormwater management or storm sewer design.

Rate Control

1. The site is shown to be meeting rate control with the current design. All previous comments have been addressed and there are no additional comments.

Volume Control

1. Volume control requirements are being met by the two infiltration basins and one underground infiltration system. All previous comments have been addressed.
2. Applicant must notify the City if infiltration rates found in the field do not meet or exceed the design infiltration rate of 0.8 inches per hour.

Water Quality

1. The applicant is currently meeting the volume control standard and per the City's Engineering Guidelines the water quality control standard shall be considered satisfied if the volume control standard has been met.

701 XENIA AVENUE S | SUITE 300 | MINNEAPOLIS, MN | 55416 | 763.541.4800 | WSBENG.COM

Erosion Control and Restoration

1. All comments have been addressed.

Wetlands

The applicant is proposing to fill an on-site wetland and replace with banking credits. This review is part of a separate process through the Wetland Conservation Act. Construction will not be permitted to begin prior to final approval through WCA.

Variance Request for Building Height

Staff has reviewed the submitted materials related to the height variance for the building. Staff can confirm that overall grading limits will be reduced and the distance of site disturbance to the lake will be increased with the current grading plan (with the variance). Additionally, a number of mature trees will be protected and saved with the plan as currently proposed. For these reasons, from an engineering standpoint, staff supports the variance request.

Conclusions and Recommendations

Based upon our review of the engineering, stormwater management and site grading for this proposed development, we have determined that the proposed site and grading plans submitted on July 6, 2021 are found to be in accordance with City requirements and we recommend approval from an engineering standpoint for this project.

Summary of Project

The homeowners at 100 Windy Hill Road bought the property with the intention of continuing to raise their family in Sunfish Lake. They have several family members in and around the community and felt this was the best location for their future. Having been residences of the community for several years they have grown to appreciate living in such a small, tight knit, community.

We are proposing a single-family home on the property, located in the northwestern corner of the parcel, leaving a majority of the 40-acre property un-touched. We have worked with the city engineer, forester, inspector and planner to place the house in a location to minimize the impact on the site and surrounding properties. The house was designed to meet the zoning requirements of the city (setbacks, building coverage, building height, etc.). However, following a meeting with the city planner, city engineer and mayor we discussed raising the house out of the ground by three feet in order to reduce the amount of grading and tree removal needed for the house to be built. Discussing this with the city officials, we made the determination that it would be a greater benefit to the neighboring properties and the lake if the home were allowed to be pulled out of the ground by three feet. The structure did not get any taller, we simply lifted it up out of the ground by three feet in order to create positive drainage around the house and save 21 mature trees, mostly located between the house and the lake. To the neighboring properties and anyone viewing the house from the lake the house will not appear any larger or taller if we are granted the variance we are requesting. The entire mass of the house remains identical whether we place the house within the building height requirements or if we are granted the variance of lifting the house three feet. The only change to the surrounding properties is that the area of grading and number of trees will be reduced if we are granted the building height variance.

Practical Difficulties

1. **Practical difficulties of existing site:**

   The existing site is heavily forested and has a lot of topographic undulation. In the 7.85 acre site where the house is proposed there are 594 trees and the grade changes vertically by 16 feet (within the building setbacks) and 23 feet between the highest point and the level of the lake. Since building height is calculated by using the existing grades on the site, it forces the house down into the ground and requires extensive grading and earthwork to be performed.

   The property owners bought this property with the expectation of being able to build a large home (since this is one of the largest properties in the city). We were able to design a home that fit within the parameters of the city code but it required a fair amount of grading and tree removal. By allowing the house to be pulled out of the ground three feet we are able to minimize the amount of grading needed as well as save 21mature trees.

2. **Compliance with the requirements of the provisions of this Ordinance would deprive the applicant of rights commonly enjoyed by other properties in the same district under the terms of this Ordinance or deny the applicant the ability to put the property in question to a reasonable use and the proposed variance permits the owner to use the property in a reasonable manner:**
   The property owners want to maintain as much of the natural aspects of the site as is possible. They are looking to minimize the disturbance and disruption to the site as possible while also building a house that suits the lot size and value. By bringing the house out of the ground by three feet we limit the amount of grading work needed as well as saving 21 trees (mostly between the house and lake). This also maintains more of the natural buffer between the house and the lake (reducing the visibility of the house from the lake).

3. **The special conditions and circumstances causing the practical difficulties do not result from the actions of the applicant.**
   The property has seen zero development for at least 40 years. It is a heavily forested site as well as being very hilly. This is the state of the property that applicants purchased with the intention of building a new single-family home.

4. **Granting the variance requested will not confer on the applicant any special privilege that is denied by this Ordinance to other lands, structures or buildings in the same district under the same conditions:**
   Due to the variation in topography placing any new structure on the site will result in the loss of trees as well as substantial regrading. The property owners are requesting a variance to the building height in order to minimize the impact on the site and to better conform to the overall aesthetic and doctrine of Sunfish Lake.

5. **The request is not a use variance:**
   The request is not for a use variance. The property is an existing single-family home and will continue to be a single-family home

6. **The variance requested is the minimum variance necessary to accomplish the intended purpose of the applicant:**
   The property owners are attempting to minimize the amount of disruption to an existing site. By requesting the variance to the building height, we minimize the amount of disturbance and save 21 trees. To the neighboring properties the building height will appear nearly identical while a larger buffer will be maintained between the house and the neighbors. However, if the variance is not granted, the perceived building height will not be much different, yet, the impact to the surrounding trees and landscape will be much more invasive.

7. **The request does not create an inconvenience to neighboring properties and uses**:

By granting this variance request, the impact on the neighboring properties would be less extensive than if we complied with the building height. The building simply fits better on the site by raising it out of the ground.

8. **The variance requested is in harmony with the purpose and intent of the Ordinance:**
   The intent of the ordinance is to provide privacy and visual space between structures. It is also to maintain as much of the natural environment as possible. By granting this variance we accomplish both, trees and natural vegetation are left un-touched maintaining a visual buffer between neighboring properties as well as maintaining a larger visual buffer between the lake and the proposed home.

9. **The variance requested is consistent with the Comprehensive Plan:**
   The variance is consistent with the comprehensive plan.

10. **The variance requested will not alter the essential character of the locality:**
    By granting this variance, we maintain a greater amount of the essential character of the locality.

LEGAL DESCRIPTION PARCEL TWO:

Lot 5, AUDITOR'S SUBDIVISION NO. 41 Dakota County, Minnesota together with that part of Lot 6, said AUDITORS SUBDIVISION NO. 41 lying West of the following described line: Commencing at the Southwest corner of Lot 2, Block 1, WINDY HILL, Dakota County, Minnesota; thence South 88 degrees 58 minutes 15 seconds East, assumed bearing, along the South line of said Lot 2, a distance of 15.00 feet to the point of beginning of the line to be described; thence South 52 degrees 14 minutes 31 seconds East a distance of 182.41 feet and there terminating.

LEGAL DESCRIPTION PARCEL FIVE:

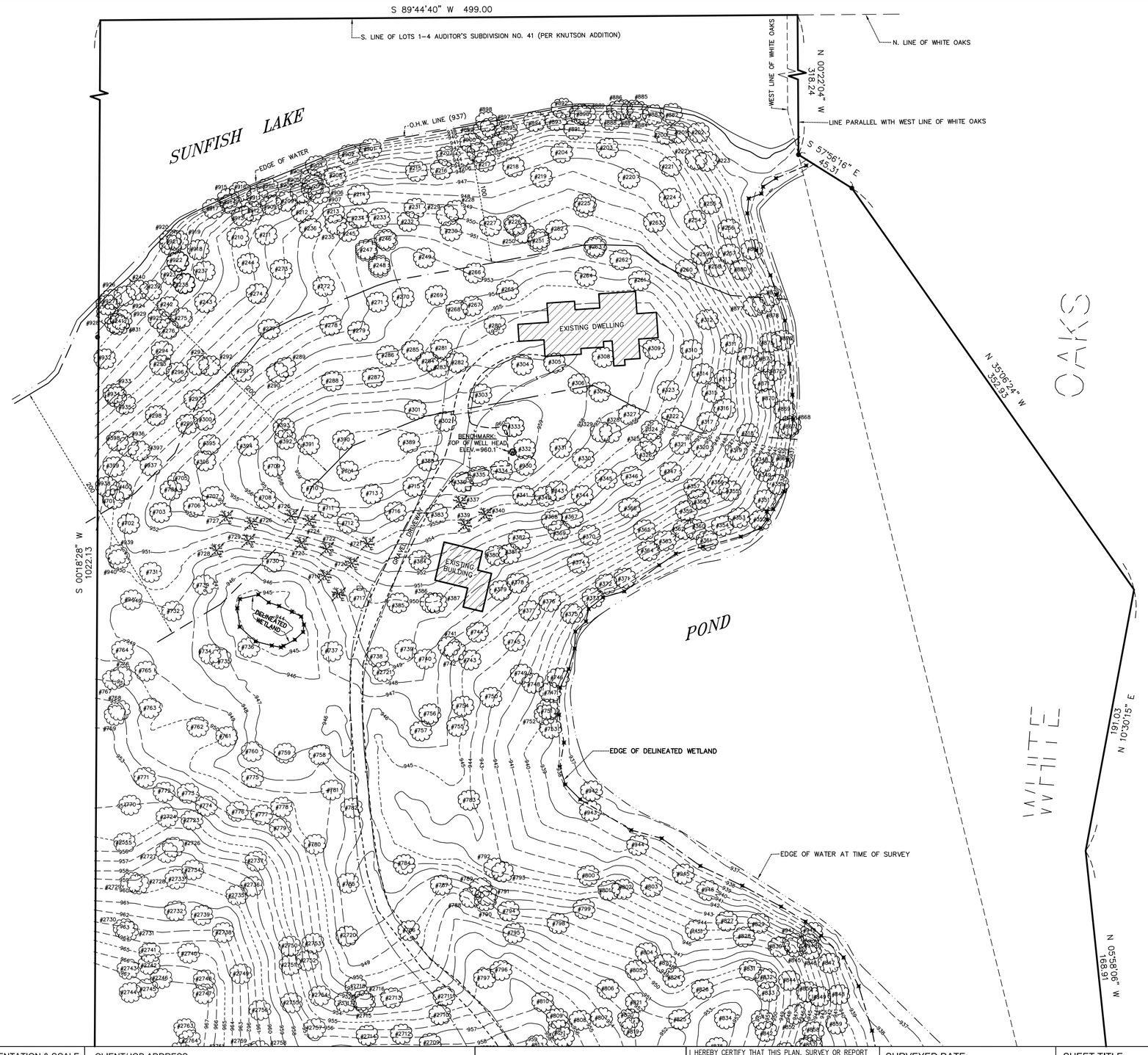
That part of WHITE OAKS ADDITION, Dakota County, Minnesota, according to the recorded plat thereof, lying Westerly of the following described line: Commencing at the Southeast corner of WINDY HILL (which was formerly described as the Southeast corner of and shown on the plat of WINDY HILL), which point is indicated by and iron monument; thence West along the South boundary of WINDY HILL (which was formerly described as the South boundary of "CODERE ADDITION TO WHITE OAKS" and shown on the plat of WINDY HILL) 80 feet more or less to the Southeast corner of WHITE OAKS as shown on the plat of WINDY HILL (which was formerly described as the Southwest corner of "CODERE ADDITION TO WHITE OAKS"), which pointis indicated by an iron monument; thence approximately 340 feet along the South boundary of WINDY HILL (which was formerly described as the South boundary of "WHITE OAKS") to the point of beginning of the line to be described; thence North 4 degrees 22 minutes 02 seconds West a distance of 168.75 feet, thence North 12 degrees 06 minutes 51 seconds East a distance of 191.03 feet, thence North 33 degrees 33 minutes 54 seconds West a distance of 352.86 feet, thence North 56 degrees 07 minutes 50 seconds West a distance of 45.73 feet, thence North 00 degrees 00 minutes East and parallel to the West line of "WHITE OAKS" a distance of 308 feet more or less to the North line of "WHITE OAKS" and there terminating, located in Section 31, Township 28, Range 22, Dakota County, Minnesota.

SCOPE OF WORK & LIMITATIONS:

1. Showing the length and direction of boundary lines of the legal description listed above. The scope of our services does not include determining what you own, which is a legal matter. Please check the legal description with your records or consult with competent legal counsel, if necessary, to make sure that it is correct and that any matters of record, such as easements, that you wish to be included on the survey have been shown.
2. Showing the location of observed existing improvements we deem necessary for the survey.
3. Setting survey markers or verifying existing survey markers to establish the corners of the property.
4. Existing building dimensions and setbacks measured to outside of siding or stucco.
5. Showing elevations on the site at selected locations to give some indication of the topography of the site. We have also provided a benchmark for your use in determining elevations for construction on this site. The elevations shown relate only to the benchmark provided on this survey. Use that benchmark and check at least one other feature shown on the survey when determining other elevations for use on this site or before beginning construction.
6. This survey has been completed without the benefit of a current title commitment. There may be existing easements or other encumbrances that would be revealed by a current title commitment. Therefore, this survey does not purport to show any easements or encumbrances other than the ones shown hereon.
7. Tree tag numbers refer to tree inventory provided by Savana Designs, Inc.

STANDARD SYMBOLS & CONVENTIONS:

"●" Denotes iron survey marker, found, unless otherwise noted.



DATE	REVISION DESCRIPTION

DRAWING ORIENTATION & SCALE

0 20' 40'

CLIENT/JOB ADDRESS

ALEXANDER DESIGN GROUP INC.

100 WINDY HILL ROAD
SUNFISH LAKE, MN

Advance
Surveying & Engineering, Co.

17917 Highway No. 7
Minnetonka, Minnesota 55345
Phone (952) 474-7964
Web: www.advsur.com

I HEREBY CERTIFY THAT THIS PLAN, SURVEY OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY REGISTERED LAND SURVEYOR UNDER THE LAWS OF THE STATE OF MINNESOTA.

Wayne W. Preuss
#43503
LICENSE NO.
MARCH 24, 2021
DATE

SURVEYED DATE:
MARCH 18, 2021

DRAFTED DATE:
MARCH 24, 2021

SHEET TITLE
EXISTING SURVEY

SHEET SIZE: 22 X 34

DRAWING NUMBER
210184 WP

SHEET NO.
S1

EXISTING DWELLING

EXISTING BUILDING

DELINEATED WETLAND

BENCHMARK:
TOP OF WELL HEAD
ELEV.=960.1'

POND

EDGE OF DELINEATED WETLAND

EDGE OF WATER AT TIME OF SURVEY

GRAVEL DRIVEWAY

S 00°18'28" W
1022.13

792.89
S 89°44'59" W

N 35°06'24" W
392.93

N 00°58'06" W
168.91

191.03'
N 10°30'15" E

SW COR. OF LOT 2, BLOCK 1, WINDY HILL

N 89°23'06" E
15.23

N 53°58'04" W
182.46

S 87°48'47" E
60.00

N 62°39'03" E
64.00

N 40°26'01" E
61.94

SE COR. OF WHITE OAKS

36.47
N 00°15'01" W

S 89°44'59" W
20.30

GRAVEL DRIVEWAY

DATE	REVISION DESCRIPTION

DRAWING ORIENTATION & SCALE

0 20' 40'

CLIENT/JOB ADDRESS

ALEXANDER DESIGN

100 WINDY HILL ROAD
SUNFISH LAKE, MN

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Wayne W. Preuss
#43503
LICENSE NO.
MARCH 24, 2021
DATE

SURVEYED DATE:
MARCH 18, 2021

DRAFTED DATE:
MARCH 24, 2021

SHEET TITLE
EXISTING SURVEY

SHEET SIZE: 22 X 34

DRAWING NUMBER
210184 WP

SHEET NO.
S2

100 WINDY HILL ROAD

SUNFISH LAKE, MINNESOTA

LEGAL DESCRIPTION:

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"THE BOUNDARY AND TOPOGRAPHIC WORK ON THIS PROJECT WAS CONDUCTED BY ADVANCE LAND SURVEYING AND ENGINEERING AND DEPICTED ON A CERTIFICATE OF SURVEY DATED MARCH 24, 2021. CORNERSTONE LAND SURVEYING HAS VERIFIED THE BOUNDARY SHOWN HEREON IN THE FIELD, BUT THE DEVELOPMENT DRAWINGS ARE BASED ON THE WORK PREVIOUSLY COMPLETED BY ADVANCED LAND SURVEYING AND ENGINEER.

AREA:

PARCEL AREA TO OHWL OF SUNFISH LAKE = 483906 SQ. FT. / 11.11 ACRES

ZONING:

ZONING: SINGLE FAMILY RESIDENTIAL
SETBACKS:
STREET: 100 FT.
SIDEYARD: 50 FT.
REAR: 50 FT.

PROPOSED IMPROVED AREAS:

HOUSE	12451 SF	
NEW DRIVEWAY	7679 SF	
EX. GRAVEL DRIVE	4040 SF	
FRONT WALKS/ENTRY	674 SF	*AREAS LISTED IN SQUARE FEET
POOLHOUSE	2715 SF	
POOL DECK	2762 SF	
REAR STEPS	163 SF	
REAR PATIO	399 SF	
FIRE PIT WALL/PATIO	302 SF	
STEPS TO WETLAND	60 SF	
POOLHOUSE FLAGSTONE	309 SF	
BLOCK WALLS	272 SF	
ROCK WALLS	1781 SF	
TOTAL	31171 SF	
IMPERVIOUS	6.4%	

BENCHMARKS

ELEVATIONS BASED ON INFORMATION SHOWN ON THE SURVEY BY ADVANCE LAND SURVEYING AND ENGINEERING. TOP OF EXISTING WELL = 960.11

FLOOD INFORMATION:

THIS PROPERTY LIES WITHIN ZONE X, AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN, AS SHOWN ON NON-PRINTED FEMA FLOOD INSURANCE RATE MAP NUMBER 27037C0105E HAVING AN EFFECTIVE DATE OF 12/02/2011.

UNDERGROUND UTILITIES NOTES:

THE UNDERGROUND UTILITIES SHOWN HAVE BEEN LOCATED FROM FIELD SURVEY INFORMATION AND EXISTING DRAWINGS. THE SURVEYOR MAKES NO GUARANTEE THAT THE UNDERGROUND UTILITIES SHOWN COMPRISE ALL SUCH UTILITIES IN THE AREA, EITHER IN SERVICE OR ABANDONED. THE SURVEYOR FURTHER DOES NOT WARRANT THAT THE UNDERGROUND UTILITIES SHOWN ARE IN THE EXACT LOCATION INDICATED ALTHOUGH HE DOES CERTIFY THAT THEY ARE LOCATED AS ACCURATELY AS POSSIBLE FROM THE INFORMATION AVAILABLE. THIS SURVEY HAS NOT PHYSICALLY LOCATED THE UNDERGROUND UTILITIES. ADDITIONAL UTILITIES OF WHICH WE ARE UNAWARE MAY EXIST.

CALL BEFORE YOU DIG!
Gopher State One Call
TWIN CITY AREA: 651-454-0002
TOLL FREE: 1-800-252-1166

SURVEY NOTES:

1. ALL BOUNDARY AND TOPOGRAPHIC INFORMATION PER SURVEY BY ADVANCE LAND SURVEYING AND ENGINEERING DATED MARCH 24, 2021.
2. ARCHITECTURE INFORMATION FROM ELECTRONIC PLANS BY ALEXANDER DESIGN GROUP JUNE 8, 2021.
3. ENGINEERING PLANS PER ELECTRONIC PLANS BY PIERCE PINI AND ASSOCIATES DATED JUNE 8, 2021.
4. LANDSCAPE/SITE PLANS PER SAVANNA DESIGN PLANS.

LEGEND:

- FOUND MONUMENT
- SET 1/2" IRON PIPE MARKED RLS NO. 25718
- CABLE TV PEDESTAL
- AIR CONDITIONER
- ELECTRIC MANHOLE
- ELECTRIC METER
- ELECTRIC PEDESTAL
- ELECTRIC TRANSFORMER
- LIGHT POLE
- GUY WIRE
- POWER POLE
- GAS MANHOLE
- GAS METER
- TELEPHONE MANHOLE
- TELEPHONE PEDESTAL
- SANITARY CLEANOUT
- SANITARY MANHOLE
- CATCH BASIN
- STORM DRAIN
- FLARED END SECTION
- STORM MANHOLE
- FIRE DEPT. CONNECTION
- HYDRANT
- CURB STOP
- WATER WELL
- WATER MANHOLE
- WATER METER
- POST INDICATOR VALVE
- WATER VALVE
- BOLLARD
- FLAG POLE
- MAIL BOX
- TRAFFIC SIGN
- UNKNOWN MANHOLE
- SOIL BORING
- SPOT ELEVATION
- TRAFFIC SIGNAL
- CONIFEROUS TREE
- DECIDUOUS TREE
- UE — UNDERGROUND ELECTRIC
- UTV — UNDERGROUND CABLE TV
- UF — UNDERGROUND FIBER OPTIC
- UT — UNDERGROUND TELEPHONE
- OE — OVERHEAD UTILITY
- UG — UNDERGROUND GAS
- S — SANITARY SEWER
- SS — STORM SEWER
- W — WATERMAIN
- x — FENCE
- CURB [TYPICAL]
- 950 — CONTOURS
- 100 — PROPOSED CONTOUR
- X 100.0 — PROPOSED SPOT ELEVATION
- 1% — PROPOSED DRAINAGE WITH PERCENT GRADE

REVISIONS:

DATE	REVISION
06-08-2021	INITIAL ISSUE
07-02-2021	ADD TEMP PARKING

CERTIFICATION:

I hereby certify that this plan was prepared by me, or under my direct supervision, and that I am a duly Licensed Land Surveyor under the laws of the state of Minnesota.

Daniel L. Thurnes Registration Number: 25718

Date: 06-08-2021

CONTACT:

JOHN BISANZ
Email: john.bisanz@gmail.com

COUNTY/CITY:
DAKOTA COUNTY
CITY OF SUNFISH LAKE

PROJECT LOCATION:

100 WINDY HILL ROAD
PID#38-03800-06-013

Suite #200
1970 Northwestern Ave.
Stillwater, MN 55082
Phone 651.275.8969
dan@pcssurvey.net

CORNERSTONE
LAND SURVEYING, INC.

FILE NAME SURVSFL05
PROJECT NO. SFL21005

BOUNDARY/TOPOGRAPHIC
PROPOSED IMPROVEMENTS
SURVEY

GENERAL CONSTRUCTION NOTES

1. ALL EXISTING INFORMATION TAKEN FROM SURVEY BY ADVANCE SURVEYING AND ENGINEERING CO. DATED MARCH 24, 2021.
2. A GEOTECHNICAL EXPLORATION REPORT WAS COMPLETED FOR THIS SITE BY HAUGO GEOTECHNICAL SERVICES, PROJECT NO. 20-0891 DATED OCTOBER 29, 2020.
3. A SOIL INFILTRATION INVESTIGATION REPORT WAS COMPLETED FOR THIS SITE BY SOIL INVESTIGATION & DESIGN INC. DATED MAY 4, 2021.
4. CONTRACTOR TO FIELD VERIFY ALL EXISTING CONDITIONS, INCLUDING LOCATIONS OF EXISTING UTILITIES, AND NOTIFY ENGINEER OF ANY DISCREPANCIES PRIOR TO STARTING CONSTRUCTION.
5. ALL AREAS DISTURBED BY CONSTRUCTION WHICH ARE OUTSIDE THE LIMITS OF PAVING ARE TO BE RESTORED AND REVEGETATED.
6. EXISTING UTILITIES ARE SHOWN IN THEIR APPROXIMATE LOCATIONS. CONTRACTOR TO FIELD VERIFY THE LOCATION OF ALL EXISTING UTILITIES WHICH MAY INCLUDE BUT IS NOT LIMITED TO: ELECTRIC, TELEPHONE, GAS, CABLE TV, COMPUTER CABLE, FIBER OPTIC CABLE, SANITARY SEWER, STORM SEWER, STEAM, CONDENSATE, ELECTRICAL DUCT BANK AND WATER MAIN. CONTRACTOR TO CONTACT GOPHER ONE-CALL BEFORE EXCAVATING.
7. ALL EXISTING UTILITIES AND OTHER IMPROVEMENTS ARE TO REMAIN UNLESS NOTED OTHERWISE.
8. CONTRACTOR TO PROTECT FROM DAMAGE ALL EXISTING IMPROVEMENTS, LANDSCAPING, STRUCTURES AND UTILITIES THAT ARE TO REMAIN. CONTRACTOR TO REPAIR ANY DAMAGE AT OWN EXPENSE.
9. ALL WORK TO CONFORM WITH CITY OF SUNFISH LAKE AND STATE OF MINNESOTA STANDARDS AND REGULATIONS.
10. ALL EXCAVATIONS MUST COMPLY WITH THE REQUIREMENTS OF OSHA 29 CFR, PART 1926, SUBPART P "EXCAVATIONS AND TRENCHES". THIS DOCUMENT STATES THAT EXCAVATION SAFETY IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
11. CATCH BASINS AND MANHOLES ARE SHOWN ON PLAN LARGER THAN ACTUAL SIZE. COORDINATE LOCATION OF MANHOLE COVER AND CASTING SO THAT IT IS PROPERLY CENTERED IN THE AREA AS SHOWN ON THE PLAN FOR THE AREA DRAINS AND MANHOLE COVERS.
12. SITE UTILITY CONTRACTOR TO FURNISH AND INSTALL ALL STORM SEWER FACILITIES AND APPURTENANCES TO WITHIN TWO FEET OUTSIDE THE BUILDING. COORDINATE WITH MECHANICAL CONTRACTOR FOR EXACT LOCATION AND DEPTH OF CONNECTION WITHIN BUILDING.
13. CONTRACTOR SHALL COORDINATE WITH ARCHITECT'S DRAWINGS TO VERIFY LOCATION, SIZE AND QUANTITY OF ALL ROOF DRAINS AND UTILITY CONNECTIONS. LIMITS OF PROPOSED SITE PLUMBING FACILITIES SHALL BE TWO FEET FROM EDGE OF BUILDING UNLESS OTHERWISE NOTED.
14. CONTRACTOR SHALL OBTAIN ALL REQUIRED PERMITS PRIOR TO STARTING CONSTRUCTION.
15. SEE LANDSCAPE PLANS FOR LANDSCAPING, TREE REMOVAL, TREE PROTECTION, STONE RETAINING WALLS, STONE STEPS AND WALKWAYS, SPECIAL PAVING AND LANDSCAPE ELEMENTS.
16. ALL WORK TO CONFORM TO CITY OF SUNFISH LAKE STANDARDS. ALL COMPLETED WORK IS SUBJECT TO INSPECTION BY THE CITY OF SUNFISH LAKE SEWER AT A REASONABLE TIME BEFORE BACKFILLING.
17. ALL MATERIALS FOR PROPOSED CONSTRUCTION OR REPAIR OF EXISTING FACILITIES SHALL BE NEW PRODUCTS DIRECT FROM THE FACTORY AND FREE FROM DEFECTS.
18. WHEN WORKING AROUND EXISTING UTILITIES THAT BECOME EXPOSED, THE CONTRACTOR SHALL PROVIDE SUFFICIENT SUPPORT TO PREVENT EXCESSIVE STRESS ON THE PIPING. THE CONTRACTOR IS FULLY RESPONSIBLE FOR ANY DAMAGES CAUSED BY FAILURE TO EXACTLY LOCATE AND PRESERVE THESE UNDERGROUND FACILITIES.
19. WASTE MATERIALS INCLUDING PAVEMENT REMOVED DURING CONSTRUCTION, WASTE PIPING AND SUPPLIES, CONSTRUCTION DEBRIS AND EXCESS EXCAVATED MATERIAL SHALL BECOME THE PROPERTY OF THE CONTRACTOR AND SHALL BE REMOVED FROM THE PROJECT SITE AND DISPOSED OF PROPERLY BY THE CONTRACTOR.
20. CONTRACTOR SHALL NOT BLOCK DRAINAGE FROM OR DIRECT EXCESS DRAINAGE ONTO ADJACENT PROPERTY.
21. ADEQUATE DRAINAGE SHALL BE MAINTAINED AT ALL TIMES DURING CONSTRUCTION AND ANY DRAINAGE DITCH OR STRUCTURE DISTURBED DURING CONSTRUCTION SHALL BE RESTORED TO THE SATISFACTION OF THE OWNING AUTHORITY. ALL CONSTRUCTION STORM RUNOFF SHALL COMPLY WITH THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) REQUIREMENTS.
22. ALL STUMPS FROM TREES REMOVED WITHIN PROJECT LIMITS SHALL BE GROUND AND REMOVED IN THEIR ENTIRETY.
23. DRAWINGS DO NOT INDICATE AREAS OF TEMPORARY SUPPORT SYSTEMS. THE CONTRACTOR IS RESPONSIBLE FOR ALL MEANS AND METHODS AND WILL HAVE TOTAL CONTROL OVER THE TYPES AND DESIGN OF ALL SHORING, SHEETING, BRACING, ANCHORAGES, EXCAVATION SUPPORT WALLS, DIRECTIONAL BORING, AUGER JACKING, SOIL STABILIZATION AND OTHER METHODS OF PROTECTING EXISTING IMPROVEMENTS. SEE SPECIFICATIONS FOR SUBMITTAL REQUIREMENTS.
24. CONTRACTOR TO RECORD EXISTING CONDITIONS AS NEEDED (PHOTOGRAPHS, VIDEO PHOTOGRAPHY, FIELD SURVEYING, ETC.) TO ENABLE RECONSTRUCTION TO MATCH EXISTING CONDITIONS AS REQUIRED. CONTRACTOR TO DOCUMENT EXISTING CONDITIONS SO THAT RECONSTRUCTED AREAS WILL HAVE POSITIVE DRAINAGE SIMILAR TO EXISTING.
25. CARE MUST BE TAKEN DURING CONSTRUCTION AND EXCAVATION TO PROTECT ANY SURVEY MONUMENTS AND/OR PROPERTY IRONS.
26. ALL CONSTRUCTION WORK SHALL BE COMPLETED WITHIN CITY OF SUNFISH LAKE APPROVED WORKING HOURS.
27. A GOPHER STATE ONE CALL IS REQUIRED BEFORE ANY EXCAVATION WORK CAN COMMENCE.
28. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING ALL PERMITS INCLUDING, BUT NOT LIMITED TO, THE NPDES PERMIT (SEE SHEET C2.0) AND CITY OF SUNFISH LAKE PERMITS. ALL PERMITS MUST BE OBTAINED PRIOR TO CONSTRUCTION.
29. CONTRACTOR SHALL ADHERE TO ALL AXLE LOAD LIMITS WHEN DELIVERING MATERIALS TO SITE.
30. ANY DAMAGE TO WINDY HILL ROAD AND CITY RIGHT-OF-WAY SHALL BE REPAIRED TO THE SATISFACTION OF THE CITY AND AT THE CONTRACTOR'S EXPENSE PRIOR TO THE CERTIFICATE OF OCCUPANCY BEING ISSUED. CONTRACTOR SHALL PHOTOGRAPH AND DOCUMENT ALL EXISTING ROADWAY CONDITIONS PRIOR TO CONSTRUCTION.
31. THE PROPOSED WELL MUST BE SPECIFIED AND INSTALLED BY A LICENSED WELL DRILLER IN ACCORDANCE WITH MINNESOTA DEPARTMENT OF HEALTH RULES AND REGULATIONS.
32. MAINTAIN 3 FEET VERTICAL SEPARATION BETWEEN WATER AND SEWER PIPES OR A 12-INCH SEPARATION WITH 4-INCH HIGH DENSITY INSULATION.
33. PROVIDE THE FOLLOWING MINIMUM COVER OVER THE TOP OF PIPE AS FOLLOWS:
    A. 2' OVER STORM SEWER
    B. 3' OVER STORMWATER MANAGEMENT PIPING SYSTEM
    C. 2' OVER DRAINTILE
34. GRADE ALONG FACE OF BUILDING SHALL HAVE POSITIVE SLOPE AWAY FROM THE BUILDING.
35. CONTRACTOR IS RESPONSIBLE FOR PROPER REMOVAL AND DISPOSAL OF ALL DEBRIS, EXCESS FILL AND OTHER UNUSED MATERIALS GENERATED BY PROJECT AND DONE IN FULL COMPLIANCE WITH ALL LOCAL, STATE AND FEDERAL RULES AND REGULATIONS. THE SITE SHALL BE KEPT CLEAN AND FREE FROM ALL WASTE MATERIALS.
36. ALL WORK WILL BE IN ACCORDANCE WITH OSHA CODES AND STANDARDS. NOTHING INDICATED ON THE DRAWINGS OR SPECIFICATIONS SHALL RELIEVE THE CONTRACTOR FROM COMPLYING WITH ANY APPROPRIATE SAFETY REGULATIONS.
37. THE DRAWINGS REPRESENT TO FINISHED SITE, NOT THE METHOD OF CONSTRUCTION. CONTOURS, ELEVATIONS AND GRADING REPRESENT TO THE FINISHED SITE AND DO NOT NOTE HOLD-DOWNS OR SUBGRADE ELEVATIONS.
38. THE ENGINEER IS NOT RESPONSIBLE FOR CONTRACTOR'S MEANS AND METHODS, SEQUENCING OF CONSTRUCTION OR SAFETY PROGRAM. OBSERVATION VISITS TO THE SITE BY THE ENGINEER WILL NOT INVOLVE REVIEW OF THESE ITEMS.
39. WHERE DISCREPANCIES OCCUR BETWEEN GENERAL NOTES, PLANS, DETAILS AND SPECIFICATIONS, THE MOST STRINGENT REQUIREMENTS SHALL GOVERN, UNLESS OTHERWISE VERIFIED BY THE ENGINEER OR OWNER IN WRITING.
40. THESE DOCUMENTS SHALL NOT BE CONSTRUED AS STAND-ALONE DOCUMENTS. CONTRACTOR SHALL COORDINATE WITH ALL OTHER DISCIPLINES' DOCUMENTS.
41. CONTRACTOR SHALL COORDINATE WITH SURVEYOR TO PROVIDE A RECORD OF CONSTRUCTION OF ALL BELOW-GRADE WORK. CONTRACTOR SHALL NOT BACKFILL UNTIL SURVEYOR HAS COMPLETED NECESSARY AS-BUILT SURVEYING. CONTRACTOR TO HIRE AND COORDINATE SURVEYOR.
42. ANY REDESIGN OF DEMOLISHED STRUCTURAL ELEMENTS WILL NEED TO BE DESIGNED AND CERTIFIED BY A REGISTERED ENGINEER.
43. CAD FILES OF THE SITE LAYOUT PLAN WILL BE PROVIDED TO THE CONTRACTOR AT THE TIME OF CONSTRUCTION FOR STAKING PURPOSES. DIMENSIONS SHOWN HEREIN ARE FOR GENERAL REFERENCES TO TYPICAL LAYOUT OF THE SITE. NOT ALL SITE ELEMENTS ARE DIMENSIONED.
44. STORM SEWER PIPE TO BE HIGH DENSITY POLYETHYLENE DUAL WALL SMOOTH INTERIOR PIPE OR POLYVINYL CHLORIDE (PVC) SDR 26 MINIMUM COMPLYING WITH ASTM D3034 AND F679 WITH SOLVENT CEMENT OR FLEXIBLE WATERTIGHT JOINTS AS NOTED ON THE DRAWINGS AND PER SPECIFICATIONS.
45. FOR WATERMAIN AND SERVICES LOCATED NEAR GRAVITY SEWER PIPES, CLEANOUTS, MANHOLES, DRAINAGE STRUCTURES OR STORMWATER MANAGEMENT SYSTEMS, A MINIMUM OF TEN FEET MEASURED HORIZONTALLY BETWEEN THE OUTER SURFACE OF THE PIPE TO THE OUTER SURFACE OF THE ASSOCIATED SEWER ELEMENT IS REQUIRED. IN LOCATIONS WHERE CONDITIONS PREVENT REQUIRED HORIZONTAL SEPARATION, WATERMAIN IS TO BE LAID 18" ABOVE THE TOP OF THE SEWER IN A SEPARATE SHELF.
46. FOR WATERMAIN AND SERVICES CROSSING GRAVITY SANITARY AND STORM SEWERS, A MINIMUM VERTICAL SEPARATION OF 18" MUST BE PROVIDED BETWEEN THE OUTER SURFACES OF THE PIPES, WITH PREFERENCE THAT THE WATERMAIN CROSS ABOVE THE SEWER WHEREVER POSSIBLE. ONE FULL LENGTH OF PIPE SHALL BE LOCATED SO THAT BOTH JOINTS WILL BE AS FAR FROM THE SEWER AS POSSIBLE
47. ALL RETAINING WALLS WILL NEED CERTIFIED ENGINEERING DRAWINGS REVIEWED AND APPROVED BY THE CITY OF SUNFISH LAKE BUILDING OFFICIAL PRIOR TO STARTING CONSTRUCTION. SEE LANDSCAPE PLANS FOR ALL WALLS AND DETAILS. 1
48. THE OHWL ELEVATION SHOWN ON CIVIL PLANS IS FROM THE BASE SURVEY FILES PREPARED BY ADVANCE SURVEYING. DATUM INFORMATION IS NOTED ON SURVEY.

EROSION CONTROL NOTES

1. INSTALL PERIMETER EROSION CONTROL AT THE LOCATIONS SHOWN ON THE PLANS PRIOR TO BEGINNING CONSTRUCTION. (HAY BALES ARE NOT AN ACCEPTABLE PERIMETER CONTROL)
2. BEFORE BEGINNING CONSTRUCTION, INSTALL A TEMPORARY ROCK CONSTRUCTION ENTRANCE AT EACH POINT WHERE VEHICLES EXIT THE CONSTRUCTION SITE. USE 2 INCH OR GREATER DIAMETER ROCK IN A LAYER AT LEAST 12 INCHES THICK ACROSS THE ENTIRE WIDTH OF THE ENTRANCE. EXTEND THE ROCK ENTRANCE AT LEAST 50 FEET INTO THE CONSTRUCTION ZONE. USE A GEOTEXTILE FABRIC BENEATH THE AGGREGATE IN ORDER TO PREVENT MIGRATION OF SOIL INTO THE ROCK FROM BELOW. SEE DETAIL ON SHEET C2.2.
3. REMOVE ALL SOILS AND SEDIMENTS TRACKED OR OTHERWISE DEPOSITED ONTO PUBLIC AND PRIVATE PAVEMENT AREAS. REMOVAL SHALL BE ON A DAILY BASIS WHEN TRACKING OCCURS. SWEEPING MAY BE ORDERED BY AT ANY TIME IF CONDITIONS WARRANT. SWEEPING SHALL BE MAINTAINED THROUGHOUT THE DURATION OF THE CONSTRUCTION AND DONE IN A MANNER TO PREVENT DUST BEING BLOWN TO ADJACENT PROPERTIES.
4. INSTALL INLET PROTECTION AT ALL PUBLIC AND PRIVATE CATCH BASIN INLETS WHICH RECEIVE RUNOFF FROM THE DISTURBED AREAS. CATCH BASIN INSERTS ARE REQUIRED IN UNDISTURBED AREAS THAT RECEIVE RUNOFF FROM DISTURBED AREAS. NOTE: HAY BALES OR FILTER FABRIC WRAPPING THE GRATES ARE NOT EFFECTIVE OR AN ACCEPTABLE FORM OF INLET PROTECTION.
5. LOCATE SOIL OR DIRT STOCKPILES NO LESS THAN 25 FEET FROM ANY PUBLIC OR PRIVATE ROADWAY OR DRAINAGE CHANNEL. IF REMAINING FOR MORE THAN SEVEN DAYS, STABILIZE THE STOCKPILES BY MULCHING, VEGETATIVE COVER, TARPS, OR OTHER MEANS. CONTROL EROSION FROM ALL STOCKPILES BY PLACING SILT BARRIERS AROUND THE PILES. TEMPORARY STOCKPILES LOCATED ON PAVED SURFACES MUST BE NO LESS THAN TWO FEET FROM THE DRAINAGE/GUTTER LINE AND SHALL BE COVERED IF LEFT MORE THAN 24 HOURS.
6. MAINTAIN ALL TEMPORARY EROSION AND SEDIMENT CONTROL DEVICES IN PLACE UNTIL THE CONTRIBUTING DRAINAGE AREA HAS BEEN STABILIZED. INSPECT TEMPORARY EROSION AND SEDIMENT CONTROL DEVICES ON A DAILY BASIS AND REPLACE DETERIORATED, DAMAGED, OR ROTTED EROSION CONTROL DEVICES IMMEDIATELY.
7. TEMPORARILY OR PERMANENTLY STABILIZE ALL CONSTRUCTION AREAS WHICH HAVE BEEN FINISH GRADED, AND ALL AREAS IN WHICH GRADING OR SITE BUILDING CONSTRUCTION OPERATIONS ARE NOT ACTIVELY UNDERWAY AGAINST EROSION DUE TO RAIN, WIND AND RUNNING WATER WITHIN 7 DAYS. USE SEEDING AND MULCHING, EROSION CONTROL MATTING, AND/OR SODDING AND STAKING IN GREEN SPACE AREAS. APPLICATION OF GRAVEL BASE ON AREAS TO BE PAVED IS RECOMMENDED FOR MINIMIZING EROSION POTENTIAL.
8. REMOVE ALL TEMPORARY SYNTHETIC, STRUCTURAL, NON-BIODEGRADABLE EROSION AND SEDIMENT CONTROL DEVICES AFTER THE SITE HAS UNDERGONE FINAL STABILIZATION AND PERMANENT VEGETATION HAS BEEN ESTABLISHED, MINIMUM VEGETATION ESTABLISHMENT IS 70% COVER. MAINTAIN ALL TEMPORARY EROSION CONTROL DEVICES UNTIL 70% ESTABLISHED COVER IS ACHIEVED.
9. READY MIXED CONCRETE AND CONCRETE BATCH PLANTS PROHIBITED WITHIN THE PUBLIC RIGHT-OF-WAY. UNDER NO CIRCUMSTANCES MAY WASHOUT WATER DRAIN ONTO THE PUBLIC RIGHT-OF-WAY OR INTO THE STORM SEWER. CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING DESIGNATED CONCRETE WASHOUT AREA THAT COMPLIES WITH MPCA REQUIREMENT.
10. ALL EROSION CONTROL ELEMENTS ARE TEMPORARY. CONTRACTOR TO INSTALL EROSION CONTROL ELEMENTS PRIOR TO START OF LAND DISTURBING ACTIVITIES, MAINTAIN IN GOOD CONDITION DURING CONSTRUCTION AND REMOVE FROM THE SITE UPON COMPLETION OF FINAL PAVING AND TURF ESTABLISHMENT.
11. EROSION CONTROL SHALL BE PLACED ALONG THE PERIMETER OF THE SITE EXCAVATION. EROSION CONTROL SHALL BE PLACED SO IT DOES NOT DISTURB THE EXISTING PAVEMENT OR DRIVEWAY THAT ARE TO REMAIN. MANY METHODS OF EROSION CONTROL WILL WORK AND IT IS THE CONTRACTOR'S RESPONSIBILITY TO INSTALL THE MEASURE MOST APPROPRIATE TO THE SITE CONDITIONS AND THAT WHICH MEETS THE CITY OF SUNFISH LAKE AND MPCA STANDARDS. GRAPHICALLY SHOWN ON THE PLANS FOR CLARITY BUT SHALL BE PLACED IN THE MOST APPROPRIATE LOCATIONS NOT TO DAMAGE EXISTING PAVEMENT AND/OR TREES TO REMAIN. DAMAGED PAVEMENT AND/OR TREES SHALL BE PAID FOR SOLELY BY THE CONTRACTOR. SEE DETAILS AND SPECIFICATIONS.
12. CONTRACTOR TO PROVIDE TEMPORARY SEED AND MULCH ON ALL NON-PAVED AREAS WITHIN 7 DAYS AFTER ROUGH GRADING IS COMPLETED. SEED WITH ANNUAL RYE SEED AT 60 LBS PER ACRE AND WOOD MULCH FIBER AT 45 LBS PER 1,000 SF.
13. CONTRACTOR TO PREVENT DIRT AND/OR DEBRIS FROM ENTERING STORM SEWER OR BEING TRANSPORTED OFF-SITE IN AN UNCONTROLLED MANNER. CONTRACTOR TO VERIFY AT PROJECT CLOSEOUT THAT STORM SEWER SYSTEM IS CLEAR OF SEDIMENT AND/OR DEBRIS AND IS FULLY FUNCTIONAL.
14. STRAWBALES ARE NOT ALLOWED ON SITE IN ANY CAPACITY.
15. SEE TP1.0 TREE REMOVAL AND PROTECTION PLAN FOR TREE PROTECTION DETAIL AND LOCATIONS.
16. SEE EROSION AND SEDIMENT CONTROL PLANS C2.0-C2.2 FOR ADDITIONAL EROSION AND SEDIMENT CONTROL INFORMATION, PROCEDURES AND DETAILS.
17. AN NPDES PERMIT IS REQUIRED FOR THIS PROJECT. SEE PLANS C2.0-C2.2 FOR FURTHER INFORMATION. PROVIDE A COPY OF THE PERMIT TO THE CITY AFTER RECEIPT BEFORE CONSTRUCTION BEGINS. 1

CONSTRUCTION SEQUENCING AND INSPECTION OF EROSION AND SEDIMENT CONTROL PRACTICES FOR STORMWATER MANAGEMENT SYSTEMS

A. OBTAIN PERMITS FOR SITE WORK FROM CITY OF SUNFISH LAKE AND ALL GOVERNING AUTHORITIES WITH JURISDICTION IN THIS CONSTRUCTION AREA.

B. INSTALL EROSION CONTROL AND TREE PROTECTION ALONG PERIMETER OF SITE. INSTALL EROSION CONTROL INSERTS AT ALL CATCHBASINS AND MANHOLES AND CONSTRUCT ROCK CONSTRUCTION ENTRANCE. SEE EROSION CONTROL NOTES FOR FURTHER INSTRUCTION.

C. PROCEED WITH SITE DEMOLITION, GRADING AND CONSTRUCTION.

D. MAINTAIN EROSION CONTROL BMP'S AND CONTROL RUNOFF REQUIREMENTS AS OUTLINED ON DRAWING AND SPECIFICATIONS.

E. ALL SITE WORK SHOULD BE COMPLETE PRIOR TO WORK ON THE STORMWATER AREAS BEING STARTED TO THE EXTENT POSSIBLE. IF CONSTRUCTION OF THESE AREAS NEEDS TO OCCUR PRIOR TO FINAL SITE STABILIZATION, THEN THE CONSTRUCTED AREA MUST BE PROTECTED AND CONTRIBUTING FLOWS NEED TO BE FILTERED TO PREVENT SEDIMENT ACCUMULATION. THE STORMWATER MANAGEMENT SYSTEMS NEED TO BE PROTECTED FROM EROSION AND SEDIMENT. A FENCE WILL BE REQUIRED AROUND ITS PERIMETER TO KEEP THE AREA OF THE POND PROTECTED.

F. NOTIFY CIVIL ENGINEER AND CITY OF SUNFISH LAKE OF WORK BEING DONE ON STORMWATER SYSTEMS AND THE SCHEDULE FOR CONSTRUCTION. ALLOW A MINIMUM OF FIVE WORKING DAYS FOR NOTIFICATION, SO ENGINEER CAN CONDUCT SITE MEETING TO DISCUSS THE INTENT OF THE SYSTEMS AND SO CONSTRUCTION OBSERVATION CAN BE SCHEDULED ACCORDINGLY. SITE MEETING TO REVIEW THE INTENT OF THE DESIGN AND THE CONSTRUCTION OF THE STORMWATER SYSTEM NEEDS TO OCCUR PRIOR TO STARTING CONSTRUCTION ON THE SYSTEM.

G. MAINTAIN EROSION AND SEDIMENT CONTROL ON CONTRIBUTING AREAS TO AVOID SEDIMENTATION OF SYSTEM.

H. CONSTRUCT STORMWATER SYSTEMS PER DRAWINGS AND SPECIFICATIONS.

I. COMPLETE CONSTRUCTION OF DRIVEWAY AFTER STORMWATER SYSTEM IS INSTALLED. AFTER PAVEMENT IS INSTALLED, VERIFY THAT STORMWATER SYSTEMS ARE CLEAR AND FULLY FUNCTIONAL. EXCAVATE, DREDGE, OR CLEAN AS NEEDED SO THEY ARE FULLY FUNCTIONAL AT PROJECT CLOSEOUT.

J. INSTALL LANDSCAPING AND PLANTING MATERIALS PER LANDSCAPE DRAWINGS AND SPECIFICATIONS.

K. REMOVE ALL TEMPORARY EROSION CONTROL BMP'S AFTER PAVING AND STORMWATER AREAS ARE COMPLETE AND AFTER TURF HAS BEEN ESTABLISHED.

L. CONTRACTOR SHALL TAKE PHOTOGRAPHS AND MEASUREMENTS OF ALL STORMWATER MANAGEMENT SYSTEMS THROUGHOUT CONSTRUCTION. DOCUMENTATION OF CONSTRUCTION SHALL BE SUBMITTED TO THE CIVIL ENGINEER AT THE CLOSEOUT OF THE PROJECT. CLOSEOUT DOCUMENTATION SHALL INCLUDE PHOTOGRAPHS AND MEASUREMENTS OF SYSTEM DURING CONSTRUCTION, TESTING REPORTS AND OBSERVATIONS AND REDLINE DRAWINGS OF ANY FIELD MODIFICATIONS MADE DURING CONSTRUCTION.

M. A LETTER WRITTEN ON COMPANY LETTERHEAD THAT THE STORMWATER MANAGEMENT PRACTICES HAVE BEEN BUILT PER THE CIVIL PLANS, OR PER REDLINE FIELD DRAWINGS, SHALL BE SUBMITTED TO THE CIVIL ENGINEER AT THE CLOSEOUT OF THE PROJECT.

N. THE CONTRACTOR SHALL SUBMIT AN AS-BUILT SURVEY OF THE COMPLETED SITE PREPARED AND SIGNED BY A LICENSED SURVEYOR TO THE CIVIL ENGINEER AT THE END OF THE PROJECT. AS-BUILT SURVEY SHALL INCLUDE ENOUGH INFORMATION TO VERIFY THE CONSTRUCTED TOPOGRAPHY, UTILITY AND SITE ELEMENTS. TOPOGRAPHY OF THE PONDS SHALL BE INCLUDED IN THE AS-BUILT SURVEY. COORDINATE WITH OWNER AND CIVIL ENGINEER FOR SCHEDULE FOR WHEN THIS SHALL BE COMPLETED.

O. REMOVE ALL TEMPORARY EROSION CONTROL BMP'S AFTER PAVING AND STORMWATER AREAS ARE COMPLETE AND AFTER TURF HAS BEEN ESTABLISHED. SEE STORMWATER POLLUTION PREVENTION PLANS ON SHEETS C2.0-C2.2

LEGEND

- EXISTING TREE
- EXISTING WATER WELL
- E — EXISTING UNDERGROUND ELECTRIC LINE
- G — EXISTING UNDERGROUND GAS LINE
- T — EXISTING TELECOMMUNICATION LINES
- 896 — EXISTING CONTOUR
- × 836.21 — EXISTING SPOT ELEVATIONS
- 954 — PROPOSED CONTOUR
- + 934.5 — PROPOSED SPOT ELEVATION
- DENOTES SURFACE DRAINAGE
- PROPOSED LIMITS OF DISTURBANCE
- B-2 — APPROXIMATE SOIL BORING LOCATION
- STM> — PROPOSED STORM SEWER
- PROPOSED CATCH BASIN
- PROPOSED MANHOLE
- PROPOSED AREA DRAIN
- SILT FENCE
- EROSION CONTROL AT CB/MH
- EXISTING BITUMINOUS PAVEMENT TO BE REMOVED
- PROPOSED BITUMINOUS PAVEMENT, SEE DETAIL 1/C6.0

CONTACT INFORMATION

CIVIL ENGINEER
PIERCE PINI & ASSOCIATES, INC.
9298 CENTRAL AVENUE NE, SUITE 312
BLAINE, MN 55434
CONTACT: RHONDA PIERCE, P.E.
763.537.1311 OFFICE / 763.242.9039 CELL
RHONDA@PIERCEPINI.COM

CIVIL DRAWING INDEX

C0.0 CIVIL NOTES AND LEGEND
C1.0 SITE DEMOLITION PLAN
C2.0 EROSION AND SEDIMENT CONTROL-GENERAL INFORMATION AND NARRATIVE
C2.1 EROSION AND SEDIMENT CONTROL-SITE LAYOUT
C2.2 EROSION AND SEDIMENT CONTROL-DETAILS
C3.0 GRADING AND DRAINAGE PLAN
C3.1 SECTIONS PLAN AND PROFILES
C4.0 STORM SEWER PLAN
C4.1 STORMWATER MANAGEMENT PLAN
C5.0 DRIVEWAY PAVING PLAN
C6.0 CIVIL DETAILS

PIERCE PINI & ASSOCIATES
CONSULTING CIVIL ENGINEERS
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WINDY HILL
100 WINDY HILL ROAD
SUNFISH LAKE, MN

I hereby certify that this plan or drawing was prepared by me or under my direct supervision and that I am a duly licensed ENGINEER under the laws of the State of Minnesota.
For PIERCE PINI & ASSOCIATES, INC.
By Rhonda S. Pierce
Name RHONDA S. PIERCE
Date 06/08/2021 Reg. No. 41333

Issued for	Date
0 ISSUED FOR PERMIT	06/08/2021
1 CITY COMMENTS	07/06/2021

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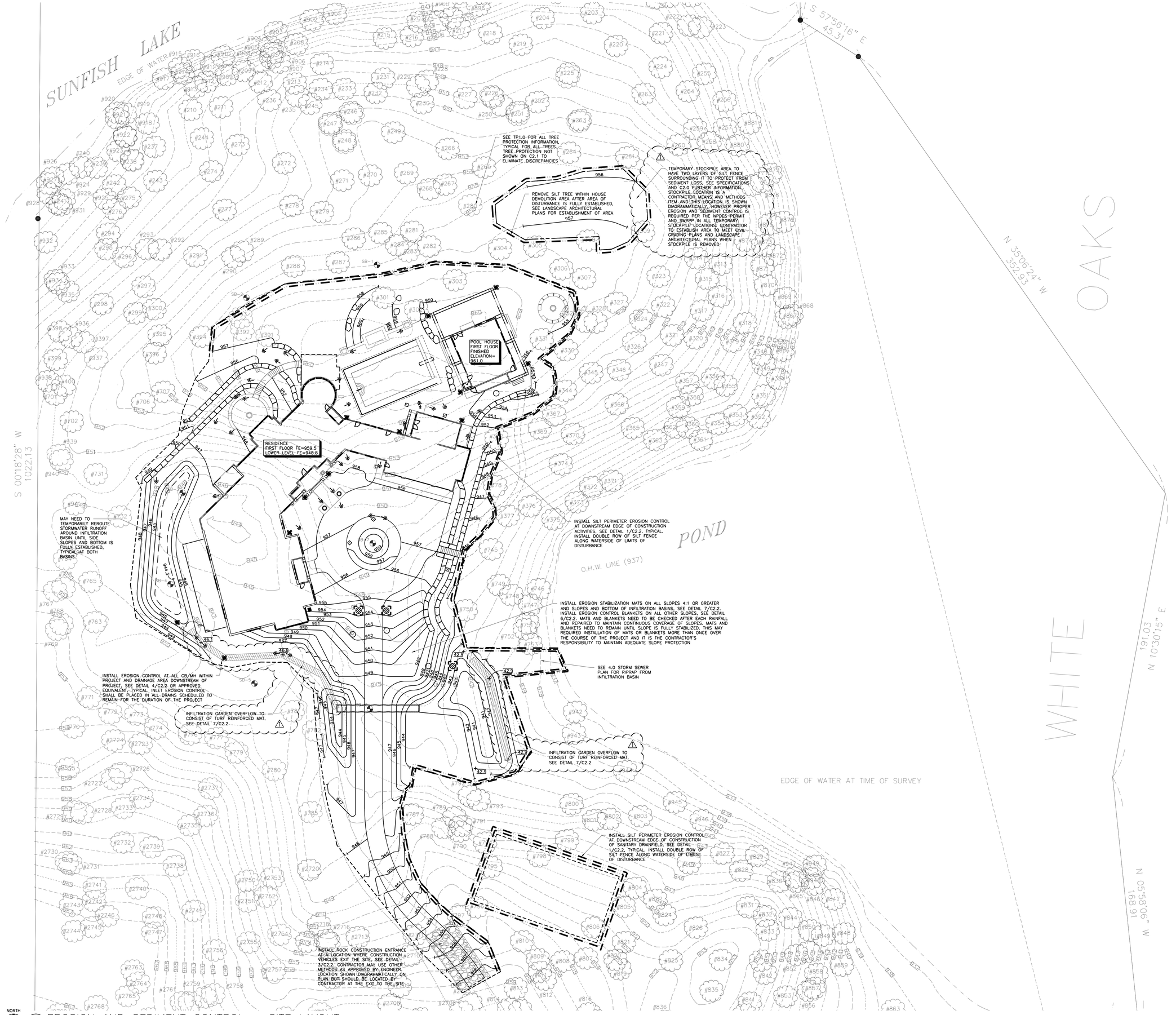
Drawn	DPM
Checked	RSP
Date	06/08/2021

PERMIT SET

Drawing Title
CIVIL NOTES AND LEGEND

C0.00



NORTH

1 C2.1 EROSION AND SEDIMENT CONTROL – SITE LAYOUT

0 20' 40' 60'

1"=20'

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For PIERCE PINI & ASSOCIATES, INC.

