

Date November 15, 2018
To Town of Cumberland Planning Board
From Carla Nixon, Town Planner
Subject **Major Subdivision Amendment: Orchard Road - 10 Lot Subdivision**

I. REQUEST/OVERVIEW:

The applicant is TZ Properties. The applicant is requesting approval of a subdivision amendment to a previously approved 10 lot clustered subdivision on Orchard Road. The proposed amendment reflects the relocation of the former Lot # 10 to a new location. This amendment does not increase the number of lots, the amount of open space or the roadway layout. The lots will be served by private water and septic systems. The 24.9 acre parcel is located on Orchard Road (approximately 750' south of the intersection with Whitney Road) and is shown on Tax Assessor Map R-08, Lot 59 and on a portion of Map R08, Lot 59B in the Rural Residential 2 (RR 2) zoning district. Will Haskell, P.E. of Gorrill Palmer Engineers is the Applicant's representative.

II. PROJECT HISTORY:

Preliminary and Final Plan Approval: June 19, 2018.

Preliminary Plan Review: November 15, 2018; tabled.

Sketch Plan Review: July 18, 2017

Site Walk: The Board did not hold a site walk on this property.

III. DESCRIPTION:

Parcel size:	24.9 acres (1,087,735 sf)
Net Residential Density:	Allows for 15 lots; 10 are proposed.
Zoning:	Rural Residential 2
Development Type:	Clustered Subdivision Design
Min. Lot Size:	RR 2: 60,000 sf for clustered subdivision.
Lot frontage:	100' for clustered subdivision.
Setbacks:	Front: 25', Rear: 75', Side: 30' (combined = 75')
Water:	Private drilled wells
Septic:	Private septic systems.
Open Space:	8.13 acres (25% required; 32.5 % provided)
Wetlands:	88,453 sf (2.2 acres)
Trails:	None

Utilities: Underground electric, telephone and cable from Orchard Rd.

Street Lighting: None proposed.

Road: The road will extend 1,500' from Orchard Rd. to a cul-de-sac turn-a-round. There will be a 22' paved traveled way with a 4' paved by-way on one side and a 2' paved shoulder (where road is curbed; 2' gravel where not paved) on the other side. Road will be constructed to municipal standards for a Residential Access Road and proposed for public acceptance.

Sidewalks: 4' paved byway.

Homeowners Association: Draft Declaration of Protective Covenants and Common Easements have been reviewed by the Town Attorney and are on file.

Right, Title and Interest: Quitclaim deed with Covenant.

Waiver Request: See Page 2 of application packet binder.

➤ **Outside Agency Approvals Required:**

Agency	Type of Permit	Status
MDEP	Stormwater Permit/General Construction Permit	Permit dated 4-3-18 on file Awaiting amended permit.
U.S. Army Corp of Engineers	Category 2 Permit for stream crossing, wetland impact, vernal pool habitat impacts.	Permit dated 4-9-18 on file. Awaiting amended permit.
Maine Historic Preservation Commission		On File
Maine Natural Areas Program	Rare & Exemplary Botanical Features. None documented.	Letter dated 10-23-17 on file
Maine Inland Fisheries & Wildlife		Letter dated 10-27-17 on file.

IV. REVIEW COMMENTS:

DEPARTMENT HEAD REVIEWS:

William Longley, CEO: No comments.

Police Chief Charles Rumsey: No concerns.

Fire Chief Small: The application material for this subdivision project does not show any fire protection requirements as mandated by the Town of Cumberland's ordinances which include, but are not limited to, the following:

- 1) As denoted in the project drawings, all dwellings in this subdivision shall include an automatic fire protection sprinkler system conforming to applicable National Fire Protection Association (NFPA) standards, State of Maine Fire Marshal's Office mandates and approval by the Cumberland Fire Chief.
- 2) It is recommended, **but not required**, to have monitored fire alarm systems in each residence.
- 3) It is recommended, **but not required**, to have fire department approved key boxes on each residence.

TOWN PLANNER'S REVIEW:

1. The Board needs to reapprove the requested waivers. (See list below under Town Engineer's review.)

V. Engineering Reviews:

TOWN ENGINEER'S REVIEW: Jeff Read, P.E., Sevee and Maher. 11/15/18

NOTE: THIS REVIEW WILL BE SENT INDEPENDENTLY AS IT WAS NOT READY FOR INCLUSION AT THE TIME THIS REVIEW WAS UPLOADED.

TOWN ENGINEER'S REVIEW: Dan Diffin, P.E., Sevee and Maher. 6/7/18

As requested, Sevee & Maher Engineers, Inc. (SME) has conducted a peer review of the preliminary and final application for a Major Subdivision Review of the proposed Orchard Road Subdivision in Cumberland. The application materials received by SME were prepared by Gorrill-Parmer and consist of:

- Cover letter by William C. Haskell, P.E., describing the project and waiver requests.
- Application Package prepared by Gorrill-Palmer dated May 2018.
- Project plan set dated May 22, 2018.

PROJECT DESCRIPTION

The Applicant proposes to subdivide the 24.9-acre property into a total of ten (10) lots at Orchard Road in Cumberland, Maine. Lots will be accessed by a proposed public roadway constructed in accordance with Town Residential Access Road standards for subdivisions with greater than 50 vehicle trips per day. The subdivision will be served with individual septic systems and private water supply wells.

This project is being reviewed as a Major Subdivision as outlined in Chapter 250, Subdivision of Land of the Town of Cumberland Ordinances, most recently amended and adopted on January 12, 2011. The comments below relate to the appropriate Ordinance Sections.

Chapter 250: Subdivision of Land

SME has reviewed the applicable sections of Chapter 250 and has provided comments for those sections not found to be addressed by the Application. The remaining sections have been reviewed and found to comply with Chapter 250 requirements.

Section 250-29 Sewage Disposal - Groundwater Impact Study

1. If significant modifications are necessary to accommodate future building plans on a lot, then it is recommended that a revised groundwater impact study be prepared by a qualified Professional Engineer or Certified Geologist licensed in the State of Maine and submitted to the Town. SME recommends that this be included as a condition of approval.

Response: Acknowledged.

Section 250-49 – Waivers and modifications.

1. Trees 10-inch diameter or more: SME recommends approval of this waiver.
2. High Intensity Soil Survey: A wetland delineation and soil test pit information are consistent with the soils and geological map information provided in the Application. SME recommends approval of this waiver.
3. Soil boundaries and names superimposed on plot plan: SME recommends approval of this waiver.
4. Building locations: SME recommends approval of this waiver.
5. Location of temporary markers in field: SME recommends approval of this waiver.

General Comments

1. The curb locations shown on the road sections on Drawing No. 10 do not appear to match the curb locations shown on Drawing No. 7.

Response: Drawing 10 will be revised to reflect the curb locations shown on Drawing 7.

VI. MAJOR SUBDIVISION AMENDMENT REVIEW:

PROPOSED FINDINGS OF FACT - Chapter 250 - Subdivision of Land

The purpose of these standards shall be to assure the comfort, convenience, safety, health and welfare of the people, to protect the environment and to promote the development of an economically sound and stable community. To this end, in approving subdivisions within the Town of Cumberland, Maine, the Board shall consider the following criteria and before granting approval shall determine that the proposed subdivision:

1. Pollution. The proposed subdivision will not result in undue water or air pollution. In making this determination, it shall at least consider:
 - A. The elevation of the land above sea level and its relation to the flood plains;
 - B. The nature of soils and subsoil and their ability to adequately support waste disposal;
 - C. The slope of the land and its effect on effluents;
 - D. The availability of streams for disposal of effluents; and
 - E. The applicable state and local health and water resource rules and regulations;

The property is located a minimum of 390 feet above sea level and is not within a zone A 100 year floodplain; Test pits show that soils are capable of disposing of wastewater; the site does not contain excessive slopes; the existing stream will not be used for disposal of effluents; The subsurface wastewater disposal systems and well locations will conform to all applicable state and local regulations.

Based on the information provided, the standards of this section have been met.

2. Sufficient Water. The proposed subdivision has sufficient water available for the reasonable foreseeable needs of the subdivision;

The lots will be served by individual wells, a hydrogeologic study was submitted.

Based on the information provided, the standards of this section have been met.

3. Municipal Water Supply. The proposed subdivision will not cause an unreasonable burden on an existing water supply, if one is to be used;

The subdivision will not utilize a municipal water source.

Based on the information provided, the standards of this section have been met.

4. Erosion. The proposed subdivision will not cause unreasonable soil erosion or a reduction in the land's capacity to hold water so that a dangerous or unhealthy condition results;

The applicant has submitted an erosion and sedimentation control plan that has been reviewed and approved by the Town Engineer and MDEP.

Based on the information provided, the standards of this section have been met.

5. Traffic. The proposed subdivision will not cause unreasonable highway or public road congestion or unsafe conditions with respect to the use of the highways or public roads existing or proposed;

A traffic study dated October 2017 was submitted by the applicant. The forecasted trip generation is less than the 99 trip ends during a peak hour that would require a Maine DOT Traffic Movement Permit. The Town has approved the removal of several small trees to the north of the exit location which will provide the necessary site distance in that direction.

Based on the information provided, the standards of this section have been met.

6. Sewage disposal. The proposed subdivision will provide for adequate sewage waste disposal and will not cause an unreasonable burden on municipal services, if they are utilized;

The project will utilize private septic systems. The applicant has submitted a report by Sebago Technics that concludes "the wastewater disposal system will not result in an increase of NO³-N concentrations above 10mg/L in groundwater at the subdivision perimeter study. This report has been reviewed and approved by the Town Engineer.

Based on the information provided, the standards of this section have been met.

7. Municipal solid waste disposal. The proposed subdivision will not cause an unreasonable burden on the municipality's ability to dispose of solid waste, if municipal services are to be utilized;

Cumberland provides curbside trash collection and recycling through a contracted waste hauler. The addition of 10 new homes will not cause a burden on the municipality's ability to dispose of solid waste.

Based on the information provided, the standards of this section have been met.

8. Aesthetic, cultural and natural values. The proposed subdivision will not have an undue adverse effect on the scenic or natural beauty of the area, aesthetics, historic sites, significant wildlife habitat identified by the Department of inland Fisheries and Wildlife or the municipality, or rare and irreplaceable natural areas or any public rights for physical or visual access to the shoreline;

Letters are on file stating that the subdivision will not have an undue adverse effect on the scenic or natural beauty of the area, aesthetics, historic sites, significant wildlife habitat or rare and irreplaceable natural areas.

Based on the information provided, the standards of this section have been met for preliminary approval.

9. Conformity with local ordinances and plans. The proposed subdivision conforms to a duly adopted subdivision regulation or ordinance, comprehensive plan, development plan or land use plan, if any. In making this determination, the municipal reviewing authority may interpret these ordinances and plans;

The plans have been reviewed and approved by the town planner, the town engineer and town department heads.

Based on the information provided, the standards of this section have been met.

10. Financial and technical capacity. The subdivider has adequate financial and technical capacity to meet the standards of this section;

Technical capacity is evidenced by the use of the following experts: a professional engineer, a licensed land surveyor, a licensed site evaluator, licensed geologist and a wetland scientist.

Financial capacity: The applicant has provided a letter dated May 10, 2018 from UBS Financial Services stating that the applicant had a credit line account with \$700,000 available.

Based on the information provided, the standards of this section have been met.

11. Surface waters; outstanding river segments. Whenever situated entirely or partially within the watershed of any pond or lake or within 250 feet of any wetland, great pond or river as defined in Title 38 chapter 3, subchapter I, article 2-B, the proposed subdivision will not adversely affect the quality of that body of water or unreasonably affect the shoreline of the body of water;

The proposed subdivision will not adversely affect the quality of the mapped wetland or unreasonably affect the shoreline of the stream on the parcel. The proposed stream crossing and wetland impacts have been reviewed and approved by MDEP and the U.S. Army Corp of Engineers for the initial approval in June, 2018. An amended permit application has been submitted to the ACE and their approval is a condition of this amendment approval.

Based on the information provided, the standards of this section have been met.

12. Ground water. The proposed subdivision will not alone, or in conjunction with, existing activities, adversely affect the quality or quantity of ground water;

The soils have been found to have capacity to support sub surface waste water disposal systems.

The proposed subsurface waste disposal systems will conform to the Maine Subsurface Wastewater Disposal Rules. A Groundwater Impact Study conducted by a Maine Certified Geologist, has been reviewed and approved by the Town Engineer.

Based on the information provided, the standards of this section have been met.

13. Flood areas. Based on the Federal Emergency Management Agency's Flood Boundary and Floodway Maps and Flood Insurance Rate Maps, and information presented by the applicant whether the subdivision is in a flood-prone area. If the subdivision, or any part of it, is in such an area, the subdivider shall determine the 100-year flood elevation and flood hazard boundaries within the subdivision. The proposed subdivision plan must include a condition of plan approval requiring that principal structures in

the subdivision will be constructed with their lowest floor, including the basement, at least one foot above the 100-year flood elevation;

The parcel is shown on FEMA floodplain maps as being in Zone C (area of minimal flooding).

Based on the information provided, the standards of this section have been met.

14. Storm water. The proposed subdivision will provide for adequate storm water management;
A stormwater management plan was submitted as part of the application packet and has been reviewed and approved by the Town Engineer. A Stormwater Permit from MDEP is on file.

Based on the information provided, the standards of this section have been met.

15. Freshwater wetlands. All potential freshwater wetlands, as defined in 30-A M.R.S.A. §4401 (2-A), within the proposed subdivision have been identified on any maps submitted as part of the application, regardless of the size of these wetlands. Any mapping of freshwater wetlands may be done with the help of the local soil and water conservation district.

All wetlands within the proposed subdivision are outlined in the project plan set.

Based on the information provided, the standards of this section have been met.

16. River, stream or brook... Any river, stream, or brook within or abutting the proposed subdivision has been identified on any map submitted as a part of the application. For purposes of this section, "river, stream or brook" has the same meaning as in Title 38, Section 480-B, Subsection 9. [Amended; Effective. 11/27/89]

A perennial stream has been identified on the northerly end of the parcel.

Based on the information provided, the standards of this section have been met.

V. STANDARD CONDITIONS OF APPROVAL

This approval is dependent upon and limited to the proposals and plans contained in the application and supporting documents submitted by the applicant. Any variation from the plans, proposals and supporting documents, except de minimus changes as so determined by the Town Planner which do not affect approval standards, is subject to review and approval of the Planning Board prior to implementation.

VI. LIMITATION OF APPROVAL

Construction of the improvements covered by any site plan approval must be substantially commenced within twelve (12) months of the date upon which the approval was granted. If construction has not been substantially commenced and substantially completed within the specified period, the approval shall be null and void. The applicant may request an extension of the approval deadline prior to expiration of the period. Such request must be in writing and must be made to the Planning Board. The Planning Board may grant up to two (2) 1 year extensions to the periods if the approved plan conforms to the ordinances in effect at the time the extension is granted and any and all federal and state approvals and permits are current.

VII. RECOMMENDED CONDITIONS OF FINAL PLAN APPROVAL:

1. An amended permit application has been submitted to the ACE and this approval is a condition of this subdivision amendment approval.

2. An amended MDEP Stormwater permit application has been submitted to MDEP and this approval is a condition of this subdivision amendment approval.
3. Statement of values for required improvements for all lots to be submitted prior to releasing the plat for recording.
4. A performance guarantee in a form and amount acceptable to the Town Manager shall be provided prior to the pre-construction conference.
5. A blasting permit, if required, shall be obtained from the Code Enforcement Officer.
6. If significant modifications are necessary to accommodate future building plans on a lot, then a revised groundwater impact study should be prepared by a qualified Professional Engineer or Certified Geologist licensed in the State of Maine and submitted to the Town.
7. Clearing limits shall be flagged and approved by the peer review engineer prior to the preconstruction conference.
8. The trees that have been identified for removal to enhance sight distance to the north of the entrance/exit shall be flagged and removed prior to the start of work.
9. A pre-construction conference is required prior to the start of work.

November 15, 2018

Ms. Carla Nixon, Town Planner
Town of Cumberland
290 Tuttle Road
Cumberland, Maine 04021

Subject: Peer Review of Orchard Road Subdivision
Revisions to Final Approval
Orchard Road, Cumberland, Maine

Dear Ms. Nixon:

As requested, Sevee & Maher Engineers, Inc. (SME) has conducted a peer review of the revised application for a Major Subdivision Review of the proposed Orchard Road Subdivision in Cumberland. The application materials received by SME were prepared by Gorrill-Parmer and consist of:

- Application Package prepared by Gorrill-Palmer dated October 30, 2018.
- Project plan set dated September 25, 2018.

PROJECT DESCRIPTION

The Applicant proposes to subdivide the 24.9-acre property into a total of ten (10) lots at Orchard Road in Cumberland, Maine. Lots will be accessed by a proposed public roadway constructed in accordance with Town Residential Access Road standards for subdivisions with greater than 50 vehicle trips per day. The subdivision will be served with individual septic systems and private water supply wells.

This revision to the approved plan was submitted in response to an appeal from a project abutter. Plan modifications include relocation of Lot 10 and the proposed open space provided for the subdivision. Changed are minor and minimal impact to the original subdivision approved by the Town.

This project is being reviewed as a Major Subdivision as outlined in Chapter 250, Subdivision of Land of the Town of Cumberland Ordinances, most recently amended and adopted on January 12, 2011. The comments below relate to the appropriate Ordinance Sections.

Chapter 250: Subdivision of Land

SME has reviewed the applicable sections of Chapter 250 and has provided comments for those sections not found to be addressed by the Application. The remaining sections have been reviewed and found to comply with Chapter 250 requirements.

Section 250-29 Sewage Disposal - Groundwater Impact Study

1. If significant modifications are necessary to accommodate future building plans on a lot, then it is recommended that a revised groundwater impact study be prepared by a qualified Professional Engineer or Certified Geologist licensed in the State of Maine and submitted to the Town. SME recommends that this be included as a condition of approval.

Section 250-49 – Waivers and modifications.

1. Trees 10-inch diameter or more: SME recommends approval of this waiver.
2. High Intensity Soil Survey: A wetland delineation and soil test pit information are consistent with the soils and geological map information provided in the Application. SME recommends approval of this waiver.
3. Soil boundaries and names superimposed on plot plan: SME recommends approval of this waiver.
4. Building locations: SME recommends approval of this waiver.
5. Location of temporary markers in field: SME recommends approval of this waiver.

General Comments

1. The curb locations shown on the road sections on Drawing No. 10 do not appear to match the curb locations shown on Drawing No. 7.
2. Please verify the side setback for lot 10 near the southwest property corner is 30 feet (minimum) from the property line.

Please call me with any questions, or if you would like, I could meet with you to discuss our comments.

Sincerely,

SEVEE & MAHER ENGINEERS, INC.



Daniel P. Diffin, P.E.
Principal

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Subdivision
Amendment
Orchard Road
Cumberland, Maine

PREPARED FOR:
TZ Properties, LLC

October 2018

SUBMITTED BY:
Gorrill Palmer
707 Sable Oaks Drive
Suite 30
So. Portland, ME 0410
207.772.2515

October 30, 2018

Ms. Carla Nixon
Town Planner
Town of Cumberland
290 Tuttle Road
Cumberland, ME 04021

Subject: Orchard Road Subdivision
Orchard Road
Amendment to Major Subdivision Plan

Dear Carla,

TZ Properties, LLC received a subdivision permit from the Town of Cumberland on June 19, 2018. The site is shown on the Assessor's Map R08, Lot 59, is approximately 24.9 acres in size, and is located in the Rural Residential 2 (RR2) District. Figure 1 attached to this letter is a location map depicting the project site. The project also received an ACOE permit on April 9, 2018 for a stream crossing and wetland impacts and a MDEP Stormwater permit on April 3, 2018. A MDEP Permit-by-Rule application was submitted in December 2017 for the stream crossing.

Subsequent to receiving all applicable permits for the project, an abutter concern has resulted in an amendment to the proposed subdivision plan. The Applicant requests an amended Subdivision permit from the Town of Cumberland for the revision presented below. Applications for amended permits from the ACOE and MDEP will be submitted to the two agencies and will be copied to the Town.

Proposed Amendment

Due to an appeal from a project abutter, the Applicant has determined that the most beneficial outcome for all parties is to amend the approved subdivision by relocating Lot 10 from the approved location to the proposed location shown on the attached revised plan set. The previously approved Lot 10 has been revised to provide 73,472 sf of open space. The proposed Lot 10 has replaced 73,472 sf of previously approved open space resulting in no change to the number of proposed lots and no change to the provided area of open space.

The proposed change will have a minimal impact on the overall subdivision as approved by the Town. The following effects are noted.

- No change to the approved stream crossing permitted under the NRPA Permit-by-Rule and ACOE permit.
- No change to the ACOE approved impacts to the Vernal Pool and wetlands.
- No change to the number of proposed lots.
- No change to the proposed roadway, with the exception of removing a driveway apron from the location of the former Lot 10 and adding a driveway apron at the location of the amended Lot 10.
- No change to the open space provided within the subdivision.
- No change to the stormwater runoff treatment percentage permitted by MDEP.
- No change to the conclusions of the stormwater quantity analysis provided in the approved subdivision. The post-development peak flow as a result of the proposed development does not



result in an increase in runoff compared to the pre-development condition. Minor revisions to the stormwater analysis data as a result of the shift of 140 sf of driveway apron from the subcatchment of grassed underdrained soil filter #2 to grassed underdrained soil filter #1 are presented in the revised stormwater analysis attached to this amendment request.

- As a result of the relocation of Lot 10, a new soil test pit and nitrate plume location are shown on the revised plan set. David Chapman of Sebago Technics excavated a test pit on September 23, 2018 at the proposed Lot 10. The revised Groundwater Impact Study is attached to this amendment request.
- The Declaration of Protective Covenants and Common Easements document has been revised to include additional restrictions and descriptions as a result of the appeal by the project abutter. A draft copy of the revised document is attached to this application.
- No changes are proposed to the remainder of the subdivision requirements as presented in the approved application.
- The following waivers approved with the original submission have not changed and are requested as part of this amended application.
 - Trees 10" diameter or more – A waiver is requested to depict trees 10" in diameter or larger. 32.5% of the wooded site is proposed as open space which will preserve the existing woodland and a 75' buffer is provided along the parcel boundary. The open space and buffers will protect the existing trees. The remainder of the site is subject to development therefore the location of the trees is not beneficial.
 - High Intensity Soil Survey – A waiver is requested for the High Intensity Soil Survey for this project, due to small scale of this project. Test Pits have been conducted on all lots to determine suitability for on-site septic systems and a Hydro-geologic study has also been conducted for the project. A copy of the test pit logs and hydro-geologic study are included in Attachment 7.
 - Soil boundaries and names superimposed on plot plan – Since a waiver of the High Intensity Soil Survey is requested, a waiver to put the soil boundaries on the plot plan is requested. A medium intensity soil survey is included in the Stormwater Management Report and the Erosion Control Report for this project.
 - Building locations – The Applicant proposes to construct the roadway, storm drainage, and electric service. The lots will be developed by the lot owners. Building locations will be proposed by the lot owners at the time of applying for building permits to develop each lot. The building envelope, potential subsurface disposal location, and potential well location is indicated for each lot on the subdivision plans. The applicant requests a waiver from the requirement to show building locations on the subdivision plans.
 - Location of temporary markers in field – A waiver is requested for location of temporary markers in field. The centerline of the proposed roadway has been marked.
- The Applicant requests conditional approval of this amended subdivision, conditional upon receipt of an amended MDEP Stormwater permit and receipt of an amended Army Corps permit. Copies of these permits will be submitted to the Town upon receipt.

Attachments:

- Groundwater Impact Study
- Declaration of Protective Covenants
- Stormwater Analysis
- Revised plan set



Conclusion

As required by the Ordinance, Gorrill Palmer on behalf of TZ Properties, LLC has submitted the proposed revision to the approved subdivision plan to the Planning Board for approval. The project team looks forward to the Planning Staff and Board's review of this project.

A check for \$1,952.50 for the application and notice fee and peer review escrow fee will be delivered under separate cover to the Planning office on 10/30/2018.

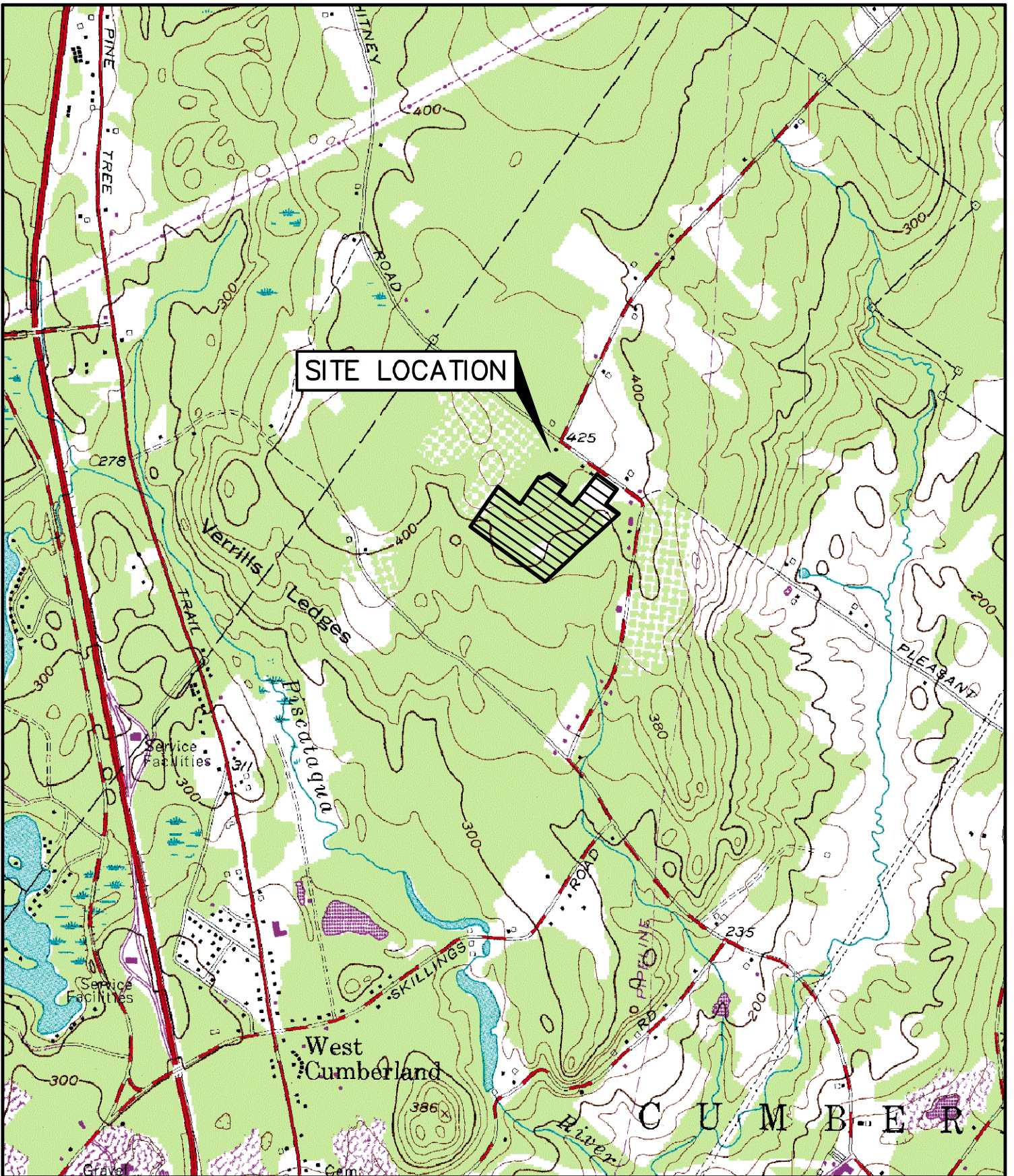
Sincerely,
Gorrill Palmer

William C. Haskell, P.E.
Principal



Enclosure

Copy: Zareh DerHagopian



U.S.G.S. Location Map
 Subdivision Feasibility, Orchard Road, Cumberland, Maine
 U.S.G.S. Cumberland Center, State-7.5 Minute Series (Topographic)

Design: WCH	Date: OCT 2017
Draft: LAN	Job No.: 3236.01
Checked: WCH	Scale: None
File Name: 3236-LOCMAP.dwg	



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Figure

1

GROUNDWATER IMPACT STUDY



**GROUNDWATER IMPACT STUDY UPDATE
LOT 10
ORCHARD ROAD SUBDIVISION
ORCHARD ROAD, CUMBERLAND**

INTRODUCTION:

The purpose of this study is to update a December 17, 2017 assessment report regarding the hydrogeologic conditions of the above-mentioned site and the estimate of the groundwater quality impact caused by the proposed on-site subsurface wastewater disposal systems. The update is necessary because of the proposed relocation of Lot 10. The new location of Lot 10 is depicted on the attached Groundwater Impact Study Map (Figure 2).

The proposed development is located along southwest and west sides of Orchard Road opposite the intersection of Orchard Road and Apple Blossom Way at the position indicated on the attached topographic map (Appendix A, Figure 1). Data used for this project includes a site plan titled *Concept Plan – Cluster for TZ Properties* prepared by Gorrill & Palmer and dated June, 2017; a site plan titled *Option B, Orchard Road Subdivision, Cumberland Maine* dated December, 2017, also by Gorrill and Palmer; test pit logs generated by Sebago Technics; and published regional maps and literature.

DISPOSAL FIELDS AND WATER SUPPLY:

The proposed disposal fields will be ten individual subsurface wastewater disposal systems (SSWD) each designed to serve a four-bedroom home. Water for this project will be provided by individual on-site wells. The location of test pits, wastewater disposal systems, well exclusion zones and simulated nitrate-nitrogen ($\text{NO}_3\text{-N}$) plumes are shown on the Groundwater Impact Study Map (Appendix A, Figure 2).

A potential water supply related concern was raised concerning the potential presence of arsenic in the groundwater under the site. Arsenic is a naturally occurring element in bedrock and was a component of some pesticides used in orchards historically. To evaluate the potential presence of arsenic in the bedrock aquifer under the site, Sebago Technics collected a sample from the water supply at 74 Orchard Road. The water supply consists of a drilled well located near the north wall of the house.

The sample was placed in containers provided by Katahdin Analytical (Katahdin) of Scarborough, Maine. The containers were stored in a cooler, on ice, and delivered to Katahdin the same day. Katahdin analyzed the samples for arsenic and nitrates. Katahdin reported the arsenic level at below the Practical Quantitation Level (PQL) of 0.008 mg/L. The nitrate concentration was reported at 1.1 mg/L. A copy of the Katahdin report is in Appendix B.

SURFICIAL GEOLOGY AND TOPOGRAPHY:

The site is located on the *U.S.G.S. Cumberland Center, Maine 7.5 Minute Series* (Appendix A, Figure 1). Site area topography slopes generally downward from north to south towards Blanchard Road.

The *Significant Sand and Gravel Aquifer Map of the Cumberland Center, Maine Quadrangle* (Appendix A, Figure 3) shows that the site does not fall within a Significant Sand and Gravel Aquifer.

The *Surficial Geology Map of the Cumberland Center, Maine Quadrangle* (Appendix A, Figure 5) shows glacial till underlying the Site.

According to the U.S. Department of Agriculture-National Cooperative Soil Service (USDA-NCSS) soil web, the soil under the site consists of four types of glacial till: Hollis fine sandy loam, Paxton fine sandy loam, Woodbridge fine sandy loam and Ridgebury fine sandy loam. Hollis and Paxton soil forms at the summits and shoulders of hills. Woodbridge soil forms till plains on the shoulders and back slopes of hills. Ridgebury forms till plains in toe slopes environments. Logs for Testpit 101 to 110, 301 to 303, and 401 are included in Appendix B.

HYDROGEOLOGY:

Precipitation falling on this site enters the open pore spaces on the upper soil horizon, and percolates vertically downward until the water table is encountered. Thereupon, flow is both horizontal and downhill. Two factors of importance in determining the amount of recharge of precipitation into the soil on this site are the groundwater slope or gradient and soil texture. The groundwater seepage velocity is used to calculate the extent of groundwater impact downgradient of the disposal field sites and has been calculated utilizing the following equation:

$$v = Ki/n$$

where,

v	= groundwater seepage velocity (ft/day)
K	= hydraulic conductivity (ft/day)
i	= hydraulic gradient (ft/ft)
n	= effective porosity (dimensionless)

The hydraulic conductivity of the soil in the disposal area is estimated at 2 feet per day. The average hydraulic gradient under the areas downgradient of the disposal fields varied from 3 to 8%. A groundwater surface gradient of 1.5% was used for the flatter areas and 3% for steeper areas was used as the slope parameter in the model.

CONTAMINATION POTENTIAL:

It is assumed that the worst potential for contamination is the nitrate-nitrogen (NO₃-N) released from wastewater disposal fields. NO₃-N is known to cause methemoglobinemia in infants and is a suspected cause of stomach cancer. The average NO₃-N concentration value of untreated septic tank effluent entering a disposal field is assumed to be 40 milligrams per liter (mg/L). A level of 1.1 mg/L (according to onsite sampling results) was used as a background nitrate concentration in the aquifer. The Federal and State Drinking Water Limit for NO₃-N in public water supplies is 10 mg/L.

The primary mechanism of NO₃-N concentration reduction is through dilution in groundwater and surface water. Since groundwater is always slowly flowing beneath a disposal field, the NO₃-N intercepting the water table below a disposal field mixes and dilutes in the groundwater and moves in the direction of groundwater flow in the form of a plume. NO₃-N is more concentrated in the center than near the edges of a plume. A source that emanates a constant quantity of potential contaminants into groundwater will eventually reach a "steady state." The plume can then be characterized with regard to size, shape, and distribution of concentration.

The method of analysis used to assess the impact of the septic systems on groundwater is an analytical model used to simulate individual plumes. Analysis of the results of this model is instructive in assessing the possible shape and size of wastewater plumes. The model was developed by Baetsle (1969) to depict the migration of radionuclides in porous media, which is adapted here to represent the subsurface migration of $\text{NO}_3\text{-N}$. It is a three-dimensional transport model of plumes generated by continuous, point sources in a uniform groundwater flow field. Variables employed include seepage velocity (hydraulic conductivity multiplied by hydraulic gradient, divided by effective porosity), nitrate mass, time, and dispersivity. The concentration of $\text{NO}_3\text{-N}$ is calculated at a downgradient point at a specified time by use of the following equation:

$$C(x, y, z, t) = \left[\frac{CoVo}{8(\pi)^{1.5} \sqrt{DxDyDz}} \right] \exp \left[-\frac{(x - vt)^2}{4Dxt} - \frac{y^2}{4Dyt} - \frac{z^2}{4Dzt} \right] ;$$

where,

$C(x,y,z,t)$	=	$\text{NO}_3\text{-N}$ concentration at specified location and time (mg/L)
x	=	specified distance from source parallel to the direction of groundwater flow (ft)
y	=	specified distance from source perpendicular to the direction of groundwater flow (ft)
z	=	specified vertical distance from source (ft)
Co	=	initial concentration at the source (mg/L)
Vo	=	volume of source (ft^3)
t	=	time elapsed (day)
Dx,Dy,Dz	=	dispersion coefficient along the x,y,z axes (ft^2/day)
v	=	average linear velocity (ft/day).

Assuming that groundwater flow is horizontal, the dispersion coefficient can be calculated as follows:

$$D_{x,y,z} = v_{x,y,z} \alpha_{x,y,z};$$

where $\alpha_{x,y,z}$ is dispersivity (ft).

The contaminant velocity of a solute subject to sorption/adsorption is calculated as follows:

$$V_p = v/R_d;$$

where V_p is the contaminant velocity (ft/day) and R_d is the retardation factor (unitless). The retardation factor for $\text{NO}_3\text{-N}$ is equal to one, however, so the contaminant velocity is equal to the average linear velocity ($V_p = v$). Dispersivity is estimated by an equation based on a weighted least-squares statistical analysis of collected longitudinal dispersivity data versus scale (Xu, Eckstein, 1995). Longitudinal dispersivity can be estimated based on the following calculation:

$$\alpha_x = (0.83)[\log_{10}(L_p)]^{2.414};$$

where α_x is longitudinal dispersivity (ft), and L_p is the plume length (ft). The plume length is a function of the elapsed time and is calculated by the following equation:

$$L_p = V_p t.$$

It has already been established that for $\text{NO}_3\text{-N}$, the contaminant velocity (V_p) is equal to the average linear velocity (v). Thus, $L_p = vt$. The transverse and vertical dispersivities are related to the longitudinal dispersivity, as shown below:

$$\begin{aligned} y &= x/3 \\ z &= x/20. \end{aligned}$$

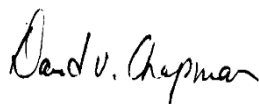
This method is used to calculate a downgradient $\text{NO}_3\text{-N}$ concentration at a specified elapsed time for a single release of $\text{NO}_3\text{-N}$. However, by applying the superposition technique, the estimated concentration of $\text{NO}_3\text{-N}$ downgradient at a specified time can be calculated for reoccurring daily $\text{NO}_3\text{-N}$ releases to simulate the $\text{NO}_3\text{-N}$ plume of a septic system (Chang, *et al.* 1998).

In the main equation, CoVo is represented as a daily mass of nitrate-nitrogen loaded into the subsurface wastewater disposal systems. This is estimated by multiplying the design flow volume of effluent by the assumed $\text{NO}_3\text{-N}$ concentration in the effluent. The simulations were run based on average annual precipitation during drought conditions (60% of average annual precipitation). The $\text{NO}_3\text{-N}$ concentration of the wastewater is diluted by the rainfall infiltrating the disposal fields during drought conditions. The rainfall is assumed to have a $\text{NO}_3\text{-N}$ concentration of 0.5 mg/L. The percent of rainfall infiltrating the soils above the disposal fields is estimated based on the soil type and ground surface slope (Maine Department of Environmental Protection, 1991).

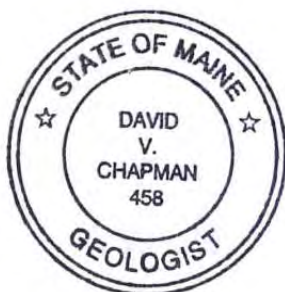
Parameters and results for the disposal field are displayed in Appendix D. The resulting 10 mg/L $\text{NO}_3\text{-N}$ concentration plume lengths for the disposal fields are shown on the site plan. The 10 mg/L plumes do not cross the boundaries of the subdivision.

CONCLUSION:

According to the assumptions made for this simulation, the wastewater disposal system will not result in an increase of $\text{NO}_3\text{-N}$ concentrations above 10 mg/L in groundwater at the subdivision perimeter property line.



David Chapman
Maine Certified Geologist #458



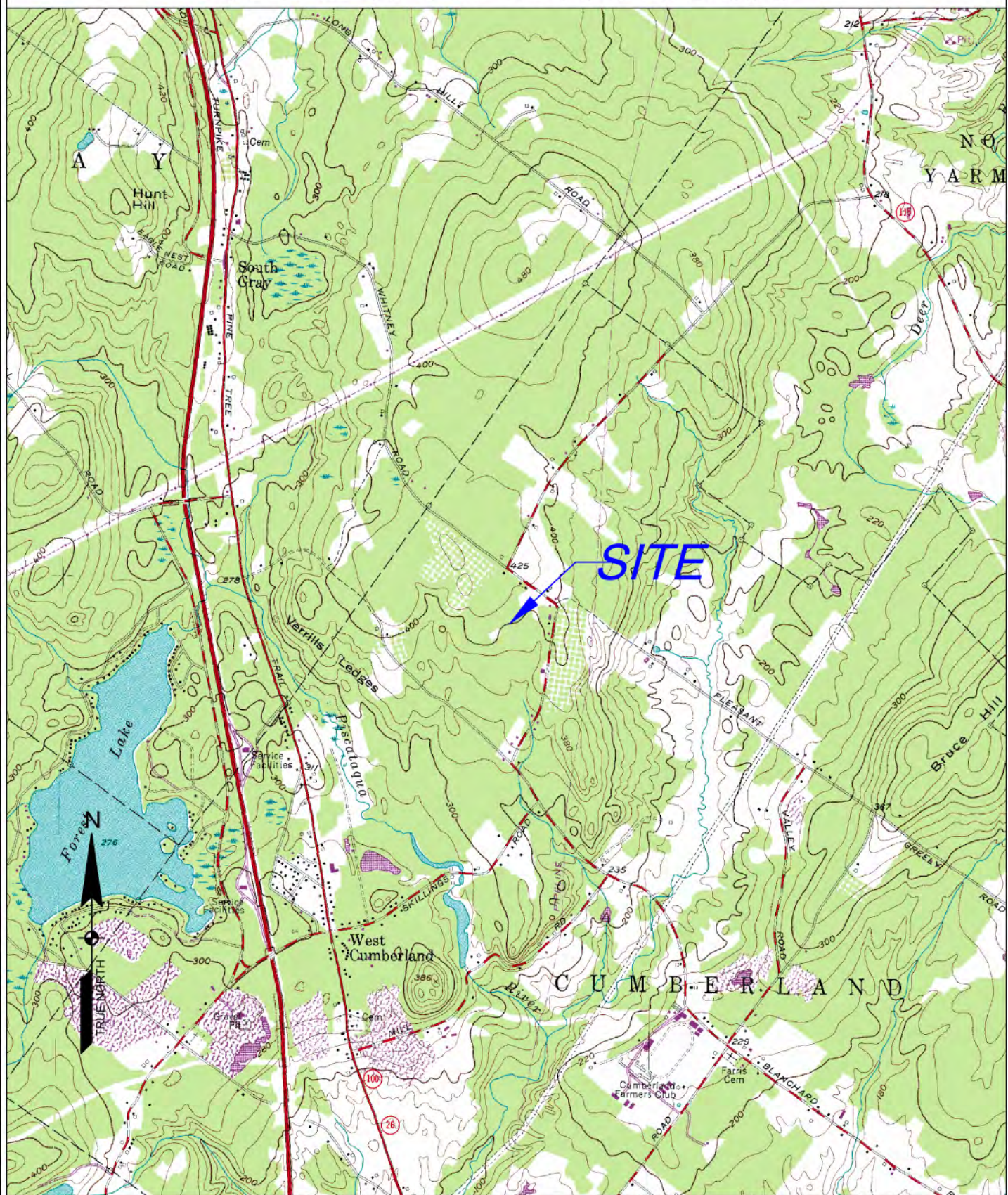
REFERENCES

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- Maine Geological Survey, Cumberland Center, Maine, Significant Sand and Gravel Aquifers.
- Maine Geological Survey, Cumberland Center Quadrangle (Maine), Surficial Geology.
- U.S.G.S., Cumberland Center Quadrangle (Maine) 7.5' Quadrangle 1:24,000, Topographic Map.
- Xu, M. and Y. Eckstein, 1995, *Use of Weighted Least-Squares Method in Evaluation of the Relationship Between Dispersivity and Field Scale*: Ground Water, vol.33, No.6, pp.905-908.