By Rhonda S. Pierce

Name RHONDA S. PIERCE

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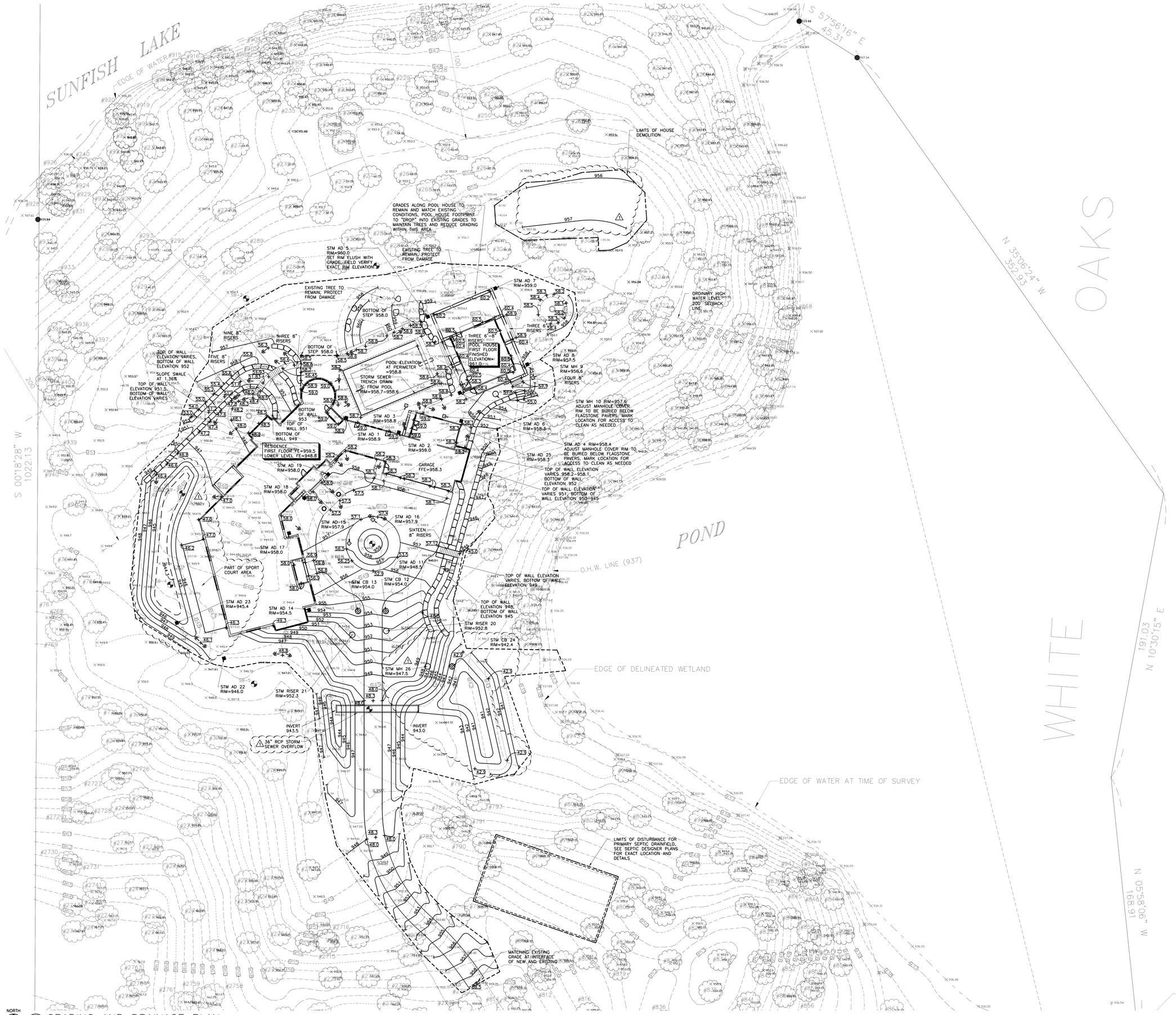
EROSION AND SEDIMENT CONTROL – SITE LAYOUT

C2.1



NORTH

1 C3.0 GRADING AND DRAINAGE PLAN

0 20' 40' 60'

1"=20'

PIERCE PINI & ASSOCIATES

CONSULTING CIVIL ENGINEERS
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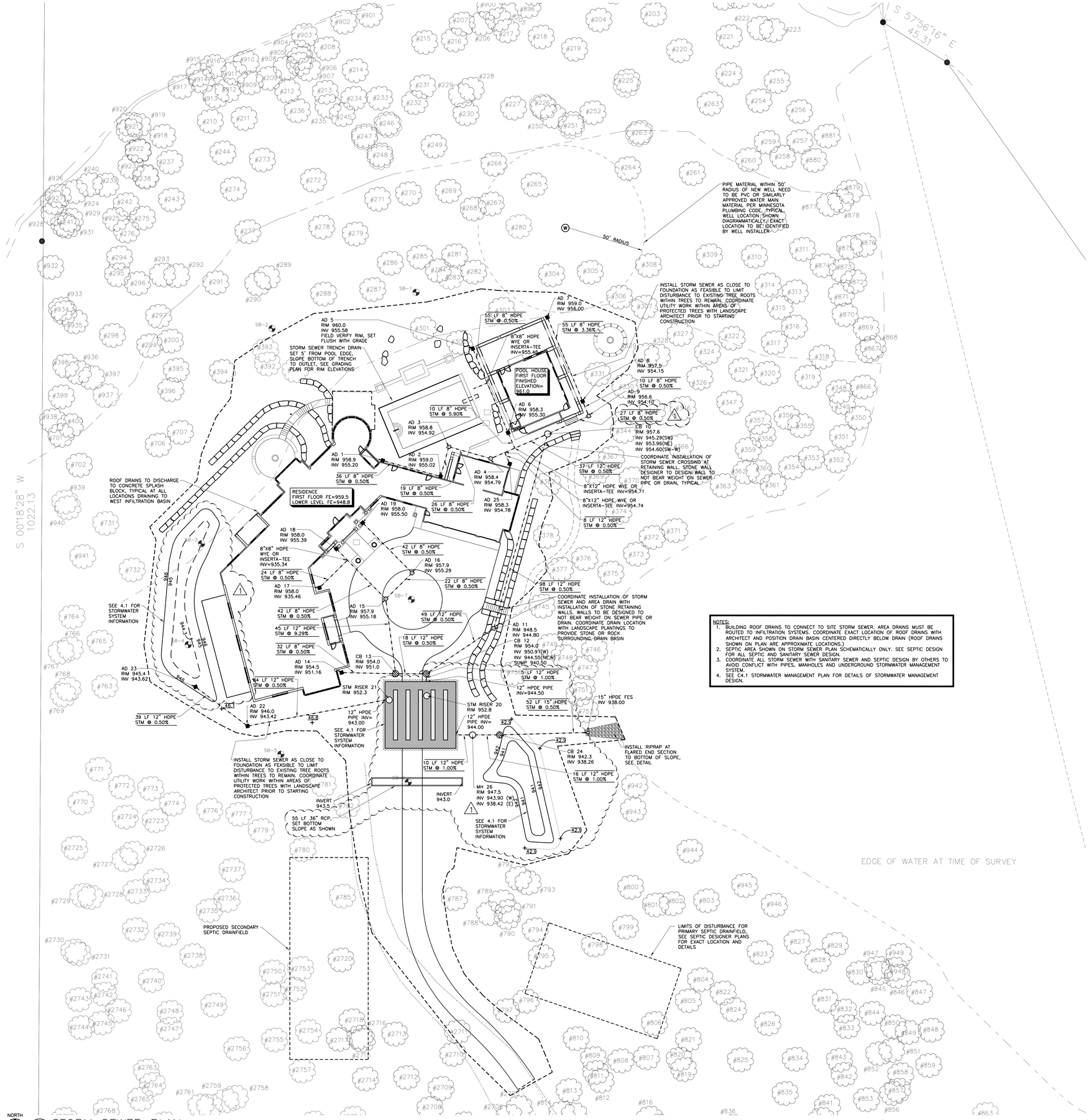
GRADING AND DRAINAGE PLAN

C3.0



NOTES:
1. BUILDING ROOF DRAINS TO CONNECT TO SITE STORM SEWER. AREA DRAINS MUST BE ROUTED TO INFILTRATION SYSTEMS. COORDINATE EXACT LOCATION OF ROOF DRAINS WITH ARCHITECT AND POSITION DRAIN BASIN CENTERED DIRECTLY BELOW DRAIN (ROOF DRAINS SHOWN ON PLAN ARE APPROXIMATE LOCATIONS.)
2. SEPTIC AREA SHOWN ON STORM SEWER PLAN SCHEMATICALLY ONLY. SEE SEPTIC DESIGN FOR ALL SEPTIC AND SANITARY SEWER DESIGN.
3. COORDINATE ALL STORM SEWER WITH SANITARY SEWER AND SEPTIC DESIGN BY OTHERS TO AVOID CONFLICT WITH PIPES, MANHOLES AND UNDERGROUND STORMWATER MANAGEMENT SYSTEM.
4. SEE C4.1 STORMWATER MANAGEMENT PLAN FOR DETAILS OF STORMWATER MANAGEMENT DESIGN.

NORTH

1 / C4.0 STORM SEWER PLAN

0 20' 40' 60'

1"=20'

PIERCE PINI & ASSOCIATES
CONSULTING CIVIL ENGINEERS
9298 CENTRAL AVENUE NE, SUITE 312
BLAINE, MN 55434
TEL 763.537.1311
rhonda@piercepini.com

WINDY HILL
100 WINDY HILL ROAD
SUNFISH LAKE, MN

I hereby certify that this plan or drawing was prepared by me or under my direct supervision and that I am a duly licensed ENGINEER under the laws of the State of Minnesota.
For PIERCE PINI & ASSOCIATES, INC.
By Rhonda S. Pierce
Name RHONDA S. PIERCE
Date 06/08/2021 Reg. No. 41333

Issued for	Date
0 ISSUED FOR PERMIT	06/08/2021
1 CITY COMMENTS	07/06/2021

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Checked	RSP
Date	06/08/2021

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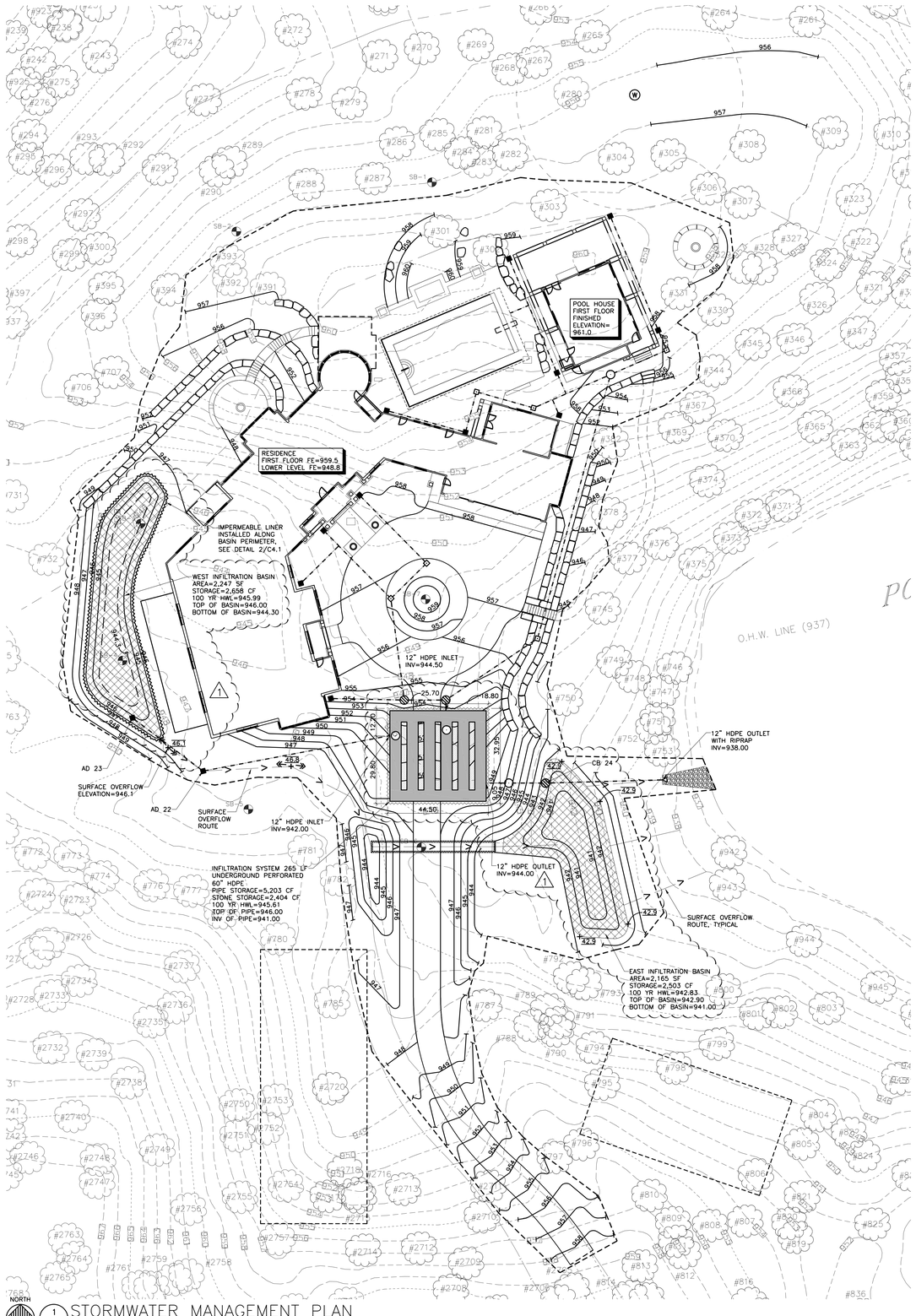
Drawing Title

STORM SEWER PLAN

C4.0

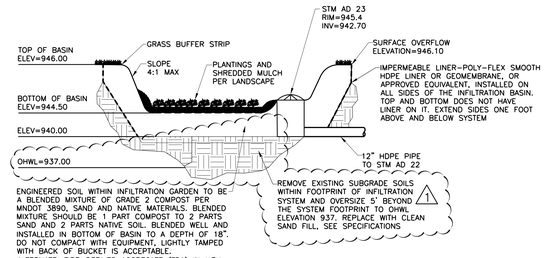


NORTH

1 C4.1 STORMWATER MANAGEMENT PLAN

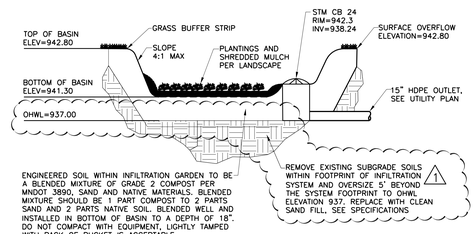
0 20' 40' 60'

1"=20'



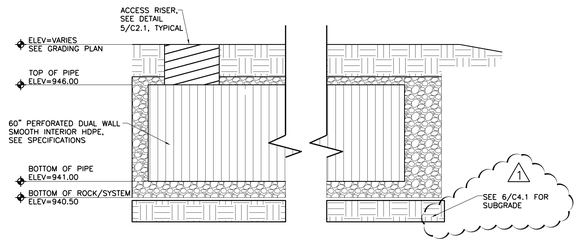
2 C4.1 WEST INFILTRATION BASIN

NO SCALE



3 C4.1 EAST INFILTRATION BASIN

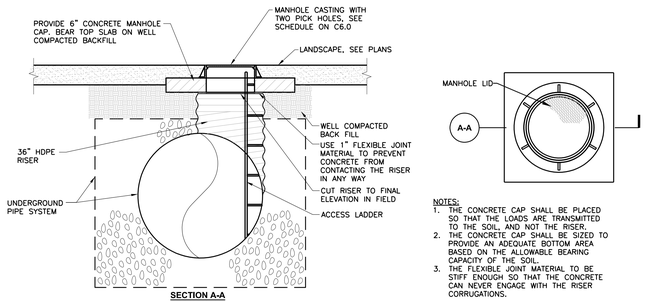
NO SCALE



4 C4.1 STORMWATER INFILTRATION SYSTEM SECTION

NOTE: RISERS, INLET AND OUTLET PIPES ARE SHOWN IN PROFILE VIEW FOR REFERENCE ONLY. SEE PLAN VIEW FOR ACTUAL LOCATIONS AND NUMBER OF RISERS AND PIPES.

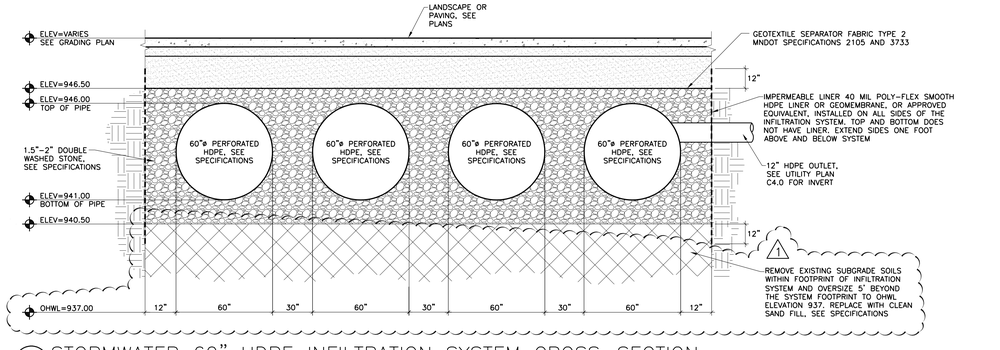
NO SCALE



NOTES:
1. THE CONCRETE CAP SHALL BE PLACED SO THAT THE LOADS ARE TRANSMITTED TO THE SOIL, AND NOT THE RISER.
2. THE CONCRETE CAP SHALL BE SIZED TO PROVIDE AN ADEQUATE BOTTOM AREA BASED ON THE ALLOWABLE BEARING CAPACITY OF THE SOIL.
3. THE FLEXIBLE JOINT MATERIAL TO BE STIFF ENOUGH SO THAT THE CONCRETE CAN NEVER ENGAGE WITH THE RISER CORRUGATIONS.

5 C4.1 RISER DETAIL

NO SCALE



6 C4.1 STORMWATER 60" HDPE INFILTRATION SYSTEM CROSS-SECTION

NO SCALE

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9298 CENTRAL AVENUE NE, SUITE 312
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For PIERCE PINI & ASSOCIATES, INC.

By Rhonda S. Pierce

Name RHONDA S. PIERCE

Date 06/08/2021 Reg. No. 41333

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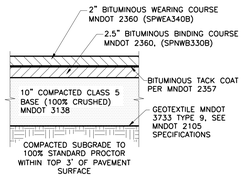
STORMWATER MANAGEMENT PLAN

C4.1



1 C6.0 BITUMINOUS PAVEMENT DETAIL

NO SCALE

NOTES:
1. SPECIFICATIONS PER MNDOT 3733 AND 2105.
2. PROVIDE A WOVEN GEOTEXTILE WITH THE ATTRIBUTES SHOWN IN THE TABLE AND ADD THE FOLLOWING TO MNDOT SPECIFICATION 3733.2 REQUIREMENTS.
3. COMPLY WITH THE SEAM BREAKING STRENGTH REQUIREMENT FOR TYPE 5 IN MNDOT SPECIFICATION 3733.
4. GEOTEXTILE FABRIC SPECIAL TYPE 9 FOR STABILIZATION OF SUBGRADE BELOW CLASS V PAVEMENT BASE.

PROPERTIES	TEST METHOD	UNIT	MINIMUM AVERAGE ROLL VALUE	
			MD	CD
TENSILE STRENGTH AT ULTIMATE	ASTM D4595	LBS/FT	3500	3200

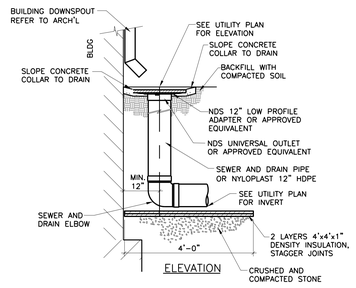
PROPERTIES	TEST METHOD	UNIT	MAXIMUM OPENING SIZE
APPARENT OPENING SIZE (AOS)	ASTM D4751	U.S. SIEVE	30

PROPERTIES	TEST METHOD	UNIT	MAXIMUM OPENING SIZE
PERMITTIVITY	ASTM D4491	SEC^{-1}	0.8
FLOW RATE	ASTM D4491	GAL/MIN/FT^2	60

PROPERTIES	TEST METHOD	UNIT	MAXIMUM OPENING SIZE
UV RESISTANCE (AT 500 HOURS)	ASTM D4355	% STRENGTH RETAINED	70

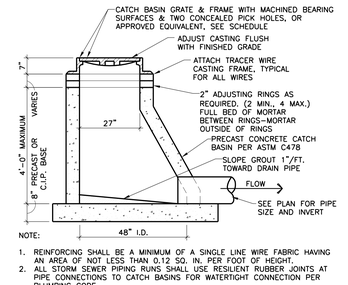
2 C6.0 GEOTEXTILE TYPE 9

NO SCALE



3 C6.0 AREA DRAIN AT DOWNSPOUT

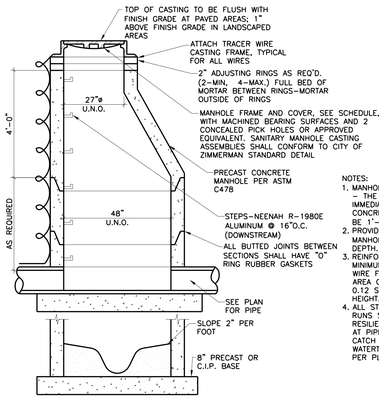
NO SCALE



NOTE:
1. REINFORCING SHALL BE A MINIMUM OF A SINGLE LINE WIRE FABRIC HAVING AN AREA OF NOT LESS THAN 0.12 SQ. IN. PER FOOT OF HEIGHT.
2. ALL STORM SEWER PIPING RUNS SHALL USE RESILIENT RUBBER JOINTS AT PIPE CONNECTIONS TO CATCH BASINS FOR WATERTIGHT CONNECTION PER PLUMBING CODE.

5 C6.0 SHALLOW CATCH BASIN

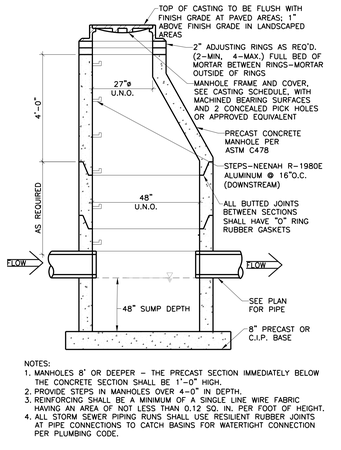
NO SCALE



NOTES:
1. MANHOLES 8' OR DEEPER – THE PRECAST SECTION IMMEDIATELY BELOW THE CONCRETE SECTION SHALL BE 1'-0" HIGH.
2. PROVIDE STEPS IN MANHOLES OVER 4-0" IN DEPTH.
3. REINFORCING SHALL BE A MINIMUM OF A SINGLE LINE WIRE FABRIC HAVING AN AREA OF NOT LESS THAN 0.12 SQ. IN. PER FOOT OF HEIGHT.
4. ALL STORM SEWER PIPING RUNS SHALL USE RESILIENT RUBBER JOINTS AT PIPE CONNECTIONS TO CATCH BASINS FOR WATERTIGHT CONNECTION PER PLUMBING CODE.

6 C6.0 STANDARD SEWER MANHOLE

NO SCALE



NOTES:
1. MANHOLES 8' OR DEEPER – THE PRECAST SECTION IMMEDIATELY BELOW THE CONCRETE SECTION SHALL BE 1'-0" HIGH.
2. PROVIDE STEPS IN MANHOLES OVER 4-0" IN DEPTH.
3. REINFORCING SHALL BE A MINIMUM OF A SINGLE LINE WIRE FABRIC HAVING AN AREA OF NOT LESS THAN 0.12 SQ. IN. PER FOOT OF HEIGHT.
4. ALL STORM SEWER PIPING RUNS SHALL USE RESILIENT RUBBER JOINTS AT PIPE CONNECTIONS TO CATCH BASINS FOR WATERTIGHT CONNECTION PER PLUMBING CODE.

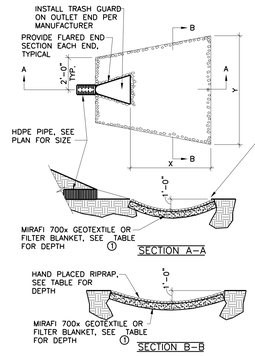
7 C6.0 MANHOLE WITH SUMP

NO SCALE

STRUCTURE SCHEDULE			
STRUCTURE TYPE	STRUCTURE TYPE/DETAIL	GRATE TYPE (NDS/NEENAH)	REMARKS
STM AD 1	NYLOPLAST INLINE	NDS #1210	12X12 SQUARE GRATE
STM AD 2	NYLOPLAST INLINE	NDS #1210	12X12 SQUARE GRATE
STM AD 3	NYLOPLAST INLINE	NDS #1210	12X12 SOLID COVER
STM AD 4	NYLOPLAST INLINE	NDS #1210	12X12 SOLID COVER
STM AD 5	NYLOPLAST INLINE	NDS #1210	12X12 SQUARE GRATE
STM AD 6	NYLOPLAST INLINE	NDS #1210	12X12 SQUARE GRATE
STM AD 7	NYLOPLAST INLINE	NDS #1210	12X12 SQUARE GRATE
STM AD 8	NYLOPLAST INLINE	NDS #1210	12X12 SQUARE GRATE
STM AD 9	NYLOPLAST INLINE	NDS #1210	12X12 SOLID COVER
STM MH 10	DETAIL 6/C6.0	R-1642-A	MANHOLE
STM AD 11	NYLOPLAST INLINE	NDS #1210	12X12 SOLID COVER
STM CB 12	DETAIL 7/C6.0	R-2560-E1	CB BEEHIVE
STM CB 13	DETAIL 5/C6.0	R-2560-E1	CB BEEHIVE
STM AD 14	NYLOPLAST INLINE	NDS #1210	12X12 SQUARE GRATE
STM AD 15	NYLOPLAST INLINE	NDS #1210	12X12 SOLID COVER
STM AD 16	NYLOPLAST INLINE	NDS #1210	12X12 SOLID COVER
STM AD 17	NYLOPLAST INLINE	NDS #1210	12X12 SQUARE GRATE
STM AD 18	NYLOPLAST INLINE	NDS #1210	12X12 SQUARE GRATE
STM AD 19	NYLOPLAST INLINE	NDS #1210	12X12 SQUARE GRATE
RISER MH 20	DETAIL 5/C4.1	R-1642-A	MANHOLE
RISER MH 21	DETAIL 5/C4.1	R-1642-A	MANHOLE
STM AD 22	NYLOPLAST INLINE	NDS #1210	12X12 SQUARE GRATE
STM AD 23	NYLOPLAST INLINE	NDS #1210	12X12 SQUARE GRATE
STM CB 24	DETAIL 6/C6.0	R-2560-E1	CB BEEHIVE
STM AD 25	NYLOPLAST INLINE	NDS #1210	12X12 SQUARE GRATE
STM MH 26	DETAIL 6/C6.0	R-1642-A	MANHOLE

8 C6.0 STORM SEWER SCHEDULE

NO SCALE

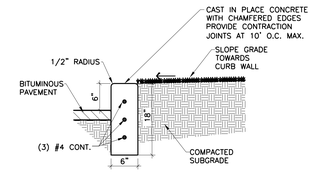


NOTES:
① THE CONTRACTOR, MAY SUBSTITUTE A GEOTEXTILE FABRIC PER MN DOT SPEC. SECTION 3601, FOR THE GRANULAR FILTER BLANKET U.N.O. THE FABRIC SHOULD COVER THE AREA OF THE RIPRAP AND EXTEND UNDER THE CULVERT APRON 3 FT.

PROVIDE RIPRAP & GRANULAR FILTER (PER MNDOT 2511) AS FOLLOWS					
				CLASS III	
PIPE DIA.	X	Y		18" DEPTH RIPRAP (CY)	9" DEPTH GRAN FILTER (CY)
12"	8'	11'		4.7	2.4
15"	8'	11'8"		5.2	2.6

9 C6.0 RIPRAP AT HDPE OUTLET

NO SCALE



10 C6.0 6" HIGH CURB WALL

NO SCALE

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TEL 763.537.1311
rhonda@piercepini.com

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I hereby certify that this plan or drawing was prepared by me or under my direct supervision and that I am a duly licensed ENGINEER under the laws of the State of Minnesota.
For PIERCE PINI & ASSOCIATES, INC.
By Rhonda S. Pierce
Name RHONDA S. PIERCE
Date 06/08/2021 Reg. No. 41333

Issued for	Date
0 ISSUED FOR PERMIT	06/08/2021
1 CITY COMMENTS	07/06/2021

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Date	06/08/2021

PERMIT SET

Drawing Title

CIVIL DETAILS

C6.0

PIERCE PINI + ASSOCIATES, INC.

CONSULTING CIVIL ENGINEERS

STORMWATER CALCULATIONS

FOR

WINDY HILL

100 Windy Hill Road
Sunfish Lake, MN 55077

June 08, 2021
Revised July 06, 2021

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.

Rhonda S. Pierce 41333 06/08/2021

Name: RHONDA S. PIERCE **LICENSE NO.** **DATE**

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3. DRAINAGE MAPS
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    c. WEST INFILTRATION BASIN STAGE-AREA-STORAGE TABLE
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6. GEOTECHNICAL REPORT
7. SOIL INVESTIGATION REPORT

9298 CENTRAL AVENUE NE, SUITE 312 • BLAINE, MN • 55434
PHONE: 763.537.1311 • EMAIL: RHONDA@PIERCEPINI.COM

STORMWATER MANGEMENT NARRATIVE

Existing Conditions

The subject property is located at 100 Windy Hill Road located on the south side of Sunfish Lake. It consists of four parcels that total 40-acres and is zoned residential. The northwestern parcel is 12.6 acres of which 2.00 acres will be disturbed for the new house and site.

Within this 2.00 acre limit of disturbance, there is an existing house, garage, and driveway and is 0.25 acres of impervious surface. The topography on-site is rolling with a lot of grade change but generally drains north and east to Sunfish Lake. There currently are no stormwater management features on the property. The existing house, garage, and driveway will be demolished for the new home.

Proposed Conditions

The project includes the construction of a new house with an attached garage and pool house, a swimming pool and walks, terraces, and a driveway connecting the outdoor spaces to the indoor spaces. The proposed work will result in 0.72 acres of total impervious area. This is a net increase of 0.47 acres of impervious area.

There are three stormwater management treatment systems proposed for the site. A west infiltration basin, an east infiltration basin, and an underground infiltration pipe gallery. See proposed drainage map.

The west side of the site is treated by the west infiltration basin and discharges to the underground pipe gallery. This portion of the site collets runoff from a portion of the roof and the west side of the site which sheet flows to the basin. This is shown as P2 on the proposed drainage map.

The east infiltration basin collects the new bituminous driveway via swales and ditches which flow to the basin. This basin is currently oversized for the proposed, reconstructed driveway in the project plans dated 07/06/2021. However, as the home is constructed, it is recognized there may be a need to reconstruct additional driveway if it is damaged by construction traffic so the basin is larger to account for additional pavement runoff. This basin has an overflow drain that discharges to the existing pond. This is shown as P4 on the proposed drainage map.

The underground pipe gallery system collects the remainder of the roof through downspouts, area drains, and storm sewer piping for runoff from the roof, pool deck, and driveway court. The pipe gallery system consists of 60” dual wall, smooth interior, perforated HDPE pipe located below the driveway. The underground system discharges to a 12” culvert connected to the overflow manhole of the east infiltration basin. This is shown as P3 on the proposed drainage map.

A small portion will runoff to the north and east of the site without being treated. This is shown as P1 on the proposed drainage map.

Soil Analysis

A geotechnical report was completed for the site by Haugo Geotechnical Services dated October 29, 2020. The report shows subgrade soils of Silty Sands (SM) which corresponds to HSG soil type "B".

A soil investigation report was also completed for the site by Soil Investigation & Design, Inc. dated May 4, 2021. The soil investigations report indicated infiltration rates varying between 0.50 – 7.50 inches/hour.

The existing soils underneath the systems and within 5' of the system will be cut down to the groundwater level and replaced with clean sand soil type "A" allowing the systems an overall infiltration rate of 0.80 in/hr.

Stormwater Management

The local government unit for stormwater is the City of Sunfish Lake and the city stormwater management plan has requirements for water quality, rate control, and volume control for the site stormwater.

The water quality requirement is a treatment volume that equates to one inch from the net increase of the new or disturbed impervious areas. A small amount of impervious area flows untreated to the north and east but the impervious area is small and consists of retaining walls and stone pathways. Overall, the site exceeds the required treatment volume within the three stormwater systems. A summary of the infiltration requirements is below:

Water Quality Volume Table

Treatment System	Impervious Area to System (SF)	Required Water Quality Volume (CF)	Treatment Volume Provided (CF)
North Runoff Untreated (1P)	2,479	207	0
West Basin (2P)	8,019	668	1,450
Pipe System (3P)	17,037	1,420	4,572
East Basin (4P)	3,886	324	1,541
Total Site Impervious Area (SF)	31,421		
Total Site Required Treatment Volume (SF)		2,618	
Total Site Treatment Volume (CF)			7,563
Net Excess Treatment Volume (CF)			4,945

The rate control requirement means the proposed site runoff rate must be equal to or less than the runoff from the existing conditions runoff rate for the 2-, 10-, and 100-year storm events. The proposed site rates of runoff are less than the existing rates of runoff.

The volume control requirement means the proposed site volume runoff must be equal to or less than the existing conditions site volume runoff for the 2-, 10- and 100-year storm events. The proposed site runoff volumes are less than the existing site runoff volumes.

Summary tables of the existing and proposed conditions for discharge rates and volume control are shown below:

Rate Runoff Summary Table		
Storm Event	Existing Rate (cfs)	Proposed Rate (cfs)
2-Year Event	3.14	1.45
10-Year Event	6.03	2.83
100-Year Event	12.95	12.43

Volume Runoff Summary Table		
Storm Event	Existing Volume (ac-ft)	Proposed Volume (ac-ft)
2-Year Event	0.140	0.065
10-Year Event	0.272	0.203
100-Year Event	0..682	0.677

A HydroCAD hydraulic model has been developed for the site. The hydrograph method uses NRCS TR-20 modeling. All modeling analyses use the most current rainfall frequencies based on NOAA Atlas 14 rainfall data.

Infiltration BMPs are required to provide a drawdown time within 48 hours for surface features. The maximum drawdown depth for HSG "A" type soils is 3.20 feet. Each system meets this requirement and the infiltration systems drawdown in 48 hours or less.

The HydroCAD model output includes existing and proposed reports, stage-storage and drawdown tables. These are attached.

Sediment and Erosion Control

A Storm Water Pollution Prevention Plan has been prepared and will be implemented for the project. See Construction Drawings C2.0-C2.2.

Mauer House Stormwater Calculations
Pierce Pini & Associates, Inc.
Date: 07/07/21

Existing Conditions						
Drainage Area	Pervious Area [sf]	CN Value	Impervious Area [sf]	CN Value	Total Area [sf]	CN Value
EX1	25873	79	1264	98	27137	80
EX2	50395	79	9480	98	59875	82
Total	76268	79	10744	98	87012	81

Proposed Conditions						
Drainage Area	Pervious Area [sf]	CN Value	Impervious Area [sf]	CN Value	Total Area [sf]	CN Value
P1	26566	79	2479	98	29045	81
P2	9711	79	8019	98	17730	88
P3A	40	79	9842	98	9882	98
P3B	3284	79	7195	98	10479	92
P4	15990	79	3886	98	19876	83
Total	55591	79	31421	98	87012	86

Rate Runoff Summary Table			Volume Runoff Summary Table		
Stormwater Event	Existing Conditons (cfs)	Proposed Conditions (cfs)	Stormwater Event	Existing Conditons (af)	Proposed Conditions (af)
2-Year Event	3.14	1.45	2-Year Event	0.140	0.065
10-Year Event	6.03	2.83	10-Year Event	0.272	0.203
100-Year Event	12.95	12.43	100-Year Event	0.682	0.677

Project: Mauer Residence
PN: 21-008
Client: Greco
Date Modified: 7/7/2020

Design Location FROM	Design Location TO	Contrib Area (feet)	Contrib Area (acres)	Average Area Coeff. (c)	Area (A*c)	Total Tc (min)	Total Intensity (in/hr) Using 10 year 10 minute * 6	Contributing Area Discharge (cfs)	Total Design Discharge for D.S. Pipe		Length (ft)	Slope (%)	**Diameter (in)**	Pipe Capacity (cfs)	**% Capacity**	Velocity (fps)	Pipe Time (min)	Design Met	Assumptions
Site Storm Sewer Routing																			
AD 1	AD 2	725	0.017	0.95	0.016	6	5.44	0.087	0.087		36.0	0.500	**8**	0.854	**10.15**	2.449	0.24	YES	
AD 2	AD 3	691	0.016	0.95	0.015	6	5.44	0.083	0.169		19.0	0.500	**8**	0.854	**19.82**	2.449	0.13	YES	
AD 3	AD 4	0	0.000	0.95	0.000	6	5.44	0.000	0.169		26.0	0.500	**8**	0.854	**19.82**	2.449	0.18	YES	
AD 4	MH 10	0	0.000	0.95	0.000	6	5.44	0.000	0.169		37.0	0.500	**12**	2.518	**6.72**	3.209	0.19	YES	
AD 5	AD 6	721	0.017	0.95	0.016	6	5.44	0.086	0.086		55.0	0.500	**8**	0.854	**10.09**	2.449	0.37	YES	
POOL DRAIN	AD 6	3,859	0.089	0.95	0.084	6	5.44	0.461	0.461		9.0	0.500	**8**	0.854	**54.01**	2.449	0.06	YES	
AD 6	MH 10	777	0.018	0.95	0.017	6	5.44	0.093	0.640		10.0	5.900	**8**	2.934	**21.82**	8.413	0.02	YES	
AD 7	AD 8	720	0.017	0.95	0.016	6	5.44	0.086	0.086		55.0	3.360	**8**	2.214	**3.89**	6.349	0.14	YES	
AD 8	AD 9	803	0.018	0.95	0.018	6	5.44	0.096	0.182		10.0	0.500	**8**	0.854	**21.31**	2.449	0.07	YES	
AD 9	MH 10	0	0.000	0.95	0.000	6	5.44	0.000	0.182		27.0	0.500	**8**	0.854	**21.31**	2.449	0.18	YES	
AD 25	MH 10	617	0.014	0.95	0.013	6	5.44	0.074	0.074		8.0	0.500	**8**	0.854	**8.63**	2.449	0.05	YES	
MH 10	AD 11	0	0.000	0.95	0.000	6	5.44	0.000	1.065		98.0	0.500	**12**	2.518	**42.31**	3.209	0.51	YES	
AD 11	CB 12	0	0.000	0.95	0.000	6	5.44	0.000	1.065		49.0	0.500	**12**	2.518	**42.31**	3.209	0.25	YES	
AD 19	AD 16	375	0.009	0.95	0.008	6	5.44	0.045	0.045		42.0	0.500	**8**	0.854	**5.25**	2.449	0.29	YES	
AD 16	AD 15	0	0.000	0.95	0.000	6	5.44	0.000	0.045		22.0	0.500	**8**	0.854	**5.25**	2.449	0.15	YES	
AD 18	AD 15	375	0.009	0.95	0.008	6	5.44	0.045	0.045		42.0	0.500	**8**	0.854	**5.25**	2.449	0.29	YES	
AD 17	AD 15	718	0.016	0.95	0.016	6	5.44	0.086	0.086		24.0	0.500	**8**	0.854	**10.05**	2.449	0.16	YES	
AD 15	CB 13	0	0.000	0.95	0.000	6	5.44	0.000	0.175		45.0	9.290	**12**	10.855	**1.62**	13.833	0.05	YES	
AD 14	CB 13	512	0.012	0.95	0.011	6	5.44	0.061	0.061		32.0	0.500	**8**	0.854	**7.17**	2.449	0.22	YES	
CB 13	CB 12	3,995	0.092	0.95	0.087	6	5.44	0.478	0.478		18.0	0.500	**12**	2.518	**18.96**	3.209	0.09	YES	
CB 12	UG SYSTEM	5,319	0.122	0.95	0.116	6	5.44	0.636	1.350		5.0	1.000	**12**	3.562	**37.91**	4.538	0.02	YES	
AD 23	AD 22	0	0.000	0.95	0.000	6	5.44	0.970	0.970		39.0	0.500	**12**	2.518	**38.52**	3.209	0.20	YES	*From HydroCAD
AD 22	UG SYSTEM	17,075	0.392	0.40	0.157	6	5.44	0.859	1.829		84.0	0.500	**12**	2.518	**72.64**	3.209	0.44	YES	
UG SYSTEM	MH 26	0	0.000	0.95	0.000	6	5.44	0.310	0.310		10.0	1.000	**12**	3.562	**8.70**	4.538	0.04	YES	*From HydroCAD
MH 26	CB 24	0	0.000	0.95	0.000	6	5.44	0.000	0.310		16.0	1.000	**12**	3.562	**8.70**	4.538	0.06	YES	
Offsite	Road Culvert	47,350	1.087	0.30	0.326	6	5.44	1.787	1.787		55.0	0.910	**36**	63.604	**2.81**	9.006	0.10	YES	
CB 24	SUNFISH LAKE	0	0.000	0.95	0.000	6	5.44	0.710	1.020		52.0	0.500	**15**	4.566	**22.34**	3.724	0.23	YES	*From HydroCAD

PIERCE PINI &
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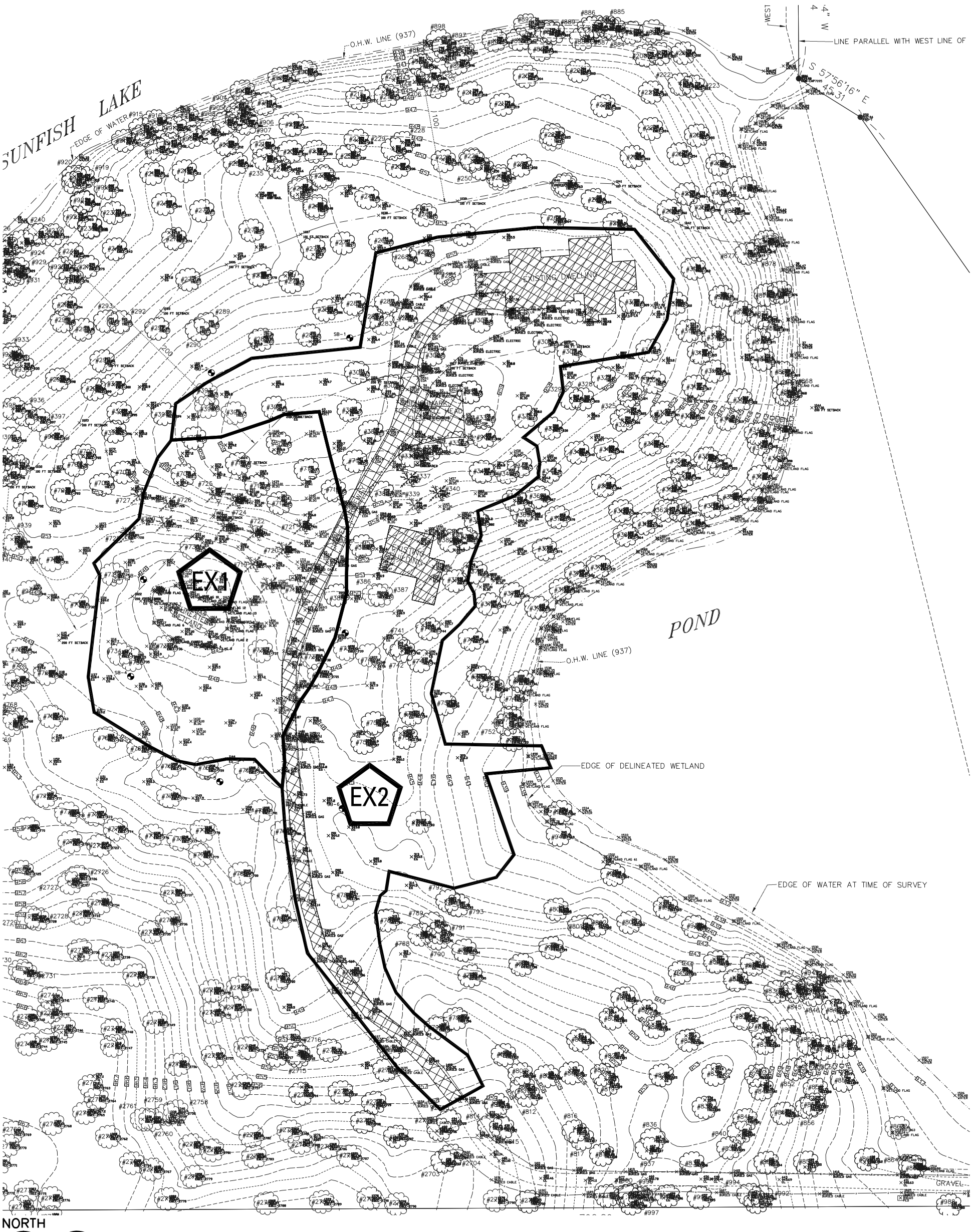
MAUER HOUSE
100 WINDY HILL ROAD
SUNFISH LAKE, MINNESOTA

PPA PROJECT: 21-008
DATE: 07.07.21
DRAWN BY: DPM

IMPERVIOUS AREA



A EXISTING DRAINAGE MAP

PIERCE PINI &
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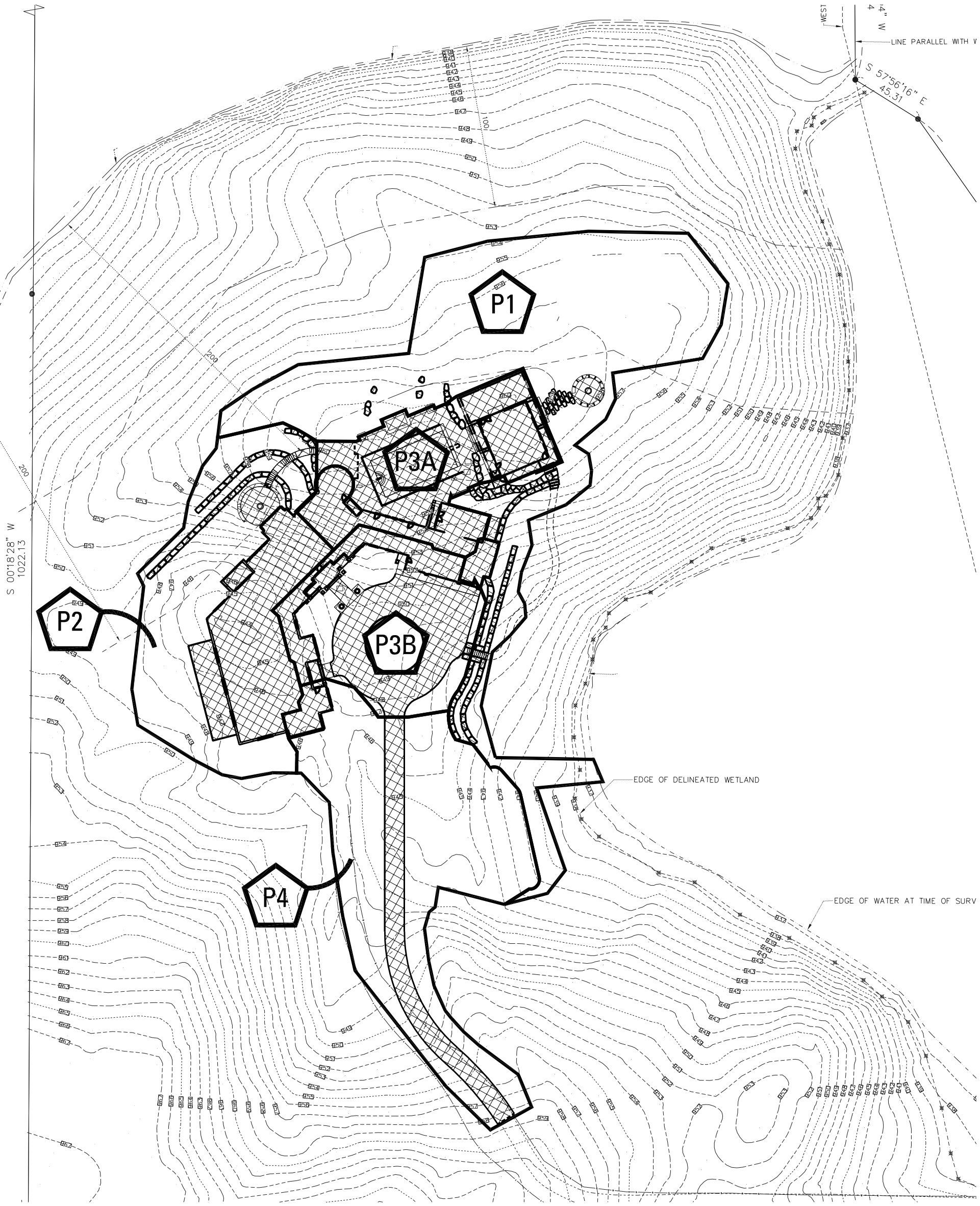
PPA PROJECT: 21-008
DATE: 07.07.21
DRAWN BY: DPM

IMPERVIOUS AREA

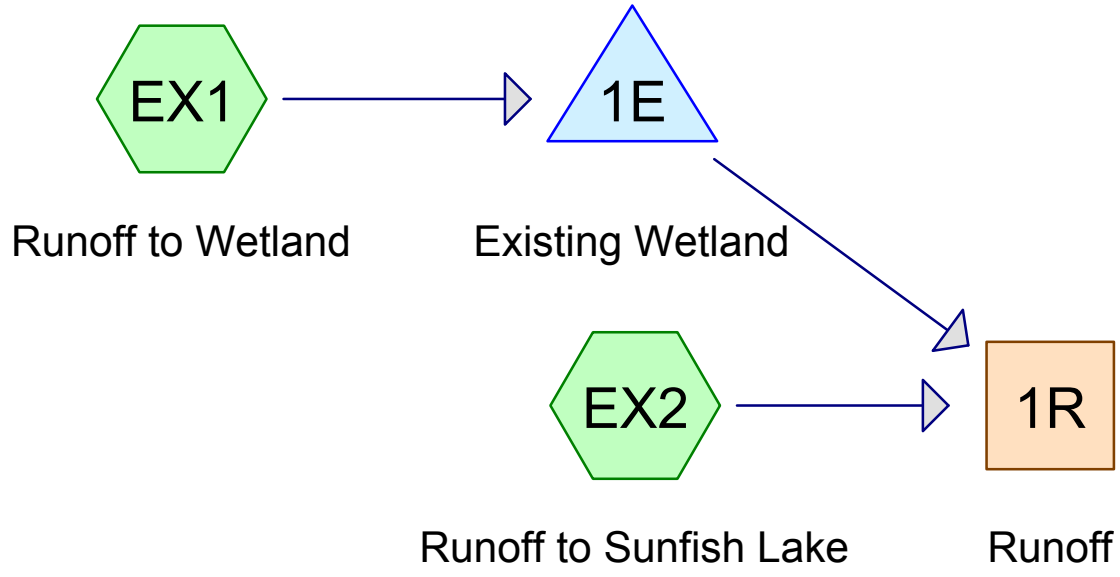


NORTH

B PROPOSED DRAINAGE MAP

0' 60' 120' 180'

Existing Conditions



Subcat Reach Pond Link

Routing Diagram for HydroCAD Model
Prepared by {enter your company name here}, Printed 7/2/2021
HydroCAD® 10.00-20 s/n 03481 © 2017 HydroCAD Software Solutions LLC

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.751	79	50-75% Grass cover, Fair, HSG C (EX1, EX2)
0.247	98	Paved parking, HSG A (EX1, EX2)
1.998	**81**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.247	HSG A	EX1, EX2
0.000	HSG B	
1.751	HSG C	EX1, EX2
0.000	HSG D	
0.000	Other	
1.998		**TOTAL AREA**

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment EX1: Runoff to Wetland Runoff Area=27,137 sf 4.66% Impervious Runoff Depth=1.10"
Tc=6.0 min CN=80 Runoff=1.28 cfs 0.057 af

Subcatchment EX2: Runoff to Sunfish Lake Runoff Area=59,875 sf 15.83% Impervious Runoff Depth=1.22"
Tc=6.0 min CN=82 Runoff=3.14 cfs 0.140 af

Reach 1R: Runoff Inflow=3.14 cfs 0.140 af
Outflow=3.14 cfs 0.140 af

Pond 1E: Existing Wetland Peak Elev=945.58' Storage=2,492 cf Inflow=1.28 cfs 0.057 af
Outflow=0.00 cfs 0.000 af

Total Runoff Area = 1.998 ac Runoff Volume = 0.197 af Average Runoff Depth = 1.19"
87.65% Pervious = 1.751 ac 12.35% Impervious = 0.247 ac

Summary for Subcatchment EX1: Runoff to Wetland

Runoff = 1.28 cfs @ 12.14 hrs, Volume= 0.057 af, Depth= 1.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-year Rainfall=2.80"

Area (sf)	CN	Description
25,873	79	50-75% Grass cover, Fair, HSG C
1,264	98	Paved parking, HSG A
27,137	80	Weighted Average
25,873		95.34% Pervious Area
1,264		4.66% Impervious Area

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

Summary for Subcatchment EX2: Runoff to Sunfish Lake

Runoff = 3.14 cfs @ 12.14 hrs, Volume= 0.140 af, Depth= 1.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-year Rainfall=2.80"

Area (sf)	CN	Description
50,395	79	50-75% Grass cover, Fair, HSG C
9,480	98	Paved parking, HSG A
59,875	82	Weighted Average
50,395		84.17% Pervious Area
9,480		15.83% Impervious Area

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

Summary for Reach 1R: Runoff

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.998 ac, 12.35% Impervious, Inflow Depth = 0.84" for 2-year event
Inflow = 3.14 cfs @ 12.14 hrs, Volume= 0.140 af
Outflow = 3.14 cfs @ 12.14 hrs, Volume= 0.140 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3

Summary for Pond 1E: Existing Wetland

Inflow Area = 0.623 ac, 4.66% Impervious, Inflow Depth = 1.10" for 2-year event
Inflow = 1.28 cfs @ 12.14 hrs, Volume= 0.057 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 945.58' @ 24.34 hrs Surf.Area= 4,230 sf Storage= 2,492 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	944.00'	363 cf	**Wetland Ponding Area (Prismatic)** Listed below (Recalc)
#2	944.50'	10,494 cf	**Outisde Ponding Area (Prismatic)** Listed below (Recalc)
		10,857 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
944.00	233	0	0
944.50	1,220	363	363

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
944.50	1,220	0	0
945.00	1,750	743	743
946.00	3,912	2,831	3,574
947.00	9,928	6,920	10,494

Device	Routing	Invert	Outlet Devices
#1	Primary	946.70'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=944.00' TW=0.00' (Dynamic Tailwater)
↑—**1=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment EX1: Runoff to Wetland Runoff Area=27,137 sf 4.66% Impervious Runoff Depth=2.21"
Tc=6.0 min CN=80 Runoff=2.56 cfs 0.115 af

Subcatchment EX2: Runoff to Sunfish Lake Runoff Area=59,875 sf 15.83% Impervious Runoff Depth=2.37"
Tc=6.0 min CN=82 Runoff=6.03 cfs 0.272 af

Reach 1R: Runoff Inflow=6.03 cfs 0.272 af
Outflow=6.03 cfs 0.272 af

Pond 1E: Existing Wetland Peak Elev=946.23' Storage=4,993 cf Inflow=2.56 cfs 0.115 af
Outflow=0.00 cfs 0.000 af

Total Runoff Area = 1.998 ac Runoff Volume = 0.387 af Average Runoff Depth = 2.32"
87.65% Pervious = 1.751 ac 12.35% Impervious = 0.247 ac

Summary for Subcatchment EX1: Runoff to Wetland

Runoff = 2.56 cfs @ 12.13 hrs, Volume= 0.115 af, Depth= 2.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-year Rainfall=4.20"

Area (sf)	CN	Description
25,873	79	50-75% Grass cover, Fair, HSG C
1,264	98	Paved parking, HSG A
27,137	80	Weighted Average
25,873		95.34% Pervious Area
1,264		4.66% Impervious Area

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

Summary for Subcatchment EX2: Runoff to Sunfish Lake

Runoff = 6.03 cfs @ 12.13 hrs, Volume= 0.272 af, Depth= 2.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-year Rainfall=4.20"

Area (sf)	CN	Description
50,395	79	50-75% Grass cover, Fair, HSG C
9,480	98	Paved parking, HSG A
59,875	82	Weighted Average
50,395		84.17% Pervious Area
9,480		15.83% Impervious Area

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

Summary for Reach 1R: Runoff

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.998 ac, 12.35% Impervious, Inflow Depth = 1.63" for 10-year event
Inflow = 6.03 cfs @ 12.13 hrs, Volume= 0.272 af
Outflow = 6.03 cfs @ 12.13 hrs, Volume= 0.272 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3

Summary for Pond 1E: Existing Wetland

Inflow Area = 0.623 ac, 4.66% Impervious, Inflow Depth = 2.21" for 10-year event
Inflow = 2.56 cfs @ 12.13 hrs, Volume= 0.115 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 946.23' @ 24.34 hrs Surf.Area= 6,513 sf Storage= 4,993 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	944.00'	363 cf	**Wetland Ponding Area (Prismatic)** Listed below (Recalc)
#2	944.50'	10,494 cf	**Outisde Ponding Area (Prismatic)** Listed below (Recalc)
		10,857 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
944.00	233	0	0
944.50	1,220	363	363

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
944.50	1,220	0	0
945.00	1,750	743	743
946.00	3,912	2,831	3,574
947.00	9,928	6,920	10,494

Device	Routing	Invert	Outlet Devices
#1	Primary	946.70'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=944.00' TW=0.00' (Dynamic Tailwater)
↑—**1=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment EX1: Runoff to Wetland Runoff Area=27,137 sf 4.66% Impervious Runoff Depth=5.06"
Tc=6.0 min CN=80 Runoff=5.67 cfs 0.263 af

Subcatchment EX2: Runoff to Sunfish Lake Runoff Area=59,875 sf 15.83% Impervious Runoff Depth=5.29"
Tc=6.0 min CN=82 Runoff=12.95 cfs 0.606 af

Reach 1R: Runoff Inflow=12.95 cfs 0.682 af
Outflow=12.95 cfs 0.682 af

Pond 1E: Existing Wetland Peak Elev=946.76' Storage=8,640 cf Inflow=5.67 cfs 0.263 af
Outflow=0.24 cfs 0.076 af

Total Runoff Area = 1.998 ac Runoff Volume = 0.869 af Average Runoff Depth = 5.22"
87.65% Pervious = 1.751 ac 12.35% Impervious = 0.247 ac

Summary for Subcatchment EX1: Runoff to Wetland

Runoff = 5.67 cfs @ 12.13 hrs, Volume= 0.263 af, Depth= 5.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-year Rainfall=7.40"

Area (sf)	CN	Description
25,873	79	50-75% Grass cover, Fair, HSG C
1,264	98	Paved parking, HSG A
27,137	80	Weighted Average
25,873		95.34% Pervious Area
1,264		4.66% Impervious Area

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

Summary for Subcatchment EX2: Runoff to Sunfish Lake

Runoff = 12.95 cfs @ 12.13 hrs, Volume= 0.606 af, Depth= 5.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-year Rainfall=7.40"

Area (sf)	CN	Description
50,395	79	50-75% Grass cover, Fair, HSG C
9,480	98	Paved parking, HSG A
59,875	82	Weighted Average
50,395		84.17% Pervious Area
9,480		15.83% Impervious Area

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

Summary for Reach 1R: Runoff

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.998 ac, 12.35% Impervious, Inflow Depth = 4.10" for 100-year event
Inflow = 12.95 cfs @ 12.13 hrs, Volume= 0.682 af
Outflow = 12.95 cfs @ 12.13 hrs, Volume= 0.682 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3

Summary for Pond 1E: Existing Wetland

Inflow Area = 0.623 ac, 4.66% Impervious, Inflow Depth = 5.06" for 100-year event
Inflow = 5.67 cfs @ 12.13 hrs, Volume= 0.263 af
Outflow = 0.24 cfs @ 13.55 hrs, Volume= 0.076 af, Atten= 96%, Lag= 84.9 min
Primary = 0.24 cfs @ 13.55 hrs, Volume= 0.076 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 946.76' @ 13.55 hrs Surf.Area= 9,699 sf Storage= 8,640 cf

Plug-Flow detention time= 316.8 min calculated for 0.076 af (29% of inflow)
Center-of-Mass det. time= 220.9 min (1,009.2 - 788.3)

Volume	Invert	Avail.Storage	Storage Description
#1	944.00'	363 cf	**Wetland Ponding Area (Prismatic)** Listed below (Recalc)
#2	944.50'	10,494 cf	**Outisde Ponding Area (Prismatic)** Listed below (Recalc)
		10,857 cf	Total Available Storage