APPENDIX A

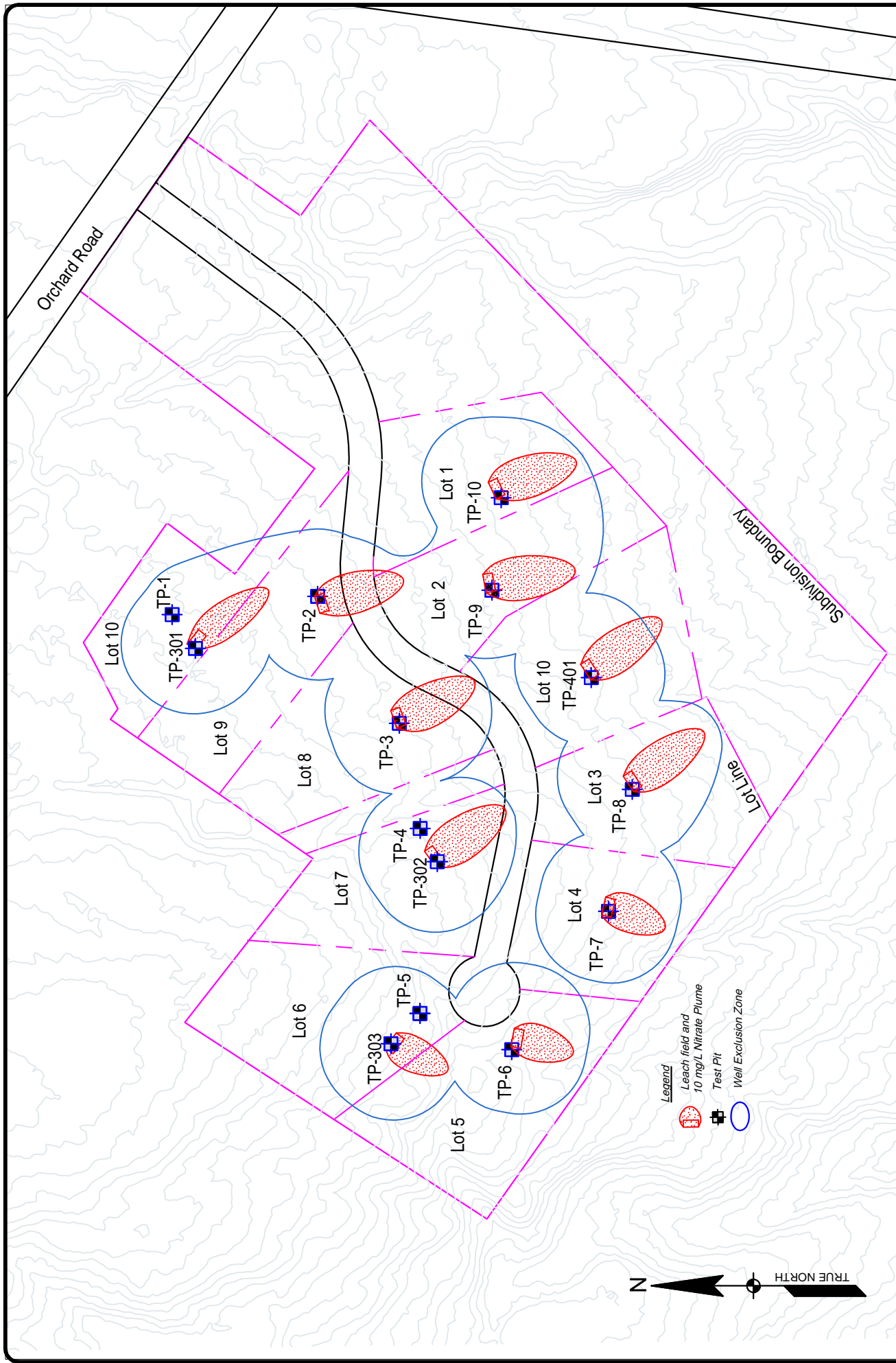
FIGURES

FIGURE 1. TOPOGRAPHIC MAP



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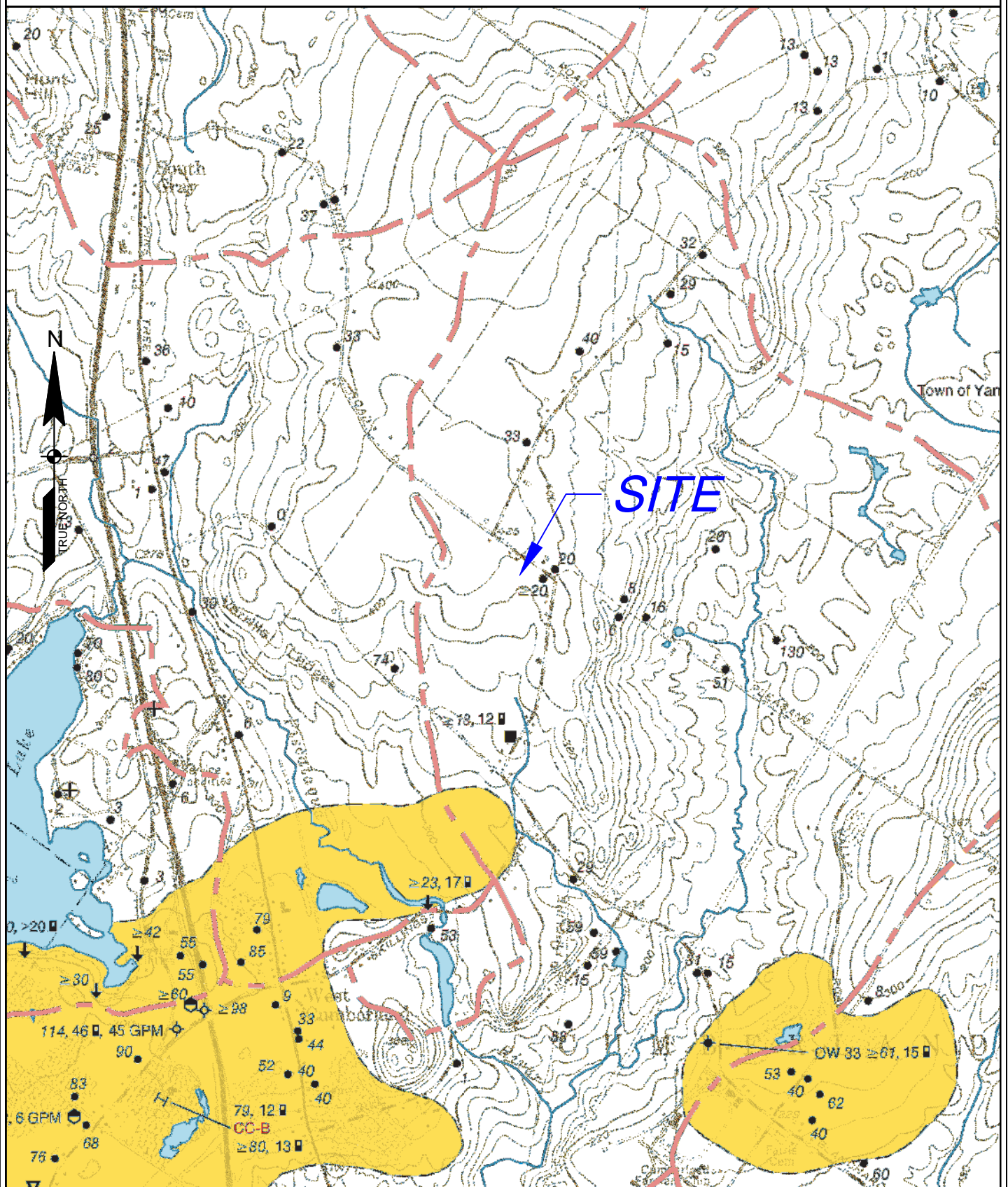
 <p> WWW.SEBAGOTECHNICS.COM 75 John Roberts Rd. Suite 114 NE 04106 South Portland, ME 04240 Tel. 207-200-2100 Fax 207-783-5656 </p>	<p>FIGURE 2</p>	<p>SCALE: 1" = 200'</p>
	<p>Groundwater Impact Study Map</p>	<p>DATE: 9-24-18</p>
	<p>ORCHARD ROAD SUBDIVISION ORCHARD ROAD, CUMBERLAND</p>	<p>SHEET: 1 OF 1</p>

FIGURE 3. SIGNIFICANT SAND & GRAVEL AQUIFERS



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FIGURE 4. AQUIFERS LEGEND

Significant Sand & Gravel Aquifer Map Unit and Symbol Descriptions



Surficial deposits with good to excellent potential ground-water yield; yields generally greater than 50 gallons per minute to a properly constructed well. Deposits consist primarily of glacial sand and gravel, but can include areas of sandy till and alluvium; yield zones are based on subsurface data where available, and may vary from mapped extent in areas where data are unavailable.



Surficial deposits with moderate to good potential ground-water yield; yields generally greater than 10 gallons per minute to a properly constructed well. Deposits consist primarily of glacial sand and gravel, but can include areas of sandy till and alluvium; yields may exceed 50 gallons per minute in deposits hydraulically connected with surface-water bodies, or in extensive deposits where subsurface data are available.



Areas with moderate to low or no potential ground-water yield (includes areas underlain by till, marine deposits, eolian deposits, alluvium, swamps, thin glacial sand and gravel deposits, or bedrock); yields in surficial deposits generally less than 10 gallons per minute to a properly constructed well.



Drilled overburden well



Drilled bedrock well



Quarry



Dug well



Driven point



Test pit



Bedrock outcrop

50

Depth to bedrock, in feet below land surface

≥ 13

Penetration depth of boring, ≥ symbol refers to minimum depth to bedrock based on boring depth or refusal

6

Depth to water level in feet below land surface (observed in well, spring, test boring, pit, or seismic line)



Gravel pit (overburden thickness noted in feet, e.g. 5-12')

4 GPM

Yield (flow) of well or spring in gallons per minute (GPM)



Spring, with general direction of flow



Observation well (project well if labeled; nonproject well if unlabeled)



Test boring (project boring if labeled; nonproject boring if unlabeled)



Potential point source of ground-water contamination



Surface-water drainage-basin boundary; surface-water divides generally correspond to ground-water divides. Horizontal direction of ground-water flow generally is away from divides and toward surface-water bodies.



MAP-7 131, 23

Twelve-channel seismic line, with depth to bedrock and depth to water shown at the midpoint of the line, in feet below land surface.

69, 12

MAP-E

72, 12

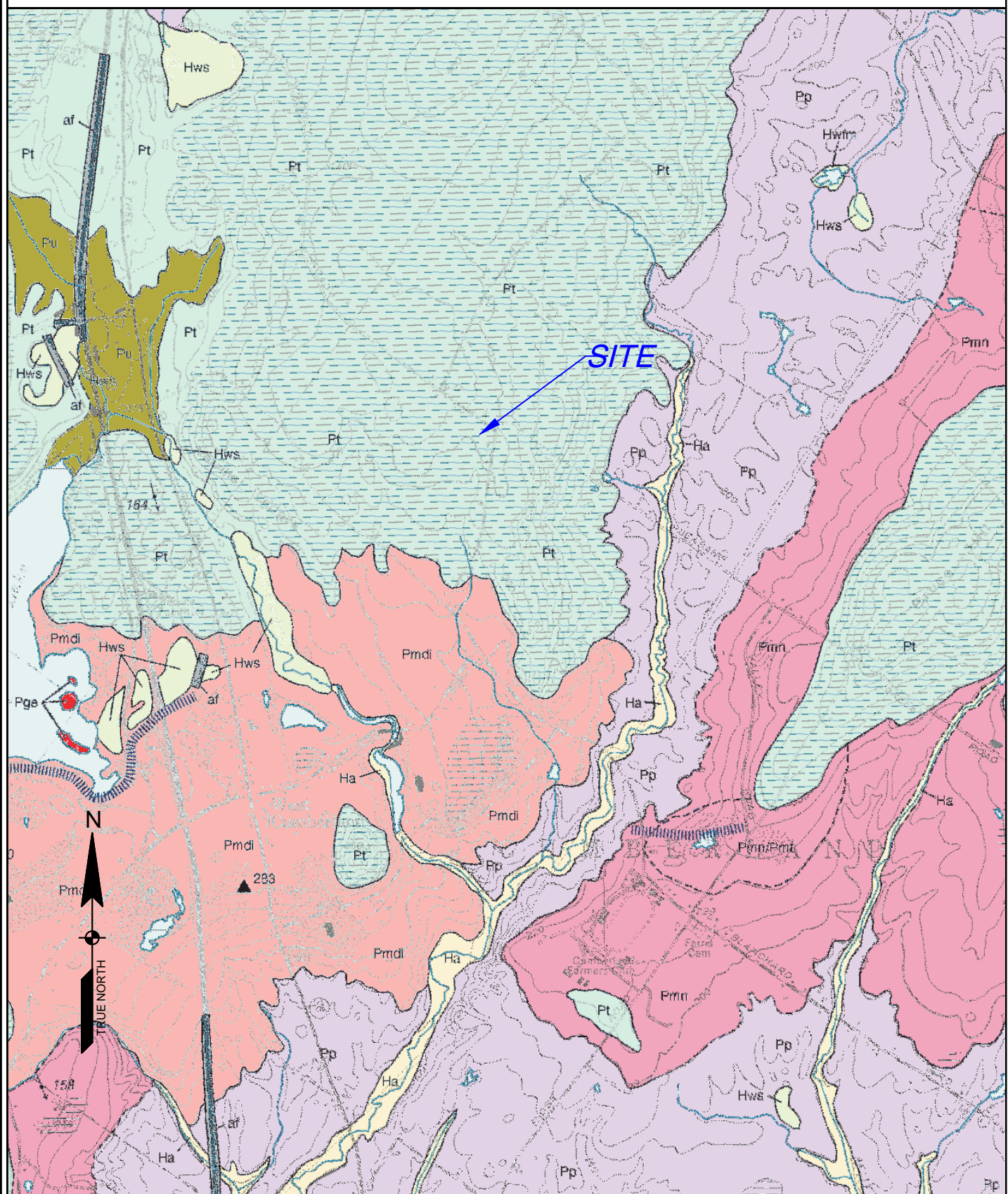
Single-channel seismic line, with depth to bedrock and depth to water shown at each end of the line, in feet below land surface.

Unless otherwise indicated, data shown above the line-identifier box refers to the northern end of the seismic line.

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FIGURE 5. SURFICIAL GEOLOGY



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FIGURE 6. SURFICIAL GEOLOGY LEGEND























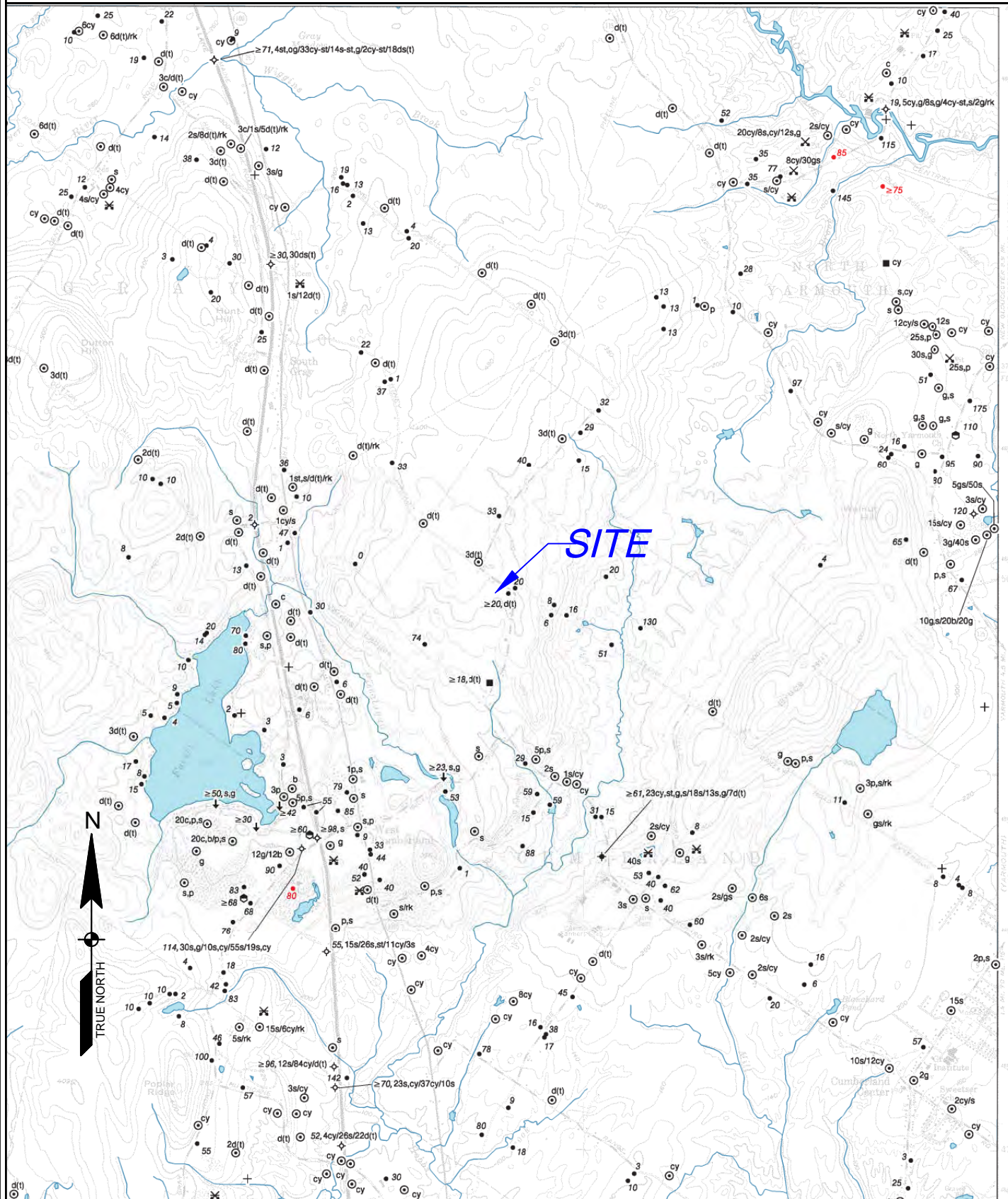
HOLOCENE DEPOSITS	
	Stream alluvium - Sand, silt, and minor amounts of gravel deposited on flood plains of modern streams
	Stream terraces - Flat alluvial benches situated above modern flood plains of streams. Materials forming the depositional terrace include gravel, sand, silt, and clay. Step-like morphology is created by downcutting of the stream through previously deposited material, of glacial or postglacial origin and age
	Wetland, swamp - Peat and fine-grained inorganic sediment. Poorly drained area with standing water common. Hwsp indicates swamps which are likely to include peat deposits that equal or exceed 1.5 meters in thickness
	Wetland, freshwater marsh - Peat and fine-grained inorganic sediment. Poorly drained grassland with standing water common. Hwfp indicates marshes that are likely to include peat deposits that equal or exceed 1.5 meters in thickness
PLEISTOCENE DEPOSITS	
	Marine nearshore deposits - Sand and gravel deposits formed as beaches, and shallow marine sand bodies formed during marine submergence and regression.
	Presumpscot Formation - Fine-grained marine mud (silt and clay with local sandy beds and lenses) locally with marine fossils and dropstones deposited in deeper quieter water during the marine submergence of the coastal lowland
	Marine fan - Layered gravel and sand deposited on the seafloor in a wedge or mound form at the glacier margin during marine submergence
	Marine delta - Sorted and stratified sand and gravel deposited in the late-glacial sea, with flat top graded to ocean surface
	Marine ice-contact delta - Ice-contact delta composed primarily of sorted and stratified sand and gravel. Deposit was graded to surface of late-glacial sea and is distinguished by flat top and foreset and topset beds
	Esker - Gravel and sand deposited in an ice tunnel by subglacial meltwater stream
	End moraine complex - Area of end moraines and associated glaciomarine sediments (submarine fan and sea-floor deposits). Composed of till, sand, and gravel deposited at the margin of the late Wisconsinan ice sheet
	Till - Poorly sorted mixture of gravel, sand, silt, and clay deposited directly by the action of glacier ice.
	Undifferentiated sediments - Pleistocene surficial sediments of uncertain origin.
	Bedrock - Gray dots indicate individual outcrops of ledge exposed at the surface. Horizontal ruled pattern indicates areas where bedrock is covered by a thin veneer of surficial sediments.
	Artificial fill - Mixture of till, gravel, sand, clay, and artificial materials transported and dumped to form elevated sections of roadways, etc.
	Contact - Indicates boundary between adjacent map units, dashed where approximate.
	Glacial striation or groove - Arrow shows direction of former ice movement. Dot marks point of observation.
	End moraine - Ridge of till, sand, and gravel deposited and/or deformed by glacier ice.
	Ice margin position - Line shows approximate position of ice margin during glacial retreat for major ice-margin positions. Dashed where approximate.
	Glacially streamlined hill - Symbol shows trend of long axis, which is parallel to former ice-flow direction.
	Marine fossil locality - Indicates site where marine fossils were located. Sites where radiocarbon age estimates were obtained also show radiocarbon age estimate.
	Glaciomarine delta - Elevation of contact between topset and foreset beds in glaciomarine delta, which indicates former position of sea level (from Thompson and others, 1989).
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FIGURE 7. SURFICIAL MATERIALS



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FIGURE 8. SURFICIAL MATERIALS LEGEND

Surficial Material Symbol Descriptions

This map shows the textures of surficial sediments in the quadrangle, independent of interpretations regarding their origin. For example, poorly sorted sediments deposited directly from glacial ice are shown here as "diamicton", although they may be genetically classified as "till".

The symbols listed below indicate materials observed in borrow pits and other surface exposures, as well as subsurface data from various sources. Where more than one textural class is present, materials are separated by commas and listed in decreasing order of abundance (e.g. s, st, cy). Individual materials may occur in distinct layers, or they may be mixed. Hyphens show the ranges of particle sizes present where their relative abundances are uncertain (e.g. st-c). Slash marks indicate superposition of materials; thicknesses are in feet (e.g. 10s/3cy). "E" indicates a significant stratigraphic sequence of interbedded materials. Some borrow pits and other localities may be designated by numbers that refer to descriptions in the quadrangle text. Not all symbols will necessarily be found on the map.

g Undifferentiated gravel, used as a general term. Can be subdivided by size as follows:

- b** Boulder gravel >256 mm (10")
- c** Cobble gravel 64-256 mm (2.5-10")
- p** Pebble gravel 2-64 mm (0.1-2.5")

gs Gravelly sand (this is a special case for sand with lesser amounts of intermixed gravel, i.e. pebbly sand, cobbly sand, or bouldery sand)

sg Sand and gravel (used only to describe slumped face or other site where relative abundances of sand vs. gravel are unknown).

s Undifferentiated sand, used as a general term. Can be subdivided by size as follows:

- vcs** Very coarse sand (1-2 mm)
- cs** Coarse sand (0.5-1 mm)
- ms** Medium sand (0.25-0.5 mm)
- fs** Fine sand (0.125-0.25 mm)
- vfs** Very fine sand (0.0625-0.125 mm)

st Silt (0.002-0.0625 mm)

cy Clay (<0.002 mm)

og Organic-rich sediment (can be any organic material, including forest litter, wood, shells, etc.)

pt Peat (reserved for actual fibrous peat)

d Undifferentiated diamicton (poorly-sorted sediment in which particle sizes may range from clay to boulders). Used as a general term or subdivided as follows:

- dg** Gravelly-matrix diamicton
- ds** Sandy-matrix diamicton
- dt** Silty-matrix diamicton
- dy** Clayey-matrix diamicton

Note: Diamictons of glacial origin may be classified as one of the following varieties of till (shown on the map in parentheses):

- t** Till, undifferentiated. Usually of late Wisconsinan age (deposited by the last glacial ice sheet).
- ta** Ablation till. Deposited during retreat of the late Wisconsinan ice sheet. Typically sandy, stony, and not very compact.
- tl** Lodgement till. Inferred to have been deposited at the base of the late Wisconsinan ice sheet. Usually very compact.
- tf** Flowtill. Deposited by slumping adjacent to glacial ice.
- T** Variably weathered till (usually a lodgment facies) of inferred pre-late Wisconsinan age.

af Artificial fill (e.g. road fills, building sites, dumps)

bd Scattered boulders; interpreted as till where followed by (t)

rk Bedrock (observed in pit floor, boring, or natural exposure)

rs Rottenstone, disintegrated or weathered bedrock, saprolite,

u Unknown (material unidentified)

R Refusal (in test boring or well)

(f) Fossiliferous (used to indicate fossiliferous units within a sequence).

• Bedrock well

⊗ Drilled overburden well

■ Dug well

↓ Driven point

⊕ Bedrock outcrop

⊗ Quarry

◆ 20fs,st Observation well with materials data

◆ 10gs/rk Test boring with materials data

⊙ 8s-b Materials data from shovel hole, hand-auger hole, natural exposure, or excavation (other than borrow pit).

50 Depth to bedrock from well (≥ is used to indicate minimum depth to bedrock), in feet below land surface

✕ s-b Borrow pit, recently active at time of mapping, with materials data.

✕ s-p Borrow pit, evidently abandoned or in long disuse at time of mapping, with materials data.

Ⓜ Location of site for which a data sheet is on file at the Maine Geological Survey.

■ 50 Depth to bedrock from seismic line, in feet below land surface

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APPENDIX B
KATAHDIN ANALYTICAL REPORT

October 27, 2017

Mr. Dave Chapman
Sebago Technics
75 John Roberts Rd
Suite 1A
South Portland, ME 04106

RE: Katahdin Lab Number: SK9925
Project ID: Orchard Road IVIT
Project Manager: Mr. Galen Nickerson
Sample Receipt Date(s): October 25, 2017

Dear Mr. Chapman:

Please find enclosed the following information:

- * Report of Analysis (Analytical and/or Field)
- * Chain of Custody (COC)
- * Login Report

A copy of the Chain of Custody is included in the paginated report. The original COC is attached as an addendum to this report.

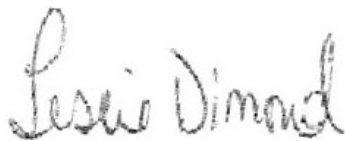
Should you have any questions or comments concerning this Report of Analysis, please do not hesitate to contact the project manager listed above. The results contained in this report relate only to the submitted samples. This cover letter is an integral part of the ROA.

We certify that the test results provided in this report meet all the requirements of the NELAC standards unless otherwise noted in an attached technical narrative or in the Report of Analysis.

We appreciate your continued use of our laboratory and look forward to working with you in the future. The following signature indicates technical review and acceptance of the data.

Please go to <http://www.katahdinlab.com/cert.html> for copies of Katahdin Analytical Services Inc. current certificates and analyte lists.

Sincerely,
KATAHDIN ANALYTICAL SERVICES



Authorized Signature - Quality Assurance Officer

10/27/2017

Date

KATAHDIN ANALYTICAL SERVICES – INORGANIC DATA QUALIFIERS

The sampled date indicated on the attached Report(s) of Analysis (ROA) is the date for which a grab sample was collected or the date for which a composite sample was completed. Beginning and start times for composite samples can be found on the Chain-of-Custody.

U Indicates the compound was analyzed for but not detected above the specified level. This level may be the Practical Quantitation Level (PQL) (also called Limit of Quantitation (LOQ)), the Limit of Detection (LOD) or Method Detection Limit (MDL) as required by the client.

Note: All results reported as "U" MDL have a 50% rate for false negatives compared to those results reported as "U" PQL "U" LOQ or "U" LOD, where the rate of false negatives is <1%.

E Estimated value. This flag identifies compounds whose concentrations exceed the upper level of the calibration range of the instrument for that specific analysis.

J Estimated value. The analyte was detected in the sample at a concentration less than the laboratory Practical Quantitation Level (PQL) (also called Limit of Quantitation (LOQ)), but above the Method Detection Limit (MDL).

I-7 The laboratory's Practical Quantitation Level (PQL) or LOQ could not be achieved for this parameter due to sample composition, matrix effects, sample volume, or quantity used for analysis.

A-4 Please refer to cover letter or narrative for further information.

H_ Please note that the regulatory holding time for _____ is "analyze immediately". Ideally, this analysis must be performed in the field at the time of sample collection. _____ for this sample was not performed at the time of sample collection. The analysis was performed as soon as possible after receipt by the laboratory.

H1 - pH

H2 - DO

H3 - sulfite

H4 - residual chlorine

T1 The client did not provide the full volume of at least one liter for analysis of TSS. Therefore, the PQL of 2.5 mg/L could not be achieved.

T2 The client provided the required volume of at least one liter for analysis of TSS, but the laboratory could not filter the full one liter volume due to the sample matrix. Therefore, the PQL of 2.5 mg/L could not be achieved.

M1 The matrix spike and/or matrix spike duplicate recovery performed on this sample was outside of the laboratory acceptance criteria. Sample matrix is suspected. The laboratory criteria was met for the Laboratory Control Sample (LCS) analyzed concurrently with this sample.

M2 The matrix spike and/or matrix spike duplicate recovery was outside of the laboratory acceptance criteria. The native sample concentration is greater than four times the spike added concentration so the spike added could not be distinguished from the native sample concentration.

R1 The relative percent difference (RPD) between the duplicate analyses performed on this sample was outside of the laboratory acceptance criteria (when both values are greater than ten times the PQL).

MCL Maximum Contaminant Level

NL No limit

NFL No Free Liquid Present

FLP Free Liquid Present

NOD No Odor Detected

TON Threshold Odor Number

D-1 As required by Method 5210B, APHA Standard Methods for the Examination of Water and Wastewater (21st edition), the BOD value reported for this sample is 'qualified' because the check standard run concurrently with the sample analysis did not meet the criteria specified in the method (198 +/- 30.5 mg/L). These results may not be reportable for compliance purposes.

D-2 The measured final dissolved oxygen concentrations of all dilutions were less than the method-specified limit of 1 mg/L. The reported BOD result was calculated assuming a final oxygen concentration equal to 1 mg/L. The reported value should be considered a minimum value.

D-3 The dilution water used to prepare this sample did not meet the method and/or regulatory criteria of less than 0.2 or 0.4 mg/L dissolved oxygen (DO) uptake over the five day period of incubation. These results may not be reportable for compliance purposes.



REPORT OF ANALYTICAL RESULTS

Client: Dave Chapman
Sebago Technics
75 John Roberts Rd
Suite 1A
South Portland, ME 04106

Lab Sample ID: SK9925-001
Report Date: 10/27/2017
PO No.:
Project: Orchard Road IVIT

Sample Description						Matrix		Filtered		Date Sampled		Date Received	
74 ORCHARD ROAD						AQ		No(Total)		10/25/2017		10/25/2017	
Parameter	Result	Units	Adjusted PQL	Dilution Factor	PQL	Analytical Method	Analysis Date	By	Prep Method	Prepped Date	By	QC	Notes
ARSENIC	U 0.008	mg/L	0.008	1	0.008	SW846 6010	10/26/17	MD	SW846 3010	10/26/17	AMJ	KJ26ICW2	

Report of Analytical Results

Client: Dave Chapman
Sebago Technics
75 John Roberts Rd
South Portland, ME 04106

Lab Sample ID: SK9925-1
Report Date: 26-OCT-17
Client PO:
Project: Orchard Road IVIT
SDG: SK9925

Sample Description
74 ORCHARD ROAD

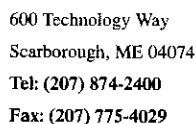
Matrix **Date Sampled** **Date Received**
AQ 25-OCT-17 09:20:00 25-OCT-17

Parameter	Result	Adj PQL	Adj MDL	Anal. Method	QC Batch	Analysis Date	Prep. Method	Prep. Date	Analyst	Footnotes	RPD/RSD
Nitrate As N	1.1 mg/L	0.050	.0152	EPA 353.2	WG216349	25-OCT-17 16:56:23	N/A	N/A	AP		

Client: <u>Sebago Tech</u>	KAS PM: <u>GN</u>	Sampled By: <u>Client</u>
Project:	KIMS Entry By: <u>SO</u>	Delivered By: <u>Client</u>
KAS Work Order#: <u>SK9925</u>	KIMS Review By: <u>GN</u>	Received By: <u>JCB</u>
SDG #:	Cooler: <u>1</u> of <u>1</u>	Date/Time Rec.: <u>10.25.17 1800</u>

Receipt Criteria	Y	N	EX*	NA	Comments and/or Resolution
1. Custody seals present / intact?	<input checked="" type="checkbox"/>				
2. Chain of Custody present in cooler?	<input checked="" type="checkbox"/>				
3. Chain of Custody signed by client?	<input checked="" type="checkbox"/>				
4. Chain of Custody matches samples?	<input checked="" type="checkbox"/>				
5. Temperature Blanks present? If not, take temperature of any sample w/ IR gun.	<input checked="" type="checkbox"/>				Temp (°C): <u>4.6</u>
Samples received at <6 °C w/o freezing?	<input checked="" type="checkbox"/>				Note: Not required for metals (except Hg soil) analysis.
Ice packs or ice present?	<input checked="" type="checkbox"/>				The lack of ice or ice packs (i.e. no attempt to begin cooling process) or insufficient ice may not meet certain regulatory requirements and may invalidate certain data.
If yes, was there sufficient ice to meet temperature requirements?	<input checked="" type="checkbox"/>				
If temp. out, has the cooling process begun (i.e. ice or packs present) and sample collection times <6hrs., but samples are not yet cool?				<input checked="" type="checkbox"/>	Note: No cooling process required for metals (except Hg soil) analysis.
6. Volatiles:					
Aqueous: No bubble larger than a pea?				<input checked="" type="checkbox"/>	
Soil/Sediment:					
Received in airtight container?				<input checked="" type="checkbox"/>	
Received in methanol?				<input checked="" type="checkbox"/>	
Methanol covering soil?				<input checked="" type="checkbox"/>	
D.I. Water - Received within 48 hour HT?				<input checked="" type="checkbox"/>	
Air: Refer to KAS COC for canister/flow controller requirements.	<input checked="" type="checkbox"/> if air included				
7. Trip Blank present in cooler?				<input checked="" type="checkbox"/>	
8. Proper sample containers and volume?	<input checked="" type="checkbox"/>				
9. Samples within hold time upon receipt?	<input checked="" type="checkbox"/>				
10. Aqueous samples properly preserved?	<input checked="" type="checkbox"/>				
Metals, COD, NH3, TKN, O/G, phenol, TPO4, N+N, TOC, DRO, TPH - pH <2					
Sulfide - >9				<input checked="" type="checkbox"/>	
Cyanide - pH >12				<input checked="" type="checkbox"/>	

* Log-In Notes to Exceptions: document any problems with samples or discrepancies or pH adjustments.



**PLEASE BEAR DOWN AND
PRINT LEGIBLY IN PEN**

Page 1 of 1

THE TERMS AND CONDITIONS ON THE REVERSE SIDE HEREOF SHALL GOVERN SERVICES, EXCEPT WHEN A SIGNED CONTRACTUAL AGREEMENT EXISTS.



Katahdin Analytical Services
Login Chain of Custody Report (Ino1)

Page: 1 of 1

Oct. 25, 2017

11:05 AM

Quote/Incoming:

Login Number: SK9925

Account: SEBAGOTECH001

Sebago Technics

NoWeb

Project:

Primary Report Address:

Dave Chapman
Sebago Technics
75 John Roberts Rd
Suite 1A
South Portland, ME 04106
dchapman@sebagotechnics.com

Primary Invoice Address:

Accounts Payable
Sebago Technics
75 John Roberts Rd
Suite 1A
South Portland, ME 04106

Report CC Addresses:

Invoice CC Addresses:

Login Information:

ANALYSIS INSTRUCTIONS : FIRM-HARD COPY BY END OF DAY
CHECK NO. :
CLIENT PO# :
CLIENT PROJECT MANAGE :
CONTRACT :
COOLER TEMPERATURE : 4.6
DELIVERY SERVICES : Client
EDD FORMAT :
LOGIN INITIALS : SO
PM : GN
PROJECT NAME : Orchard Road IVIT
QC LEVEL : I
REPORT INSTRUCTIONS : email pdf, EDD and Invoice to Dave, no HC
SDG ID :
SDG STATUS :
VERBAL TAT :

Laboratory Sample ID	Client Sample Number	Collect Date/Time	Receive Date	PR	Verbal Date	Due Date	Mailed
SK9925-1	74 ORCHARD ROAD	25-OCT-17 09:20	25-OCT-17		27-OCT-17	27-OCT-17	
Matrix	Product	Hold Date (shortest)	Bottle Type	Bottle Count	Comments		
Aqueous	S E353.2-NITRATE	27-OCT-17	125mL Plastic				
Aqueous	S SW3010-PREP	23-APR-18	250mL Plastic+HNO3				
Aqueous	S SW6010-ARSENIC	23-APR-18	250mL Plastic+HNO3				

Total Samples: 1

Total Analyses: 3

APPENDIX C
TESTPIT LOGS

SOIL PROFILE / CLASSIFICATION INFORMATION		DETAILED DESCRIPTION OF SUBSURFACE CONDITIONS AT PROJECT SITES
Project Name: Orchard Road Subdivision	Applicant Name: Gorrill & Palmer	Project Location (municipality): Cumberland

Observation Hole # <u>TP-1</u> <input checked="" type="checkbox"/> Test Pit <input type="checkbox"/> Boring				
<u>1-2</u> " Depth of organic horizon above mineral soil				
Texture	Consistency	Color	Mottling	
0				
6	Fine Sandy Loam	Friable	Dark Brown	
12				
18				
24	Sandy Loam	Firm	Light Olive Brown	Many/ Prominant
30				
36				
42				
48				
Limit of Excavation at 20"				
Soil	Classification	Slope	Limiting Factor	<input checked="" type="checkbox"/> Groundwater <input type="checkbox"/> Restrictive Layer <input type="checkbox"/> Bedrock
<u>3</u> Profile	<u>D</u> Condition	<u>0-3</u> Percent	<u>12"</u> Depth	

Observation Hole # <u>TP-2</u> <input checked="" type="checkbox"/> Test Pit <input type="checkbox"/> Boring				
<u>1-2</u> " Depth of organic horizon above mineral soil				
Texture	Consistency	Color	Mottling	
0				
6	Fine Sandy Loam	Friable	Dark Brown	
12				
18				
24	Sandy Loam		Light Olive Brown	Common/ Distinct
30		Firm		
36				
42				
48				
Limit of Excavation at 30"				
Soil	Classification	Slope	Limiting Factor	<input type="checkbox"/> Groundwater <input type="checkbox"/> Restrictive Layer <input type="checkbox"/> Bedrock
<u>3</u> Profile	<u>C</u> Condition	<u>0-3</u> Percent	<u>12"</u> Depth	

Observation Hole # <u>TP-3</u> <input checked="" type="checkbox"/> Test Pit <input type="checkbox"/> Boring				
<u>1-2</u> " Depth of organic horizon above mineral soil				
Texture	Consistency	Color	Mottling	
0				
6	Fine Sandy Loam	Friable	Dark Yellowish Brown	
12	Sandy Loam			
18				
24				
30		Firm	Light Olive Brown	Common/ Distinct
36				
42				
48				
Limit of Excavation at 26"				
Soil	Classification	Slope	Limiting Factor	<input type="checkbox"/> Groundwater <input type="checkbox"/> Restrictive Layer <input type="checkbox"/> Bedrock
<u>3</u> Profile	<u>C</u> Condition	<u>3-8</u> Percent	<u>24"</u> Depth	

Observation Hole # <u>TP-4</u> <input checked="" type="checkbox"/> Test Pit <input type="checkbox"/> Boring				
<u>1-2</u> " Depth of organic horizon above mineral soil				
Texture	Consistency	Color	Mottling	
0				
6			Dark Yellowish Brown	
12	Sandy Loam	Friable		None Observed
18			Yellowish Brown	
24				
30				
36				
42				
48				
Limit of Excavation at 24"				
Soil	Classification	Slope	Limiting Factor	<input type="checkbox"/> Groundwater <input type="checkbox"/> Restrictive Layer <input type="checkbox"/> Bedrock
<u>3</u> Profile	<u>C</u> Condition	<u>3-8</u> Percent	<u>>24"</u> Depth	

INVESTIGATOR INFORMATION AND SIGNATURE	
Signature: <u>David V. Chapman</u>	Date: <u>9-27-17</u>
Name Printed/typed: <u>David V. Chapman</u>	Cert/Lic/Reg.# 293
Title: <input checked="" type="checkbox"/> Licensed Site Evaluator <input type="checkbox"/> Certified Soil Scientist <input type="checkbox"/> Certified Geologist <input type="checkbox"/> Other:	

SOIL PROFILE / CLASSIFICATION INFORMATION		DETAILED DESCRIPTION OF SUBSURFACE CONDITIONS AT PROJECT SITES
Project Name: Orchard Road Subdivision	Applicant Name: Gorrill & Palmer	Project Location (municipality): Cumberland

Observation Hole # <u>TP-5</u> <input checked="" type="checkbox"/> Test Pit <input type="checkbox"/> Boring				
<u>1-2</u> " Depth of organic horizon above mineral soil				
0	Texture	Consistency	Color	Mottling
6	Sandy Loam	Friable	Dark Brown	
12			Light Olive Brown	None Observed
18				
24		Firm		
30				
36				
42				
48	Limit of Excavation at 24"			
	Soil <u>3</u> Profile	Classification <u>C</u> Condition	Slope <u>3-8</u> Percent	Limiting Factor <u>21</u> Depth
	<input type="checkbox"/> Groundwater <input checked="" type="checkbox"/> Restrictive Layer <input type="checkbox"/> Bedrock			

Observation Hole # <u>TP-6</u> <input checked="" type="checkbox"/> Test Pit <input type="checkbox"/> Boring				
<u>1-2</u> " Depth of organic horizon above mineral soil				
0	Texture	Consistency	Color	Mottling
6	Sandy Loam	Friable	Dark Brown	
12			Light Olive Brown	None Observed
18				
24		Firm		
30				
36				
42				
48	Limit of Excavation at 24"			
	Soil <u>3</u> Profile	Classification <u>D</u> Condition	Slope <u>3-8</u> Percent	Limiting Factor <u>21"</u> Depth
	<input type="checkbox"/> Groundwater <input checked="" type="checkbox"/> Restrictive Layer <input type="checkbox"/> Bedrock			

Observation Hole # <u>TP-7</u> <input checked="" type="checkbox"/> Test Pit <input type="checkbox"/> Boring				
<u>1-2</u> " Depth of organic horizon above mineral soil				
0	Texture	Consistency	Color	Mottling
6	Sandy Loam	Friable	Dark Yellowish Brown	
12			Light Olive Brown	None Observed
18				
24		Firm		
30				
36				
42				
48	Limit of Excavation at 25"			
	Soil <u>3</u> Profile	Classification <u>C</u> Condition	Slope <u>3-8</u> Percent	Limiting Factor <u>20"</u> Depth
	<input type="checkbox"/> Groundwater <input checked="" type="checkbox"/> Restrictive Layer <input type="checkbox"/> Bedrock			

Observation Hole # <u>TP-8</u> <input checked="" type="checkbox"/> Test Pit <input type="checkbox"/> Boring				
<u>1-2</u> " Depth of organic horizon above mineral soil				
0	Texture	Consistency	Color	Mottling
6	Sandy Loam	Friable	Dark Yellowish Brown	
12			Light Yellowish Brown	None Observed
18				
24		Firm		
30				
36				
42				
48	Limit of Excavation at 27"			
	Soil <u>3</u> Profile	Classification <u>C</u> Condition	Slope <u>0-3</u> Percent	Limiting Factor <u>23"</u> Depth
	<input type="checkbox"/> Groundwater <input checked="" type="checkbox"/> Restrictive Layer <input type="checkbox"/> Bedrock			

INVESTIGATOR INFORMATION AND SIGNATURE	
Signature: <u>David V. Chapman</u>	Date: <u>9-27-17</u>
Name Printed/typed: <u>David V. Chapman</u>	Cert/Lic/Reg.# <u>293</u>
Title: <input checked="" type="checkbox"/> Licensed Site Evaluator <input type="checkbox"/> Certified Soil Scientist <input type="checkbox"/> Certified Geologist <input type="checkbox"/> Other:	

SOIL PROFILE / CLASSIFICATION INFORMATION		DETAILED DESCRIPTION OF SUBSURFACE CONDITIONS AT PROJECT SITES
Project Name: Orchard Road Subdivision	Applicant Name: Gorrill & Palmer	Project Location (municipality): Cumberland

Observation Hole # <u>TP-9</u> <input checked="" type="checkbox"/> Test Pit <input type="checkbox"/> Boring				
<u>1-2</u> " Depth of organic horizon above mineral soil				
Texture	Consistency	Color	Mottling	
0				
6	Sandy Loam	Friable	Brown	
12				
18		Light Olive Brown	Common/ Distinct	
24				
30	Firm			
36				
42				
48	Limit of Excavation at 27"			
Soil	Classification	Slope	Limiting Factor	<input checked="" type="checkbox"/> Groundwater <input type="checkbox"/> Restrictive Layer <input type="checkbox"/> Bedrock
<u>3</u> Profile	<u>D</u> Condition	<u>0-3</u> Percent	<u>14"</u> Depth	

Observation Hole # <u>TP-10</u> <input checked="" type="checkbox"/> Test Pit <input type="checkbox"/> Boring				
<u>1-2</u> " Depth of organic horizon above mineral soil				
Texture	Consistency	Color	Mottling	
0				
6	Sandy Loam	Friable	Dark Yellowish Brown	
12				
18		Light Olive Brown	Common/ Distinct	
24				
30				
36				
42				
48	Limit of Excavation at 22"			
Soil	Classification	Slope	Limiting Factor	<input checked="" type="checkbox"/> Groundwater <input type="checkbox"/> Restrictive Layer <input type="checkbox"/> Bedrock
<u>3</u> Profile	<u>D</u> Condition	<u>0-3</u> Percent	<u>10"</u> Depth	

Observation Hole # _____ <input type="checkbox"/> Test Pit <input type="checkbox"/> Boring				
_____ " Depth of organic horizon above mineral soil				
Texture	Consistency	Color	Mottling	
0				
6				
12				
18				
24				
30				
36				
42				
48				
Soil	Classification	Slope	Limiting Factor	<input type="checkbox"/> Groundwater <input type="checkbox"/> Restrictive Layer <input type="checkbox"/> Bedrock
_____ Profile	_____ Condition	_____ Percent	_____ Depth	

Observation Hole # _____ <input type="checkbox"/> Test Pit <input type="checkbox"/> Boring				
_____ " Depth of organic horizon above mineral soil				
Texture	Consistency	Color	Mottling	
0				
6				
12				
18				
24				
30				
36				
42				
48				
Soil	Classification	Slope	Limiting Factor	<input type="checkbox"/> Groundwater <input type="checkbox"/> Restrictive Layer <input type="checkbox"/> Bedrock
_____ Profile	_____ Condition	_____ Percent	_____ Depth	

INVESTIGATOR INFORMATION AND SIGNATURE	
Signature: <u>David V. Chapman</u>	Date: <u>9-27-17</u>
Name Printed/typed: <u>David V. Chapman</u>	Cert/Lic/Reg.# 293
Title: <input checked="" type="checkbox"/> Licensed Site Evaluator <input type="checkbox"/> Certified Soil Scientist <input type="checkbox"/> Certified Geologist <input type="checkbox"/> Other:	

SOIL PROFILE / CLASSIFICATION INFORMATION		DETAILED DESCRIPTION OF SUBSURFACE CONDITIONS AT PROJECT SITES
Project Name: Orchard Road Subdivision	Applicant Name: TZ Properties	Project Location (municipality): Cumberland

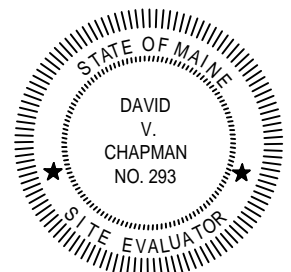
Observation Hole # <u>TP-301</u> <input checked="" type="checkbox"/> Test Pit <input type="checkbox"/> Boring				
_____ " Depth of organic horizon above mineral soil				
Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
	0		Brown	
	6	Sandy Loam	Friable	
	12		Yellowish Brown	
	18		Olive Brown	Common/ Distinct
	24		Light Olive Brown	
	30	Firm		
	36			
	42			
	48			
Soil	Classification	Slope	Limiting Factor	<input checked="" type="checkbox"/> Groundwater <input type="checkbox"/> Restrictive Layer <input type="checkbox"/> Bedrock
<u>3</u> Profile	<u>C</u> Condition	<u>0-3</u> Percent	<u>17"</u> Depth	

Observation Hole # <u>TP-302</u> <input checked="" type="checkbox"/> Test Pit <input type="checkbox"/> Boring				
_____ " Depth of organic horizon above mineral soil				
Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
	0		Dark Brown	
	6	Sandy Loam	Friable	
	12		Yellowish Brown	
	18			
	24			
	30	Firm		Common/ Distinct
	36			
	42			
	48			
Soil	Classification	Slope	Limiting Factor	<input type="checkbox"/> Groundwater <input checked="" type="checkbox"/> Restrictive Layer <input type="checkbox"/> Bedrock
<u>3</u> Profile	<u>C</u> Condition	<u>3-8</u> Percent	<u>26"</u> Depth	

Observation Hole # <u>TP-303</u> <input checked="" type="checkbox"/> Test Pit <input type="checkbox"/> Boring				
_____ " Depth of organic horizon above mineral soil				
Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
	0		Dark Brown	
	6	Sandy Loam	Friable	
	12		Yellowish Brown	
	18			
	24			Common/ Distinct
	30	Firm		
	36			
	42			
	48			
Soil	Classification	Slope	Limiting Factor	<input type="checkbox"/> Groundwater <input checked="" type="checkbox"/> Restrictive Layer <input type="checkbox"/> Bedrock
<u>3</u> Profile	<u>C</u> Condition	<u>3-8</u> Percent	<u>24"</u> Depth	

Observation Hole # _____ <input type="checkbox"/> Test Pit <input type="checkbox"/> Boring				
_____ " Depth of organic horizon above mineral soil				
Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
	0			
	6			
	12			
	18			
	24			
	30			
	36			
	42			
	48			
Soil	Classification	Slope	Limiting Factor	<input type="checkbox"/> Groundwater <input type="checkbox"/> Restrictive Layer <input type="checkbox"/> Bedrock
_____ Profile	_____ Condition	_____ Percent	_____ Depth	

INVESTIGATOR INFORMATION AND SIGNATURE	
Signature: <u>David V. Chapman</u>	Date: <u>12-8-17</u>
Name Printed/typed: <u>David V. Chapman</u>	Cert/Lic/Reg.# <u>293</u>
Title: <input checked="" type="checkbox"/> Licensed Site Evaluator <input type="checkbox"/> Certified Soil Scientist <input type="checkbox"/> Certified Geologist <input type="checkbox"/> Other:	



SOIL PROFILE / CLASSIFICATION INFORMATION		DETAILED DESCRIPTION OF SUBSURFACE CONDITIONS AT PROJECT SITES
Project Name: Orchard Road Subdivision	Applicant Name: TZ Properties	Project Location (municipality): Cumberland

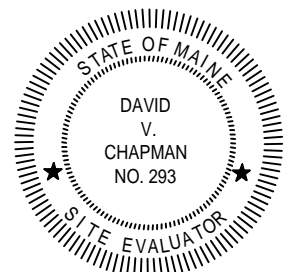
Observation Hole # <u>TP-401</u> <input checked="" type="checkbox"/> Test Pit <input type="checkbox"/> Boring					
_____ " Depth of organic horizon above mineral soil					
Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling	
	0		Brown		
	6	Sandy Loam	Friable		
	12		Dark Yellowish Brown		
	18		Yellowish Brown		
	24	Firm		Common/ Distinct	
	30				
	36				
	42				
	48				
	Soil	Classification	Slope	Limiting Factor	<input checked="" type="checkbox"/> Groundwater <input type="checkbox"/> Restrictive Layer <input type="checkbox"/> Bedrock
	<u>3</u> Profile	<u>C</u> Condition	<u>0-3</u> Percent	<u>19"</u> Depth	

Observation Hole # _____ <input type="checkbox"/> Test Pit <input type="checkbox"/> Boring					
_____ " Depth of organic horizon above mineral soil					
Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling	
	0				
	6				
	12				
	18				
	24				
	30				
	36				
	42				
	48				
	Soil	Classification	Slope	Limiting Factor	<input type="checkbox"/> Groundwater <input type="checkbox"/> Restrictive Layer <input type="checkbox"/> Bedrock
	_____ Profile	_____ Condition	_____ Percent	_____ Depth	

Observation Hole # _____ <input type="checkbox"/> Test Pit <input type="checkbox"/> Boring					
_____ " Depth of organic horizon above mineral soil					
Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling	
	0				
	6				
	12				
	18				
	24				
	30				
	36				
	42				
	48				
	Soil	Classification	Slope	Limiting Factor	<input type="checkbox"/> Groundwater <input type="checkbox"/> Restrictive Layer <input type="checkbox"/> Bedrock
	_____ Profile	_____ Condition	_____ Percent	_____ Depth	

Observation Hole # _____ <input type="checkbox"/> Test Pit <input type="checkbox"/> Boring					
_____ " Depth of organic horizon above mineral soil					
Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling	
	0				
	6				
	12				
	18				
	24				
	30				
	36				
	42				
	48				
	Soil	Classification	Slope	Limiting Factor	<input type="checkbox"/> Groundwater <input type="checkbox"/> Restrictive Layer <input type="checkbox"/> Bedrock
	_____ Profile	_____ Condition	_____ Percent	_____ Depth	

INVESTIGATOR INFORMATION AND SIGNATURE	
Signature: <u>David V. Chapman</u>	Date: <u>9-23-18</u>
Name Printed/typed: <u>David V. Chapman</u>	Cert/Lic/Reg.# <u>293</u>
Title: <input checked="" type="checkbox"/> Licensed Site Evaluator <input type="checkbox"/> Certified Soil Scientist <input type="checkbox"/> Certified Geologist <input type="checkbox"/> Other:	



APPENDIX D

PARAMETERS AND RESULTS

**Groundwater Impact Study, Nitrates
Model Input Parameters and Solution
Orchard Road Subdivision
Orchard Road, Cumberland, Maine
Lot 1, 2, 3, 7, 8, 9, and 10**

Annual rainfall (inches):	44
Hydrologic soil group* (above disposal field):	C to D
% Slope (above disposal field):	2%
% Infiltration* (into disposal field):	21
Assumed rainfall flow into disposal field (gal/day):	6.63
Assumed rainfall flow into disposal field during drought conditions^(gal/day):	3.98
Background NO3-N concentration (mg/L):	0
Assumed effluent NO3-N concentration (mg/L):	41
Assumed effluent flow into disposal field (gal/day):	360
Assumed NO3-N concentration in rainfall (mg/L):	0.5
Hydraulic conductivity of aquifer (ft/day):	2
Hydraulic gradient of aquifer (ft/ft):	0.015
Effective porosity of aquifer:	0.21
Seepage velocity of aquifer (ft/day):	0.14
Retardation factor	1
Half-Life (0 for no decay)	0
Simulation duration to reach NO3-N concentration equilibrium (days)	2,655
Longitudinal dispersivity at end of simulation duration (ft)	2.23
Lateral dispersivity at end of simulation duration (ft)	0.74
Vertical dispersivity at end of simulation duration (ft)	0.11
Disposal bed length (ft)	15
Disposal bed width (ft)	28
Length of 10 mg/L plume during drought conditions (ft)	120

Notes:

* - from The State of Maine Department of Environmental Protection, 1991, The guidelines for expediting the processing of applications under the site location of development act.

^ - drought conditions equals 60% of average annual rainfall

% - percent

gal/day - gallons per day

ft - feet

mg/L - milligrams per liter

NO3-N - Nitrate-Nitrogen

**Groundwater Impact Study, Nitrates
Model Input Parameters and Solution
Orchard Road Subdivision
Orchard Road, Cumberland, Maine
Lots 4, 5, and 6**

Annual rainfall (inches):	44
Hydrologic soil group* (above disposal field):	C to D
% Slope (above disposal field):	2-3%
% Infiltration* (into disposal field):	21
Assumed rainfall flow into disposal field (gal/day):	6.63
Assumed rainfall flow into disposal field during drought conditions^(gal/day):	3.98
Background NO3-N concentration (mg/L):	0
Assumed effluent NO3-N concentration (mg/L):	41
Assumed effluent flow into disposal field (gal/day):	360
Assumed NO3-N concentration in rainfall (mg/L):	0.5
Hydraulic conductivity of aquifer (ft/day):	2
Hydraulic gradient of aquifer (ft/ft):	0.030
Effective porosity of aquifer:	0.21
Seepage velocity of aquifer (ft/day):	0.29
Retardation factor	1
Half-Life (0 for no decay)	0
Simulation duration to reach NO3-N concentration equilibrium (days)	1,135
Longitudinal dispersivity at end of simulation duration (ft)	4.12
Lateral dispersivity at end of simulation duration (ft)	1.37
Vertical dispersivity at end of simulation duration (ft)	0.21
Disposal bed length (ft)	28
Disposal bed width (ft)	15
Length of 10 mg/L plume during drought conditions (ft)	80

Notes:

* - from The State of Maine Department of Environmental Protection, 1991, The guidelines for expediting the processing of applications under the site location of development act.

^ - drought conditions equals 60% of average annual rainfall

% - percent

gal/day - gallons per day

ft - feet

mg/L - milligrams per liter

NO3-N - Nitrate-Nitrogen

DECLARATION OF COVENANTS

**DECLARATION OF PROTECTIVE COVENANTS AND COMMON EASEMENTS
ORCHARD ROAD SUBDIVISION
TOWN OF CUMBERLAND, COUNTY OF CUMBERLAND, STATE OF MAINE
BY
TZ PROPERTIES, LLC**

THIS DECLARATION dated this _____ day of _____, 2018, by TZ Properties, LLC, a Maine limited liability company with a mailing address of _____ (hereinafter referred to as the "Declarant").

WITNESSETH:

WHEREAS, the Declarant owns certain real property in the Town of Cumberland, Cumberland County, State of Maine, as described on **Exhibit A** attached hereto and as delineated on a plan entitled "Orchard Road Subdivision, Cumberland, Maine" prepared for Declarant by Gorrill Palmer and dated October 2017, and recorded in the Cumberland County Registry of Deeds in Plan Book xxx, Page xxx (the "Plan"), which subdivision consists of Ten (10) lots numbered on the Plan as 1-10 and also a parcel of land designated "Open Space." Lots 1 through 10 inclusive shall hereinafter be referred to as the "Lots," and together with the appurtenant Common Open Space easements shown on the Plan or referenced in this Declaration hereinafter referred to as the "Property." Declarant proposes to develop and improve the Property in accordance with the Plan; and

WHEREAS, Declarant desires to assure quality standards for the orderly development of the Property and to promote the interest and welfare of each owner of a part of the Property and therefore desires to subject the Property to protective covenants and common easements as set forth hereinafter.

WHEREAS, Declarant desires to subject the Property to protective covenants and common easements as set forth hereinafter to incorporate the conditions of the Town of Cumberland Planning Board approval for the subdivision of the Property.

NOW, THEREFORE, Declarant hereby declares that the Property is and shall be owned, occupied, improved, transferred, leased and otherwise used and disposed of subject to the protective covenants and common easements set forth herein, all of which are declared to be in furtherance of a uniform scheme of mutual equitable servitudes upon each and every portion thereof, in favor of each and every other portion thereof, and to create reciprocal rights and privity of contract and estate between all persons acquiring or owning an interest in any portion thereof, which protective covenants and common easements shall be determined to run with the land and be a burden and benefit upon and to, and be enforceable by, all persons having any interest in any portion of the Property, their heirs, successors and assigns.

**ARTICLE I
DEFINITIONS.**

1. **Association:** "Association" shall mean and refer to *Orchard Road Subdivision Homeowners Association*, its successors and assigns, a non-profit, non-stock Maine corporation, to be formed by Declarant pursuant to the terms of Article V below.

2. **Building:** "Building" shall mean and refer to any dwelling, garage, or storage structures or other improvement now or hereafter constructed on a Lot.

3. Common Expenses: "Common Expenses" shall mean and refer to expenditures made by or financial liabilities of the Association, together with any allocations to capital or other reserve accounts.

4. Lot: "Lot" shall mean each whole Lot or any interest therein as joint tenants or tenants in common.

5. Remaining Land: "Remaining Land" shall mean and refer to any land not a Lot and all improvements thereon, including without limitation the roads, curbing, and storm water drainage fixtures and improvements, all as shown on the Plan. Remaining Land also shall include the Common Open Space.

6. Easement Areas: "Easement Areas" shall mean and refer to all of the easements areas shown on the Plan or described below or on Exhibit A attached hereto that burden any Lot or Lots or that benefit the Association and all of the Lots, including without limitation utility easements, pedestrian access to open space easement, vehicle and pedestrian access easements in the roadway, forested buffer easements, drainage easements, and and all improvements on, in, across or under such easement areas including pavement, curbing, landscaping, storm water drainage fixtures and improvements.

7. Member: "Member" shall mean and refer to those persons entitled to membership in the Association as determined by the Bylaws of the Association and as set forth herein.

8. Owners: "Owners" or in the singular, "Owner", shall mean and refer to the record owner or owners of fee simple title in and to any Lot, and shall include the Declarant so long as it owns any Lot or any other portion of the Property, but shall not include any person or legal entity owning an interest merely as security for an obligation.

ARTICLE II

PROTECTIVE COVENANTS AND RESTRICTIONS.

Each conveyance by Declarant, its successors and assigns, of any Lot, and all subsequent conveyances of any Lot, whether directly or by operation of law, shall be subject to the following:

1. No Commercial Uses: Subject to the rights of the Declarant to develop and sell the Lots and such other rights of the Declarant as are set forth in this Declaration, each Lot shall be used only for residences, and no commercial enterprise of any nature or description shall be conducted or maintained on any portion of the Property, except that Lots may be used for a home office for telecommuting purposes by the Owners of such Lots provided that no customer, client or employee visits are made to the Lots incident to such commercial use.

2. Buildings and Lot Improvements: One single family residential structure shall be constructed or kept on any Lot. Each such Lot shall be improved subject to the following restrictions:

- (a) Not less than 1 ½ stories in height that meets or exceeds seventeen hundred (1700) square feet of usable living area excluding basements, garages, decks and patios, one (1) private garage attached to the single-family dwelling or detached from said dwelling, for not more than three (3) cars, in ground pool, pool house and outbuildings incidental and accessory to

the permitted use of the premises. All structures shall comply with all applicable state and municipal building codes.

- (b) No structure shall be constructed outside of the building envelope shown on the Plan, which building envelope is determined by the application of the Town of Cumberland setback requirements.
- (c) No wetland or vernal pool area on any Lot shall be disturbed, beyond the disturbance shown on the approved Subdivision Plan, without permits from the U.S. Army Corps. Of Engineers, and/or the Maine Department of Environmental Protection as applicable.
- (d) Any disturbance within the Critical Terrestrial Habitat boundary, shown on the approved Subdivision Plan, beyond 15,000 square feet per lot shall comply with applicable requirements of the Department of the Army General Permit for the State of Maine dated 2015 or most recent revision.
- (e) All construction, including paved driveway, must be completed not more than twenty-four (24) months from the commencement date. Commencement of construction shall be defined as the date on which site work has begun on the subject property.
- (f) Any additions to a structure after initial construction that increase the footprint, that materially change the exterior appearance, or that require structural modification to the structure must be approved by the Declarant, or after the Declarant has conveyed the last Lot, by the Board of Directors of the Association, in writing prior to commencement of construction of such additions or modifications.
- (g) Declarant reserves to itself, its successors and assigns, the exclusive right to erect, place and maintain such facilities in or upon any portion of the Property as in its sole discretion may be necessary or convenient while selling the Lots or portions thereof, selling or constructing residences and other improvements upon the Property. Such facilities shall include, but are not limited to, sales and construction offices, storage areas, model units, signs, and portable toilet facilities.

3. Damage or Destruction: Any Building on any Lot that is destroyed or damaged in whole or in part by fire, windstorm, or other casualty promptly must be rebuilt or all debris removed and the affected portion of the Lot restored to its natural condition without delay.

4. Compliance with Governmental Regulations: Owners shall occupy and maintain the Lots in accordance with the rules, regulations, ordinances, and statutes enacted by governmental entities having jurisdiction over the Property, including without limitation the terms and conditions imposed by the Town of Cumberland Planning Board in connection with the subdivision approval for the Property on xxx, and xxx (the "Town Approvals"), and as reflected on the Plan.

5. Maintenance and Use of the Remaining Land and Easement Areas: The Association shall bear all cost (subject to the right to assess lots as provided below) and responsibility of operation, upkeep, maintenance, repair and replacement of any Remaining Land and Easement Areas, including without limitation any necessary routine maintenance and repair of the roads, storm drainage and grassed underdrained soil filters, landscaping, curbing, utility wires and conduits, development signage or other common area improvements. The Association shall also obtain and maintain adequate commercial general liability insurance on said Remaining Land and with respect to the Easement Areas, which insurance shall be obtained on an occurrence basis

in an amount not less than \$5,000,000 combined single limit. Until and only until conveyance of any portion of the Remaining Land to the Association, the Declarant shall undertake the maintenance responsibilities of the Association with respect to the Remaining Land and Easement Areas; provided, however, the Association shall be unconditionally obligated to accept conveyance of the Remaining Land and Easement Areas or any part thereof, and Declarant may record a deed or deeds to the Association for such areas without further action by the Association. The Remaining Land shall be conveyed to the Association by Declarant at any time prior to or contemporaneously with Declarant conveying out the first Lot of the Property, with the timing of such conveyance to be in Declarant's sole discretion. Upon any such conveyance to the Association, the Declarant shall be relieved of all obligations under this paragraph with respect to the land conveyed.

The open space lot (1.69 acres) that directly abuts the lot N/F Christopher S. Neagle, Map R08 Lot 58 shall be subject to the same restrictions as the Buffer Area Restrictions described in Article IX.

6. Animals: No poultry, swine, livestock or other animals shall be kept on a Lot or otherwise on the Property, except household pets of the kind and number normally housed in a residence. There shall be no exterior pet fencing, shelters, or caging. No boarding of dogs, cats or other household pets shall be conducted on a Lot.

7. Prohibited Vehicles: Except in the development and sale of the Lots by the Declarant and construction of houses and other Buildings by Owners, no business or commercial vehicle or vehicle of similar nature shall be brought upon, or be maintained, or be permitted to remain on the Property except that a business or commercial vehicle regularly used by an Owner in his or her occupation may remain on a Lot. No junk automobiles or other vehicles that do not display a current State of Maine motor vehicle inspection sticker may be kept or maintained on the Property unless parked in a garage or storage shed.

8. Prohibited Activities: No hunting or use of firearms, air guns, or bows shall be allowed anywhere on the Property. No wetland or vernal pool area on any of the Remaining Land shall be disturbed, beyond the disturbance shown on the approved Subdivision Plan, without permits from the U.S. Army Corps. Of Engineers, and/or the Maine Department of Environmental Protection as applicable.

9. Rubbish and Debris: Except during the initial construction of a Building, rubbish and debris shall be stored between pickups in the garage in sanitary receptacles with sealing covers or as required by Town of Cumberland ordinances or regulations and shall be placed curbside for pickup in such receptacles with the covers placed tightly over the receptacles and promptly re-stored in a garage after rubbish pickup.

10. Exterior Lighting: Any exterior lighting shall be directed to illuminate only the ground or the Buildings on the Lot and shall be installed such that no light is directly visible from any other part of the Property.

11. Buffer Restrictions: Restrictions on the "75' Buffer" areas shown on the Plan are described in Article IX of this Declaration.

ARTICLE III
DURATION.

The protective covenants, common easements and other provisions of this Declaration as set forth herein and as may be amended from time to time as provided below in Article X, shall run with the land and burden the Property and shall inure to the benefit of and be enforceable by the Declarant, the Association, and any other Owner of any portion of the Property, their respective legal representatives, heirs, successors or assigns, in perpetuity.

ARTICLE IV
DECLARANT'S RESERVED RIGHTS.

The conveyance of the Lots to Owners shall be subject to the following rights reserved by the Declarant until completion of the construction, marketing and sale of all Lots:

1. To change the size, number, dimension, and location of Lots and other improvements owned by the Declarant, subject to the requirement that Declarant obtain necessary approval from the Town of Cumberland planning authority. The foregoing change or changes shall be effective upon the recording by the Declarant of an amendment to this Declaration, no other signatures being necessary on such amendment, and/or the recording by the Declarant of an amended subdivision plan indicating the changes made;
2. To locate on the Property, even though not depicted on the Plan, and grant and reserve easements and rights of way for the installation, maintenance, repair, replacement and inspection of utility lines, wires, pipes, conduits and facilities, including, but not limited to, water, electric, telephone, cable and sewer;
3. To connect with and make use of utility lines, wires, pipes and conduits located on the Property for construction and sales purposes, provided that the Declarant shall be responsible for the cost of services so used;
4. To use the roads shown on the Plan and access easements appurtenant to the Property for ingress and egress to the Property or any portion thereof for all purposes including, but not limited to development and construction of a residential subdivision and use the Property for the storage of materials used in the construction of the residences and improvements on the Lots and infrastructure on the Property and equipment used in the completion of the project;
5. To install and maintain signs and lighting for marketing and sales purposes; and
6. To do all things reasonably necessary to facilitate the development of the Property and the marketing and sale of the Lots.

Declarant further reserves from the land described in Exhibit A attached hereto a perpetual easement in gross, assignable to any other party or parties in part or in whole, for vehicular and pedestrian access on and all utilities under, across or over the 50' wide roadway right-of-way as shown on the Plan. The foregoing reserved easement may benefit any additional land and any number of additional lots or dwellings without exceeding the scope of or overburdening the reserved easement rights. The foregoing reserved easement is perpetual in nature and does not expire upon the sale of the Lots by Declarant.

ARTICLE V

HOMEOWNERS ASSOCIATION.

On or about the date of execution and recording of this Declaration, there will be formed *Orchard Road Subdivision Homeowners Association*, a non-profit, non-stock corporation organized under the laws of the State of Maine (the "Association"). Each Owner or Owners of a Lot, including the Declarant prior to the conveyance of each Lot, shall automatically become and be a member of the Association as long as said Owner(s) continues as record owner of a Lot. Upon termination of the interest of an Owner in a Lot, the Owner's membership and any interest in the Association shall automatically terminate and transfer and inure to the next successive record owner of the Lot. Each Owner shall be bound by the Bylaws of the Association, as the same may be amended from time to time, and each Owner shall comply strictly with such Bylaws. No holder of a mortgage on a Lot shall be considered as an Owner until such holder shall have acquired title to such Lot by foreclosure or deed in lieu of foreclosure. With respect to Association governance matters requiring a vote of the Owners, each Lot shall have One (1) vote.

ARTICLE VI **ASSESSMENTS FOR COMMON EXPENSES.**

1. Upon ratification of the budget for Common Expenses (as defined herein), the Association shall cause to be sent to each Owner a statement showing such Owner's share of the Common Expenses. The Common Expenses shall include, without limitation, the costs necessary to own, operate, manage, maintain, repair and replace the Remaining Land and Easement Areas and to operate, maintain, repair and replace the roads, curbing, landscaping, signage, drainage swales, grassed underdrained soil filter, and all structures and equipment related or connected thereto. Assessments for Common Expenses shall be billed on or about the first day of each quarter. All sums so assessed and billed shall become due no later than 30 days after the date of mailing or delivery of each bill. The Members of the Association may from time to time at special meetings levy additional assessments, in accordance with the terms of the Bylaws.

2. Assessments authorized and billed by the Association shall be a charge on the Lot and shall be a continuing lien upon the Lot upon which such assessment is made. If the assessment to an Owner shall not be paid within Thirty (30) days after the date when due, then said assessment shall be delinquent and shall, together with interest at the rate of one percent (1%) per month or any portion thereof, costs of collection and attorneys' fees, become a continuing lien on the Lot owned by the delinquent Owner, which lien shall bind the Lot with the Building and improvements thereon, as well as the delinquent Owner, his heirs, devisees, successors, personal representatives and assigns, without the necessity of filing any document of record. Such lien may be enforced and foreclosed by the Association in the manner provided by applicable law for the foreclosure of real estate mortgages. The lien for unpaid assessments established hereby shall be prior to all liens and encumbrances on the Lot other than (i) the first mortgage recorded prior to the date on which the assessment that is sought to be enforced becomes delinquent, (ii) any second mortgage in favor of Declarant, (iii) liens for real estate taxes and other governmental/municipal assessments or charges against the Lot, or (iv) any other lien that according to law takes priority over existing liens pursuant to any statute. All such assessments, in addition to being a lien, shall also constitute the personal liability of the Owner of the Lot so assessed at the time of the assessment. In the collection of any assessment, the defaulting Owner also shall pay all of the Association's costs of collection, including attorneys' fees.

ARTICLE VII **EASEMENTS.**

The Lots and the Remaining Land are and shall be subject to all of the conditions, restrictions, easements and reservations set forth on the Plan, as it may be amended from time to time, and as more fully described below, and all Owners shall be bound by all of said conditions, restrictions, easements and reservations.

1. **“Common Open Space”**: An easement for maintenance and use of the land for passive recreational activities such as walking, running, snowshoeing, and Nordic skiing.

2. **“Roadway Access and Utility Easement”**: An easement for access by pedestrians and vehicles to and from the Lots and including the right to construct, maintain, repair and replace the roadway, including without limitation the gravel, pavement and curbing therefor. Also an easement to construct, install, use, repair, maintain and replace above and/or below ground any and all utility lines, pipes, conduits, wires, poles, guys, transformer and juncture boxes including without limitation those necessary for the provision of sewer, water, electricity, telephone, cable television, data and other communication services, including the right to enter the easement area at any time and from time to time with workers and equipment to exercise the rights reserved pursuant to this easement, including without limitation the removal of stumps and roots, the construction decorative walls and columns, and the alteration of the grade of the earth, including the right to maintain and replace all of the foregoing, including the right to enter the easement area at any time and from time to time with pedestrians, motor vehicles and equipment to exercise the rights reserved pursuant to this easement. Declarant reserves for itself and its successors and assigns the right to dedicate and convey the right-of-way to the Town of Cumberland for all public purposes.

3. **“Drainage Swales”**: An easement for the installation, maintenance, repair, and replacement of level lip spreaders and drainage swales for the purpose of treating storm water runoff, which easement includes access thereto with workers and equipment for such purposes.

4. **“Winter Maintenance Easement”**: An easement across the roadway for the Town of Cumberland to use for all purposes in connection with the plowing and snow removal activities on the roadway right-of-way, in the event that the roadway is offered and accepted by the Town of Cumberland for winter maintenance purposes.

ARTICLE VIII **MAINTENANCE OF STORMWATER MANAGEMENT FACILITIES**

The Association shall comply with the recommendations and requirements contained in the “Stormwater management report and Erosion and Sedimentation Control Report for Orchard Road Subdivision, Cumberland, Maine” prepared by Gorrill Palmer for Declarant and dated November, 2017, and October, 2017, as such maintenance plan has been approved by the Town of Cumberland Planning Board and the Maine Department of Environmental Protection. The Maintenance of Facilities section of the Erosion and Sedimentation Report presents the required maintenance for the Orchard Road Subdivision and is included as follows.

Maintenance of facilities

The stormwater facilities will be maintained by the Applicant, TZ Properties, LLC or their assigned heirs. The contract documents will require the contractor to designate a person responsible for maintenance of the sedimentation control features during construction as required by the Erosion Control Report. Long-term operation/maintenance recommended for the stormwater facilities is presented below.

The responsible party may contract with such professionals, as may be necessary in order to comply with this provision and may rely on the advice of such professionals in carrying out its duty hereunder, provided, that the following operation and maintenance procedures are hereby established as a minimum for compliance with this section. A maintenance log of the inspections shall be kept by the responsible party.

Inspection and Maintenance Frequency and Corrective Measures:

The following areas, facilities, and measures will be inspected and the identified deficiencies will be corrected. Clean-out must include the removal and legal disposal of any accumulated sediments and debris.

Catch Basins:

Inspect catch basins 2 times per year (preferably in Spring and Fall) to ensure that the catch basins are working in their intended fashion and that they are free of debris. Clean structures when sediment depths reach 12" from invert of outlet. If the basin outlet is designed with a hood to trap floatable materials (i.e. Snout), check to ensure watertight seal is working. At a minimum, remove floating debris and hydrocarbons at the time of the inspection.

Culverts:

Inspect culverts 2 times per year (preferably in Spring and Fall) to ensure that the culverts are working in their intended fashion and that they are free of debris. Remove any obstructions to flow; remove accumulated sediments and debris at the inlet, at the outlet, and within the conduit and repair any erosion damage at the culvert's inlet and outlet.

Inlet/Outlet Control Structures:

Inspect structures and piping 2 times per year (preferably in Spring and Fall) to ensure that the structures are working in their intended fashion and that they are free of debris. Remove any obstructions to flow; remove accumulated sediments and debris within the structure.

Stormdrain Outlets:

Inspect outlets 2 times per year (preferably in Spring and Fall) to ensure that the outlets are working in their intended fashion and that they are free of debris. Remove any obstructions to flow; remove accumulated sediments and debris at the outlet and within the conduit. Repair any erosion damage at the stormdrain outlet.

Soil Filter – Bio-Filtration:

Inspect all upstream pre-treatment measures 2 times per year (preferably in Spring and Fall) for sediment and floatables accumulation. Remove and dispose of any sediments or debris.

Surface (Underdrain Pond, Swale or Bio-Filter):

The soil filter will be inspected within the first three months after construction; thereafter the filter will be inspected 2 times per year (preferably in Spring and Fall) to ensure that the filter is draining within 24 to 48 hours of a rain event equivalent to 1" or more. Adjustments will be made to the outlet valve to ensure that the grassed underdrained soil filter drains within 24 to 48 hours. Failure to drain in 72 hours will require part or all of the soil filter media to be removed and replaced with new material meeting the soil filter gradation. The facilities will be inspected after major storms and any identified deficiencies will be corrected. Harvesting and weeding of excessive growth shall be performed as needed. Inspect for unwanted or invasive plants and remove as necessary.

Vegetated Areas:

Inspect slopes and embankments early in the growing season to identify active or potential erosion problems. Replant bare areas or areas with sparse growth. Where rill erosion is evident, armor the area with an appropriate lining or divert the erosive flows to on-site areas able to withstand the concentrated flows. The facilities will be inspected after major storms and any identified deficiencies will be corrected.

Ditches, Swales and other Open Stormwater Channels:

Inspect 2 times per year (preferably in Spring and Fall) to ensure they are working in their intended fashion and that they are free of sediment and debris. Remove any obstructions to flow, including accumulated sediments and debris and vegetated growth. Repair any erosion of the ditch lining. Vegetated ditches will be mowed at least annually or otherwise maintained to control the growth of woody vegetation and maintain flow capacity. Any woody vegetation growing through riprap linings must also be removed. Repair any slumping side slopes as soon as practicable. If the ditch has a riprap lining, replace riprap on areas where any underlying filter fabric or underdrain gravel is showing through the stone or where stones have dislodged. Correct any erosion of the channel's bottom or sideslopes. The facilities shall be inspected after major storms and any identified deficiencies shall be corrected.

Roadways and Parking Surfaces: Clear accumulations of winter sand in parking lots and along roadways at least once a year, preferably in the spring. Accumulations on pavement may be removed by pavement sweeping. Accumulations of sand along road shoulders may be removed by grading excess sand to the pavement edge and removing it manually or by a front-end loader. Repair potholes and other roadway obstructions and hazards. Plowing and sanding of paved areas shall be performed as necessary to maintain vehicular traffic safety.

In the event that the Roadway is accepted by the Town of Cumberland, the maintenance requirements of all stormwater facilities within the right-of-way will become the responsibility of the Town of Cumberland. In the event that the Roadway is accepted by the Town of Cumberland, the Association shall be responsible for the maintenance of all stormwater facilities outside of the right-of-way, including but not limited to the grassed underdrained soil filters, inlet/outlet control structures, storm drain outlets, vegetated areas, and swales.

ARTICLE IX

RESTRICTED BUFFER AREAS

To preserve the “75’ Buffer” areas shown on the Plan (hereinafter referred to as the “Buffer Areas”), the Buffer Areas shall be maintained as follows:

The Buffer Areas are and shall forever be held, transferred, sold, conveyed, occupied and maintained subject to the conditions and restrictions set forth in this Article IX of the Declaration (the “Restrictions”). The Restrictions shall run with the Buffer Areas and shall be binding on all parties having any right, title or interest in and to the Buffer Areas, or any portion thereof, and their heirs, personal representatives, successors, and assigns. Any present or future owner or occupant of the Buffer Areas or any portion thereof, by the acceptance of a deed of conveyance of all or part of the Buffer Areas or an instrument conveying any interest therein, whether or not the deed or instrument shall so express, shall be deemed to have accepted the Buffer Areas subject to the Restrictions and shall agree to be bound by, to comply with and to be subject to each and every one of the Restrictions hereinafter set forth.

1. Restrictions on Buffer Area. The Buffer Area must remain undeveloped in perpetuity. To maintain the ability of the Buffer Area to filter and absorb stormwater, the use of the Buffer Area is hereinafter limited as follows.
 - a. No soil, loam, peat, sand, gravel, concrete, rock or other mineral substance, refuse, trash, vehicle bodies or parts, rubbish, debris, junk waste, pollutants or other fill material may be placed, stored or dumped on the Buffer Area, nor may the topography of the area be altered or manipulated in any way;
 - b. No vegetation may be cut or removed from the Buffer Area with the exception of dead, dying and dangerous trees.
 - c. No building or other temporary or permanent structure may be constructed, placed or permitted to remain on the Buffer Area, except for a sign, utility pole or fence;
 - d. No trucks, cars, dirt bikes, ATVs, bulldozers, backhoes, or other motorized vehicles or mechanical equipment may be permitted on the Buffer Area;

Any activity on or use of the Buffer Area inconsistent with the purpose of these Restrictions is prohibited.

2. Binding Effect. If a Buffer Area is at any time owned by more than one owner, each owner shall be bound by the foregoing restrictions to the extent that any of the Buffer Area is included within such owner’s property.

ARTICLE X **AMENDMENTS.**

This declaration may be amended at any time and from time to time by written instrument duly executed by the Owners of record of six of the ten Lots; provided, however, that at any time during which the Declarant owns one or more Lots, no amendment shall be effective unless the written consent of the Declarant to such amendment is obtained and further provided that no provisions of this Declaration required as conditions of approval for the subdivision of the Property may be terminated or modified without the approval of the planning authority of the Town of Cumberland. Any such amendment shall be recorded in the Cumberland County Registry of Deeds.

ARTICLE XI
GENERAL PROVISIONS.

1. Enforcement. By the acceptance of the deed to a Lot, each Owner covenants and agrees for himself, his heirs, devisees, successors, personal representatives and assigns, to comply with the covenants and restrictions set forth in this Declaration. Any failure to so comply shall be grounds for an action against the Owner, his heirs, devisees, successors, personal representatives and assigns, to recover damages or for injunctive relief or both. Such action may be maintained by the Association, the Declarant or by any aggrieved Owner. Notwithstanding anything in this Declaration to the contrary, the Association shall enforce the provisions of this Declaration that satisfy the conditions of the Town Approvals. In the event the Association, Declarant or an Owner shall substantially prevail in any such action, they shall be entitled to recover attorneys' fees and related expenses incurred in enforcing the terms of this Declaration. Nothing herein shall require the Declarant to enforce any of the covenants and restrictions in this Declaration.

2. Waivers. No delay or omission on part of the Declarant, the Association, or any Owner in enforcing the covenants set forth herein shall be construed as a waiver of any right to enforce or seek such remedy or acquiescence in such breach.

3. Severability. In the event any one or more of the provisions of this Declaration shall be found for any reason by a court of competent jurisdiction to be unenforceable or null and void, such judgment or decree shall not affect, modify, change, abrogate or nullify any other provision of this Declaration.

4. Pronouns. Wherever used, the singular number shall include the plural, the plural the singular, and the use of any gender shall be applicable to all genders.

IN WITNESS WHEREOF, TZ Properties, LLC, has caused this Declaration to be executed by Anthony J. Procida, its duly-authorized Manager, as of the day and year first above written.

WITNESS:

TZ PROPERTIES, LLC

By: _____

Anthony J. Procida, its Manager

STATE OF MAINE

COUNTY OF CUMBERLAND

_____, 2018

Personally appeared before me the above-named Anthony J. Procida, Manager of TZ Properties, LLC, as aforesaid, and acknowledged the foregoing to be his free act and deed in said capacity and the free act and deed of said company.