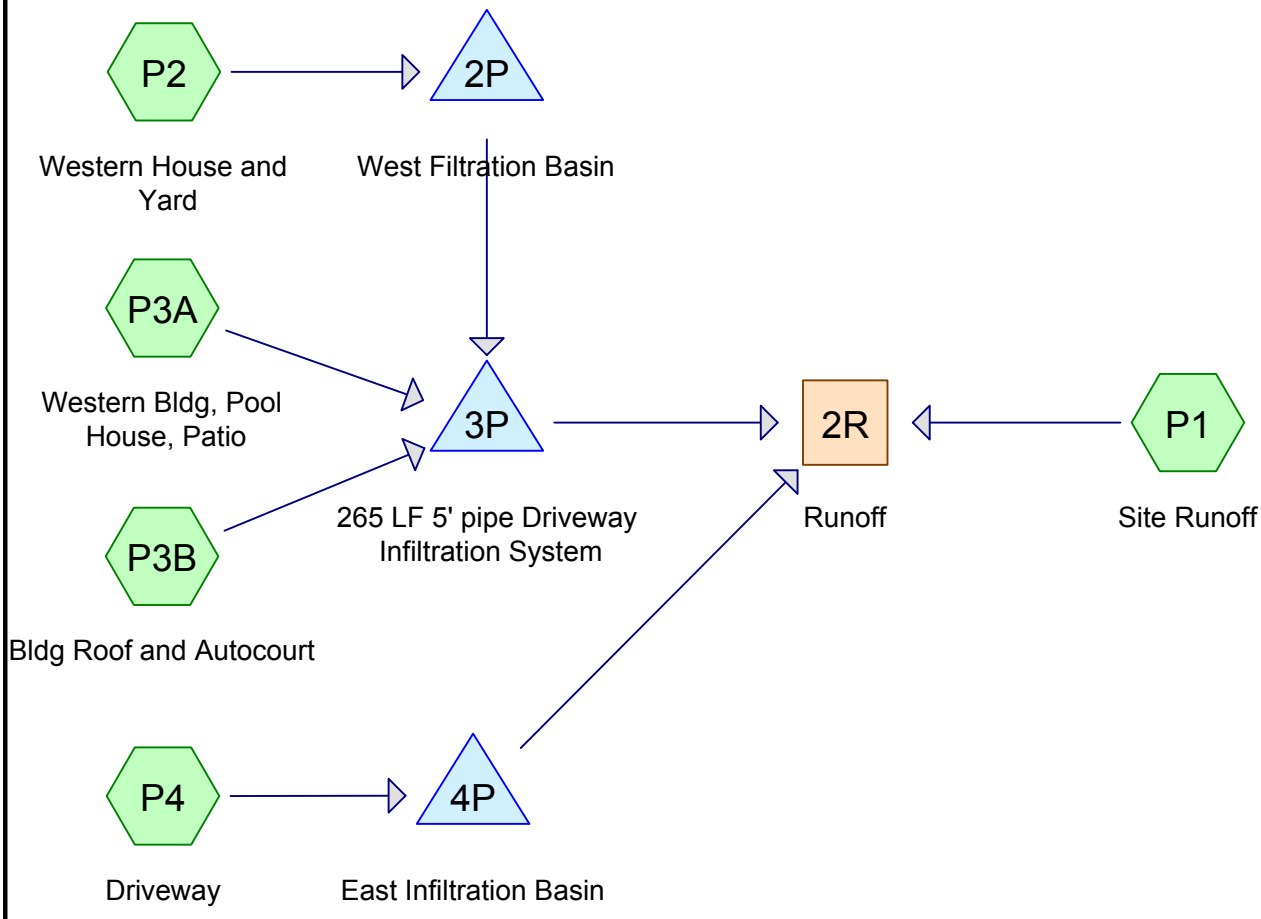
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
944.00	233	0	0
944.50	1,220	363	363

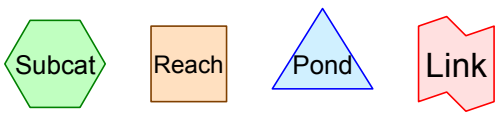
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
944.50	1,220	0	0
945.00	1,750	743	743
946.00	3,912	2,831	3,574
947.00	9,928	6,920	10,494

Device	Routing	Invert	Outlet Devices
#1	Primary	946.70'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height

Primary OutFlow Max=0.24 cfs @ 13.55 hrs HW=946.76' TW=0.00' (Dynamic Tailwater)
↑—**1=Sharp-Crested Rectangular Weir** (Weir Controls 0.24 cfs @ 0.81 fps)

Proposed Conditions





Routing Diagram for HydroCAD Model
Prepared by {enter your company name here}, Printed 7/2/2021
HydroCAD® 10.00-20 s/n 03481 © 2017 HydroCAD Software Solutions LLC

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.276	79	50-75% Grass cover, Fair, HSG C (P1, P2, P3A, P3B, P4)
0.721	98	Paved parking, HSG A (P1, P2, P3A, P3B, P4)
1.998	**86**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.721	HSG A	P1, P2, P3A, P3B, P4
0.000	HSG B	
1.276	HSG C	P1, P2, P3A, P3B, P4
0.000	HSG D	
0.000	Other	
1.998		**TOTAL AREA**

Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	2P	943.62	943.00	123.0	0.0050	0.010	12.0	0.0	0.0
2	3P	944.00	943.90	10.0	0.0100	0.010	12.0	0.0	0.0
3	4P	938.26	938.00	52.0	0.0050	0.010	15.0	0.0	0.0

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment P1: Site Runoff Runoff Area=29,045 sf 8.54% Impervious Runoff Depth=1.16"
Tc=6.0 min CN=81 Runoff=1.45 cfs 0.065 af

Subcatchment P2: Western House and Runoff Area=17,730 sf 45.23% Impervious Runoff Depth=1.64"
Tc=6.0 min CN=88 Runoff=1.23 cfs 0.056 af

Subcatchment P3A: Western Bldg, Pool Runoff Area=9,882 sf 99.60% Impervious Runoff Depth=2.57"
Tc=6.0 min CN=98 Runoff=0.94 cfs 0.049 af

Subcatchment P3B: Bldg Roof and Runoff Area=10,479 sf 68.66% Impervious Runoff Depth=1.97"
Tc=6.0 min CN=92 Runoff=0.85 cfs 0.040 af

Subcatchment P4: Driveway Runoff Area=19,876 sf 19.55% Impervious Runoff Depth=1.29"
Tc=6.0 min CN=83 Runoff=1.10 cfs 0.049 af

Reach 2R: Runoff Inflow=1.45 cfs 0.065 af
Outflow=1.45 cfs 0.065 af

Pond 2P: West Filtration Basin Peak Elev=945.44' Storage=1,515 cf Inflow=1.23 cfs 0.056 af
Discarded=0.02 cfs 0.048 af Primary=0.07 cfs 0.008 af Outflow=0.08 cfs 0.056 af

Pond 3P: 265 LF 5' pipe Driveway Infiltration Peak Elev=942.88' Storage=2,848 cf Inflow=1.78 cfs 0.096 af
Discarded=0.03 cfs 0.096 af Primary=0.00 cfs 0.000 af Outflow=0.03 cfs 0.096 af

Pond 4P: East Infiltration Basin Peak Elev=942.31' Storage=1,401 cf Inflow=1.10 cfs 0.049 af
Discarded=0.03 cfs 0.049 af Primary=0.00 cfs 0.000 af Outflow=0.03 cfs 0.049 af

Total Runoff Area = 1.998 ac Runoff Volume = 0.257 af Average Runoff Depth = 1.55"
63.89% Pervious = 1.276 ac 36.11% Impervious = 0.721 ac

Summary for Subcatchment P1: Site Runoff

Runoff = 1.45 cfs @ 12.14 hrs, Volume= 0.065 af, Depth= 1.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-year Rainfall=2.80"

Area (sf)	CN	Description
26,566	79	50-75% Grass cover, Fair, HSG C
2,479	98	Paved parking, HSG A
29,045	81	Weighted Average
26,566		91.46% Pervious Area
2,479		8.54% Impervious Area

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

Summary for Subcatchment P2: Western House and Yard

Runoff = 1.23 cfs @ 12.13 hrs, Volume= 0.056 af, Depth= 1.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-year Rainfall=2.80"

Area (sf)	CN	Description
9,711	79	50-75% Grass cover, Fair, HSG C
8,019	98	Paved parking, HSG A
17,730	88	Weighted Average
9,711		54.77% Pervious Area
8,019		45.23% Impervious Area

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

Summary for Subcatchment P3A: Western Bldg, Pool House, Patio

Runoff = 0.94 cfs @ 12.13 hrs, Volume= 0.049 af, Depth= 2.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-year Rainfall=2.80"

Area (sf)	CN	Description
40	79	50-75% Grass cover, Fair, HSG C
9,842	98	Paved parking, HSG A
9,882	98	Weighted Average
40		0.40% Pervious Area
9,842		99.60% Impervious Area

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

Summary for Subcatchment P3B: Bldg Roof and Autocourt

Runoff = 0.85 cfs @ 12.13 hrs, Volume= 0.040 af, Depth= 1.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-year Rainfall=2.80"

Area (sf)	CN	Description
3,284	79	50-75% Grass cover, Fair, HSG C
7,195	98	Paved parking, HSG A
10,479	92	Weighted Average
3,284		31.34% Pervious Area
7,195		68.66% Impervious Area

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

Summary for Subcatchment P4: Driveway

Runoff = 1.10 cfs @ 12.14 hrs, Volume= 0.049 af, Depth= 1.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-year Rainfall=2.80"

Area (sf)	CN	Description
15,990	79	50-75% Grass cover, Fair, HSG C
3,886	98	Paved parking, HSG A
19,876	83	Weighted Average
15,990		80.45% Pervious Area
3,886		19.55% Impervious Area

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

Summary for Reach 2R: Runoff

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.998 ac, 36.11% Impervious, Inflow Depth = 0.39" for 2-year event
Inflow = 1.45 cfs @ 12.14 hrs, Volume= 0.065 af
Outflow = 1.45 cfs @ 12.14 hrs, Volume= 0.065 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3

Summary for Pond 2P: West Filtration Basin

Inflow Area = 0.407 ac, 45.23% Impervious, Inflow Depth = 1.64" for 2-year event
Inflow = 1.23 cfs @ 12.13 hrs, Volume= 0.056 af
Outflow = 0.08 cfs @ 13.14 hrs, Volume= 0.056 af, Atten= 93%, Lag= 60.3 min
Discarded = 0.02 cfs @ 11.14 hrs, Volume= 0.048 af
Primary = 0.07 cfs @ 13.14 hrs, Volume= 0.008 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 945.44' @ 13.14 hrs Surf.Area= 1,808 sf Storage= 1,515 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 813.1 min (1,611.8 - 798.7)

Volume	Invert	Avail.Storage	Storage Description
#1	944.30'	2,658 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
944.30	820	0	0
945.00	1,468	801	801
946.00	2,247	1,858	2,658

Device	Routing	Invert	Outlet Devices
#1	Primary	943.62'	**12.0" Round Culvert** L= 123.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 943.62' / 943.00' S= 0.0050 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf
#2	Device 1	945.40'	**12.0" Horiz. Overflow AD 23** C= 0.600 Limited to weir flow at low heads
#3	Discarded	944.30'	**0.800 in/hr Exfiltration over Surface area below 944.30'**

Discarded OutFlow Max=0.02 cfs @ 11.14 hrs HW=944.32' (Free Discharge)
↑—**3=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.07 cfs @ 13.14 hrs HW=945.44' TW=942.62' (Dynamic Tailwater)
↑—**1=Culvert** (Passes 0.07 cfs of 3.88 cfs potential flow)
↑—**2=Overflow AD 23** (Weir Controls 0.07 cfs @ 0.62 fps)

Summary for Pond 3P: 265 LF 5' pipe Driveway Infiltration System

Inflow Area = 0.874 ac, 65.78% Impervious, Inflow Depth = 1.32" for 2-year event
Inflow = 1.78 cfs @ 12.13 hrs, Volume= 0.096 af
Outflow = 0.03 cfs @ 11.04 hrs, Volume= 0.096 af, Atten= 98%, Lag= 0.0 min
Discarded = 0.03 cfs @ 11.04 hrs, Volume= 0.096 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3

Peak Elev= 942.88' @ 15.38 hrs Surf.Area= 1,869 sf Storage= 2,848 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 737.5 min (1,511.6 - 774.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	940.50'	2,404 cf	**44.50'W x 42.00'L x 6.00'H Field A** 11,214 cf Overall - 5,203 cf Embedded = 6,011 cf x 40.0% Voids
#2A	941.00'	5,203 cf	**CMP Round 60** x 6 Inside #1 Effective Size= 60.0"W x 60.0"H => 19.63 sf x 20.00'L = 392.7 cf Overall Size= 60.0"W x 60.0"H x 20.00'L Row Length Adjustment= +10.00' x 19.63 sf x 6 rows 42.50' Header x 19.63 sf x 2 = 1,669.0 cf Inside
		7,608 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	944.00'	**12.0" Round Culvert** L= 10.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 944.00' / 943.90' S= 0.0100 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf
#2	Discarded	940.50'	**0.800 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.03 cfs @ 11.04 hrs HW=940.56' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=940.50' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Controls 0.00 cfs)

Summary for Pond 4P: East Infiltration Basin

Inflow Area = 0.456 ac, 19.55% Impervious, Inflow Depth = 1.29" for 2-year event
Inflow = 1.10 cfs @ 12.14 hrs, Volume= 0.049 af
Outflow = 0.03 cfs @ 15.05 hrs, Volume= 0.049 af, Atten= 97%, Lag= 175.1 min
Discarded = 0.03 cfs @ 15.05 hrs, Volume= 0.049 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 942.31' @ 15.05 hrs Surf.Area= 1,598 sf Storage= 1,401 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 569.6 min (1,381.5 - 811.9)

Volume	Invert	Avail.Storage	Storage Description
#1	941.00'	2,503 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
941.00	600	0	0
942.00	1,293	947	947
942.90	2,165	1,556	2,503

Device	Routing	Invert	Outlet Devices
#1	Primary	938.26'	**15.0" Round Culvert** L= 52.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 938.26' / 938.00' S= 0.0050 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.23 sf
#2	Device 1	942.40'	**16.0" Horiz. Overflow CB 24** C= 0.600 Limited to weir flow at low heads
#3	Discarded	941.00'	**0.800 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.03 cfs @ 15.05 hrs HW=942.31' (Free Discharge)
↑└**3=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=941.00' TW=0.00' (Dynamic Tailwater)
↑└**1=Culvert** (Passes 0.00 cfs of 8.59 cfs potential flow)
  ↑└**2=Overflow CB 24** (Controls 0.00 cfs)

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment P1: Site Runoff Runoff Area=29,045 sf 8.54% Impervious Runoff Depth=2.29"
Tc=6.0 min CN=81 Runoff=2.83 cfs 0.127 af

Subcatchment P2: Western House and Runoff Area=17,730 sf 45.23% Impervious Runoff Depth=2.92"
Tc=6.0 min CN=88 Runoff=2.13 cfs 0.099 af

Subcatchment P3A: Western Bldg, Pool Runoff Area=9,882 sf 99.60% Impervious Runoff Depth=3.96"
Tc=6.0 min CN=98 Runoff=1.42 cfs 0.075 af

Subcatchment P3B: Bldg Roof and Runoff Area=10,479 sf 68.66% Impervious Runoff Depth=3.31"
Tc=6.0 min CN=92 Runoff=1.38 cfs 0.066 af

Subcatchment P4: Driveway Runoff Area=19,876 sf 19.55% Impervious Runoff Depth=2.46"
Tc=6.0 min CN=83 Runoff=2.07 cfs 0.094 af

Reach 2R: Runoff Inflow=2.83 cfs 0.203 af
Outflow=2.83 cfs 0.203 af

Pond 2P: West Filtration Basin Peak Elev=945.61' Storage=1,836 cf Inflow=2.13 cfs 0.099 af
Discarded=0.02 cfs 0.051 af Primary=0.97 cfs 0.048 af Outflow=0.99 cfs 0.099 af

Pond 3P: 265 LF 5' pipe Driveway Infiltration Peak Elev=944.29' Storage=5,015 cf Inflow=3.02 cfs 0.189 af
Discarded=0.03 cfs 0.147 af Primary=0.31 cfs 0.042 af Outflow=0.34 cfs 0.189 af

Pond 4P: East Infiltration Basin Peak Elev=942.54' Storage=1,785 cf Inflow=2.07 cfs 0.094 af
Discarded=0.03 cfs 0.060 af Primary=0.71 cfs 0.033 af Outflow=0.75 cfs 0.094 af

Total Runoff Area = 1.998 ac Runoff Volume = 0.461 af Average Runoff Depth = 2.77"
63.89% Pervious = 1.276 ac 36.11% Impervious = 0.721 ac

Summary for Subcatchment P1: Site Runoff

Runoff = 2.83 cfs @ 12.13 hrs, Volume= 0.127 af, Depth= 2.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-year Rainfall=4.20"

Area (sf)	CN	Description
26,566	79	50-75% Grass cover, Fair, HSG C
2,479	98	Paved parking, HSG A
29,045	81	Weighted Average
26,566		91.46% Pervious Area
2,479		8.54% Impervious Area

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

Summary for Subcatchment P2: Western House and Yard

Runoff = 2.13 cfs @ 12.13 hrs, Volume= 0.099 af, Depth= 2.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-year Rainfall=4.20"

Area (sf)	CN	Description
9,711	79	50-75% Grass cover, Fair, HSG C
8,019	98	Paved parking, HSG A
17,730	88	Weighted Average
9,711		54.77% Pervious Area
8,019		45.23% Impervious Area

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

Summary for Subcatchment P3A: Western Bldg, Pool House, Patio

Runoff = 1.42 cfs @ 12.13 hrs, Volume= 0.075 af, Depth= 3.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-year Rainfall=4.20"

Area (sf)	CN	Description
40	79	50-75% Grass cover, Fair, HSG C
9,842	98	Paved parking, HSG A
9,882	98	Weighted Average
40		0.40% Pervious Area
9,842		99.60% Impervious Area

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

Summary for Subcatchment P3B: Bldg Roof and Autocourt

Runoff = 1.38 cfs @ 12.13 hrs, Volume= 0.066 af, Depth= 3.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-year Rainfall=4.20"

Area (sf)	CN	Description
3,284	79	50-75% Grass cover, Fair, HSG C
7,195	98	Paved parking, HSG A
10,479	92	Weighted Average
3,284		31.34% Pervious Area
7,195		68.66% Impervious Area

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

Summary for Subcatchment P4: Driveway

Runoff = 2.07 cfs @ 12.13 hrs, Volume= 0.094 af, Depth= 2.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-year Rainfall=4.20"

Area (sf)	CN	Description
15,990	79	50-75% Grass cover, Fair, HSG C
3,886	98	Paved parking, HSG A
19,876	83	Weighted Average
15,990		80.45% Pervious Area
3,886		19.55% Impervious Area

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

Summary for Reach 2R: Runoff

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.998 ac, 36.11% Impervious, Inflow Depth = 1.22" for 10-year event
Inflow = 2.83 cfs @ 12.13 hrs, Volume= 0.203 af
Outflow = 2.83 cfs @ 12.13 hrs, Volume= 0.203 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3

Summary for Pond 2P: West Filtration Basin

Inflow Area = 0.407 ac, 45.23% Impervious, Inflow Depth = 2.92" for 10-year event
Inflow = 2.13 cfs @ 12.13 hrs, Volume= 0.099 af
Outflow = 0.99 cfs @ 12.23 hrs, Volume= 0.099 af, Atten= 54%, Lag= 5.9 min
Discarded = 0.02 cfs @ 10.40 hrs, Volume= 0.051 af
Primary = 0.97 cfs @ 12.23 hrs, Volume= 0.048 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 945.61' @ 12.23 hrs Surf.Area= 1,941 sf Storage= 1,836 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 496.8 min (1,284.0 - 787.3)

Volume	Invert	Avail.Storage	Storage Description
#1	944.30'	2,658 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
944.30	820	0	0
945.00	1,468	801	801
946.00	2,247	1,858	2,658

Device	Routing	Invert	Outlet Devices
#1	Primary	943.62'	**12.0" Round Culvert** L= 123.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 943.62' / 943.00' S= 0.0050 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf
#2	Device 1	945.40'	**12.0" Horiz. Overflow AD 23** C= 0.600 Limited to weir flow at low heads
#3	Discarded	944.30'	**0.800 in/hr Exfiltration over Surface area below 944.30'**

Discarded OutFlow Max=0.02 cfs @ 10.40 hrs HW=944.32' (Free Discharge)
↑—**3=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.97 cfs @ 12.23 hrs HW=945.61' TW=943.13' (Dynamic Tailwater)
↑—**1=Culvert** (Passes 0.97 cfs of 4.11 cfs potential flow)
↑—**2=Overflow AD 23** (Weir Controls 0.97 cfs @ 1.49 fps)

Summary for Pond 3P: 265 LF 5' pipe Driveway Infiltration System

Inflow Area = 0.874 ac, 65.78% Impervious, Inflow Depth = 2.60" for 10-year event
Inflow = 3.02 cfs @ 12.15 hrs, Volume= 0.189 af
Outflow = 0.34 cfs @ 13.03 hrs, Volume= 0.189 af, Atten= 89%, Lag= 52.8 min
Discarded = 0.03 cfs @ 10.14 hrs, Volume= 0.147 af
Primary = 0.31 cfs @ 13.03 hrs, Volume= 0.042 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3

Peak Elev= 944.29' @ 13.03 hrs Surf.Area= 1,869 sf Storage= 5,015 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 940.6 min (1,709.6 - 769.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	940.50'	2,404 cf	**44.50'W x 42.00'L x 6.00'H Field A** 11,214 cf Overall - 5,203 cf Embedded = 6,011 cf x 40.0% Voids
#2A	941.00'	5,203 cf	**CMP Round 60** x 6 Inside #1 Effective Size= 60.0"W x 60.0"H => 19.63 sf x 20.00'L = 392.7 cf Overall Size= 60.0"W x 60.0"H x 20.00'L Row Length Adjustment= +10.00' x 19.63 sf x 6 rows 42.50' Header x 19.63 sf x 2 = 1,669.0 cf Inside
		7,608 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	944.00'	**12.0" Round Culvert** L= 10.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 944.00' / 943.90' S= 0.0100 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf
#2	Discarded	940.50'	**0.800 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.03 cfs @ 10.14 hrs HW=940.56' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.31 cfs @ 13.03 hrs HW=944.29' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 0.31 cfs @ 2.40 fps)

Summary for Pond 4P: East Infiltration Basin

Inflow Area = 0.456 ac, 19.55% Impervious, Inflow Depth = 2.46" for 10-year event
Inflow = 2.07 cfs @ 12.13 hrs, Volume= 0.094 af
Outflow = 0.75 cfs @ 12.27 hrs, Volume= 0.094 af, Atten= 64%, Lag= 8.3 min
Discarded = 0.03 cfs @ 12.27 hrs, Volume= 0.060 af
Primary = 0.71 cfs @ 12.27 hrs, Volume= 0.033 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 942.54' @ 12.27 hrs Surf.Area= 1,816 sf Storage= 1,785 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 398.6 min (1,197.4 - 798.8)

Volume	Invert	Avail.Storage	Storage Description
#1	941.00'	2,503 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
941.00	600	0	0
942.00	1,293	947	947
942.90	2,165	1,556	2,503

Device	Routing	Invert	Outlet Devices
#1	Primary	938.26'	**15.0" Round Culvert** L= 52.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 938.26' / 938.00' S= 0.0050 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.23 sf
#2	Device 1	942.40'	**16.0" Horiz. Overflow CB 24** C= 0.600 Limited to weir flow at low heads
#3	Discarded	941.00'	**0.800 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.03 cfs @ 12.27 hrs HW=942.54' (Free Discharge)
↑└**3=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.71 cfs @ 12.27 hrs HW=942.54' TW=0.00' (Dynamic Tailwater)
↑└**1=Culvert** (Passes 0.71 cfs of 11.30 cfs potential flow)
↑└**2=Overflow CB 24** (Weir Controls 0.71 cfs @ 1.22 fps)

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment P1: Site Runoff Runoff Area=29,045 sf 8.54% Impervious Runoff Depth=5.18"
Tc=6.0 min CN=81 Runoff=6.18 cfs 0.288 af

Subcatchment P2: Western House and Runoff Area=17,730 sf 45.23% Impervious Runoff Depth=5.98"
Tc=6.0 min CN=88 Runoff=4.17 cfs 0.203 af

Subcatchment P3A: Western Bldg, Pool Runoff Area=9,882 sf 99.60% Impervious Runoff Depth=7.16"
Tc=6.0 min CN=98 Runoff=2.51 cfs 0.135 af

Subcatchment P3B: Bldg Roof and Runoff Area=10,479 sf 68.66% Impervious Runoff Depth=6.45"
Tc=6.0 min CN=92 Runoff=2.57 cfs 0.129 af

Subcatchment P4: Driveway Runoff Area=19,876 sf 19.55% Impervious Runoff Depth=5.41"
Tc=6.0 min CN=83 Runoff=4.37 cfs 0.206 af

Reach 2R: Runoff Inflow=12.43 cfs 0.677 af
Outflow=12.43 cfs 0.677 af

Pond 2P: West Filtration Basin Peak Elev=945.99' Storage=2,639 cf Inflow=4.17 cfs 0.203 af
Discarded=0.02 cfs 0.055 af Primary=2.75 cfs 0.148 af Outflow=2.77 cfs 0.203 af

Pond 3P: 265 LF 5' pipe Driveway Infiltration Peak Elev=945.61' Storage=6,825 cf Inflow=7.72 cfs 0.412 af
Discarded=0.03 cfs 0.159 af Primary=3.98 cfs 0.253 af Outflow=4.01 cfs 0.412 af

Pond 4P: East Infiltration Basin Peak Elev=942.83' Storage=2,348 cf Inflow=4.37 cfs 0.206 af
Discarded=0.04 cfs 0.069 af Primary=3.83 cfs 0.136 af Outflow=3.87 cfs 0.206 af

Total Runoff Area = 1.998 ac Runoff Volume = 0.961 af Average Runoff Depth = 5.77"
63.89% Pervious = 1.276 ac 36.11% Impervious = 0.721 ac

Summary for Subcatchment P1: Site Runoff

Runoff = 6.18 cfs @ 12.13 hrs, Volume= 0.288 af, Depth= 5.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-year Rainfall=7.40"

Area (sf)	CN	Description
26,566	79	50-75% Grass cover, Fair, HSG C
2,479	98	Paved parking, HSG A
29,045	81	Weighted Average
26,566		91.46% Pervious Area
2,479		8.54% Impervious Area

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

Summary for Subcatchment P2: Western House and Yard

Runoff = 4.17 cfs @ 12.13 hrs, Volume= 0.203 af, Depth= 5.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-year Rainfall=7.40"

Area (sf)	CN	Description
9,711	79	50-75% Grass cover, Fair, HSG C
8,019	98	Paved parking, HSG A
17,730	88	Weighted Average
9,711		54.77% Pervious Area
8,019		45.23% Impervious Area

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

Summary for Subcatchment P3A: Western Bldg, Pool House, Patio

Runoff = 2.51 cfs @ 12.13 hrs, Volume= 0.135 af, Depth= 7.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-year Rainfall=7.40"

Area (sf)	CN	Description
40	79	50-75% Grass cover, Fair, HSG C
9,842	98	Paved parking, HSG A
9,882	98	Weighted Average
40		0.40% Pervious Area
9,842		99.60% Impervious Area

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

Summary for Subcatchment P3B: Bldg Roof and Autocourt

Runoff = 2.57 cfs @ 12.13 hrs, Volume= 0.129 af, Depth= 6.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-year Rainfall=7.40"

Area (sf)	CN	Description
3,284	79	50-75% Grass cover, Fair, HSG C
7,195	98	Paved parking, HSG A
10,479	92	Weighted Average
3,284		31.34% Pervious Area
7,195		68.66% Impervious Area

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

Summary for Subcatchment P4: Driveway

Runoff = 4.37 cfs @ 12.13 hrs, Volume= 0.206 af, Depth= 5.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-year Rainfall=7.40"

Area (sf)	CN	Description
15,990	79	50-75% Grass cover, Fair, HSG C
3,886	98	Paved parking, HSG A
19,876	83	Weighted Average
15,990		80.45% Pervious Area
3,886		19.55% Impervious Area

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

Summary for Reach 2R: Runoff

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.998 ac, 36.11% Impervious, Inflow Depth = 4.07" for 100-year event
Inflow = 12.43 cfs @ 12.16 hrs, Volume= 0.677 af
Outflow = 12.43 cfs @ 12.16 hrs, Volume= 0.677 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3

Summary for Pond 2P: West Filtration Basin

Inflow Area = 0.407 ac, 45.23% Impervious, Inflow Depth = 5.98" for 100-year event
Inflow = 4.17 cfs @ 12.13 hrs, Volume= 0.203 af
Outflow = 2.77 cfs @ 12.15 hrs, Volume= 0.203 af, Atten= 34%, Lag= 1.4 min
Discarded = 0.02 cfs @ 8.44 hrs, Volume= 0.055 af
Primary = 2.75 cfs @ 12.15 hrs, Volume= 0.148 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 945.99' @ 12.22 hrs Surf.Area= 2,240 sf Storage= 2,639 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 263.1 min (1,036.2 - 773.1)

Volume	Invert	Avail.Storage	Storage Description
#1	944.30'	2,658 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
944.30	820	0	0
945.00	1,468	801	801
946.00	2,247	1,858	2,658

Device	Routing	Invert	Outlet Devices
#1	Primary	943.62'	**12.0" Round Culvert** L= 123.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 943.62' / 943.00' S= 0.0050 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf
#2	Device 1	945.40'	**12.0" Horiz. Overflow AD 23** C= 0.600 Limited to weir flow at low heads
#3	Discarded	944.30'	**0.800 in/hr Exfiltration over Surface area below 944.30'**

Discarded OutFlow Max=0.02 cfs @ 8.44 hrs HW=944.32' (Free Discharge)
↑—**3=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=2.76 cfs @ 12.15 hrs HW=945.93' TW=945.16' (Dynamic Tailwater)
↑—**1=Culvert** (Passes 2.76 cfs of 2.86 cfs potential flow)
↑—**2=Overflow AD 23** (Orifice Controls 2.76 cfs @ 3.52 fps)

Summary for Pond 3P: 265 LF 5' pipe Driveway Infiltration System

Inflow Area = 0.874 ac, 65.78% Impervious, Inflow Depth = 5.66" for 100-year event
Inflow = 7.72 cfs @ 12.13 hrs, Volume= 0.412 af
Outflow = 4.01 cfs @ 12.25 hrs, Volume= 0.412 af, Atten= 48%, Lag= 6.7 min
Discarded = 0.03 cfs @ 8.32 hrs, Volume= 0.159 af
Primary = 3.98 cfs @ 12.25 hrs, Volume= 0.253 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3

Peak Elev= 945.61' @ 12.25 hrs Surf.Area= 1,869 sf Storage= 6,825 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 474.0 min (1,238.4 - 764.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	940.50'	2,404 cf	**44.50'W x 42.00'L x 6.00'H Field A** 11,214 cf Overall - 5,203 cf Embedded = 6,011 cf x 40.0% Voids
#2A	941.00'	5,203 cf	**CMP Round 60** x 6 Inside #1 Effective Size= 60.0"W x 60.0"H => 19.63 sf x 20.00'L = 392.7 cf Overall Size= 60.0"W x 60.0"H x 20.00'L Row Length Adjustment= +10.00' x 19.63 sf x 6 rows 42.50' Header x 19.63 sf x 2 = 1,669.0 cf Inside
		7,608 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	944.00'	**12.0" Round Culvert** L= 10.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 944.00' / 943.90' S= 0.0100 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf
#2	Discarded	940.50'	**0.800 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.03 cfs @ 8.32 hrs HW=940.56' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=3.98 cfs @ 12.25 hrs HW=945.61' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 3.98 cfs @ 5.06 fps)

Summary for Pond 4P: East Infiltration Basin

Inflow Area = 0.456 ac, 19.55% Impervious, Inflow Depth = 5.41" for 100-year event
Inflow = 4.37 cfs @ 12.13 hrs, Volume= 0.206 af
Outflow = 3.87 cfs @ 12.16 hrs, Volume= 0.206 af, Atten= 12%, Lag= 1.9 min
Discarded = 0.04 cfs @ 12.16 hrs, Volume= 0.069 af
Primary = 3.83 cfs @ 12.16 hrs, Volume= 0.136 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 942.83' @ 12.16 hrs Surf.Area= 2,095 sf Storage= 2,348 cf

Plug-Flow detention time= 213.5 min calculated for 0.206 af (100% of inflow)
Center-of-Mass det. time= 213.7 min (996.7 - 783.1)

Volume	Invert	Avail.Storage	Storage Description
#1	941.00'	2,503 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
941.00	600	0	0
942.00	1,293	947	947
942.90	2,165	1,556	2,503

Device	Routing	Invert	Outlet Devices
#1	Primary	938.26'	**15.0" Round Culvert** L= 52.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 938.26' / 938.00' S= 0.0050 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.23 sf
#2	Device 1	942.40'	**16.0" Horiz. Overflow CB 24** C= 0.600 Limited to weir flow at low heads
#3	Discarded	941.00'	**0.800 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.04 cfs @ 12.16 hrs HW=942.83' (Free Discharge)
↑└**3=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=3.82 cfs @ 12.16 hrs HW=942.83' TW=0.00' (Dynamic Tailwater)
↑└**1=Culvert** (Passes 3.82 cfs of 11.73 cfs potential flow)
  ↑└**2=Overflow CB 24** (Weir Controls 3.82 cfs @ 2.14 fps)

Stage-Area-Storage for Pond 2P: West Filtration Basin

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
944.30	820	0
944.32	839	17
944.34	857	34
944.36	876	51
944.38	894	69
944.40	913	87
944.42	931	105
944.44	950	124
944.46	968	143
944.48	987	163
944.50	1,005	183
944.52	1,024	203
944.54	1,042	223
944.56	1,061	244
944.58	1,079	266
944.60	1,098	288
944.62	1,116	310
944.64	1,135	332
944.66	1,153	355
944.68	1,172	378
944.70	1,190	402
944.72	1,209	426
944.74	1,227	450
944.76	1,246	475
944.78	1,264	500
944.80	1,283	526
944.82	1,301	552
944.84	1,320	578
944.86	1,338	604
944.88	1,357	631
944.90	1,375	659
944.92	1,394	686
944.94	1,412	714
944.96	1,431	743
944.98	1,449	772
945.00	1,468	801
945.02	1,484	830
945.04	1,499	860
945.06	1,515	890
945.08	1,530	921
945.10	1,546	951
945.12	1,561	983
945.14	1,577	1,014
945.16	1,593	1,046
945.18	1,608	1,078
945.20	1,624	1,110
945.22	1,639	1,143
945.24	1,655	1,176
945.26	1,671	1,209
945.28	1,686	1,242
945.30	1,702	1,276
945.32	1,717	1,310
945.34	1,733	1,345
945.36	1,748	1,380
945.38	1,764	1,415
945.40	1,780	1,450
945.42	1,795	1,486
945.44	1,811	1,522
945.46	1,826	1,558
945.48	1,842	1,595
945.50	1,858	1,632
945.52	1,873	1,669
945.54	1,889	1,707
945.56	1,904	1,745
945.58	1,920	1,783
945.60	1,935	1,822
945.62	1,951	1,861
945.64	1,967	1,900
945.66	1,982	1,939
945.68	1,998	1,979
945.70	2,013	2,019
945.72	2,029	2,060
945.74	2,044	2,100
945.76	2,060	2,141
945.78	2,076	2,183
945.80	2,091	2,224
945.82	2,107	2,266
945.84	2,122	2,309
945.86	2,138	2,351
945.88	2,154	2,394
945.90	2,169	2,437
945.92	2,185	2,481
945.94	2,200	2,525
945.96	2,216	2,569
945.98	2,231	2,614
946.00	**2,247**	**2,658**

Hydrograph for Pond 2P: West Filtration Basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.00	0	944.30	0.00	0.00	0.00
2.00	0.00	0	944.30	0.00	0.00	0.00
4.00	0.00	0	944.30	0.00	0.00	0.00
6.00	0.01	0	944.30	0.01	0.01	0.00
8.00	0.02	5	944.31	0.02	**0.02**	0.00
10.00	0.06	165	944.48	0.02	**0.02**	0.00
12.00	**2.01**	**1,893**	**945.64**	**1.20**	0.02	**1.18**
14.00	**0.11**	**1,532**	**945.45**	**0.12**	0.02	**0.10**
16.00	0.05	1,495	945.43	0.06	0.02	0.04
18.00	0.04	1,486	945.42	0.04	0.02	0.03
20.00	0.03	1,476	945.41	0.03	0.02	0.02
22.00	0.02	1,464	945.41	0.02	0.02	0.01
24.00	0.01	1,440	945.39	0.02	0.02	0.00
26.00	0.00	1,333	945.33	0.02	0.02	0.00
28.00	0.00	1,224	945.27	0.02	0.02	0.00
30.00	0.00	1,114	945.20	0.02	0.02	0.00
32.00	0.00	1,005	945.13	0.02	0.02	0.00
34.00	0.00	896	945.06	0.02	0.02	0.00
36.00	0.00	786	944.99	0.02	0.02	0.00
38.00	0.00	677	944.91	0.02	0.02	0.00
40.00	0.00	568	944.83	0.02	0.02	0.00
42.00	0.00	458	944.75	0.02	0.02	0.00
44.00	0.00	349	944.65	0.02	0.02	0.00
46.00	0.00	240	944.56	0.02	0.02	0.00
48.00	0.00	130	944.45	0.02	0.02	0.00
50.00	0.00	21	944.33	0.02	0.02	0.00
52.00	0.00	0	944.30	0.00	0.00	0.00
54.00	0.00	0	944.30	0.00	0.00	0.00
56.00	0.00	0	944.30	0.00	0.00	0.00
58.00	0.00	0	944.30	0.00	0.00	0.00
60.00	0.00	0	944.30	0.00	0.00	0.00
62.00	0.00	0	944.30	0.00	0.00	0.00
64.00	0.00	0	944.30	0.00	0.00	0.00
66.00	0.00	0	944.30	0.00	0.00	0.00
68.00	0.00	0	944.30	0.00	0.00	0.00
70.00	0.00	0	944.30	0.00	0.00	0.00
72.00	0.00	0	944.30	0.00	0.00	0.00

Stage-Area-Storage for Pond 3P: 265 LF 5' pipe Driveway Infiltration System

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
940.50	**1,869**	0
940.60	1,869	75
940.70	1,869	150
940.80	1,869	224
940.90	1,869	299
941.00	1,869	374
941.10	1,869	463
941.20	1,869	565
941.30	1,869	675
941.40	1,869	790
941.50	1,869	910
941.60	1,869	1,035
941.70	1,869	1,163
941.80	1,869	1,294
941.90	1,869	1,429
942.00	1,869	1,566
942.10	1,869	1,705
942.20	1,869	1,847
942.30	1,869	1,991
942.40	1,869	2,136
942.50	1,869	2,283
942.60	1,869	2,431
942.70	1,869	2,581
942.80	1,869	2,731
942.90	1,869	2,883
943.00	1,869	3,035
943.10	1,869	3,188
943.20	1,869	3,342
943.30	1,869	3,495
943.40	1,869	3,650
943.50	1,869	3,804
943.60	1,869	3,958
943.70	1,869	4,112
943.80	1,869	4,266
943.90	1,869	4,419
944.00	1,869	4,572
944.10	1,869	4,725
944.20	1,869	4,876
944.30	1,869	5,027
944.40	1,869	5,176
944.50	1,869	5,325
944.60	1,869	5,472
944.70	1,869	5,617
944.80	1,869	5,760
944.90	1,869	5,902
945.00	1,869	6,042
945.10	1,869	6,179
945.20	1,869	6,313
945.30	1,869	6,445
945.40	1,869	6,573
945.50	1,869	6,697
945.60	1,869	6,818
945.70	1,869	6,933
945.80	1,869	7,042
945.90	1,869	7,144
946.00	1,869	7,234
946.10	1,869	7,309
946.20	1,869	7,383
946.30	1,869	7,458
946.40	1,869	7,533
946.50	1,869	**7,608**

Hydrograph for Pond 3P: 265 LF 5' pipe Driveway Infiltration System

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.00	0	940.50	0.00	0.00	0.00
2.00	0.00	0	940.50	0.00	0.00	0.00
4.00	0.01	0	940.50	0.01	0.01	0.00
6.00	0.03	0	940.50	0.03	0.03	0.00
8.00	0.05	30	940.54	0.03	**0.03**	0.00
10.00	0.11	303	940.91	0.03	**0.03**	0.00
12.00	**3.71**	**3,273**	**943.16**	**0.03**	0.03	**0.00**
14.00	**0.23**	**4,963**	**944.26**	**0.28**	0.03	**0.24**
16.00	0.11	4,789	944.14	0.12	0.03	0.08
18.00	0.08	4,739	944.11	0.09	0.03	0.05
20.00	0.05	4,693	944.08	0.06	0.03	0.03
22.00	0.03	4,630	944.04	0.04	0.03	0.01
24.00	0.01	4,505	943.96	0.03	0.03	0.00
26.00	0.00	4,259	943.80	0.03	0.03	0.00
28.00	0.00	4,010	943.63	0.03	0.03	0.00
30.00	0.00	3,761	943.47	0.03	0.03	0.00
32.00	0.00	3,512	943.31	0.03	0.03	0.00
34.00	0.00	3,262	943.15	0.03	0.03	0.00
36.00	0.00	3,013	942.99	0.03	0.03	0.00
38.00	0.00	2,764	942.82	0.03	0.03	0.00
40.00	0.00	2,515	942.66	0.03	0.03	0.00
42.00	0.00	2,266	942.49	0.03	0.03	0.00
44.00	0.00	2,016	942.32	0.03	0.03	0.00
46.00	0.00	1,767	942.14	0.03	0.03	0.00
48.00	0.00	1,518	941.97	0.03	0.03	0.00
50.00	0.00	1,269	941.78	0.03	0.03	0.00
52.00	0.00	1,020	941.59	0.03	0.03	0.00
54.00	0.00	770	941.38	0.03	0.03	0.00
56.00	0.00	521	941.16	0.03	0.03	0.00
58.00	0.00	272	940.86	0.03	0.03	0.00
60.00	0.00	23	940.53	0.03	0.03	0.00
62.00	0.00	0	940.50	0.00	0.00	0.00
64.00	0.00	0	940.50	0.00	0.00	0.00
66.00	0.00	0	940.50	0.00	0.00	0.00
68.00	0.00	0	940.50	0.00	0.00	0.00
70.00	0.00	0	940.50	0.00	0.00	0.00
72.00	0.00	0	940.50	0.00	0.00	0.00

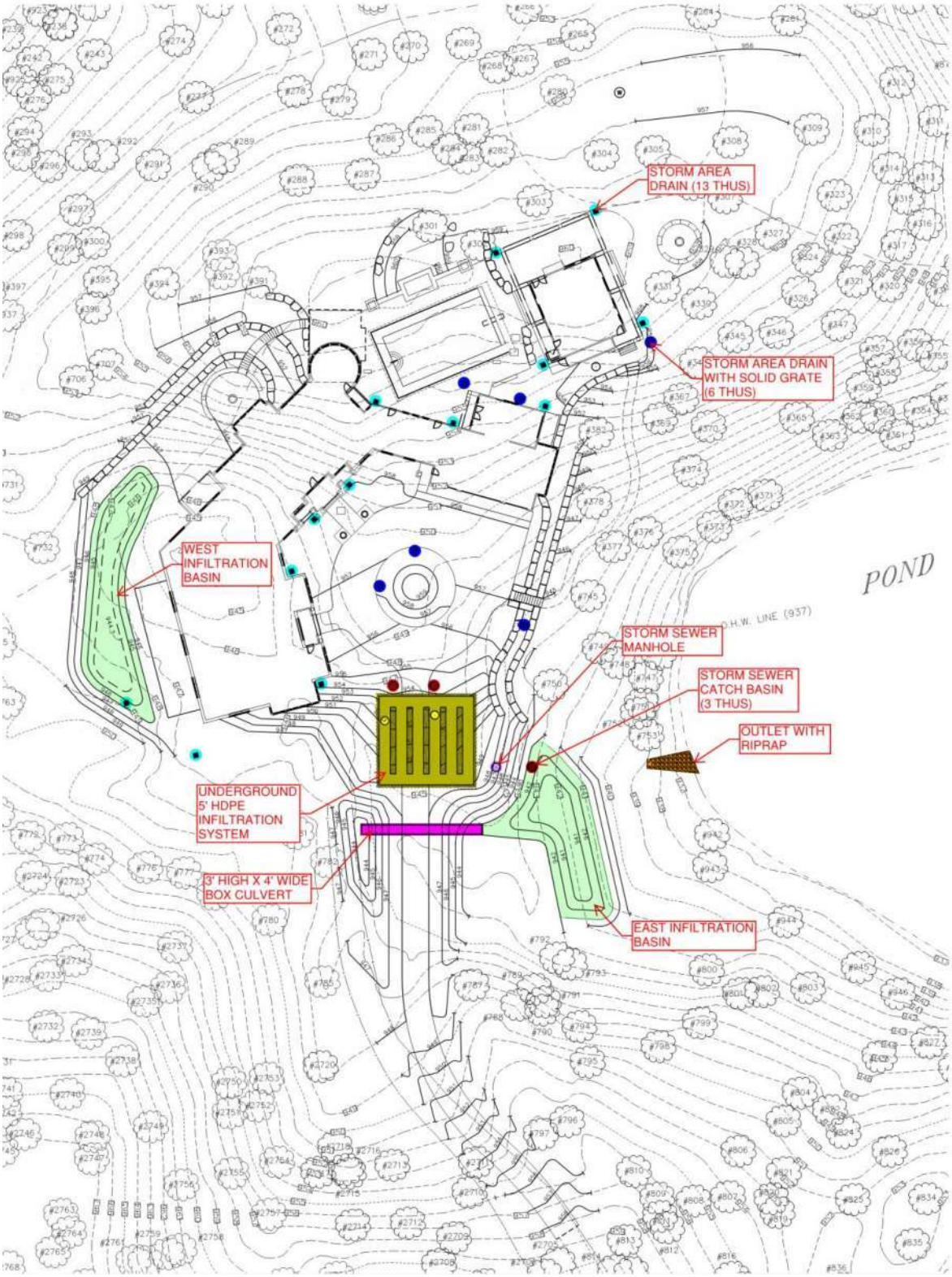
Stage-Area-Storage for Pond 4P: East Infiltration Basin

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
941.00	600	0
941.02	614	12
941.04	628	25
941.06	642	37
941.08	655	50
941.10	669	63
941.12	683	77
941.14	697	91
941.16	711	105
941.18	725	119
941.20	739	134
941.22	752	149
941.24	766	164
941.26	780	179
941.28	794	195
941.30	808	211
941.32	822	227
941.34	836	244
941.36	849	261
941.38	863	278
941.40	877	295
941.42	891	313
941.44	905	331
941.46	919	349
941.48	933	368
941.50	947	387
941.52	960	406
941.54	974	425
941.56	988	445
941.58	1,002	465
941.60	1,016	485
941.62	1,030	505
941.64	1,044	526
941.66	1,057	547
941.68	1,071	568
941.70	1,085	590
941.72	1,099	612
941.74	1,113	634
941.76	1,127	656
941.78	1,141	679
941.80	1,154	702
941.82	1,168	725
941.84	1,182	748
941.86	1,196	772
941.88	1,210	796
941.90	1,224	821
941.92	1,238	845
941.94	1,251	870
941.96	1,265	895
941.98	1,279	921
942.00	1,293	947
942.02	1,312	973
942.04	1,332	999
942.06	1,351	1,026
942.08	1,371	1,053
942.10	1,390	1,081
942.12	1,409	1,109
942.14	1,429	1,137
942.16	1,448	1,166
942.18	1,467	1,195
942.20	1,487	1,224
942.22	1,506	1,254
942.24	1,526	1,285
942.26	1,545	1,315
942.28	1,564	1,347
942.30	1,584	1,378
942.32	1,603	1,410
942.34	1,622	1,442
942.36	1,642	1,475
942.38	1,661	1,508
942.40	1,681	1,541
942.42	1,700	1,575
942.44	1,719	1,609
942.46	1,739	1,644
942.48	1,758	1,679
942.50	1,777	1,714
942.52	1,797	1,750
942.54	1,816	1,786
942.56	1,836	1,823
942.58	1,855	1,859
942.60	1,874	1,897
942.62	1,894	1,934
942.64	1,913	1,972
942.66	1,932	2,011
942.68	1,952	2,050
942.70	1,971	2,089
942.72	1,991	2,129
942.74	2,010	2,169
942.76	2,029	2,209
942.78	2,049	2,250
942.80	2,068	2,291
942.82	2,087	2,333
942.84	2,107	2,374
942.86	2,126	2,417
942.88	2,146	2,459
942.90	**2,165**	**2,503**

Hydrograph for Pond 4P: East Infiltration Basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.00	0	941.00	0.00	0.00	0.00
2.00	0.00	0	941.00	0.00	0.00	0.00
4.00	0.00	0	941.00	0.00	0.00	0.00
6.00	0.00	0	941.00	0.00	0.00	0.00
8.00	0.01	0	941.00	0.01	0.01	0.00
10.00	0.05	101	941.15	0.01	0.01	0.00
12.00	**2.03**	**1,844**	**942.57**	**1.01**	**0.03**	**0.98**
14.00	**0.12**	**1,601**	**942.44**	**0.12**	**0.03**	**0.09**
16.00	0.06	1,569	942.42	0.06	0.03	0.03
18.00	0.05	1,561	942.41	0.05	0.03	0.02
20.00	0.03	1,550	942.41	0.04	0.03	0.00
22.00	0.02	1,519	942.39	0.03	0.03	0.00
24.00	0.01	1,410	942.32	0.03	0.03	0.00
26.00	0.00	1,208	942.19	0.03	0.03	0.00
28.00	0.00	1,020	942.06	0.02	0.02	0.00
30.00	0.00	848	941.92	0.02	0.02	0.00
32.00	0.00	689	941.79	0.02	0.02	0.00
34.00	0.00	542	941.66	0.02	0.02	0.00
36.00	0.00	408	941.52	0.02	0.02	0.00
38.00	0.00	286	941.39	0.02	0.02	0.00
40.00	0.00	176	941.26	0.01	0.01	0.00
42.00	0.00	78	941.12	0.01	0.01	0.00
44.00	0.00	0	941.00	0.00	0.00	0.00
46.00	0.00	0	941.00	0.00	0.00	0.00
48.00	0.00	0	941.00	0.00	0.00	0.00
50.00	0.00	0	941.00	0.00	0.00	0.00
52.00	0.00	0	941.00	0.00	0.00	0.00
54.00	0.00	0	941.00	0.00	0.00	0.00
56.00	0.00	0	941.00	0.00	0.00	0.00
58.00	0.00	0	941.00	0.00	0.00	0.00
60.00	0.00	0	941.00	0.00	0.00	0.00
62.00	0.00	0	941.00	0.00	0.00	0.00
64.00	0.00	0	941.00	0.00	0.00	0.00
66.00	0.00	0	941.00	0.00	0.00	0.00
68.00	0.00	0	941.00	0.00	0.00	0.00
70.00	0.00	0	941.00	0.00	0.00	0.00
72.00	0.00	0	941.00	0.00	0.00	0.00

LOCATION MAP



STORMWATER OPERATION AND MAINTENANCE PLAN
Windy Hill – 100 Windy Hilly Road, Sunfish Lake, Minnesota

OVERVIEW – INFILTRATION BASIN

A infiltration basin is a shallow depression that allows rainwater runoff from impervious urban areas, like roofs, driveways, walkways, and compacted lawn areas, the opportunity to infiltrate into the underlying soils The purpose of a infiltration basin is to improve water quality in nearby bodies of water and to ensure that rainwater becomes available for plants as groundwater rather than being sent through stormwater drains and discharging to the nearest river or lake. Below the surface of the basin, are engineered soils appropriate as a growing medium for plants or turf that can also infiltrate.

OVERVIEW – INFILTRATION PIPE

The underground infiltration pipe consists of four rows of 60" high density polyethylene pipe with a 60" header pipe of the same material. The pipe system is perforated and encased in a clean, clear rock surrounding it. Stormwater enters the system through drains and pipes and infiltrates into the underlying soils.

OVERVIEW – MAINTENANCE OF INFILTRATION SYSTEM

Regular inspection and maintenance aids in the effective operation of the infiltration basin system. It is the responsibility of the property owner to maintain all stormwater BMP's in accordance with the minimum design standards and other guidance provided in this manual.

Inspection Schedule: One inspection form shall be completed for the proposed system on a regular basis as specified on the attached checklist.

Erosion Control: The soil and mulch on the property shall be inspected for eroded areas. Eroded areas shall be filled with soil or mulch and vegetated. In the event that erosion persists in a particular area, compacted aggregate shall be used to further stabilize the slope and to mitigate future erosion.

Sediment Accumulation & Clogging: Sediment accumulation within the basin or pipe gallery may reduce the infiltration capacity and impair proper performance of the facility. The facility should be inspected for accumulation of sediment as part of the inspection. Excessive sediment accumulation should be removed as noted in the attached form.

Standing Water: The recurring presence of standing water more than 48 hours after a rain event indicates that the soil media within the basin has been over-compacted or has accumulated sediment that is impeding filtration. If this condition occurs, the vegetation within the basin should be removed and the confining layer of soil removed and replaced with new, free-draining soil. The new soil media should be tested for proper filtration and then the vegetation replaced.

INSPECTION AND MAINTENANCE FORM

BMP/Location: Infiltration Pipe Gallery		
Date:	**Inspector:**	
Inspection Activity	**Comments**	**Recommended Actions**
Monthly (& following large storm events)		
Trash and Debris		*Remove trash and debris as soon as possible *Remove sediment in pipes when depth exceeds 6" or when infiltration is compromised *Record depth of sediment at each inspection to gauge sediment accumulation rate *A vacuum truck shall be utilized to remove sediment within infiltration systems when infiltration is compromised
Catch Basins and Roof Drains		
BMP: UG 36" HDPE		
Dewatering		*If standing water is located, notify the city of the system's failure to drain within 72 hours of a storm event for further direction
Annually		
Structural Components		*Notify maintenance staff of any observed structural or screen damage, loose or missing bolts, inlet or outlet blockages, etc.
Surfaces above structure		*Sinkholes shall be filled and monitored for further depression. Continued depressions likely indicate a device failure and internal inspection is warranted.
Vegetation		*Remove and replace dead or diseased plants *Remove invasive weeds and make sure bare areas are covered
Additional Comments:		
Maintenance Required?	**YES / NO**	**Maintenance Date:**
Maintenance Comments:		

STORMWATER OPERATION AND MAINTENANCE PLAN
Windy Hill – 100 Windy Hilly Road, Sunfish Lake, Minnesota

BMP/Location: Infiltration Basin		
Date:	**Inspector:**	
Inspection Activity	**Comments**	**Recommended Actions**
Monthly (& following large storm events)		
Trash and Debris		*Remove trash from basin area and clear inflow points
Ponding		*Clear inflow points of built-up sediment, check for erosion
Annually		
Mulch		*Check mulch surface for sediment build-up. Remove and replace mulch material as required
Underdrain System		*If clogged, try back-washing/vacuuming under the drain from the outlet
Infiltration Basin Soil Mix		*Make sure soil level is below overflow grate and has a hard surface level.
Vegetation		*Remove and replace dead or diseased plants *Remove invasive weeds and make sure bare areas are covered
Additional Comments:		
Maintenance Required?	**YES / NO**	**Maintenance Date:**
Maintenance Comments:		

HAUGO GEOTECHNICAL SERVICES

October 29, 2020 HGTS Project Number: 20-0891

Mrs. Madeline Mauer
2400 Delaware Avenue
Sunfish Lake, MN 55118

Re: Geotechnical Exploration Report, Proposed Home, 100 Windy Hill Road, Sunfish Lake, Minnesota

Dear Mrs. Mauer:

We have completed the geotechnical exploration report for the proposed home at 100 Windy Hill Road in Sunfish Lake, Minnesota. A brief summary of our results and recommendations is presented below. Specific details regarding our procedures, results and recommendations follow in the attached geotechnical exploration report.

Four (4) soil borings were completed for this project that encountered about ½ foot of topsoil or gravel driveway at the surface underlain by native alluvial and glacial till soils that extended to the termination depths of borings. Groundwater was not encountered in the soil borings while drilling and sampling or after removal of the auger from the boreholes.

The vegetation and topsoil are not suitable for foundation support and will need to be removed from within the proposed building and oversize areas. The underlying native alluvial and glacial till soil in our opinion are directly suitable for foundation support and we do not anticipate that soil corrections in excess of stripping the topsoil and vegetation will be required.

With the building pad prepared as recommended, it is our opinion that the foundations for the proposed home can be designed for a net allowable soil bearing capacity up to 2,000 pounds per square foot.

Thank you for the opportunity to assist you on this project. If you have any questions or need additional information, please contact Paul Gionfriddo at 612-729-2959.

Sincerely,
Haugo GeoTechnical Services

Jesse Miller, E.I.T.
Staff Engineer

Paul Gionfriddo, P.E.
Senior Engineer

GEOTECHNICAL EXPLORATION REPORT

PROJECT:

Proposed Home
100 Windy Hill Road
Sunfish Lake, Minnesota

PREPARED FOR:

Mrs. Madeline Mauer
2400 Delaware Avenue
Sunfish Lake, MN 55118

PREPARED BY:

Haugo GeoTechnical Services
2825 Cedar Avenue South
Minneapolis, Minnesota 55407

Haugo GeoTechnical Services Project: 20-0891

October 29, 2020

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

Paul Gionfriddo, P.E.
Senior Engineer
License Number: 23093

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APPENDIX
Boring Location Sketch and GPS Coordinates, Figure 1
Soil Boring Log, SB-1 thru SB-4
Descriptive Terminology

1.0 INTRODUCTION

1.1 Project Description

Mrs. Madeline Mauer is proposing to construct a new home at 100 Windy Hill Road in Sunfish Lake, Minnesota and retained Haugo GeoTechnical Services (HGTS) to perform a geotechnical exploration to evaluate the suitability of site soil conditions to support the proposed home.

1.2 Purpose

The purpose of this geotechnical exploration was to characterize subsurface soil and groundwater conditions and provide recommendations for foundation design and construction.

1.3 Site Description

The project site is located at 100 Windy Hill Road in Sunfish Lake, Minnesota. A home existed on the property at the time of our exploration that we assume will be demolished to make way for the new home. Access to the home was via a fairly long gravel driveway off Windy Hill Road.

The property was generally wooded and the home was generally located on the "high spot" near the middle/center of the property. Site topography was generally sloped downhill in all directions away from the existing home with elevations near the home at about 960 and dropping off to the about elevation 938 near Sunfish Lake. Elevations at the soil boring locations ranged from about 956 to 962 feet above mean sea level (MSL).

1.4 Scope of Services

Our services were performed in accordance with the Haugo GeoTechnical Services proposal 20-0891 dated October 6, 2020. Our scope of services was performed under the terms of our General Conditions and limited to the following tasks:

- Completing four (4) standard penetration test (SPT) soil borings, each extending to nominal depths of 20 feet.
- Sealing the boreholes in accordance with MDH requirements.
- Visually/manually classifying samples recovered from the soil borings.
- Obtaining ground surface elevations and GPS coordinates at the soil boring locations.
- Performing laboratory tests on select soil samples.
- Preparing soil boring logs describing the materials encountered and the results of groundwater level measurements.
- Preparing an engineering report describing soil and groundwater conditions, and providing recommendations for foundation support.

1.5 Documents Provided

Specific architectural, structural or civil plans were not available at the time of this geotechnical evaluation.

1.6 Locations and Elevations

The soil boring locations were selected by HGTS based on the anticipated construction and site access. The approximate locations of the soil borings are shown on Figure 1, "Soil Boring Location Sketch," in the Appendix. The sketch was prepared by HGTS using an aerial image from Google Earth as a base.

HGTS obtained the GPS coordinates and ground surface elevations at the soil boring locations using GPS technology based on the Minnesota County Coordinate System. GPS coordinates and the ground surface elevations are also shown on Figure 1 in the Appendix.

2.0 FIELD PROCEDURES

Four (4) standard penetration test borings were advanced on October 19, 2020 by HGTS with a rotary drilling rig, using continuous flight augers to advance the boreholes. Representative samples were obtained from the borings, using the split-barrel sampling procedures in general accordance with ASTM Specification D-1586. In the split-barrel sampling procedure, a 2-inch O.D. split-barrel spoon is driven into the ground with a 140-pound hammer falling 30 inches. The number of blows required to drive the sampling spoon the last 12 inches of an 18-inch penetration is recorded as the standard penetration resistance value, or "N" value. The results of the standard penetration tests are indicated on the boring logs. The samples were sealed in containers and provided to HGTS for testing and soil classification.

Field log of each boring was prepared by HGTS. The logs contain visual classifications of the soil materials encountered during drilling, as well as the driller's interpretation of the subsurface conditions between samples and water observation notes. The final boring logs included with this report represent an interpretation of the field logs and include modifications based on visual/manual method observation of the samples.