Print name:

Notary Public/Attorney-at-Law

EXHIBIT A

A certain lot or parcel of land located on the southwesterly side of Orchard Road in the Town of Cumberland, County of Cumberland, State of Maine, bounded and described as follows:

Beginning at a capped iron rod (PLS #1175) located on the southwesterly side of Orchard Road at the northerly corner of land now or formerly of Philip J. Terison as described in a deed recorded in the Cumberland County Registry of Deeds in Book 8929, Page 237. Thence:

- 1) S 36°10'41" W by said land of Terison a distance of Two Hundred Nine and 91/100 (209.91) feet to a capped iron rod (PLS #1175);
- 2) S 53°49'19" E by said land of Terison a distance of One Hundred Seventy-Nine and 00/100 (179.00) feet to a capped iron rod (PLS #1175) and land now or formerly of Thomas U. Gordon and Norma J. Gordon as described in a deed recorded in said Registry in Book 14950, Page 310;
- 3) S 47°27'35" W by said land of Gordon and following a stone wall a distance of Two Hundred Thirty-Four and 00/100 (234.00) feet to a capped iron rod (PLS #1328) and the northerly corner of land now or formerly of Amy Y. Parker as described in a deed recorded in said Registry in Book 28842, Page 59;
- 4) S 47°42'21" W by said land of Parker and following a stone wall a distance of Three Hundred Ninety-Five and 88/100 (395.88) feet to a capped iron rod and the northerly corner of land now or formerly of Margaret E. Stone and Stephen S. Carey as described in a deed recorded in said Registry in Book 29787, Page 187;
- 5) S 47°30'50" W by said land of Stone and Carey and following a stone wall a distance of Ninety-Nine and 90/100 (99.90) feet to a capped iron rod at the northerly corner of land now or formerly of Peter J. McCabe and Cinderella J. McCabe as described in a deed recorded in said Registry in Book 16335, Page 180;
- 6) S 47°24'08" W by said land of McCabe and following a stone wall a distance of Three Hundred Ninety-Six and 73/100 (396.73) feet to a ½" rebar set in a stone wall and the easterly corner of land now or formerly of Suzanne L. McCormack, Trustee of the Suzanne L. McCormack Declaration of Trust dated February 18, 2004 as described in a deed recorded in said Registry in Book 34142, Page 44;
- 7) N 53°46'20" W by said land of McCormack Trust a distance of One Thousand Thirty-Six and 60/100 (1036.60) feet to a capped iron rod (PLS #1175) and the southerly corner of land now or formerly of Carl Terison, Jr. as described in a deed recorded in said Registry in Book 3594, Page 252;
- 8) N 34°05'55" E by said land of Terison a distance of Five Hundred Forty-Eight and 95/100 (548.95) feet to a capped iron rod (PLS #1175) and the westerly corner of land now or formerly of Tyler Weidner as described in deeds recorded in said Registry in Book 33581, Page 141 and Book 34287, Page 98;
- 9) S 51°24'24" E by said land of Weidner a distance of Three Hundred Fourteen and 44/100 (314.44) feet to a capped iron rod (PLS #1175);

- 10) N 35°46'54" E by said land of Weidner a distance of Three Hundred Sixty-Eight and 95/100 (368.95) feet to a point;
- 11) S 54°13'06" E by said land of Weidner a distance of Twenty and 00/100 (20.00) feet to a point;
- 12) N 63°35'28" E by said land of Weidner a distance of One Hundred Eleven and 58/100 (111.58) feet to a capped iron rod (PLS #1175) at the westerly corner of land now or formerly of Christopher S. Neagle as described in a deed recorded in said Registry in Book 25057, Page 46;
- 13) S 53°49'19" E by said land of Neagle a distance of Two Hundred Twenty and 01/100 (220.01) feet to a point at land now or formerly of Zachary O. Davis and Jenny J. Davis as described in a deeds recorded in said Registry in Book 33622, Page 303 and Book 34882, Page 209;
- 14) S 38°03'32" W by said land of Davis a distance of Twenty-Seven and 61/100 (27.61) feet to a point;
- 15) S 51°56'28" E by said land of Davis a distance of Two Hundred Thirty-Eight and 27/100 (238.27) feet to a non-tangent curve;
- 16) Northeasterly by said land of Davis following a curve to the left, having a radius of Two Hundred and 00/100 (200.00) feet, an arc distance of One Hundred Seven and 43/100 (107.43) feet to a point, said point being located N 52°02'45 E a distance of One Hundred Six and 14/100 (106.14) feet from the last described point;
- 17) N 36°39'29" E by said land of Davis a distance of Two Hundred Forty-Three and 33/100 (243.33) feet to a point at the southwesterly side of said Orchard Road;
- 18) S 53°49'19" E by said Orchard Road a distance of Two Hundred Twenty-Seven and 99/100 (227.99) feet to the point of beginning.

Bearings are referenced to Grid North of the Maine State Plane Coordinate System, West Zone, NAD83.

The above described parcel contains 24.97 acres, more or less. Meaning and intending to describe the same parcel of land as described in a deed to TZ Properties recorded in the Cumberland County Registry of Deeds in Book 34882, Page 207 and a portion of property as described in a deed to TZ Properties recorded in said Registry in Book 34200, Page 67.

STORMWATER ANALYSIS

STORMWATER MANAGEMENT

12.1 Overview

The proposed 10 lot single family residential subdivision will create approximately 46,351 square feet of impervious area. Pursuant to the Cumberland Subdivision Ordinance 250-38, projects which create more than 10,000 square feet of impervious area shall submit a stormwater management plan. Section 250-39 of the subdivision ordinance states that the peak discharge from the developed site shall not exceed the peak discharge for the undeveloped site for the two- and twenty five-year storms.

12.2 Introduction

Gorrill Palmer has been retained by TZ Properties, LLC to prepare a Stormwater Report for the proposed ten lot subdivision off Orchard Road in Cumberland, Maine. Figure 1 is a map showing the project location. The project will also need a Stormwater Permit from the MDEP. This narrative contains the stormwater management report for the construction of the project. The plans prepared by Gorrill Palmer include the infrastructure necessary to serve the project.

12.3 Development Description

The development site comprises approximately 24.9 acres and is currently undeveloped. The Applicant proposes the construction of a dead end roadway approximately 1,500 feet in length, construction of related stormwater drainage conveyances, and construction of two proposed grassed underdrained soil filters. The lot development will be by the individual lot owners.

Abutting land uses include:

- North – Residential
- East – Residential
- South – Residential/Undeveloped
- West – Residential/Apple Orchard

Runoff from the site is tributary to an unnamed stream which conveys the flow to the Piscataqua River. Neither the unnamed stream, nor the Piscataqua River are currently listed as “Urban Impaired Streams”, therefore, the development will not be required to meet the Chapter 500 Urban Impaired Stream Standard.

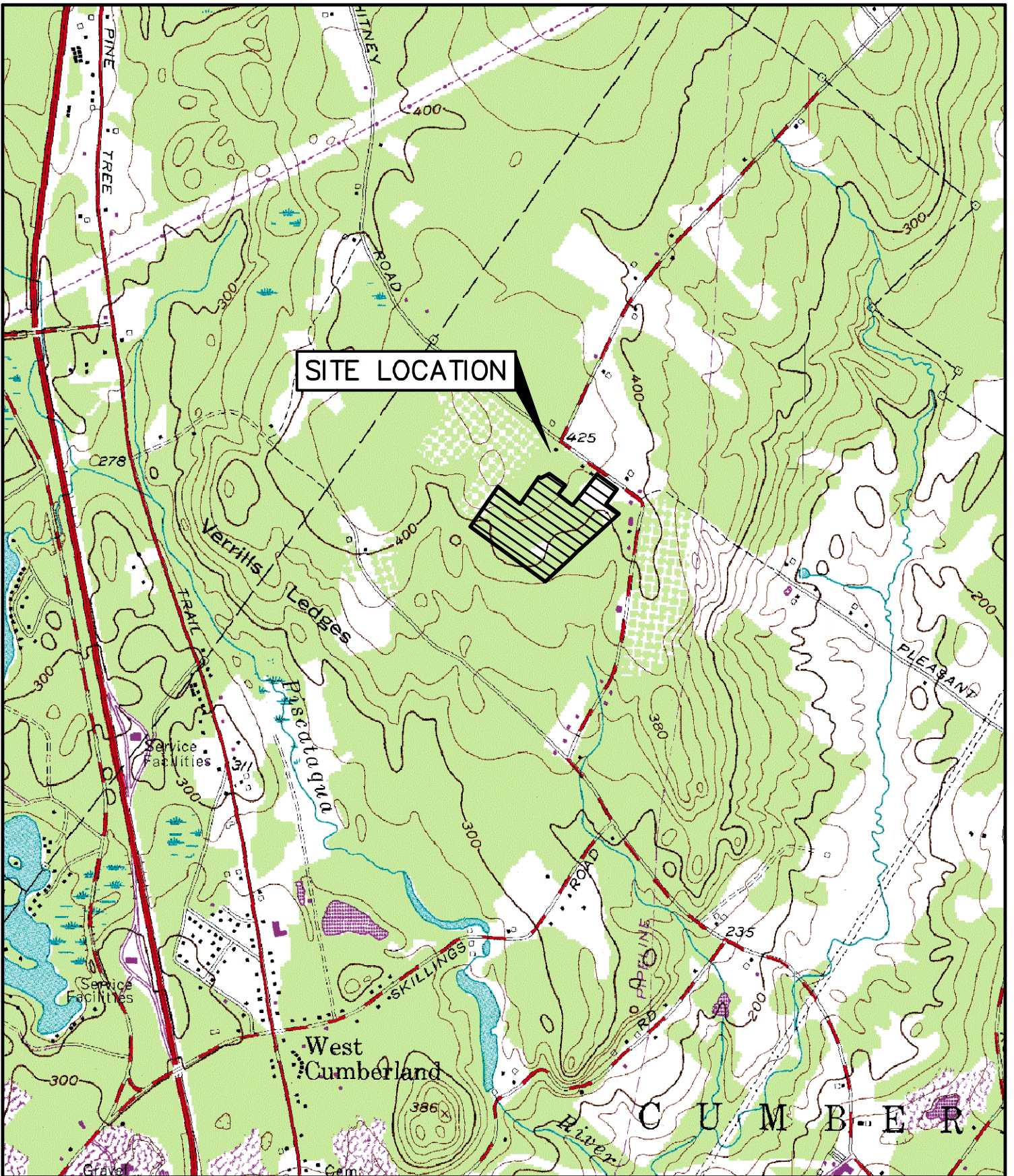
The construction of the subdivision roadway will result in approximately 1.08 acres of new impervious area.

12.4 Surface Water

There are no lakes located on, adjacent to or downstream of the project site.

12.5 General Topography

Topography in the area of the proposed construction is moderately steep with slopes of approximately 5% to 17%.



U.S.G.S. Location Map
 Subdivision Feasibility, Orchard Road, Cumberland, Maine
 U.S.G.S. Cumberland Center, State-7.5 Minute Series (Topographic)

Design: WCH	Date: OCT 2017
Draft: LAN	Job No.: 3236.01
Checked: WCH	Scale: None
File Name: 3236-LOCMAP.dwg	



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Figure

1

12.6 Flooding

Based upon the FEMA maps, no part of the site is located within a Zone A 100-year floodplain.

12.7 Natural Drainage Ways

The project will require a stream crossing and a wetland crossing which will be submitted to MDEP and the ACOE for permitting.

12.8 Alterations to Land Cover

Changes in land cover will include removal of wooded areas through portions of the project site and the addition of roof, paved surfaces and lawn areas.

12.9 Stormwater Management Control

This stormwater management report will address the Town of Cumberland peak flow requirements. Although the Applicant does not propose construction of the house lots, an allowance of 3,000 square feet of impervious area and 12,000 square feet of lawn was utilized in the post development condition for each lot to analyze the peak flow.

12.9.1 Approach and Analysis for Quantity Control

Since the proposed subdivision will require approval from the MDEP, grassed underdrained soil filters designed to conform with the MDEP BMP's have been used to provide stormwater peak control. The water quality control provided by the grassed underdrained soil filters will be addressed in the MDEP Stormwater Law permit submission which will be copied to the Town upon submission.

12.9.2 Water Quantity Sizing Requirements

The stormwater management study provides an analysis of predevelopment and post development stormwater runoff rates.

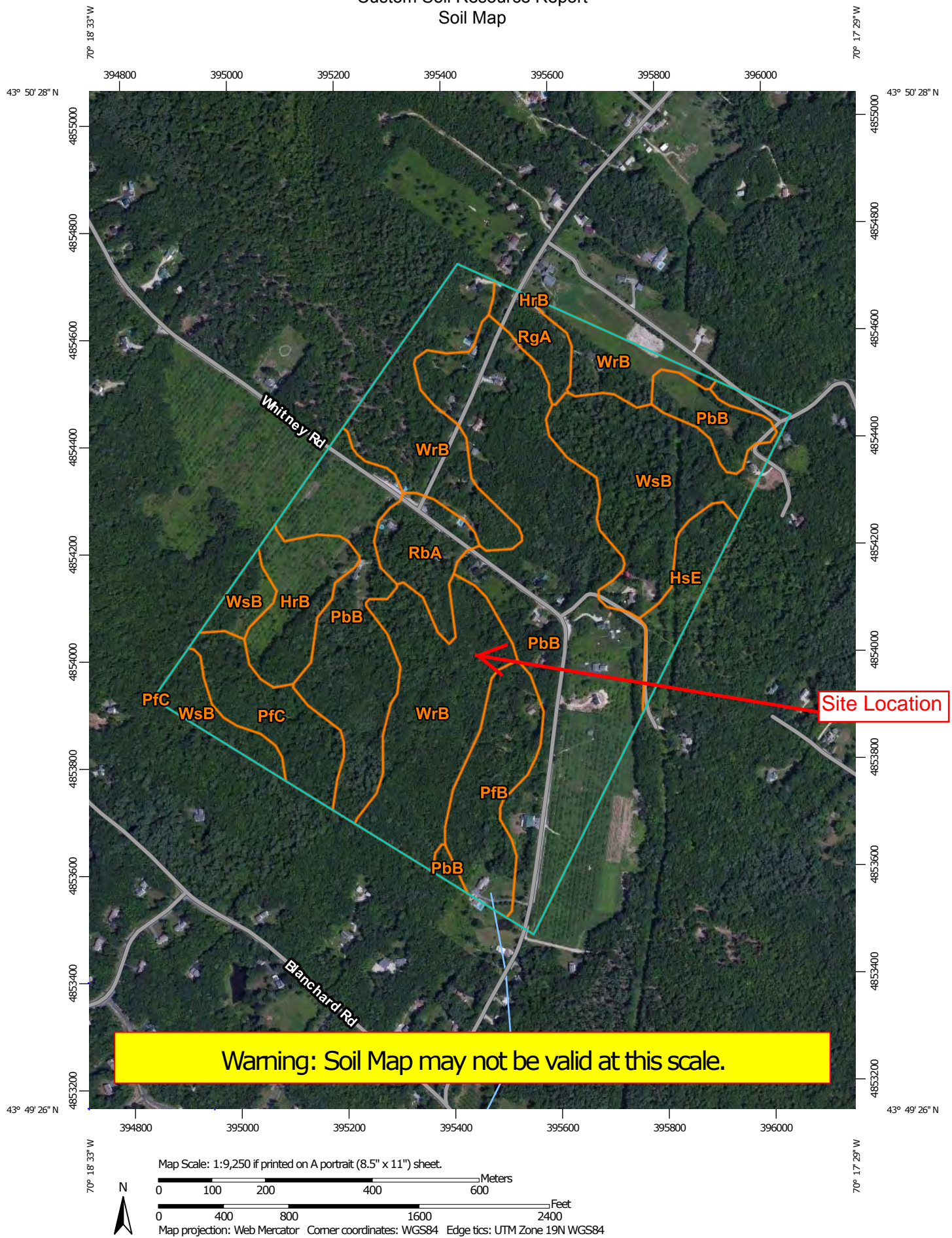
The soil types are shown on the watershed maps included in Attachment A and were obtained from the NRCS Cumberland County Medium Intensity Soil Survey which follows this page.

The SCS TR-20 methodology, using the HydroCad program, was employed by Gorrill Palmer to analyze predevelopment and post development conditions. A 24-hour, SCS Type III storm distribution for the two, ten, and twenty-five year storm frequencies were used. The corresponding rainfall amounts for these storms are 3.1", 4.6", and 5.8" respectively.

Land use cover, delineations of watershed hydraulic flow paths, and hydraulic soils data were obtained using the following data:

1. Cumberland Center 7.5 Minute Quadrangle Maps prepared by the U.S.G.S.
2. On-site topographic survey with 1' contour intervals from an existing conditions plan of the site.


Custom Soil Resource Report Soil Map



Custom Soil Resource Report

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 1:24,000.

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: <http://websoilsurvey.nrcs.usda.gov>
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: Cumberland County and Part of Oxford County, Maine
Survey Area Data: Version 12, Sep 15, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 20, 2010—Jul 18, 2010

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

Cumberland County and Part of Oxford County, Maine (ME005)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
HrB	Hollis fine sandy loam, 3 to 8 percent slopes	8.8	4.5%
HsE	Hollis very rocky fine sandy loam, 20 to 35 percent slopes	6.0	3.1%
PbB	Paxton fine sandy loam, 3 to 8 percent slopes	76.5	39.3%
PfB	Paxton very stony fine sandy loam, 3 to 8 percent slopes	11.9	6.1%
PfC	Paxton very stony fine sandy loam, 8 to 15 percent slopes	9.5	4.9%
RbA	Ridgebury fine sandy loam, 0 to 3 percent slopes	7.1	3.6%
RgA	Ridgebury very stony fine sandy loam, 0 to 3 percent slopes	3.9	2.0%
WrB	Woodbridge fine sandy loam, 0 to 8 percent slopes	42.9	22.0%
WsB	Woodbridge very stony fine sandy loam, 0 to 8 percent slopes	28.2	14.5%
Totals for Area of Interest		194.7	100.0%

Map Unit Descriptions

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

3. Aerial Photography of the project site and aerial contours, obtained from the Maine Office of GIS.
4. Field Reconnaissance.

Predevelopment Conditions

The drainage study analyzes the watersheds in the predevelopment condition as depicted on the Predevelopment Watershed Map.

The predevelopment condition was analyzed as seven subcatchments with seven points of interest (POI). The tributary areas to the POIs which are affected by the proposed redevelopment are analyzed for this stormwater report.

Subcatchment 1 consists of wooded area and orchard tributary to POI 1. The orchard area was modelled as a meadow landcover. The subcatchment is the area that is tributary to an existing swale at the westerly corner of the property.

Subcatchment 2 is a wooded area tributary to a swale that exits the southwesterly edge of the parcel which is designated as POI 2.

Subcatchment 3 is a wooded area tributary to a swale that exits the southwesterly edge of the parcel which is designated as POI 3.

Subcatchment 4 contains onsite and offsite area consisting of woodland, residential land, and orchard, which is tributary to a drainage swale that exits the southerly edge of the parcel. POI 4 is located at the parcel property line. The existing drainage swale conveys runoff from an offsite farm pond across the subdivision parcel.

Subcatchment 5 is a wooded area that conveys runoff across the southeasterly property line. POI 5 is located within a wetland area at the parcel boundary.

Subcatchment 6 is a wooded area that also conveys runoff to the southeasterly property line with POI 6 located within a wetland area at the parcel boundary.

Subcatchment 7 contains onsite and offsite area tributary to the unnamed stream which exits the parcel at the southeasterly property line. The subcatchment consists of woodland, roadway, residential land, and orchard.

A watershed map for the predevelopment condition is attached to this section as drawing number WI in Attachment A. Table 1 presents the peak flow rates at the POI for the design storms.

Table I– Predevelopment Peak Flow Rates (cfs)			
Point of Interest	Peak Flow (cfs)		
	2 Year	10 Year	25 Year
POI #1	3.5	7.4	10.8
POI # 2	0.7	1.7	2.6
POI # 3	0.7	1.7	2.7
POI # 4	6.2	13.8	20.5
POI # 5	2.1	5.3	8.2
POI # 6	2.1	5.0	7.7
POI # 7	9.2	20.0	29.5

Copies of the calculations for the predevelopment conditions are included in Attachment B.

Post development Conditions

Analysis for the post development condition consists of determining post development peak flows and limiting the post development flows to predevelopment levels. Detention will be provided within the grassed underdrained soil filters.

The seven predevelopment subcatchments have been modified to reflect the proposed project, the post development condition contains nine subcatchments tributary to seven points of interest. The points of interest are the same as the predevelopment points of interest. The overall watershed area remains the same as in the predevelopment condition.

Subcatchment 1 is predevelopment subcatchment 1 reduced in size as a result of the proposed roadway construction.

Subcatchment 2 is predevelopment subcatchment 1 reduced in size as a result of the proposed roadway construction.

Subcatchment 3 is predevelopment subcatchment 1 reduced in size as a result of the proposed roadway construction.

Subcatchment 4 is predevelopment subcatchment 4 which is not tributary to the proposed grassed underdrained soil filter.

Subcatchment 4A is the area tributary to the grassed underdrained soil filter. The outflow of the grassed underdrained soil filter is tributary to POI 4.

Subcatchment 5 is the southerly portion of predevelopment subcatchment 5 tributary to POI 5.

Subcatchment 6 is the southerly portion of predevelopment subcatchment 6 tributary to POI 6.

Subcatchment 6A is the northerly portion of predevelopment subcatchment 5 and 6 which is tributary to the grassed underdrained soil filter. The outflow of the grassed underdrained soil filter is tributary to POI 6.

Subcatchment 7 is the post development area tributary to the unnamed stream and is tributary to POI 7.

A watershed map for the post development condition is attached as drawing number W2 in Attachment A. Attachment B contains the TR-20 calculations.

A comparison of predevelopment and post development peak flow at the POI without detention is presented in the following table.

Table 2 – Comparison of Peak flows without detention (cfs)						
Point of Interest	Peak Flow (cfs)					
	2 Year		10 Year		25 Year	
	Pre	Post	Pre	Post	Pre	Post
POI #1	3.5	3.5	7.4	7.2	10.8	10.3
POI #2	0.7	0.6	1.7	1.3	2.6	2.0
POI #3	0.7	0.7	1.7	1.7	2.7	2.6
POI #4	6.2	7.3	13.8	15.6	20.5	22.9
POI #5	2.1	1.8	5.3	4.3	8.2	6.5
POI #6	2.1	4.3	5.0	9.5	7.7	13.9
POI #7	9.2	9.1	20.0	19.8	29.5	29.2

As can be seen from Table 2, detention is required to reduce the peak flow at POI 4, and 6 to predevelopment levels. The remainder of subcatchments remain at or below predevelopment flows due to changes in subcatchment area.

The grassed underdrained soil filters will provide detention of stormwater runoff for this project.

Pond I

The grassed underdrained soil filter has been analyzed to determine its performance for the 2-, 10-, and 25-year storms. The stormwater runoff from subcatchment 4A will enter the grassed underdrained soil filter through the inlet ditch. The smaller storms which generate runoff volume equal to or less than the channel protection volume will be conveyed through the soil filter and underdrain system. Larger storms will be conveyed through the soil filter underdrain and through the outlet control structure. The outlet control structure has an orifice with its invert set at the channel protection elevation, and a second orifice set at the 2-year stage. An emergency spillway is set at the 25-year storm stage and modelled as a broad crested weir. Flow over the weir during the 25 year storm, assuming the weir is the sole outlet, results in 1 foot of freeboard to the top of the pond berm. The following table presents the pond performance.

Table 3– Pond 1			
	Storm Event		
	2 Year	10 Year	25 Year
Peak Inflow (cfs)	2.57	5.34	7.72
Peak Outflow (cfs)	0.36	1.25	1.73
Stage (Max. Elevation)	397.55	398.38	399.12
Storage (cf)	5,233	9,512	14,105
Depth above base (ft)	1.88	2.71	3.45

Pond 2

The grassed underdrained soil filter has been analyzed to determine its performance for the 2-, 10-, and 25-year storms. The stormwater runoff from subcatchment 6A will enter the grassed underdrained soil filter through the stormdrain system. The smaller storms which generate runoff volume equal to or less than the channel protection volume will be conveyed through the soil filter and underdrain system. Larger storms will be conveyed through the soil filter underdrain and through the outlet control structure. The outlet control structure has a weir with its invert set above channel protection elevation. An emergency spillway is set at the 25-year storm stage and modelled as a broad crested weir. Flow over the weir during the 25 year storm, assuming the weir is the sole outlet, results in 1 foot of freeboard to the top of the pond berm. The following table presents the pond performance.

Table 4– Pond 2			
	Storm Event		
	2 Year	10 Year	25 Year
Peak Inflow (cfs)	3.11	6.59	9.63
Peak Outflow (cfs)	0.45	2.14	4.04
Stage (Max. Elevation)	406.34	407.10	407.70
Storage (cf)	9,932	16,414	22,150
Depth above base (ft)	2.17	2.93	3.53

As presented in Table 2 previously, detention of tributary runoff to POI 4, and POI 6 is required. The following table presents a comparison of peak flow with detention at the two POIs.

Table 5 – Comparison of Peak flows with detention (cfs)						
Point of Interest	Peak Flow (cfs)					
	2 Year		10 Year		25 Year	
	Pre	Post	Pre	Post	Pre	Post
POI #4	6.2	5.9	13.8	13.7	20.5	20.2
POI #6	2.1	1.3	5.0	3.3	7.7	6.2

As can be seen from Table 5 above, the peak post development flow is at or below predevelopment levels at POI 4, and POI 6.

12.9.3 Conclusion – Overall Water Quantity

The peak flow at the Points of Interest have been reduced to be at or below predevelopment peak levels.

12.10 Construction BMPs

Additional water quality treatment will be provided during construction by best management practices (BMP). Standard BMPs to be employed include siltation fencing around the downslope construction perimeter, siltation fence around the vegetated underdrains, riprap, pipe, stabilized construction entrances, and erosion control fabrics applied to slopes prior to revegetation.

12.11 Maintenance of Facilities

See the Erosion and Sedimentation Control report for this project.

12.12 Conclusion

Gorrill Palmer has been retained by TZ Properties, LLC to prepare plans and permit applications for the proposed ten lot subdivision off Orchard Road in Cumberland. Based upon the attached calculations, the proposed subdivision meets or exceeds the Cumberland stormwater management requirement through the use of detention within grassed underdrained soil filters.

12.13 Attachments

Attached to this section are the following items:

Attachment A – Watershed Maps (Pre, Post,)

Attachment B – TR-20 Calculations

Attachment C – Ditch and Stormdrain Calculations

ATTACHMENT A

WATERSHED MAPS

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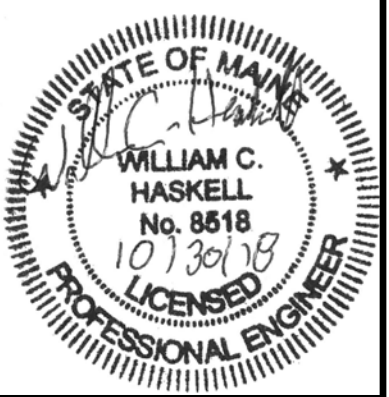
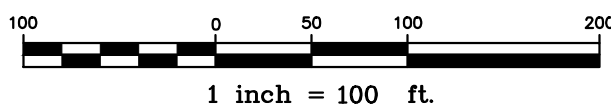


LEGEND

- 1 SUBCATCHMENT AREA
- A TIME OF CONCENTRATION FLOW PATH
- WATERSHED BOUNDARY
- WETLAND BOUNDARY
- SF SHEET FLOW
- PF PIPE FLOW
- SCF SHALLOW CONCENTRATED FLOW
- CF CHANNEL FLOW
- POI POINT OF INTEREST
- 1 REACH

SOIL SCHEDULE

SOIL	HYDROLOGIC SOIL GROUP
HrB - Hollis	D
PbB - Paxton	C
RbA - Ridgebury	C/D
WrB - Woodbridge	C
WsB - Woodbridge	C



Rev.	Date	Revision

Subdivision Amendment	9-25-18	WCH
Planning Board Signature	8-1-18	WCH
Preliminary/Final Subdivision Application	5-22-18	WCH
MDEP/ACOE Permitting	12-22-17	WCH
Preliminary Subdivision Application	10-31-17	WCH
Issued For	Date	By

Design: JWA	Draft: LAN	Date: DEC 2017
Checked: WCH	Scale: 1"=100'	Job No.: 3236.01
File Name: 3236-WS-PRE.dwg		
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Drawing Name:	Pre Development Watershed Map
Project:	Orchard Road Subdivision Cumberland, Maine
Client:	TZ Properties Falmouth, Me 04105

Drawing No.

W1

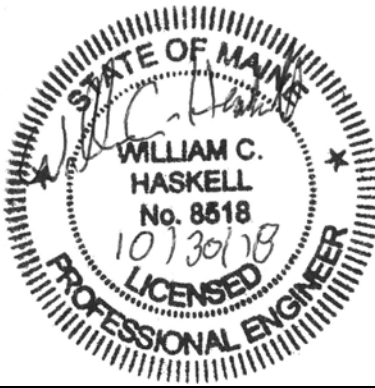
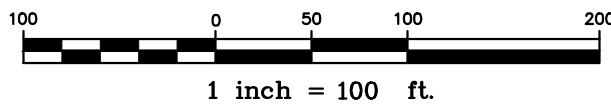
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LEGEND

- 1 SUBCATCHMENT AREA
- > A TIME OF CONCENTRATION FLOW PATH
- WATERSHED BOUNDARY
- WETLAND BOUNDARY
- SF SHEET FLOW
- PF PIPE FLOW
- SCF SHALLOW CONCENTRATED FLOW
- CF CHANNEL FLOW
- POI POINT OF INTEREST
- 1 REACH

SOIL SCHEDULE	
SOIL	HYDROLOGIC SOIL GROUP
HrB - Hollis	D
PbB - Paxton	C
RbA - Ridgebury	C/D
WrB - Woodbridge	C
WsB - Woodbridge	C



Rev.	Date	Revision

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Design: JWA	Draft: LAN	Date: DEC 2017
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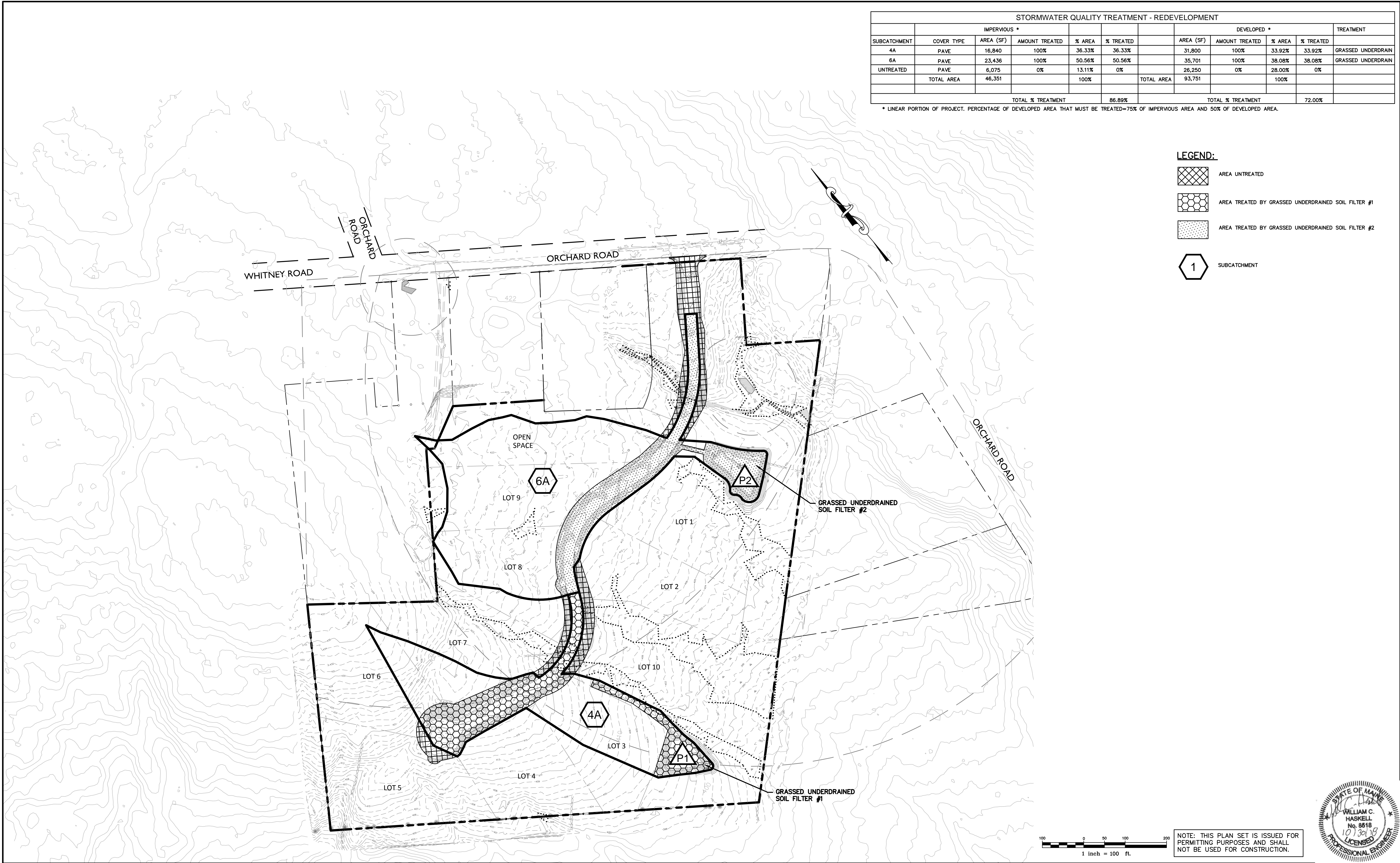
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Drawing Name:	Post Development Watershed Map
Project:	Orchard Road Subdivision Cumberland, Maine
Client:	TZ Properties Falmouth, Me 04105

Drawing No.

W2

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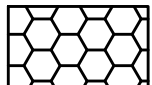
STORMWATER QUALITY TREATMENT - REDEVELOPMENT										
IMPERVIOUS *						DEVELOPED *				TREATMENT
SUBCATCHMENT	COVER TYPE	AREA (SF)	AMOUNT TREATED	% AREA	% TREATED	AREA (SF)	AMOUNT TREATED	% AREA	% TREATED	
4A	PAVE	16,840	100%	36.33%	36.33%	31,800	100%	33.92%	33.92%	GRASSED UNDERDRAIN
6A	PAVE	23,436	100%	50.56%	50.56%	35,701	100%	38.08%	38.08%	GRASSED UNDERDRAIN
UNTREATED	PAVE	6,075	0%	13.11%	0%	26,250	0%	28.00%	0%	
	TOTAL AREA	46,351		100%		TOTAL AREA		100%		
TOTAL % TREATMENT					86.89%	TOTAL % TREATMENT				72.00%

* LINEAR PORTION OF PROJECT. PERCENTAGE OF DEVELOPED AREA THAT MUST BE TREATED=75% OF IMPERVIOUS AREA AND 50% OF DEVELOPED AREA.

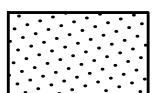
LEGEND:



AREA UNTREATED



AREA TREATED BY GRASSED UNDERDRAINED SOIL FILTER #1



AREA TREATED BY GRASSED UNDERDRAINED SOIL FILTER #2



SUBCATCHMENT



NOTE: THIS PLAN SET IS ISSUED FOR PERMITTING PURPOSES AND SHALL NOT BE USED FOR CONSTRUCTION.

Rev.	Date	Revision

Amended Subdivision	9-25-18	WCH
NRPA/ACOE Permitting	-	WCH
Issued For	Date	By

Design: JWA	Draft: LAN	Date: OCT 2017
Checked: WCH	Scale: 1"=100'	Job No.: 3236
File Name: 3236-WQ_OPTB.dwg		
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Drawing Name:	Water Quality Map
Project:	Orchard Road Subdivision Cumberland, Maine
Client:	TZ Properties Falmouth, Me 04105

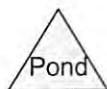
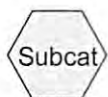
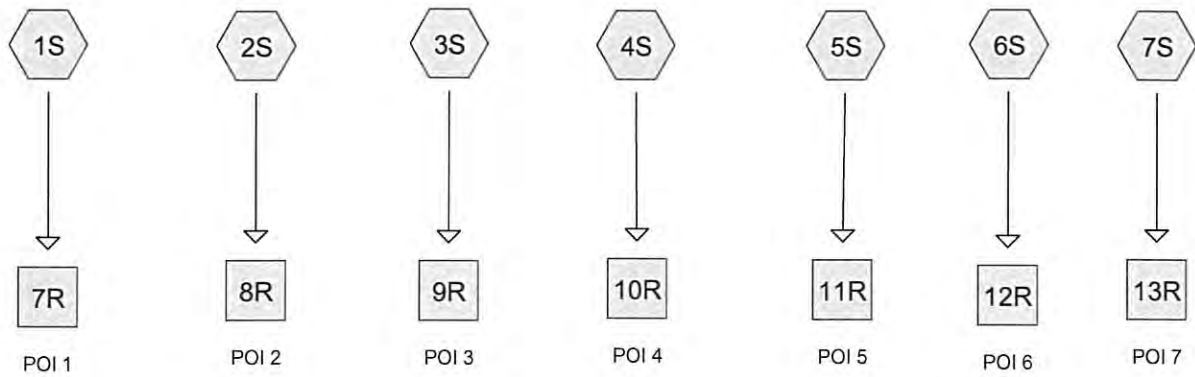
Drawing No.

WQ

ATTACHMENT B

TR-20 CALCULATIONS

PRE-DEVELOPMENT



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points x 3

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S:	Runoff Area=211,000 sf 0.00% Impervious Runoff Depth=1.08" Flow Length=690' Tc=27.1 min CN=76 Runoff=3.48 cfs 0.437 af
Subcatchment 2S:	Runoff Area=56,900 sf 0.00% Impervious Runoff Depth=0.82" Flow Length=350' Tc=23.9 min CN=71 Runoff=0.70 cfs 0.089 af
Subcatchment 3S:	Runoff Area=65,200 sf 0.00% Impervious Runoff Depth=0.77" Flow Length=470' Tc=28.4 min CN=70 Runoff=0.69 cfs 0.096 af
Subcatchment 4S:	Runoff Area=485,000 sf 4.32% Impervious Runoff Depth=0.97" Flow Length=1,690' Tc=35.6 min CN=74 Runoff=6.23 cfs 0.902 af
Subcatchment 5S:	Runoff Area=244,400 sf 0.00% Impervious Runoff Depth=0.77" Flow Length=950' Tc=42.6 min CN=70 Runoff=2.13 cfs 0.360 af
Subcatchment 6S:	Runoff Area=222,000 sf 0.00% Impervious Runoff Depth=0.82" Flow Length=965' Tc=43.0 min CN=71 Runoff=2.09 cfs 0.348 af
Subcatchment 7S:	Runoff Area=800,400 sf 6.57% Impervious Runoff Depth=1.03" Flow Length=1,890' Tc=49.3 min CN=75 Runoff=9.21 cfs 1.572 af
Reach 7R: POI 1	Inflow=3.48 cfs 0.437 af Outflow=3.48 cfs 0.437 af
Reach 8R: POI 2	Inflow=0.70 cfs 0.089 af Outflow=0.70 cfs 0.089 af
Reach 9R: POI 3	Inflow=0.69 cfs 0.096 af Outflow=0.69 cfs 0.096 af
Reach 10R: POI 4	Inflow=6.23 cfs 0.902 af Outflow=6.23 cfs 0.902 af
Reach 11R: POI 5	Inflow=2.13 cfs 0.360 af Outflow=2.13 cfs 0.360 af
Reach 12R: POI 6	Inflow=2.09 cfs 0.348 af Outflow=2.09 cfs 0.348 af
Reach 13R: POI 7	Inflow=9.21 cfs 1.572 af Outflow=9.21 cfs 1.572 af

Total Runoff Area = 47.863 ac Runoff Volume = 3.805 af Average Runoff Depth = 0.95"
96.47% Pervious = 46.175 ac 3.53% Impervious = 1.688 ac

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points x 3

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S:	Runoff Area=211,000 sf 0.00% Impervious Runoff Depth=2.21" Flow Length=690' Tc=27.1 min CN=76 Runoff=7.39 cfs 0.892 af
Subcatchment 2S:	Runoff Area=56,900 sf 0.00% Impervious Runoff Depth=1.82" Flow Length=350' Tc=23.9 min CN=71 Runoff=1.70 cfs 0.198 af
Subcatchment 3S:	Runoff Area=65,200 sf 0.00% Impervious Runoff Depth=1.74" Flow Length=470' Tc=28.4 min CN=70 Runoff=1.72 cfs 0.218 af
Subcatchment 4S:	Runoff Area=485,000 sf 4.32% Impervious Runoff Depth=2.05" Flow Length=1,690' Tc=35.6 min CN=74 Runoff=13.78 cfs 1.902 af
Subcatchment 5S:	Runoff Area=244,400 sf 0.00% Impervious Runoff Depth=1.74" Flow Length=950' Tc=42.6 min CN=70 Runoff=5.31 cfs 0.816 af
Subcatchment 6S:	Runoff Area=222,000 sf 0.00% Impervious Runoff Depth=1.82" Flow Length=965' Tc=43.0 min CN=71 Runoff=5.02 cfs 0.773 af
Subcatchment 7S:	Runoff Area=800,400 sf 6.57% Impervious Runoff Depth=2.13" Flow Length=1,890' Tc=49.3 min CN=75 Runoff=20.00 cfs 3.260 af
Reach 7R: POI 1	Inflow=7.39 cfs 0.892 af Outflow=7.39 cfs 0.892 af
Reach 8R: POI 2	Inflow=1.70 cfs 0.198 af Outflow=1.70 cfs 0.198 af
Reach 9R: POI 3	Inflow=1.72 cfs 0.218 af Outflow=1.72 cfs 0.218 af
Reach 10R: POI 4	Inflow=13.78 cfs 1.902 af Outflow=13.78 cfs 1.902 af
Reach 11R: POI 5	Inflow=5.31 cfs 0.816 af Outflow=5.31 cfs 0.816 af
Reach 12R: POI 6	Inflow=5.02 cfs 0.773 af Outflow=5.02 cfs 0.773 af
Reach 13R: POI 7	Inflow=20.00 cfs 3.260 af Outflow=20.00 cfs 3.260 af

Total Runoff Area = 47.863 ac Runoff Volume = 8.058 af Average Runoff Depth = 2.02"
 96.47% Pervious = 46.175 ac 3.53% Impervious = 1.688 ac

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points x 3

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S:	Runoff Area=211,000 sf 0.00% Impervious Runoff Depth=3.21" Flow Length=690' Tc=27.1 min CN=76 Runoff=10.80 cfs 1.295 af
Subcatchment 2S:	Runoff Area=56,900 sf 0.00% Impervious Runoff Depth=2.74" Flow Length=350' Tc=23.9 min CN=71 Runoff=2.60 cfs 0.298 af
Subcatchment 3S:	Runoff Area=65,200 sf 0.00% Impervious Runoff Depth=2.65" Flow Length=470' Tc=28.4 min CN=70 Runoff=2.67 cfs 0.330 af
Subcatchment 4S:	Runoff Area=485,000 sf 4.32% Impervious Runoff Depth=3.02" Flow Length=1,690' Tc=35.6 min CN=74 Runoff=20.50 cfs 2.800 af
Subcatchment 5S:	Runoff Area=244,400 sf 0.00% Impervious Runoff Depth=2.65" Flow Length=950' Tc=42.6 min CN=70 Runoff=8.21 cfs 1.238 af
Subcatchment 6S:	Runoff Area=222,000 sf 0.00% Impervious Runoff Depth=2.74" Flow Length=965' Tc=43.0 min CN=71 Runoff=7.70 cfs 1.163 af
Subcatchment 7S:	Runoff Area=800,400 sf 6.57% Impervious Runoff Depth=3.11" Flow Length=1,890' Tc=49.3 min CN=75 Runoff=29.54 cfs 4.766 af
Reach 7R: POI 1	Inflow=10.80 cfs 1.295 af Outflow=10.80 cfs 1.295 af
Reach 8R: POI 2	Inflow=2.60 cfs 0.298 af Outflow=2.60 cfs 0.298 af
Reach 9R: POI 3	Inflow=2.67 cfs 0.330 af Outflow=2.67 cfs 0.330 af
Reach 10R: POI 4	Inflow=20.50 cfs 2.800 af Outflow=20.50 cfs 2.800 af
Reach 11R: POI 5	Inflow=8.21 cfs 1.238 af Outflow=8.21 cfs 1.238 af
Reach 12R: POI 6	Inflow=7.70 cfs 1.163 af Outflow=7.70 cfs 1.163 af
Reach 13R: POI 7	Inflow=29.54 cfs 4.766 af Outflow=29.54 cfs 4.766 af

Total Runoff Area = 47.863 ac Runoff Volume = 11.890 af Average Runoff Depth = 2.98"
 96.47% Pervious = 46.175 ac 3.53% Impervious = 1.688 ac

Summary for Subcatchment 1S:

Runoff = 10.80 cfs @ 12.38 hrs, Volume= 1.295 af, Depth= 3.21"

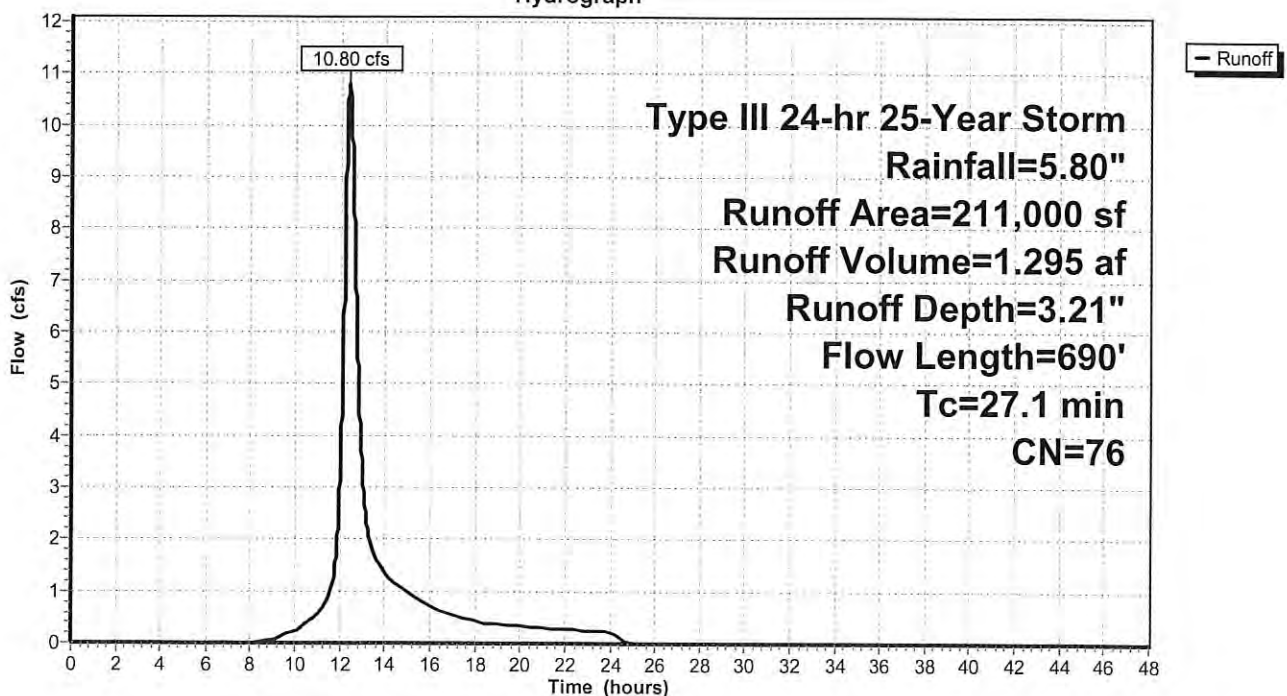
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Storm Rainfall=5.80"

Area (sf)	CN	Description
7,600	71	Meadow, non-grazed, HSG C
77,200	78	Meadow, non-grazed, HSG D
29,900	70	Woods, Good, HSG C
96,300	77	Woods, Good, HSG D
211,000	76	Weighted Average
211,000		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.9	150	0.0400	0.11		Sheet Flow, A-B
					Woods: Light underbrush n= 0.400 P2= 3.10"
1.0	240	0.0700	3.97		Shallow Concentrated Flow, B-C
					Grassed Waterway Kv= 15.0 fps
3.2	300	0.1000	1.58		Shallow Concentrated Flow, C-D
					Woodland Kv= 5.0 fps
27.1	690	Total			

Subcatchment 1S:

Hydrograph



Summary for Subcatchment 2S:

Runoff = 2.60 cfs @ 12.35 hrs, Volume= 0.298 af, Depth= 2.74"

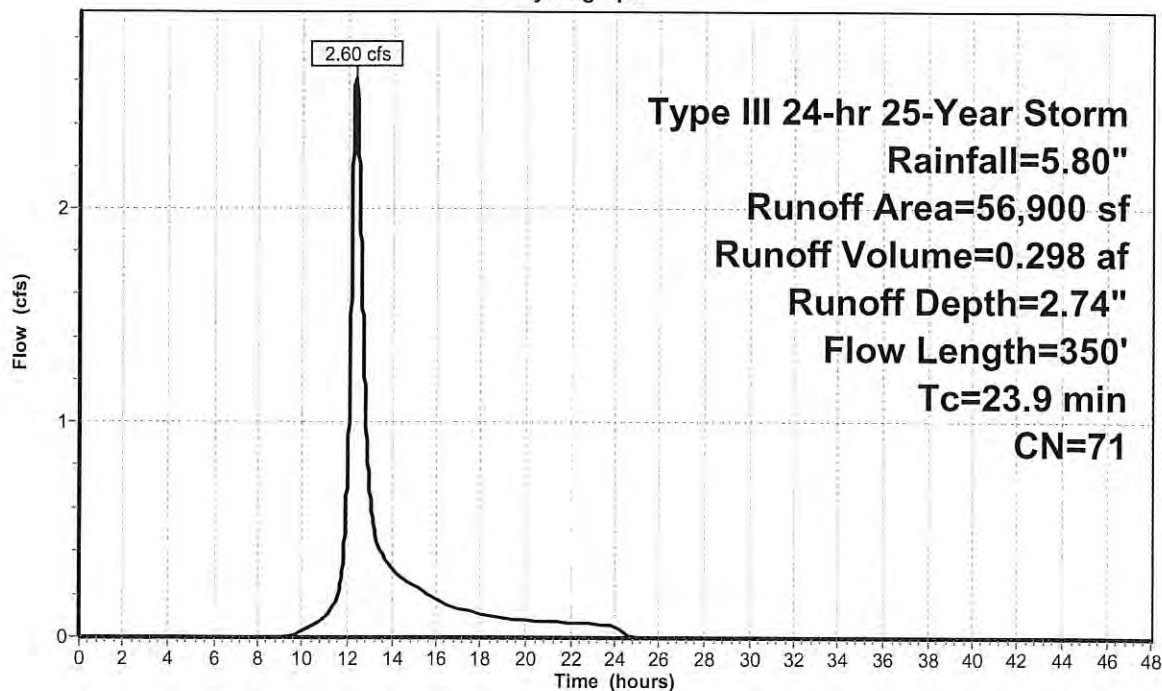
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Storm Rainfall=5.80"

Area (sf)	CN	Description
44,800	70	Woods, Good, HSG C
12,100	77	Woods, Good, HSG D
56,900	71	Weighted Average
56,900		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.4	150	0.0470	0.12		Sheet Flow, A-B
					Woods: Light underbrush n= 0.400 P2= 3.10"
2.5	200	0.0700	1.32		Shallow Concentrated Flow, B-C
					Woodland Kv= 5.0 fps
23.9	350	Total			

Subcatchment 2S:

Hydrograph



Summary for Subcatchment 3S:

Runoff = 2.67 cfs @ 12.40 hrs, Volume= 0.330 af, Depth= 2.65"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

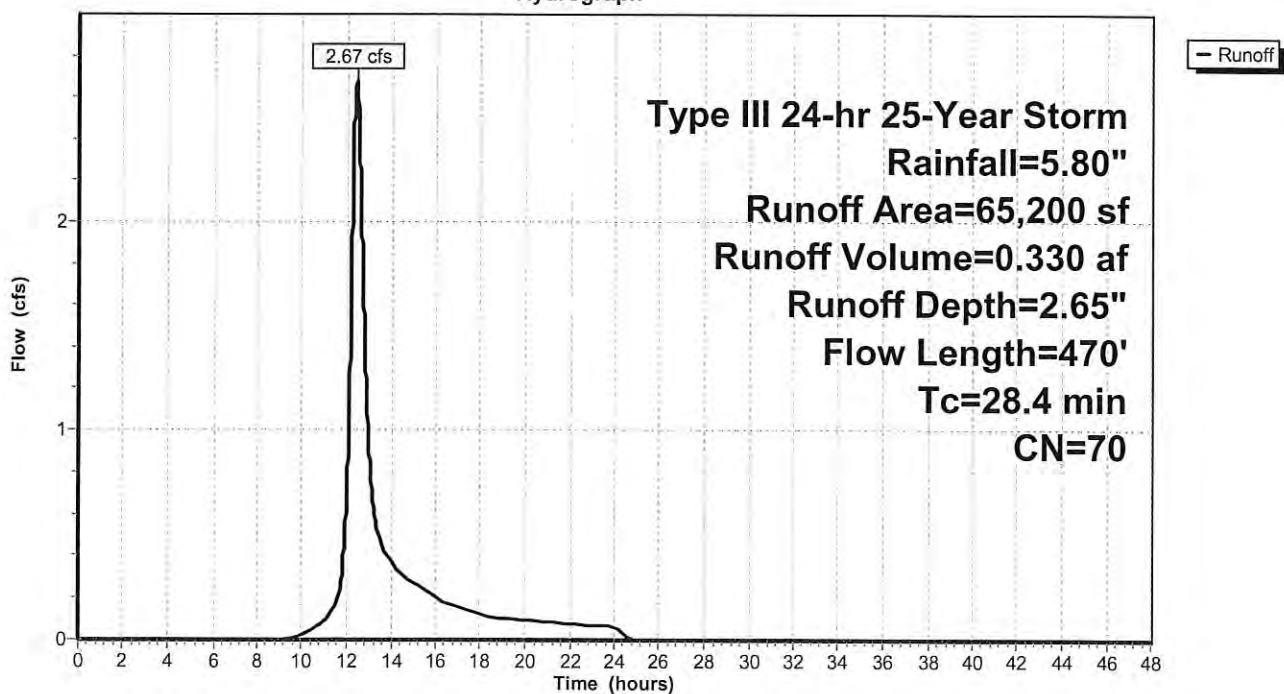
Type III 24-hr 25-Year Storm Rainfall=5.80"

Area (sf)	CN	Description
65,200	70	Woods, Good, HSG C
65,200		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.9	150	0.0360	0.10		Sheet Flow, A-B
					Woods: Light underbrush n= 0.400 P2= 3.10"
4.5	320	0.0550	1.17		Shallow Concentrated Flow, B-C
					Woodland Kv= 5.0 fps
28.4	470	Total			

Subcatchment 3S:

Hydrograph



Summary for Subcatchment 4S:

Runoff = 20.50 cfs @ 12.50 hrs, Volume= 2.800 af, Depth= 3.02"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Storm Rainfall=5.80"

Area (sf)	CN	Description
118,700	77	2 acre lots, 12% imp, HSG C
55,800	82	2 acre lots, 12% imp, HSG D
45,000	71	Meadow, non-grazed, HSG C
51,600	78	Meadow, non-grazed, HSG D
211,900	70	Woods, Good, HSG C
2,000	77	Woods, Good, HSG D
485,000	74	Weighted Average
464,060		Pervious Area
20,940		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.1	150	0.0300	0.15		Sheet Flow, A-B
					Grass: Dense n= 0.240 P2= 3.10"
3.7	630	0.0360	2.85		Shallow Concentrated Flow, B-C
					Grassed Waterway Kv= 15.0 fps
14.8	910	0.0420	1.02		Shallow Concentrated Flow, C-D
					Woodland Kv= 5.0 fps
35.6	1,690	Total			

Pre 10-18-17

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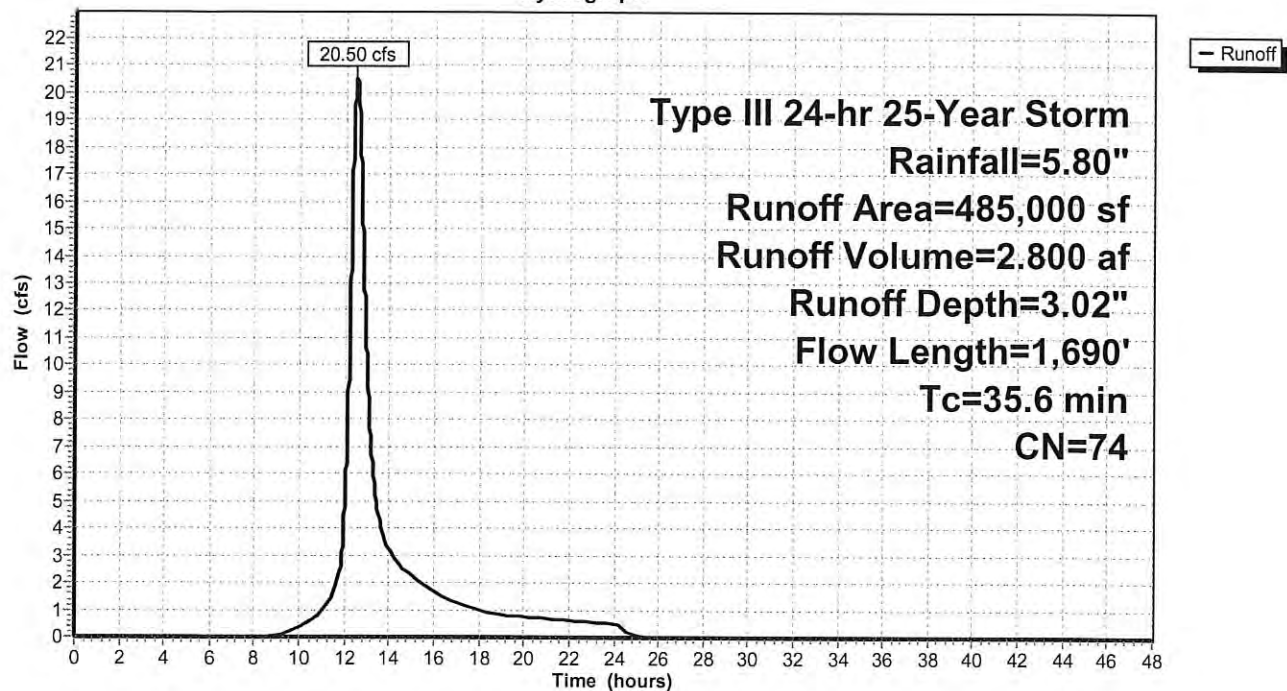
Type III 24-hr 25-Year Storm Rainfall=5.80"

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Subcatchment 4S:

Hydrograph



Pre 10-18-17

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Type III 24-hr 25-Year Storm Rainfall=5.80"

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Summary for Subcatchment 5S:

Runoff = 8.21 cfs @ 12.60 hrs, Volume= 1.238 af, Depth= 2.65"

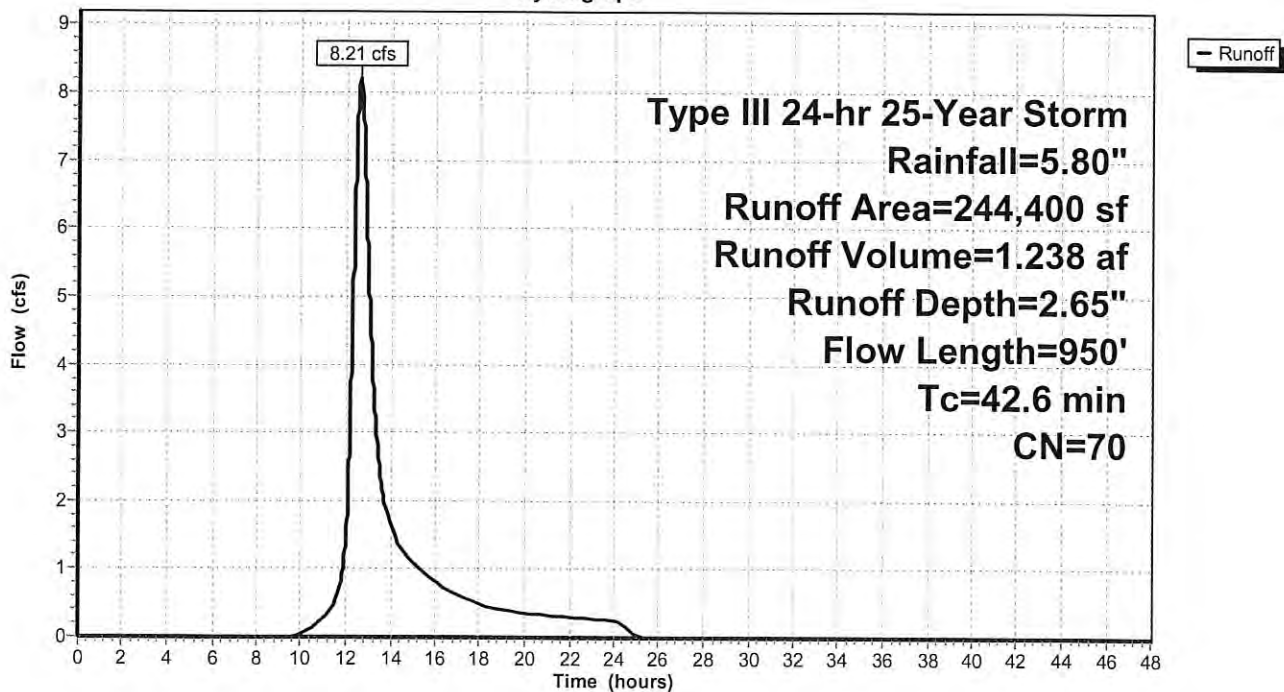
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Storm Rainfall=5.80"

Area (sf)	CN	Description
244,400	70	Woods, Good, HSG C
244,400		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
29.6	150	0.0210	0.08		Sheet Flow, A-B
13.0	800	0.0420	1.02		Woods: Light underbrush n= 0.400 P2= 3.10"
					Shallow Concentrated Flow, B-C
					Woodland Kv= 5.0 fps
42.6	950	Total			

Subcatchment 5S:

Hydrograph



Summary for Subcatchment 6S:

Runoff = 7.70 cfs @ 12.61 hrs, Volume= 1.163 af, Depth= 2.74"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

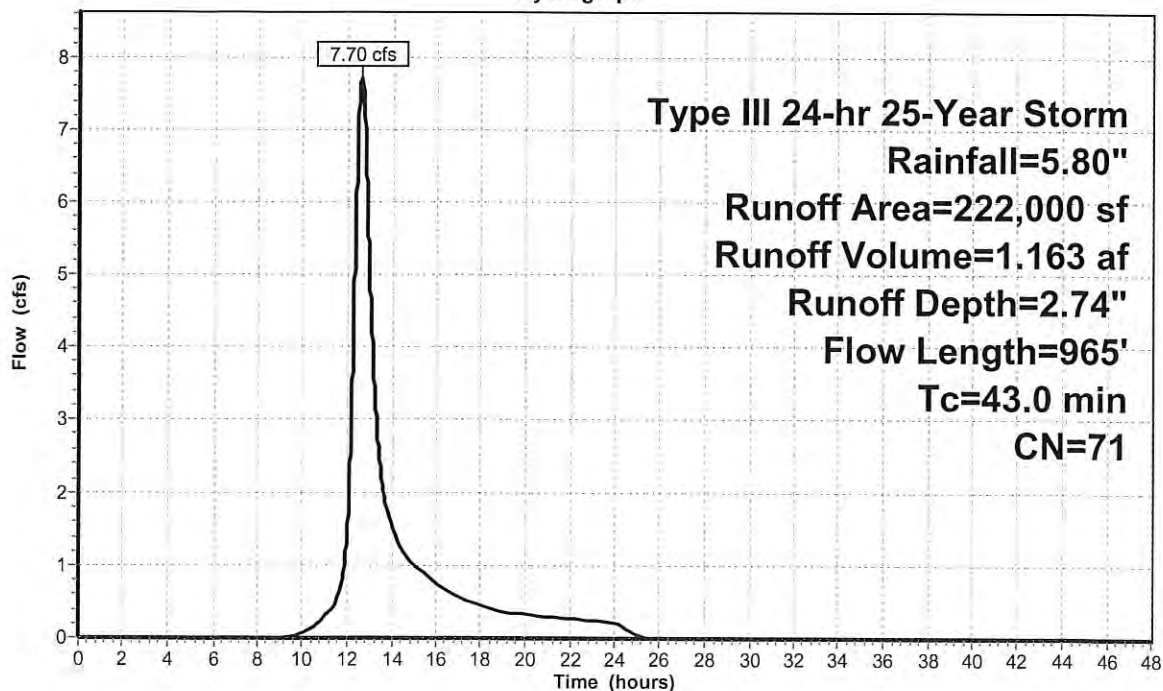
Type III 24-hr 25-Year Storm Rainfall=5.80"

Area (sf)	CN	Description
185,600	70	Woods, Good, HSG C
36,400	77	Woods, Good, HSG D
222,000	71	Weighted Average
222,000		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
26.8	150	0.0270	0.09		Sheet Flow, A-B
					Woods: Light underbrush n= 0.400 P2= 3.10"
16.2	815	0.0280	0.84		Shallow Concentrated Flow, B-C
					Woodland Kv= 5.0 fps
43.0	965	Total			

Subcatchment 6S:

Hydrograph



— Runoff

Summary for Subcatchment 7S:

Runoff = 29.54 cfs @ 12.66 hrs, Volume= 4.766 af, Depth= 3.11"

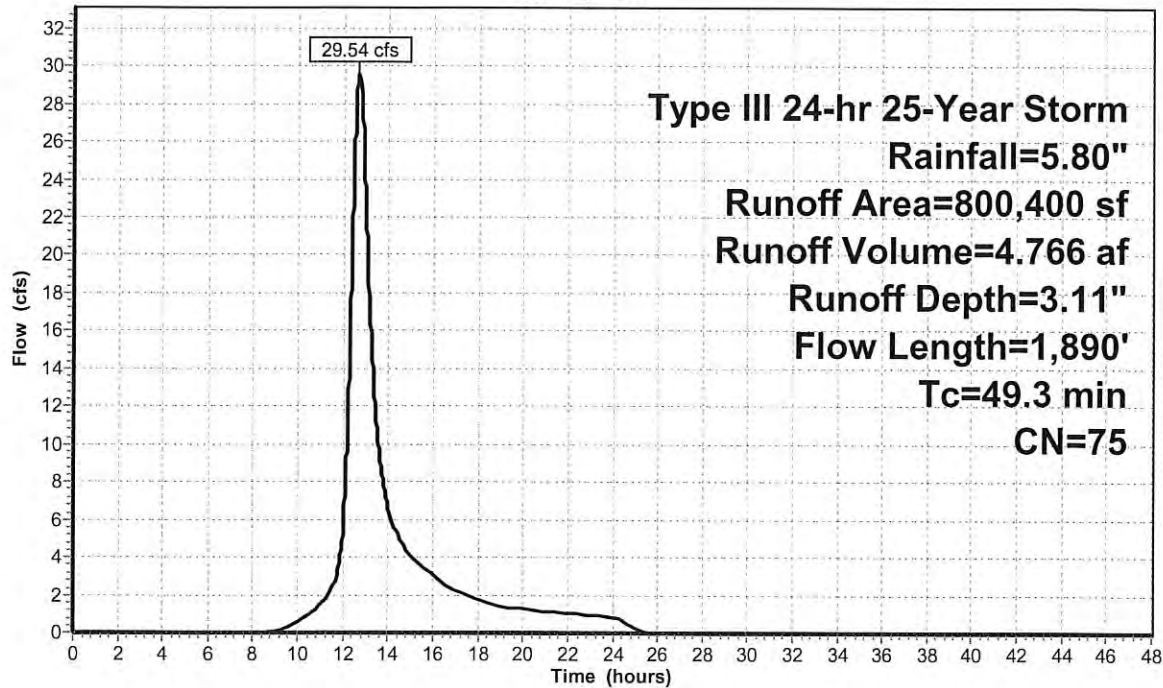
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Storm Rainfall=5.80"

Area (sf)	CN	Description
2,712	98	Paved parking & roofs
218,288	77	2 acre lots, 12% imp, HSG C
197,200	82	2 acre lots, 12% imp, HSG D
76,700	71	Meadow, non-grazed, HSG C
284,400	70	Woods, Good, HSG C
21,100	77	Woods, Good, HSG D
800,400	75	Weighted Average
747,829		Pervious Area
52,571		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.3	150	0.0250	0.14		Sheet Flow, A-B
					Grass: Dense n= 0.240 P2= 3.10"
2.8	390	0.0240	2.32		Shallow Concentrated Flow, B-C
					Grassed Waterway Kv= 15.0 fps
10.0	390	0.0170	0.65		Shallow Concentrated Flow, C-D
					Woodland Kv= 5.0 fps
0.1	20	0.0100	6.22	7.63	Circular Channel (pipe), D-E
					Diam= 15.0" Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.011
18.1	940	0.0300	0.87		Shallow Concentrated Flow, E-F
					Woodland Kv= 5.0 fps
49.3	1,890	Total			

Subcatchment 7S:

Hydrograph



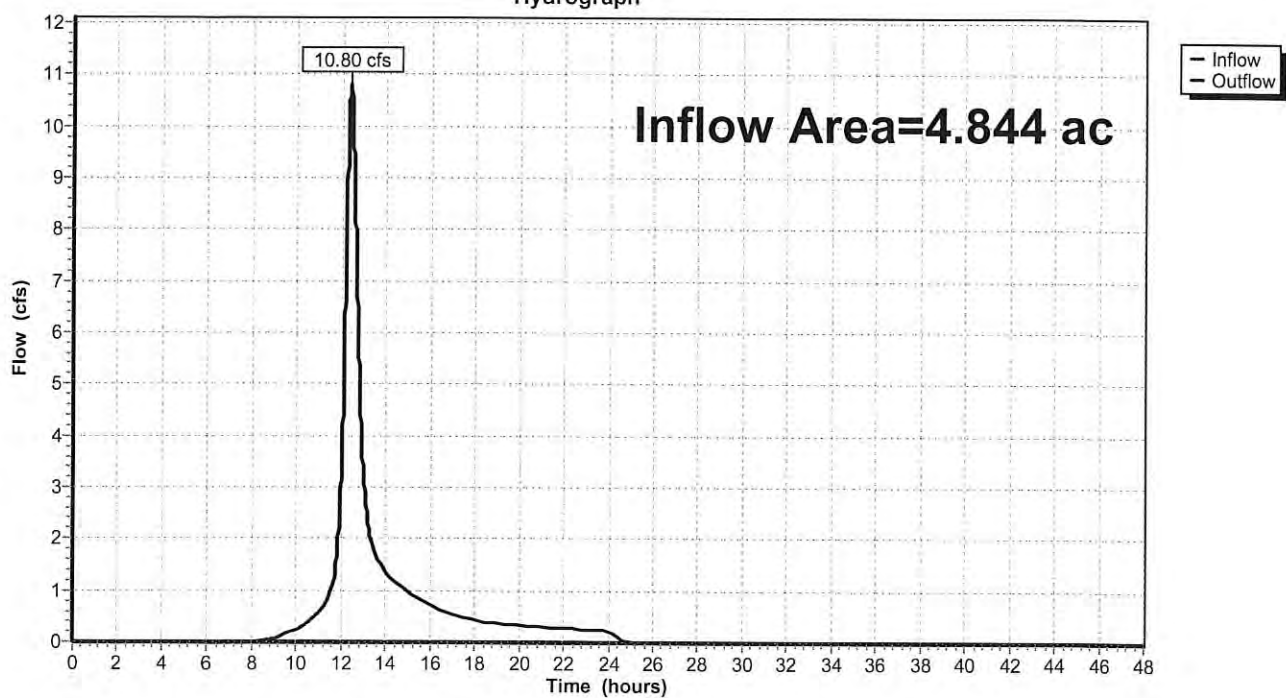
Summary for Reach 7R: POI 1

Inflow Area = 4.844 ac, 0.00% Impervious, Inflow Depth = 3.21" for 25-Year Storm event
Inflow = 10.80 cfs @ 12.38 hrs, Volume= 1.295 af
Outflow = 10.80 cfs @ 12.38 hrs, Volume= 1.295 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3

Reach 7R: POI 1

Hydrograph



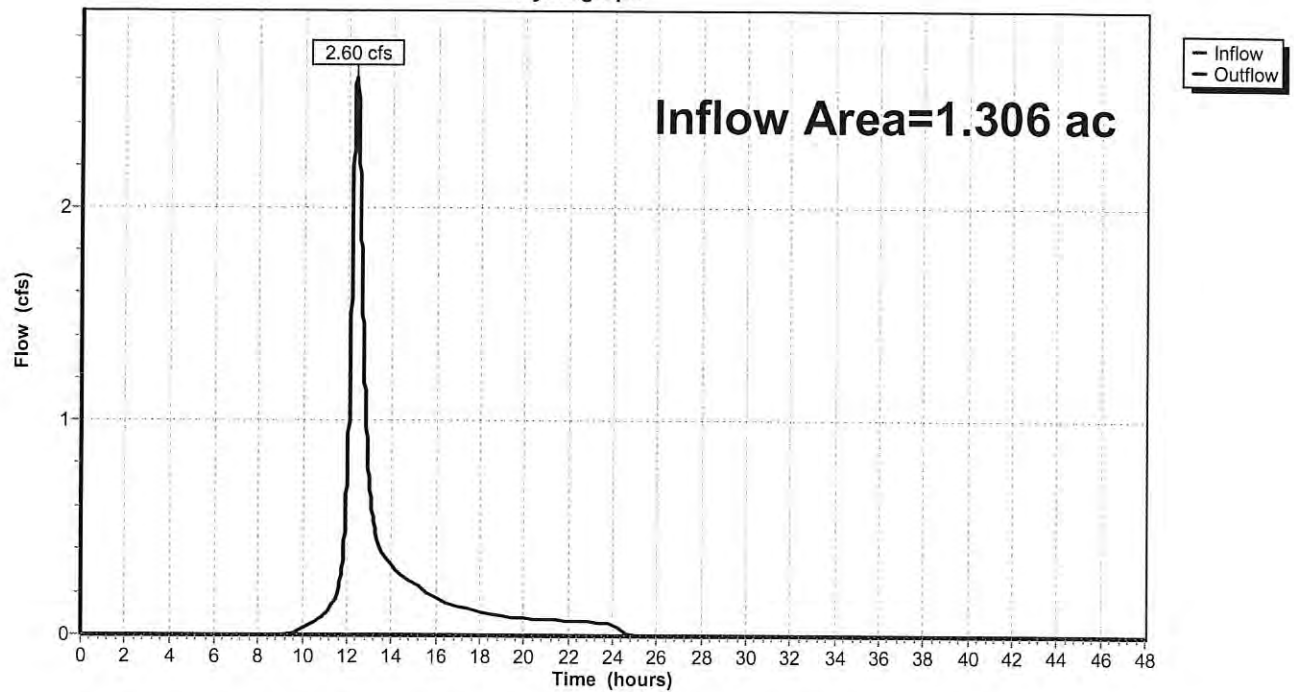
Summary for Reach 8R: POI 2

Inflow Area = 1.306 ac, 0.00% Impervious, Inflow Depth = 2.74" for 25-Year Storm event
Inflow = 2.60 cfs @ 12.35 hrs, Volume= 0.298 af
Outflow = 2.60 cfs @ 12.35 hrs, Volume= 0.298 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3

Reach 8R: POI 2

Hydrograph



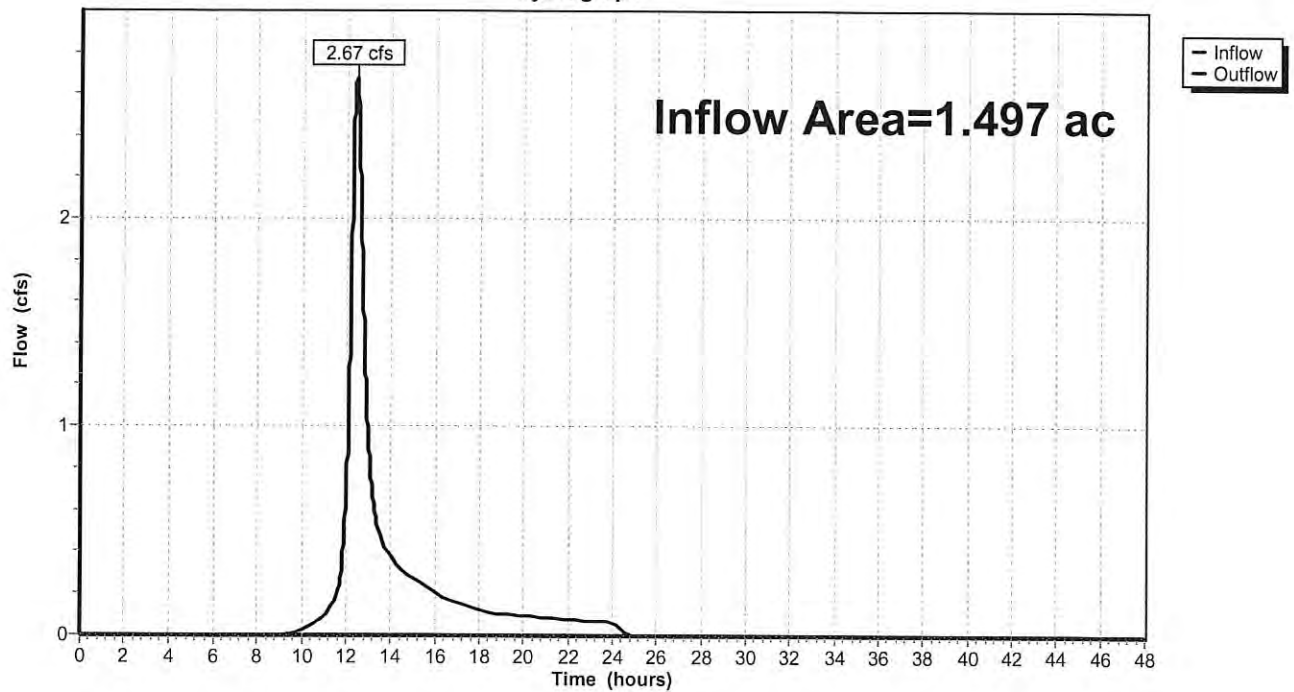
Summary for Reach 9R: POI 3

Inflow Area = 1.497 ac, 0.00% Impervious, Inflow Depth = 2.65" for 25-Year Storm event
Inflow = 2.67 cfs @ 12.40 hrs, Volume= 0.330 af
Outflow = 2.67 cfs @ 12.40 hrs, Volume= 0.330 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3

Reach 9R: POI 3

Hydrograph



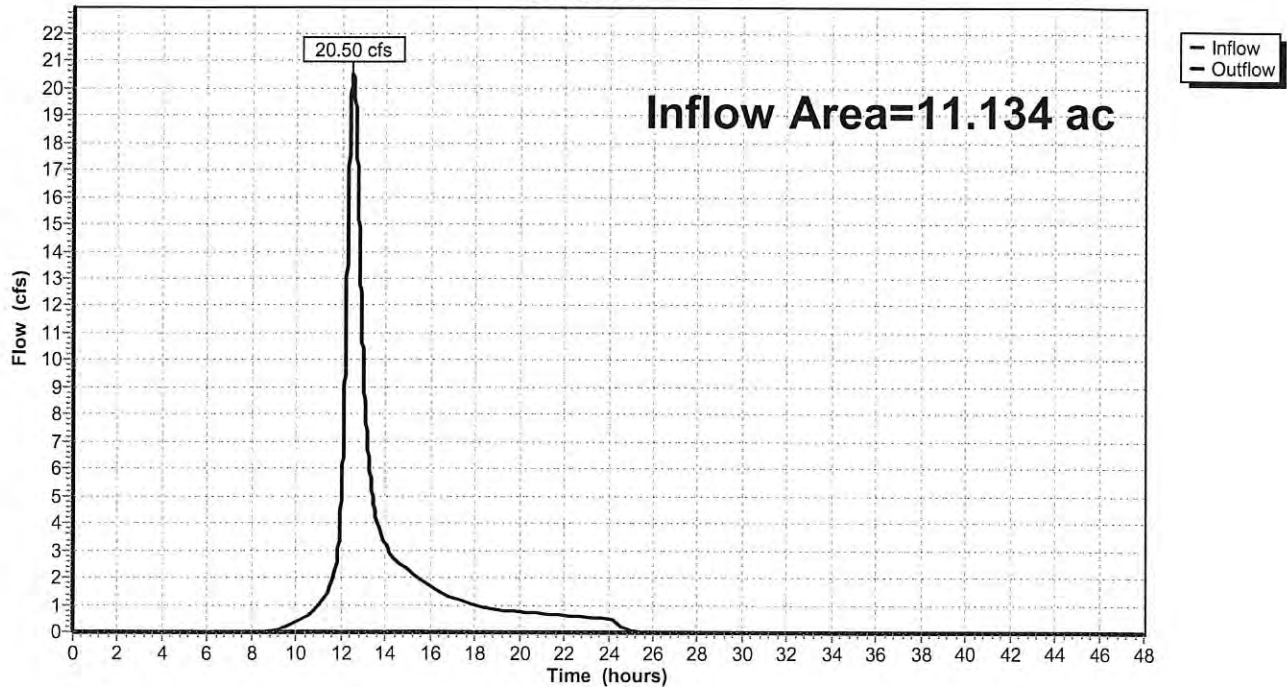
Summary for Reach 10R: POI 4

Inflow Area = 11.134 ac, 4.32% Impervious, Inflow Depth = 3.02" for 25-Year Storm event
Inflow = 20.50 cfs @ 12.50 hrs, Volume= 2.800 af
Outflow = 20.50 cfs @ 12.50 hrs, Volume= 2.800 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3

Reach 10R: POI 4

Hydrograph



Pre 10-18-17

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Type III 24-hr 25-Year Storm Rainfall=5.80"

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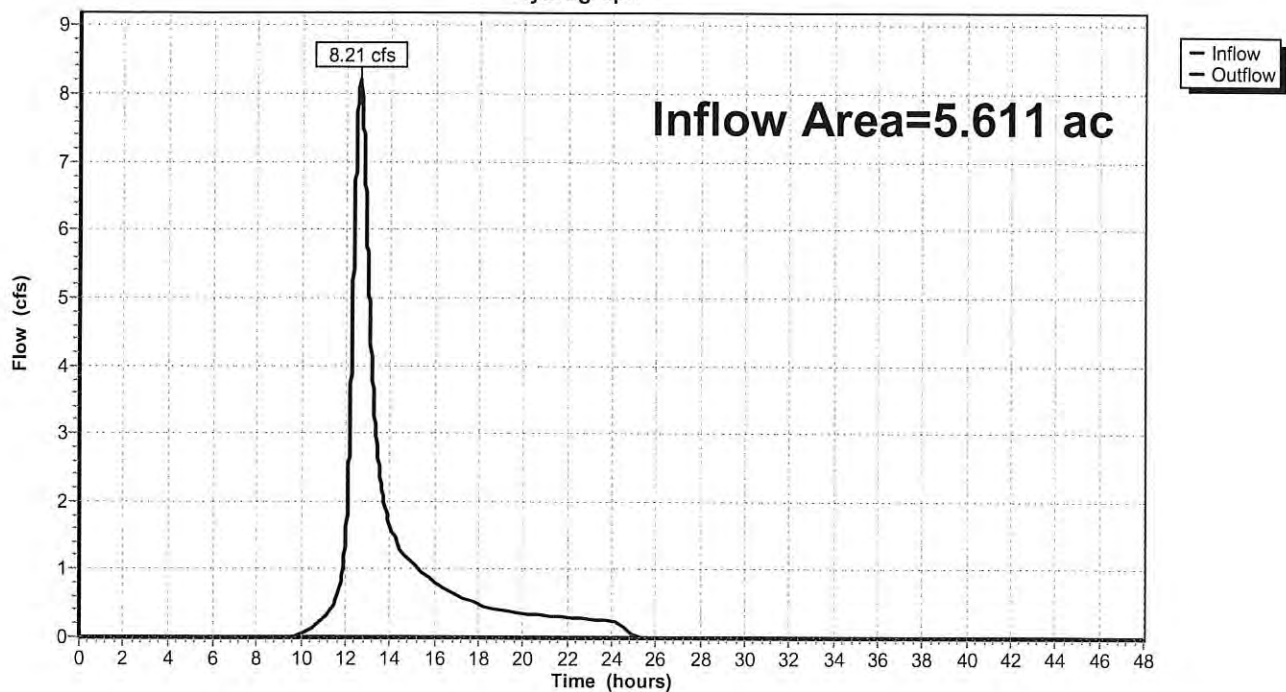
Summary for Reach 11R: POI 5

Inflow Area = 5.611 ac, 0.00% Impervious, Inflow Depth = 2.65" for 25-Year Storm event
Inflow = 8.21 cfs @ 12.60 hrs, Volume= 1.238 af
Outflow = 8.21 cfs @ 12.60 hrs, Volume= 1.238 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3

Reach 11R: POI 5

Hydrograph



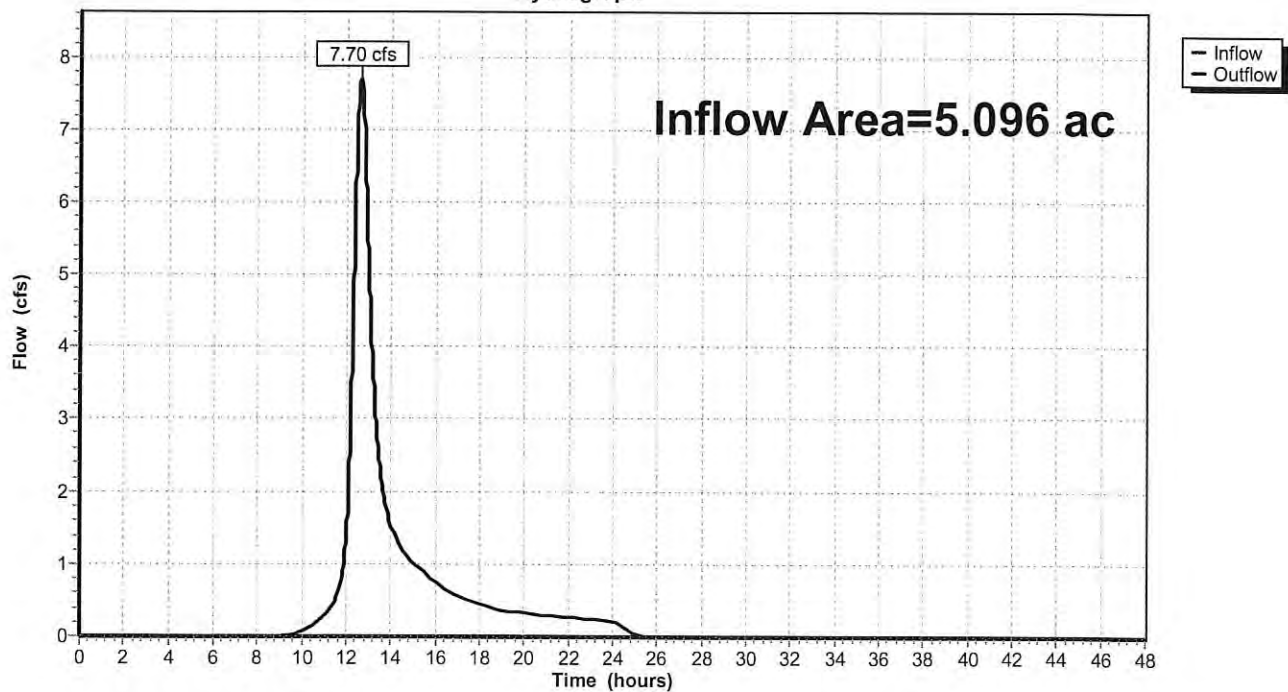
Summary for Reach 12R: POI 6

Inflow Area = 5.096 ac, 0.00% Impervious, Inflow Depth = 2.74" for 25-Year Storm event
Inflow = 7.70 cfs @ 12.61 hrs, Volume= 1.163 af
Outflow = 7.70 cfs @ 12.61 hrs, Volume= 1.163 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3