The soil boring logs, general terminology for soil description and identification, and classification of soils for engineering purposes are also included in the appendix. The soil boring logs identify and describe the materials encountered, the relative density or consistency based on the Standard Penetration resistance (N-value, "blows per foot") and groundwater observations.

The strata changes were inferred from the changes in the samples and auger cuttings. The depths shown as changes between strata are only approximate. The changes are likely transitions, variations can occur beyond the location of the borings.

3.0 RESULTS

3.1 Soil Conditions

At the surface, soil borings SB-2, SB-3, and SB-4 encountered about ½ foot of silty sand topsoil that was dark brown in color, contained traces of roots. Boring SB-1 encountered about 3 inches of gravel/aggregate base (gravel driveway) at the surface consisting of silty sand that was dark brown in color.

Below the topsoil and gravel driveway the soil borings encountered native alluvial and glacially deposited soils that extended to the termination depths of the borings. The native alluvium and glacial till consisted of; lean clay, silty clay, silt, silty sand, poorly graded sand with silt and clayey sand that were brown in color.

Soil borings SB-1 met with auger refusal at about 14 feet below the ground surface. The reason for auger refusal is unknown but was likely due gravel, cobble or boulders within the soils. Soil borings SB-2 thru SB-4 terminated at their intended depths at nominal depths of 20 feet below the ground surface.

N-Values within the cohesionless soils (silt, silty sand, clayey sand and poorly graded sand with silt) ranged from 9 to 24 bpf indicating a loose to medium dense relative density. N-Values within the native alluvial clay soils ranged from 9 to 24 bpf, indicating a loose to medium dense relative density.

N-Values within the cohesive soils (lean clay and silty clay) ranged from 9 to 24 bpf indicating rather stiff to very stiff consistency.

3.2 Groundwater

Groundwater was not encountered in the soil borings while drilling and sampling or after removal of the auger from the boreholes. Groundwater appears to be below the depths explored by our borings. We do not anticipate that groundwater will be encountered during construction.

Water levels were measured on the dates as noted on the boring logs and the period of water level observation was relatively short. Given the cohesive nature of portions of the soils encountered, it is possible that insufficient time was available for groundwater to seep into the borings and rise to hydrostatic level. Groundwater monitoring wells or piezometers would be required to more accurately determine water levels. Seasonal and annual fluctuations in the groundwater levels should be expected.

3.3 Laboratory Testing

Laboratory moisture content tests were performed on selected samples recovered from the soil borings. Table 1 below summarizes the results of the laboratory tests. Results of the moisture content tests are also shown on the boring logs adjacent to the sample tested.

Table 1. Summary of Laboratory Tests

Boring Number	Sample Number	Depth (feet)	Moisture Content (%) *
SB-1	SS-2	2 ½	17
SB-1	SS-3	5	4 ½
SB-2	SS-10	2 ½	11
SB-2	SS-11	5	18 ½
SB-2	SS-13	10	9
SB-3	SS-18	2 ½	7 ½
SB-4	SS-26	2 ½	4 ½
SB-4	SS-28	7 ½	3 ½

*Moisture content values rounded to the nearest ½ percent.

3.4 OSHA Soil Classification

The soils encountered in the borings at the anticipated excavation depths consisted of a variety of mostly cohesionless soils (i.e. sandy soils) that included; silty sand, poorly graded sand with silt, clayey sand and silt that generally correspond to the ASTM Classifications of SM, SP-SM, SC, and ML, respectively. These soils will generally be Type C soils under Department of Labor Occupational Safety and Health Administration (OSHA) guidelines.

An OSHA-approved qualified person should review the soil classification in the field. Excavations must comply with the requirements of OSHA 29 CFR, Part 1926, Subpart P, "Excavations and Trenches." This document states excavation safety is the responsibility of the contractor. The project specifications should reference these OSHA requirements.

4.0 DISCUSSION AND RECOMMENDATIONS

4.1 Proposed Construction

Specific architectural, structural or civil construction plans were not available at the time of this geotechnical evaluation. We understand the project will consist of constructing a new single-family home on the project site. We anticipate the new home will include one or two stores above grade and could include a walkout style basement or full depth basement. We assume the main floor grade will be at or slightly above existing site grade at about elevation 863 with a basement floor grade at about elevation 853. We anticipate below grade construction consisting of cast-in-place concrete foundation walls supported on concrete spread footings. The above grade construction will likely consist of wood framing, a pitched roof and asphalt shingles.

Based on the assumed construction we estimate wall loadings will range from about 1 to 2 kips (1,000 to 2,000 pounds) per lineal foot and column loads, if any will be less than 50 kips (50,000 pounds).

If the proposed loads exceed these values, the proposed grades differ by more than 2 feet from the assumed values or if the design or location of the proposed building changes, we should be informed. Additional analyses and revised recommendations may be necessary.

4.2 Discussion

Structures existed on the property at the time of our exploration which we understand will be removed/demolished to make way for the new home. We recommend that all remnants of the structures including footings, foundation walls, floor slabs and underground utilities be removed from within the proposed building footprint and oversize areas.

The vegetation and topsoil are not suitable for foundation support and will need to be removed from below the building and oversize areas and replaced with suitable compacted engineered fill. If the new home will include a basement level, removal of these materials will likely be incidental to construction.

It is our opinion that the underlying native alluvial and glacial till soils are directly suitable for foundation support. Loose soils and any soils disturbed during grading and demolition activities should be compacted to increase their density and uniformity prior to placing additional fill or foundations.

Silt soils were encountered in soil boring SB-2. Silt soils are moisture sensitive and can lose strength due to repeated construction traffic and due to excess moisture. Excavations in silt soils should be completed using backhoes with smooth buckets and repeated construction traffic on or over the soil should be avoided. Soft or loose silt soils, if encountered, should be removed and replaced with suitable compacted engineered fill.

Groundwater was not encountered in the borings while drilling and sampling or after removal of the auger from the boreholes. We do not anticipate that groundwater will be encountered during construction.

With the building pads prepared as recommended, it is our opinion the footings can be designed for a net allowable bearing pressure up to 2,000 pounds per square foot (psf).

The following sections provide recommendations for foundation design and construction.

4.3 Site Grading Recommendations

Excavation We recommend that all vegetation, topsoil, gravel Fill (driveways) and any soft or otherwise unsuitable soils, if encountered, be removed from below the proposed building and oversize areas. Structure(s) exist on the project site that will be removed/demolished to make way for the proposed development. We recommend that all building remnants such as footings, floor slabs, foundation walls and underground utilities be removed from within the building and oversize area. Table 2 below summarizes the anticipated excavation depths at the soil boring locations. Excavation depths may vary and could be deeper.

Table 2. Anticipated Excavation Depths

Boring Number	Measured Surface Elevation (feet)	Anticipated Excavation Depth (feet)*	Anticipated Excavation Elevation (feet)*	Approximate Groundwater Elevation (feet)*
SB-1	956.7	½	956	NE
SB-2	956.1	½	951 ½	NE
SB-3	961.5	½	961	NE
SB-4	961.9	½	955	NE

* = Excavation and groundwater elevations were rounded to nearest ½ foot.
NE = Not Encountered

Oversizing In areas where the excavations extend below the proposed footing elevations, the excavations require oversizing. We recommend the perimeter of the excavation be extended a foot outside the proposed footprint for every foot below footing grade (1H:1V oversizing). The purpose of the oversizing is to provide lateral support of the foundation.

Fill Material Fill required to attain site grades may consist of any debris-free, non-organic mineral soil. Except we recommend that fill or backfill placed in wet excavations or within 2 feet of the groundwater table, if encountered, consist of granular soil (sand) with less than 5 percent passing the number 200 sieve and at least 50 percent retained on the number 40 sieve.

The on-site native soils that will be excavated during foundation construction appear to be generally suitable for reuse as structural fill or backfill. Soils that will be reused as fill or backfill could require some moisture conditioning (wetting or drying) to meet the recommended compaction levels.

As discussed above silt soils were encountered on the project site which are moisture sensitive and can lose strength due to repeated construction traffic and due to excess moisture. If the silts will be reused ad fill or backfill we recommend they be compacted near their optimum soil moisture content.

Topsoil or soils that are black in color are not suitable for reuse as structural fill or backfill.

Backfilling We recommend that backfill placed to attain site grades be compacted to a minimum of 95 percent of its standard Proctor density (ASTM D 698). Granular fill classified as SP or SP-SM should be placed within 65 percent to 105 percent of its optimum moisture content as determined by the standard Proctor. Other fill soils should be placed within 3 percentage points above and 1 percentage point below its optimum moisture content as determined by the standard Proctor. All fill should be placed in thin lifts and be compacted with a large self-propelled vibratory compactor operating in vibratory mode.

Foundations We recommend the perimeter footings bear a minimum of 42 inches below the exterior grade for frost protection. Interior footings may be placed immediately below the slab provided construction does not occur during below freezing weather conditions. Foundation elements in unheated areas (i.e. deck or porch footings) should bear at least 5 feet below exterior grade for frost protection.

We anticipate the foundations and floor slabs will bear on compacted engineered fill or native alluvial soils. With the building pad prepared as recommended, it is our opinion the footings can be designed for a net allowable bearing pressure up to 2,000 pounds per square foot (psf).

We anticipate total and differential settlement of the foundations will be less than 1 inch and ½ inch, respectively, across a 30-foot span.

4.4 Dewatering

Groundwater was not encountered in the soil borings while drilling and sampling or after removal of the auger from the boreholes. We do not anticipate that groundwater will be encountered and do not anticipate that dewatering will be required.

4.5 Interior Slabs

The anticipated floor subgrade could consist of a variety of sandy, clayey or silty soils. It is our opinion a modulus of subgrade reaction, k, of 100 pounds per square inch of deflection (psi) may be used to design the floor.

If floor coverings or coatings less permeable than the concrete slab will be used, we recommend that a vapor retarder or vapor barrier be placed immediately beneath the slab. Some contractors prefer to bury the vapor barrier or vapor retarder beneath a layer of sand to reduce curling and shrinkage, but this practice often traps water between the slab and vapor retarder or barrier. Regardless of where the vapor retarder or vapor barrier is placed, we recommend consulting the floor covering manufacturer regarding the appropriate type, use and installation of the vapor retarder or vapor barrier to preserve the warranty.

We recommend following all state and local building codes with regards to a radon mitigation plan beneath interior slabs.

4.6 Below Grade Walls

Foundation walls or below grade (basement) walls will have lateral loads from the surrounding soil transmitted to them. We recommend general waterproofing of the below grade walls. We recommend either placing drainage composite against the backs of the exterior walls or backfilling adjacent to the walls with sand having less than 50 percent of the particles by weight passing the #40 sieve and less than 5 percent of the particles by weight passing the #200 sieve. The sand backfill should be placed within 2 feet horizontally of the wall. We recommend the balance of the backfill for the walls consist of sand however the sand may contain up to 20 percent of the particles by weight passing the #200 sieve.

We recommend installing drain tile behind the below grade walls, adjacent to the wall footing and below the slab elevation. Preferably the drain tile should consist of perforated pipe embedded in gravel. A geotextile filter fabric should encase the pipe and gravel. The drain tile should be routed to a storm sewer, sump pump or other suitable disposal site.

Active earth pressures can be used to design the below grade walls if the walls are allowed to rotate slightly. If wall rotation cannot be tolerated, then below grade wall design should be based on at-rest earth pressures. It is our opinion that the estimated soil parameters presented in Table 3 can be used for below grade wall design. These estimated parameters are based on the assumptions that the walls are drained, there are no surcharge loads within a horizontal distance equal to the height of the wall and the backfill is level.

Table 3. Estimated Soil Parameters

Soil Type	Estimated Unit Weight (pcf)	Estimated Friction Angle (degrees)	At-Rest Pressure (pcf)	Active Soil Pressure (pcf)	Passive Soil Pressure (pcf)
Sand (SP & SP-SM)	120	32	55	35	390
Other Soils (CL, CL-ML, SC, SM, ML)	135	28	70	50	375

Resistance to lateral earth pressures will be provided by passive resistance against the wall footings and by sliding resistance along the bottom of the wall footings. We recommend a sliding coefficient of 0.35. This value does not include a factor of safety.

4.7 Exterior Slabs

Exterior slabs will likely be underlain by clayey and silty soils which are considered moderately to highly frost susceptible. If these soils become saturated and freeze, frost heave may occur. This heave can be a nuisance in front of doors and at other critical grade areas. One way to help reduce the potential for heaving is to remove the frost-susceptible soils below the slabs down to bottom of footing grades and replace them with non-frost-susceptible backfill consisting of sand having less than 5 percent of the particles by weight passing the number 200 sieve.

If this approach is used and the excavation bottoms terminate in non-free draining granular soil, we recommend a drain tile be installed along the bottom outer edges of the excavation to collect and remove any water that may accumulate within the sand. The bottom of the excavation should be graded away from the building.

If the banks of the excavations to remove the frost-susceptible soils are not sloped, abrupt transitions between the frost-susceptible and non-frost-susceptible backfill will exist along which unfavorable amounts of differential heaving may occur. Such transitions could exist between exterior slabs and sidewalks, between exterior slabs and pavements and along the slabs themselves if the excavations are confined to only the building entrances. To address this issue, we recommend sloping the excavations to remove frost-susceptible soils at a minimum 3:1 (horizontal:vertical) gradient.

An alternative method of reducing frost heave is to place a minimum of 2 inches of extruded polystyrene foam insulation beneath the slabs and extending it about 4 feet beyond the slabs. The insulation will reduce frost penetration into the underlying soil and reduce heave. Six to

twelve inches of granular soil is typically placed over the insulation to protect it during construction.

Another alternative for reducing frost heave is to support the slabs on frost depth footings. A void space of at least 4 inches should be provided between the slab and the underlying soil to allow the soil to heave without affecting the slabs.

4.8 Site Grading and Drainage

We recommend the site be graded to provide positive run-off away from the proposed house. We recommend landscaped areas be sloped a minimum of 6 inches within 10 feet of the building and slabs be sloped a minimum of 2 inches. In addition, we recommend downspouts with long splash blocks or extensions.

We recommend the lowest floor grades be constructed to meet City of Sunfish Lake (City) requirements with respect to groundwater separation distances. In the absence of City requirements, we recommend maintaining at least a 4-foot separation between the lowest floor slab and the observed groundwater levels and at least a 2-foot separation between the lowest floor slab and the 100-year flood level of nearby wetlands, storm water ponds or other surface water features.

4.9 Utilities

We anticipate that new utilities could be installed as part of this project. We further anticipate that new utilities will bear at depths ranging from about 7 to 10 feet below the ground surface. At these depths, we anticipate that the pipes will bear on compacted engineered fill or native alluvial soils which in our opinion are suitable for pipe support. We recommend that all vegetation, topsoil and any soft or otherwise unsuitable materials be removed from below the utilities prior to placement.

We recommend bedding material be thoroughly compacted around the pipes. We recommend trench backfill above the pipes be compacted to a minimum of 95 percent beneath slabs and pavements, the exception being within 3 feet of the proposed pavement subgrade, where 100 percent of standard Proctor density is required. In landscaped areas, we recommend a minimum compaction of 90 percent.

Groundwater was not encountered in the soil borings while drilling and sampling or after removal of the auger from the boreholes. We do not anticipate that groundwater will be encountered during utility construction and dewatering will likely not be required. See section 4.4 for dewatering considerations.

5.0 CONSTRUCTION CONSIDERATIONS

5.1 Excavation

The soils encountered in the borings at the anticipated excavation depths consisted of a variety of mostly cohesionless soils (i.e. sandy soils) that included; silty sand, poorly graded sand with silt, clayey sand and silt that generally correspond to the ASTM Classifications of

SM, SP-SM, SC, and ML, respectively. These soils will generally be Type C soils under Department of Labor Occupational Safety and Health Administration (OSHA) guidelines.

Temporary excavations in Type C soils should be constructed at a minimum of 1 ½ foot horizontal to every 1 foot vertical within excavations.

Slopes constructed in this manner may still exhibit surface sloughing. If site constraints do not allow the construction of slopes with these dimensions, then temporary shoring may be required.

5.2 Observations

A geotechnical engineer or qualified engineering technician should observe the excavation subgrade to evaluate if the subgrade soils are similar to those encountered in the borings and adequate to support the proposed construction.

5.3 Backfill and Fills

We recommend moisture conditioning all soils that will be used as fill or backfill in accordance with Section 4.3 above. We recommend that fill and backfill be placed in lifts not exceeding 4 to 12 inches, depending on the size of the compactor and materials used.

5.4 Testing

We recommend density tests of backfill and fills placed for the proposed house foundations. Samples of the proposed materials should be submitted to our laboratory prior to placement for evaluation of their suitability and to determine their optimum moisture content and maximum dry density (Standard Proctor).

5.5 Winter Construction

If site grading and construction is anticipated to proceed during cold weather, all snow and ice should be removed from cut and fill areas prior to additional grading and placement of fill. No fill should be placed on frozen soil and no frozen soil should be used as fill or backfill.

Concrete delivered to the site should meet the temperature requirements of ASTM and/or ACI. Concrete should not be placed on frozen soil. Concrete should be protected from freezing until the necessary strength is obtained. Frost should not be permitted to penetrate below the footings.

6.0 PROCEDURES

6.1 Soil Classification

The drill crew chief visually and manually classified the soils encountered in the borings in general accordance with ASTM D 2488, "Description and Identification of Soils (Visual-Manual Procedure)." Soil terminology notes are included in the Appendix. The samples

were returned to our laboratory for review of the field classification by a soils engineer. Samples will be retained for a period of 30 days.

6.2 Groundwater Observations

Immediately after taking the final samples in the bottom of the boring, the hole was checked for the presence of groundwater. Immediately after removing the augers from the borehole the hole was once again checked and the depth to water and cave-in depths were noted.

7.0 GENERAL

7.1 Subsurface Variations

The analyses and recommendations presented in this report are based on data obtained from a limited number of soil boring(s). Variations can occur away from the boring, the nature of which may not become apparent until additional exploration work is completed, or construction is conducted. A reevaluation of the recommendations in this report should be made after performing on-site observations during construction to note the characteristics of any variations. The variations may result in additional foundation costs and it is suggested that a contingency be provided for this purpose.

It is recommended that we be retained to perform the observation and testing program during construction to evaluate whether the design is as expected, if any design changes have affected the validity of our recommendations, and if our recommendations have been correctly interpreted and implemented in the designs, specifications and construction methods. This will allow correlation of the soil conditions encountered during construction to the soil borings and test pits and will provide continuity of professional responsibility.

7.2 Review of Design

This report is based on the design of the proposed structures as related to us for preparation of this report. It is recommended that we be retained to review the geotechnical aspects of the design and specifications. With the review, we will evaluate whether any changes have affected the validity of the recommendations and whether our recommendations have been correctly interpreted and implemented in the design and specifications.

7.3 Groundwater Fluctuations

We made water level measurements in the borings at the times and under the conditions stated on the boring log. The data was interpreted in the text of this report. The period of observation was relatively short and fluctuations in the groundwater level may occur due to rainfall, flooding, irrigation, spring thaw, drainage, and other seasonal and annual factors not evident at the time the observations were made. Design drawings and specifications and construction planning should recognize the possibility of fluctuations.

7.4 Use of Report

This report is for the exclusive use of Mrs. Madeline Mauer and her design team to use to design the proposed structures and prepare construction documents. In the absence of our written approval, we make no representation and assume no responsibility to other parties regarding this report. The data, analysis and recommendations may not be appropriate for other structures or purposes. We recommend that parties contemplating other structures or purposes contact us.

7.5 Level of Care

Haugo GeoTechnical Services has used the degree of skill and care ordinarily exercised under similar circumstance by members of the profession currently practicing in this locality. No warranty expressed or implied is made.

APPENDIX

GPS Boring Locations

Boring Number	Elevation (US Survey Feet)	Northing Coordinate	Easting Coordinate
SB-1	956.7	246782.599	557554.192
SB-2	956.1	246813.847	557567.082
SB-3	961.5	246772.618	557669.676
SB-4	961.9	246839.539	557636.764

Disclaimer: Map and parcel data are believed to be accurate, but accuracy is not guaranteed. This is not a legal document and should not be substituted for a title search, appraisal, survey, or for zoning verification.

Haugo GeoTechnical Services, LLC
2825 Cedar Avenue S.
Minneapolis, MN 55407

Soil Boring Location Sketch
100 Windy Hill Road
Sunfish Lake, Minnesota

Figure #: 1
Drawn By: RD
Date: 10/22/20
Scale: None
Project #: 20-0891

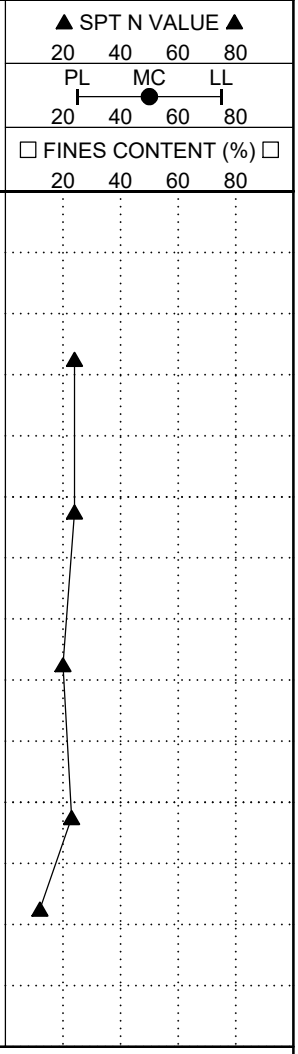
Haugo GeoTechnical Services
2825 Cedar Ave South
Minneapolis, MN 55407
Telephone: 612-729-2959
Fax: 763-445-2238

BORING NUMBER SB-1

CLIENT Madeline Mauer
PROJECT NAME 100 Windy Hill Road
PROJECT NUMBER 20-0891
PROJECT LOCATION Sunfish Lake, MN
DATE STARTED 10/19/20 **COMPLETED** 10/19/20
GROUND ELEVATION 956.7 ft **HOLE SIZE** 3 1/4 inches
DRILLING CONTRACTOR HGTS - 45
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger/Split Spoon
AT TIME OF DRILLING --- Not Encountered
LOGGED BY CP **CHECKED BY** PG
AT END OF DRILLING --- Not Encountered
NOTES Auger met refusal at 14 feet.
AFTER DRILLING --- Not Encountered with Cave-In Depth of 16 feet

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	MOISTURE CONT. (%)	NOTES
0		Silty Sand, trace Gravel, dark brown, moist. (Aggregate Base)					
		(CL) Lean Clay, brown, moist, medium dense. (Alluvium)	AU 1				
			SS 2		6-8-16 (24)	17	
5		(SP-SM) Poorly Graded Sand with Silt, fine to coarse grained, trace Gravel, brown, moist, medium dense. (Glacial Till)	SS 3		10-11-13 (24)	4.5	
			SS 4		7-9-11 (20)		
10		(SM) Silty Sand, fine to medium grained, trace Gravel, brown, moist, medium dense. (Glacial Till)	SS 5		18-10-13 (23)		
			SS 6		5-5-7 (12)		
			SS 7		50		

Bottom of borehole at 14.0 feet.



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Haugo GeoTechnical Services
2825 Cedar Ave South
Minneapolis, MN 55407
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Fax: 763-445-2238

BORING NUMBER SB-2

CLIENT Madeline Mauer
PROJECT NAME 100 Windy Hill Road
PROJECT NUMBER 20-0891
PROJECT LOCATION Sunfish Lake, MN
DATE STARTED 10/19/20 **COMPLETED** 10/19/20
GROUND ELEVATION 956.1 ft **HOLE SIZE** 3 1/4 inches
DRILLING CONTRACTOR HGTS - 45
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger/Split Spoon
AT TIME OF DRILLING --- Not Encountered
LOGGED BY CP **CHECKED BY** PG
AT END OF DRILLING --- Not Encountered
NOTES Borehole grouted.
AFTER DRILLING --- Not Encountered with Cave-In Depth of 16 feet

DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	MOISTURE CONT. (%)	NOTES
0	Silty Sand, trace Roots, dark brown, moist. (Topsoil)					
	(ML) Silt, brown, moist, loose. (Alluvium)	AU 9				
		SS 10		5-5-4 (9)	11	
5	(CL-ML) Silty Clay, brown, moist, rather stiff. (Alluvium)	SS 11		4-4-5 (9)	18.5	
	(SM) Silty Sand, fine to coarse grained, trace Gravel, brown, moist, medium dense. (Glacial Till)	SS 12		5-6-8 (14)		
10		SS 13		4-7-9 (16)	9	
		SS 14		4-5-12 (17)		
15		SS 15		5-7-11 (18)		
20		SS 16		6-8-10 (18)		

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

Bottom of borehole at 21.0 feet.

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Minneapolis, MN 55407
Telephone: 612-729-2959
Fax: 763-445-2238

BORING NUMBER SB-3

CLIENT Madeline Mauer
PROJECT NAME 100 Windy Hill Road
PROJECT NUMBER 20-0891
PROJECT LOCATION Sunfish Lake, MN
DATE STARTED 10/19/20 **COMPLETED** 10/19/20
GROUND ELEVATION 961.5 ft **HOLE SIZE** 3 1/4 inches
DRILLING CONTRACTOR HGTS - 45
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger/Split Spoon
AT TIME OF DRILLING --- Not Encountered
LOGGED BY CP **CHECKED BY** PG
AT END OF DRILLING --- Not Encountered
NOTES Borehole grouted.
AFTER DRILLING --- Not Encountered with Cave-In Depth of 17 feet

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	MOISTURE CONT. (%)	NOTES
0		Silty Sand, trace Roots, dark brown, moist. (Topsoil)					
		(SM) Silty Sand, fine to coarse grained, trace Gravel, brown, moist, medium dense. (Glacial Till)	AU 17				
			SS 18		6-5-9 (14)	7.5	
5			SS 19		9-9-9 (18)		
			SS 20		6-8-10 (18)		
10			SS 21		7-7-9 (16)		
			SS 22		5-7-8 (15)		
15		(SC) Clayey Sand, fine to medium grained, trace Gravel, brown, moist, medium dense. (Glacial Till)	SS 23		6-6-10 (16)		
20			SS 24		7-9-12 (21)		

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

Bottom of borehole at 21.0 feet.

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Haugo GeoTechnical Services
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Minneapolis, MN 55407
Telephone: 612-729-2959
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BORING NUMBER SB-4

CLIENT Madeline Mauer
PROJECT NAME 100 Windy Hill Road
PROJECT NUMBER 20-0891
PROJECT LOCATION Sunfish Lake, MN
DATE STARTED 10/19/20 **COMPLETED** 10/19/20
GROUND ELEVATION 961.9 ft **HOLE SIZE** 3 1/4 inches
DRILLING CONTRACTOR HGTS - 45
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger/Split Spoon
AT TIME OF DRILLING --- Not Encountered
LOGGED BY CP **CHECKED BY** PG
AT END OF DRILLING --- Not Encountered
NOTES Borehole grouted.
AFTER DRILLING --- Not Encountered with Cave-In Depth of 12 feet

DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	MOISTURE CONT. (%)	NOTES
0	Silty Sand, trace Roots, dark brown, moist. (Topsoil)					
	(SM) Silty Sand, fine to medium grained, trace Gravel, brown, moist, medium dense. (Glacial Till)	AU 25				
		SS 26		6-5-9 (14)	4.5	
5		SS 27		7-7-7 (14)		
		SS 28		7-7-9 (16)	3.5	
10		SS 29		8-10-11 (21)		
		SS 30		8-10-10 (20)		
15		SS 31		7-9-12 (21)		
20		SS 32		6-8-8 (16)		

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

Bottom of borehole at 21.0 feet.

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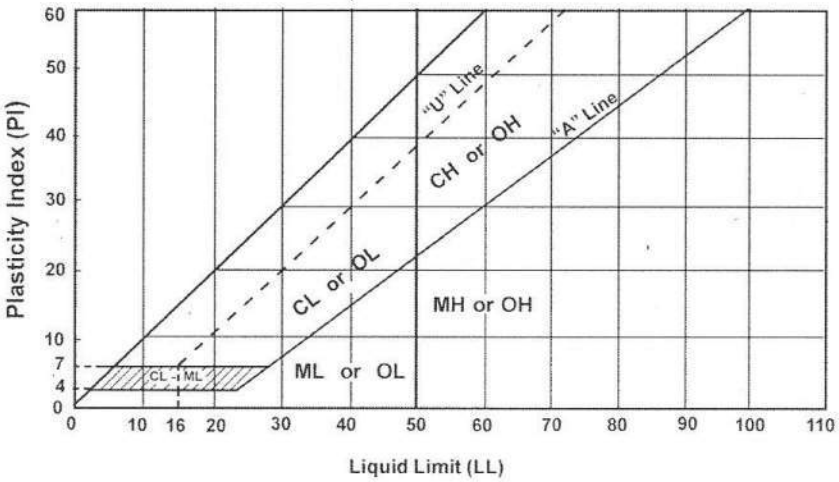
Descriptive Terminology of Soil

Standard D 2487 - 00
Classification of Soils for Engineering Purposes
(Unified Soil Classification System)

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [a]				Soils Classification	
				Group Symbol	Group Name [b]
Coarse-grained Soils more than 50% retained on No. 200 sieve	Gravels More than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels 5% or less fines [e]	$C_u \geq 4$ and $1 \leq C_c \leq 3$ [c]	GW	Well-graded gravel [d]
			$C_u < 4$ and/or $1 > C_c > 3$ [c]	GP	Poorly graded gravel [d]
		Gravels with Fines More than 12% fines [e]	Fines classify as ML or MH	GM	Silty gravel [d f g]
			Fines classify as CL or CH	GC	Clayey gravel [d f g]
	Sands 50% or more of coarse fraction passes No. 4 sieve	Clean Sands 5% or less fines [i]	$C_u \geq 6$ and $1 \leq C_c \leq 3$ [c]	SW	Well-graded sand [h]
			$C_u < 6$ and/or $1 > C_c > 3$ [c]	SP	Poorly graded sand [h]
		Sands with Fines More than 12% [i]	Fines classify as ML or MH	SM	Silty sand [f g h]
			Fines classify as CL or CH	SC	Clayey sand [f g h]
Fine-grained Soils 50% or more passed the No. 200 sieve	Silts and Clays Liquid limit less than 50	Inorganic	PI > 7 and plots on or above "A" line [j]	CL	Lean clay [k l m]
			PI < 4 or plots below "A" line [j]	ML	Silt [k l m]
		Organic	Liquid limit - oven dried / Liquid limit - not dried < 0.75	OL	Organic clay [k l m n]
				OL	Organic silt [k l m o]
	Silts and clays Liquid limit 50 or more	Inorganic	PI plots on or above "A" line	CH	Fat clay [k l m]
			PI plots below "A" line	MH	Elastic silt [k l m]
		Organic	Liquid limit - oven dried / Liquid limit - not dried < 0.75	OH	Organic clay [k l m p]
				OH	Organic silt [k l m q]
Highly Organic Soils		Primarily organic matter, dark in color and organic odor		PT	Peat

a. Based on the material passing the 3-in (75mm) sieve.
b. If field sample contained cobbles or boulders, or both, add "with cobbles or boulders or both" to group name.
c. $C_u = D_{60} / D_{10}$ $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$
d. If soil contains ≥15% sand, add "with sand" to group name.
e. Gravels with 5 to 12% fines require dual symbols:
GW-GM well-graded gravel with silt
GW-GC well-graded gravel with clay
GP-GM poorly graded gravel with silt
GP-GC poorly graded gravel with clay
f. If fines classify as CL-ML, use dual symbol GC-GM or SC-SM.
g. If fines are organic, add "with organic fines" to group name.
h. If soil contains ≥ 15% gravel, add "with gravel" to group name.
i. Sands with 5 to 12% fines require dual symbols:
SW-SM well-graded sand with silt
SW-SC well-graded sand with clay
SP-SM poorly graded sand with silt
SP-SC poorly graded sand with clay
j. If Atterberg limits plot in hatched area, soil is a CL-ML, silty clay.
k. If soil contains 10 to 29% plus No. 200, add "with sand" or "with gravel" whichever is predominant.
l. If soil contains ≥ 30% plus No. 200, predominantly sand, add "sandy" to group name.
m. If soil contains ≥ 30% plus No. 200 predominantly gravel, add "gravelly" to group name.
n. PI ≥ 4 and plots on or above "A" line.
o. PI < 4 or plots below "A" line.
p. PI plots on or above "A" line.
q. PI plots below "A" line.



Laboratory Tests

DD	Dry density, pcf	OC	Organic content, %
WD	Wet density, pcf	S	Percent of saturation, %
MC	Natural moisture content, %	SG	Specific gravity
LL	Liquid limit, %	C	Cohesion, psf
PL	Plastic limit, %	∅	Angle of internal friction
PI	Plasticity index, %	qu	Unconfined compressive strength, psf
P200	% passing 200 sieve	qp	Pocket penetrometer strength, tsf

Particle Size Identification

Boulders	over 12"
Cobbles	3" to 12"
Gravel	
Coarse	3/4" to 3"
Fine	No. 4 to 3/4"
Sand	
Coarse	No. 4 to No. 10
Medium	No. 10 to No. 40
Fine	No. 40 to No. 200
Silt	< No. 200, PI < 4 or below "A" line
Clay	< No. 200, PI ≥ 4 and on or above "A" line

Relative Density of Cohesionless Soils

Very loose	0 to 4 BPF
Loose	5 to 10 BPF
Medium dense	11 to 30 BPF
Dense	31 to 50 BPF
Very dense	over 50 BPF

Consistency of Cohesive Soils

Very soft	0 to 1 BPF
Soft	2 to 3 BPF
Rather soft	4 to 5 BPF
Medium	6 to 8 BPF
Rather stiff	9 to 12 BPF
Stiff	13 to 16 BPF
Very stiff	17 to 30 BPF
Hard	over 30 BPF

Drilling Notes

Standard penetration test borings were advanced by 3 1/4" or 6 1/4" ID hollow-stem augers unless noted otherwise. Jetting water was used to clean out auger prior to sampling only where indicated on logs. Standard penetration test borings are designated by the prefix "ST" (Split Tube). All samples were taken with the standard 2" OD split-tube sampler, except where noted.

Power auger borings were advanced by 4" or 6" diameter continuous-flight, solid-stem augers. Soil classifications and strata depths were inferred from disturbed samples augered to the surface and are, therefore, somewhat approximate. Power auger borings are designated by the prefix "B."

Hand auger borings were advanced manually with a 1 1/2" or 3 1/4" diameter auger and were limited to the depth from which the auger could be manually withdrawn. Hand auger borings are indicated by the prefix "H."

BPF: Numbers indicate blows per foot recorded in standard penetration test, also known as "N" value. The sampler was set 6" into undisturbed soil below the hollow-stem auger. Driving resistances were then counted for second and third 6" increments and added to get BPF. Where they differed significantly, they are reported in the following form: 2/12 for the second and third 6" increments, respectively.

WH: WH indicates the sampler penetrated soil under weight of hammer and rods alone; driving not required.

WR: WR indicates the sampler penetrated soil under weight of rods alone; hammer weight and driving not required.

TW indicates thin-walled (undisturbed) tube sample.

Note: All tests were run in general accordance with applicable ASTM standards.

Soil Investigation & Design INC

Mr. John Bisanz
100 Windy Hill Road,
Sunfish Lake, MN

Re: Soil Borings for infiltration rates and storm water control.

Dear Mr. Bisanz,

This report is to discuss the findings of our investigation of the 100 Windy Hill Road site. We completed seven soil borings to 14.5 feet or groundwater whichever was less. Stormwater cannot be discharged into the groundwater and it is recommended that it be discharged no greater than seven feet in depth into the soil. Another requirement is that it cannot be discharged in the soil that is periodically saturated. In point of fact, stormwater must not be discharged closer than three feet to that periodically saturated soil layer.

In other words, untreated stormwater cannot be discharged to groundwater or surface water, it must have three feet of unmottled soil between the bottom of the infiltration area and mottled soil.

Soil Borings:

Soil boring 1 consists of a well-developed silty clay soil over a sand deposit. The silty clay deposit has good structure and soil development. It will pass water at a rate of 5.40 inches per hour. Please note that if construction traffic runs over this area and/or the soil is rutted/moved, the infiltration rate drops to 0.75 inches per hour or less. As a native deposit, this surface soil is an HSG C soil; but if manipulated or compacted, it will drop to an HSG D.

The sand layer has approximately two to 2.5 feet of unmottled soil and has an infiltration rate of 7.5 inches per hour. Adding a minimum of one foot of clean sand would make this soil a good candidate for infiltration of stormwater. Since the deposit appears to be larger, an interception trench could be installed to accept surface water flow.

Soil boring 2 consists of a well-developed silty clay soil over a sand deposit. The silty clay deposit has good structure and soil development. It will pass water at a rate of 5.55 inches per hour. Please note that if construction traffic runs over this area and/or the soil is rutted/moved, the infiltration rate drops to 0.75 inches per hour or less. As a native deposit, this surface soil is an HSG C soil; but if manipulated or compacted, it will drop to an HSG D.

The sand layer has approximately two to 2.5 feet of unmottled soil and has an infiltration rate of 7.5 inches per hour. Adding a minimum of one foot of clean sand would make this soil a good candidate for infiltration of stormwater. Since, the deposit appears to be larger, an interception trench could be installed to accept surface water flow.

Soil boring 3 consists of a well-developed silty clay soil over a denser undeveloped silty clay layer. This boring had redoximorphic features to the surface and is unsuitable for stormwater infiltration. However, by

manipulating the soil, a nearly impervious liner can be established and the soil can be used for a filtration basin with treated discharge to a lower elevation. Groundwater was encountered at 11.5 feet below the surface.

This soil will pass water at a rate of 5.57 inches per hour. Please note that if construction traffic runs over this area and/or the soil is rutted/moved, the infiltration rate drops to 0.5 inches per hour or less. As a native deposit, this surface soil is an HSG C soil; but if manipulated or compacted, it will drop to an HSG D.

Soil boring 4 consists of a well-developed silty clay soil over a denser undeveloped silty clay layer. This boring had redoximorphic features to the surface and is unsuitable for stormwater infiltration. However, by manipulating the soil, a nearly impervious liner can be established and the soil can be used for a filtration basin with treated discharge to a lower elevation. Groundwater was encountered at 12.5 feet below the surface.

This soil will pass water at a rate of 5.4 inches per hour. Please note that if construction traffic runs over this area and/or the soil is rutted/moved, the infiltration rate drops to 0.5 inches per hour or less. As a native deposit, this surface soil is an HSG C soil; but if manipulated or compacted, it will drop to an HSG D.

Soil boring 5 consists of a well-developed silty clay soil over a denser undeveloped silty clay layer. This boring had redoximorphic features to the surface and is unsuitable for stormwater infiltration. However, by manipulating the soil, a nearly impervious liner can be established and the soil can be used for a filtration basin with treated discharge to a lower elevation. Groundwater was encountered at 12.25 feet below the surface.

This soil will pass water at a rate of 3.4 inches per hour. Please note that if construction traffic runs over this area and/or the soil is rutted/moved, the infiltration rate drops to 0.5 inches per hour or less. As a native deposit, this surface soil is an HSG C soil; but if manipulated or compacted, it will drop to an HSG D.

Soil boring 6 consists of a well-developed silty clay soil over a denser undeveloped silty clay layer. This boring had redoximorphic features to the surface and is unsuitable for stormwater infiltration. However, by manipulating the soil, a nearly impervious liner can be established and the soil can be used for a filtration basin with treated discharge to a lower elevation. Groundwater was encountered at eight feet below the surface.

This soil will pass water at a rate of 3.45 inches per hour. Please note that if construction traffic runs over this area and/or the soil is rutted/moved, the infiltration rate drops to 0.5 inches per hour or less. As a native deposit, this surface soil is an HSG C soil; but if manipulated or compacted, it will drop to an HSG D.

Soil boring 7 consists of a well-developed silty clay soil over a denser undeveloped silty clay layer. This boring had no redoximorphic features and is suitable for stormwater infiltration. Groundwater was not encountered.

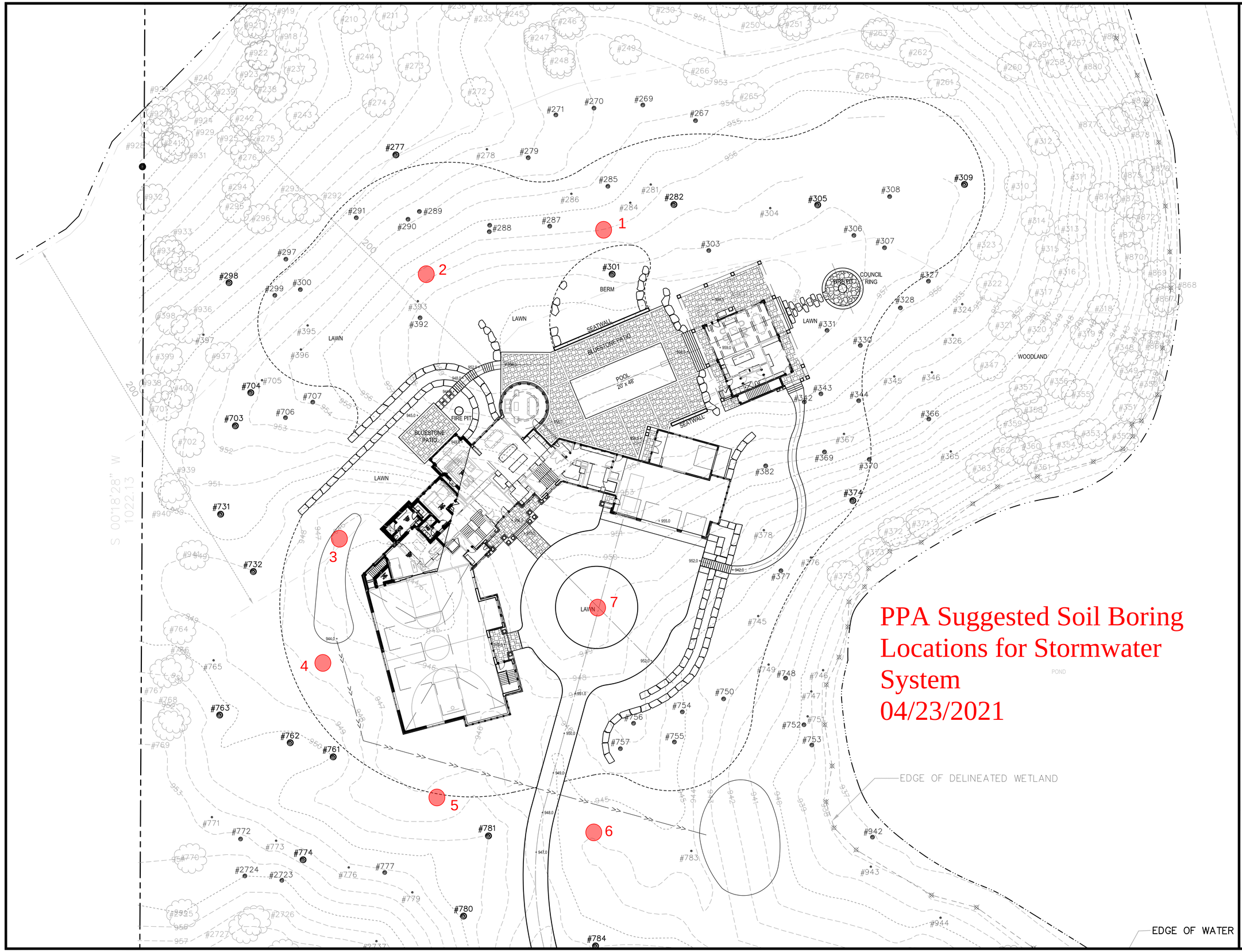
This soil will pass water at a rate of 4.55 inches per hour. Please note that if construction traffic runs over this area and/or the soil is rutted/moved, the infiltration rate drops to 0.5 inches per hour or less. As a native deposit, this surface soil is an HSG C soil; but if manipulated or compacted, it will drop to an HSG D.

If you have any questions please feel free to contact me at 651-260-3783 and/or pbrandt@soilinvestigations.us .

I hereby certify that this plan, document, or report was prepared
by me or under my direct supervision and that I am a Licensed
Professional Soil Scientist under the Laws of the State of Minnesota.
Print Name: Paul J. Brandt PSS; License: 30007

Signature: Date: May 4, 2021.

Paul Brandt PSS, President
Soil Investigation & Design, Inc.



SAVANNA DESIGNS

Environmentally Appropriate Landscape Design

3637 Trading Post Trail South
Afton, MN 55042
(651)436-6049 · info@savannadesigns.com

PROJECT

Windy Hill

100 Windy Hill Road
Sunfish Lake, MN 55077

SHEET TITLE

Enlarged Site Plan

REVISION

NO.	DESCRIPTION	DATE

CERTIFICATION

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED LANDSCAPE ARCHITECT UNDER THE LAWS OF THE STATE OF MINNESOTA.

PRINT NAME: _____

SIGNATURE: _____

DATE: _____ LIC. NO. _____

NORTH

0 10 20 30 40

1" = 20'

SHEET NUMBER

L1.1 OF 2

Project: **MEC LLC**

Project Location: **100 Windy Hill Road, Sunfish Lake, MN**

Project Number: **100WindyHill**

Log of Boring 1

Sheet 1 of 1

Date(s) Drilled **May 3, 2021**	Logged By **TO**	Checked By **PJB**
Drilling Method **Flighted Auger**	Drill Bit Size/Type **3.5"**	Total Depth of Borehole **10.25 feet bgs**
Drill Rig Type **Simco B2400**	Drilling Contractor **Soil ID**	Approximate Surface Elevation **956**
Groundwater Level and Date Measured **Not encountered**	Sampling Method(s)	Hammer Data **None**
Borehole Backfill **Cuttings**	Location **North of Proposed**	

Elevation (feet)	Depth (feet)	Material Type	MATERIAL DESCRIPTION
956	0	Grass / CH-MH	Dark Brown Clay Loam, many macro and micro pores, roots, krotovina, little gravel
		CL-ML	Brown Clay Loam, many macro and micro pores, roots, krotovina, little gravel
			Tan Clay Loam, many macro and micro pores, roots, krotovina, little gravel, significant redoximorphic featrues
951	5	GM-GC / SP-SM	Tan Sandy Gravelly Clay, macro and micro pores, few roots, krotovina, significant redoximorphic featrues
			Tan Sand moderately well sorted, some fines, granular. No redoximorphic featrues
		SP-SM	Tan Sand moderately well sorted, some fines, granular. Significant redoximorphic featrues
946	10		Auger refusal, boring terminated backfilled with cuttings. The upper layer of silt loam is an HSG C with an infiltration rate of 5.45 Inches per hour. If disturbed or compacted the infiltration rate declines to 0.75 inches per hour. The sand layer is an HSG A with an infiltration rate of 7.5 Inches per hour.
941	15		
936	20		
931	25		
926	30		

Sample Type | Sample Number | Sampling Resistance, blows/ft | Graphic Log | REMARKS AND OTHER TESTS

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Project: **MEC LLC** Project Location: **100 Windy Hill Road, Sunfish Lake, MN** Project Number: **100WindyHill**	Log of Boring 2 **Sheet 1 of 1**

Date(s) Drilled **May 3, 2021**	Logged By **TO**	Checked By **PJB**
Drilling Method **Flighted Auger**	Drill Bit Size/Type **3.5"**	Total Depth of Borehole **14.5 feet bgs**
Drill Rig Type **Simco B2400**	Drilling Contractor **Soil ID**	Approximate Surface Elevation **956**
Groundwater Level and Date Measured **Not encountered**	Sampling Method(s)	Hammer Data **None**
Borehole Backfill **Cuttings**	Location **North of Proposed**	

Elevation (feet)	Depth (feet)	Material Type	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
956	0	CL-ML	Dark Brown Clay Loam, many macro and micro pores, roots, krotovina, little gravel	
		CL-ML	Brown Clay Loam, many macro and micro pores, roots, krotovina, little gravel	
951	5	SP-SM	Tan Sand moderately well sorted, some fines, granular. No redoximorphic featrues	
		SP-SM	Tan Sand moderately well sorted, some fines, granular. Significant redoximorphic featrues	
946	10			
941	15		boring terminated backfilled with cuttings. The upper layer of silt loam is an HSG C with an infiltration rate of 5.55 Inches per hour. If disturbed or compacted the infiltration rate declines to 0.70 inches per hour. The sand layer is an HSG A with an infiltration rate of 7.0 Inches per hour. boring terminated backfilled with cuttings. The upper layer of silt loam is an HSG C with an infiltration rate of 5.55 Inches per hour. If disturbed or compacted the infiltration rate declines to 0.70 inches per hour. The sand layer is an HSG A with an infiltration rate of 7.0 Inches per hour.	
936	20			
931	25			
926	30			

Sample Type | Sample Number | Sampling Resistance, blows/ft

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Project: **MEC LLC**

Project Location: **100 Windy Hill Road, Sunfish Lake, MN**

Project Number: **100WindyHill**

Log of Boring 3

Sheet 1 of 1

Date(s) Drilled **May 3, 2021**	Logged By **TO**	Checked By **PJB**
Drilling Method **Flighted Auger**	Drill Bit Size/Type **3.5"**	Total Depth of Borehole **14.5 feet bgs**
Drill Rig Type **Simco B2400**	Drilling Contractor **Soil ID**	Approximate Surface Elevation **946**
Groundwater Level and Date Measured **11.5**	Sampling Method(s)	Hammer Data **None**
Borehole Backfill **Cuttings**	Location **West of Proposed**	

Elevation (feet)	Depth (feet)	Material Type	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
946	0	CL-ML	Dark Brown Clay Loam, many macro and micro pores, roots, krotovina, little gravel	
		CL-ML	Redish Brown Silty Clay, significant redoximorphic featrures, roots, and krotovina, macro and micro pores,	
941	5			
		SP-SC	Redish Brown Sandy Clay, some gravel, no roots, significant redoximorphic features wet.	
936	10		1 hour after dilling ▼	
931	15		boring terminated backfilled with cuttings. The upper layer of silt loam is an HSG C with an infiltration rate of 5.57 Inches per hour. If disturbed or compacted the infiltration rate declines to 0.50 inches per hour.	
926	20			
921	25			
916	30			

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Project: **MEC LLC** Project Location: **100 Windy Hill Road, Sunfish Lake, MN** Project Number: **100WindyHill**	Log of Boring 4 **Sheet 1 of 1**

Date(s) Drilled **May 3, 2021**	Logged By **TO**	Checked By **PJB**
Drilling Method **Flighted Auger**	Drill Bit Size/Type **3.5"**	Total Depth of Borehole **14.5 feet bgs**
Drill Rig Type **Simco B2400**	Drilling Contractor **Soil ID**	Approximate Surface Elevation **947.5**
Groundwater Level and Date Measured **12.5**	Sampling Method(s)	Hammer Data **None**
Borehole Backfill **Cuttings**	Location **South of Proposed**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
947.5	0				CL-ML CL-ML		Dark Brown Clay Loam, many macro and micro pores, roots, krotovina, little gravel Dark Brown Sandy Clay Loam, many macro and micro pores, roots, krotovina, little gravel Significant redoximorphic features.	
942.5	5				CL-ML		Dark Brown Sandy Clay Loam, some gravel Significant redoximorphic features, along with free carbonate features.	
937.5	10						1 hour after drilling ▼	
932.5	15						boring terminated backfilled with cuttings. The upper layer of silt loam is an HSG C with an infiltration rate of 5.4 Inches per hour. If disturbed or compacted the infiltration rate declines to 0.50 inches per hour.	
927.5	20							
922.5	25							
917.5	30							

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Project: **MEC LLC** Project Location: **100 Windy Hill Road, Sunfish Lake, MN** Project Number: **100WindyHill**	Log of Boring 5 **Sheet 1 of 1**

Date(s) Drilled **May 3, 2021**	Logged By **TO**	Checked By **PJB**
Drilling Method **Flighted Auger**	Drill Bit Size/Type **3.5"**	Total Depth of Borehole **14.5 feet bgs**
Drill Rig Type **Simco B2400**	Drilling Contractor **Soil ID**	Approximate Surface Elevation **947.5**
Groundwater Level and Date Measured **12.25**	Sampling Method(s)	Hammer Data **None**
Borehole Backfill **Cuttings**	Location **South of Proposed**	

Elevation (feet)	Depth (feet)	Material Type	MATERIAL DESCRIPTION
947.5	0	CL-ML / CL	Dark Brown Clay Loam, many macro and micro pores, roots, krotovina, little gravel
			Brown Clay, macro and micro pores, roots, krotovina, little gravel Significant redoximorphic features.
942.5	5	CL-ML	Brown Sandy Clay Loam, many macro and micro pores, roots, krotovina, little gravel Significant redoximorphic features.
937.5	10		1 hour after drilling ▼
932.5	15		boring terminated backfilled with cuttings. The upper layer of silt loam is an HSG C with an infiltration rate of 3.4 Inches per hour. If disturbed or compacted the infiltration rate declines to 0.50 inches per hour.
927.5	20		
922.5	25		
917.5	30		

Sample Type | Sample Number | Sampling Resistance, blows/ft | Graphic Log | REMARKS AND OTHER TESTS

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Project: **MEC LLC**

Project Location: **100 Windy Hill Road, Sunfish Lake, MN**

Project Number: **100WindyHill**

Log of Boring 6

Sheet 1 of 1

Date(s) Drilled **May 3, 2021**	Logged By **TO**	Checked By **PJB**
Drilling Method **Flighted Auger**	Drill Bit Size/Type **3.5"**	Total Depth of Borehole **8 feet bgs**
Drill Rig Type **Simco B2400**	Drilling Contractor **Soil ID**	Approximate Surface Elevation **944**
Groundwater Level and Date Measured **7.45**	Sampling Method(s)	Hammer Data **None**
Borehole Backfill **Cuttings**	Location **South of Proposed**	

Elevation (feet)	Depth (feet)	Material Type	MATERIAL DESCRIPTION
944	0	CL-ML	Dark Brown Clay Loam, many macro and micro pores, roots, krotovina, little gravel
		CL-ML	Reddish Brown Clay Loam, few macro and micro pores, some roots, significant redoximorphic features.
939	5		1 hour after drilling ▼
			boring terminated backfilled with cuttings.
934	10		The upper layer of silt loam is an HSG C with an infiltration rate of 3.45 Inches per hour. If disturbed or compacted the infiltration rate declines to 0.50 inches per hour.
929	15		
924	20		
919	25		
914	30		

REMARKS AND OTHER TESTS

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Project: **MEC LLC** Project Location: **100 Windy Hill Road, Sunfish Lake, MN** Project Number: **100WindyHill**	Log of Boring 7 **Sheet 1 of 1**

Date(s) Drilled **May 3, 2021**	Logged By **TO**	Checked By **PJB**
Drilling Method **Flighted Auger**	Drill Bit Size/Type **3.5"**	Total Depth of Borehole **14.5 feet bgs**
Drill Rig Type **Simco B2400**	Drilling Contractor **Soil ID**	Approximate Surface Elevation **949**
Groundwater Level and Date Measured **not encountered**	Sampling Method(s)	Hammer Data **None**
Borehole Backfill **Cuttings**	Location **East of Proposed**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
949	0				CL-ML CL-ML		Dark Brown Clay Loam, many macro and micro pores, roots, krotovina, little gravel Brown Sandy Clay Loam, nbo redoximorphic features, uniform, May be fill.	
944	5							
939	10							
934	15						boring terminated backfilled with cuttings. The upper layer of silt loam is an HSG C with an infiltration rate of 4.45 Inches per hour. If disturbed or compacted the infiltration rate declines to 0.86 inches per hour.	
929	20							
924	25							
919	30							

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Project: **MEC LLC**
Project Location: **100 Windy Hill Road, Sunfish Lake, MN**
Project Number: **100WindyHill**

Key to Log of Boring
Sheet 1 of 1

1 Elevation (feet)	2 Depth (feet)	3 Sample Type	4 Sample Number	5 Sampling Resistance, blows/ft	6 Material Type	7 Graphic Log	8 MATERIAL DESCRIPTION	9 REMARKS AND OTHER TESTS

COLUMN DESCRIPTIONS

1 Elevation (feet): Elevation (MSL, feet).
2 Depth (feet): Depth in feet below the ground surface.
3 Sample Type: Type of soil sample collected at the depth interval shown.
4 Sample Number: Sample identification number.
5 Sampling Resistance, blows/ft: Number of blows to advance driven sampler one foot (or distance shown) beyond seating interval using the hammer identified on the boring log.
6 Material Type: Type of material encountered.
7 Graphic Log: Graphic depiction of the subsurface material encountered.
8 MATERIAL DESCRIPTION: Description of material encountered. May include consistency, moisture, color, and other descriptive text.
9 REMARKS AND OTHER TESTS: Comments and observations regarding drilling or sampling made by driller or field personnel.

FIELD AND LABORATORY TEST ABBREVIATIONS

CHEM: Chemical tests to assess corrosivity
COMP: Compaction test
CONS: One-dimensional consolidation test
LL: Liquid Limit, percent
PI: Plasticity Index, percent
SA: Sieve analysis (percent passing No. 200 Sieve)
UC: Unconfined compressive strength test, Qu, in ksf
WA: Wash sieve (percent passing No. 200 Sieve)

MATERIAL GRAPHIC SYMBOLS

Fat CLAY/SILT (CH-MH)
Lean CLAY, CLAY w/SAND, SANDY CLAY (CL)
SILTY CLAY (CL-ML)
Silty GRAVEL to Clayey GRAVEL (GM-GC)
Grass and/or topsoil
Poorly graded SAND with Clay (SP-SC)
Poorly graded SAND with Silt (SP-SM)

TYPICAL SAMPLER GRAPHIC SYMBOLS

Auger sampler
Bulk Sample
3-inch-OD California w/ brass rings
CME Sampler
Grab Sample
2.5-inch-OD Modified California w/ brass liners
Pitcher Sample
2-inch-OD unlined split spoon (SPT)
Shelby Tube (Thin-walled, fixed head)

OTHER GRAPHIC SYMBOLS

Water level (at time of drilling, ATD)
Water level (after waiting)
Minor change in material properties within a stratum
Inferred/gradational contact between strata
Queried contact between strata

GENERAL NOTES

1: Soil classifications are based on the Unified Soil Classification System. Descriptions and stratum lines are interpretive, and actual lithologic changes may be gradual. Field descriptions may have been modified to reflect results of lab tests.
2: Descriptions on these logs apply only at the specific boring locations and at the time the borings were advanced. They are not warranted to be representative of subsurface conditions at other locations or times.

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Figure B-1

University of Minnesota Onsite Sewage Treatment Program

Preliminary Evaluation Worksheet

MINNESOTA POLLUTION CONTROL AGENCY

1. Contact Information

v 04.01.2021

Property Owner/Client:	MEC LLC	Date Completed:	5/4/2021
Site Address:	100 Windy Hill Road, Sunfish Lake MN	Project ID:	100WindyHill
Email:	john.bisanz@gmail.com	Phone:	
Mailing Address:	100 Windy Hill Road, Sunfish Lake MN	Alt Phone:	
Legal Description:	LOT 5 & THAT PT OF LOT 6 LYING W OF FOL DES LINE COMM SW COR LOT 2 BLK 1		
Parcel ID:	38-03800-06-013	SEC:	TWP: RNG:

2. Flow and General System Information

A. Client-Provided Information

Project Type: ☐ New Construction ☑ Replacement ☐ Expansion ☐ Repair

Project Use: ☑ Residential ☐ Other Establishment:

Residential use: # Bedrooms: 6 Dwelling Sq.ft.: Unfinished Sq. Ft.:

Adults: 2 # Children: 4 # Teenagers:

In-home business (Y/N): No If yes, describe:

Water-using devices: *(check all that apply)*

☑ Garbage Disposal/Grinder	☑ Dishwasher	☐ Hot Tub*
☑ Sewage pump in basement	☑ Water Softener*	☐ Sump Pump*
☑ Large Bathtub >40 gallons	☐ Iron Filter*	☐ Self-Cleaning Humidifier*
☑ Clothes Washing Machine	☐ High Eff. Furnace*	☐ Other:

* Clear water source - should not go into system

Additional current or future uses: Residential

Anticipated non-domestic waste:

The above is complete & accurate: ***Client signature & date***

B. Designer-determined flow Information

Attach additional information as necessary.