Reach 12R: POI 6

Hydrograph



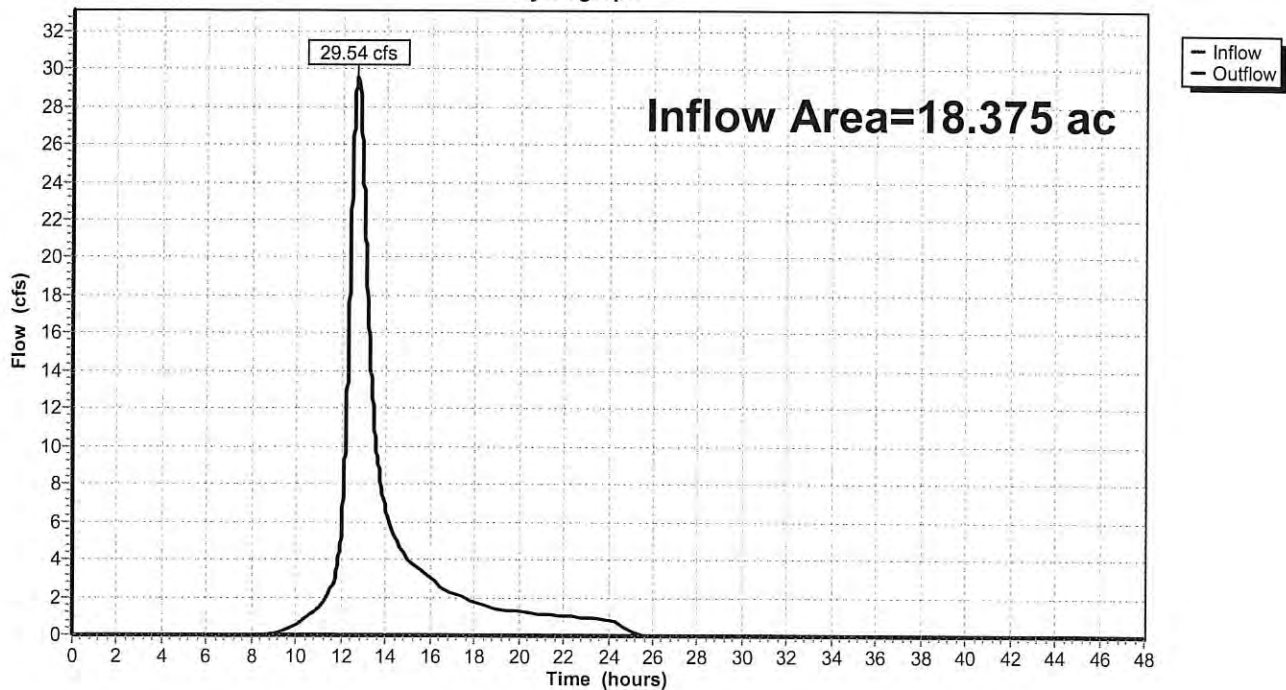
Summary for Reach 13R: POI 7

Inflow Area = 18.375 ac, 6.57% Impervious, Inflow Depth = 3.11" for 25-Year Storm event
Inflow = 29.54 cfs @ 12.66 hrs, Volume= 4.766 af
Outflow = 29.54 cfs @ 12.66 hrs, Volume= 4.766 af, Atten= 0%, Lag= 0.0 min

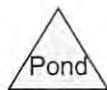
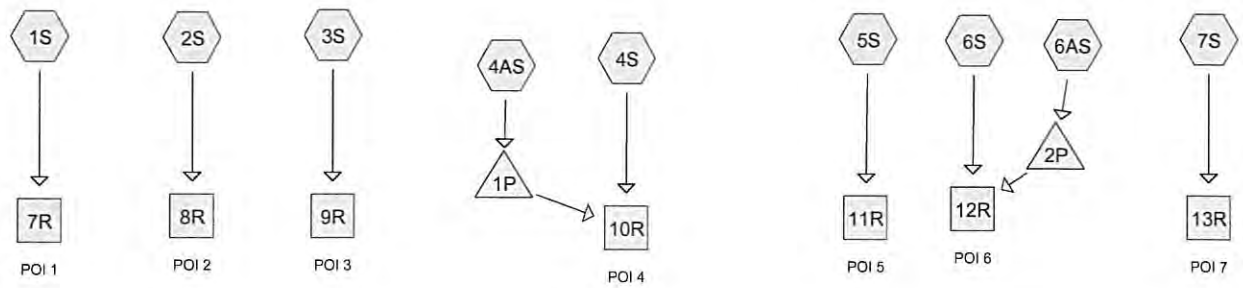
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3

Reach 13R: POI 7

Hydrograph



POST-DEVELOPMENT



Drainage Diagram for Post 9-18-18

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Post 9-18-18

Prepared by Gorrill Palmer

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Type III 24-hr 2-Year Storm Rainfall=3.10"

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Page 1

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points x 3

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S:	Runoff Area=189,100 sf 3.29% Impervious Runoff Depth=1.20" Flow Length=690' Tc=27.1 min CN=78 Runoff=3.52 cfs 0.434 af
Subcatchment 2S:	Runoff Area=39,800 sf 4.46% Impervious Runoff Depth=0.92" Flow Length=200' Tc=22.0 min CN=73 Runoff=0.59 cfs 0.070 af
Subcatchment 3S:	Runoff Area=55,900 sf 5.37% Impervious Runoff Depth=0.87" Flow Length=300' Tc=26.0 min CN=72 Runoff=0.72 cfs 0.093 af
Subcatchment 4AS:	Runoff Area=115,632 sf 19.75% Impervious Runoff Depth=1.14" Flow Length=785' Tc=15.3 min CN=77 Runoff=2.57 cfs 0.252 af
Subcatchment 4S:	Runoff Area=424,528 sf 5.85% Impervious Runoff Depth=1.03" Flow Length=1,690' Tc=35.6 min CN=75 Runoff=5.82 cfs 0.834 af
Subcatchment 5S:	Runoff Area=158,400 sf 2.84% Impervious Runoff Depth=0.82" Flow Length=600' Tc=30.2 min CN=71 Runoff=1.77 cfs 0.248 af
Subcatchment 6AS:	Runoff Area=208,960 sf 14.09% Impervious Runoff Depth=1.08" Flow Length=760' Tc=34.1 min CN=76 Runoff=3.11 cfs 0.433 af
Subcatchment 6S:	Runoff Area=100,550 sf 2.98% Impervious Runoff Depth=0.87" Flow Length=390' Tc=27.3 min CN=72 Runoff=1.26 cfs 0.167 af
Subcatchment 7S:	Runoff Area=792,062 sf 7.10% Impervious Runoff Depth=1.03" Flow Length=1,890' Tc=49.3 min CN=75 Runoff=9.12 cfs 1.556 af
Reach 7R: POI 1	Inflow=3.52 cfs 0.434 af Outflow=3.52 cfs 0.434 af
Reach 8R: POI 2	Inflow=0.59 cfs 0.070 af Outflow=0.59 cfs 0.070 af
Reach 9R: POI 3	Inflow=0.72 cfs 0.093 af Outflow=0.72 cfs 0.093 af
Reach 10R: POI 4	Inflow=5.90 cfs 1.031 af Outflow=5.90 cfs 1.031 af
Reach 11R: POI 5	Inflow=1.77 cfs 0.248 af Outflow=1.77 cfs 0.248 af
Reach 12R: POI 6	Inflow=1.29 cfs 0.493 af Outflow=1.29 cfs 0.493 af
Reach 13R: POI 7	Inflow=9.12 cfs 1.556 af Outflow=9.12 cfs 1.556 af

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Type III 24-hr 2-Year Storm Rainfall=3.10"

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Pond 1P:

Peak Elev=397.55' Storage=5,233 cf Inflow=2.57 cfs 0.252 af
Primary=0.34 cfs 0.135 af Secondary=0.02 cfs 0.062 af Outflow=0.36 cfs 0.197 af

Pond 2P:

Peak Elev=406.34' Storage=9,932 cf Inflow=3.11 cfs 0.433 af
Primary=0.42 cfs 0.234 af Secondary=0.03 cfs 0.092 af Outflow=0.45 cfs 0.326 af

Total Runoff Area = 47.863 ac Runoff Volume = 4.087 af Average Runoff Depth = 1.02"
92.72% Pervious = 44.377 ac 7.28% Impervious = 3.486 ac

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Type III 24-hr 10-Year Storm Rainfall=4.60"

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Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points x 3

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S:	Runoff Area=189,100 sf 3.29% Impervious Runoff Depth=2.38" Flow Length=690' Tc=27.1 min CN=78 Runoff=7.15 cfs 0.859 af
Subcatchment 2S:	Runoff Area=39,800 sf 4.46% Impervious Runoff Depth=1.97" Flow Length=200' Tc=22.0 min CN=73 Runoff=1.34 cfs 0.150 af
Subcatchment 3S:	Runoff Area=55,900 sf 5.37% Impervious Runoff Depth=1.89" Flow Length=300' Tc=26.0 min CN=72 Runoff=1.68 cfs 0.203 af
Subcatchment 4AS:	Runoff Area=115,632 sf 19.75% Impervious Runoff Depth=2.29" Flow Length=785' Tc=15.3 min CN=77 Runoff=5.34 cfs 0.507 af
Subcatchment 4S:	Runoff Area=424,528 sf 5.85% Impervious Runoff Depth=2.13" Flow Length=1,690' Tc=35.6 min CN=75 Runoff=12.57 cfs 1.729 af
Subcatchment 5S:	Runoff Area=158,400 sf 2.84% Impervious Runoff Depth=1.82" Flow Length=600' Tc=30.2 min CN=71 Runoff=4.27 cfs 0.551 af
Subcatchment 6AS:	Runoff Area=208,960 sf 14.09% Impervious Runoff Depth=2.21" Flow Length=760' Tc=34.1 min CN=76 Runoff=6.59 cfs 0.883 af
Subcatchment 6S:	Runoff Area=100,550 sf 2.98% Impervious Runoff Depth=1.89" Flow Length=390' Tc=27.3 min CN=72 Runoff=2.96 cfs 0.364 af
Subcatchment 7S:	Runoff Area=792,062 sf 7.10% Impervious Runoff Depth=2.13" Flow Length=1,890' Tc=49.3 min CN=75 Runoff=19.79 cfs 3.226 af
Reach 7R: POI 1	Inflow=7.15 cfs 0.859 af Outflow=7.15 cfs 0.859 af
Reach 8R: POI 2	Inflow=1.34 cfs 0.150 af Outflow=1.34 cfs 0.150 af
Reach 9R: POI 3	Inflow=1.68 cfs 0.203 af Outflow=1.68 cfs 0.203 af
Reach 10R: POI 4	Inflow=13.74 cfs 2.180 af Outflow=13.74 cfs 2.180 af
Reach 11R: POI 5	Inflow=4.27 cfs 0.551 af Outflow=4.27 cfs 0.551 af
Reach 12R: POI 6	Inflow=3.29 cfs 1.138 af Outflow=3.29 cfs 1.138 af
Reach 13R: POI 7	Inflow=19.79 cfs 3.226 af Outflow=19.79 cfs 3.226 af

Post 9-18-18*Type III 24-hr 10-Year Storm Rainfall=4.60"*

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Pond 1P:

Peak Elev=398.38' Storage=9,512 cf Inflow=5.34 cfs 0.507 af
Primary=1.23 cfs 0.386 af Secondary=0.02 cfs 0.064 af Outflow=1.25 cfs 0.451 af

Pond 2P:

Peak Elev=407.10' Storage=16,414 cf Inflow=6.59 cfs 0.883 af
Primary=2.11 cfs 0.678 af Secondary=0.03 cfs 0.096 af Outflow=2.14 cfs 0.774 af

Total Runoff Area = 47.863 ac Runoff Volume = 8.473 af Average Runoff Depth = 2.12"
92.72% Pervious = 44.377 ac 7.28% Impervious = 3.486 ac

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Type III 24-hr 25-Year Storm Rainfall=5.80"

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Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points x 3

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S:	Runoff Area=189,100 sf 3.29% Impervious Runoff Depth=3.40" Flow Length=690' Tc=27.1 min CN=78 Runoff=10.27 cfs 1.231 af
Subcatchment 2S:	Runoff Area=39,800 sf 4.46% Impervious Runoff Depth=2.92" Flow Length=200' Tc=22.0 min CN=73 Runoff=2.02 cfs 0.223 af
Subcatchment 3S:	Runoff Area=55,900 sf 5.37% Impervious Runoff Depth=2.83" Flow Length=300' Tc=26.0 min CN=72 Runoff=2.55 cfs 0.303 af
Subcatchment 4AS:	Runoff Area=115,632 sf 19.75% Impervious Runoff Depth=3.31" Flow Length=785' Tc=15.3 min CN=77 Runoff=7.72 cfs 0.731 af
Subcatchment 4S:	Runoff Area=424,528 sf 5.85% Impervious Runoff Depth=3.11" Flow Length=1,690' Tc=35.6 min CN=75 Runoff=18.52 cfs 2.528 af
Subcatchment 5S:	Runoff Area=158,400 sf 2.84% Impervious Runoff Depth=2.74" Flow Length=600' Tc=30.2 min CN=71 Runoff=6.53 cfs 0.830 af
Subcatchment 6AS:	Runoff Area=208,960 sf 14.09% Impervious Runoff Depth=3.21" Flow Length=760' Tc=34.1 min CN=76 Runoff=9.63 cfs 1.282 af
Subcatchment 6S:	Runoff Area=100,550 sf 2.98% Impervious Runoff Depth=2.83" Flow Length=390' Tc=27.3 min CN=72 Runoff=4.49 cfs 0.544 af
Subcatchment 7S:	Runoff Area=792,062 sf 7.10% Impervious Runoff Depth=3.11" Flow Length=1,890' Tc=49.3 min CN=75 Runoff=29.24 cfs 4.716 af
Reach 7R: POI 1	Inflow=10.27 cfs 1.231 af Outflow=10.27 cfs 1.231 af
Reach 8R: POI 2	Inflow=2.02 cfs 0.223 af Outflow=2.02 cfs 0.223 af
Reach 9R: POI 3	Inflow=2.55 cfs 0.303 af Outflow=2.55 cfs 0.303 af
Reach 10R: POI 4	Inflow=20.17 cfs 3.202 af Outflow=20.17 cfs 3.202 af
Reach 11R: POI 5	Inflow=6.53 cfs 0.830 af Outflow=6.53 cfs 0.830 af
Reach 12R: POI 6	Inflow=6.19 cfs 1.716 af Outflow=6.19 cfs 1.716 af
Reach 13R: POI 7	Inflow=29.24 cfs 4.716 af Outflow=29.24 cfs 4.716 af

Post 9-18-18*Type III 24-hr 25-Year Storm Rainfall=5.80"*

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Pond 1P:

Peak Elev=399.12' Storage=14,105 cf Inflow=7.72 cfs 0.731 af
Primary=1.71 cfs 0.609 af Secondary=0.02 cfs 0.066 af Outflow=1.73 cfs 0.675 af

Pond 2P:

Peak Elev=407.70' Storage=22,150 cf Inflow=9.63 cfs 1.282 af
Primary=4.01 cfs 1.074 af Secondary=0.03 cfs 0.098 af Outflow=4.04 cfs 1.172 af

Total Runoff Area = 47.863 ac Runoff Volume = 12.388 af Average Runoff Depth = 3.11"
92.72% Pervious = 44.377 ac 7.28% Impervious = 3.486 ac

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Type III 24-hr 25-Year Storm Rainfall=5.80"

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Summary for Subcatchment 1S:

Runoff = 10.27 cfs @ 12.38 hrs, Volume= 1.231 af, Depth= 3.40"

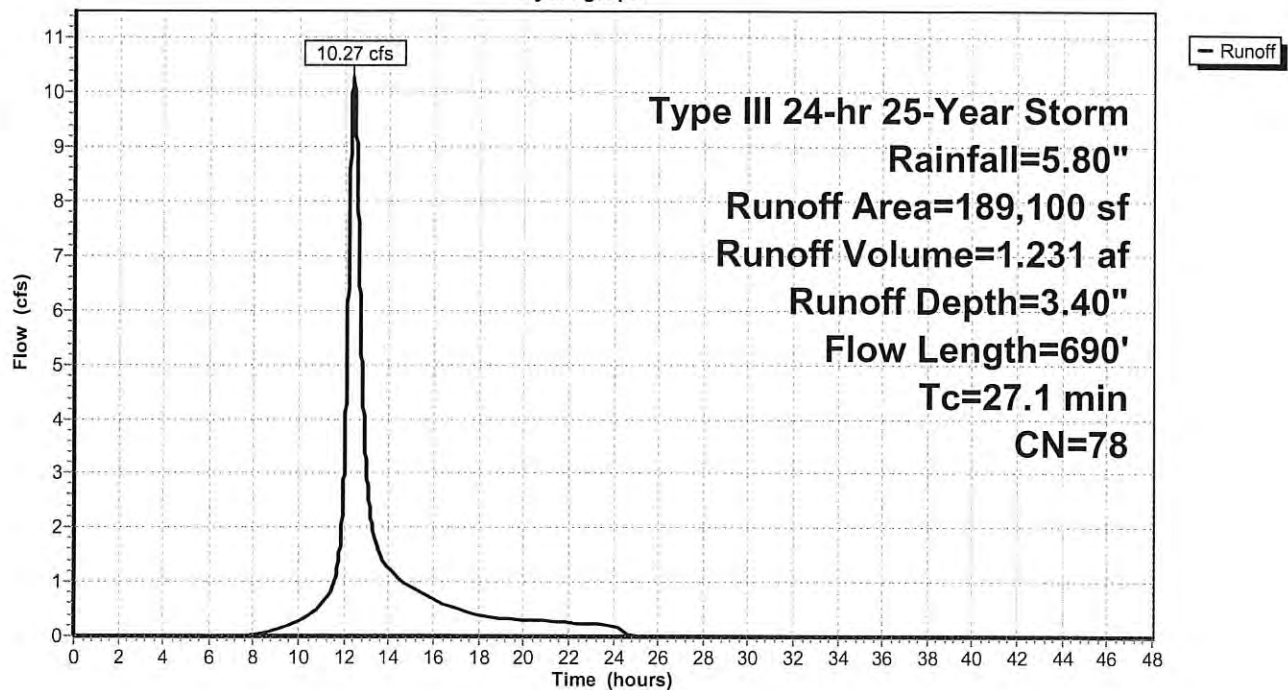
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Storm Rainfall=5.80"

Area (sf)	CN	Description
6,212	98	Paved parking & roofs
18,000	80	>75% Grass cover, Good, HSG D
7,600	71	Meadow, non-grazed, HSG C
77,200	78	Meadow, non-grazed, HSG D
6,000	70	Woods, Good, HSG C
74,088	77	Woods, Good, HSG D
189,100	78	Weighted Average
182,888		Pervious Area
6,212		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.9	150	0.0400	0.11		Sheet Flow, A-B
					Woods: Light underbrush n= 0.400 P2= 3.10"
1.0	240	0.0700	3.97		Shallow Concentrated Flow, B-C
					Grassed Waterway Kv= 15.0 fps
3.2	300	0.1000	1.58		Shallow Concentrated Flow, C-D
					Woodland Kv= 5.0 fps
27.1	690	Total			

Subcatchment 1S:

Hydrograph



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Type III 24-hr 25-Year Storm Rainfall=5.80"

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Summary for Subcatchment 2S:

Runoff = 2.02 cfs @ 12.30 hrs, Volume= 0.223 af, Depth= 2.92"

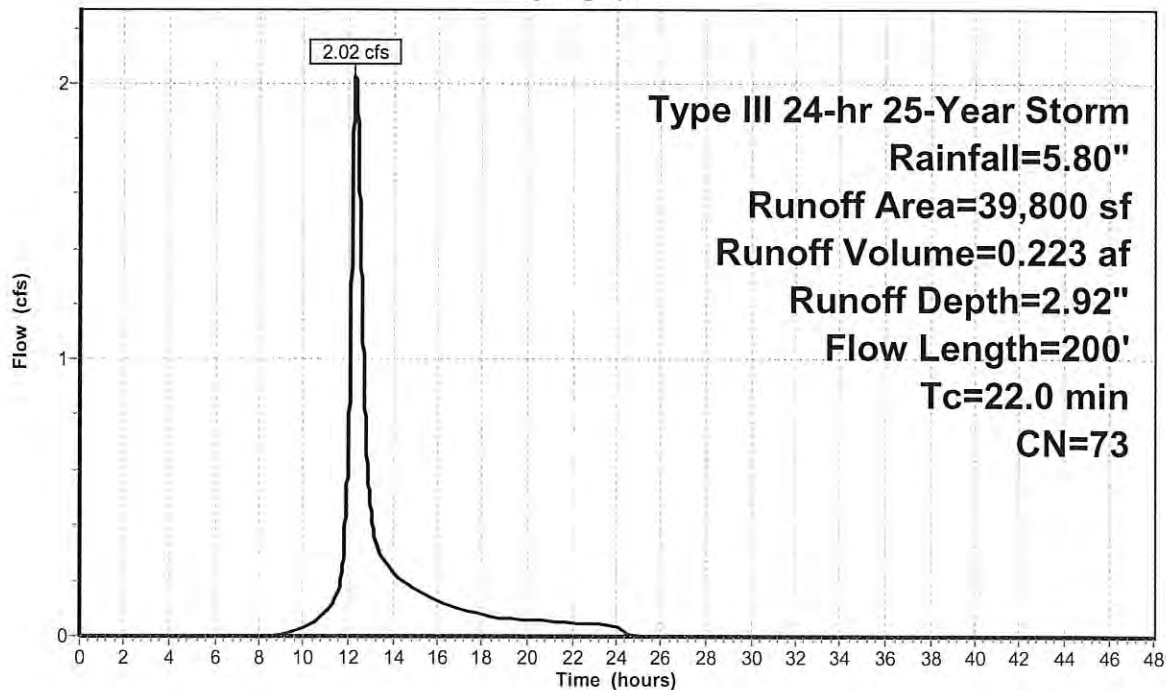
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Storm Rainfall=5.80"

Area (sf)	CN	Description
1,776	98	Paved parking & roofs
5,000	80	>75% Grass cover, Good, HSG D
28,400	70	Woods, Good, HSG C
4,624	77	Woods, Good, HSG D
39,800	73	Weighted Average
38,024		Pervious Area
1,776		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.4	150	0.0470	0.12		Sheet Flow, A-B
					Woods: Light underbrush n= 0.400 P2= 3.10"
0.6	50	0.0700	1.32		Shallow Concentrated Flow, B-C
					Woodland Kv= 5.0 fps
22.0	200	Total			

Subcatchment 2S:

Hydrograph



Summary for Subcatchment 3S:

Runoff = 2.55 cfs @ 12.37 hrs, Volume= 0.303 af, Depth= 2.83"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

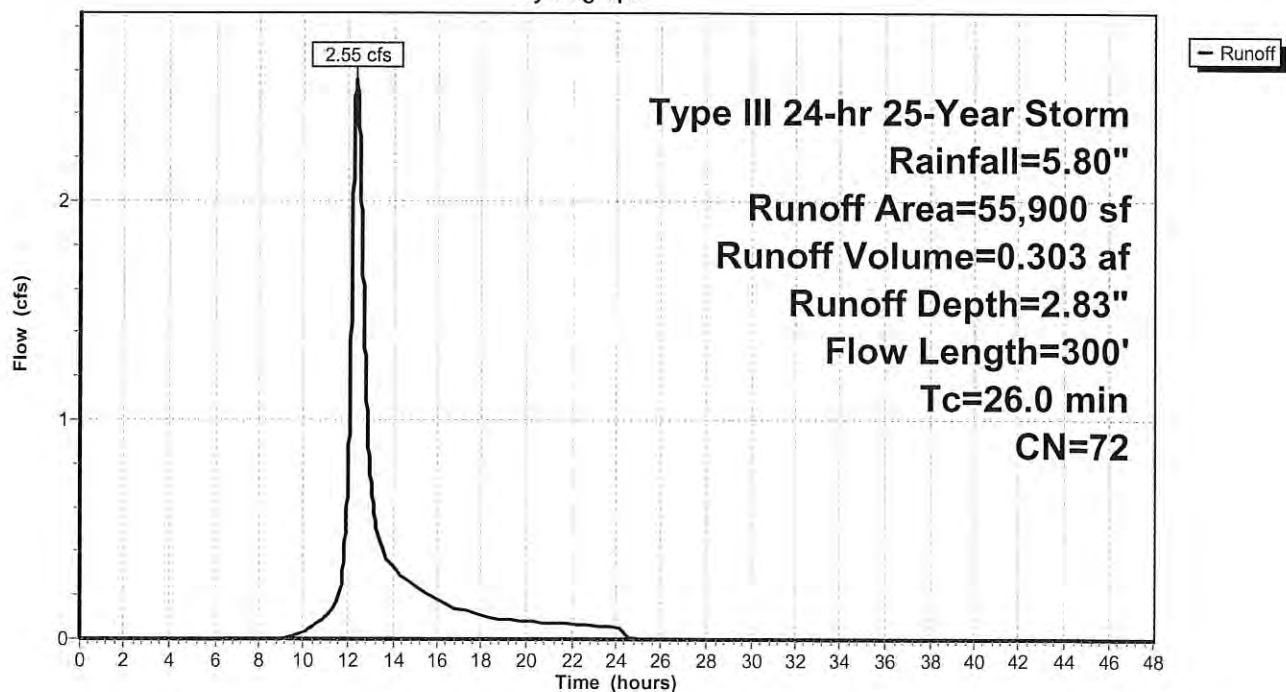
Type III 24-hr 25-Year Storm Rainfall=5.80"

Area (sf)	CN	Description
3,000	98	Paved parking & roofs
12,000	74	>75% Grass cover, Good, HSG C
40,900	70	Woods, Good, HSG C
55,900	72	Weighted Average
52,900		Pervious Area
3,000		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.9	150	0.0360	0.10		Sheet Flow, A-B
					Woods: Light underbrush n= 0.400 P2= 3.10"
2.1	150	0.0550	1.17		Shallow Concentrated Flow, B-C
					Woodland Kv= 5.0 fps
26.0	300	Total			

Subcatchment 3S:

Hydrograph



Summary for Subcatchment 4AS:

Runoff = 7.72 cfs @ 12.21 hrs, Volume= 0.731 af, Depth= 3.31"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Storm Rainfall=5.80"

Area (sf)	CN	Description
22,840	98	Paved parking & roofs
42,904	74	>75% Grass cover, Good, HSG C
49,888	70	Woods, Good, HSG C
115,632	77	Weighted Average
92,792		Pervious Area
22,840		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.3	100	0.0250	0.13		Sheet Flow, A-B
					Grass: Dense n= 0.240 P2= 3.10"
0.0	20	0.3300	8.62		Shallow Concentrated Flow, B-C
					Grassed Waterway Kv= 15.0 fps
0.3	65	0.0100	4.32	60.45	Trap/Vee/Rect Channel Flow, C-D
					Bot.W=1.00' D=2.00' Z= 3.0 '/' Top.W=13.00' n= 0.035
1.2	380	0.0100	5.26	6.46	Circular Channel (pipe), D-E
					Diam= 15.0" Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
0.5	220	0.0570	6.77	27.09	Trap/Vee/Rect Channel Flow, E-F
					Bot.W=1.00' D=1.00' Z= 3.0 '/' Top.W=7.00' n= 0.035
15.3	785	Total			

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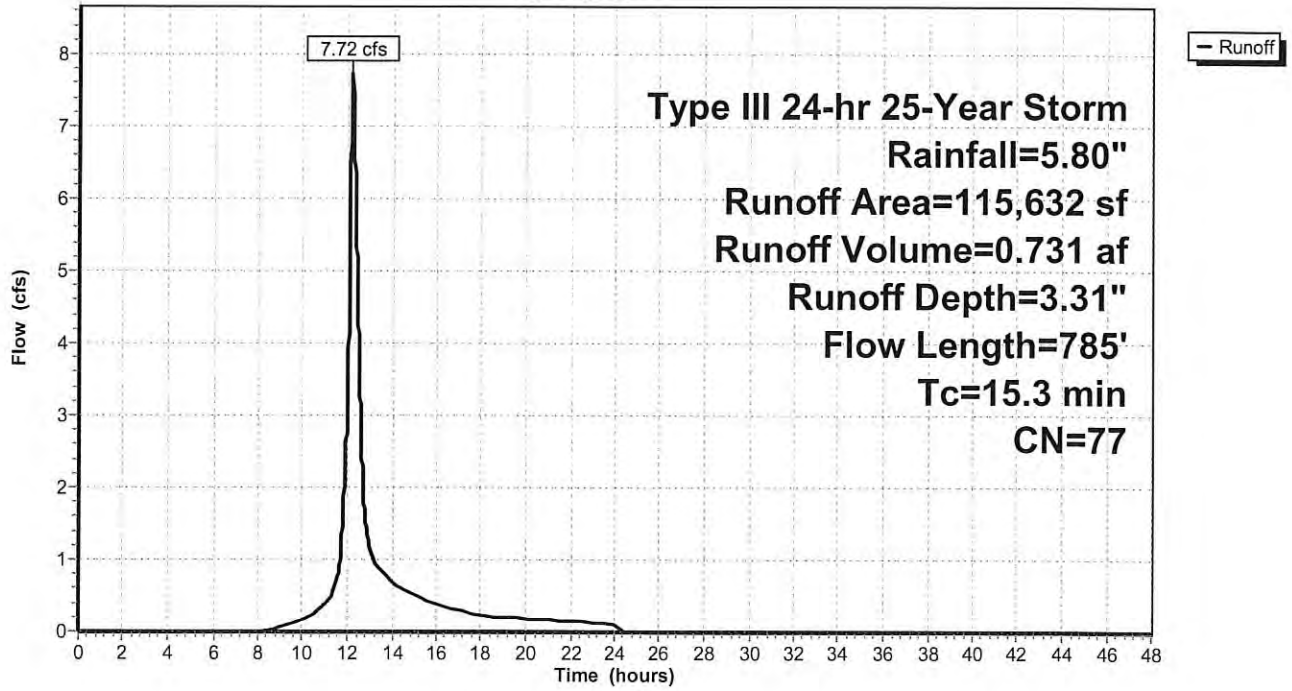
Type III 24-hr 25-Year Storm Rainfall=5.80"

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Subcatchment 4AS:

Hydrograph



Post 9-18-18

Type III 24-hr 25-Year Storm Rainfall=5.80"

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Summary for Subcatchment 4S:

Runoff = 18.52 cfs @ 12.50 hrs, Volume= 2.528 af, Depth= 3.11"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Storm Rainfall=5.80"

Area (sf)	CN	Description
3,894	98	Paved parking & roofs
16,672	74	>75% Grass cover, Good, HSG C
118,700	77	2 acre lots, 12% imp, HSG C
55,800	82	2 acre lots, 12% imp, HSG D
45,000	71	Meadow, non-grazed, HSG C
51,600	78	Meadow, non-grazed, HSG D
130,862	70	Woods, Good, HSG C
2,000	77	Woods, Good, HSG D
424,528	75	Weighted Average
399,694		Pervious Area
24,834		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.1	150	0.0300	0.15		Sheet Flow, A-B
					Grass: Dense n= 0.240 P2= 3.10"
3.7	630	0.0360	2.85		Shallow Concentrated Flow, B-C
					Grassed Waterway Kv= 15.0 fps
14.8	910	0.0420	1.02		Shallow Concentrated Flow, C-D
					Woodland Kv= 5.0 fps
35.6	1,690	Total			

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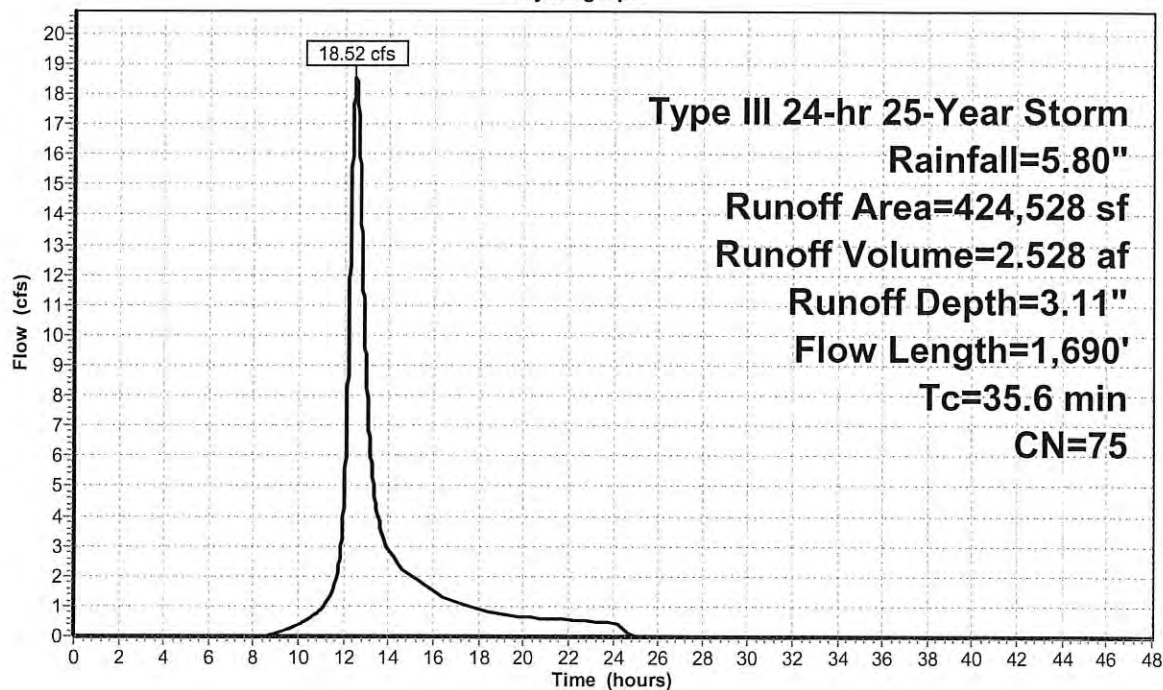
Type III 24-hr 25-Year Storm Rainfall=5.80"

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Subcatchment 4S:

Hydrograph



Summary for Subcatchment 5S:

Runoff = 6.53 cfs @ 12.44 hrs, Volume= 0.830 af, Depth= 2.74"

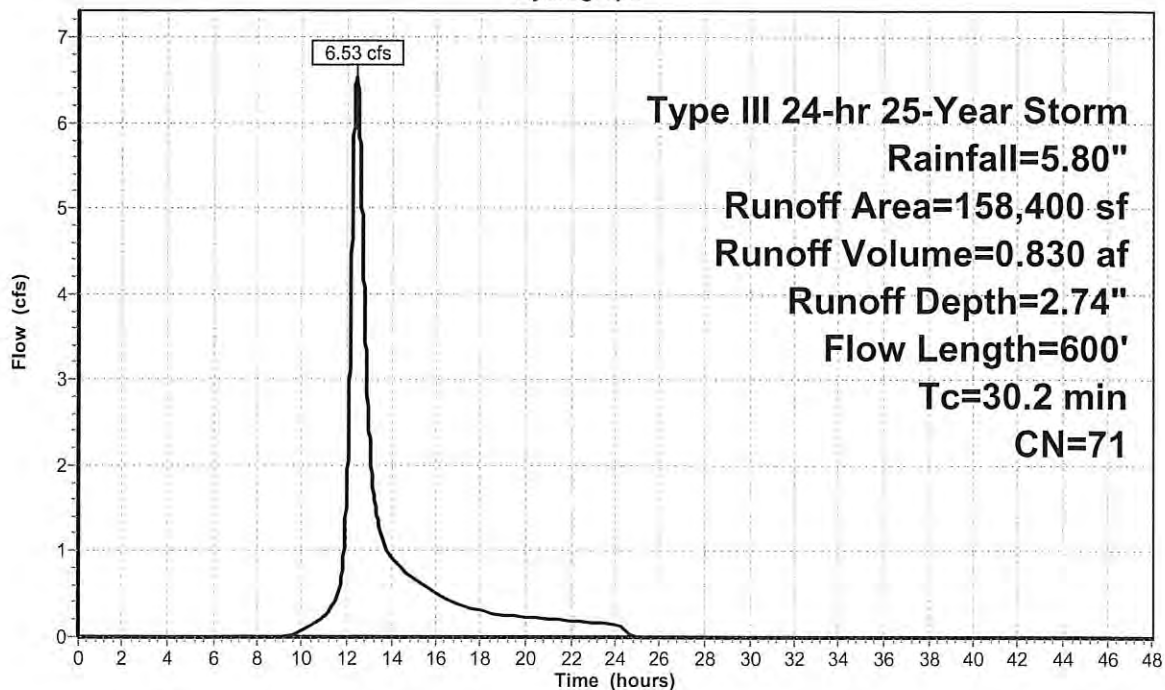
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Storm Rainfall=5.80"

Area (sf)	CN	Description
4,500	98	Paved parking & roofs
18,000	74	>75% Grass cover, Good, HSG C
135,900	70	Woods, Good, HSG C
158,400	71	Weighted Average
153,900		Pervious Area
4,500		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.9	150	0.0400	0.11		Sheet Flow, A-B
					Woods: Light underbrush n= 0.400 P2= 3.10"
7.3	450	0.0420	1.02		Shallow Concentrated Flow, B-C
					Woodland Kv= 5.0 fps
30.2	600	Total			

Subcatchment 5S:

Hydrograph



Summary for Subcatchment 6AS:

Runoff = 9.63 cfs @ 12.47 hrs, Volume= 1.282 af, Depth= 3.21"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Storm Rainfall=5.80"

Area (sf)	CN	Description
29,436	98	Paved parking & roofs
50,349	74	>75% Grass cover, Good, HSG C
101,475	70	Woods, Good, HSG C
27,700	77	Woods, Good, HSG D
208,960	76	Weighted Average
179,524		Pervious Area
29,436		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
29.6	150	0.0210	0.08		Sheet Flow, A-B
					Woods: Light underbrush n= 0.400 P2= 3.10"
2.8	140	0.0270	0.82		Shallow Concentrated Flow, B-C
					Woodland Kv= 5.0 fps
1.3	330	0.0100	4.32	60.45	Trap/Vee/Rect Channel Flow, C-D
					Bot.W=1.00' D=2.00' Z= 3.0 '/' Top.W=13.00' n= 0.035
0.4	140	0.0100	5.26	6.46	Circular Channel (pipe), D-E
					Diam= 15.0" Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
34.1	760	Total			

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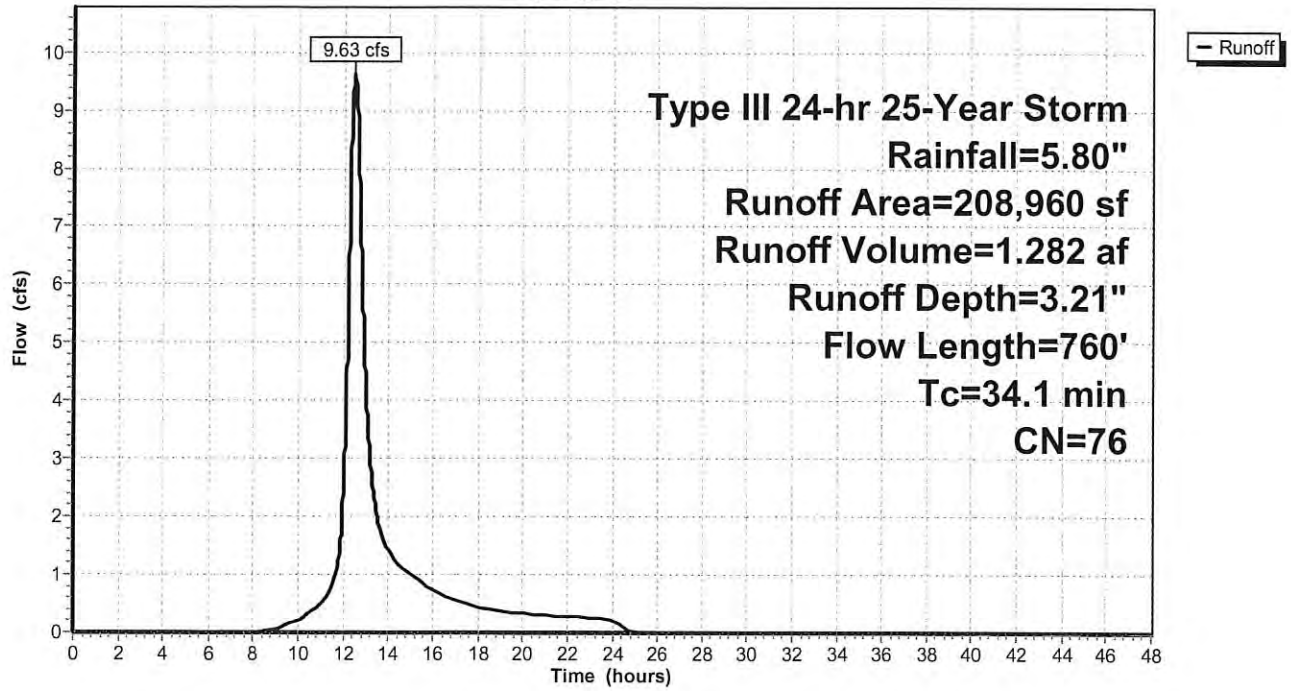
Type III 24-hr 25-Year Storm Rainfall=5.80"

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Subcatchment 6AS:

Hydrograph



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Type III 24-hr 25-Year Storm Rainfall=5.80"

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Summary for Subcatchment 6S:

Runoff = 4.49 cfs @ 12.40 hrs, Volume= 0.544 af, Depth= 2.83"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