Design Flow: 900 GPD Anticipated Waste Type: Residential

BOD: <170 mg/L TSS <60 mg/L Oil & Grease <25 mg/L

3. Preliminary Site Information

A. Water Supply Wells

#	Description	Mn. ID#	Well Depth (ft.)	Casing Depth (ft.)	Confining Layer	STA Setback	Source
1	>200 feet						
2							
3							
4							

Additional Well Information:

University of Minnesota Onsite Sewage Treatment Program

Preliminary Evaluation Worksheet

MINNESOTA POLLUTION CONTROL AGENCY

Site within 200' of noncommunity transient well (Y/N)	No	Yes, source:	
Site within a drinking water supply management area (Y/N)	No	Yes, source:	
Site in Well Head Protection inner wellhead management zone (Y/N)	No	Yes, source:	
Buried water supply pipes within 50 ft of proposed system (Y/N)	No		
B. Site located in a shoreland district/area?	Yes	Yes, name:	Sun Fish Lake
Elevation of ordinary high water level:	937 ft	Source:	MN DNR
Classification: Lake - Natural Environment	Tank Setback: 200 ft.	STA Setbk:	ft.
C. Site located in a floodplain?	No	Yes, Type(s):	N/A
Floodplain designation/elevation (10 Year):	N/A ft	Source:	N/A
Floodplain designation/elevation (100 Year):	N/A ft	Source:	N/A

D. Property Line Id / Source: ☐ Owner ☑ Survey ☐ County GIS ☐ Plat Map ☐ Other:

E. ID distance of relevant setbacks on map: ☑ Water ☑ Easements ☑ Well(s) ☐ Building(s) ☐ Property Lines ☐ OHWL ☐ Other:

4. Preliminary Soil Profile Information From Web Soil Survey (attach map & description)

Map Units: Not Accurate — Slope Range: 1 to 14 %

List landforms: moraine

Landform position(s): Back/ Side Slope

Parent materials: Till

Depth to Bedrock/Restrictive Feature: >400 in — Depth to Watertable: 144 in

Map Unit Ratings

Septic Tank Absorption Field- At-grade:	
Septic Tank Absorption Field- Mound:	
Septic Tank Absorption Field- Trench:	

5. Local Government Unit Information

Name of LGU:	Sun Fish Lake
LGU Contact:	
LGU-specific setbacks:	See Above
LGU-specific design requirements:	
LGU-specific installation requirements:	

Notes:

University of Minnesota Onsite Sewage Treatment Program

Field Evaluation Worksheet

MINNESOTA POLLUTION CONTROL AGENCY

1. Project Information

v 04.01.2021

Property Owner/Client:	MEC LLC	Project ID:	100WindyHill
Site Address:	100 Windy Hill Road, Sunfish Lake MN	Date Completed:	

2. Utility and Structure Information

Utility Locations Identified ☐ Gopher State One Call # _____ ☐ Any Private Utilities: _____

Locate and Verify (*see Site Evaluation map*) ☐ Existing Buildings ☐ Improvements ☐ Easements ☐ Setbacks

3. Site Information

Vegetation type(s):	Grass	Landscape position:	Back/ Side Slope		
Percent slope:	3 %	Slope shape:	Convex, Convex	Slope direction:	northeast

Describe the flooding or run-on potential of site: none

Describe the need for Type III or Type IV system: none

Note:

Proposed soil treatment area protected? (Y/N): Yes If yes, describe: Stakes and flagging

4. General Soils Information

Filled, Compacted, Disturbed areas (Y/N): No

If yes, describe:

Soil observations were conducted in the proposed system location (Y/N): Yes

A soil observation in the most limiting area of the proposed system (Y/N): Yes

Number of soil observations: 6 Soil observation logs attached (Y/N): Yes

Percolation tests performed & attached (Y/N): No

5. Phase I. Reporting Information

	Depth		Elevation		
Limiting Condition*:	12	in	**951.5**	ft	**Most Restrictive Depth Identified from List Below*
Periodically saturated soil:	12	in	951.5	ft	Soil Texture: Silt Loam
Standing water:	none	in		ft	Percolation Rate: 16.00 min/inch
Bedrock:	none	in		ft	Soil Hyd Loading Rate: 0.5 gpd/ft^2
Benchmark Elevation:	962.0	ft			Elevations and Benchmark on map? (Y/N): Yes

Benchmark Elevation Location: nail by road

Differences between soil survey and field evaluation:

Site evaluation issues / comments:

Anticipated construction issues:

University of Minnesota Onsite Sewage Treatment Program

Soil Observation Log

Project ID: 100WindyHill v 04.01.2021

Client:	MEC LLC	Location / Address:	100 Windy Hill Road, Sunfish Lake MN

Soil parent material(s): (Check all that apply) ☐ Outwash ☐ Lacustrine ☐ Loess ☑ Till ☐ Alluvium ☐ Bedrock ☐ Organic Matter

Landscape Position: (select one)	Back/Side Slope	Slope %: 3.0	Slope shape	Convex, Convex	Elevation-relative to benchmark: 954.0
Vegetation:	Forest	Soil survey map units:			Limiting Layer Elevation: 952.8
Weather Conditions/Time of Day:	Clear Warm		Afternoon	Date	04/30/21
Observation #/Location:		1		Observation Type:	Probe

Depth (in)	Texture	Rock Frag. %	Matrix Color(s)	Mottle Color(s)	Redox Kind(s)	Indicator(s)	Structure Shape	Structure Grade	Structure Consistence
0 to 6	Silt Loam	<35%	10YR 3/3				Blocky	Moderate	Friable
6 to 15	Silt Loam	<35%	10YR 4/4				Blocky	Moderate	Friable
15 to 30	Silt Loam	<35%	10YR 4/6	7.5YR 4/1	Concentrations	S1	Massive	Moderate	Firm
				7.5YR 4/3	Depletions	S1			

Comments

I hereby certify that I have completed this work in accordance with all applicable ordinances, rules and laws.

Paul Brandt PSS	Paul Brandt PSS	5182	5/4/2021
(Designer/Inspector)	(Signature)	(License #)	(Date)

University of Minnesota Onsite Sewage Treatment Program

Soil Observation Log

Project ID: 100WindyHill v 04.01.2021

Client:	MEC LLC	Location / Address:	100 Windy Hill Road, Sunfish Lake MN

Soil parent material(s): (Check all that apply) ☐ Outwash ☐ Lacustrine ☐ Loess ☑ Till ☐ Alluvium ☐ Bedrock ☐ Organic Matter

Landscape Position: (select one)	Back/Side Slope	Slope %:	3.0	Slope shape	Convex, Convex
Elevation-relative to benchmark:	955.0				
Vegetation:	Forest	Soil survey map units:		Limiting Layer Elevation:	
Weather Conditions/Time of Day:	Clear Warm	Afternoon		Date	04/30/21
Observation #/Location:		2		Observation Type:	Probe

Depth (in)	Texture	Rock Frag. %	Matrix Color(s)	Mottle Color(s)	Redox Kind(s)	Indicator(s)	Structure Shape	Structure Grade	Structure Consistence
0 to 5	Silt Loam	<35%	10YR 3/3				Blocky	Moderate	Friable
5 to 21	Silt Loam	<35%	10YR 4/4				Blocky	Moderate	Loose
21 to 32	Silt Loam	<35%	10YR 5/6	7.5YR 4/1	Concentrations	S1	Blocky	Moderate	
				7.5YR 4/3	Depletions	S1			

Comments

I hereby certify that I have completed this work in accordance with all applicable ordinances, rules and laws.

Paul Brandt PSS	Paul Brandt PSS	5182	5/4/2021
(Designer/Inspector)	(Signature)	(License #)	(Date)

University of Minnesota Onsite Sewage Treatment Program

Soil Observation Log

Project ID: 100WindyHill v 04.01.2021

Client:	MEC LLC	Location / Address:	100 Windy Hill Road, Sunfish Lake MN

Soil parent material(s): (Check all that apply) ☐ Outwash ☐ Lacustrine ☐ Loess ☑ Till ☐ Alluvium ☐ Bedrock ☐ Organic Matter

Landscape Position: (select one)	Back/Side Slope	Slope %: 3.0	Slope shape	Convex, Convex	Elevation-relative to benchmark: 955.0
Vegetation:	Forest	Soil survey map units:			Limiting Layer Elevation: 954
Weather Conditions/Time of Day:	Clear Warm		Afternoon	Date	04/30/21
Observation #/Location:		3		Observation Type:	Probe

Depth (in)	Texture	Rock Frag. %	Matrix Color(s)	Mottle Color(s)	Redox Kind(s)	Indicator(s)	Structure Shape	Structure Grade	Structure Consistence
0 to 6	Silt Loam	<35%	10YR 3/3				Blocky	Moderate	Friable
6 to 12	Silt Loam	<35%	10YR 4/3				Blocky	Moderate	Friable
12 tto 16	Silt Loam	<35%	10YR 5/6	10YR 4/1	Depletions	S1	Massive	Moderate	Firm
				7.5YR 4/3	Concentrations	S1			
16 to 24	Silt Loam	<35%	10YR 5/4	10YR 5/1	Depletions	S1	Massive	Moderate	Firm

Comments

I hereby certify that I have completed this work in accordance with all applicable ordinances, rules and laws.

Paul Brandt PSS	Paul Brandt PSS	5182	5/4/2021
(Designer/Inspector)	(Signature)	(License #)	(Date)

University of Minnesota Onsite Sewage Treatment Program

Soil Observation Log

Project ID: 100WindyHill v 04.01.2021

Client:	MEC LLC	Location / Address:	100 Windy Hill Road, Sunfish Lake MN

Soil parent material(s): (Check all that apply) ☐ Outwash ☐ Lacustrine ☐ Loess ☑ Till ☐ Alluvium ☐ Bedrock ☐ Organic Matter

Landscape Position: (select one)	Back/Side Slope	Slope %: 3.0	Slope shape	Convex, Convex	Elevation-relative to benchmark: 957.0
Vegetation:	Forest	Soil survey map units:			Limiting Layer Elevation: 955.5
Weather Conditions/Time of Day:	Clear Warm		Afternoon	Date	04/30/21
Observation #/Location:		4		Observation Type:	Probe

Depth (in)	Texture	Rock Frag. %	Matrix Color(s)	Mottle Color(s)	Redox Kind(s)	Indicator(s)	Structure Shape	Structure Grade	Structure Consistence
0 to 7	Silt Loam	<35%	10YR 3/3				Blocky	Moderate	Friable
7 to 18	Silt Loam	<35%	10YR 4/4				Blocky	Moderate	Friable
18 to 32	Silt Loam	<35%	10YR 4/3	10YR 4/1	Depletions	S1	Massive	Moderate	Friable
				7.5YR 4/3	Concentrations	S1			

Comments

I hereby certify that I have completed this work in accordance with all applicable ordinances, rules and laws.

Paul Brandt PSS	Paul Brandt PSS	5182	5/4/2021
(Designer/Inspector)	(Signature)	(License #)	(Date)

University of Minnesota Onsite Sewage Treatment Program

Soil Observation Log

Project ID: 100WindyHill v 04.01.2021

Client:	MEC LLC	Location / Address:	100 Windy Hill Road, Sunfish Lake MN

Soil parent material(s): (Check all that apply) ☐ Outwash ☐ Lacustrine ☐ Loess ☑ Till ☐ Alluvium ☐ Bedrock ☐ Organic Matter

Landscape Position: (select one)	Back/Side Slope	Slope %:	3.0	Slope shape	Convex, Convex	Elevation-relative to benchmark:	947.0
Vegetation:	Forest	Soil survey map units:				Limiting Layer Elevation:	945.7
Weather Conditions/Time of Day:	Clear Warm			Afternoon		Date	04/30/21
Observation #/Location:		5				Observation Type:	Probe

Depth (in)	Texture	Rock Frag. %	Matrix Color(s)		Mottle Color(s)		Redox Kind(s)	Indicator(s)	I-------- Structure----------I		
									Shape	Grade	Consistence
0 to 4	Silt Loam	<35%	10YR	3/3					Blocky	Moderate	Friable
4 to 16	Silt Loam	<35%	10YR	4/6					Blocky	Moderate	Friable
16 to 24	Silt Loam	<35%	10YR	4/6	7.5YR	4/1	Depletions	S1	Massive	Moderate	Firm
					7.5YR	4/4	Concentrations	S1			

Comments

I hereby certify that I have completed this work in accordance with all applicable ordinances, rules and laws.

Paul Brandt PSS	Paul Brandt PSS	5182	5/4/2021
(Designer/Inspector)	(Signature)	(License #)	(Date)

University of Minnesota Onsite Sewage Treatment Program

Soil Observation Log

Project ID: 100WindyHill v 04.01.2021

Client:	MEC LLC	Location / Address:	100 Windy Hill Road, Sunfish Lake MN

Soil parent material(s): (Check all that apply) ☐ Outwash ☐ Lacustrine ☐ Loess ☑ Till ☐ Alluvium ☐ Bedrock ☐ Organic Matter

Landscape Position: (select one)	Back/Side Slope	Slope %:	3.0	Slope shape	Convex, Convex	Elevation-relative to benchmark:	947.0
Vegetation:	Forest	Soil survey map units:				Limiting Layer Elevation:	945.7
Weather Conditions/Time of Day:	Clear Warm			Afternoon		Date	04/30/21
Observation #/Location:		6				Observation Type:	Probe

Depth (in)	Texture	Rock Frag. %	Matrix Color(s)		Mottle Color(s)		Redox Kind(s)	Indicator(s)	Structure Shape	Structure Grade	Structure Consistence
0 to 6	Silt Loam	<35%	10YR	3/3					Blocky	Moderate	Friable
6 to 15	Silt Loam	<35%	10YR	4/6					Blocky	Moderate	Friable
15 to 24	Silt Loam	<35%	10YR	4/6	7.5YR	4/1	Depletions	S1	Massive	Moderate	Firm
					7.5YR	4/4	Concentrations	S1			

Comments

I hereby certify that I have completed this work in accordance with all applicable ordinances, rules and laws.

Paul Brandt PSS	Paul Brandt PSS	5182	5/4/2021
(Designer/Inspector)	(Signature)	(License #)	(Date)

Textures:	
C	Clay
SiC	Silty Clay
SC	Sandy Clay
CL	Clay Loam
SiCL	Silty Clay Loam
SCL	Sandy Clay Loam
Si	Silt
SiL	Silt Loam
L	Loam
SL	Sandy Loam*
LS	Loamy Sand*
S	Sand*

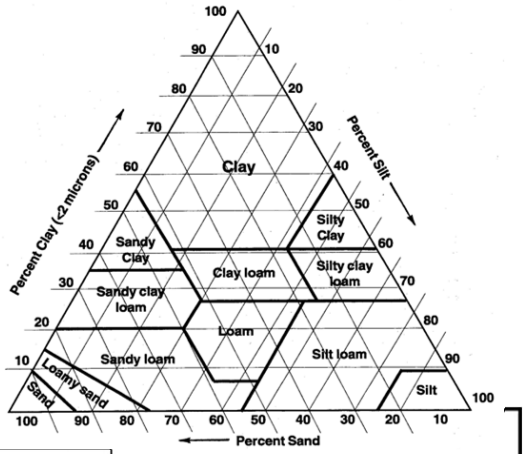
*Sand Modifiers:	
Co	Coarse
M	Medium
F	Fine
VF	Very Fine

Topsoil Indicator(s) of Saturation:

T1. Wetland Vegetation
T2. Depressional Landscape
T3. Organic texture or organic modifiers
T4. N 2.5/ 0 color
T5. Redox features in topsoil
T6. Hydraulic indicators

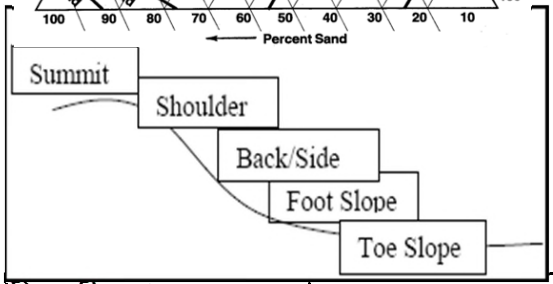
Subsoil Indicator(s) of Saturation:

S1. Distinct gray or red redox features
S2. Depleted matrix (value >/=4 and chroma </=2)
S3. 5Y chroma </= 3
S4. 7.5 YR or redder faint redox concentrations or redox depletions



Shape:

Granular	The peds are approximately spherical or polyhedral and are commonly found in topsoil. These are the small, rounded peds that hang onto roots when soil is turned over.
Platy	The peds are flat and plate like. They are oriented horizontally and are usually overlapping. Platy structure is commonly found in forested areas just below the leaf litter or shallow topsoil.
Blocky	The peds are block-like or polyhedral, and are bounded by flat or slightly rounded surface that are castings of the faces of surrounding peds. Blocky structure is commonly found in the lower topsoil and subsoil.
Prismatic	Flat or slightly rounded vertical faces bound the individual peds. Peds are distinctly longer vertically, and faces are typically casts or molds of adjoining peds. Prismatic structure is commonly found in the lower subsoil.
Single Grain	The structure found in a sandy soil. The individual particles are not held together.

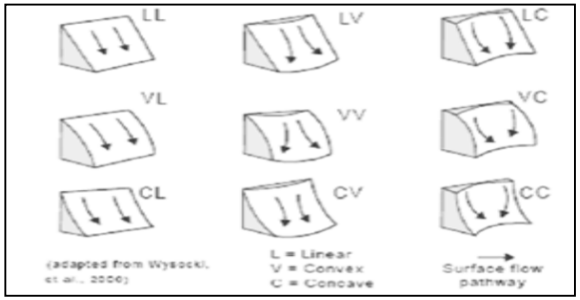


Slope Shape:

Slope shape is described in two directions:
up and down slope (perpendicular to the contour),
and across slope (along the horizontal contour);
e.g. Linear, Convex or LV'.

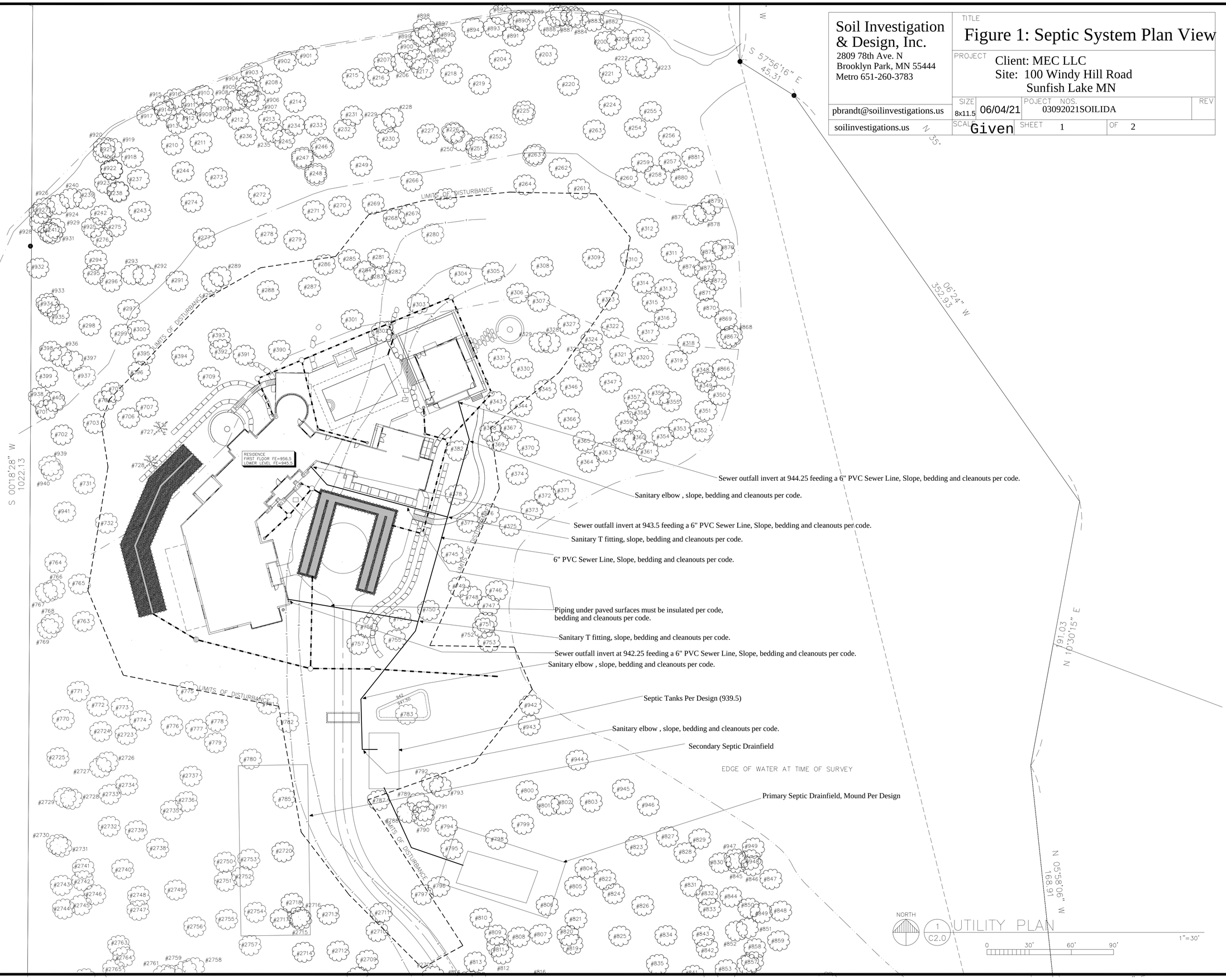
Grade:

Loose	No peds, sandy soil
Weak	Poorly formed, indistinct peds, barely observable in place
Moderate	Well formed, distinct peds, moderately durable and evident, but not distinct in undisturbed soil
Strong	Durable peds that are quite evident in un-displaced soil, adhere weakly to one another, withstand displacement, and become separated when soil is disturbed
Massive	No observable aggregates, or no orderly arrangement of natural lines of weakness



Consistence:

Loose	Intact specimen not available
Friable	Slight force between fingers
Firm	Moderate force between fingers
Extremely Firm	Moderate force between hands or slight foot pressure
Rigid	Foot pressure



Soil Investigation & Design, Inc.
2809 78th Ave. N
Brooklyn Park, MN 55444
Metro 651-260-3783

pbrandt@soilinvestigations.us

soilinvestigations.us

TITLE

Figure 1: Septic System Plan View

PROJECT

Client: MEC LLC
Site: 100 Windy Hill Road
Sunfish Lake MN

SIZE		POJECT NOS.	REV
8x11.5	06/04/21	03092021SOILIDA	
SCALE: Given	SHEET 1	OF 2	

SAVANNA DESIGNS
Environmentally Appropriate Landscape Design
3637 Trading Post Trail South
Afton, MN 55042
(651)436-6049 · info@savannadesigns.com

PIERCE PINI & ASSOCIATES
9298 CENTRAL AVENUE NE, SUITE 312
BLAINE, MN 55434
TEL 763.537.1311
rhonda@piercepini.com

PROJECT

Windy Hill

100 Windy Hill Road
Sunfish Lake, MN 55077

SHEET TITLE

Septic System Plan View

REVISION

NO.	DESCRIPTION	DATE

CERTIFICATION

Septic System & Soils

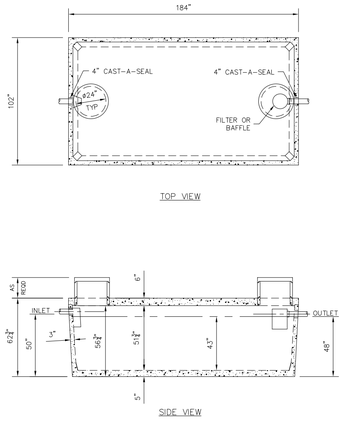
I hereby certify that this plan, document, or report was prepared by me or under my direct supervision and that I am a Licensed Professional Soil Scientist under the Laws of the State of Minnesota.

Print Name: Paul J. Brandt PSS; License: 30007

Signature:

Date: June 7, 2021.

WLP3000 TANK SPECIFICATIONS



DIMENSIONS:
WALL: 3"
BOTTOM: 5"
COVER: 6"
MANHOLE: 24" I.D. PRECAST CONCRETE RISER
HEIGHT: 62-3/4" O.D.
LENGTH: 184" O.D.
WIDTH: 102" O.D.
BELOW INLET: 50" O.D.
LIQUID LEVEL: 43"

WEIGHT: TANK – BOTTOM 15,980 LBS.
COVER 9,300 LBS.

INLET AND OUTLET:
4" CAST-A-SEAL BOOT OR EQUAL

INLET AND OUTLET BAFFLE AND FILTER:
WISCONSIN, SEE DETAIL #10
(OTHER STATES SEE CHART)

LIQUID CAPACITY: 69.77 GAL/IN

HOLDING TANK:
OUTLET HOLE PLUGGED
ACTUAL CAPACITY: 3,140 GALLONS

LOADING DESIGN: 8' 0" UNSATURATED SOIL

TANK CAN BE USED AS:
SEPTIC/ HOLDING/ PUMP OR SIPHON

COVER: MIX DESIGN #8 (NO FIBER)
TANK: MIX DESIGN #9 (SMALL FIBER)

CUSTOMIZED TANKS:
FOR CUSTOM TANKS CONTACT WIESER CONCRETE

TANKS ARE MANUFACTURED TO MEET OR EXCEED ASTM C-1227 REQUIREMENTS

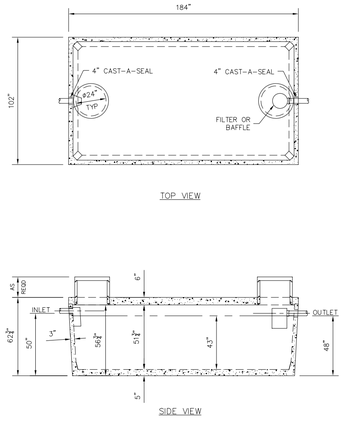
DRAWINGS SUBMITTED FOR APPROVAL
APPROVED BY: _____
APPROVAL DATE: _____
PRODUCTS NEEDED BY: _____

WIESER CONCRETE
WATERTOWN, WISCONSIN 53094
800-325-8456

PRE-POUR: POST-POUR:
SCALE: 1/4"=1'-0" DATE:
REV:
DRAWN BY: WCP
DATE: 00/00/00
FILE: #3000

WLP3000 SEPTIC MANUAL
SHEET NO. 1 OF 1

WLP3000 TANK SPECIFICATIONS



DIMENSIONS:
WALL: 3"
BOTTOM: 5"
COVER: 6"
MANHOLE: 24" I.D. PRECAST CONCRETE RISER
HEIGHT: 62-3/4" O.D.
LENGTH: 184" O.D.
WIDTH: 102" O.D.
BELOW INLET: 50" O.D.
LIQUID LEVEL: 43"

WEIGHT: TANK – BOTTOM 15,980 LBS.
COVER 9,300 LBS.

INLET AND OUTLET:
4" CAST-A-SEAL BOOT OR EQUAL

INLET AND OUTLET BAFFLE AND FILTER:
WISCONSIN, SEE DETAIL #10
(OTHER STATES SEE CHART)

LIQUID CAPACITY: 69.77 GAL/IN

HOLDING TANK:
OUTLET HOLE PLUGGED
ACTUAL CAPACITY: 3,140 GALLONS

LOADING DESIGN: 8' 0" UNSATURATED SOIL

TANK CAN BE USED AS:
SEPTIC/ HOLDING/ PUMP OR SIPHON

COVER: MIX DESIGN #8 (NO FIBER)
TANK: MIX DESIGN #9 (SMALL FIBER)

CUSTOMIZED TANKS:
FOR CUSTOM TANKS CONTACT WIESER CONCRETE

TANKS ARE MANUFACTURED TO MEET OR EXCEED ASTM C-1227 REQUIREMENTS

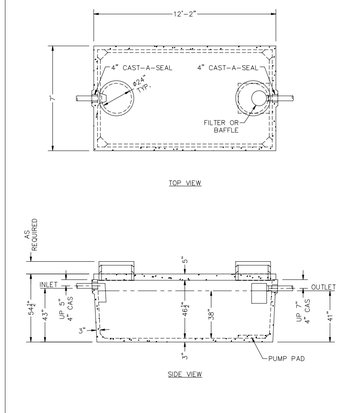
DRAWINGS SUBMITTED FOR APPROVAL
APPROVED BY: _____
APPROVAL DATE: _____
PRODUCTS NEEDED BY: _____

WIESER CONCRETE
WATERTOWN, WISCONSIN 53094
800-325-8456

PRE-POUR: POST-POUR:
SCALE: 1/4"=1'-0" DATE:
REV:
DRAWN BY: WCP
DATE: 00/00/00
FILE: #3000

WLP3000 SEPTIC MANUAL
SHEET NO. 1 OF 1

WLP1645-MR TANK SPECIFICATIONS



DIMENSIONS:
WALL: 3"
BOTTOM: 3"
COVER: 5"
MANHOLE: 24" I.D. PRECAST CONCRETE RISER
HEIGHT: 54 1/2"
LENGTH: 12'-2"
WIDTH: 7'-0"
BELOW INLET: 43"
LIQUID LEVEL: 38"
WEIGHT: 14,000 LBS.

INLET AND OUTLET:
4" CAST-A-SEAL BOOT OR EQUAL GASKET

INLET AND OUTLET BAFFLE AND FILTER:
WISCONSIN, SEE DETAIL #10
(OTHER STATES SEE CHART)

LIQUID CAPACITY: 43.32 GAL/IN

HOLDING TANK:
OUTLET HOLE PLUGGED
ACTUAL CAPACITY: 1,733 GALLONS

LOADING DESIGN: 8'-0" UNSATURATED SOIL

TANK CAN BE USED AS:
SEPTIC / HOLDING / PUMP OR SIPHON

COVER: MIX DESIGN #8 (NO FIBER)
TANK: MIX DESIGN #10 (STRUCTURAL FIBER)

CUSTOMIZED TANKS:
FOR CUSTOM TANKS CONTACT WIESER CONCRETE

TANKS ARE MANUFACTURED TO MEET OR EXCEED ASTM C-1227 REQUIREMENTS

REVIEWED BY _____
REVIEW DATE _____

DRAWINGS SUBMITTED FOR APPROVAL
APPROVED BY: _____
APPROVAL DATE: _____
PRODUCTS NEEDED BY: _____

WIESER CONCRETE
WATERTOWN, WISCONSIN 53094
800-325-8456

PRE-POUR: POST-POUR:
SCALE: 1/4" = 1'-0" DATE:
REV:
DRAWN BY: WCP
DATE: 00/00/00
FILE: wlp1645-mr

WLP1645-MR SEPTIC MANUAL
SHEET NO. 1 OF 1

Mound: Loamy Cap: 957.25; Rock Bed: 955.0; Bottom of mound: 953.0; SHWT: 951.5

953.0 average

Surface: 943.5

Primary Tank:
Grade: 939.5; Inlet: 938.5; Tank bottom: 934.3

Second Tank:
Grade: 943.5; Inlet: 938.3; Tank bottom: 934.8

Pump Tank:
Grade:943.5; Inlet: 937.9; Tank bottom: 933.7

Base Drawing by:

Soil Investigation
& Design, Inc.

Soil Investigation
& Design, Inc.
2809 78th Ave. N
Brooklyn Park, MN 55444
Metro 651-260-3783

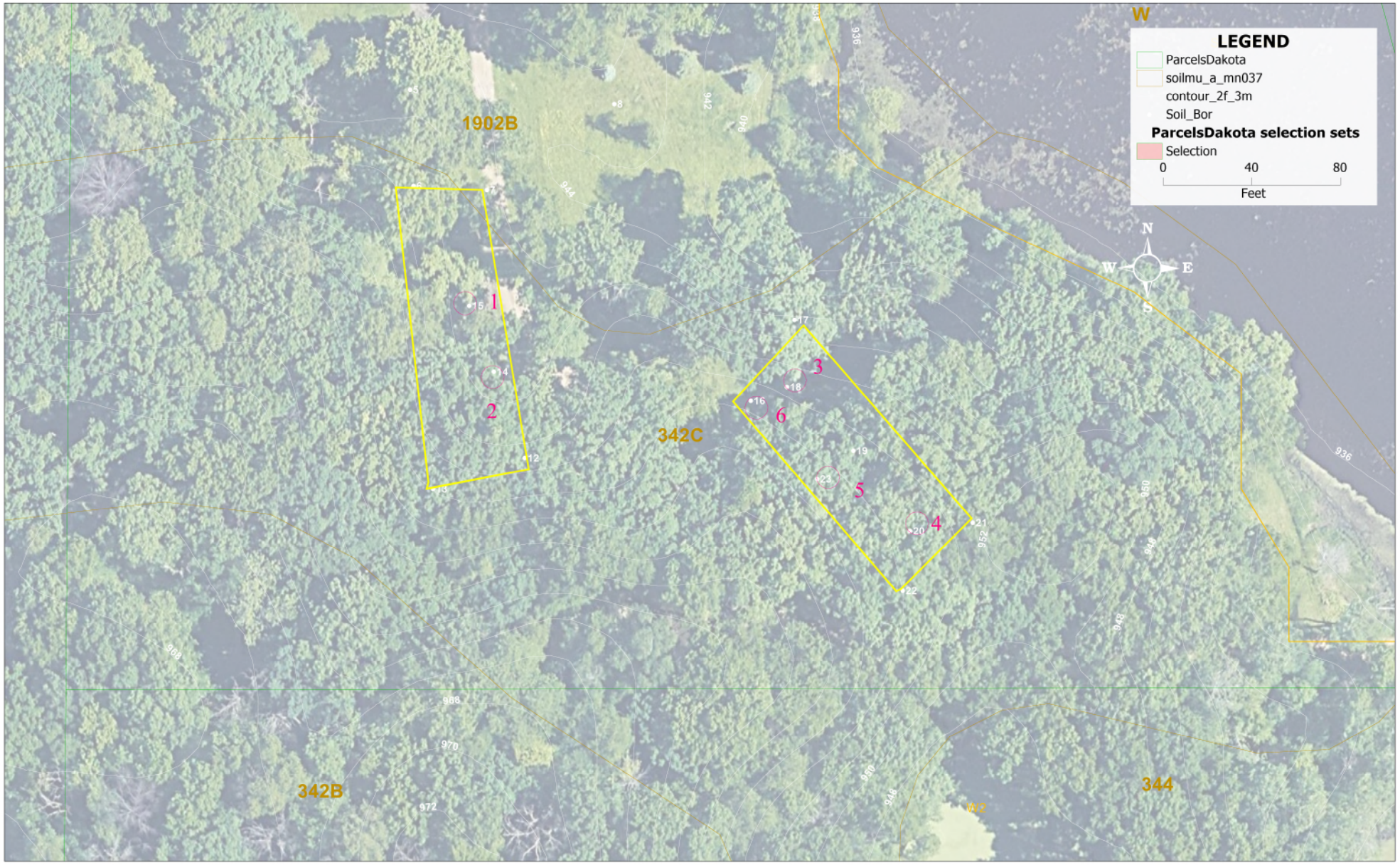
pbrandt@soilinvestigations.us

soilinvestigations.us

TITLE: Figure 2: Tank Detail

PROJECT
Client: MEC LLC
Address: 100 Windy Hill Road Sunfish Lake, MN

SIZE		PROJECT NOS.	REV
8x11.5	06/03/21	03092021SOILIDA	
SCALE: Given	SHEET 1	OF 2	



Soil Investigation Design, Inc.
2809 78th Ave. N
Brooklyn Park, MN, 55444
651-260-3783
pbrandt@soilinvestigations.us

Figure: 3: Soil Boring Map

Client: MEC LLC
Site: 100 Windy Hill Road
Sunfish Lake MN

University of Minnesota Onsite Sewage Treatment Program

Design Summary Page

Minnesota Pollution Control Agency

1. PROJECT INFORMATION

v 04.01.2021

Property Owner/Client:	MEC LLC	Project ID:	100WindyHill
Site Address:	100 Windy Hill Road, Sunfish Lake MN	Date:	
Email Address:	john.bisanz@gmail.com	Phone:	

2. DESIGN FLOW & WASTE STRENGTH

Attach data / estimate basis for Other Establishments

Design Flow: 900 GPD — Anticipated Waste Type: Residential

BOD: <170 mg/L — TSS: <60 mg/L — Oil & Grease: <25 mg/L

Treatment Level: C — *Select Treatment Level C for residential septic tank effluent*

3. HOLDING TANK SIZING

Minimum Capacity: Residential =400 gal/bedroom, Other Establishment = Design Flow x 5.0, Minimum size 1000 gallons

Code Minimum **Holding Tank** Capacity: ____ Gallons in ____ Tanks or Compartments

Recommended **Holding Tank** Capacity: ____ Gallons in ____ Tanks or Compartments

Type of High Level Alarm: ____ (Set @ 75% tank capacity)

Comments: ____

4. SEPTIC TANK SIZING

A. Residential dwellings:

Number of Bedrooms (Residential): 6

Code Minimum **Septic Tank** Capacity: 3750 Gallons in 2 Tanks or Compartments

Recommended **Septic Tank** Capacity: 4000 Gallons in 2 Tanks or Compartments

Effluent Screen & Alarm (Y/N): Yes — Model/Type: TBD

B. Other Establishments:

Waste received by: ____ ____ GPD x ____ Days Hyd. Retention Time

Code Minimum **Septic Tank** Capacity: ____ Gallons In ____ Tanks or Compartments

Recommended **Septic Tank** Capacity: ____ Gallons In ____ Tanks or Compartments

Effluent Screen & Alarm (Y/N): ____ Model/Type: ____

5. PUMP TANK SIZING

Pump Tank 1 Capacity (Minimum):	900 Gal	Pump Tank 2 Capacity (Minimum):	Gal
Pump Tank 1 Capacity (Recommended):	1645 Gal	Pump Tank 2 Capacity (Recommended):	Gal
Pump 1 51.0 GPM Total Head	40.5 ft	Pump 2 GPM Total Head	ft
Supply Pipe Dia. 2.00 in Dose Vol:	200.0 gal	Supply Pipe Dia. Dose Vol:	Gal

University of Minnesota Onsite Sewage Treatment Program

Design Summary Page

MINNESOTA POLLUTION CONTROL AGENCY

6. SYSTEM AND DISTRIBUTION TYPE

Project ID: 100WindyHill

Soil Treatment Type:	Mound	Distribution Type:	Pressure Distribution-Level
Elevation Benchmark:	962 ft	Benchmark Location:	nail by road
MPCA System Type:	Type I	Distribution Media:	Rock
Type III/IV/V Details:			

7. SITE EVALUATION SUMMARY:

Describe Limiting Condition: Redoximorphic Features/Saturated Soils

Layers with >35% Rock Fragments? (yes/no) No If yes, describe below: % rock and layer thickness, amount of soil credit and any additional information for addressing the rock fragments in this design.

Note:

	Depth		Depth		Elevation of Limiting Condition	
Limiting Condition:	12	inches	1.0	ft	951.50	ft
Minimum Req'd Separation:	36	inches	3.0	ft		***Critical for system compliance***
					Elevation	
Code Max System Depth:	Mound	inches	-2.0	ft	954.50	ft

This is the maximimum depth to the bottom of the distribution media for required separation. Negative Depth (ft) means it must be a mound.

Soil Texture:	Silt Loam		
Soil Hyd. Loading Rate:	0.50 GPD/ft^2	Percolation Rate:	16.00 MPI
Contour Loading Rate:	12	Note:	
Measured Land Slope:	3 %	Note:	
Comments:			

8. SOIL TREATMENT AREA DESIGN SUMMARY

Trench:

Dispersal Area	ft^2	Sidewall Depth	in	Trench Width	ft
Total Lineal Feet	ft	No. of Trenches		Code Max. Trench Depth	in
Contour Loading Rate	ft	Minimum Length	ft	Designed Trench Depth	in

Bed:

Dispersal Area	ft^2	Sidewall Depth	in	Maximum Bed Depth	in
Bed Width	ft	Bed Length	ft	Designed Bed Depth	in

Mound:

Dispersal Area	750.0 ft^2	Bed Length	75.0 ft	Bed Width	10.0 ft
Absorption Width	15.0 ft	Clean Sand Lift	2.0 ft	Berm Width (0-1%)	ft
Upslope Berm Width	12.4 ft	Downslope Berm	15.8 ft	Endslope Berm Width	14.4 ft
Total System Length	103.8 ft	System Width	38.2 ft	Contour Loading Rate	12.0 gal/ft

University of Minnesota Onsite Sewage Treatment Program

Design Summary Page

Minnesota Pollution Control Agency

Project ID: 100WindyHill

At-Grade:

Bed Width		ft	Bed Length		ft	Finished Height		ft
Contour Loading Rate		gal/ft	Upslope Berm		ft	Downslope Berm		ft
Endslope Berm		ft	System Length		ft	System Width		ft

Level & Equal Pressure Distribution

No. of Laterals	3		Perforation Spacing	2.5	ft	Perforation Diameter	7/32	in
Lateral Diameter	1.50	in	Min Dose Volume	96	gal	Max Dose Volume	225	gal

Non-Level and Unequal Pressure Distribution

	Elevation (ft)	Pipe Size (in)	Pipe Volume (gal/ft)	Pipe Length (ft)	Perf Size (in)	Spacing (ft)	Spacing (in)
Lateral 1							
Lateral 2							
Lateral 3							
Lateral 4							
Lateral 5							
Lateral 6							

Minimum Dose Volume: _____ gal

Maximum Dose Volume: _____ gal

9. Additional Info for At-Risk, HSW or Type IV Design

A. Starting BOD Concentration = Design Flow X Starting BOD (mg/L) X 8.35 ÷ 1,000,000

_____ gpd X _____ mg/L X 8.35 ÷ 1,000,000 = _____ lbs. BOD/day

B. Target BOD Concentration = Design Flow X Target BOD (mg/L) X 8.35 ÷ 1,000,000

_____ gpd X _____ mg/L X 8.35 ÷ 1,000,000 = _____ lbs. BOD/day

Lbs. BOD To Be Removed: _____

PreTreatment Technology: _____ *Must Meet or Exceed Target

Disinfection Technology: _____ *Required for Levels A & B

C. Organic Loading to Soil Treatment Area:

_____ mg/L X _____ gpd x 8.35 ÷ 1,000,000 ÷ _____ ft^2 = _____ $lbs./day/ft^2$

10. Comments/Special Design Considerations:

I hereby certify that I have completed this work in accordance with all applicable ordinances, rules and laws.

Paul Brandt	Paul Brandt PE	5182	5/5/2021
(Designer)	(Signature)	(License #)	(Date)

University of Minnesota Onsite Sewage Treatment Program

Mound Design Worksheet
≥1% Slope

MINNESOTA POLLUTION CONTROL AGENCY

1. SYSTEM SIZING: Project ID: 100WindyHill v 04.01.2021

A. Design Flow: 900 GPD

B. Soil Loading Rate: 0.50 GPD/ft^2

C. Depth to Limiting Condition 1.0 ft

D. Percent Land Slope: 3.0 %

E. Design Media Loading Rate: 1.2 GPD/ft^2

F. Mound Absorption Ratio: 1.50

Table I
MOUND CONTOUR LOADING RATES:

Measured Perc Rate	← OR →	Texture - derived mound absorption ratio		Contour Loading Rate:
≤ 60mpi		1.0, 1.3, 2.0, 2.4, 2.6	→	≤12
61-120 mpi	← OR →	5.0	→	≤12
≥ 120 mpi*		>5.0*	→	≤6*

TABLE IXa
LOADING RATES FOR DETERMINING BOTTOM ABSORPTION AREA AND ABSORPTION RATIOS USING PERCOLATION TESTS

Percolation Rate (MPI)	Treatment Level C		Treatment Level A, A-2, B,	
	Absorption Area Loading Rate (gpd/ft^2)	Mound Absorption Ratio	Absorption Area Loading Rate (gpd/ft^2)	Mound Absorption Ratio
<0.1	-	1	-	1
0.1 to 5	1.2	1	1.6	1
0.1 to 5 (fine sand and loamy fine sand)	0.6	2	1	1.6
6 to 15	0.78	1.5	1	1.6
16 to 30	0.6	2	0.78	2
31 to 45	0.5	2.4	0.78	2
46 to 60	0.45	2.6	0.6	2.6
61 to 120	-	5	0.3	5.3
>120	-	-	-	-

*Systems with these values are not Type I systems. Contour Loading Rate (linear loading rate) is a recommended value.

2. DISPERSAL MEDIA SIZING

A. Calculate Dispersal Bed Area: Design Flow ÷ Design Media Loading Rate

900 GPD ÷ 1.2 GPD/ft^2 = 750 ft^2

If a larger dispersal media area is desired, enter size: ft^2

B. Enter Dispersal Bed Width: 10.0 ft *Can not exceed 10 feet*

C. Calculate Contour Loading Rate: Bed Width X Design Media Loading Rate

10 ft^2 X 1.2 GPD/ft^2 = 12.0 gal/ft *Can not exceed Table 1*

D. Calculate Minimum Dispersal Bed Length: Dispersal Bed Area ÷ Bed Width

750 ft^2 ÷ 10.0 ft = 75.0 ft

If a larger dispersal media Length is desired, enter size: ft

3. ABSORPTION AREA SIZING

A. Calculate Absorption Width: Bed Width X Mound Absorption Ratio

10.0 ft X 1.5 = 15.0 ft

B. For slopes >1%, the Absorption Width is measured downhill from the upslope edge of the Bed.

Calculate Downslope Absorption Width: Absorption Width - Bed Width

15.0 ft - 10.0 ft = 5.0 ft

4. DISTRIBUTION MEDIA: Project ID: 100WindyHill

Select Dispersal Media: Rock Enter Either A. or B.

A. Rock Depth Below Distribution Pipe

6 in

B. Registered Media

Registered Media Depth in

Check registered product information for specific application details and design

Specific Media Comments:

6. MOUND SIZING Project ID: 100WindyHill

A. Clean Sand Lift: Required Separation - Depth to Limiting Condition = Clean Sand Lift (1 ft minimum)

3.0	ft -	1.0	ft =	2.0	ft	Design Sand Lift (optional):	2	ft	

B. Upslope Height: Clean Sand Lift + Depth of Media +Depth to Cover Pipe+ Depth of Cover (1 ft)

2.0	ft +	0.50	ft +	1	ft +	1.0	ft =	4.5	ft

Land Slope %		0	1	2	3	4	5	6	7	8	9	10	11	12
Upslope Berm Ratio	3:1	3.00	2.91	2.83	2.75	2.68	2.61	2.54	2.48	2.42	2.36	2.31	2.26	2.21
	4:1	4.00	3.85	3.70	3.57	3.45	3.33	3.23	3.12	3.03	2.94	2.86	2.78	2.70

C. Select Upslope Berm Multiplier (based on land slope): 2.75

D. Calculate Upslope Berm Width: Multiplier X Upslope Mound Height

2.75	ft X	4.5	ft =	12.4 ft

E. Calculate Drop in Elevation Under Bed: Bed Width X Land Slope ÷ 100 = Drop (ft)

10.0	ft X	3.0	% ÷ 100 =	0.30	ft

F. Calculate Downslope Mound Height: Upslope Height + Drop in Elevation

4.5	ft +	0.30	ft =	4.8 ft

Land Slope %		0	1	2	3	4	5	6	7	8	9	10	11	12
Downslope Berm Ratio	3:1	3.00	3.09	3.19	3.30	3.41	3.53	3.66	3.80	3.95	4.11	4.29	4.48	4.69
	4:1	4.00	4.17	4.35	4.54	4.76	5.00	5.26	5.56	5.88	6.25	6.67	7.14	7.69

G. Select Downslope Berm Multiplier (based on land slope): 3.30

H. Calculate Downslope Berm Width: Downslope Multiplier X Downslope Height

3.30	x	4.8	ft =	15.8 ft

I. Calculate Minimum Berm to Cover Absorption Area: Downslope Absorption Width + 4 feet

5.0	ft +	4	ft =	9.0 ft

J. Design Downslope Berm = greater of 4H and 4I: 15.8 ft

K. Select Endslope Berm Multiplier: 3.00 *(usually 3.0 or 4.0)*

L. Calculate Endslope Berm X Downslope Mound Height = Endslope Berm Width

3.00	ft X	4.8	ft =	14.4 ft

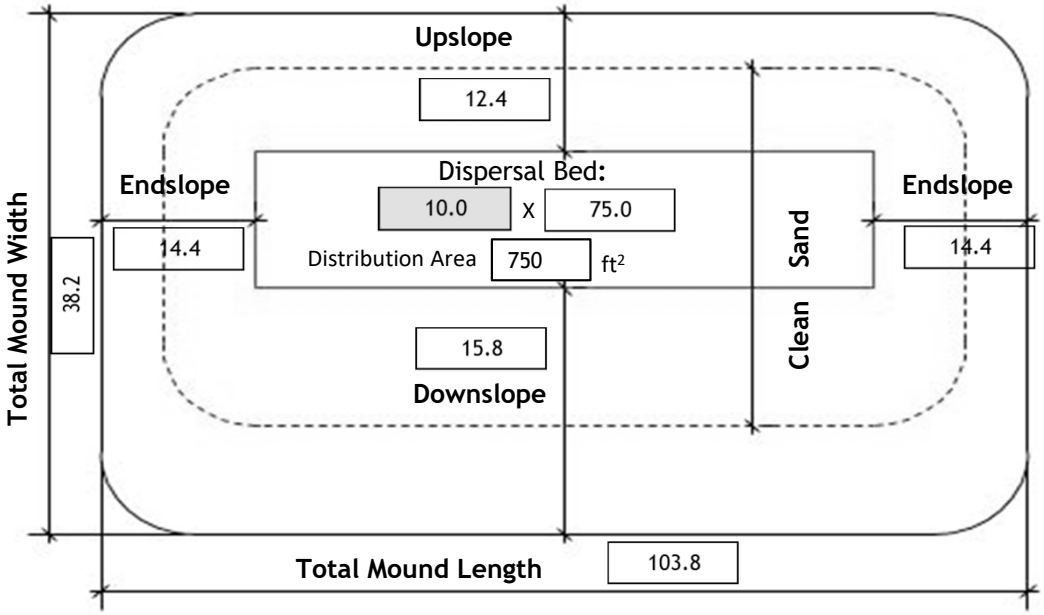
M. Calculate Mound Width: Upslope Berm Width + Bed Width + Downslope Berm Width

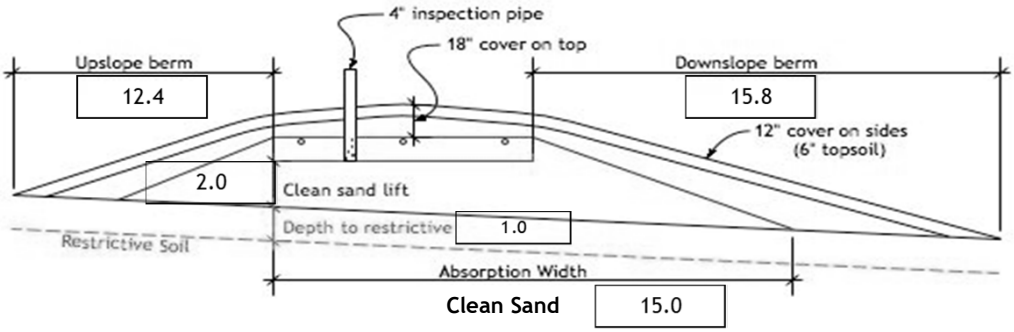
12.4	ft +	10.0	ft +	15.8	ft =	38.2 ft

N. Calculate Mound Length: Endslope Berm Width + Bed Length + Endslope Berm Width

14.4	ft +	75.0	ft +	14.4	ft =	103.8 ft

7. MOUND DIMENSIONS (Feet) Project ID: 100WindyHill





Required Separation:	36 (in)	Distribution Media:	Rock
Manifold Connection:	End	Media Depth:	6.0 (in)
Perforation Size:	7/32 (in)	Perforation Spacing:	30.0 (in)

If Split and Non-Level Pressure Distribution Used: See Non-Level Pressure Distribution Form

Comments:

University of Minnesota Onsite Sewage Treatment Program

Mound Materials Worksheet

Minnesota Pollution Control Agency

Project ID: 100WindyHill

v 04.01.2021

A. Rock *Volume* : (Rock Below Pipe + Rock to cover pipe (*pipe outside dia + ~2 inch)*) X *Bed Length* X *Bed Width* = *Volume*

(6 in + [ ] in) ÷ 12 X 75.0 ft X 10.0 ft = 375.0 ft^3

Divide ft^3 by 27 ft^3/yd^3 to calculate cubic yards: 375.0 ft^3 ÷ 27 = 13.9 yd^3

Add 30% for constructability: 13.9 yd^3 X 1.3 = 18.1 yd^3

B. Calculate *Clean Sand Volume:*

Volume Under Rock bed : *Average Sand Depth* x *Media Width* x *Media Length* = cubic feet

2.7 ft X 10.0 ft X [ ] ft = [ ] ft^3

For a Mound on a slope from 0-1%

Volume from Length = ((Upslope Mound Height - 1) X Absorption Width Beyond Bed X Media Bed Length)

[ ] ft - 1) X [ ] X [ ] ft = [ ]

Volume from Width = ((Upslope Mound Height - 1) X Absorption Width Beyond Bed X Media Bed Width)

[ ] ft - 1) X [ ] X [ ] ft = [ ]

Total Clean Sand Volume : *Volume from Length* + *Volume from Width* + *Volume Under Media*

[ ] ft^3 + [ ] ft^3 + [ ] ft^3 = [ ] ft^3

For a Mound on a slope greater than 1%

Upslope Volume : ((*Upslope Mound Height - 1*) x 3 x *Bed Length*) ÷ 2 = cubic feet

((4.5 ft - 1) X 3.0 ft X 75.0) ÷ 2 = 393.8 ft^3

Downslope Volume : ((*Downslope Height - 1)* x Downslope Absorption Width x *Media Length*) ÷ 2 = cubic feet

((4.8 ft - 1) X 5.0 ft X 75.0) ÷ 2 = 712.5 ft^3

Endslope Volume : (*Downslope Mound Height - 1)* x 3 x *Media Width* = cubic feet

(4.8 ft - 1) X 3.0 ft X 10.0 ft = 114.0 ft^3

Total Clean Sand Volume : *Upslope Volume* + *Downslope Volume* + *Endslope Volume* + *Volume Under Media*

393.8 ft^3 + 712.5 ft^3 + 114.0 ft^3 + [ ] ft^3 = 1220.3 ft^3

Divide ft^3 by 27 ft^3/yd^3 to calculate cubic yards: 1220.3 ft^3 ÷ 27 = 45.2 yd^3

Add 30% for constructability: 45.2 yd^3 X 1.3 = 58.8 yd^3

C. Calculate *Sandy Berm Volume:*

Total Berm Volume (approx) : ((Avg. Mound Height - 0.5 ft topsoil) x Mound Width x Mound Length) ÷ 2

(4.7 - 0.5)ft X 38.2 ft X 103.8) ÷ 2 = 8230.9 ft^3

Total Mound Volume - Clean Sand volume -Rock Volume = cubic feet

8230.9 ft^3 - 1220.3 ft^3 - 375.0 ft^3 = 6635.7 ft^3

Divide ft^3 by 27 ft^3/yd^3 to calculate cubic yards: 6635.7 ft^3 ÷ 27 = 245.8 yd^3

Add 30% for constructability: 245.8 yd^3 x 1.3 = 319.5 yd^3

D. Calculate *Topsoil Material Volume: Total Mound Width X Total Mound Length X .5 ft*

38.2 ft X 103.8 ft X 0.5 ft = 1983.4 ft^3

Divide ft^3 by 27 ft^3/yd^3 to calculate cubic yards: 1983.4 ft^3 ÷ 27 = 73.5 yd^3

Add 30% for constructability: 73.5 yd^3 x 1.3 = 95.5 yd^3

Pressure Distribution Design Worksheet

University of Minnesota Onsite Sewage Treatment Program

MINNESOTA POLLUTION CONTROL AGENCY

Project ID: 100WindyHill v 04.01.2021

1. Media Bed Width: 10 ft

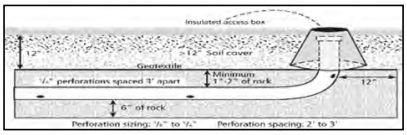
2. Minimum Number of Laterals in system/zone = Rounded up number of [(Media Bed Width - 4) ÷ 3] + 1.

[(10 - 4) ÷ 3] + 1 = 3 laterals *Does not apply to at-grades*

3. Designer Selected *Number of Laterals*: 3 laterals
Cannot be less than line 2 (Except in at-grades)

4. Select *Perforation Spacing*: 2.50 ft

5. Select *Perforation Diameter Size:* 7/32 in



6. *Length of Laterals* = Media Bed Length - 2 Feet.

75.0 - 2ft = 73.0 ft *Perforation can not be closer then 1 foot from edge.*

7. Determine the *Number of Perforation Spaces*. Divide the *Length of Laterals* by the *Perforation Spacing* and round down to the nearest whole number.

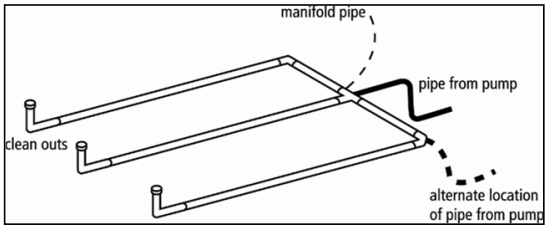
Number of Perforation Spaces = 73.0 ft ÷ 2.5 ft = 29 Spaces

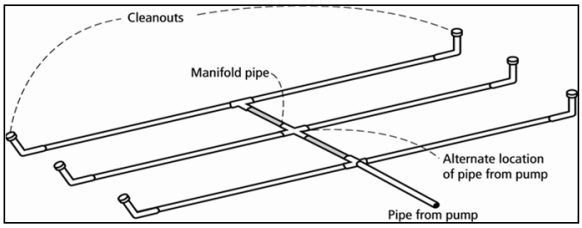
8. *Number of Perforations per Lateral* is equal to 1.0 plus the *Number of Perforation Spaces*. Check table below to verify the number of perforations per lateral guarantees less than a 10% discharge variation. The value is double with a center manifold.