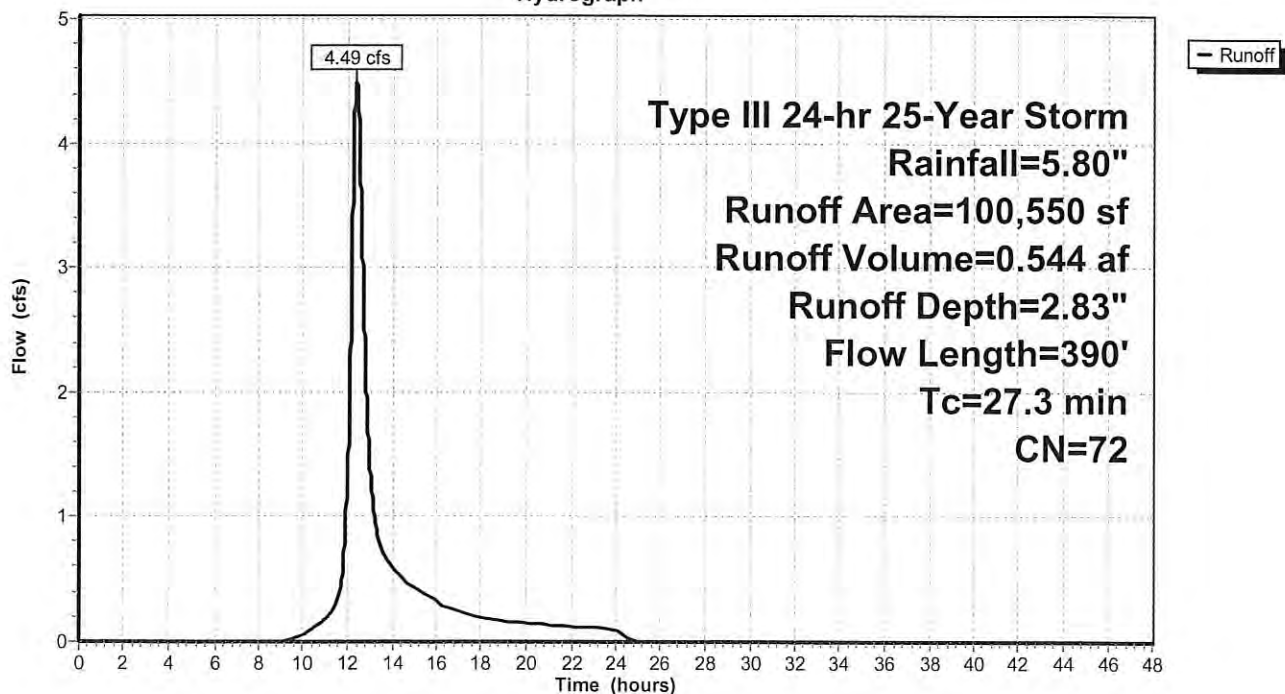
Type III 24-hr 25-Year Storm Rainfall=5.80"

Area (sf)	CN	Description
3,000	98	Paved parking & roofs
18,000	74	>75% Grass cover, Good, HSG C
79,550	70	Woods, Good, HSG C
100,550	72	Weighted Average
97,550		Pervious Area
3,000		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.9	150	0.0400	0.11		Sheet Flow, A-B
					Woods: Light underbrush n= 0.400 P2= 3.10"
4.4	240	0.0330	0.91		Shallow Concentrated Flow, B-C
					Woodland Kv= 5.0 fps
27.3	390	Total			

Subcatchment 6S:

Hydrograph



Summary for Subcatchment 7S:

Runoff = 29.24 cfs @ 12.66 hrs, Volume= 4.716 af, Depth= 3.11"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

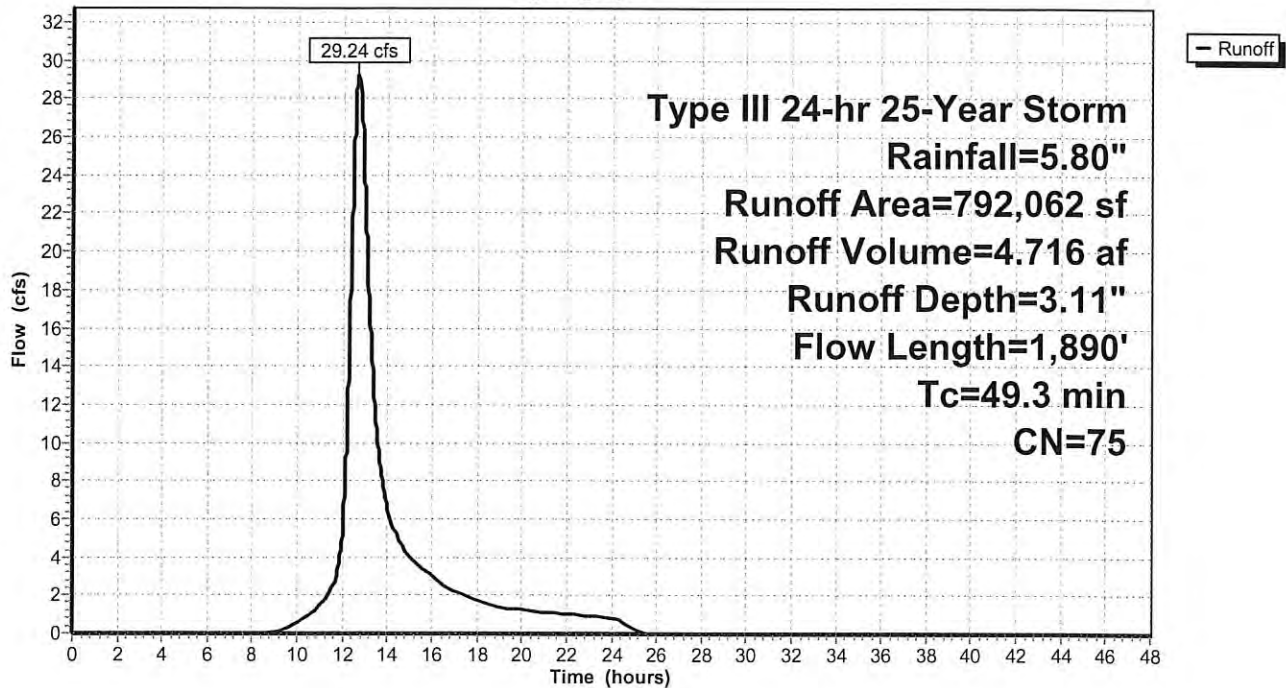
Type III 24-hr 25-Year Storm Rainfall=5.80"

Area (sf)	CN	Description
6,412	98	Paved parking & roofs
6,800	74	>75% Grass cover, Good, HSG C
218,288	77	2 acre lots, 12% imp, HSG C
197,200	82	2 acre lots, 12% imp, HSG D
76,700	71	Meadow, non-grazed, HSG C
265,562	70	Woods, Good, HSG C
21,100	77	Woods, Good, HSG D
792,062	75	Weighted Average
735,791		Pervious Area
56,271		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.3	150	0.0250	0.14		Sheet Flow, A-B
					Grass: Dense n= 0.240 P2= 3.10"
2.8	390	0.0240	2.32		Shallow Concentrated Flow, B-C
					Grassed Waterway Kv= 15.0 fps
10.0	390	0.0170	0.65		Shallow Concentrated Flow, C-D
					Woodland Kv= 5.0 fps
0.1	20	0.0100	6.22	7.63	Circular Channel (pipe), D-E
					Diam= 15.0" Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.011
18.1	940	0.0300	0.87		Shallow Concentrated Flow, E-F
					Woodland Kv= 5.0 fps
49.3	1,890	Total			

Subcatchment 7S:

Hydrograph



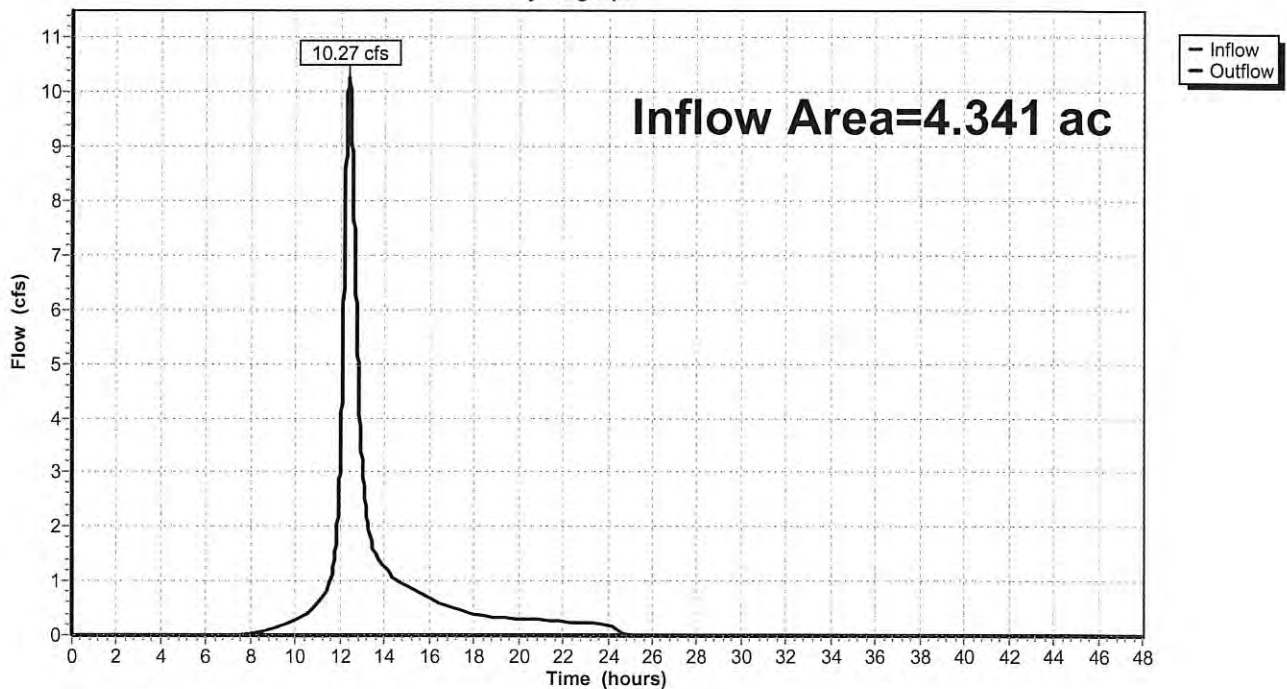
Summary for Reach 7R: POI 1

Inflow Area = 4.341 ac, 3.29% Impervious, Inflow Depth = 3.40" for 25-Year Storm event
 Inflow = 10.27 cfs @ 12.38 hrs, Volume= 1.231 af
 Outflow = 10.27 cfs @ 12.38 hrs, Volume= 1.231 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3

Reach 7R: POI 1

Hydrograph



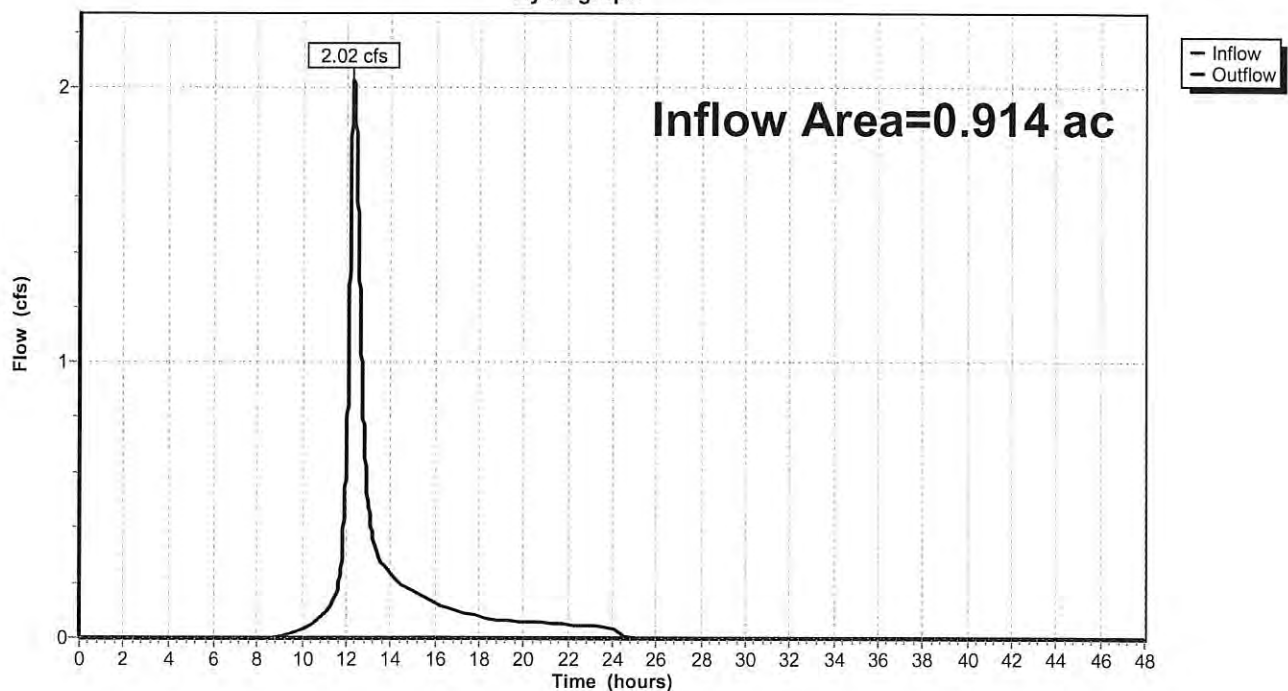
Summary for Reach 8R: POI 2

Inflow Area = 0.914 ac, 4.46% Impervious, Inflow Depth = 2.92" for 25-Year Storm event
Inflow = 2.02 cfs @ 12.30 hrs, Volume= 0.223 af
Outflow = 2.02 cfs @ 12.30 hrs, Volume= 0.223 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3

Reach 8R: POI 2

Hydrograph



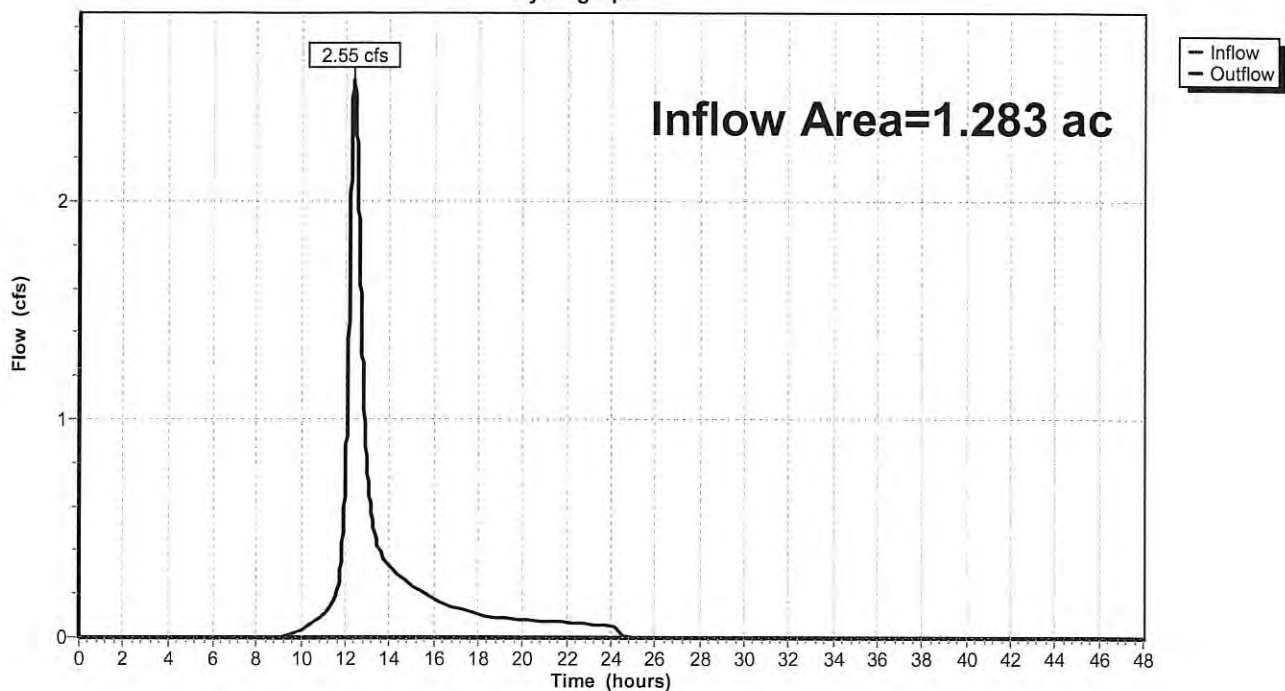
Summary for Reach 9R: POI 3

Inflow Area = 1.283 ac, 5.37% Impervious, Inflow Depth = 2.83" for 25-Year Storm event
 Inflow = 2.55 cfs @ 12.37 hrs, Volume= 0.303 af
 Outflow = 2.55 cfs @ 12.37 hrs, Volume= 0.303 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3

Reach 9R: POI 3

Hydrograph



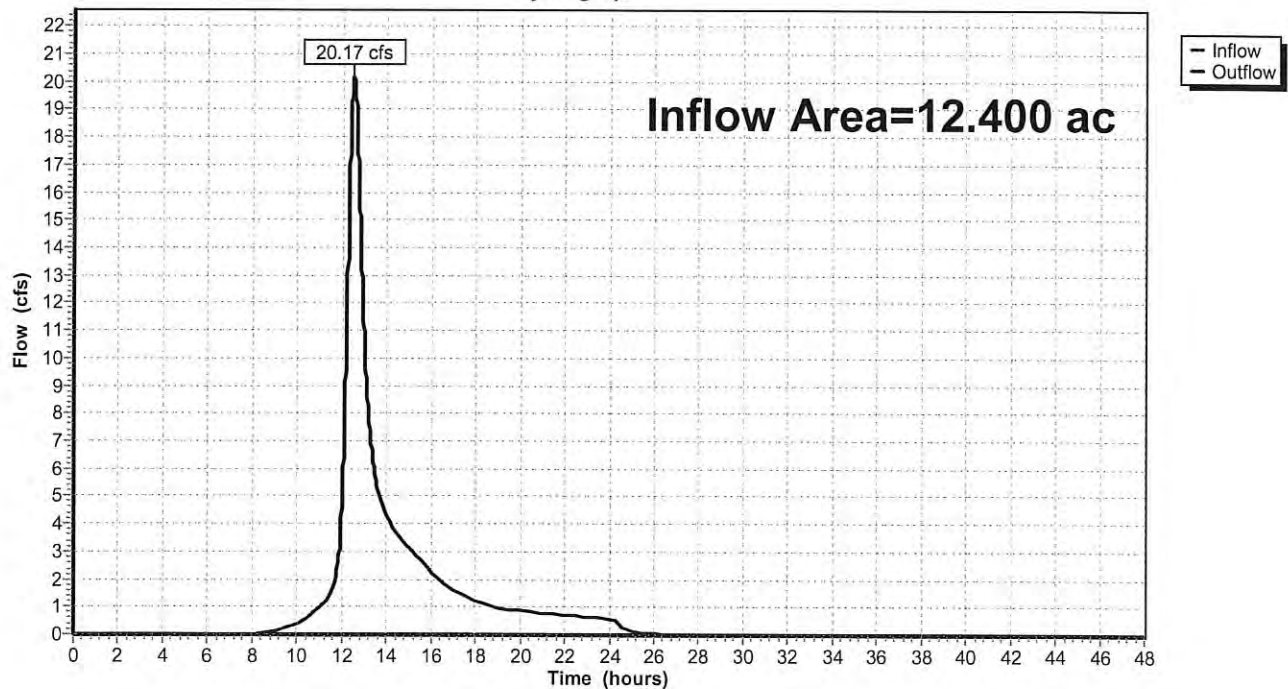
Summary for Reach 10R: POI 4

Inflow Area = 12.400 ac, 8.83% Impervious, Inflow Depth > 3.10" for 25-Year Storm event
 Inflow = 20.17 cfs @ 12.50 hrs, Volume= 3.202 af
 Outflow = 20.17 cfs @ 12.50 hrs, Volume= 3.202 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3

Reach 10R: POI 4

Hydrograph



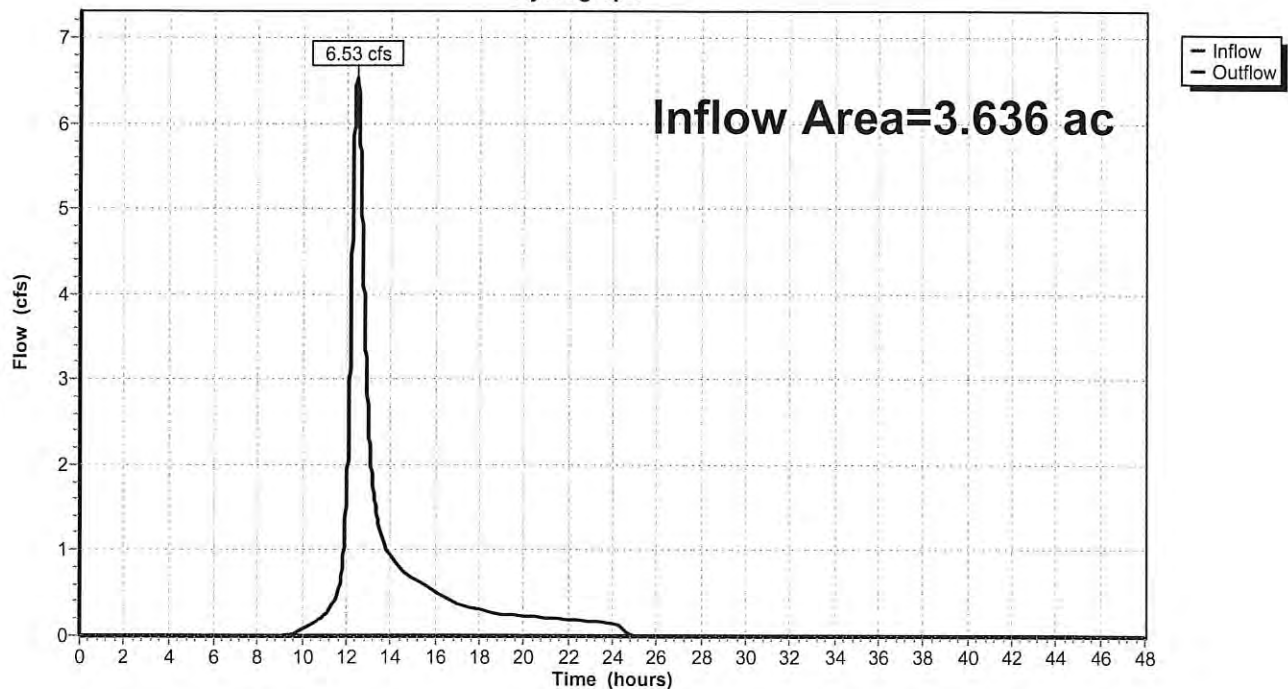
Summary for Reach 11R: POI 5

Inflow Area = 3.636 ac, 2.84% Impervious, Inflow Depth = 2.74" for 25-Year Storm event
Inflow = 6.53 cfs @ 12.44 hrs, Volume= 0.830 af
Outflow = 6.53 cfs @ 12.44 hrs, Volume= 0.830 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3

Reach 11R: POI 5

Hydrograph



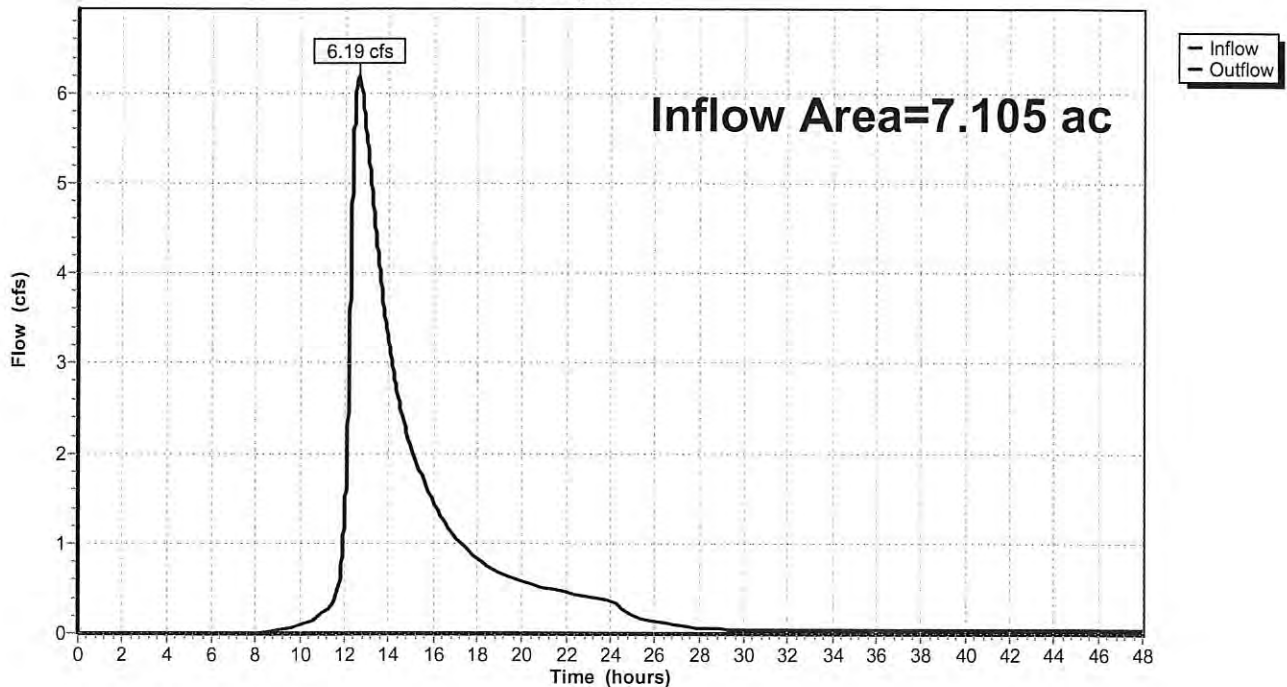
Summary for Reach 12R: POI 6

Inflow Area = 7.105 ac, 10.48% Impervious, Inflow Depth > 2.90" for 25-Year Storm event
 Inflow = 6.19 cfs @ 12.64 hrs, Volume= 1.716 af
 Outflow = 6.19 cfs @ 12.64 hrs, Volume= 1.716 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3

Reach 12R: POI 6

Hydrograph



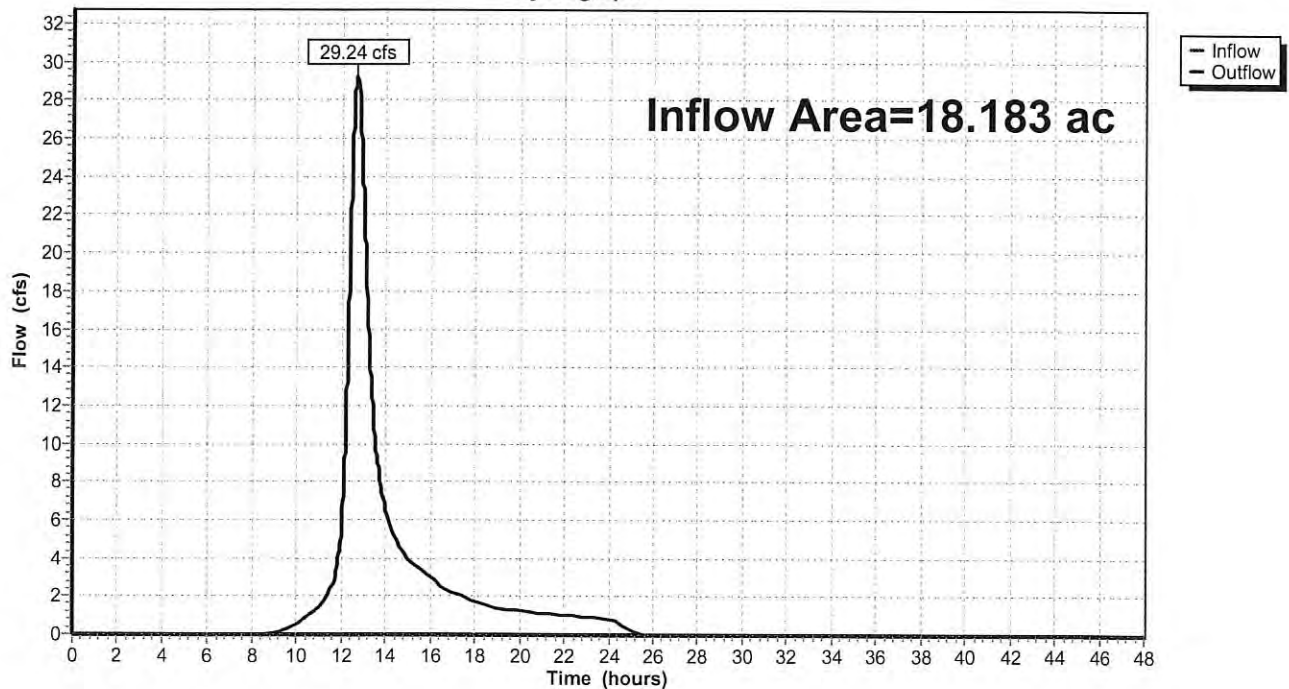
Summary for Reach 13R: POI 7

Inflow Area = 18.183 ac, 7.10% Impervious, Inflow Depth = 3.11" for 25-Year Storm event
 Inflow = 29.24 cfs @ 12.66 hrs, Volume= 4.716 af
 Outflow = 29.24 cfs @ 12.66 hrs, Volume= 4.716 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3

Reach 13R: POI 7

Hydrograph



Post 9-18-18

Type III 24-hr 25-Year Storm Rainfall=5.80"

Prepared by Gorrill Palmer

Printed 9/19/2018

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Summary for Pond 1P:

Inflow Area = 2.655 ac, 19.75% Impervious, Inflow Depth = 3.31" for 25-Year Storm event
 Inflow = 7.72 cfs @ 12.21 hrs, Volume= 0.731 af
 Outflow = 1.73 cfs @ 12.77 hrs, Volume= 0.675 af, Atten= 78%, Lag= 33.3 min
 Primary = 1.71 cfs @ 12.77 hrs, Volume= 0.609 af
 Secondary = 0.02 cfs @ 9.00 hrs, Volume= 0.066 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 399.12' @ 12.77 hrs Surf.Area= 6,611 sf Storage= 14,105 cf

Plug-Flow detention time= 205.9 min calculated for 0.675 af (92% of inflow)
 Center-of-Mass det. time= 166.2 min (997.9 - 831.7)

Volume	Invert	Avail.Storage	Storage Description
#1	395.67'	20,560 cf	Custom Stage Data (Irregular) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
395.67	2,040	210.0	0	0	2,040
397.17	3,140	240.0	3,855	3,855	3,166
398.00	5,452	305.0	3,522	7,377	5,994
399.00	6,408	330.0	5,924	13,301	7,297
400.00	8,144	450.0	7,259	20,560	14,755

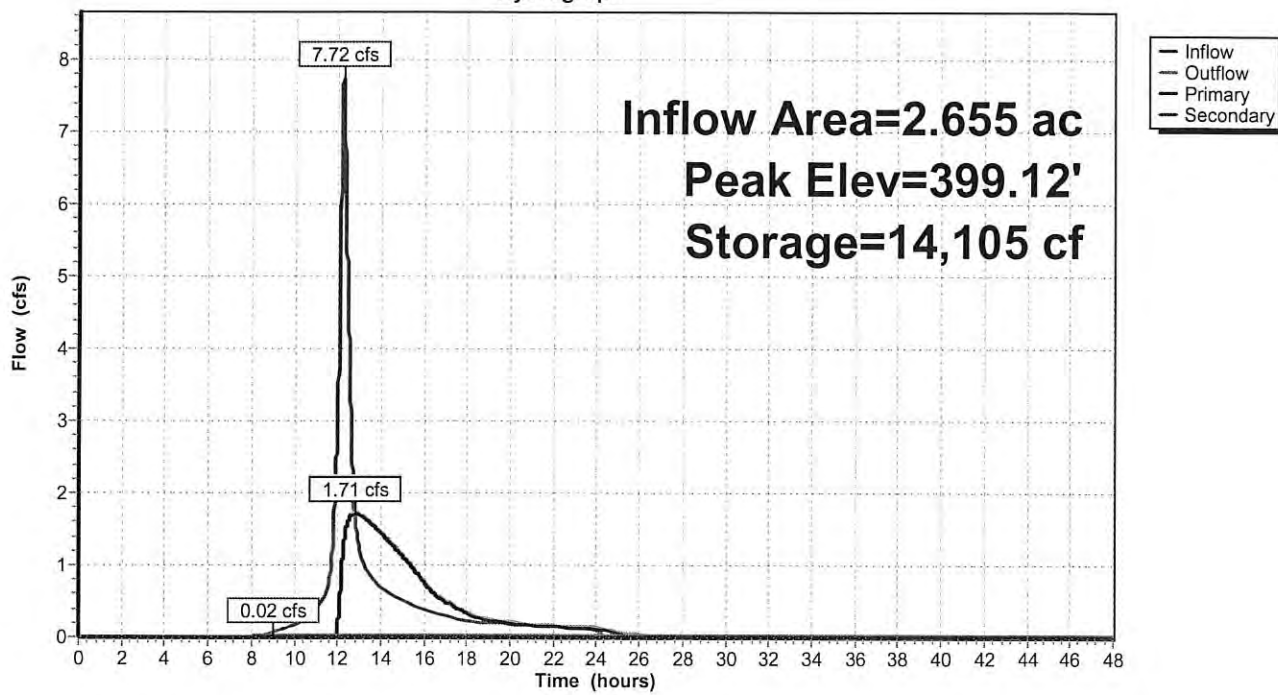
Device	Routing	Invert	Outlet Devices
#1	Secondary	395.67'	0.02 cfs Exfiltration at all elevations
#2	Primary	397.17'	6.0" Vert. Orifice/Grate C= 0.600
#3	Primary	397.68'	4.0" Vert. Orifice/Grate C= 0.600

Primary OutFlow Max=1.71 cfs @ 12.77 hrs HW=399.12' TW=0.00' (Dynamic Tailwater)
 ↳ **2=Orifice/Grate** (Orifice Controls 1.23 cfs @ 6.28 fps)
 ↳ **3=Orifice/Grate** (Orifice Controls 0.47 cfs @ 5.44 fps)

Secondary OutFlow Max=0.02 cfs @ 9.00 hrs HW=395.70' TW=0.00' (Dynamic Tailwater)
 ↳ **1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Pond 1P:

Hydrograph



Post 9-18-18

Type III 24-hr 25-Year Storm Rainfall=5.80"

Prepared by Gorrill Palmer

Printed 9/19/2018

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Summary for Pond 2P:

Inflow Area = 4.797 ac, 14.09% Impervious, Inflow Depth = 3.21" for 25-Year Storm event
 Inflow = 9.63 cfs @ 12.47 hrs, Volume= 1.282 af
 Outflow = 4.04 cfs @ 13.01 hrs, Volume= 1.172 af, Atten= 58%, Lag= 32.6 min
 Primary = 4.01 cfs @ 13.01 hrs, Volume= 1.074 af
 Secondary = 0.03 cfs @ 9.34 hrs, Volume= 0.098 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 407.70' @ 13.01 hrs Surf.Area= 10,002 sf Storage= 22,150 cf

Plug-Flow detention time= 204.1 min calculated for 1.172 af (91% of inflow)
 Center-of-Mass det. time= 160.7 min (1,012.3 - 851.6)

Volume	Invert	Avail.Storage	Storage Description		
#1	404.17'	36,488 cf	Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
404.17	2,892	305.0	0	0	2,892
405.67	4,264	340.0	5,334	5,334	4,752
406.00	7,572	395.0	1,927	7,261	7,972
409.00	12,088	560.0	29,227	36,488	20,593

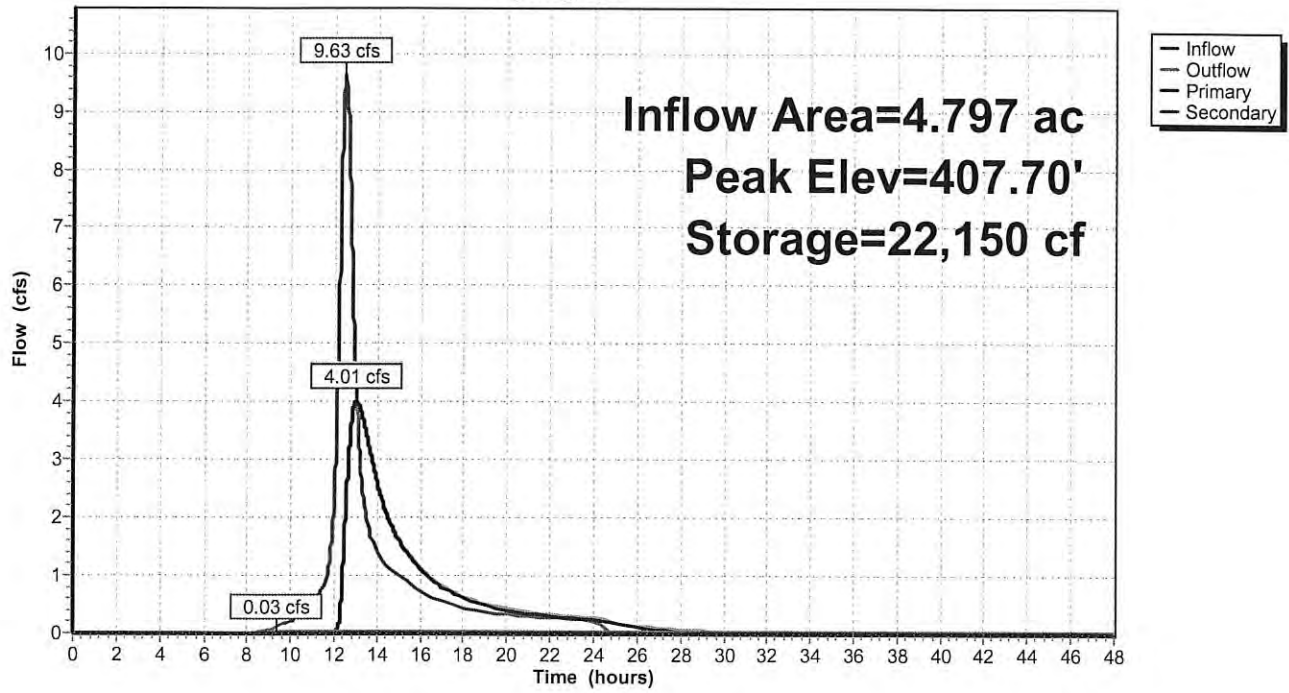
Device	Routing	Invert	Outlet Devices											
#1	Primary	405.90'	0.5' long x 0.7' breadth Broad-Crested Rectangular Weir											
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00											
			2.50											
			Coef. (English) 2.76 2.82 2.93 3.09 3.18 3.22 3.27 3.30 3.32											
			3.31 3.32											
#2	Secondary	404.17'	0.03 cfs Exfiltration at all elevations											

Primary OutFlow Max=4.01 cfs @ 13.01 hrs HW=407.70' TW=0.00' (Dynamic Tailwater)
 ↳ **1=Broad-Crested Rectangular Weir** (Weir Controls 4.01 cfs @ 4.45 fps)

Secondary OutFlow Max=0.03 cfs @ 9.34 hrs HW=404.20' TW=0.00' (Dynamic Tailwater)
 ↳ **2=Exfiltration** (Exfiltration Controls 0.03 cfs)

Pond 2P:

Hydrograph



STAGE/STORAGE TABLES

Stage-Area-Storage for Pond 1P:

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
395.67	2,040	0	398.27	5,703	8,883
395.72	2,073	103	398.32	5,750	9,169
395.77	2,106	207	398.37	5,797	9,458
395.82	2,139	313	398.42	5,844	9,749
395.87	2,173	421	398.47	5,892	10,042
395.92	2,207	531	398.52	5,939	10,338
395.97	2,241	642	398.57	5,987	10,636
396.02	2,276	755	398.62	6,036	10,937
396.07	2,310	869	398.67	6,084	11,240
396.12	2,345	986	398.72	6,133	11,545
396.17	2,380	1,104	398.77	6,181	11,853
396.22	2,416	1,224	398.82	6,230	12,163
396.27	2,452	1,346	398.87	6,279	12,476
396.32	2,488	1,469	398.92	6,329	12,791
396.37	2,524	1,594	398.97	6,378	13,109
396.42	2,560	1,721	399.02	6,441	13,429
396.47	2,597	1,850	399.07	6,523	13,753
396.52	2,634	1,981	399.12	6,605	14,082
396.57	2,672	2,114	399.17	6,688	14,414
396.62	2,709	2,248	399.22	6,772	14,750
396.67	2,747	2,385	399.27	6,856	15,091
396.72	2,785	2,523	399.32	6,941	15,436
396.77	2,824	2,663	399.37	7,026	15,785
396.82	2,862	2,805	399.42	7,112	16,139
396.87	2,901	2,950	399.47	7,198	16,496
396.92	2,940	3,096	399.52	7,285	16,859
396.97	2,980	3,244	399.57	7,372	17,225
397.02	3,019	3,394	399.62	7,460	17,596
397.07	3,059	3,546	399.67	7,548	17,971
397.12	3,100	3,699	399.72	7,637	18,351
397.17	3,140	3,855	399.77	7,726	18,735
397.22	3,261	4,015	399.82	7,816	19,123
397.27	3,385	4,182	399.87	7,907	19,516
397.32	3,511	4,354	399.92	7,997	19,914
397.37	3,639	4,533	399.97	8,089	20,316
397.42	3,770	4,718			
397.47	3,903	4,910			
397.52	4,038	5,108			
397.57	4,175	5,314			
397.62	4,315	5,526			
397.67	4,457	5,745			
397.72	4,601	5,972			
397.77	4,748	6,205			
397.82	4,897	6,446			
397.87	5,048	6,695			
397.92	5,202	6,951			
397.97	5,357	7,215			
398.02	5,470	7,487			
398.07	5,516	7,761			
398.12	5,563	8,038			
398.17	5,609	8,317			
398.22	5,656	8,599			

Stage-Area-Storage for Pond 2P:

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
404.17	2,892	0	406.77	8,631	13,494
404.22	2,933	146	406.82	8,702	13,928
404.27	2,975	293	406.87	8,773	14,365
404.32	3,017	443	406.92	8,845	14,805
404.37	3,060	595	406.97	8,917	15,249
404.42	3,102	749	407.02	8,989	15,697
404.47	3,145	905	407.07	9,062	16,148
404.52	3,188	1,064	407.12	9,135	16,603
404.57	3,232	1,224	407.17	9,208	17,062
404.62	3,276	1,387	407.22	9,282	17,524
404.67	3,320	1,552	407.27	9,355	17,990
404.72	3,364	1,719	407.32	9,430	18,459
404.77	3,409	1,888	407.37	9,504	18,933
404.82	3,454	2,060	407.42	9,579	19,410
404.87	3,499	2,234	407.47	9,653	19,891
404.92	3,545	2,410	407.52	9,729	20,375
404.97	3,591	2,588	407.57	9,804	20,863
405.02	3,637	2,769	407.62	9,880	21,356
405.07	3,683	2,952	407.67	9,956	21,851
405.12	3,730	3,137	407.72	10,033	22,351
405.17	3,777	3,325	407.77	10,109	22,855
405.22	3,825	3,515	407.82	10,186	23,362
405.27	3,872	3,707	407.87	10,264	23,873
405.32	3,920	3,902	407.92	10,341	24,388
405.37	3,968	4,099	407.97	10,419	24,907
405.42	4,017	4,299	408.02	10,497	25,430
405.47	4,066	4,501	408.07	10,576	25,957
405.52	4,115	4,705	408.12	10,654	26,488
405.57	4,164	4,912	408.17	10,733	27,023
405.62	4,214	5,122	408.22	10,813	27,561
→ 405.67	4,264	5,334	408.27	10,892	28,104
405.72	4,705	5,558	408.32	10,972	28,651
405.77	5,167	5,805	408.37	11,052	29,201
405.82	5,651	6,075	408.42	11,133	29,756
405.87	6,156	6,370	408.47	11,214	30,314
405.92	6,683	6,691	408.52	11,295	30,877
405.97	7,232	7,039	408.57	11,376	31,444
406.02	7,599	7,413	408.62	11,458	32,015
406.07	7,665	7,794	408.67	11,540	32,590
406.12	7,732	8,179	408.72	11,622	33,169
406.17	7,800	8,567	408.77	11,705	33,752
406.22	7,867	8,959	408.82	11,787	34,339
406.27	7,935	9,354	408.87	11,871	34,931
406.32	8,004	9,753	408.92	11,954	35,526
406.37	8,072	10,154	408.97	12,038	36,126
406.42	8,141	10,560			
406.47	8,210	10,969			
406.52	8,279	11,381			
406.57	8,349	11,797			
406.62	8,419	12,216			
406.67	8,489	12,638			
406.72	8,560	13,065			