Perforations Per Lateral = 29 Spaces + 1 = 30 Perfs. Per Lateral

Maximum Number of Perforations Per Lateral to Guarantee <10% Discharge Variation

¼ Inch Perforations						7/32 Inch Perforations					
Perforation Spacing (Feet)	Pipe Diameter (Inches)					Perforation Spacing (Feet)	Pipe Diameter (Inches)				
	1	1¼	1½	2	3		1	1¼	1½	2	3
2	10	13	18	30	60	2	11	16	21	34	68
2½	8	12	16	28	54	2½	10	14	20	32	64
3	8	12	16	25	52	3	9	14	19	30	60
3/16 Inch Perforations						1/8 Inch Perforations					
Perforation Spacing (Feet)	Pipe Diameter (Inches)					Perforation Spacing (Feet)	Pipe Diameter (Inches)				
	1	1¼	1½	2	3		1	1¼	1½	2	3
2	12	18	26	46	87	2	21	33	44	74	149
2½	12	17	24	40	80	2½	20	30	41	69	135
3	12	16	22	37	75	3	20	29	38	64	128





9. *Total Number of Perforations* equals the *Number of Perforations per Lateral* multiplied by the *Number of Perforated Laterals.*

30 Perf. Per Lat. X 3 Number of Perf. Lat. = 90 Total Number of Perf.

10. Spacing of laterals; Must be greater than 1 foot and no more than 3 feet: 2.5 ft

11. Select *Type of Manifold Connection* (End or Center): End

12. *Select Lateral Diameter (See Table)*: 1.50 in

University of Minnesota Onsite Sewage Treatment Program

Pressure Distribution Design Worksheet

MINNESOTA POLLUTION CONTROL AGENCY

13. Calculate the *Square Feet per Perforation.*

Recommended value is 4-11 ft2 per perforation, Does not apply to At-Grades

a. *Bed Area* = Bed Width (ft) X Bed Length (ft)

10	ft X	75	ft =	750	ft^2

b. *Square Foot per Perforation* = *Bed Area* ÷ by the *Total Number of Perfs*

750	ft^2 ÷	90	perf =	8.3	ft^2/perf

14. Select *Minimum Average Head* : 1.0 ft

15. Select *Perforation Discharge* based on Table: 0.56 GPM per Perf

16. *Flow Rate* = *Total Number of Perfs X Perforation Discharge.*

90	Perfs X	0.56	GPM per Perforation =	51	GPM

17. *Volume of Liquid Per Foot of Distribution Piping (Table II)* : 0.110 Gallons/ft

18. *Volume of Distribution Piping* =

= [*Number of Perforated Laterals* X *Length of Laterals* X (Volume of Liquid Per Foot of Distribution Piping]

3	X	73	ft X	0.110	gal/ft =	24.1	Gallons

19. Minimum Delivered Volume = Volume of Distribution Piping X 4

24.1	gals X	4	=	96.4	Gallons

Perforation Discharge (GPM)				
Head (ft)	Perforation Diameter			
	1/8	3/16	7/32	1/4
1.0[a]	0.18	0.41	0.56	0.74
1.5	0.22	0.51	0.69	0.9
2.0[b]	0.26	0.59	0.80	1.04
2.5	0.29	0.65	0.89	1.17
3.0	0.32	0.72	0.98	1.28
4.0	0.37	0.83	1.13	1.47
5.0[c]	0.41	0.93	1.26	1.65
1 foot	Dwellings with 3/16 inch to 1/4 inch perforations			
2 feet	Dwellings with 1/8 inch perforations			
	Other establishments and MSTS with 3/16 inch to 1/4 inch perforations			
5 feet	Other establishments and MSTS with 1/8 inch perforations			

Table II Volume of Liquid in Pipe

Pipe Diameter (inches)	Liquid Per Foot (Gallons)
1	0.045
1.25	0.078
1.5	0.110
2	0.170
3	0.380
4	0.661

Comments/Special Design Considerations:

Basic Pump Selection Design Worksheet

University of Minnesota Onsite Sewage Treatment Program | Minnesota Pollution Control Agency

1. PUMP CAPACITY Project ID: 100WindyHill v 04.01.2021

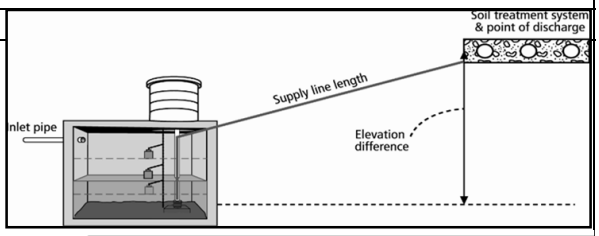
Pumping to Gravity or Pressure Distribution: Pressure

A. If pumping to gravity enter the gallon per minute of the pump: _____ GPM *(10 - 45 gpm)*

B. If pumping to a pressurized distribution system: 51.0 GPM

C. Enter pump description: _____

2. HEAD REQUIREMENTS



A. Elevation Difference between pump and point of discharge: 21.3 ft

B. Distribution Head Loss: 5 ft

C. Additional Head Loss: _____ ft (due to special equipment, etc.)

Distribution Head Loss	
Gravity Distribution = 0ft	
Pressure Distribution based on Minimum Average Head Value on Pressure Distribution Worksheet:	
Minimum Average Head	**Distribution Head Loss**
1ft	5ft
2ft	6ft
5ft	10ft

Table I. Friction Loss in Plastic Pipe per 100ft

Flow Rate (GPM)	Pipe Diameter (inches)			
	1	1.25	1.5	2
10	9.1	3.1	1.3	0.3
12	12.8	4.3	1.8	0.4
14	17.0	5.7	2.4	0.6
16	21.8	7.3	3.0	0.7
18		9.1	3.8	0.9
20		11.1	4.6	1.1
25		16.8	6.9	1.7
30		23.5	9.7	2.4
35			12.9	3.2
40			16.5	4.1
45			20.5	5.0
50				6.1
55				7.3
60				8.6
65				10.0
70				11.4
75				13.0
85				16.4
95				20.1

D. 1. Supply Pipe Diameter: 2.0 in

2. Supply Pipe Length: 180 ft

E. **Friction Loss in Plastic Pipe per 100ft** from Table I:

Friction Loss = 6.33 ft per 100ft of pipe

F. Determine *Equivalent Pipe Length* from pump discharge to soil dispersal area discharge point. Estimate by adding 25% to supply pipe length for fitting loss. *Supply Pipe Length* X 1.25 = *Equivalent Pipe Length*

180 ft X 1.25 = 225.0 ft

G. Calculate *Supply Friction Loss* by multiplying *Friction Loss Per 100ft* by the *Equivalent Pipe Length* and divide by 100.

Supply Friction Loss =

6.33 ft per 100ft X 225.0 ft ÷ 100 = 14.2 ft

H. *Total Head* requirement is the sum of the *Elevation Difference* + Distribution Head Loss, + Additional Head Loss + Supply Friction Loss

21.3 ft + 5.0 ft + _____ ft + 14.2 ft = 40.5 ft

3. PUMP SELECTION

A pump must be selected to deliver at least **51.0** GPM with at least **40.5** feet of total head.

Comments:

University of Minnesota Onsite Sewage Treatment Program

Pump Tank Design Worksheet (Demand Dose)

Minnesota Pollution Control Agency

DETERMINE TANK CAPACITY AND DIMENSIONS Project ID: 100WindyHill v 04.01.2021

1. A. *Design Flow (Design Sum.1A)*: 900 GPD C. Tank Use: **Dosing**
   B. Min. required pump tank capacity: 900 Gal D. Recommended pump tank capacity: 1645 Gal

2. A. Tank Manufacturer: Wieser Concrete B. Tank Model: WLP1645
   C. Capacity from manufacturer: 1645 Gallons
   D. Gallons per inch from manufacturer: 43.3 Gallons per inch
   E. Liquid depth of tank from manufacturer: 38.0 inches

Note: Design calculations are based on this specific tank. Substituting a different tank model will change the pump float or timer settings. Contact designer if changes are necessary.

DETERMINE DOSING VOLUME

3 Calculate *Volume to Cover Pump* (The inlet of the pump must be at least 4-inches from the bottom of the pump tank & 2 inches of water covering the pump is recommended)

(Pump and block height + 2 inches) X *Gallons Per Inch*

(14 in + 2 inches) X 43.3 Gallons Per Inch = 693 Gallons

4 ***Minimum*** *Delivered Volume* = 4 X Volume of Distribution Piping:

-Item 18 of the Pressure Distribution or Item 11 of Non-level 96 **Gallons (Minimum dose)** 2.2 inches/dose

5 Calculate ***Maximum*** *Pumpout Volume* (25% of Design Flow)

Design Flow: 900 GPD X 0.25 = 225 **Gallons (Maximum dose)** 5.2 inches/dose

6 *Select a pumpout volume that meets both Minimum and Maximum:* 200 Gallons

7 Calculate *Doses Per Day* = Design Flow ÷ *Delivered Volume*

900 gpd ÷ 200 gal = 4.50 *Doses*

8 Calculate Drainback:

A. *Diameter of Supply Pipe* = 2 inches

B. Length of Supply Pipe = 180 feet

C. *Volume of Liquid Per Lineal Foot of Pipe* = 0.170 Gallons/ft

D. *Drainback = Length of Supply Pipe* X *Volume of Liquid Per Lineal Foot of Pipe*

180 ft X 0.170 gal/ft = 30.6 Gallons

9. *Total Dosing Volume = Delivered Volume* plus *Drainback*

200 gal + 30.6 gal = 231 Gallons

10. Minimum Alarm Volume = Depth of alarm (2 or 3 inches) X gallons per inch of tank

3 in X 43.3 gal/in = 130.0 Gallons

Volume of Liquid in Pipe

Pipe Diameter (inches)	Liquid Per Foot (Gallons)
1	0.045
1.25	0.078
1.5	0.110
2	0.170
3	0.380
4	0.661

DEMAND DOSE FLOAT SETTINGS

11. Calculate *Float Separation Distance* using *Dosing Volume*.

Total Dosing Volume /Gallons Per Inch

231 gal ÷ 43.3 gal/in = 5.3 Inches

12. Measuring from bottom of tank:

A. *Distance to set Pump Off Float* = Pump + block height + 2 inches

14 in + 2 in = 16 Inches

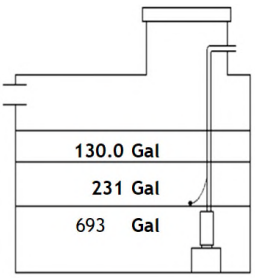
B. *Distance to set Pump On Float=Distance to Set Pump-Off Float + Float Separation Distance*

16 in + 5.3 in = 21 Inches

C. *Distance to set Alarm Float = Distance to set Pump-On Float + Alarm Depth* (2-3 inches)

21 in + 3.0 in = 24 Inches

Inches for Dose: 5.3 in
Alarm Depth 24.3 in
Pump On 21.3 in
Pump Off 16.0 in



UNIVERSITY OF MINNESOTA

Septic System Management Plan for Above Grade Systems

The goal of a septic system is to protect human health and the environment by properly treating wastewater before returning it to the environment. Your septic system is designed to kill harmful organisms and remove pollutants before the water is recycled back into our lakes, streams and groundwater.

This **management plan** will identify the operation and maintenance activities necessary to ensure long-term performance of your septic system. Some of these activities must be performed by you, the homeowner. Other tasks must be performed by a licensed septic maintainer or service provider. However, it is **YOUR** responsibility to make sure all tasks get accomplished in a timely manner.

The University of Minnesota's *Septic System Owner's Guide* contains additional tips and recommendations designed to extend the effective life of your system and save you money over time.

Proper septic system design, installation, operation and maintenance means safe and clean water!

Property Owner	MEC LLC	Email	john.bisanz@gmail.com
Property Address	100 Windy Hill Road, Sun Fish Lake	Property ID	38-03800-06-013
System Designer	Paul Brandt PSS	Contact Info	6512603783
System Installer		Contact Info	
Service Provider/Maintainer		Contact Info	
Permitting Authority	Sun Fish Lake	Contact Info	
Permit #		Date Inspected	

Keep this Management Plan with your Septic System Owner's Guide. The Septic System Owner's Guide includes a folder to hold maintenance records including pumping, inspection and evaluation reports. Ask your septic professional to also:

- Attach permit information, designer drawings and as-built of your system, if they are available.
- Keep copies of all pumping records and other maintenance and repair invoices with this document.
- Review this document with your maintenance professional at each visit; discuss any changes in product use, activities, or water-use appliances.

For a copy of the *Septic System Owner's Guide*, visit www.bookstores.umn.edu and search for the word "septic" or call 800-322-8642.

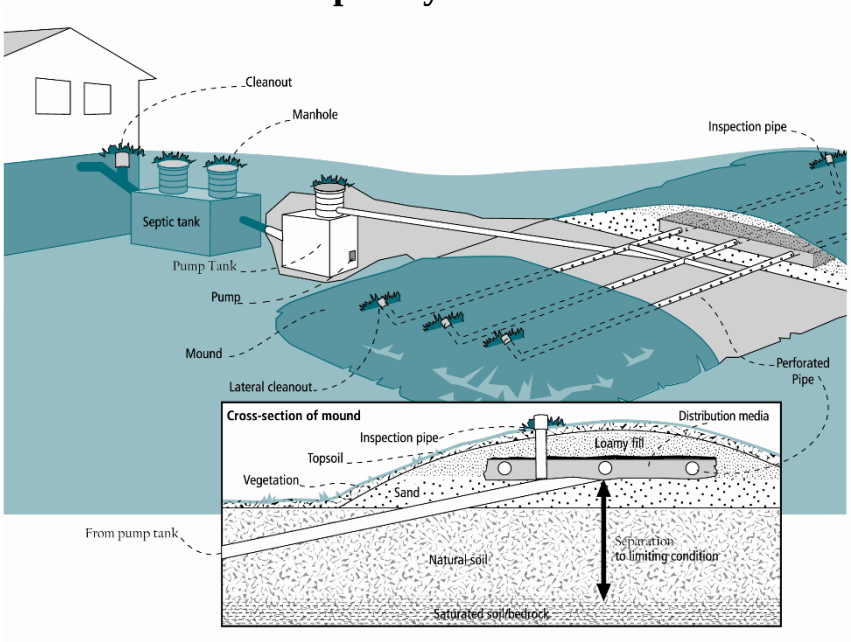
For more information see http://septic.umn.edu

Version: August 2015

UNIVERSITY OF MINNESOTA

Septic System Management Plan for Above Grade Systems

Your Septic System



Septic System Specifics

System Type: ◯ I ◯ II ◯ III ◯ IV* ◯ V*

(*Based on MN Rules Chapter 7080.2200 – 2400)*

**Additional Management Plan required*

☐ System is subject to operating permit*

☐ System uses UV disinfection unit*

Type of advanced treatment unit _____

Dwelling Type

Number of bedrooms: Residential

System capacity/ design flow (gpd): 900

Anticipated average daily flow (gpd): 900

Comments_____

Business? : ◯ Y ◯ N What type? _____

Well Construction

Well depth (ft): Not Installed

- ❑ Cased well Casing depth: _____
- ❑ Other (specify): _____

Distance from septic (ft):_____

Is the well on the design drawing? ◯ Y ◯ N

Septic Tank

- ❑ First tank *Tank volume:* 3000 *gallons*
  Does tank have two compartments? ◯ Y ◯ N
- ❑ Second tank *Tank volume:* 1000 *gallons*
- ❑ Tank is constructed of _____
- ❑ Effluent screen: ◯ Y ◯ N Alarm ◯ Y ◯ N

- ❑ Pump Tank 1645 *gallons*
- ❑ Effluent Pump *make/model*:_____
  Pump capacity 51 GPM
  TDH 39.2 Feet of head
- ❑ Alarm location By Tanks

Soil Treatment Area (STA)

Mound/At-Grade area (width x length): 40 ft x 101 ft

Rock bed size (width x length): 10 ft x 75 ft

Location of additional STA: See Design

Type of distribution media: _____

☑ Inspection ports ☑ Cleanouts

☑ Surface water diversions

☐ Additional STA not available

Homeowner Management Tasks

These op*eration and maintenance ac*tivities are your responsibility. *Chart on page 6 can help track your activities.*

Your toilet is not a garbage can. Do not flush anything besides human waste and toilet paper. No wet wipes, cigarette butts, disposal diapers, used medicine, feminine products or other trash!

The system and septic tanks needs to be checked every 24 months

Your service provider or pumper/maintainer should evaluate if your tank needs to be pumped more or less often.

Seasonally or several times per year

- *Leaks.* Check (listen, look) for leaks in toilets and dripping faucets. Repair leaks promptly.
- *Soil treatment area.* Regularly check for wet or spongy soil around your soil treatment area. If surfaced sewage or strong odors are not corrected by pumping the tank or fixing broken caps and leaks, call your service professional. *Untreated sewage may make humans and animals sick.* Keep bikes, snowmobiles and other traffic off and control borrowing animals.
- *Alarms.* Alarms signal when there is a problem; contact your service professional any time the alarm signals.
- *Lint filter.* If you have a lint filter, check for lint buildup and clean when necessary. If you do not have one, consider adding one after washing machine.
- *Effluent screen.* If you do not have one, consider having one installed the next time the tank is cleaned along with an alarm.

Annually

- *Water usage rate.* A water meter or another device can be used to monitor your average daily water use. Compare your water usage rate to the design flow of your system (listed on the next page). Contact your septic professional if your average daily flow over the course of a month exceeds 70% of the design flow for your system.
- *Caps.* Make sure that all caps and lids are intact and in place. Inspect for damaged caps at least every fall. Fix or replace damaged caps before winter to help prevent freezing issues.
- *Water conditioning devices.* See Page 5 for a list of devices. When possible, program the recharge frequency based on *water demand (gallons)* rather than *time (days)*. Recharging too frequently may negatively impact your septic system. Consider updating to demand operation if your system currently uses time,
- *Review your water usage rate.* Review the Water Use Appliance chart on Page 5. Discuss any major changes with your service provider or pumper/maintainer.

During each visit by a service provider or pumper/maintainer

- Make sure that your service professional services the tank through the manhole. (NOT though a 4" or 6" diameter inspection port.)
- Ask how full your tank was with sludge and scum to determine if your service interval is appropriate.
- Ask your pumper/maintainer to accomplish the tasks listed on the Professional Tasks on Page 4.

Professional Management Tasks

These are the operation and maintenance activities that a pumper/maintainer performs to help ensure long-term performance of your system. At each visit a written report/record must be provided to homeowner.

Plumbing/Source of Wastewater

- Review the Water Use Appliance Chart on Page 5 with homeowner.
  Discuss any changes in water use and the impact those changes may have on the septic system.
- Review water usage rates (if available) with homeowner.

Septic Tank/Pump Tanks

- *Manhole lid*. A riser is recommended if the lid is not accessible from the ground surface. Insulate the riser cover for frost protection.
- *Liquid level*. Check to make sure the tank is not leaking. The liquid level should be level with the bottom of the outlet pipe. (If the water level is below the bottom of the outlet pipe, the tank may not be watertight. If the water level is higher than the bottom of the outlet pipe of the tank, the effluent screen may need cleaning, or there may be ponding in the soil treatment area.)
- *Inspection pipes*. Replace damaged or missing pipes and caps.
- *Baffles*. Check to make sure they are in place and attached, and that inlet/outlet baffles are clear of buildup or obstructions.
- *Effluent screen*. Check to make sure it is in place; clean per manufacturer recommendation. Recommend retrofitted installation if one is not present.
- *Alarm*. Verify that the alarm works.
- *Scum and sludge*. Measure scum and sludge in each compartment of each septic and pump tank, pump if needed.

Pump

- *Pump and controls*. Check to make sure the pump and controls are operating correctly.
- *Pump vault*. Check to make sure it is in place; clean per manufacturer recommendations.
- *Alarm*. Verify that the alarm works.
- *Drainback*. Check to make sure it is draining properly.
- *Event counter or elapsed time meter*. Check to see if there is an event counter or elapsed time meter for the pump. If there is one or both, calculate the water usage rate and compare to the anticipated use listed on Design and Page 2. Dose Volume: 200 gallons: Pump run time: 4.4 Minutes

Soil Treatment Area

- *Inspection pipes*. Check to make sure they are properly capped. Replace caps and pipes that are damaged.
- *Surfacing of effluent*. Check for surfacing effluent or other signs of problems.
- *Lateral flushing*. Check lateral distribution; if cleanouts exist, flush and clean at recommended frequency.
- *Vegetation* - Check to see that a good growth of vegetation is covering the system.

All other components – evaluate as listed here:

Water-Use Appliances and Equipment in the Home

Appliance	Impacts on System	Management Tips
Garbage disposal	• Uses additional water. • Adds solids to the tank. • Finely-ground solids may not settle. Unsettled solids can exit the tank and enter the soil treatment area.	• Use of a garbage disposal is not recommended. • Minimize garbage disposal use. Compost instead. • To prevent solids from exiting the tank, have your tank pumped more frequently. • Add an effluent screen to your tank.
Washing machine	• Washing several loads on one day uses a lot of water and may overload your system. • Overloading your system may prevent solids from settling out in the tank. Unsettled solids can exit the tank and enter the soil treatment area.	• Choose a front-loader or water-saving top-loader, these units use less water than older models. • Limit the addition of extra solids to your tank by using liquid or easily biodegradable detergents. Limit use of bleach-based detergents and fabric softeners. • Install a lint filter after the washer and an effluent screen to your tank • Wash only full loads and think even – spread your laundry loads throughout the week.
Dishwasher	• Powdered and/or high-phosphorus detergents can negatively impact the performance of your tank and soil treatment area. • New models promote “no scraping”. They have a garbage disposal inside.	• Use gel detergents. Powdered detergents may add solids to the tank. • Use detergents that are low or no-phosphorus. • Wash only full loads. • Scrape your dishes anyways to keep undigested solids out of your septic system.
Grinder pump (in home)	• Finely-ground solids may not settle. Unsettled solids can exit the tank and enter the soil treatment area.	• Expand septic tank capacity by a factor of 1.5. • Include pump monitoring in your maintenance schedule to ensure that it is working properly. • Add an effluent screen.
Large bathtub (whirlpool)	• Large volume of water may overload your system. • Heavy use of bath oils and soaps can impact biological activity in your tank and soil treatment area.	• Avoid using other water-use appliances at the same time. For example, don’t wash clothes and take a bath at the same time. • Use oils, soaps, and cleaners in the bath or shower sparingly.
Clean Water Uses	**Impacts on System**	**Management Tips**
High-efficiency furnace	• Drip may result in frozen pipes during cold weather.	• Re-route water directly out of the house. Do not route furnace discharge to your septic system.
Water softener Iron filter Reverse osmosis	• Salt in recharge water may affect system performance. • Recharge water may hydraulically overload the system.	• These sources produce water that is not sewage and should not go into your septic system. • Reroute water from these sources to another outlet, such as a dry well, draintile or old drainfield. • When replacing, consider using a demand-based recharge vs. a time-based recharge. • Check valves to ensure proper operation; have unit serviced per manufacturer directions
Surface drainage Footing drains	• Water from these sources will overload the system and is prohibited from entering septic system.	

Homeowner Maintenance Log

Track maintenance activities here for easy reference. See list of management tasks on pages 3 and 4.

Activity	Date accomplished									
Check frequently:										
Leaks: check for plumbing leaks*										
Soil treatment area check for surfacing**										
Lint filter: check, clean if needed*										
Effluent screen (if owner-maintained)***										
Alarm**										
Check annually:										
Water usage rate (maximum gpd _____)										
Caps: inspect, replace if needed										
Water use appliances – review use										
Other:										

*Monthly

**Quarterly

***Bi-Annually

Notes:

"As the owner of this SSTS, I understand it is my responsibility to properly operate and maintain the sewage treatment system on this property, utilizing the Management Plan. If requirements in this Management Plan are not met, I will promptly notify the permitting authority and take necessary corrective actions. If I have a new system, I agree to adequately protect the reserve area for future use as a soil treatment system."

Property Owner Signature: Date

Management Plan Prepared By: Paul Brandt PSS Certification # 5182

Permitting Authority:

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United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Dakota County, Minnesota

February 25, 2021

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map (Sunfish Lake)

Map Scale: 1:1,940 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 25 50 100 150

Feet
0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 15N WGS84

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: Dakota County, Minnesota
Survey Area Data: Version 16, Jun 5, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 3, 2020—Jun 12, 2020

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 (Sunfish Lake)

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
189	Auburndale silt loam	0.0	0.0%
342B	Kingsley sandy loam, 3 to 8 percent slopes	1.6	8.9%
342C	Kingsley sandy loam, 8 to 15 percent slopes	8.5	47.2%
344	Quam silt loam	1.7	9.5%
1902B	Jewett silt loam, 1 to 6 percent slopes	2.0	11.2%
W	Water	4.2	23.3%
Totals for Area of Interest		**18.0**	**100.0%**

Map Unit Descriptions (Sunfish Lake)

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Dakota County, Minnesota

189—Auburndale silt loam

Map Unit Setting

National map unit symbol: f9x0
Elevation: 700 to 1,950 feet
Mean annual precipitation: 23 to 35 inches
Mean annual air temperature: 43 to 50 degrees F
Frost-free period: 155 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Auburndale and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Auburndale

Setting

Landform: Depressions on moraines
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Glaciofluvial sediments over till

Typical profile

A1,A2 - 0 to 13 inches: silt loam
E1,E2 - 13 to 25 inches: silt loam
Btg - 25 to 36 inches: silt loam
Cg - 36 to 58 inches: silt loam
2C - 58 to 60 inches: sandy loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 1.98 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Available water capacity: Very high (about 12.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D
Forage suitability group: Level Swale, Acid (G091XN005MN)
Other vegetative classification: Level Swale, Acid (G091XN005MN)
Hydric soil rating: Yes

Minor Components

Quam

Percent of map unit: 10 percent
Landform: Depressions on moraines

Hydric soil rating: Yes

342B—Kingsley sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: f9y7
Elevation: 1,000 to 1,300 feet
Mean annual precipitation: 23 to 35 inches
Mean annual air temperature: 43 to 50 degrees F
Frost-free period: 155 to 200 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Kingsley and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kingsley

Setting

Landform: Moraines
Landform position (two-dimensional): Backslope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Till

Typical profile

A - 0 to 8 inches: sandy loam
E - 8 to 12 inches: loamy sand
Bt,Bw - 12 to 38 inches: sandy loam
C - 38 to 60 inches: sandy loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.14 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Available water capacity: Moderate (about 8.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: R103XY020MN - Loamy Upland Savannas
Forage suitability group: Sloping Upland, Acid (G091XN006MN)
Other vegetative classification: Sloping Upland, Acid (G091XN006MN)

Hydric soil rating: No

Minor Components

Kennebec

Percent of map unit: 5 percent
Hydric soil rating: No

Chetek

Percent of map unit: 5 percent
Hydric soil rating: No

Auburndale

Percent of map unit: 5 percent
Landform: Depressions on moraines
Hydric soil rating: Yes

342C—Kingsley sandy loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: f9y8
Elevation: 1,000 to 1,300 feet
Mean annual precipitation: 23 to 35 inches
Mean annual air temperature: 43 to 50 degrees F
Frost-free period: 155 to 200 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Kingsley and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kingsley

Setting

Landform: Moraines
Landform position (two-dimensional): Backslope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Till

Typical profile

A - 0 to 8 inches: sandy loam
E - 8 to 12 inches: loamy sand
Bt,Bw - 12 to 38 inches: sandy loam
C - 38 to 60 inches: sandy loam

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.14 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Available water capacity: Moderate (about 8.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: R103XY020MN - Loamy Upland Savannas
Forage suitability group: Sloping Upland, Acid (G091XN006MN)
Other vegetative classification: Sloping Upland, Acid (G091XN006MN)
Hydric soil rating: No

Minor Components

Chetek

Percent of map unit: 5 percent
Hydric soil rating: No

Kennebec

Percent of map unit: 5 percent
Hydric soil rating: No

Auburndale

Percent of map unit: 5 percent
Landform: Depressions on moraines
Hydric soil rating: Yes

344—Quam silt loam

Map Unit Setting

National map unit symbol: f9yc
Elevation: 1,000 to 1,700 feet
Mean annual precipitation: 23 to 35 inches
Mean annual air temperature: 43 to 50 degrees F
Frost-free period: 155 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Quam and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Quam

Setting

Landform: Depressions on moraines

Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Glaciolacustine sediments

Typical profile

A1 - 0 to 12 inches: silt loam
A2,Ab - 12 to 45 inches: silt loam
Cg - 45 to 60 inches: silt loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.14 to 0.57 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Calcium carbonate, maximum content: 20 percent
Available water capacity: High (about 11.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: C/D
Ecological site: R103XY015MN - Depressional Marsh
Forage suitability group: Ponded If Not Drained (G091XN013MN)
Other vegetative classification: Ponded If Not Drained (G091XN013MN)
Hydric soil rating: Yes

Minor Components

Palms

Percent of map unit: 5 percent
Landform: Depressions on moraines
Hydric soil rating: Yes

Kennebec

Percent of map unit: 5 percent
Hydric soil rating: No

1902B—Jewett silt loam, 1 to 6 percent slopes

Map Unit Setting

National map unit symbol: f9x5
Elevation: 750 to 1,160 feet
Mean annual precipitation: 23 to 35 inches
Mean annual air temperature: 43 to 50 degrees F
Frost-free period: 155 to 200 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Jewett and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Jewett

Setting

Landform: Moraines
Landform position (two-dimensional): Backslope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess over till

Typical profile

A - 0 to 4 inches: silt loam
E - 4 to 13 inches: silt loam
Bt - 13 to 24 inches: silt loam
2Bt - 24 to 33 inches: loam
2C - 33 to 60 inches: sandy loam

Properties and qualities

Slope: 1 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.14 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: High (about 9.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Forage suitability group: Sloping Upland, Acid (G091XN006MN)
Other vegetative classification: Sloping Upland, Acid (G091XN006MN)
Hydric soil rating: No

Minor Components

Spencer

Percent of map unit: 5 percent
Hydric soil rating: No

Antigo

Percent of map unit: 5 percent
Hydric soil rating: No

Kingsley

Percent of map unit: 5 percent
Hydric soil rating: No

W—Water

Map Unit Composition

Water: 100 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Soil Information for All Uses

Suitabilities and Limitations for Use

The Suitabilities and Limitations for Use section includes various soil interpretations displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each interpretation.

Land Classifications

Land Classifications are specified land use and management groupings that are assigned to soil areas because combinations of soil have similar behavior for specified practices. Most are based on soil properties and other factors that directly influence the specific use of the soil. Example classifications include ecological site classification, farmland classification, irrigated and nonirrigated land capability classification, and hydric rating.

Hydric Rating by Map Unit (Sunfish Lake)

This rating indicates the percentage of map units that meets the criteria for hydric soils. Map units are composed of one or more map unit components or soil types, each of which is rated as hydric soil or not hydric. Map units that are made up dominantly of hydric soils may have small areas of minor nonhydric components in the higher positions on the landform, and map units that are made up dominantly of nonhydric soils may have small areas of minor hydric components in the lower positions on the landform. Each map unit is rated based on its respective components and the percentage of each component within the map unit.

The thematic map is color coded based on the composition of hydric components. The five color classes are separated as 100 percent hydric components, 66 to 99 percent hydric components, 33 to 65 percent hydric components, 1 to 32 percent hydric components, and less than one percent hydric components.

In Web Soil Survey, the Summary by Map Unit table that is displayed below the map pane contains a column named 'Rating'. In this column the percentage of each map unit that is classified as hydric is displayed.

Hydric soils are defined by the National Technical Committee for Hydric Soils (NTCHS) as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (Federal Register, 1994). Under natural conditions, these soils are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation.

The NTCHS definition identifies general soil properties that are associated with wetness. In order to determine whether a specific soil is a hydric soil or nonhydric soil, however, more specific information, such as information about the depth and duration of the water table, is needed. Thus, criteria that identify those estimated soil properties unique to hydric soils have been established (Federal Register, 2002). These criteria are used to identify map unit components that normally are associated with wetlands. The criteria used are selected estimated soil properties that are described in "Soil Taxonomy" (Soil Survey Staff, 1999) and "Keys to Soil Taxonomy" (Soil Survey Staff, 2006) and in the "Soil Survey Manual" (Soil Survey Division Staff, 1993).

If soils are wet enough for a long enough period of time to be considered hydric, they should exhibit certain properties that can be easily observed in the field. These visible properties are indicators of hydric soils. The indicators used to make onsite determinations of hydric soils are specified in "Field Indicators of Hydric Soils in the United States" (Hurt and Vasilas, 2006).

References:

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18.

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service. U.S. Department of Agriculture Handbook 436.

Soil Survey Staff. 2006. Keys to soil taxonomy. 10th edition. U.S. Department of Agriculture, Natural Resources Conservation Service.

Map—Hydric Rating by Map Unit (Sunfish Lake)

Map Scale: 1:1,940 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 25 50 100 150

Feet
0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 15N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- Hydric (100%)
- Hydric (66 to 99%)
- Hydric (33 to 65%)
- Hydric (1 to 32%)
- Not Hydric (0%)
- Not rated or not available

Soil Rating Lines
- Hydric (100%)
- Hydric (66 to 99%)
- Hydric (33 to 65%)
- Hydric (1 to 32%)
- Not Hydric (0%)
- Not rated or not available

Soil Rating Points
- Hydric (100%)
- Hydric (66 to 99%)
- Hydric (33 to 65%)
- Hydric (1 to 32%)
- Not Hydric (0%)
- Not rated or not available

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: Dakota County, Minnesota
Survey Area Data: Version 16, Jun 5, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 3, 2020—Jun 12, 2020

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.

Table—Hydric Rating by Map Unit (Sunfish Lake)

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
189	Auburndale silt loam	100	0.0	0.0%
342B	Kingsley sandy loam, 3 to 8 percent slopes	5	1.6	8.9%
342C	Kingsley sandy loam, 8 to 15 percent slopes	5	8.5	47.2%
344	Quam silt loam	95	1.7	9.5%
1902B	Jewett silt loam, 1 to 6 percent slopes	0	2.0	11.2%
W	Water	0	4.2	23.3%
Totals for Area of Interest			**18.0**	**100.0%**

Rating Options—Hydric Rating by Map Unit (Sunfish Lake)

Aggregation Method: Percent Present

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Sanitary Facilities

Sanitary Facilities interpretations are tools designed to guide the user in site selection for the safe disposal of sewage and solid waste. Example interpretations include septic tank absorption fields, sewage lagoons, and sanitary landfills.

Septic Tank Absorption Fields — Trench (MN) (Sunfish Lake)

Trench septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through perforated pipe. In this system the drain field is placed in a trench and covered with soil material. The ratings are based on the soil properties that affect absorption of the effluent, construction and maintenance of the system, and public health. Saturated hydraulic conductivity (Ksat) is evaluated from a depth of 30 to 107 centimeters. Depth to saturation and depth to bedrock are evaluated from the surface to a depth of 203 centimeters. The frequency of ponding and flooding also is evaluated. Excessive slope may cause lateral seepage and surfacing of the effluent in downslope areas.

The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect this use. "Not limited" indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. "Slightly limited"

indicates that the soil has features that are favorable for the specified use. "Moderately limited" indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Good performance and moderate maintenance can be expected. "Very limited" indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without special design or expensive installation procedures. "Extremely limited" indicates that the soil has one or more features that are very unfavorable for the specified use. The limitations generally cannot be overcome.

Numerical ratings indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

The components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as the one shown for the map unit. The percent composition of each component in a particular map unit is given to help the user better understand the extent to which the rating applies to the map unit.

Other components with different ratings may occur in each map unit. The ratings for all components, regardless the aggregated rating of the map unit, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

Map Scale: 1:1,940 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 25 50 100 150

Feet
0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 15N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- Extremely limited
- Very limited
- Moderately limited
- Slightly limited
- Not limited
- Not rated or not available

Soil Rating Lines
- Extremely limited
- Very limited
- Moderately limited
- Slightly limited
- Not limited
- Not rated or not available

Soil Rating Points
- Extremely limited
- Very limited
- Moderately limited
- Slightly limited
- Not limited
- Not rated or not available

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: Dakota County, Minnesota
Survey Area Data: Version 16, Jun 5, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 3, 2020—Jun 12, 2020

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.

Tables—Septic Tank Absorption Fields — Trench (MN) (Sunfish Lake)

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
189	Auburndale silt loam	Extremely limited	Auburndale (90%)	Ponding (1.00)	0.0	0.0%
				Soil saturation (1.00)		
342B	Kingsley sandy loam, 3 to 8 percent slopes	Moderately limited	Kingsley (85%)	Restricted percolation (0.30)	1.6	8.9%
342C	Kingsley sandy loam, 8 to 15 percent slopes	Moderately limited	Kingsley (85%)	Restricted percolation (0.30)	8.5	47.2%
				Slope (0.09)		
344	Quam silt loam	Extremely limited	Quam (90%)	Ponding (1.00)	1.7	9.5%
				Soil saturation (1.00)		
				Restricted percolation (0.30)		
1902B	Jewett silt loam, 1 to 6 percent slopes	Moderately limited	Jewett (85%)	Restricted percolation (0.30)	2.0	11.2%
W	Water	Not rated	Water (100%)		4.2	23.3%
Totals for Area of Interest					**18.0**	**100.0%**

Rating	Acres in AOI	Percent of AOI
Moderately limited	12.1	67.2%
Extremely limited	1.7	9.5%
Null or Not Rated	4.2	23.3%
Totals for Area of Interest	**18.0**	**100.0%**

Rating Options—Septic Tank Absorption Fields — Trench (MN) (Sunfish Lake)

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Septic Tank Absorption Fields — Mound (MN) (Sunfish Lake)

"Mound septic tank absorption fields" are areas in which effluent from a septic tank is distributed into the soil surface through perforated pipe. In this system the drain field is placed above the soil surface in a mound. The ratings are based on the soil properties that affect absorption of the effluent, construction and maintenance of the system, and public health. Saturated hydraulic conductivity (Ksat) is evaluated from the surface to a depth of 30 centimeters. Depth to saturation and depth to bedrock are evaluated from the surface to a depth of 203 centimeters. The frequency of ponding and flooding also is evaluated. Excessive slope may cause lateral seepage and surfacing of the effluent in downslope areas.

The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect the specified use. "Not limited" indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. "Slightly limited" indicates that the soil has features that are favorable for the specified use. "Moderately limited" indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Good performance and moderate maintenance can be expected. "Very limited" indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without special design or expensive installation procedures. "Extremely limited" indicates that the soil has one or more features that are very unfavorable for the specified use. The limitations generally cannot be overcome.

Numerical ratings indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

The components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as the one shown for the map unit. The percent composition of each component in a particular map unit is given to help the user better understand the extent to which the rating applies to the map unit.

Other components with different ratings may occur in each map unit. The ratings for all components, regardless the aggregated rating of the map unit, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

Map Scale: 1:1,940 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 25 50 100 150

Feet
0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 15N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- Extremely limited
- Very limited
- Moderately limited
- Slightly limited
- Not limited
- Not rated or not available

Soil Rating Lines
- Extremely limited
- Very limited
- Moderately limited
- Slightly limited
- Not limited
- Not rated or not available

Soil Rating Points
- Extremely limited
- Very limited
- Moderately limited
- Slightly limited
- Not limited
- Not rated or not available

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: Dakota County, Minnesota
Survey Area Data: Version 16, Jun 5, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 3, 2020—Jun 12, 2020

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.

Tables—Septic Tank Absorption Fields — Mound (MN) (Sunfish Lake)

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
189	Auburndale silt loam	Extremely limited	Auburndale (90%)	Ponding (1.00)	0.0	0.0%
				Soil saturation (1.00)		
342B	Kingsley sandy loam, 3 to 8 percent slopes	Extremely limited	Kingsley (85%)	Restricted percolation (1.00)	1.6	8.9%
				Slope (0.15)		
342C	Kingsley sandy loam, 8 to 15 percent slopes	Extremely limited	Kingsley (85%)	Restricted percolation (1.00)	8.5	47.2%
				Slope (0.93)		
344	Quam silt loam	Extremely limited	Quam (90%)	Ponding (1.00)	1.7	9.5%
				Soil saturation (1.00)		
				Restricted percolation (1.00)		
1902B	Jewett silt loam, 1 to 6 percent slopes	Slightly limited	Jewett (85%)	Slope (0.07)	2.0	11.2%
W	Water	Not rated	Water (100%)		4.2	23.3%
Totals for Area of Interest					**18.0**	**100.0%**

Rating	Acres in AOI	Percent of AOI
Extremely limited	11.8	65.5%
Slightly limited	2.0	11.2%
Null or Not Rated	4.2	23.3%
Totals for Area of Interest	**18.0**	**100.0%**

Rating Options—Septic Tank Absorption Fields — Mound (MN) (Sunfish Lake)

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Drainage Class (Sunfish Lake)

"Drainage class (natural)" refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized-excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained, and very poorly drained. These classes are defined in the "Soil Survey Manual."

Custom Soil Resource Report
Map—Drainage Class (Sunfish Lake)

Map Scale: 1:1,940 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 25 50 100 150

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 15N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- Excessively drained
- Somewhat excessively drained
- Well drained
- Moderately well drained
- Somewhat poorly drained
- Poorly drained
- Very poorly drained
- Subaqueous
- Not rated or not available

Soil Rating Lines

- Excessively drained
- Somewhat excessively drained
- Well drained
- Moderately well drained
- Somewhat poorly drained
- Poorly drained
- Very poorly drained
- Subaqueous
- Not rated or not available

Soil Rating Points

- Excessively drained
- Somewhat excessively drained
- Well drained
- Moderately well drained
- Somewhat poorly drained
- Poorly drained
- Very poorly drained
- Subaqueous
- Not rated or not available

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.

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Soil Survey Area: Dakota County, Minnesota
Survey Area Data: Version 16, Jun 5, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 3, 2020—Jun 12, 2020

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.

Table—Drainage Class (Sunfish Lake)

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
189	Auburndale silt loam	Poorly drained	0.0	0.0%
342B	Kingsley sandy loam, 3 to 8 percent slopes	Well drained	1.6	8.9%
342C	Kingsley sandy loam, 8 to 15 percent slopes	Well drained	8.5	47.2%
344	Quam silt loam	Very poorly drained	1.7	9.5%
1902B	Jewett silt loam, 1 to 6 percent slopes	Well drained	2.0	11.2%
W	Water		4.2	23.3%
Totals for Area of Interest			**18.0**	**100.0%**

Rating Options—Drainage Class (Sunfish Lake)

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Hydrologic Soil Group (Sunfish Lake)

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

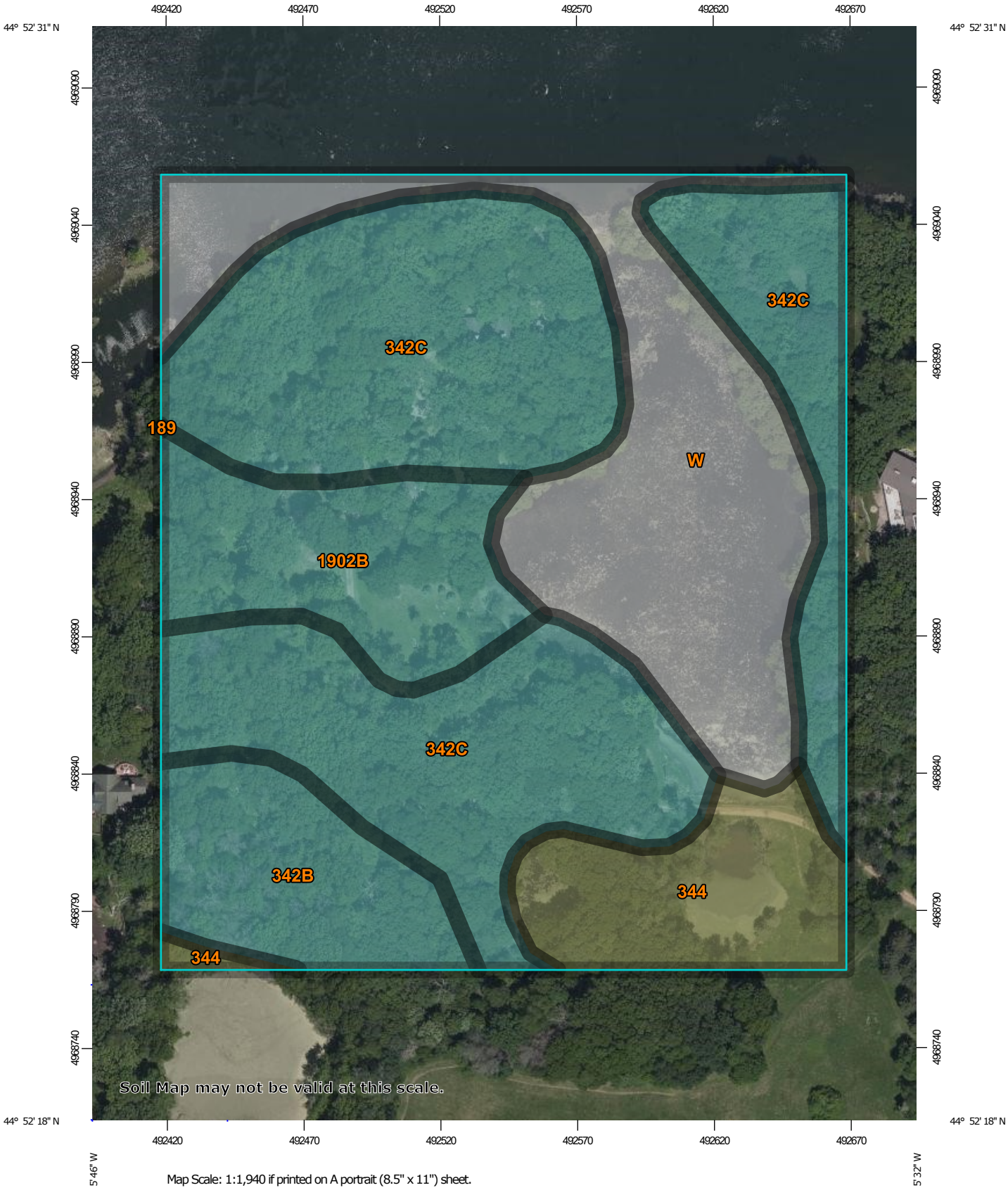
Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Map—Hydrologic Soil Group (Sunfish Lake)



Map Scale: 1:1,940 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 25 50 100 150

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 15N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

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)

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Table—Hydrologic Soil Group (Sunfish Lake)

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
189	Auburndale silt loam	B/D	0.0	0.0%
342B	Kingsley sandy loam, 3 to 8 percent slopes	C	1.6	8.9%
342C	Kingsley sandy loam, 8 to 15 percent slopes	C	8.5	47.2%
344	Quam silt loam	C/D	1.7	9.5%
1902B	Jewett silt loam, 1 to 6 percent slopes	C	2.0	11.2%
W	Water		4.2	23.3%
Totals for Area of Interest			**18.0**	**100.0%**

Rating Options—Hydrologic Soil Group (Sunfish Lake)

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

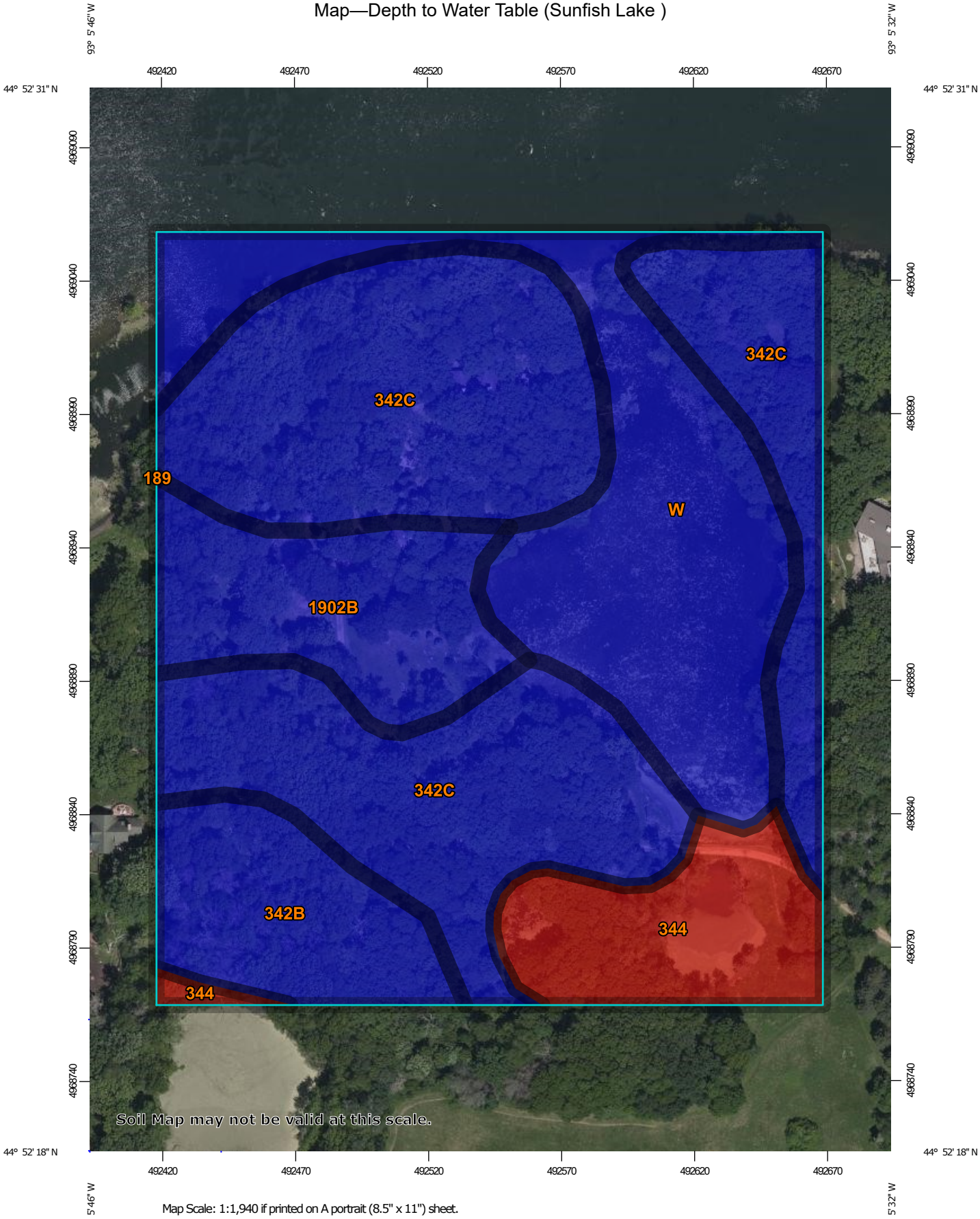
Water Features

Water Features include ponding frequency, flooding frequency, and depth to water table.

Depth to Water Table (Sunfish Lake)

"Water table" refers to a saturated zone in the soil. It occurs during specified months. Estimates of the upper limit are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.



Map Scale: 1:1,940 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 25 50 100 150

Feet
0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 15N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Soil Rating Lines

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Soil Rating Points

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

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.

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Table—Depth to Water Table (Sunfish Lake)

Map unit symbol	Map unit name	Rating (centimeters)	Acres in AOI	Percent of AOI
189	Auburndale silt loam	0	0.0	0.0%
342B	Kingsley sandy loam, 3 to 8 percent slopes	>200	1.6	8.9%
342C	Kingsley sandy loam, 8 to 15 percent slopes	>200	8.5	47.2%
344	Quam silt loam	0	1.7	9.5%
1902B	Jewett silt loam, 1 to 6 percent slopes	>200	2.0	11.2%
W	Water	>200	4.2	23.3%
Totals for Area of Interest			**18.0**	**100.0%**

Rating Options—Depth to Water Table (Sunfish Lake)

Units of Measure: centimeters

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Interpret Nulls as Zero: No

Beginning Month: January

Ending Month: December

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

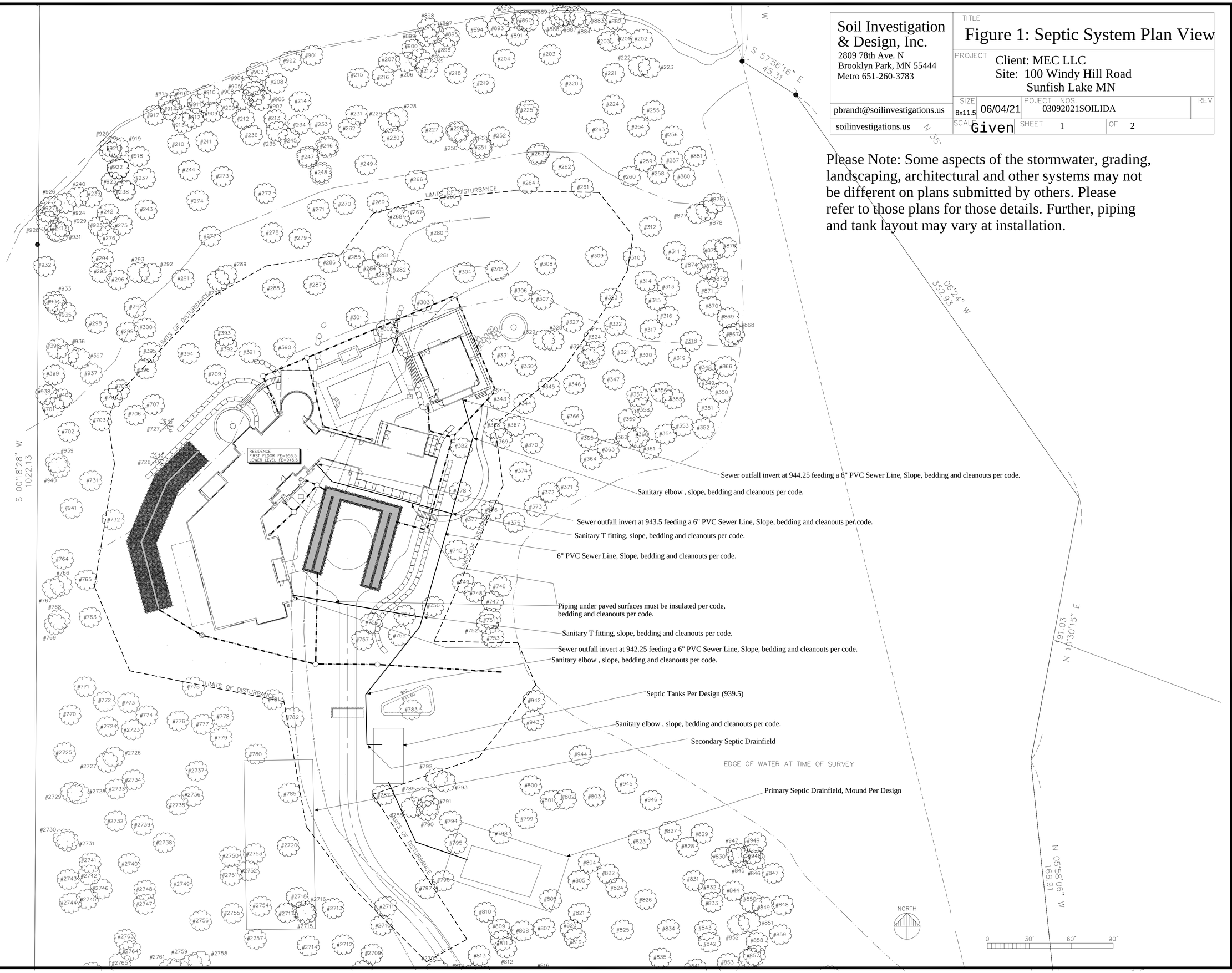
United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf



Sewer outfall invert at 944.25 feeding a 6" PVC Sewer Line, Slope, bedding and cleanouts per code.

Sanitary elbow , slope, bedding and cleanouts per code.

Sewer outfall invert at 943.5 feeding a 6" PVC Sewer Line, Slope, bedding and cleanouts per code.

Sanitary T fitting, slope, bedding and cleanouts per code.

6" PVC Sewer Line, Slope, bedding and cleanouts per code.

Piping under paved surfaces must be insulated per code, bedding and cleanouts per code.

Sanitary T fitting, slope, bedding and cleanouts per code.

Sewer outfall invert at 942.25 feeding a 6" PVC Sewer Line, Slope, bedding and cleanouts per code.

Sanitary elbow , slope, bedding and cleanouts per code.

Septic Tanks Per Design (939.5)

Sanitary elbow , slope, bedding and cleanouts per code.

Secondary Septic Drainfield

Primary Septic Drainfield, Mound Per Design

Soil Investigation & Design, Inc.
2809 78th Ave. N
Brooklyn Park, MN 55444
Metro 651-260-3783

pbrandt@soilinvestigations.us

soilinvestigations.us

TITLE

Figure 1: Septic System Plan View

PROJECT

Client: MEC LLC
Site: 100 Windy Hill Road
Sunfish Lake MN

SIZE		POJECT NOS.	REV
8x11.5	06/04/21	03092021SOILIDA	
SCALE	Given	SHEET 1	OF 2

Please Note: Some aspects of the stormwater, grading, landscaping, architectural and other systems may not be different on plans submitted by others. Please refer to those plans for those details. Further, piping and tank layout may vary at installation.

SAVANNA DESIGNS
Environmentally Appropriate Landscape Design
3637 Trading Post Trail South
Afton, MN 55042
(651)436-6049 · info@savannadesigns.com

PIERCE PINI & ASSOCIATES
9298 CENTRAL AVENUE NE, SUITE 312
BLAINE, MN 55434
TEL 763.537.1311
rhonda@piercepini.com

PROJECT

Windy Hill

100 Windy Hill Road
Sunfish Lake, MN 55077

SHEET TITLE

Septic System Plan View

REVISION

NO.	DESCRIPTION	DATE

CERTIFICATION

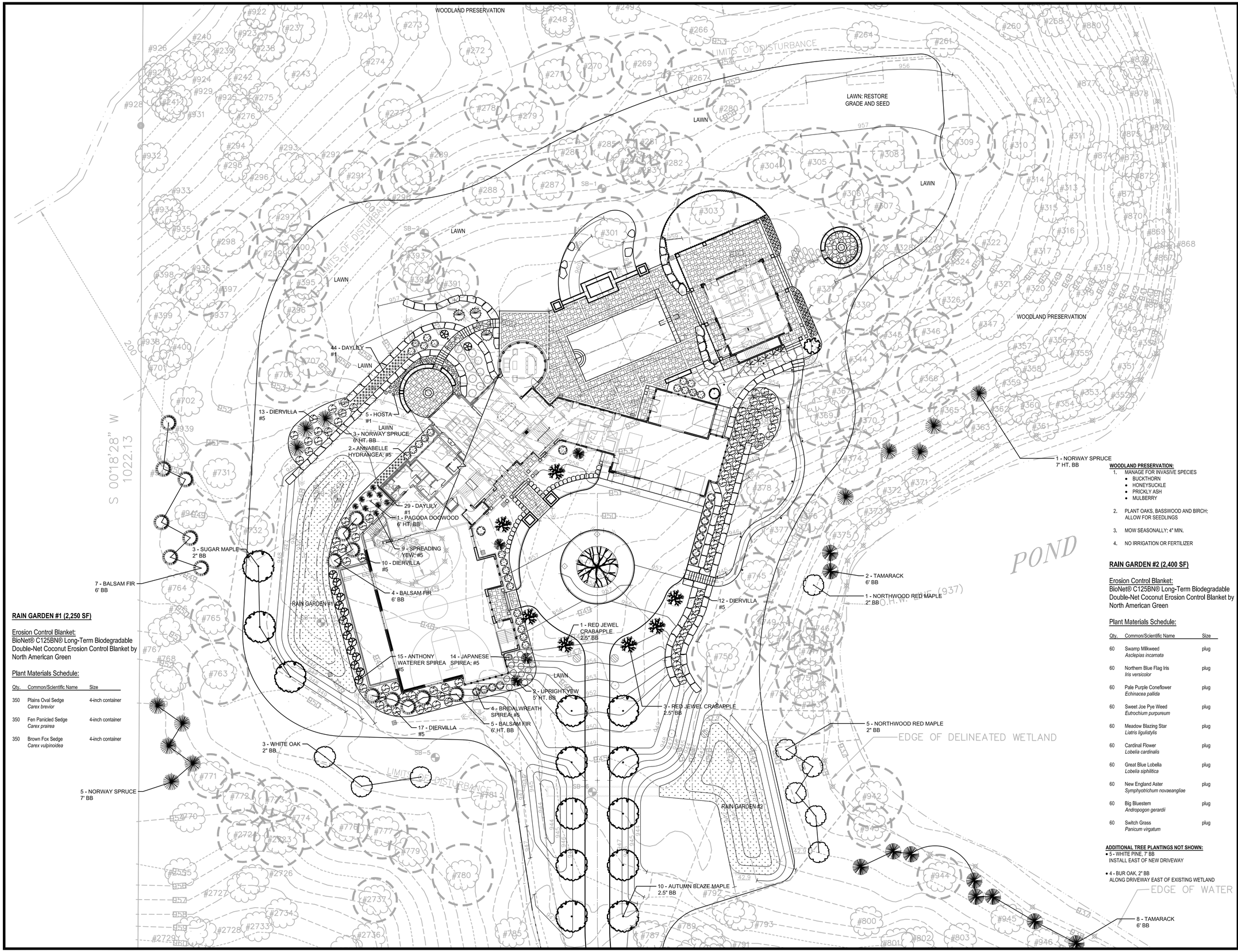
Septic System & Soils

I hereby certify that this plan, document, or report was prepared by me or under my direct supervision and that I am a Licensed Professional Soil Scientist under the Laws of the State of Minnesota.

Print Name: Paul J. Brandt PSS; License: 30007

Signature:

Date: June 7, 2021.



RAIN GARDEN #1 (2,250 SF)

Erosion Control Blanket:
BioNet® C125BN® Long-Term Biodegradable Double-Net Coconut Erosion Control Blanket by North American Green

Plant Materials Schedule:

Qty.	Common/Scientific Name	Size
350	Plains Oval Sedge *Carex brevior*	4-inch container
350	Fen Panicled Sedge *Carex prairea*	4-inch container
350	Brown Fox Sedge *Carex vulpinoidea*	4-inch container

WOODLAND PRESERVATION:

1. MANAGE FOR INVASIVE SPECIES
   - BUCKTHORN
   - HONEYSUCKLE
   - PRICKLY ASH
   - MULBERRY
2. PLANT OAKS, BASSWOOD AND BIRCH: ALLOW FOR SEEDLINGS
3. MOW SEASONALLY: 4" MIN.
4. NO IRRIGATION OR FERTILIZER

RAIN GARDEN #2 (2,400 SF)

Erosion Control Blanket:
BioNet® C125BN® Long-Term Biodegradable Double-Net Coconut Erosion Control Blanket by North American Green

Plant Materials Schedule:

Qty.	Common/Scientific Name	Size
60	Swamp Milkweed *Asclepias incarnata*	plug
60	Northern Blue Flag Iris *Iris versicolor*	plug
60	Pale Purple Coneflower *Echinacea pallida*	plug
60	Sweet Joe Pye Weed *Eutrochium purpureum*	plug
60	Meadow Blazing Star *Liatris ligulistylis*	plug
60	Cardinal Flower *Lobelia cardinalis*	plug
60	Great Blue Lobelia *Lobelia siphilitica*	plug
60	New England Aster *Symphyotrichum novaeangliae*	plug
60	Big Bluestem *Andropogon gerardii*	plug
60	Switch Grass *Panicum virgatum*	plug

ADDITIONAL TREE PLANTINGS NOT SHOWN:

- 5 - WHITE PINE, 7' BB
  INSTALL EAST OF NEW DRIVEWAY
- 4 - BUR OAK, 2" BB
  ALONG DRIVEWAY EAST OF EXISTING WETLAND

SAVANNA DESIGNS

Environmentally Appropriate Landscape Design

3637 Trading Post Trail South
Afton, MN 55042
(651)436-6049 · info@savannadesigns.com

PROJECT

Windy Hill

100 Windy Hill Road
Sunfish Lake, MN 55077

SHEET TITLE

Planting Plan

REVISION

NO.	DESCRIPTION	DATE
	Plantings	2021 05 03
	Revisions	2021 05 21
	Revisions	2021 06 04
	City Submittal	2021 06 08
	City Resubmittal	2021 07 01

CERTIFICATION

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED LANDSCAPE ARCHITECT UNDER THE LAWS OF THE STATE OF MINNESOTA.

PRINT NAME: _____

SIGNATURE: _____

DATE: _____ LIC. NO. _____

NORTH

0 10 20 30 40

1" = 20'

SHEET NUMBER

L3.0 OF 6

Tree Inventory for Parcel 2 at 100 Windy Hill Road Sunfish Lake, MN

All trees over 6” trunk diameter were tagged and identified between February 26 – March 5, 2021. A total of 594 trees have been tagged. Clumps have a combined total of all sprouts and some are noted as doubles.

Advance Surveying & Engineering
17917 Highway 7
Minnetonka, MN 55345
(952) 474-7964

Savanna Designs, Inc.
3637 Trading Post Trail South
Afton, MN 55001
(651) 436-6049 – info@savannadesigns.com

Windy Hill Tree Inventory

revised 06/01/21

Tree Tag #	Size "dbh	Common Name	Scientific Name	Notes	save	diseased	remove
		North of House	02/26/21				
200	26	Red Oak	Quercus rubra		1		
201	12	Mountain Ash	Sorborus decora	sick & rotten		1	
202	16	Red Oak	Quercus rubra	half dead		1	
203	25	White Oak	Quercus alba	exceptional specimen	1		
204	19	White Oak	Quercus alba	nice	1		
205	14	Red Oak	Quercus rubra		1		
206	7	Red Oak	Quercus rubra		1		
207	14	Red Oak	Quercus rubra		1		
208	15	Red Oak	Quercus rubra		1		
209	15	Red Oak	Quercus rubra		1		
210	27	Red Oak	Quercus rubra		1		
211	24	White Oak	Quercus alba	nice	1		
212	16	Basswood	Tilia americana		1		
213	19	White Oak	Quercus alba		1		
214	10	Red Oak	Quercus rubra	nice	1		
215	12	Red Oak	Quercus rubra		1		
216	7	White Oak	Quercus alba	nice	1		
217	13	Red Oak	Quercus rubra		1		
218	12	Red Oak	Quercus rubra		1		
219	21	White Oak	Quercus alba		1		
220	15	Red Oak	Quercus rubra		1		
221	12	Black Cherry	Prunus serotina	bad - remove		1	
222	29	Red Oak	Quercus rubra	split	1		
223	18	White Oak	Quercus alba	leaning	1		
224	14	Red Oak	Quercus rubra		1		
225	35	Red Oak	Quercus rubra	huge, beautiful	1		
226	15	Red Oak	Quercus rubra		1		
227	8	Sugar Maple	Acer saccharum	nice specimen	1		
228	16	White Oak	Quercus alba		1		
229	20	White Oak	Quercus alba		1		
230	14	White Oak	Quercus alba		1		
231	12	Black Cherry	Prunus serotina		1		
232	30	Red Oak	Quercus rubra		1		
233	25	Red Oak	Quercus rubra		1		
234	7	Red Oak	Quercus rubra		1		
235	11	Red Oak	Quercus rubra		1		
236	10	Black Cherry	Prunus serotina		1		
237	16	White Oak	Quercus alba		1		
238	7	Red Oak	Quercus rubra		1		
239	11	Quaking Aspen	Populus tremuloides		1		
240	17	Red Oak	Quercus rubra		1		
241	17	Red Oak	Quercus rubra	clump of 3	1		
242	11	Paper Birch	Betula papyrifera		1		

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Tree Tag #	Size "dbh	Common Name	Scientific Name	Notes	save	diseased	remove
243	23	White Oak	Quercus alba	specimen	1		
244	8	Red Oak	Quercus rubra	nice	1		
245	9	Red Oak	Quercus rubra		1		
246	18	White Oak	Quercus alba	burl	1		
247	11	Red Oak	Quercus rubra		1		
248	12	Red Oak	Quercus rubra		1		
249	21	White Oak	Quercus alba	specimen	1		
250	8	Red Oak	Quercus rubra		1		
251	18	Red Oak	Quercus rubra		1		
252	11	Red Oak	Quercus rubra		1		
253	12	Red Oak	Quercus rubra		1		
254	22	White Oak	Quercus alba	nice	1		
255	24	White Oak	Quercus alba	nice	1		
256	13	Red Oak	Quercus rubra		1		
257	28	White Oak	Quercus alba		1		
258	14	White Oak	Quercus alba		1		
259	16	Red Oak	Quercus rubra		1		
260	18	White Oak	Quercus alba		1		
261	21	White Oak	Quercus alba	nearby house NW	1		
262	21	Green Ash	Fraxinus pennsylvanica	blonding - remove EAB		1	
263	17	White Oak	Quercus alba		1		
264	18	White Oak	Quercus alba	specimen by house	1		
265	31	White Oak	Quercus alba	nw, house	1		
266	20	White Oak	Quercus alba	specimen	1		
267	16	White Oak	Quercus alba		1		
268	18	White Oak	Quercus alba	damaged remove		1	
269	23	White Oak	Quercus alba	specimen	1		
270	21	White Oak	Quercus alba		1		
271	17	White Oak	Quercus alba	clump	1		
272	25	Basswood	Tilia americana		1		
273	23	White Oak	Quercus alba	clump	1		
274	25	White Oak	Quercus alba	clump	1		
275	6	Red Oak	Quercus rubra		1		
276	15	Red Oak	Quercus rubra		1		
277	25	White Oak	Quercus alba	nice	1		
278	8	White Oak	Quercus alba		1		
279	18	Red Oak	Quercus rubra		1		
280	11	Paper Birch	Betula papyrifera	leaning	1		
281	11	White Oak	Quercus alba		1		
282	25	White Oak	Quercus alba		1		
283	5	White Oak	Quercus alba		1		
284	10	White Oak	Quercus alba		1		
285	23	Red Oak	Quercus rubra		1		
286	7	Red Oak	Quercus rubra		1		

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Tree Tag #	Size "dbh	Common Name	Scientific Name	Notes	save	diseased	remove
287	23	White Oak	Quercus alba		1		
288	24	Basswood	Tilia americana	tall	1		
289	18	White Oak	Quercus alba		1		
290	20	White Oak	Quercus alba		1		
291	19	White Oak	Quercus alba		1		
292	12	White Oak	Quercus alba		1		
293	25	White Oak	Quercus alba		1		
294	21	White Oak	Quercus alba		1		
295	29	Red Oak	Quercus rubra		1		
296	13	Basswood	Tilia americana		1		
297	24	White Oak	Quercus alba	specimen	1		
298	25	Red Oak	Quercus rubra		1		
299	23	White Oak	Quercus alba		1		
300	13	Red Oak	Quercus rubra		1		
301	26	White Oak	Quercus alba	large, specimen	1		
302	11	White Oak	Quercus alba				1
303	24	White Oak	Quercus alba	large, specimen	1		
304	9	Sugar Maple	Acer saccharum		1		
305	26	White Oak	Quercus alba		1		
306	24	White Oak	Quercus alba		1		
307	19	White Oak	Quercus alba		1		
308	19	White Oak	Quercus alba	by house	1		
309	28	White Oak	Quercus alba	by house	1		
310	25	White Oak	Quercus alba		1		
311	24	White Oak	Quercus alba	wood duck house	1		
312	7	Sugar Maple	Acer saccharum		1		
313	26	Red Oak	Quercus rubra		1		
314	15	Arborviate	Thuja occidentalis	clump	1		
315	18	Arborviate	Thuja occidentalis		1		
316	15	White Oak	Quercus alba		1		
317	28	White Oak	Quercus alba		1		
318	14	Arborviate	Thuja occidentalis	clump	1		
319	8	Arborvitae	Thuja occidentalis		1		
320	9	Red Oak	Quercus rubra		1		
321	10	Red Oak	Quercus rubra		1		
322	27	Red Oak	Quercus rubra		1		
323	23	White Oak	Quercus alba		1		
324	8	Red Oak	Quercus rubra		1		
325	16	Green Ash	Fraxinus pennsylvanica			1	
326	12	White Oak	Quercus alba		1		
327	22	White Oak	Quercus alba		1		
328	15	Red Oak	Quercus rubra		1		
329	18	Green Ash	Fraxinus pennsylvanica			1	
330	14	Red Oak	Quercus rubra		1		

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Tree Tag #	Size "dbh	Common Name	Scientific Name	Notes	save	diseased	remove
331	23	White Oak	Quercus alba		1		
332	22	White Oak	Quercus alba				1
333	23	White Oak	Quercus alba				1
334	12	Black Cherry	Prunus serotina				1
335	9	Arborvitae	Thuja occidentalis				1
336	15	Arborviate clump	Thuja occidentalis				1
337	14	Balsam Fir	Abies balsamea				1
338	7	Balsam Fir	Abies balsamea				1
339	14	Balsam Fir	Abies balsamea				1
340	11	Balsam Fir	Abies balsamea				1
341	15	Bur Oak	Quercus macrocarpa	top gone, poor		1	
342	23	White Oak	Quercus alba	specimen			1
343	21	White Oak	Quercus alba				1
344	18	White Oak	Quercus alba		1		
345	9	White Oak	Quercus alba		1		
346	8	White Oak	Quercus alba		1		
347	21	White Oak	Quercus alba		1		
348	22	Red Oak	Quercus rubra		1		
349	25	White Oak	Quercus alba		1		
350	13	Red Oak	Quercus rubra		1		
351	36	White Oak clump	Quercus alba	clump	1		
352	16	Red Oak	Quercus rubra	pond edge	1		
353	7	White Oak	Quercus alba		1		
354	18	Red Oak	Quercus rubra		1		
355	8	Red Oak	Quercus rubra		1		
356	29	Red Oak	Quercus rubra	tall	1		
357	11	Red Oak	Quercus rubra		1		
358	10	Paper Birch	Betula papyrifera	clump	1		
359	13	Paper Birch	Betula papyrifera	clump	1		
360	8	Paper Birch	Betula papyrifera	clump	1		
361	7	Red Oak	Quercus rubra	pond edge	1		
362	32	Red Oak	Quercus rubra	specimen	1		
363	12	Red Oak	Quercus rubra		1		
364	26	Bur Oak	Quercus macrocarpa	declining	1		
365	10	Red Oak	Quercus rubra	specimen	1		
366	23	Red Oak	Quercus rubra		1		
367	11	Black Cherry	Prunus serotina		1		
368	6	Black Cherry	Prunus serotina	declining		1	
369	22	Red Oak	Quercus rubra		1		
370	22	Red Oak	Quercus rubra		1		
371	21	Red Oak	Quercus rubra		1		
372	26	White Oak	Quercus alba		1		
373	10	Red Oak	Quercus rubra	pond edge	1		
374	36	White Oak	Quercus alba	clump	1		

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Tree Tag #	Size "dbh	Common Name	Scientific Name	Notes	save	diseased	remove
375	18	Red Oak	Quercus rubra	specimen	1		
376	12	Red Oak	Quercus rubra	specimen	1		
377	15	Red Oak	Quercus rubra		1		
378	12	White Oak	Quercus alba		1		
379	13	White Oak	Quercus alba				1
380	27	White Oak	Quercus alba	specimen			1
381	17	White Oak	Quercus alba				1
382	16	Bur Oak	Quercus macrocarpa		1		
383	13	White Oak	Quercus alba				1
384	15	Red Maple	Acer rubrum				1
385	13	Red Maple	Acer rubrum				1
386	18	White Oak	Quercus alba				1
387	14	White Oak	Quercus alba				1
388	17	Red Oak	Quercus rubra				1
389	8	Red Oak	Quercus rubra				1
390	26	White Oak	Quercus alba	specimen			1
391	29	White Oak	Quercus alba	leaning	1		
392	13	Bur Oak	Quercus macrocarpa		1		
393	12	Red Oak	Quercus rubra		1		
394	26	Big Tooth Aspen	Populus grandidentata	declining		1	
395	12	Red Oak	Quercus rubra	specimen	1		
396	7	Red Oak	Quercus rubra		1		
397	7	Red Oak	Quercus rubra		1		
398	9	Red Oak	Quercus rubra	specimen in birch grove	1		
399	12	Red Oak	Quercus rubra		1		
400	8	Red Oak	Quercus rubra	in birch grove	1		
701	10	Red Oak	Quercus rubra		1		
702	8	Red Oak	Quercus rubra		1		
703	26	Red Oak	Quercus rubra				1
704	45	Red Oak	Quercus rubra	huge			1
705	8	Red Oak	Quercus rubra				1
706	24	White Oak	Quercus alba		1		
707	17	White Oak	Quercus alba		1		
708	23	Red Oak	Quercus rubra				1
709	9	White Oak	Quercus alba	specimen			1
710	22	Bur Oak	Quercus macrocarpa				1
711	24	White Oak	Quercus alba				1
712	25	White Oak	Quercus alba				1
713	33	Red Oak	Quercus rubra	specimen, tall			1
714	12	Black Cherry	Prunus serotina				1
715	16	Bur Oak	Quercus macrocarpa				1
716	13	Sugar Maple	Acer saccharum				1
717	19	White Oak	Quercus alba	leaning			1
718	15	Balsam Fir	Abies balsamea				1

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Tree Tag #	Size "dbh	Common Name	Scientific Name	Notes	save	diseased	remove
719	15	Balsam Fir	Abies balsamea				1
720	13	Balsam Fir	Abies balsamea				1
721	12	Balsam Fir	Abies balsamea				1
722	11	Balsam Fir	Abies balsamea	bad top			1
723	12	Balsam Fir	Abies balsamea	dead		1	
724	6	Balsam Fir	Abies balsamea				1
725	12	White Spruce	Picea glauca				1
726	7	Balsam Fir	Abies balsamea	dead		1	
727	12	Balsam Fir	Abies balsamea				1
728	11	Balsam Fir	Abies balsamea				1
729	11	Balsam Fir	Abies balsamea				1
730	15	Red Maple	Acer rubrum	upright			1
731	33	Red Oak	Quercus rubra	huge	1		
732	31	Red Oak	Quercus rubra		1		
733	26	Red Oak	Quercus rubra				1
734	27	Black Cherry	Prunus serotina				1
735	29	Bur Oak	Quercus macrocarpa	westside low area			1
736	8	Boxelder	Acer negundo	going up into Bur Oak			1
737	37	Red Oak	Quercus rubra	awesome			1
738	22	Bur Oak	Quercus macrocarpa				1
739	7	Green Ash	Fraxinus pennsylvanica			1	
740	21	Black Cherry	Prunus serotina				1
741	12	Black Cherry	Prunus serotina				1
742	9	Black Cherry	Prunus serotina				1
743	9	Black Cherry	Prunus serotina				1
744	12	Sugar Maple	Acer saccharum				1
745	7	Sugar Maple	Acer saccharum		1		
746	11	Red Oak	Quercus rubra	in decline	1		
747	12	Red Oak	Quercus rubra	lean over pond	1		
748	15	Red Oak	Quercus rubra	leaning	1		
749	10	Sugar Maple	Acer saccharum		1		
750	22	Chinese Chesnut	Castanea mollissima	specimen	1		
751	12	Red Oak	Quercus rubra		1		
752	16	Red Oak	Quercus rubra		1		
753	14	Red Oak	Quercus rubra		1		
754	18	Red Oak	Quercus rubra	damaged crown		1	
755	12	Black Cherry	Prunus serotina	some dead branches			1
756	23	Red Oak	Quercus rubra				1
757	22	Red Oak	Quercus rubra				1
758	14	Sugar Maple	Acer saccharum				1
759	10	Red Maple	Acer rubrum	signs of trunk damage			1
760	12	Black Cherry	Prunus serotina				1
761	24	White Oak	Quercus alba	interesting form			1
762	36	Red Oak	Quercus rubra	crown damage			1

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Tree Tag #	Size "dbh	Common Name	Scientific Name	Notes	save	diseased	remove
763	26	Red Oak	Quercus rubra		1		
764	7	Red Oak	Quercus rubra		1		
765	9	Black Cherry	Prunus serotina		1		
766	15	Paper Birch	Betula papyrifera	clump	1		
767	6	Red Oak	Quercus rubra		1		
768	8	Red Oak	Quercus rubra		1		
769	12	Red Oak	Quercus rubra		1		
770	20	Black Cherry	Prunus serotina		1		
771	12	Boxelder	Acer negundo		1		
772	13	Boxelder	Acer negundo		1		
773	11	Boxelder	Acer negundo		1		
774	44	Basswood	Tilia americana	multi-stem clump	1		
775	18	Boxelder	Acer negundo	clump, mostly dead	1		
776	9	Boxelder	Acer negundo			1	
777	23	Boxelder	Acer negundo	clump, dead		1	
778	11	Boxelder	Acer negundo				1
779	11	Boxelder	Acer negundo	dead crown		1	
780	27	Hackberry	Celtis occidentalis	clump	1		
781	27	Red Oak	Quercus rubra	save, nice	1		
782	14	Black Cherry	Prunus serotina				1
783	8	Apple	Malus	some dieback, pond		1	
784	26	Red Oak	Quercus rubra	driveway			1
785	14	Apple	Malus		1		
786	18	Red Oak	Quercus rubra		1		
787	22	Red Oak	Quercus rubra				1
788	6	Black Cherry	Prunus serotina		1		
789	8	Sugar Maple	Acer saccharum		1		
790	10	Black Cherry	Prunus serotina		1		
791	12	White Oak	Quercus alba		1		
792	10	Black Cherry	Prunus serotina		1		
793	22	White Oak	Quercus alba		1		
794	17	White Oak	Quercus alba	specimen	1		
795	24	White Oak	Quercus alba	specimen	1		
796	9	Black Cherry	Prunus serotina				1
797	9	Black Cherry	Prunus serotina				1
798	22	White Oak	Quercus alba	specimen, DF edge	1		
799	24	White Oak	Quercus alba	specimen	1		
800	10	Black Cherry	Prunus serotina		1		
801	22	White Oak	Quercus alba		1		
802	11	Black Cherry	Prunus serotina		1		
803	8	White Oak	Quercus alba		1		
804	22	Red Oak	Quercus rubra		1		
805	13	White Oak	Quercus alba		1		
806	24	White Oak	Quercus alba	specimen, drainfield			1

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Tree Tag #	Size "dbh	Common Name	Scientific Name	Notes	save	diseased	remove
807	6	Black Cherry	Prunus serotina	drainfield			1
808	8	Black Cherry	Prunus serotina	drainfield			1
809	6	Black Cherry	Prunus serotina	drainfield			1
810	18	White Oak	Quercus alba	specimen	1		
811	18	White Oak	Quercus alba	specimen	1		
812	10	White Oak	Quercus alba		1		
813	11	Black Cherry	Prunus serotina	driveway			1
814	6	Red Oak	Quercus rubra	driveway			1
815	22	White Oak	Quercus alba	specimen, driveway			1
816	24	White Oak	Quercus alba	specimen	1		
817	26	White Oak	Quercus alba	specimen	1		
818	24	White Oak	Quercus alba	specimen	1		
819	24	White Oak	Quercus alba	drainfield			1
820	22	Red Oak	Quercus rubra	drainfield			1
821	16	White Oak	Quercus alba	drainfield			1
822	13	White Oak	Quercus alba	hollow stem	1		
823	24	Bur Oak	Quercus macrocarpa	specimen	1		
824	15	Bur Oak	Quercus macrocarpa		1		
825	7	Black Cherry	Prunus serotina		1		
826	23	White Oak	Quercus alba	specimen	1		
827	10	Red Oak	Quercus rubra		1		
828	9	Ohio Buckeye	Aesculus glabra		1		
829	25	Red Oak	Quercus rubra		1		
830	11	Red Oak	Quercus rubra		1		
831	6	Red Oak	Quercus rubra		1		
832	17	Bur Oak	Quercus macrocarpa		1		
833	7	Red Oak	Quercus rubra		1		
834	26	Red Oak	Quercus rubra	specimen	1		
835	9	Red Oak	Quercus rubra		1		
836	27	Red Oak	Quercus rubra		1		
837	24	White Oak	Quercus alba		1		
838	24	White Oak	Quercus alba		1		
839	19	White Oak	Quercus alba		1		
840	16	Red Oak	Quercus rubra		1		
841	16	Bur Oak	Quercus macrocarpa		1		
842	20	White Oak	Quercus alba	specimen	1		
843	21	Red Oak	Quercus rubra		1		
844	10	Red Oak	Quercus rubra		1		
845	7	Red Oak	Quercus rubra		1		
846	23	Bur Oak	Quercus macrocarpa	unique - over pond	1		
847	10	Red Oak	Quercus rubra		1		
848	19	Red Oak	Quercus rubra		1		
849	10	Red Oak	Quercus rubra		1		
850	19	Red Oak	Quercus rubra		1		

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Tree Tag #	Size "dbh	Common Name	Scientific Name	Notes	save	diseased	remove
851	6	Bur Oak	Quercus macrocarpa		1		
852	6	Red Oak	Quercus rubra		1		
853	6	Red Oak	Quercus rubra		1		
854	12	Red Oak	Quercus rubra		1		
855	26	Red Oak	Quercus rubra	spec. huge, beautiful	1		
856	22	White Oak	Quercus alba		1		
857	14	White Oak	Quercus alba		1		
858	6	Quaking Aspen	Populus tremuloides		1		
859	9	Black Cherry	Prunus serotina		1		
860	6	Bur Oak	Quercus macrocarpa		1		
861	15	Red Oak	Quercus rubra		1		
862	15	Red Oak	Quercus rubra		1		
863	10	Quaking Aspen	Populus tremuloides		1		
864	12	Quaking Aspen	Populus tremuloides		1		
865	12	Quaking Aspen	Populus tremuloides		1		
		Lakeshore Trees	03/02/21				
866	9	Red Oak	Quercus rubra		1		
867	10	Paper Birch	Betula papyrifera		1		
868	13	Red Oak	Quercus rubra		1		
869	15	Red Oak	Quercus rubra		1		
870	12	Red Oak	Quercus rubra		1		
871	10	Red Oak	Quercus rubra		1		
872	26	Red Oak	Quercus rubra		1		
873	17	White Oak	Quercus alba		1		
874	7	Red Oak	Quercus rubra		1		
875	12	Red Oak	Quercus rubra		1		
876	15	Red Oak	Quercus rubra		1		
877	8	White Oak	Quercus alba		1		
878	18	Black Cherry	Prunus serotina		1		
879	6	Red Oak	Quercus rubra		1		
880	10	Red Oak	Quercus rubra		1		
881	13	Red Oak	Quercus rubra		1		
882	6	Paper Birch	Betula papyrifera		1		
883	7	Paper Birch	Betula papyrifera		1		
884	8	Paper Birch	Betula papyrifera		1		
885	14	Paper Birch	Betula papyrifera		1		
886	6	Paper Birch	Betula papyrifera		1		
887	7	Paper Birch	Betula papyrifera		1		
888	9	Red Oak	Quercus rubra		1		
889	9	Paper Birch	Betula papyrifera		1		
890	18	Cottonwood	Populus deltoides		1		
891	10	Paper Birch	Betula papyrifera		1		
892	13	Paper Birch	Betula papyrifera	clump	1		

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Tree Tag #	Size "dbh	Common Name	Scientific Name	Notes	save	diseased	remove
893	25	Paper Birch	Betula papyrifera	clump	1		
894	15	Paper Birch	Betula papyrifera	clump	1		
895	8	Paper Birch	Betula papyrifera		1		
896	8	Paper Birch	Betula papyrifera		1		
896	6	Paper Birch	Betula papyrifera		1		
897	6	Paper Birch	Betula papyrifera		1		
898	9	Paper Birch	Betula papyrifera		1		
899	7	Paper Birch	Betula papyrifera		1		
900	11	Red Oak	Quercus rubra		1		
901	7	Paper Birch	Betula papyrifera	leaning over water	1		
902	9	Red Oak	Quercus rubra	water's edge	1		
903	8	Paper Birch	Betula papyrifera	leaning over water	1		
904	10	Paper Birch	Betula papyrifera	leaning over water	1		
905	6	Paper Birch	Betula papyrifera		1		
906	13	Paper Birch	Betula papyrifera	clump	1		
907	14	Paper Birch	Betula papyrifera		1		
908	9	Paper Birch	Betula papyrifera		1		
909	11	Paper Birch	Betula papyrifera	clump	1		
910	7	Red Oak	Quercus rubra		1		
911	16	Paper Birch	Betula papyrifera	clump	1		
912	7	Paper Birch	Betula papyrifera		1		
913	6	Paper Birch	Betula papyrifera		1		
914	7	Paper Birch	Betula papyrifera		1		
915	22	Bur Oak	Quercus macrocarpa		1		
916	11	Paper Birch	Betula papyrifera	leaning over water	1		
917	7	Red Oak	Quercus rubra		1		
918	7	Paper Birch	Betula papyrifera		1		
919	7	Red Oak	Quercus rubra		1		
920	14	Red Oak	Quercus rubra		1		
921	11	Red Oak	Quercus rubra		1		
922	9	Red Oak	Quercus rubra		1		
923	6	Red Oak	Quercus rubra		1		
924	7	Red Oak	Quercus rubra		1		
925	7	Red Oak	Quercus rubra		1		
926	9	Red Oak	Quercus rubra		1		
927	6	Red Oak	Quercus rubra		1		
928	12	Red Oak	Quercus rubra		1		
929	9	Red Oak	Quercus rubra		1		
930	12	Arborvitae	Thuja occidentalis	clump by driveway			1
931	9	Red Oak	Quercus rubra		1		
932	8	Paper Birch	Betula papyrifera		1		
933	8	Paper Birch	Betula papyrifera		1		
934	8	Paper Birch	Betula papyrifera		1		
935	12	Paper Birch	Betula papyrifera	clump	1		

Windy Hill Tree Inventory

revised 06/01/21

Tree Tag #	Size "dbh	Common Name	Scientific Name	Notes	save	diseased	remove
936	6	Paper Birch	Betula papyrifera		1		
937	9	Paper Birch	Betula papyrifera		1		
938	10	Paper Birch	Betula papyrifera		1		
939	10	Paper Birch	Betula papyrifera	in decline	1		
940	16	Paper Birch	Betula papyrifera	clump	1		
941	10	Paper Birch	Betula papyrifera	clump	1		
942	14	Green Ash	Fraxinus pennsylvanica	pond edge	1		
943	7	Paper Birch	Betula papyrifera		1		
944	12	Black Cherry	Prunus serotina		1		
945	11	White Oak	Quercus alba		1		
946	22	Red Oak	Quercus rubra		1		
947	6	Red Oak	Quercus rubra		1		
948	8	Red Oak	Quercus rubra		1		
949	11	Red Oak	Quercus rubra		1		
		Driveway - north side	03/03/21				
950	7	Black Cherry	Prunus serotina		1		
951	17	Cottonwood	Populus		1		
952	22	Cottonwood	Populus		1		
953	9	Black Cherry	Prunus serotina		1		
954	7	American Elm	Ulmus americana		1		
955	11	Quaking Aspen	Populus tremuloides		1		
956	11	American Elm	Ulmus americana		1		
957	6	Quaking Aspen	Populus tremuloides		1		
958	7	Red Oak	Quercus rubra		1		
959	9	Red Oak	Quercus rubra		1		
960	10	Black Cherry	Prunus serotina		1		
		Southside	03/03/21				
961	15	Red Pine	Pinus resinosa		1		
962	14	Red Pine	Pinus resinosa		1		
963	16	Red Pine	Pinus resinosa		1		
964	15	Red Pine	Pinus resinosa		1		
965	16	Red Pine	Pinus resinosa		1		
966	16	Red Pine	Pinus resinosa		1		
967	15	Red Pine	Pinus resinosa		1		
968	16	Red Pine	Pinus resinosa		1		
969	16	Red Pine	Pinus resinosa		1		
970	14	Quaking Aspen	Populus tremuloides		1		
971	14	Black Cherry	Prunus serotina		1		
972	12	Quaking Aspen	Populus tremuloides		1		
973	10	Quaking Aspen	Populus tremuloides		1		
974	12	Quaking Aspen	Populus tremuloides		1		
975	10	Quaking Aspen	Populus tremuloides		1		

Windy Hill Tree Inventory

revised 06/01/21

Tree Tag #	Size "dbh	Common Name	Scientific Name	Notes	save	diseased	remove
976	9	Quaking Aspen	Populus tremuloides		1		
977	14	Red Oak	Quercus rubra		1		
978	21	Red Oak	Quercus rubra		1		
979	20	Red Oak	Quercus rubra		1		
980	12	Green Ash	Fraxinus pennsylvanica	blonding - remove	1		
981	14	Quaking Aspen	Prunus serotina		1		
982	13	Quaking Aspen	Prunus serotina		1		
983	9	Red Oak	Quercus rubra		1		
984	8	Red Oak	Quercus rubra		1		
985	28	Black Willow	Salix nigra		1		
986	20	Black Willow	Salix nigra		1		
987	13	Quaking Aspen	Prunus serotina		1		
988	15	Paper Birch	Betula papyrifera	clump	1		
989	15	Green Ash	Fraxinus pennsylvanica		1		
990	15	Quaking Aspen	Prunus serotina		1		
991	8	Red Oak	Quercus rubra		1		
992	11	Red Oak	Quercus rubra		1		
993	12	Red Oak	Quercus rubra		1		
994	17	Red Oak	Quercus rubra		1		
995	15	Red Oak	Quercus rubra		1		
996	13	Red Oak	Quercus rubra		1		
997	6	Red Oak	Quercus rubra		1		
998	7	Red Oak	Quercus rubra		1		
999	10	Red Oak	Quercus rubra		1		
1000	12	Red Oak	Quercus rubra		1		
2701	8	Red Oak	Quercus rubra		1		
2702	11	Red Oak	Quercus rubra		1		
2703	20	Red Oak	Quercus rubra		1		
2704	12	Red Oak	Quercus rubra		1		
2705	28	White Oak	Quercus alba		1		
2706	13	White Oak	Quercus alba		1		
2707	16	White Oak	Quercus alba		1		
2708	32	Red Oak	Quercus rubra		1		
2709	25	White Oak	Quercus alba	specimen	1		
2710	17	White Oak	Quercus alba		1		
2711	18	White Oak	Quercus alba	double	1		
		SW "Wild Area"	03/05/21				
2712	14	White Oak	Quercus alba	trunk damage	1		
2713	20	White Oak	Quercus alba		1		
2714	13	White Oak	Quercus alba		1		
2715	7	American Elm	Ulmus americana		1		
2716	15	Basswood	Tilia americana		1		

Windy Hill Tree Inventory

revised 06/01/21

Tree Tag #	Size "dbh	Common Name	Scientific Name	Notes	save	diseased	remove
2717	34	White Oak	Quercus alba	large specimen	1		
2718	7	Black Cherry	Prunus serotina		1		
2719	6	Black Cherry	Prunus serotina		1		
2720	12	Black Cherry	Prunus serotina		1		
2721	7	Black Cherry	Prunus serotina	by garage	1		
2722	3.5	Pin Oak	Quercus palustris		1		
2723	21	White Oak	Quercus alba		1		
2724	13	Boxelder	Acer negundo		1		
2725	22	Black Cherry	Prunus serotina		1		
2726	24	Basswood	Ulmus americana		1		
2727	14	Boxelder	Acer negundo		1		
2728	6	Boxelder	Acer negundo		1		
2729	22	Black Cherry	Prunus serotina		1		
2730	15	Green Ash	Fraxinus pennsylvanica		1		
2731	9	Red Oak	Quercus rubra		1		
2732	22	Boxelder	Acer negundo	double	1		
2733	12	Black Cherry	Prunus serotina		1		
2734	14	Black Cherry	Prunus serotina		1		
2735	15	Black Cherry	Prunus serotina		1		
2736	22	White Oak	Quercus alba		1		
2737	6	Basswood	Ulmus americana		1		
2738	28	Red Oak	Quercus rubra	nice	1		
2739	11	Green Ash	Fraxinus pennsylvanica		1		
2740	14	Black Cherry	Prunus serotina		1		
2741	24	White Oak	Quercus alba	nice specimen	1		
2742	22	Red Oak	Quercus rubra		1		
2743	24	White Oak	Quercus alba		1		
2744	15	White Oak	Quercus alba		1		
2745	8	Black Cherry	Prunus serotina		1		
2746	20	White Oak	Quercus alba	nice	1		
2747	30	Red Oak	Quercus rubra	double	1		
2748	6	Black Cherry	Prunus serotina		1		
2749	21	White Oak	Quercus alba	nice	1		
2750	22	White Oak	Quercus alba		1		
2751	14	White Oak	Quercus alba		1		
2752	18	White Oak	Quercus alba		1		
2753	28	Red Oak	Quercus rubra		1		
2754	20	American Elm	Ulmus americana		1		
2755	25	White Oak	Quercus alba	specimen	1		
2756	11	Black Cherry	Prunus serotina		1		
2757	18	White Oak	Quercus alba		1		
2758	9	Black Cherry	Prunus serotina	tall	1		
2759	24	White Oak	Quercus alba	tall	1		
2760	8	Black Cherry	Prunus serotina		1		

Windy Hill Tree Inventory

revised 06/01/21

Tree Tag #	Size "dbh	Common Name	Scientific Name	Notes	save	diseased	remove
2761	6.5	Black Cherry	Prunus serotina		1		
2762	27	Red Oak	Quercus rubra		1		
2763	25	Red Oak	Quercus rubra		1		
2764	9	Black Cherry	Prunus serotina		1		
2765	8	Boxelder	Acer negundo		1		
2766	15	Green Ash	Fraxinus pennsylvanica		1		
2767	11	Red Oak	Quercus rubra		1		
2768	27	Red Oak	Quercus rubra		1		
2769	9	Red Oak	Quercus rubra		1		
2770	14	Red Oak	Quercus rubra		1		
2771	5	Red Oak	Quercus rubra		1		
2772	17	Red Oak	Quercus rubra		1		
2773	18	Red Oak	Quercus rubra	property corner	1		
2774	13	Red Oak	Quercus rubra		1		
2775	23	Red Oak	Quercus rubra		1		
2776	14	Red Oak	Quercus rubra		1		
2777	3	Red Oak	Quercus rubra		1		
2778	26	White Oak	Quercus alba	specimen	1		
2779	34	Red Oak	Quercus rubra	nice	1		
2780	22	White Oak	Quercus alba		1		
2781	10	White Oak	Quercus alba		1		
2782	10	White Oak	Quercus alba		1		
2783	22	White Oak	Quercus alba		1		
2784	22	Red Oak	Quercus rubra		1		
2785	11	Black Cherry	Prunus serotina		1		
2786	19	White Oak	Quercus alba	nice	1		
2787	18	Red Oak	Quercus rubra		1		
2788	18	Red Oak	Quercus rubra	south line	1		
2789	9	Black Cherry	Prunus serotina		1		
2790	8	Red Oak	Quercus rubra		1		
2791	6	Black Cherry	Prunus serotina		1		
2792	6	Paper Birch	Betula papyrifera	leaning	1		
				Totals	493	18	83

EXISTING DWELLING

EXISTING BUILDING

GRAVEL DRIVEWAY

DELINEATED WETLAND

Crown drip line or other limit of Tree Protection area. Refer to Tree Removal and Protection Plan for Tree Protective Barrier alignment.

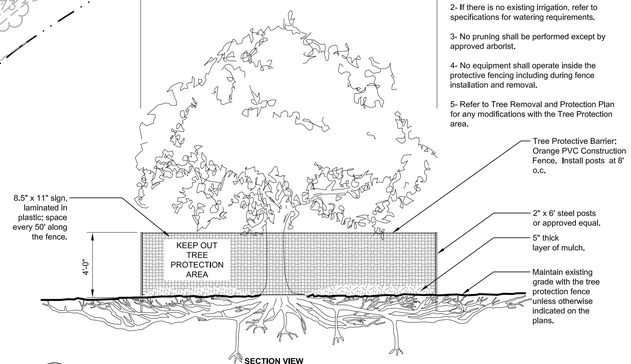
Notes:
1- Refer to specifications for additional tree protection requirements.

2- If there is no existing irrigation, refer to specifications for watering requirements.

3- No pruning shall be performed except by approved arborist.

4- No equipment shall operate inside the protective fencing including during fence installation and removal.

5- Refer to Tree Removal and Protection Plan for any modifications with the Tree Protection area.



SECTION VIEW

1 TREE PROTECTIVE BARRIER

LEGEND:

TREE PROTECTION; REFER TO DETAIL 1/TP1.0

TREE TO BE REMOVED

EDGE OF WATER

SAVANNA DESIGNS

Environmentally Appropriate Landscape Design

3637 Trading Post Trail South
Afton, MN 55042
(651)436-6049 · info@savannadesigns.com

PROJECT

Windy Hill

100 Windy Hill Road
Sunfish Lake, MN 55077

SHEET TITLE

Tree Removal and Protection Plan

REVISION

NO.	DESCRIPTION	DATE
	Tree Survey	2021 02 26
	Tree Survey	2021 03 05
	Removals House	2021 03 31
	Removals Drive; Drainfield	2021 04 28
	Protection	2021 04 29
	Revisions	2021 05 26
	City Submittal	2021 06 08

CERTIFICATION

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED LANDSCAPE ARCHITECT UNDER THE LAWS OF THE STATE OF MINNESOTA.

PRINT NAME: _____

SIGNATURE: _____

DATE: _____ LIC. NO. _____

NORTH

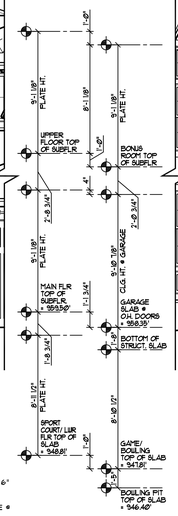
0 10 20 30 40

1" = 20'

SHEET NUMBER

TP1.0 OF 6

1 / 1 FRONT ELEVATION
SCALE: 1/4"=1'-0"



CEDAR SHAKE ROOF

6" CROWN ON 8" TRIM FRIEZE w/ 6" REVEAL

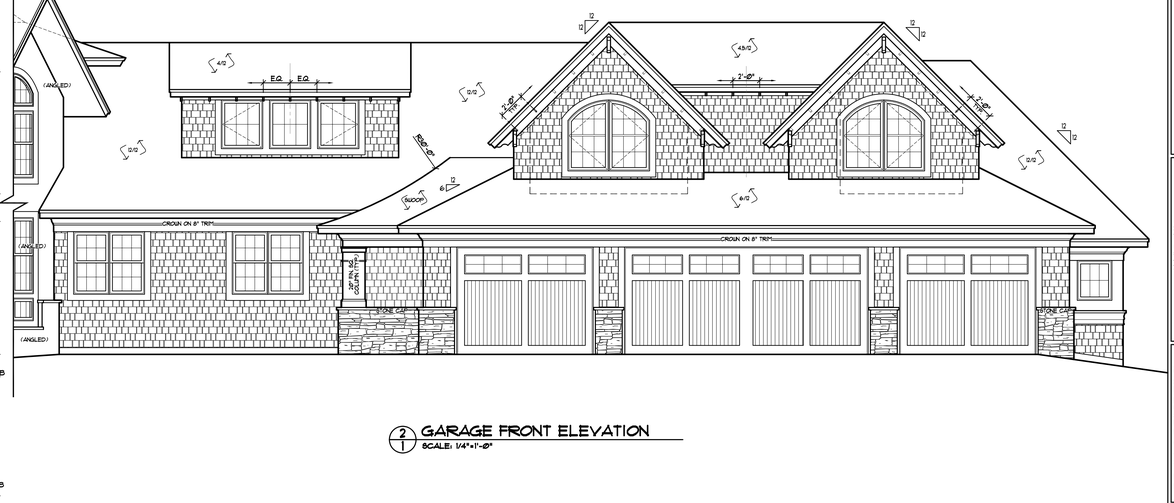
2x8 DECORATIVE RAFTER FRIEZE @ GABLES

CEDAR SHAKE SIDING PER ELEV.

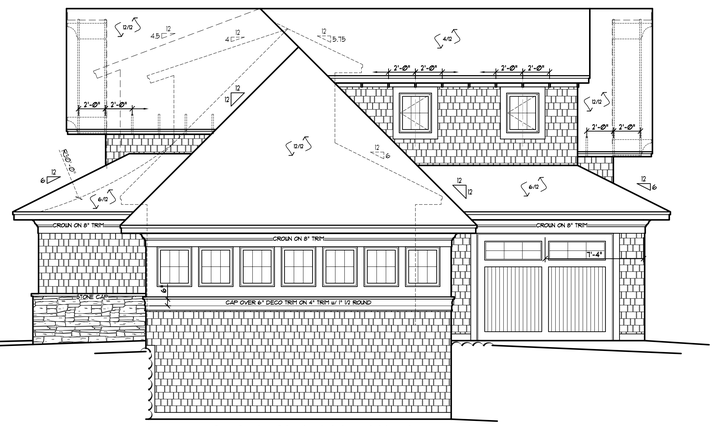
6" HARDIE WINDOW TRIM BOARDS

FULL STONE PER ELEVS.

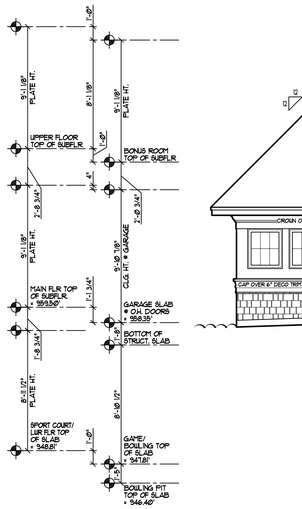
8" STONE LINTELS w/ 4" SILLS @ WINDOWS PER ELEV.

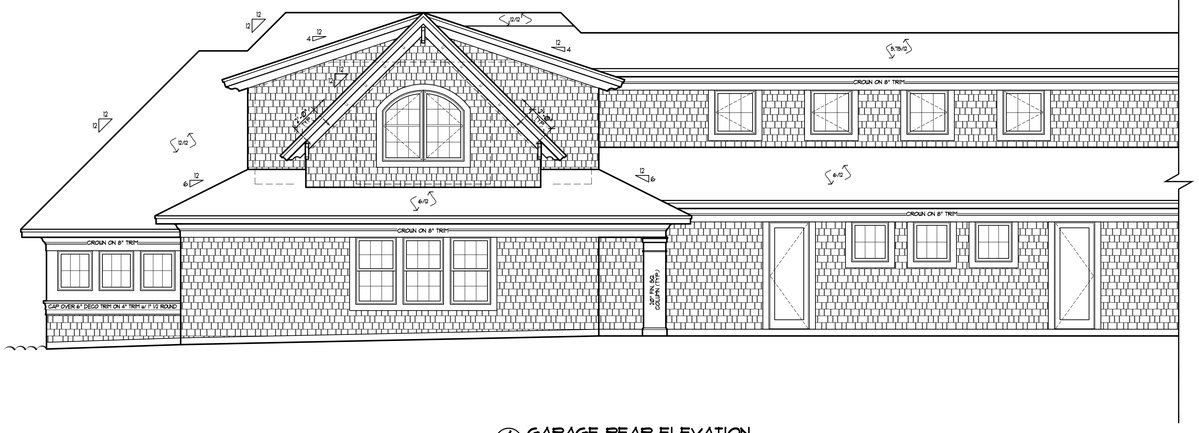


2 / 1 GARAGE FRONT ELEVATION
SCALE: 1/4"=1'-0"



3 / 1 GARAGE SIDE ELEVATION
SCALE: 1/4"=1'-0"





4 / 1 GARAGE REAR ELEVATION
SCALE: 1/4"=1'-0"

CEDAR SHAKE ROOF

6" CROWN ON 8" TRIM FRIEZE w/ 6" REVEAL

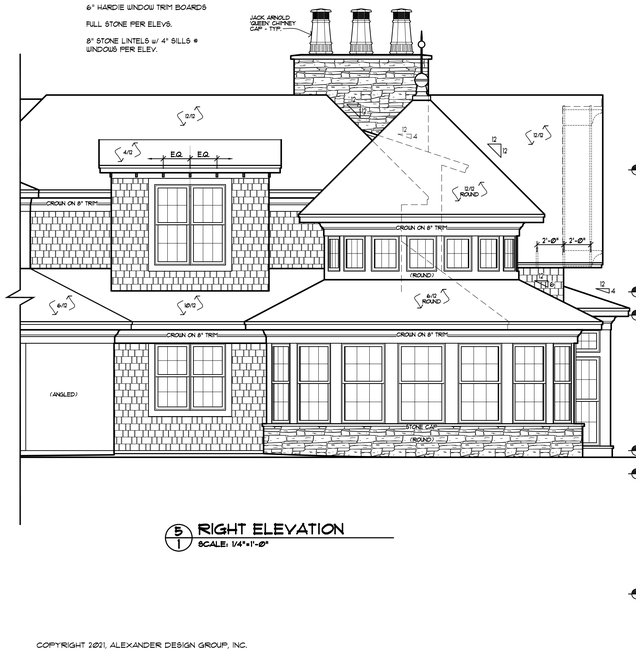
2x8 DECORATIVE RAFTER FRIEZE @ GABLES

CEDAR SHAKE SIDING PER ELEV.

6" HARDIE WINDOW TRIM BOARDS

FULL STONE PER ELEVS.

8" STONE LINTELS w/ 4" SILLS @ WINDOWS PER ELEV.



5 / 1 RIGHT ELEVATION
SCALE: 1/4"=1'-0"

6 / 1 REAR ELEVATION
SCALE: 1/4"=1'-0"

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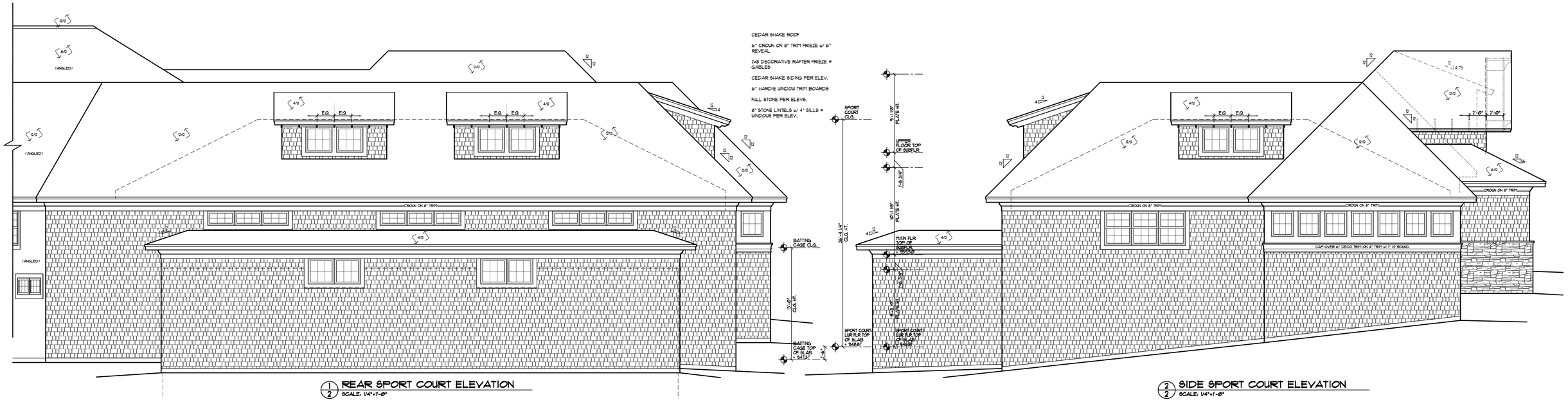
ALEXANDER DESIGN GROUP
275 LAKE STREET EAST
SUITE 102
WAYZATA, MN 55391
Phone: 952.473.8777
FAX: 952.473.8222

ISSUE DATE:
6 MAY 2021
PREVIOUS ISSUE DATES:

DRAWING DESCRIPTION:
SITE PLAN
REVIEW SET

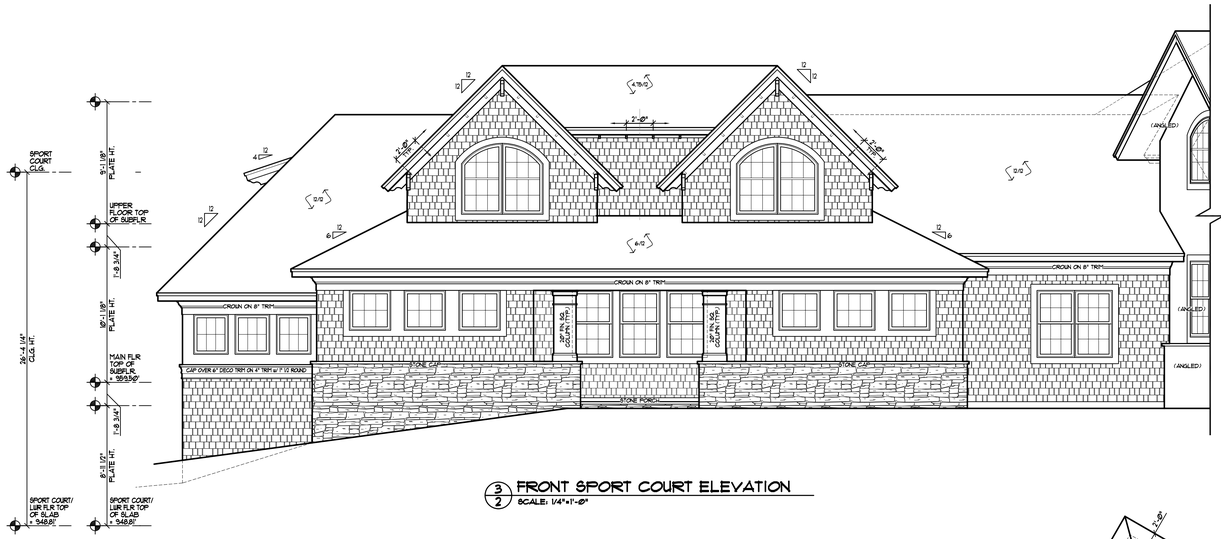
WINDY HILL ROAD RESIDENCE
100 WINDY HILL RD.
SUNFISH LAKE, MN
55077

1
1 OF 14

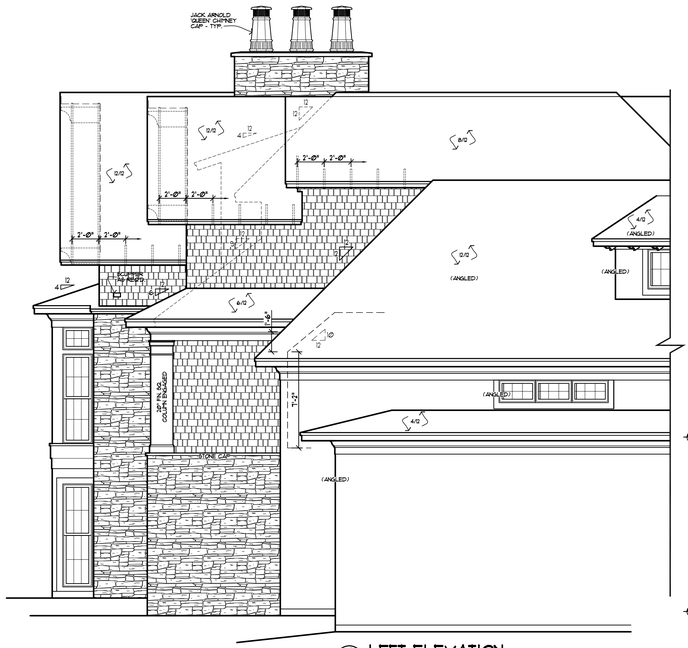


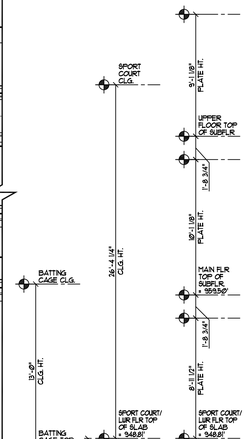
1/2 REAR SPORT COURT ELEVATION
SCALE: 1/4"=1'-0"

2/2 SIDE SPORT COURT ELEVATION
SCALE: 1/4"=1'-0"



3/2 FRONT SPORT COURT ELEVATION
SCALE: 1/4"=1'-0"





CEDAR SHAKE ROOF

6" CROWN ON 8" TRIM FRIEZE w/ 6" REVEAL

2x8 DECORATIVE RAFTER FRIEZE @ GABLES

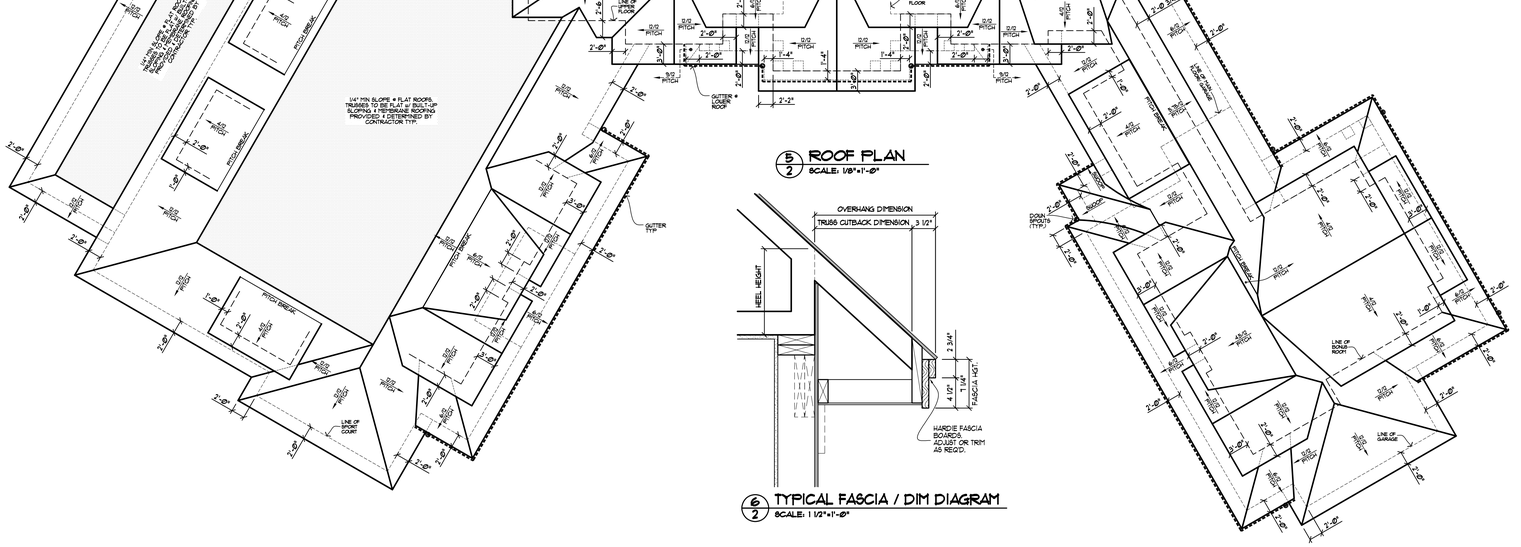
CEDAR SHAKE SIDING PER ELEV.

6" HARDIE WINDOW TRIM BOARDS

FULL STONE PER ELEVS.

8" STONE LINTELS w/ 4" SILLS @ WINDOWS PER ELEV.

4/2 LEFT ELEVATION
SCALE: 1/4"=1'-0"



5/2 ROOF PLAN
SCALE: 1/8"=1'-0"

6/2 TYPICAL FASCIA / DIM DIAGRAM
SCALE: 1 1/2"=1'-0"

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ALEXANDER DESIGN GROUP
275 LAKE STREET EAST
SUITE 102
WAYZATA, MN 55391
Phone: 952.473.8777
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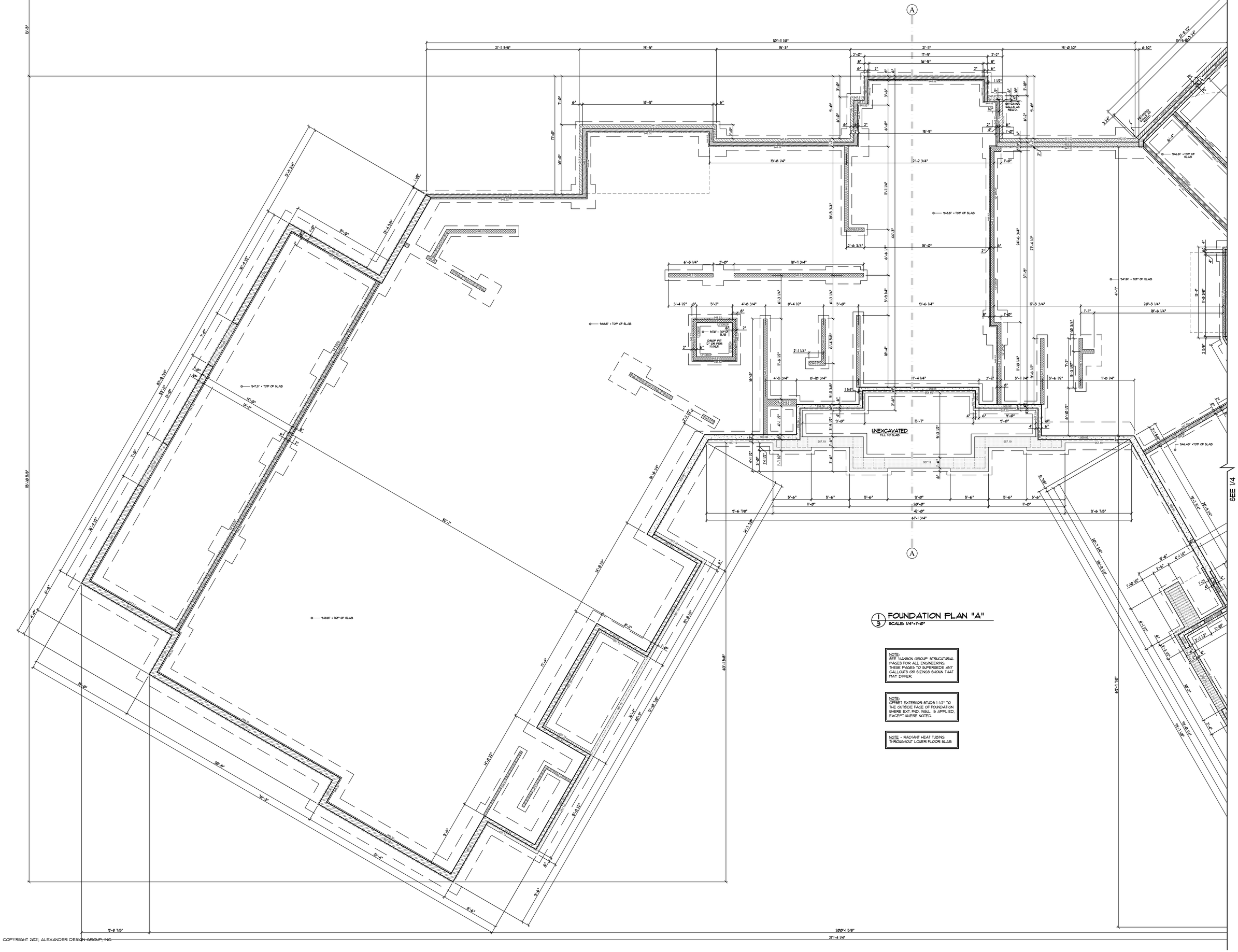
SITE PLAN
REVIEW SET

WINDY HILL ROAD RESIDENCE
100 WINDY HILL RD.
SUNFISH LAKE, MN
55077

2
2 OF 14



1/3 FOUNDATION PLAN "A"

SCALE: 1/4"=1'-0"

NOTE:
SEE 'HANSON GROUP' STRUCUTURAL PAGES FOR ALL ENGINEERING. THESE PAGES TO SUPERSEDE ANY CALLOUTS OR SIZINGS SHOWN THAT MAY DIFFER.

NOTE:
OFFSET EXTERIOR STUDS 1-1/2" TO THE OUTSIDE FACE OF FOUNDATION WHERE EXT. FND. INSUL. IS APPLIED, EXCEPT WHERE NOTED.

NOTE - RADIANT HEAT TUBING THROUGHOUT LOWER FLOOR SLAB

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ALEXANDER DESIGN GROUP
275 LAKE STREET EAST
SUITE 102
WAYZATA, MN 55391
Phone: 952.473.8777
FAX: 952.473.8222

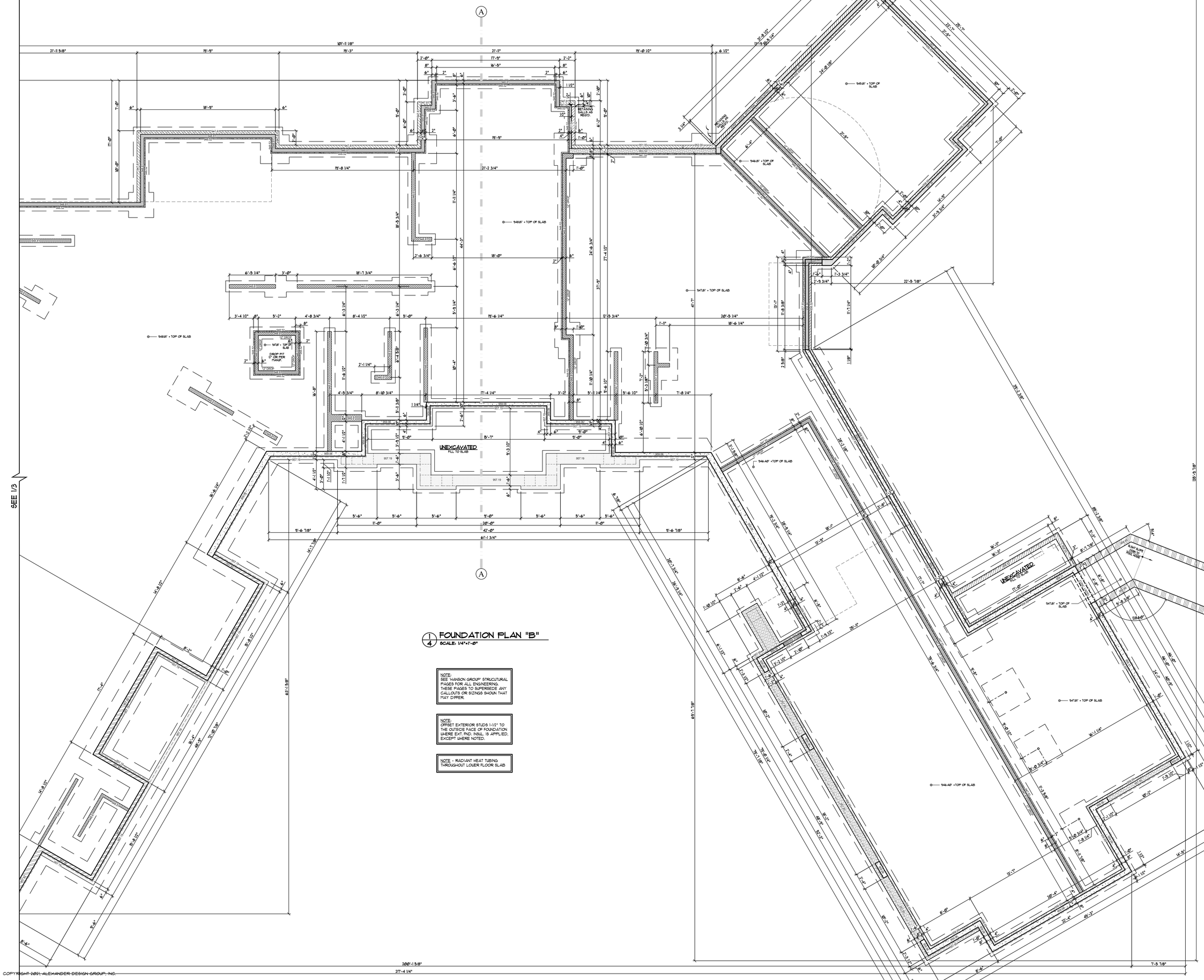
ISSUE DATE:
6 MAY 2021
PREVIOUS ISSUE DATES:

DRAWING DESCRIPTION:

SITE PLAN
REVIEW SET

WINDY HILL ROAD RESIDENCE
100 WINDY HILL RD.
SUNFISH LAKE, MN
55077

3
3 OF 14


SEE 1/3
SEE SHEET 14
UNEXCAVATED
FILL TO SLAB
948.81' +TOP OF SLAB
947.81' +TOP OF SLAB
946.40' +TOP OF SLAB
DROP PIT 12" CIR. PIER FOOTING
12" DECK
957.19
957.13
959.08
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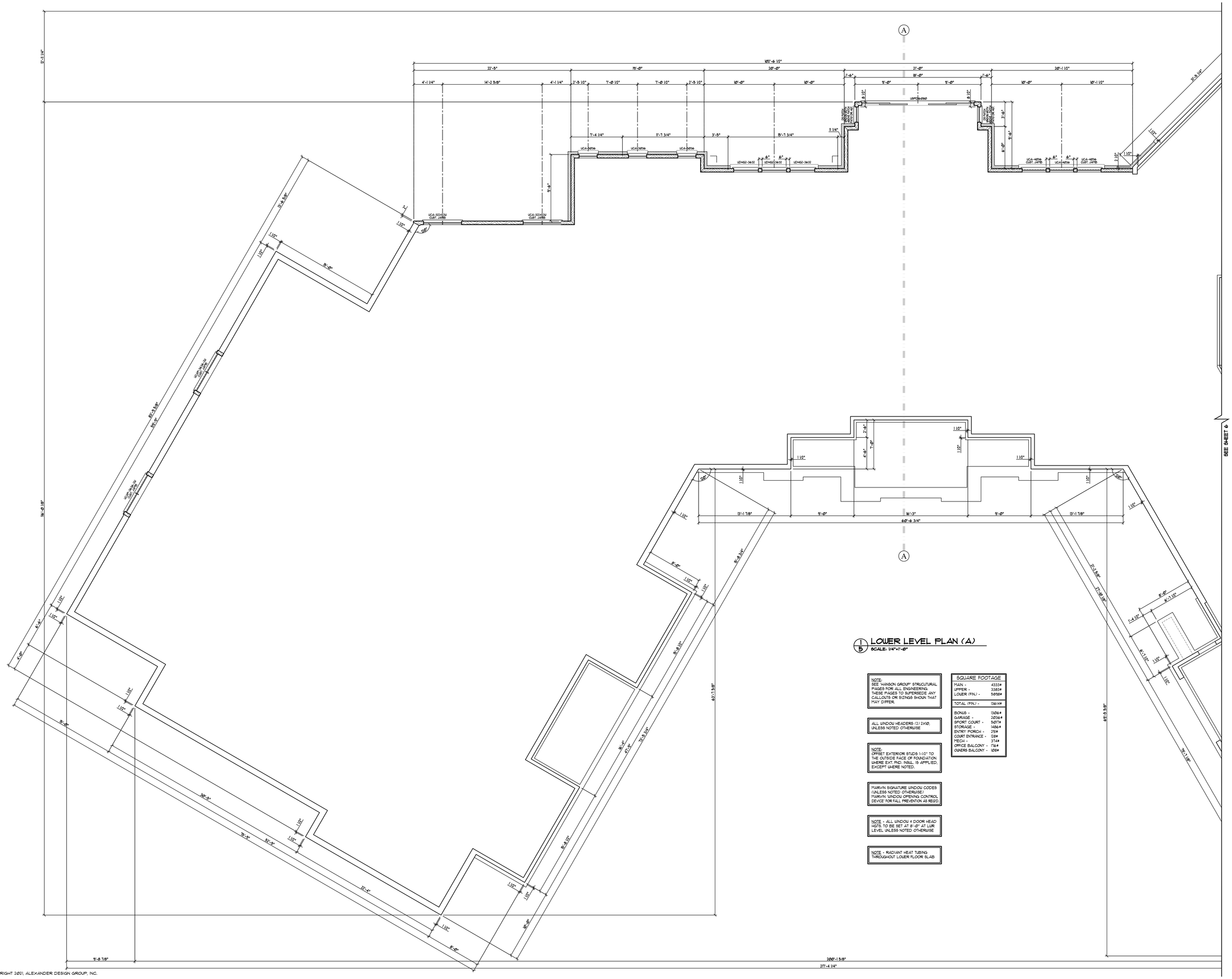
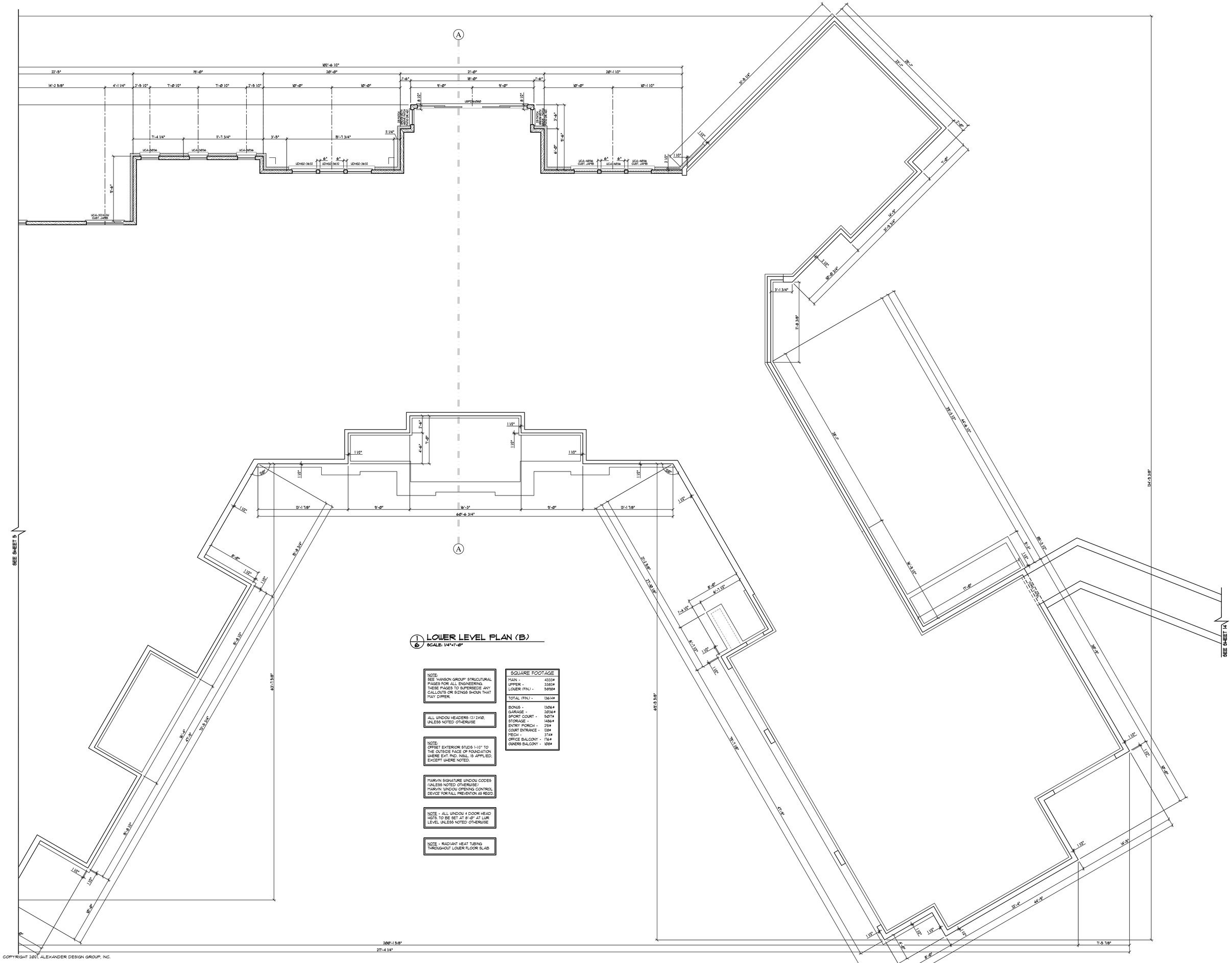

A
17'-2 1/4"
16'-9 7/8"
SEE SHEET 6
22'-5"
19'-0"
20'-0"
21'-0"
20'-1 1/2"
160'-6 1/2"
4'-1 1/4"
14'-2 5/8"
4'-1 1/4"
2'-5 1/2"
7'-0 1/2"
7'-0 1/2"
2'-5 1/2"
18'-0"
18'-0"
1'-6"
9'-0"
18'-0"
9'-0"
1'-6"
18'-0"
18'-0 1/2"
31'-3 1/4"
8 1/2"
8 1/2"
USPC34060
PATIO DOOR ROUGH OPENING 6'-0" WIDE BY 6'-8" HIGH
PATIO DOOR ROUGH OPENING 6'-0" WIDE BY 6'-8" HIGH
3'-6"
9'-6"
6'-0"
7'-4 1/4"
11'-7 3/4"
3'-5"
15'-7 3/4"
11 1/4"
UCA-4036
UCA-4036
UCA-4036
UCH402-3632
6"
6"
UCH402-3632
UCH402-3632
UCA-4036 CUST. JAMB
6"
6"
UCA-4036
UCA-4036 CUST. JAMB
1 1/2"
1 1/2"
UCA-3224LTU CUST. JAMB
UCA-3224LTU CUST. JAMB
9'-6"
7"
1 1/2"
90°
1 1/2"
1 1/2"
8'-6"
63'-3 5/8"
UCA-3624LTU CUST. JAMB
UCA-3624LTU CUST. JAMB
UCA-3624LTU CUST. JAMB
35'-3"
6'-3 5/8"
6'-6"
6'-0"
1 1/2"
1 1/2"
1 1/2"
1 1/2"
1 1/2"
1 1/2"
1 1/2"
1 1/2"
1 1/2"
1 1/2"
1 1/2"
1 1/2"
2'-6"
4'-6"
7'-0"
1 1/2"
1 1/2"
1 1/2"
90°
90°
13'-1 7/8"
9'-0"
16'-3"
9'-0"
13'-1 7/8"
60'-6 3/4"
8'-0"
1 1/2"
8'-8 3/4"
8'-8 3/4"
8'-8 3/4



1/6 LOWER LEVEL PLAN (B)

SCALE: 1/4"=1'-0"

NOTE:
SEE 'HANSON GROUP' STRUCTURAL PAGES FOR ALL ENGINEERING. THESE PAGES TO SUPERSEDE ANY CALLOUTS OR SIZINGS SHOWN THAT MAY DIFFER.

ALL WINDOW HEADERS (2) 2X10, UNLESS NOTED OTHERWISE

NOTE:
OFFSET EXTERIOR STUDS 1-1/2" TO THE OUTSIDE FACE OF FOUNDATION WHERE EXT. FND. INSUL. IS APPLIED, EXCEPT WHERE NOTED.

MARVIN SIGNATURE WINDOW CODES (UNLESS NOTED OTHERWISE)
MARVIN WINDOW OPENING CONTROL DEVICE FOR FALL PREVENTION AS REQ'D.

NOTE - ALL WINDOW & DOOR HEAD HGTS. TO BE SET AT 8'-0" AT LWR LEVEL UNLESS NOTED OTHERWISE

NOTE - RADIANT HEAT TUBING THROUGHOUT LOWER FLOOR SLAB

SQUARE FOOTAGE	
MAIN -	4333#
UPPER -	3383#
LOWER (FIN.) -	5898#
TOTAL (FIN.) -	13614#
BONUS -	1306#
GARAGE -	2036#
SPORT COURT -	9617#
STORAGE -	1486#
ENTRY PORCH -	291#
COURT ENTRANCE -	128#
MECH -	374#
OFFICE BALCONY -	176#
OWNERS BALCONY -	126#

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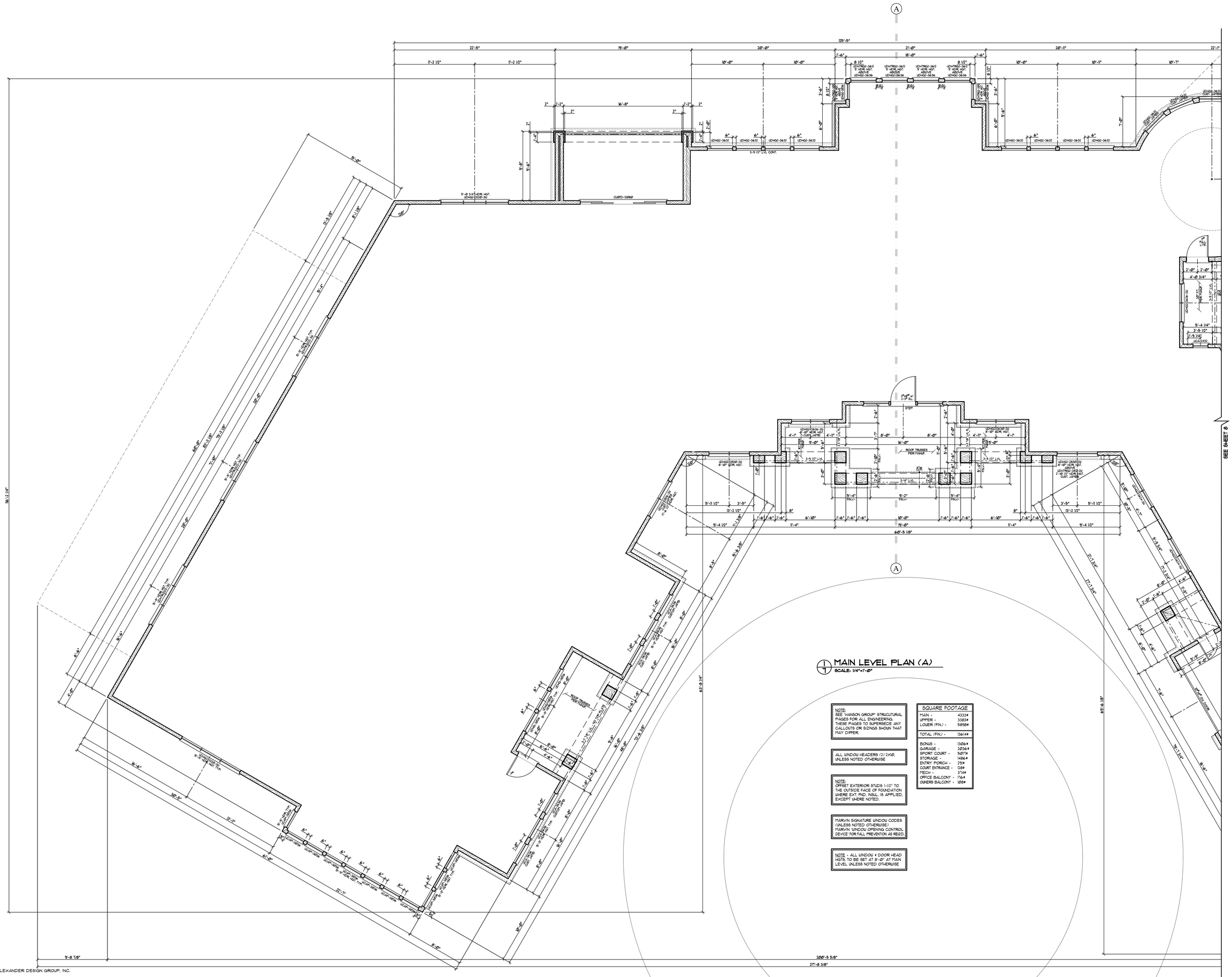
ALEXANDER DESIGN GROUP
275 LAKE STREET EAST
SUITE 102
WAYZATA, MN 55391
Phone: 952.473.8777
FAX: 952.473.8222

ISSUE DATE:
6 MAY 2021
PREVIOUS ISSUE DATES:

DRAWING DESCRIPTION:
SITE PLAN
REVIEW SET

WINDY HILL ROAD RESIDENCE
100 WINDY HILL RD.
SUNFISH LAKE, MN
55077

6
6 OF 14



1 MAIN LEVEL PLAN (A)
SCALE: 1/4"=1'-0"

NOTE:
SEE THANSON GROUP STRUCTURAL PAGES FOR ALL ENGINEERING. THESE PAGES TO SUPERSEDE ANY CALLOUTS OR SIZINGS SHOWN THAT MAY DIFFER.

ALL WINDOW HEADERS (2) 2X10, UNLESS NOTED OTHERWISE

NOTE:
OFFSET EXTERIOR STUDS 1-1/2" TO THE OUTSIDE FACE OF FOUNDATION WHERE EXT. IND. INSUL. IS APPLIED, EXCEPT WHERE NOTED.

MARVIN SIGNATURE WINDOW CODES (UNLESS NOTED OTHERWISE): MARVIN WINDOW OPENING CONTROL DEVICE FOR FALL PREVENTION AS REQ'D.

NOTE - ALL WINDOW & DOOR HEAD HGTS. TO BE SET AT 8'-0" AT MAIN LEVEL UNLESS NOTED OTHERWISE

SQUARE FOOTAGE	
MAIN -	4333#
UPPER -	3383#
LOWER (FIN.) -	5858#
TOTAL (FIN.) -	13614#
BONUS -	1306#
GARAGE -	2036#
SPORT COURT -	5071#
STORAGE -	1496#
ENTRY PORCH -	29#
COURT ENTRANCE -	128#
MECH -	374#
OFFICE BALCONY -	176#
OWNERS BALCONY -	108#

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275 LAKE STREET EAST
SUITE 102
WAYZATA, MN 55391
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ISSUE DATE:
6 MAY 2021
PREVIOUS ISSUE DATES:

DRAWING DESCRIPTION:
SITE PLAN
REVIEW SET

WINDY HILL ROAD RESIDENCE
100 WINDY HILL RD.
SUNFISH LAKE, MN
55077

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1/8 MAIN LEVEL PLAN (B)

SCALE: 1/4"=1'-0"

NOTE:
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ALL WINDOW HEADERS (2) 2X10, UNLESS NOTED OTHERWISE

NOTE:
OFFSET EXTERIOR STUDS 1-1/2" TO THE OUTSIDE FACE OF FOUNDATION WHERE EXT. FND. INSUL. IS APPLIED, EXCEPT WHERE NOTED.

MARVIN SIGNATURE WINDOW CODES (UNLESS NOTED OTHERWISE)
MARVIN WINDOW OPENING CONTROL DEVICE FOR FALL PREVENTION AS REQ'D.

NOTE - ALL WINDOW & DOOR HEAD HGTS. TO BE SET AT 8'-0" AT MAIN LEVEL UNLESS NOTED OTHERWISE

SQUARE FOOTAGE	
MAIN -	4333#
UPPER -	3383#
LOWER (FIN.) -	5898#
TOTAL (FIN.) -	13614#
BONUS -	1306#
GARAGE -	2036#
SPORT COURT -	5071#
STORAGE -	1486#
ENTRY PORCH -	29l#
COURT ENTRANCE -	128#
MECH -	374#
OFFICE BALCONY -	176#
OWNERS BALCONY -	108#

SEE SHEET 7

SEE SHEET 14

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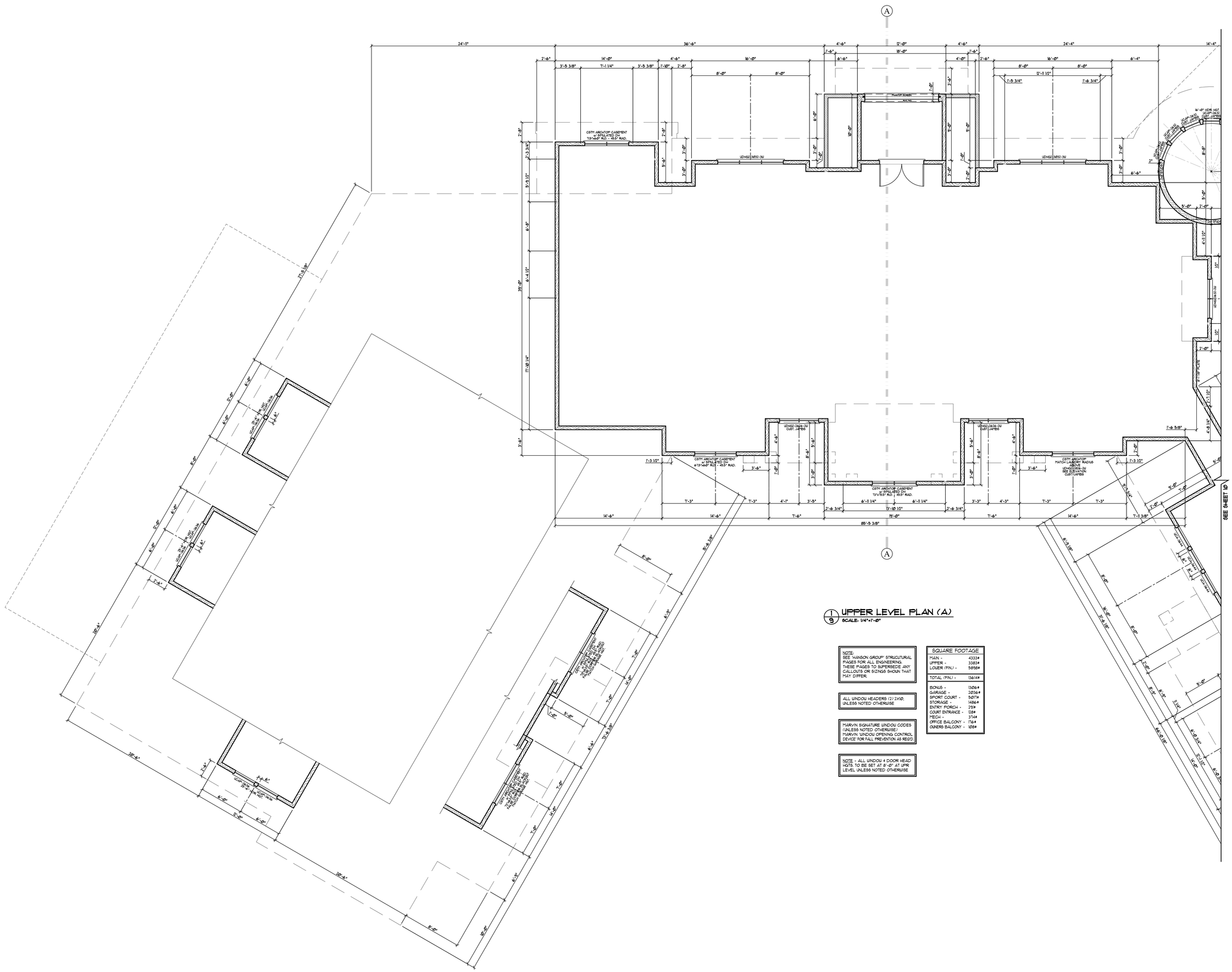
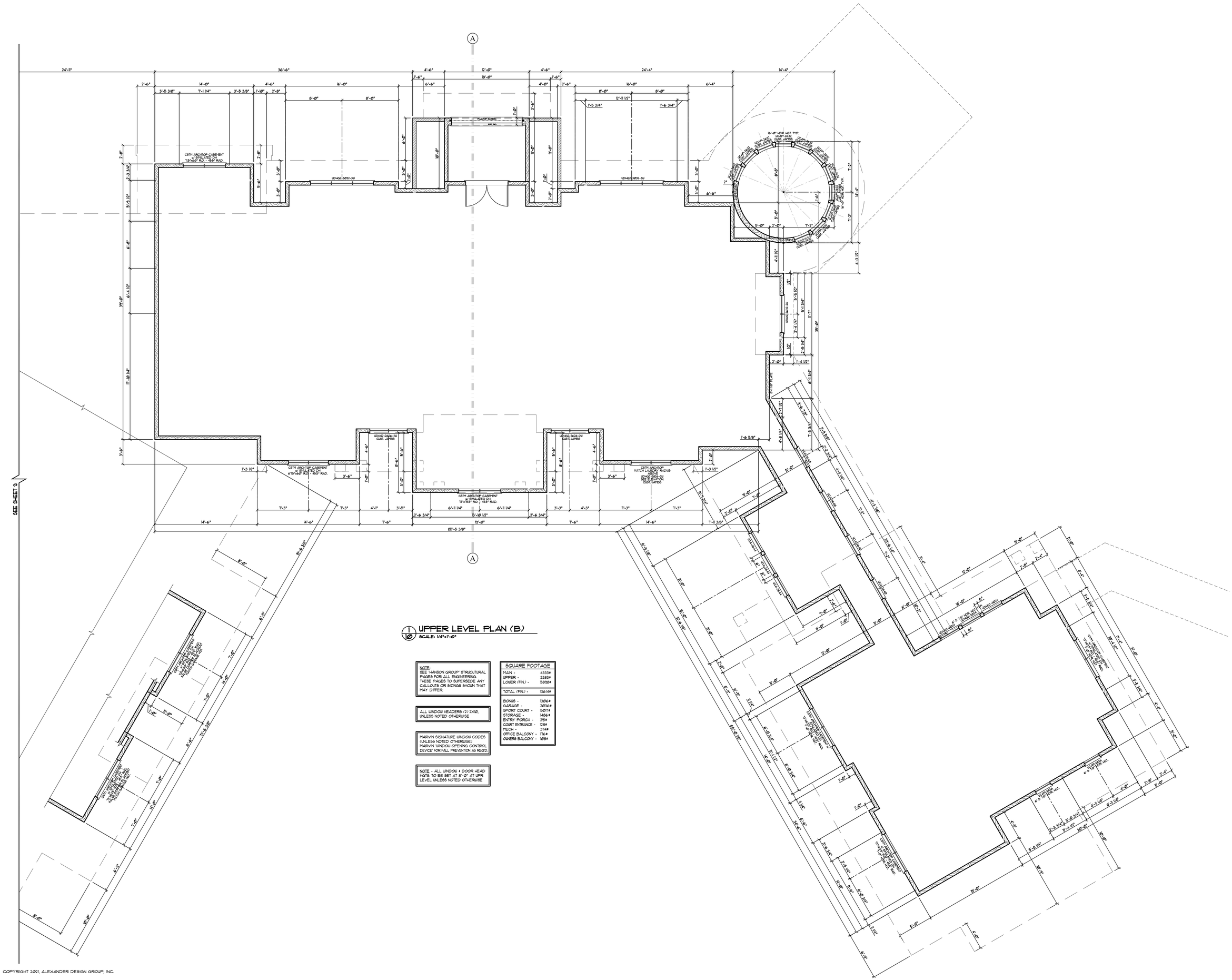
ISSUE DATE:
6 MAY 2021
PREVIOUS ISSUE DATES:

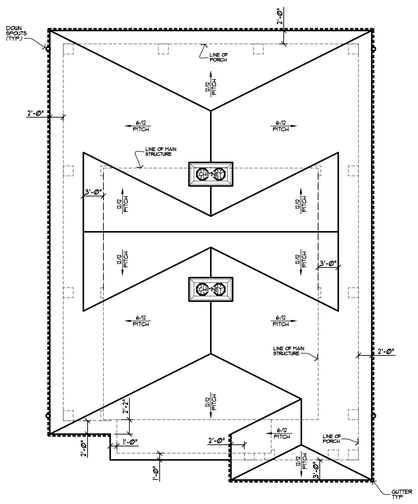
DRAWING DESCRIPTION:
SITE PLAN
REVIEW SET

WINDY HILL ROAD RESIDENCE
100 WINDY HILL RD.
SUNFISH LAKE, MN
55077

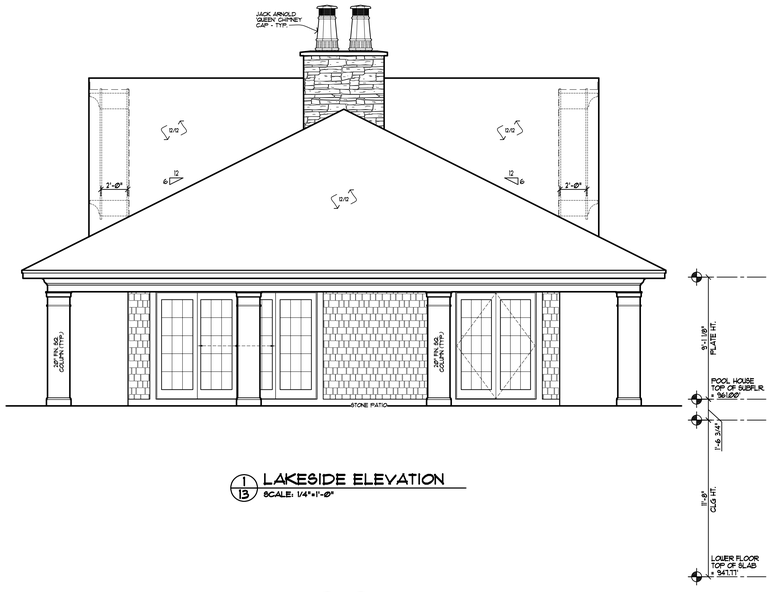
8
8 OF 14


A
24'-11"
36'-6"
4'-6"
12'-0"
4'-6"
24'-4"
14'-4"
2'-6"
14'-0"
4'-6"
16'-0"
4'-6"
18'-0"
4'-0"
2'-6"
16'-0"
6'-4"
3'-5 3/8"
7'-1 1/4"
3'-5 3/8"
1'-10"
2'-8"
8'-0"
8'-0"
6'-6"
8'-0"
8'-0"
12'-11 1/2"
7'-5 3/4"
7'-6 3/4"
C&TH ARCHITOP EASEMENT W/ SPELLATED DH 113'-9.60" RAD. - 49.5° RAD.
UCH402-3630-3U
UCH402-3630-2U CUST. LAMISS
16'-0" HDR. HGT. (C.A.P.-2630 CUST. LAMISS)
2'-8"
2'-3 3/4"
5'-3 1/2"
6'-8"
6'-4 1/2"
39'-0"
11'-8 1/4"
3'-6"
3'-6"
6'-6"
5'-0"
2'-0"
4'-3 1/2"
1/2"
2'-0"
6'-1 1/8" PLATE
2'-1 1/2"
7'-6 5/8"
4'-9 1/4"
5'-0"
1'-3 1/2"
C&TH ARCHITOP EASEMENT W/ SPELLATED DH 6'13'-9.60" RAD. - 49.5° RAD.
C&TH ARCHITOP EASEMENT W/ SPELLATED DH 13'-9.60" RAD. - 49.5° RAD.
C&TH ARCHITOP MATCH LAMONT RADIUS UCH402-2U SEE ELEVATION CUST.LAMISS
1'-3 1/2"
T'-3"
T'-3"
4'-1"
3'-5"
6'-11 1/4"
6'-11 1/4"
3'-3"
4'-3"
T'-3"
T'-3"
14'-6"
14'-6"
T'-6"
2'-6 3/4"
19'-10 1/2"
2'-6 3/4"
T'-6"
19'-0"
14'-6"
T'-11 3/8"
85'-5 3/8"
SEE SHEET 10
77'-5 1/8"
11'-0"
6'-0"
8'-0"
11'-0"
6'-0"
7'-6"
39'-6"
8'-0"
8'-0"
6'-3"
15'-5 3/8"
8'-0"
7'-0"
14'-0"
7'-0"
14'-0"
7'-0"
14

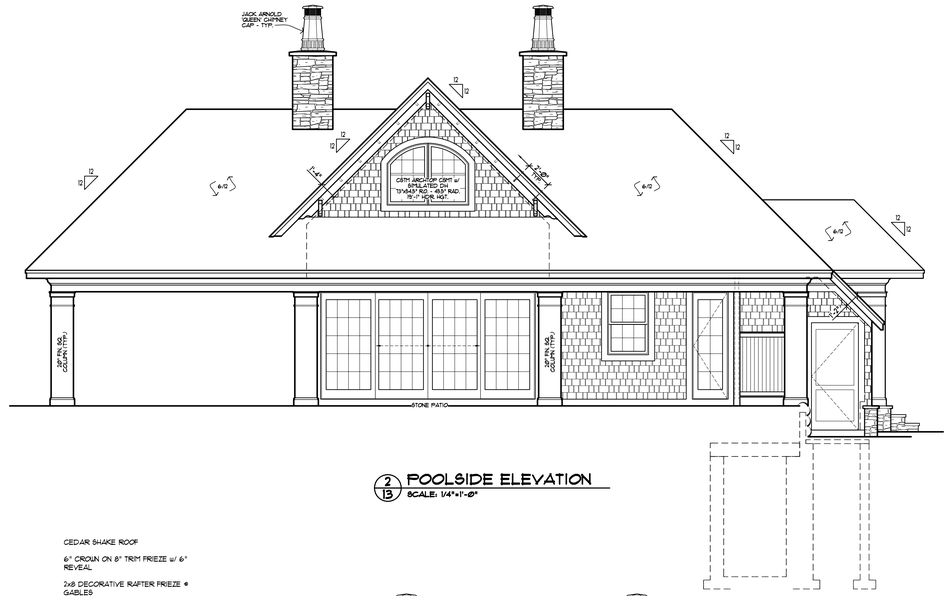

A
24'-11"
36'-6"
4'-6"
12'-0"
4'-6"
24'-4"
14'-4"
18'-0"
1'-6"
1'-6"
2'-6"
14'-0"
16'-0"
8'-0"
8'-0"
12'-11 1/2"
T-5 3/4"
T-6 3/4"
3'-5 3/8"
T-1 1/4"
3'-5 3/8"
1'-10"
2'-8"
2'-8"
3'-0"
3'-0"
6'-0"
18'-0"
9'-0"
7'-0"
2'-0"
3'-6"
1'-0"
39'-0"
11'-10 1/4"
6'-8"
6'-4 1/2"
2'-3 3/4"
5'-3 1/2"
CSTH ARCHITOP CASEMENT W/ SPRLATED DH 7.5"x66.0" RO, - 45.5° RAD.
UDH60 3652-3U
Fountain Screen
Axis No.
W/ 4'-0" HDR HGT. TYP.
UCHP-3630 CUST. JAMBS
UCHP-3630 CUST. JAMBS
UCHP-3630 CUST. JAMBS



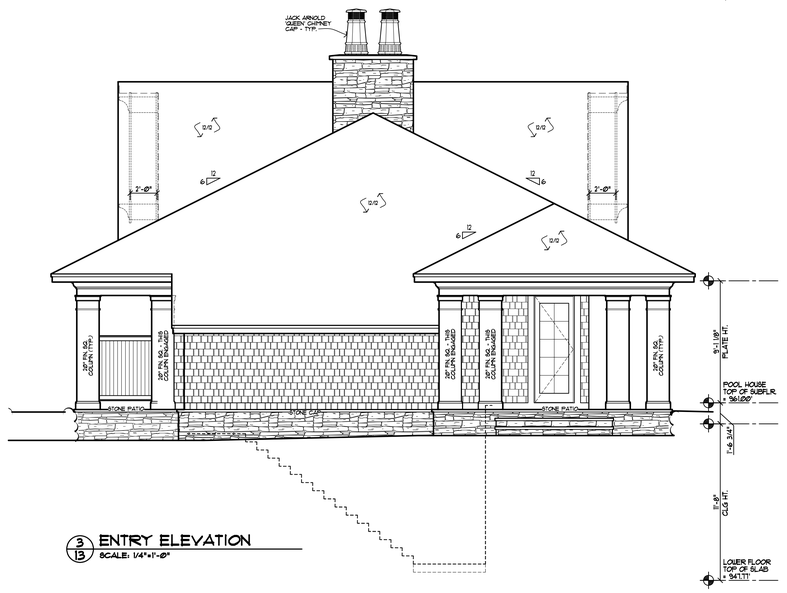
6/13 ROOF PLAN
SCALE: 1/8"=1'-0"



1/13 LAKESIDE ELEVATION
SCALE: 1/4"=1'-0"



2/13 POOLSIDE ELEVATION
SCALE: 1/4"=1'-0"



3/13 ENTRY ELEVATION
SCALE: 1/4"=1'-0"

CEDAR SHAKE ROOF

6" CROWN ON 8" TRIM FRIEZE w/ 6" REVEAL

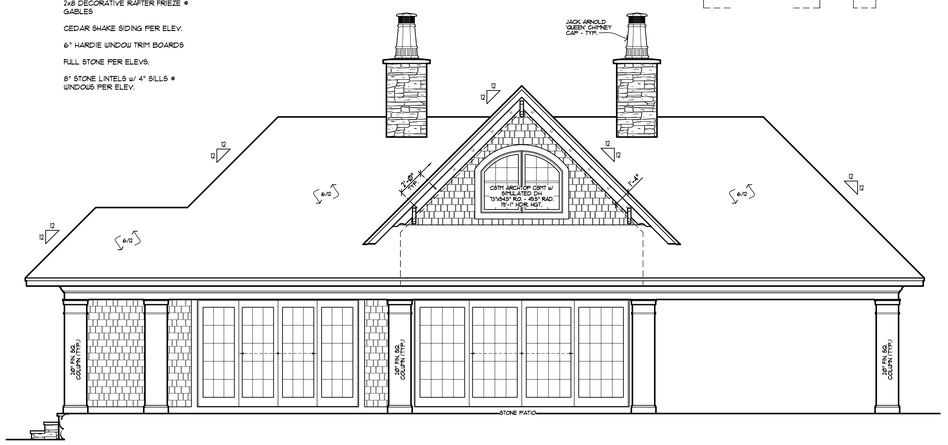
2x8 DECORATIVE RAFTER FRIEZE @ GABLES

CEDAR SHAKE SIDING PER ELEV.

6" HARDIE WINDOW TRIM BOARDS

FULL STONE PER ELEVS.

8" STONE LINTELS w/ 4" SILLS @ WINDOWS PER ELEV.



4/13 RINKSIDE ELEVATION
SCALE: 1/4"=1'-0"

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SUITE 102
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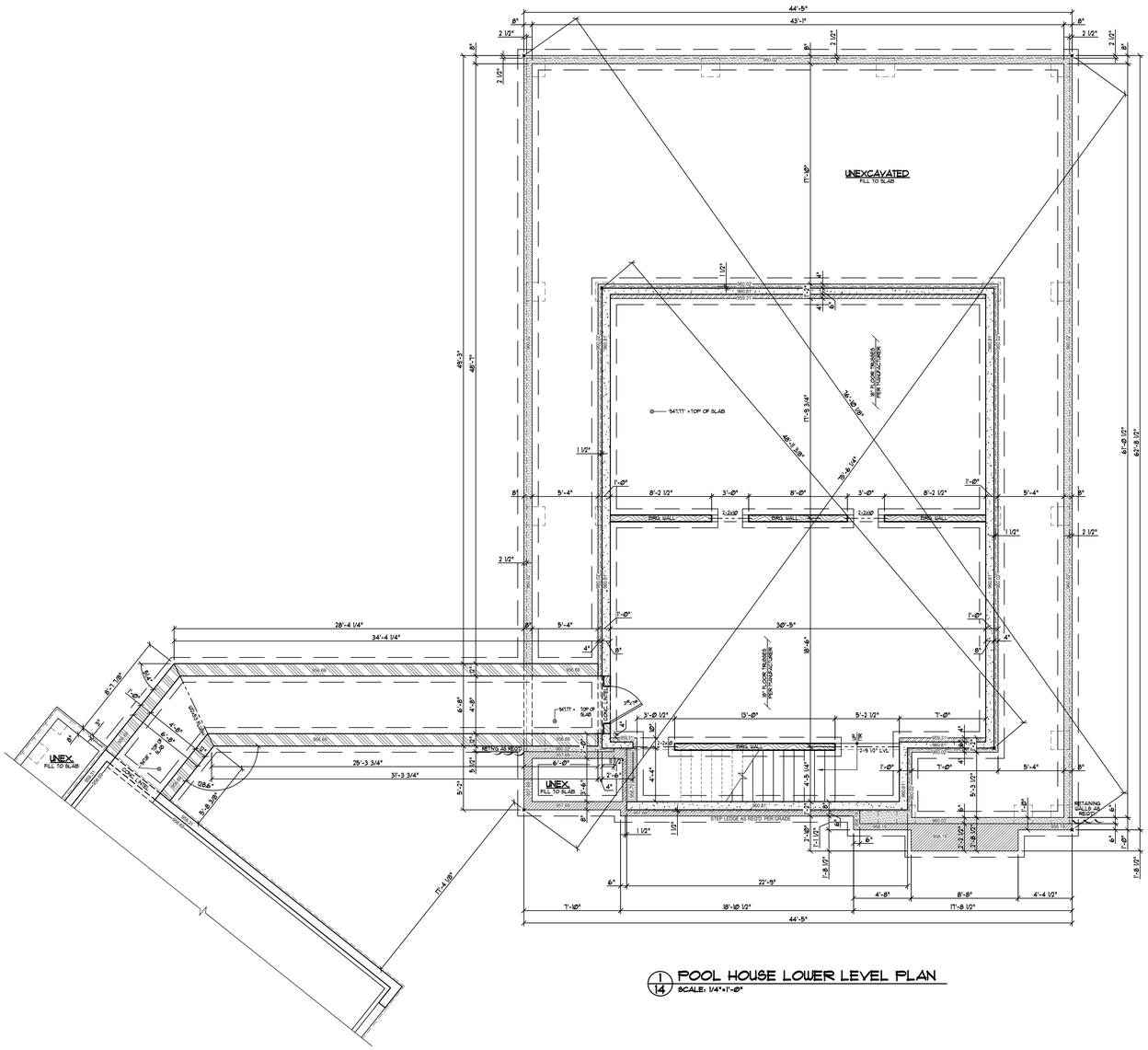
ISSUE DATE:
6 MAY 2021
PREVIOUS ISSUE DATES:

DRAWING DESCRIPTION:

SITE PLAN
REVIEW SET

WINDY HILL ROAD RESIDENCE
120 WINDY HILL RD.
SUNFISH LAKE, MN
55077

13
13 OF 14


UNEXCAVATED
FILL TO SLAB
UNEX.
FILL TO SLAB
44'-5"
43'-1"
49'-3"
46'-1"
17'-9"
17'-3 3/4"
28'-4 1/4"
34'-4 1/4"
25'-3 3/4"
31'-3 3/4"
30'-5"
18'-4"
22'-9"
4'-8"
8'-8"
4'-4 1/2"
1'-10"
18'-10 1/2"
11'-8 1/2"
44'-5"
62'-8 1/2"
61'-8 1/2"
11'-4 1/8"
8'-1 7/8"
13'-0"
5'-2 1/2"
7'-0"
5'-4"
3'-0 1/2"
2'-6"
4'-5 1/4"
9'-3 1/2"
2'-9 1/2" LVL
6"
1'-8 1/2"
2'-3 3/8"
2'-10 1/2"
2'-1 1/2"
2'-8 3/8"
RETAINING WALL AS REQ'D
STEP LEDGE AS REQ'D PER GRADE
941.11' +TOP OF SLAB
941.77' +TOP OF SLAB
941.77' +TOP OF SLAB
941.77

CCR8410K

Chancellor Outdoor Lantern

Mystic Black

DETAILS

Material: Steel

Glass/Shade Description: Clear Glass

LAMPING

Light Source: Incandescent

Bulb Included: No

Bulb Type: Candelabra Base

Bulb Quantity: 3

Watts per Bulb: 60

ELECTRICAL

Dimmable: Yes

Voltage: 120v

Wire Length: 0.5'

DIMENSIONS

Dimensions: 10.00" W x 23.50" H x 11.00" D

Backplate Dimensions: 7.50"H x 5.50"W

HCWO: 11"

Weight: 9.00 lbs

INSTALLATION

Location Rating: Wet

Install Position: Down

Sloped Ceiling Compatible: No

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03/31/2013

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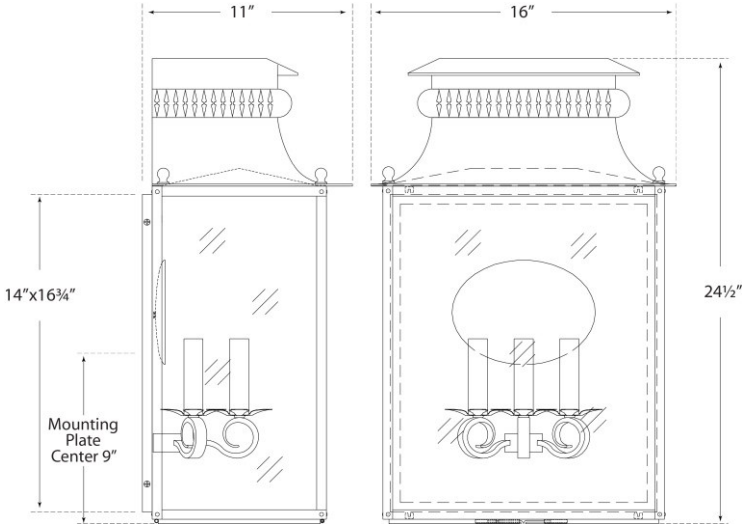
TEAR SHEET

Honore Large 3/4 Sconce
Item # SK 2327BC

Designer: Suzanne Kasler

Height: 24.5"
Width: 16"
Extension: 11"
Backplate: 14" x 16.75" Rectangle
Finishes: BC
Glass Options: CG
Socket: 3 - E12 Candelabra
Wattage: 3 - 60 C11
Weight: 23 Pounds



VISUAL COMFORT

auroralight™

TYPE:
CAT. #: HPL10-

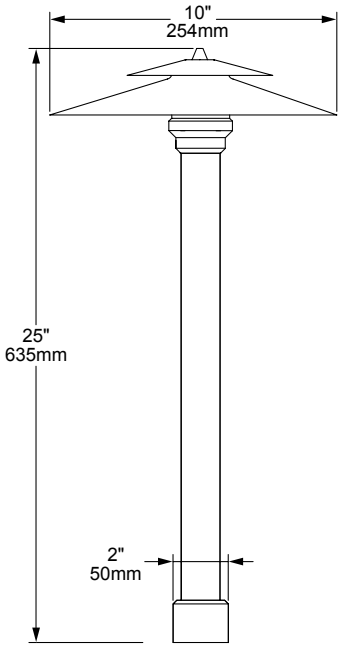
HPL10 BOREALIS

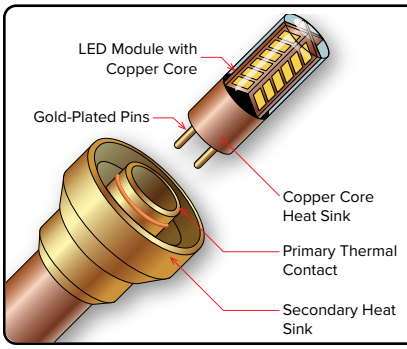
HPL10-NAT

The HPL10 graces the landscape with its regal profile and unparalleled craftsmanship. Scaled to suit architecture that requires a more substantial and bold look, this scale is well suited for illuminating grand driveways, walkways, and open areas requiring generous light spacing. Every HPL series path light includes a Thermally Integrated® Field Serviceable LED Module. Using Copper Core Technology®, the HPL LED module is precisely engineered to transfer heat away from the LED driver/circuit and dissipate throughout the luminaire, ensuring optimal performance, color consistency, and long life!

Features include:

- Interchangeable LED Module in 2.5, 3.5 or 5 Watts
- Up to 197 lumens at 5 Watts
- 2700 or 3000K (CRI 80 typ.)
- Thermally Integrated® Field Serviceable LED Module
- 12V Integral Driver, Dimmable to <10% typ.
- Compatible w/ 12V AC/DC ELV or MLV Transformers
- Solid Copper and Brass Construction
- Patent Pending





COPPER CORE TECHNOLOGY®

Copper Core® is a registered trademark of Auroralight. It is synonymous with the mark of quality and integrity. It means that our products are built upon a superior foundation of Solid Copper, ensuring every critical part functions seamlessly together Thermally integrated® one component to the next. Auroralight manufactured without compromise, engineered with passion, in the USA.

12V

THERMALLY INTEGRATED

SEE NEXT PAGE FOR ORDERING INFORMATION

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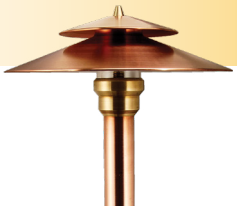
TYPE:
CAT. #: HPL10-

HPL10 BOREALIS



Prefix

ORDERING GUIDE: **HPL10** H (HIGH PERFORMANCE) PL (PATH LIGHT) 10 (INCHES)

INDICATES REQUIRED FIELD *INDICATES OPTIONAL FIELD* ✓ *INCLUDED* [_] *QUICK SPEC (See Below)*

QUICK SPEC SKU **HPL10-327-GS-NAT**

HPL10

Auroralight LED Module ✓
- **[227]** 2.5 Watts, 2700K
- **[230]** 2.5 Watts, 3000K
- **[327]** 3.5 Watts, 2700K
- **[330]** 3.5 Watts, 3000K
- **[527]** 5 Watts, 2700k
- **[530]** 5 Watts, 3000k

ACCESSORIES
(Select One)
- **[180]** 180˚ Directional Reflector™ *
- **[270]** 270˚ Directional Reflector™ *
- **[ID]** Internal Diffuser (Frosted)

* Visible light

MOUNT
- **[1/2]** 1/2" Male Thread
- **[2GS]** Ground Stake w 2" Cap ✓
- **[3GS]** Ground Stake w 3" Cap
- **[325GS]** Ground Stake w 3 1/4" Cap
- **[DS]** Deluxe Stake 9"
- **[TR-12]** 12" Trident Spike
- **[PB-S]** Power Box w/ Stake (Inc. 60W 120-12V transformer)
- **[PM-60]** 4" Pedestal Mount
- **[SM3]** 3 1/4" Surface Mount
- **[SM2]** 2 1/4" Surface Mount

FINISH
Standard:
- **[NAT]** Natural ✓

Plus ($):
- **[BLP]** Bronze Living Patina
- **[BLP-XD]** BLP Extra Dark

Premium ($$$):
- **[NI]** Nickel PVD
- **[PVD]** PVD Color (Contact Factory for Color Options)

ACCESSORIES

180 270 ID

MOUNTS

1/2 2GS 3GS 325GS DS TR PB-S PM SM2 SM3

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MADE IN THE USA

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auroralight™

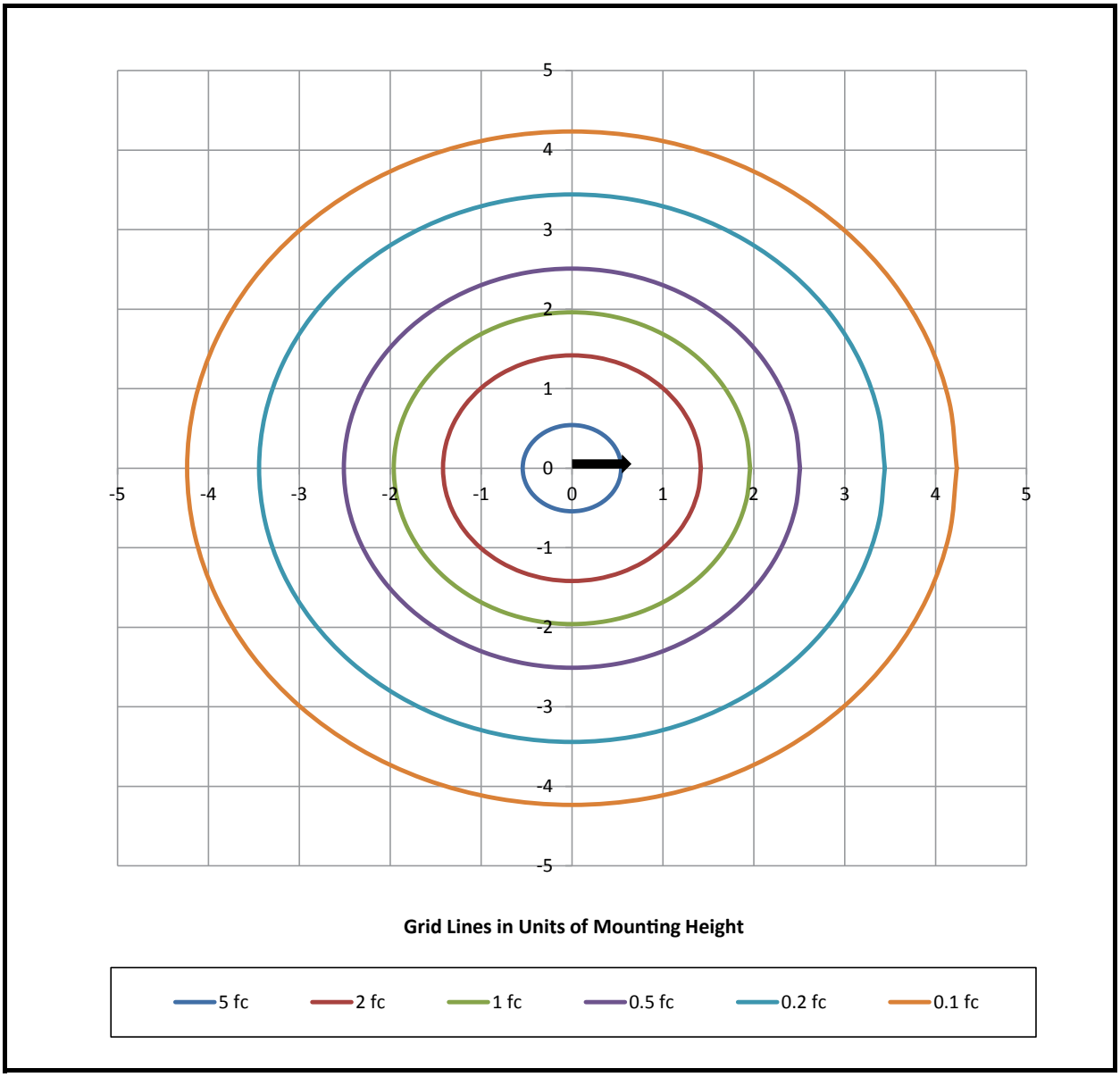
TYPE:
CAT. #: HPL10-

HPL10 BOREALIS

PHOTOMETRIC OVERVIEW

Information based on 5 Watts. To download more in-depth IES photometric data, visit auroralight.com/product/hpl10-borealis/

Mounting Height - 2 Feet



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