ATTACHMENT C

TEST PIT LOGS

SOIL PROFILE / CLASSIFICATION INFORMATION		DETAILED DESCRIPTION OF SUBSURFACE CONDITIONS AT PROJECT SITES
Project Name: Orchard Road Subdivision	Applicant Name: TZ Properties	Project Location (municipality): Cumberland

Observation Hole # <u>TP-201</u> <input checked="" type="checkbox"/> Test Pit <input type="checkbox"/> Boring				
" Depth of organic horizon above mineral soil				
Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
	0		Dark Brown	
	4	Loamy Sand	Friable	Reddish Brown
	6		Yellowish Brown	
	20		Olive Brown	
	23			Common/ Distinct
	66	Firm		
	66	Cobbly Loamy Sand with a Trace Stones		
	Limit of Excavation at 9.5'			
	Soil Profile	Classification Condition	Slope Percent	Limiting Factor Depth

Observation Hole # <u>TP-202</u> <input type="checkbox"/> Test Pit <input type="checkbox"/> Boring				
" Depth of organic horizon above mineral soil				
Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
	0		Dark Brown	
	12	Sandy Loam	Friable	Yellowish Brown
	15			Common/ Distinct
	18		Olive Brown	
	20			
	23	Firm		
	66	Cobbly Sandy Loam		
	96	Sandy Loam		
	Limit of Excavation at 10 Feet			
Soil Profile	Classification Condition	Slope Percent	Limiting Factor Depth	<input type="checkbox"/> Groundwater <input type="checkbox"/> Restrictive Layer <input type="checkbox"/> Bedrock

Observation Hole # _____ <input type="checkbox"/> Test Pit <input type="checkbox"/> Boring				
" Depth of organic horizon above mineral soil				
Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
	0			
Soil Profile	Classification Condition	Slope Percent	Limiting Factor Depth	<input type="checkbox"/> Groundwater <input type="checkbox"/> Restrictive Layer <input type="checkbox"/> Bedrock

Observation Hole # _____ <input type="checkbox"/> Test Pit <input type="checkbox"/> Boring				
" Depth of organic horizon above mineral soil				
Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
	0			
Soil Profile	Classification Condition	Slope Percent	Limiting Factor Depth	<input type="checkbox"/> Groundwater <input type="checkbox"/> Restrictive Layer <input type="checkbox"/> Bedrock

INVESTIGATOR INFORMATION AND SIGNATURE	
Signature: <u>David V. Chapman</u>	Date: <u>12-8-17</u>
Name Printed/typed: <u>David V. Chapman</u>	Cert/Lic/Reg.# <u>293</u>
Title: <input checked="" type="checkbox"/> Licensed Site Evaluator <input type="checkbox"/> Certified Soil Scientist <input type="checkbox"/> Certified Geologist <input type="checkbox"/> Other:	



ATTACHMENT C

DITCH AND STORMDRAIN



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JOB 3236.01
SHEET NO. 1 OF 1
CALCULATED BY JA DATE 10-27-17
CHECKED BY JA DATE 10-27-17
SCALE 1" = 40'

STORM DRAINAGE

DRIVEWAY CULVERT LOT 7

$$\text{TOTAL AREA} = 2.96(80^2) = 18,944 \text{ ft}^2 = 0.43 \text{ Ac}$$

$$\text{IMP} = 370(13) = 4810 \text{ ft}^2 = 0.11 \text{ Ac} \quad C = 0.9$$

$$\text{IMP} = 3000 \text{ ft}^2 (\text{HOUSE/DW}) = 0.07 \text{ Ac} \quad C = 0.9$$

$$\text{LAWN} = 6,000 \text{ ft}^2 = 0.14 \text{ Ac} \quad C = 0.2$$

$$\text{WOODS} = 5134 \text{ ft}^2 = 0.12 \text{ Ac} \quad C = 0.2$$

$$\text{ASSUME } T_c = 5 \text{ MIN} \quad i_{25} = 6.2 \text{ in/hr}$$

$$\text{COMPOSITE } C = \frac{0.18}{0.43}(0.9) + \frac{0.26}{0.43}(0.2) = 0.50$$

$$Q_{25} = 0.5(6.2)(0.43) = 1.3 \text{ cfs}$$

USE 12" CULVERT

INLET STA 24+00 RT

FROM LOT 7 DRIVEWAY CULVERT $A = 0.43 \quad C = 0.50$

$$\text{TOTAL ADDITIONAL AREA} = 5.02(80^2) = 32,128 \text{ ft}^2 = 0.74 \text{ Ac}$$

$$\text{PAVE} = 120(13) + 90(20) = 3360 \text{ ft}^2 = 0.08 \text{ Ac} \quad C = 0.9$$

$$\text{VEG} = 28,768 \text{ ft}^2 = 0.66 \text{ Ac} \quad C = 0.20$$

$$\text{COMPOSITE } C = \frac{0.43}{1.17}(0.5) + \frac{0.08}{1.17}(0.9) + \frac{0.66}{1.17}(0.20) = 0.36$$



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JOB 3236.01
SHEET NO. 2 OF
CALCULATED BY JP DATE 10-27-17
CHECKED BY DATE
SCALE

INLET STA 24+00 RT

ASSUME $T_c = 5 \text{ MIN}$ $i_{25} = 6.2 \text{ in/hr}$

$$Q_{25} = 0.36(6.2)(1.17) = 2.6 \text{ cfs}$$

USE 12" SD

INLET STA 24+00 LT USE 12" BY INSPECTION
 $A = 0.129 \text{ AC}$ $C = 0.55$

DRIVEWAY CULVERT LOT 8 USE 12" BY INSPECTION

DRIVEWAY CULVERT LOT 9

$$\text{TOTAL AREA} = 11.98(80^2) = 76,672 \text{ ft}^2 = 1.76 \text{ AC}$$

$$\text{IMP} = 3,000 + 3,000 + 250(13) = 9250 \text{ ft}^2 = 0.2 \text{ AC } C = 0.9$$

$$\text{VEG} = 67,422 \text{ ft}^2 = 1.55 \text{ AC } C = 0.2$$

$$\text{COMPOSITE } C = \frac{0.2}{1.76}(0.9) + \frac{1.55}{1.76}(0.2) = 0.28$$

$$\text{FROM HYDROCAD } T_c = 30 \text{ MIN } Q_{25} = 0.28(3)1.76 = 1.5 \text{ cfs}$$

$$i_{25} = 3 \text{ in/hr}$$

USE 12" CULVERT



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JOB 3236.01
SHEET NO. 3 OF 3
CALCULATED BY JA DATE 10-27-17
CHECKED BY _____ DATE _____
SCALE _____

LOT 10 DRIVEWAY CULVERT

FROM LOT 9 DRIVEWAY CULVERT $A = 1.76 A_c$ $C = 0.28$

$$\text{TOTAL ADDITIONAL AREA} = 12.65(80^2) = 80,960 \text{ ft}^2 \\ \text{TO INLET @ 15100 RT} \\ = 1.86 A_c$$

$$\text{IMP} = 3000 \text{ ft}^2 + 150(13) = 4950 \text{ ft}^2 \quad 0.11 A_c \quad C = 0.9$$

$$\text{VEG} = 76,010 \text{ ft}^2 = 1.74 A_c \quad C = 0.2$$

$$\text{COMPOSITE } C = \frac{1.76}{3.92} (0.28) + \frac{0.11}{3.92} (0.9) + \frac{1.74}{3.92} (0.2)$$

$$C = 0.24$$

$$Q_{25} = 0.24(3)(3.92) = 2.82 \text{ cfs}$$

USE 15" CULVERT

CB 1

$$\text{IMP} = 190(15) = 2850 \text{ ft}^2 \quad C = 0.9 \quad T_c = 5 \text{ MIN}$$

$$Q_{25} = 0.9(6.2) 0.06 = 0.33 \text{ cfs}$$

$$\text{CB 2} \quad 220(13) = 2860 \text{ ft}^2 \quad C = 0.9 \quad T_c = 5 \text{ MIN}$$

$$Q_{25} = 0.9(6.2) 0.07 = 0.39 \text{ cfs}$$

LOT 1 DRIVEWAY CULVERT = 12" BY INSPECTION



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JOB 3236.01
SHEET NO. 4 OF 1
CALCULATED BY JP DATE 10-27-17
CHECKED BY _____ DATE _____
SCALE _____

ROADSIDE DITCH FLOW

ASSUMING WORST CASE AT STA 16+00 RT +

$$Q_{15} = 2.8 \text{ cfs}$$

PERMISSIBLE VEGETATED VELOCITY
WOOD BRIDGE SOIL = 3 ft/s

$$V = 2.8 \text{ ft/s}$$

USE VEGETATED LINING

DITCH TO GRASSED UNDERDRAINED SOIL
FILTER ADJACENT TO LOT 3

RIP RAP SLOPE $D_{50} = 6''$

DITCH TO GRASSED UNDERDRAINED SOIL FILTER
ADJACENT TO LOT 1

LOW FLOW FROM LEFT SIDE ROADSIDE DITCH

USE VEGETATED LINING

MAINE EROSION AND SEDIMENT CONTROL BMPs – 10/2016

SOIL NAME	K factor	SURFACE WATER PERMISSIBLE VELOCITY		WATERTABLE			DEPTH TO BEDROCK	HYDRIC SOIL	
	(10"-20")	BARE ft/sec	VEGETATED ft/sec.	INFLOW RATE cfs/1000 ft.	Kind	Depth in ft	Duration		inches
Hydrologic Group C									
Becket	0.17	1.5	3	0.1	Perched	2.0-3.5	Mar-Apr	>60	N
Chesuncook*	0.24/0.32	1.5	3	0.1	Perched	1.5-3.0	Mar-May	>60	N
Conant	0.24	2	3.5	0.15	Apparent	1.0-2.5	Nov-May	>60	N
Dixfield*	0.20	2	3.5	0.1	Perched	1.5-2.5	Nov-Apr	>60	N
Elliottsville	0.24	1.5	3	----	----	----	----	20-40	N
Howland*	0.24	2	3.5	0.1	Perched	1.5-2.5	Oct-May	>60	N
Linneus	0.28	1.5	3	----	----	----	----	20-40	N
Mapleton	0.20	2	3.5	----	----	----	----	10-20	N
Marlow	0.24/0.32/0.20	2	4	0.1	Perched	2.0-3.5	Mar-Apr	>60	N
Melrose	0.32/0.49	2	4	0.1	----	>6	----	>60	N
Paxton	0.24/0.32/0.20	2	4	0.1	Perched	2.0-3.5	Mar-Apr	>60	N
Penquis	0.32	1.5	3	----	----	----	----	20-40	N
Perham*	0.24/0.32/0.37	1.5	3	0.1	Perched	1.5-2.5	Mar-May	>60	N
Peru*	0.24/0.32/0.37	1.5	3	0.1	Perched	1.5-2.5	Nov-May	>60	N
Plaisted	0.24	2	3.5	0.1	Perched	2.0-3.5	Nov-May	>60	N
Ragmuff*	----	----	----	----	----	----	----	----	----
Rawsonville	----	----	----	----	----	----	----	----	----
Sisk	0.28/0.32	----	----	----	----	>6	----	>60	N
Skerry**	0.20/0.28/0.17	1.5	3	0.1	Perched	1.5-2.5	Nov-May	>60	N
Suffield	0.32/0.49	1.5	3.5	0.05	Perched	1.5-3.0	Nov-May	>60	N
Surplus*	0.28/0.32	----	----	----	Perched	1.0-2.0	Oct-May	>60	N
Tunbridge	0.24/0.20	2	3.5	----	----	----	----	20-40	N
Winnecook	0.28	1.5	3	1	----	----	----	20-40	N
Hydrologic Group C/D									
Boothbay #	0.32/0.49	1.5	3	0.05	Apparent	1.0-2.0	Nov-May	>60	N
Buxton #	0.32/0.49	1.5	3.5	0.05	Perched	1.5-3.0	Nov-May	>60	N
Chesuncook**	0.24/0.32	1.5	3	0.1	Perched	1.5-3.0	Mar-May	>60	N
Dixfield**	0.20	2	3.5	0.1	Perched	1.5-2.5	Nov-Apr	>60	N
Dixmont	0.28	1.5	3	0.15	Perched	1.0-2.0	Nov-Jun	>60	N
Easton	0.24/0.37	1.5	3	0.1	Apparent	0-1.5	Oct-May	>60	Y/N
Howland**	0.24	2	3.5	0.1	Perched	1.5-2.5	Oct-May	>60	N
Lamoine	0.32/0.49	1.5	3	0.05	Perched	0.5-2.0	Nov-Jun	>60	N
Leicester	0.32	1.5	3	0.1	Perched	0-1.0	Nov-Jun	>60	Y
Perham**	0.24/0.32/0.37	1.5	3	0.1	Perched	1.5-2.5	Mar-May	>60	N
Peru**	0.24/0.32/0.37	1.5	3	0.1	Perched	1.5-2.5	Nov-May	>60	N
Pushaw	----	----	----	----	----	----	----	----	----
Ragmuff**	----	----	----	----	----	----	----	----	----
Skerry*	0.20/0.28/0.17	1.5	3	0.1	Perched	1.5-2.5	Nov-May	>60	N
Surplus**	0.28/0.32	----	----	----	Perched	1.0-2.0	Oct-May	>60	N
Washburn	0.24/0.37	2	3.5	0.1	Apparent	+1-0.5	Oct-Jul	>60	Y
Woodbridge	0.24/0.32/0.37	1.5	3	0.1	Perched	1.5-2.5	Nov-May	>60	N

TRAPAZOIDAL DITCH SIZING
Gorrill Palmer

JOB DATA

Project: 3236.01
Calc. by: JWA
Date: 10/26/2017
Ditch at:

EQUATIONS:

Manning's Equation, $V = (1.49/n)R^{2/3}S^{1/2}$
 $Q = VA$
Froude number, $F = V/(gd)^{1/2}$

INPUT:

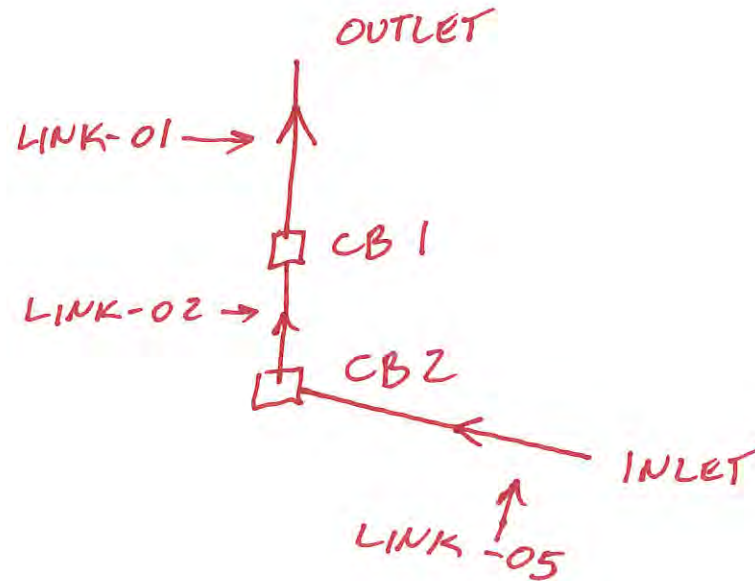
Base width (b) = 1.0 ft
Sideslope (z) = 3 on 1
Sideslope (z) = 3 on 1
Depth of flow (d) = 0.44 ft
Manning's n = 0.030 (grass)
Slope of ditch (s) = 0.0180 ft/ft

OUTPUT:

Wet Perimeter (P) = 3.78 ft
Area of Flow (A) = 1.02 sq. ft.
Hydr. Radius (R) = 0.27 ft
Velocity of Flow (V) = 2.8 fps
Flow Capacity (Q) = 2.8 cfs
Froude Number (F) = 0.74 < 1, subcritical flow



SN	Element Description ID	From (Inlet Node)	To (Outlet Node)	Length	Inlet Invert Elevation	Inlet Invert Offset	Outlet Invert Elevation	Outlet Invert Offset	Total Drop	Average Slope	Pipe Shape	Pipe Diameter or Height
				(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(%)		(inches)
1	Link-01	Inlet-01	Out-01	77.00	406.82	0.00	405.00	0.00	1.82	2.3600	CIRCULAR	15.000
2	Link-02	Inlet-02	Inlet-01	22.00	407.20	-0.10	406.92	0.10	0.28	1.2700	CIRCULAR	15.000
3	Link-05	64	Inlet-02	48.00	410.00	0.00	407.30	0.00	2.70	5.6200	CIRCULAR	15.000



Pipe Width	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow	Flap Gate	Lengthening Factor	Peak Flow	Time of Peak Flow Occurrence	Max Flow Velocity	Travel Time	Design Flow Capacity
(inches)					(cfs)			(cfs)	(days hh:mm)	(ft/sec)	(min)	(cfs)
15.00	0.0150	0.5000	0.5000	0.0000	0.00	NO	1.00	2.77	0 00:30	5.85	0.22	8.61
15.00	0.0150	0.5000	0.5000	0.0000	0.00	NO	1.00	2.77	0 00:30	4.77	0.08	7.36
15.00	0.0150	0.5000	0.8000	0.0000	0.00	NO	1.00	2.77	0 00:30	5.51	0.15	13.28

Max Flow / Design Flow Ratio	Max Flow Depth / Total Depth Ratio	Total Time Surcharged (min)	Max Flow Depth (ft)	Reported Condition
0.32	0.41	0.00	0.51	Calculated
0.38	0.48	0.00	0.60	Calculated
0.21	0.43	0.00	0.54	Calculated

SN	Element ID	X Coordinate	Y Coordinate	Description	Invert Elevation	Boundary Type	Flap Gate	Fixed Water Elevation	Peak Inflow
					(ft)			(ft)	(cfs)
1	Out-01	2205.88	8431.37		405.00	NORMAL	NO		2.77

Peak Lateral Inflow	Maximum HGL Depth Attained	Maximum HGL Elevation Attained
(cfs)	(ft)	(ft)
0.00	0.49	405.49

SN	Element ID	X Coordinate	Y Coordinate	Description	Inlet Manufacturer	Manufacturer Part Number
1	Inlet-01	2205.88	7647.06		FHWA HEC-22 GENERIC	N/A
2	Inlet-02	2215.69	7088.24		FHWA HEC-22 GENERIC	N/A

Inlet Location	Number of Inlets	Catchbasin Invert Elevation	Max (Rim) Elevation	Max (Rim) Offset	Initial Water Elevation	Initial Water Depth	Ponded Area	Grate Clogging Factor	Roadway Longitudinal Slope
		(ft)	(ft)	(ft)	(ft)	(ft)	(ft²)	(%)	(ft/ft)
On Sag	1	406.82	412.51	5.69	0.00	0.00	10.00	0.00	N/A
On Sag	1	407.30	412.55	5.25	0.00	0.00	10.00	0.00	N/A

Roadway Cross Slope (ft/ft)	Roadway Manning's Roughness	Gutter Cross Slope (ft/ft)	Gutter Width (ft)	Gutter Depression (inches)	Median Ditch Longitudinal Slope (ft/ft)	Median Ditch Bottom Width (ft)	Median Ditch Left Side Slope (V:H)	Median Ditch Right Side Slope (V:H)
0.0200	0.0160	0.0620	2.00	2.0000	45.0000	45.0000	64	64
0.0200	0.0160	0.0620	2.00	2.0000	45.0000	45.0000	64	64

Median Ditch Manning's Roughness	Peak Flow (cfs)	Peak Lateral Inflow (cfs)	Peak Flow Intercepted by Inlet (cfs)	Peak Flow Bypassing Inlet (cfs)	Inlet Efficiency during Peak Flow (%)	Allowable Spread (ft)	Max Gutter Spread during Peak Flow (ft)	Max Gutter Water Elev. during Peak Flow (ft)
45.0000	0.33	0.33	N/A	N/A	N/A	7.00	0.43	412.60
45.0000	0.39	0.39	N/A	N/A	N/A	7.00	0.51	412.66

Max Gutter Water Depth during Peak Flow (ft)	Time of Maximum Depth Occurrence (days hh:mm)	Total Flooded Volume (ac-inches)	Total Time Flooded (minutes)
0.09	0 00:30	0.00	0.00
0.11	0 00:30	0.00	0.00

SN	Element ID	X Coordinate	Y Coordinate	Description	Invert Elevation	Ground/Rim (Max) Elevation	Ground/Rim (Max) Offset	Initial Water Elevation
					(ft)	(ft)	(ft)	(ft)
1	64	3705.88	6843.14		410.00	413.00	3.00	0.00

Initial Water Depth	Surcharge Elevation	Surcharge Depth	Ponded Area	Minimum Pipe Cover	Peak Inflow	Peak Lateral Inflow	Maximum HGL Elevation Attained	Maximum HGL Depth Attained	Maximum Surcharge Depth Attained
(ft)	(ft)	(ft)	(ft ²)	(inches)	(cfs)	(cfs)	(ft)	(ft)	(ft)
-410.00	0.00	-413.00	0.00	21.00	2.78	2.78	410.41	0.41	0.00

Minimum Freeboard Attained (ft)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)	Time of Maximum HGL Occurrence (days hh:mm)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-inches)	Total Time Flooded (minutes)
2.59	410.04	0.04	0 00:30	0 00:00	0.00	0.00

SN	Element Description ID	Area	Drainage Node ID	Weighted Runoff Coefficient	Accumulated Precipitation	Total Runoff	Peak Runoff	Rainfall Intensity
		(acres)			(inches)	(inches)	(cfs)	(inches/hr)
1	Sub-01	3.92	64	0.2400	1.48	0.35	2.78	2.950
2	Sub-03	0.06	Inlet-01	0.9000	0.52	0.47	0.34	6.200
3	Sub-04	0.07	Inlet-02	0.9000	0.52	0.47	0.39	6.200

**Time
of
Concentration**

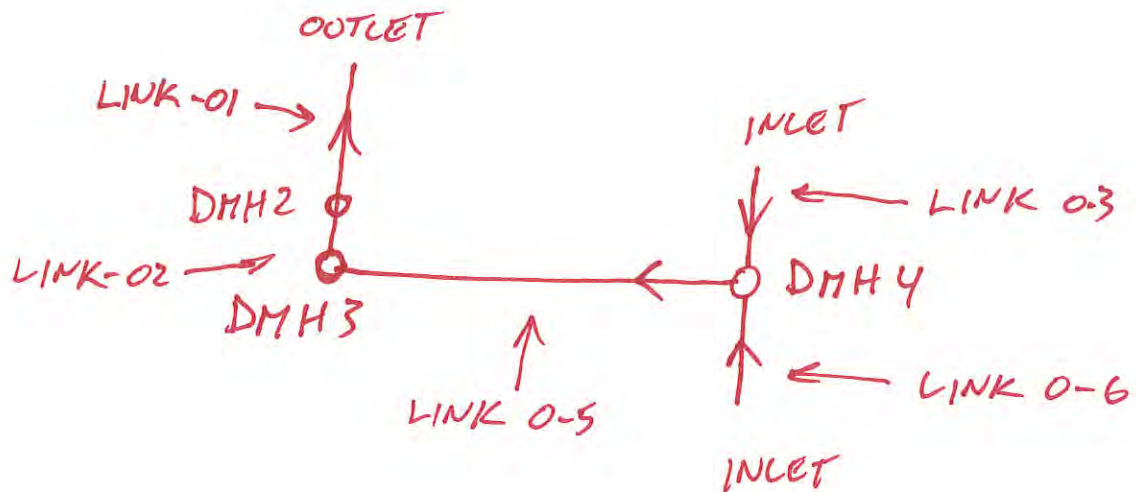
(days hh:mm:ss)

0 00:30:00

0 00:05:00

0 00:05:00

SN	Element Description ID	From (Inlet) Node	To (Outlet) Node	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)
1	Link-01	64	Out-01	55.00	407.40	0.00	407.00	0.00	0.40
2	Link-02	64	64	23.00	408.15	0.00	407.50	0.10	0.65
3	Link-03	Inlet-01	64	11.00	413.00	0.00	410.78	0.10	2.22
4	Link-05	64	64	255.00	410.68	0.00	408.25	0.10	2.43
5	Link-06	64	64	29.00	413.00	0.00	410.78	0.10	2.22



Average Slope	Pipe Shape	Pipe Diameter or Height	Pipe Width	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow	Flap Gate
(%)		(inches)	(inches)					(cfs)	
0.7300	CIRCULAR	15.000	15.00	0.0150	0.5000	0.5000	0.0000	0.00	NO
2.8300	CIRCULAR	12.000	12.00	0.0150	0.5000	0.5000	0.0000	0.00	NO
20.1800	CIRCULAR	12.000	12.00	0.0150	0.5000	0.8000	0.0000	0.00	NO
0.9500	CIRCULAR	12.000	12.00	0.0150	0.5000	0.8000	0.0000	0.00	NO
7.6600	CIRCULAR	12.000	12.00	0.0150	0.5000	0.8000	0.0000	0.00	NO

Lengthening Factor	Peak Flow	Time of Peak Flow Occurrence	Max Flow Velocity	Travel Time	Design Flow Capacity	Max Flow / Design Flow Ratio	Max Flow Depth / Total Depth Ratio	Total Time Surcharged
	(cfs)	(days hh:mm)	(ft/sec)	(min)	(cfs)			(min)
1.00	2.98	0 00:06	3.72	0.25	4.77	0.62	0.62	0.00
1.00	2.98	0 00:06	4.84	0.08	5.19	0.57	0.73	0.00
1.00	0.99	0 00:05	6.24	0.03	13.87	0.07	0.51	0.00
1.00	2.98	0 00:06	4.28	0.99	3.01	0.99	0.85	0.00
1.00	2.60	0 00:05	6.60	0.07	8.54	0.30	0.62	0.00

Max Flow Depth	Reported Condition
----------------------	-----------------------

(ft)

0.78	Calculated
0.73	Calculated
0.51	Calculated
0.85	Calculated
0.62	Calculated

SN	Element ID	X Coordinate	Y Coordinate	Description	Invert Elevation	Boundary Type	Flap Gate	Fixed Water Elevation	Peak Inflow
					(ft)			(ft)	(cfs)
1	Out-01	1627.45	7509.80		407.00	NORMAL	NO		2.98

Peak Lateral Inflow	Maximum HGL Depth Attained	Maximum HGL Elevation Attained
(cfs)	(ft)	(ft)
0.00	0.72	407.72

SN	Element ID	X Coordinate	Y Coordinate	Description	Invert Elevation	Ground/Rim (Max) Elevation	Ground/Rim (Max) Offset	Initial Water Elevation
					(ft)	(ft)	(ft)	(ft)
1	Inlet-01	3627.45	6568.63		413.00	416.00	3.00	0.00
2	64	1617.65	6735.29	DMH2	407.40	412.00	4.60	0.00
3	64	1616.81	6420.22	DMH3	408.15	418.00	9.85	0.00
4	64	3626.98	6312.68	DMH4	410.68	415.78	5.10	0.00
5	64	3631.12	6047.97		413.00	416.00	3.00	0.00

Initial Water Depth	Surcharge Elevation	Surcharge Depth	Ponded Area	Minimum Pipe Cover	Peak Inflow	Peak Lateral Inflow	Maximum HGL Elevation Attained	Maximum HGL Depth Attained	Maximum Surcharge Depth Attained
(ft)	(ft)	(ft)	(ft²)	(inches)	(cfs)	(cfs)	(ft)	(ft)	(ft)
-413.00	0.00	-416.00	10.00	24.00	0.99	0.99	413.18	0.18	0.00
-407.40	0.00	-412.00	0.00	40.20	2.98	0.00	408.24	0.84	0.00
-408.15	0.00	-418.00	0.00	105.00	2.98	0.00	408.88	0.73	0.00
-410.68	0.00	-415.78	0.00	48.00	3.59	0.00	411.64	0.96	0.00
-413.00	0.00	-416.00	0.00	24.00	2.61	2.61	413.43	0.43	0.00

Minimum Freeboard Attained	Average HGL Elevation Attained	Average HGL Depth Attained	Time of Maximum HGL Occurrence	Time of Peak Flooding Occurrence	Total Flooded Volume	Total Time Flooded
(ft)	(ft)	(ft)	(days hh:mm)	(days hh:mm)	(ac-inches)	(minutes)
2.82	413.01	0.01	0 00:05	0 00:00	0.00	0.00
3.76	407.42	0.02	0 00:06	0 00:00	0.00	0.00
9.12	408.17	0.02	0 00:06	0 00:00	0.00	0.00
4.14	410.71	0.03	0 00:06	0 00:00	0.00	0.00
2.57	413.01	0.01	0 00:05	0 00:00	0.00	0.00

SN	Element Description ID	Area	Drainage Node ID	Weighted Runoff Coefficient	Accumulated Precipitation	Total Runoff	Peak Runoff	Rainfall Intensity
		(acres)			(inches)	(inches)	(cfs)	(inches/hr)
1	Sub-01	0.29	Inlet-01	0.5500	0.52	0.28	0.99	6.200
2	Sub-02	1.17	64	0.3600	0.52	0.19	2.61	6.200

**Time
of
Concentration**

(days hh:mm:ss)

0 00:05:00

0 00:05:00

PROJECT PARCEL SITE CUMBERLAND ASSESSOR'S MAP & LOT NUMBERS	
MAP	LOT
R08	59

Applicant:
TZ PROPERTIES
23 STORMY BROOK ROAD
FALMOUTH, ME 04105

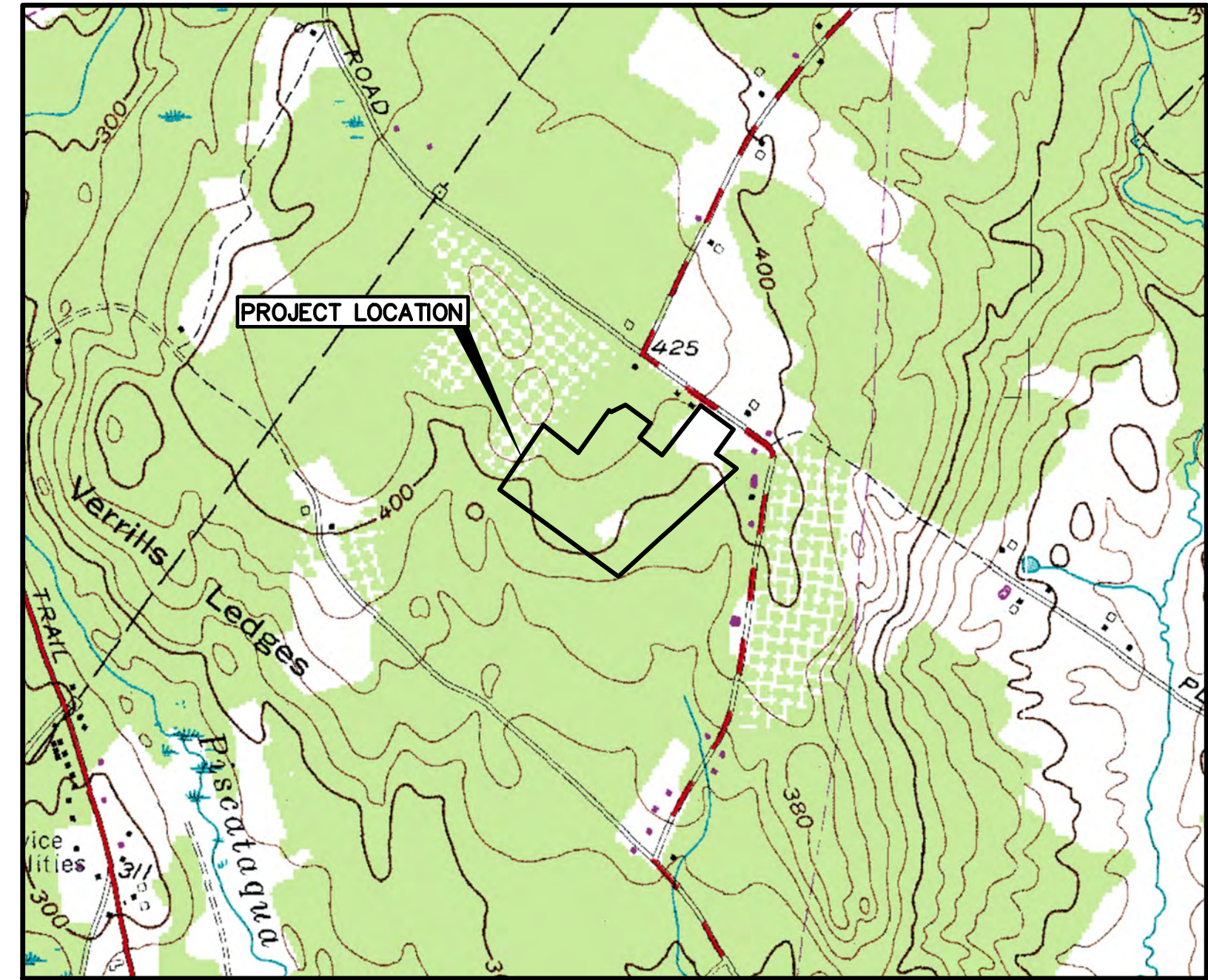
ORCHARD ROAD SUBDIVISION

CUMBERLAND, MAINE

PREPARED BY:



Relationships. Responsiveness. Results.
www.gorrillpalmer.com
207.772.2515



LOCATION MAP

SCALE: 1" = 1000'

LEGEND

EXISTING	DESCRIPTION	PROPOSED
	BUILDING	
	RIGHT OF WAY	
	PROPERTY LINE	
	BUILDING SETBACK	
	ZONE LINE	
	WETLAND BOUNDARY	
	GUIDE RAIL	
	EDGE OF PAVEMENT	
	EDGE OF GRAVEL DRIVE	
	GRADING CONTOUR LINE	
	SPOT ELEVATION	
	TREELINE	
	TREES & HEDGES	
	POLE WITH LIGHT FIXTURE(S)	
	UTILITY POLE	
	FREESTANDING SIGN	
	PAINTED DIRECTIONAL TRAFFIC ARROW	
	OVERHEAD ELECTRIC/TELEPHONE	
	UNDERGROUND ELECTRIC/TELEPHONE	
	WATER LINE	
	STORM DRAIN LINE	
	CULVERT	
	HYDRANT	
	WATER GATE VALVE	
	WATER SHUT OFF VALVE	
	MANHOLE	
	CATCH BASIN	
	TEST PIT	
	IRON ROD (SET)	
	IRON ROD (FOUND)	
	MONUMENT	
	RIPRAP	
	SILT FENCE - PERIMETER	
	STONE SEDIMENT BARRIER	
	FENCE	
	WELL	

GENERAL NOTES

GENERAL NOTES

- TOPOGRAPHIC DATA, EXISTING CONDITIONS, AND BOUNDARY SURVEY WAS PREPARED BY TITCOMB ASSOCIATES OF FALMOUTH, MAINE ON SEPTEMBER 29, 2017. FIELD SURVEYED TOPOGRAPHY INCLUDED A 100 FOOT WIDE STRIP CENTERED ON THE ROAD AND THE STORMWATER TREATMENT BASINS. ALL OTHER TOPOGRAPHY IS AERIAL BASED OBTAINED FROM THE MAINE GIS WEBSITE.
 - THE CONTRACTOR IS SPECIFICALLY CAUTIONED THAT THE LOCATION AND/OR THE ELEVATION OF THE EXISTING UTILITIES AS SHOWN ON THESE PLANS IS BASED ON RECORDS OF THE VARIOUS UTILITY COMPANIES AND WHERE POSSIBLE MEASUREMENTS TAKEN IN THE FIELD. THIS INFORMATION IS NOT TO BE RELIED ON AS BEING EXACT OR COMPLETE. THE CONTRACTOR MUST CALL THE APPROPRIATE UTILITY COMPANY AND DIG SAFE AT LEAST 72 HOURS PRIOR TO ANY EXCAVATION TO REQUEST EXACT FIELD LOCATION OF UTILITIES. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO RELOCATE ALL EXISTING UTILITIES WHICH CONFLICT WITH THE PROPOSED IMPROVEMENTS SHOWN ON THE PLANS.
 - MAINTENANCE OF EROSION CONTROL MEASURES IS OF PARAMOUNT IMPORTANCE TO THE OWNER AND THE CONTRACTOR IS RESPONSIBLE FOR COMPLYING WITH ALL EROSION CONTROL MEASURES SHOWN ON THE PLANS. ADDITIONAL EROSION CONTROL MEASURES SHALL BE INSTALLED IF DEEMED NECESSARY BY ON-SITE INSPECTIONS OF THE OWNER, THE TOWN OF CUMBERLAND OR THEIR REPRESENTATIVES AT NO ADDITIONAL COST TO THE OWNER.
 - ALL MATERIAL SCHEDULES SHOWN ON THE PLANS ARE FOR GENERAL INFORMATION ONLY. THE CONTRACTOR SHALL PREPARE HIS OWN MATERIAL SCHEDULES BASED UPON HIS PLAN REVIEW. ALL SCHEDULES SHALL BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO ORDERING MATERIALS OR PERFORMING WORK.
 - ALL MATERIALS AND CONSTRUCTION METHODS SHALL CONFORM TO MAINE DEPARTMENT OF TRANSPORTATION SPECIFICATIONS, AND/OR TOWN OF CUMBERLAND SPECIFICATIONS.
 - WETLANDS ON THIS PLAN WERE DELINEATED AND GPS LOCATED BY TRC OF SCARBOROUGH, MAINE.
- ### PERMITTING NOTES
- THIS PROJECT IS SUBJECT TO THE TERMS AND CONDITIONS OF A SUBDIVISION PLAN APPROVAL FROM THE TOWN OF CUMBERLAND. THE CONSTRUCTION WILL BE GOVERNED BY THE TOWN OF CUMBERLAND ZONING ORDINANCE WHICH IS AVAILABLE FOR VIEWING AT THE OFFICE OF THE ENGINEER OR THE MUNICIPAL OFFICE.
 - THIS PROJECT IS SUBJECT TO THE TERMS AND CONDITIONS OF A STORMWATER PERMIT AND NRPA PERMIT BY RULE FROM MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION AND A CATEGORY 2 PERMIT FROM THE U.S. ARMY CORPS OF ENGINEERS.
 - THE CONTRACTOR SHALL REVIEW THE ABOVE REFERENCED PERMITS PRIOR TO SUBMITTING A BID FOR THIS PROJECT, AND INCLUDE COSTS AS NECESSARY TO COMPLY WITH THE CONDITIONS OF THESE PERMITS.

LAYOUT NOTES

- ALL DIMENSIONING, UNLESS NOTED OTHERWISE, IS TO THE FACE OF CURB.
- OFFSETS TO CATCH BASINS AND MANHOLES ARE TO THE CENTER OF THE FRAME.
- PIPE LENGTH EQUALS THE CENTER TO CENTER DISTANCES BETWEEN CATCH BASINS AND/OR MANHOLES MINUS ONE-HALF OF THE DIAMETER OF EACH CATCH BASIN OR MANHOLE.
- PROPERTY LINE AND R.O.W. MONUMENTS SHALL NOT BE DISTURBED BY CONSTRUCTION. IF DISTURBED, THEY SHALL BE RESET TO THEIR ORIGINAL LOCATIONS AT THE CONTRACTOR'S EXPENSE, BY A MAINE LICENSED LAND SURVEYOR.
- PROPOSED RIGHT OF WAY MONUMENTS AND PROPERTY LINE PINS SHALL BE INSTALLED UNDER THE DIRECTION OF A MAINE LICENSED LAND SURVEYOR.
- CURB RADI UNLESS OTHERWISE NOTED ON THE PLAN SHALL BE A MINIMUM OF 3'.

UTILITY NOTES

- THE LOCATION OF THE PROPOSED UNDERGROUND ELECTRICAL SERVICE IS APPROXIMATE AND THE CONTRACTOR SHALL COORDINATE THE EXACT LOCATION WITH CENTRAL MAINE POWER COMPANY.
- SUBSURFACE WASTEWATER DISPOSAL SHALL COMPLY WITH THE HHE-200 APPLICATION FOR EACH SITE.

GRADING AND DRAINAGE NOTES

- UNLESS OTHERWISE NOTED, ALL STORM DRAIN PIPE SHALL BE IN ACCORDANCE WITH MDOT SPECIFICATIONS SECTION 603-- PIPE CULVERTS AND STORM DRAINS, LATEST REVISION WITH THE EXCEPTION THAT THE ONLY ACCEPTABLE TYPES OF PIPE ARE AS FOLLOWS:
REINFORCED CONCRETE PIPE, CLASS III
POLYVINYL-CHLORIDE (PVC) PIPE
SMOOTH BORE POLYETHYLENE - ADS OR HANCOR
- TOPSOIL STRIPPED IN AREAS OF CONSTRUCTION THAT IS SUITABLE FOR REUSE AS LOAM SHALL BE STOCKPILED ON SITE AT A LOCATION TO BE DESIGNATED BY THE OWNER. UNSUITABLE SOIL SHALL BE SEPARATED, REMOVED AND DISPOSED OF AT AN APPROVED DISPOSAL LOCATION OFF SITE.
- THE CONTRACTOR SHALL ANTICIPATE THAT GROUNDWATER WILL BE ENCOUNTERED DURING CONSTRUCTION AND SHALL INCLUDE SUFFICIENT COSTS WITHIN THEIR BID TO PROVIDE DEWATERING AS NECESSARY. NO SEPARATE PAYMENT SHALL BE MADE TO THE CONTRACTOR FOR DEWATERING.

EROSION CONTROL NOTES

- LAND DISTURBING ACTIVITIES SHALL BE ACCOMPLISHED IN A MANNER AND SEQUENCE THAT CAUSES THE LEAST PRACTICAL DISTURBANCE OF THE SITE.
- PRIOR TO BEGINNING ANY CLEARING/LAND DISTURBING ACTIVITIES, THE CONTRACTOR SHALL INSTALL THE PERIMETER SILT FENCES AND THE CONSTRUCTION ENTRANCE.
- ALL GROUND AREAS DISTURBED FOR CONSTRUCTION WILL BE GRADED, LOAMED AND SEEDED AS SOON AS POSSIBLE. PERMANENT SEED MIXTURE SHALL CONFORM TO THE SEEDING PLAN CONTAINED IN THE EROSION CONTROL NOTES INCLUDED ON SHEET 15.
- PRIOR TO PAVING, THE CONTRACTOR SHALL FLUSH SEDIMENT FROM ALL STORM DRAIN LINES, REMOVE ACCUMULATED SEDIMENT FROM SUMPS AND INVERTS AND PROPERLY DISPOSE OF.
- ALL CATCH BASINS WITH OUTLET PIPES 18" DIAMETER OR LESS SHALL BE PROVIDED WITH A "SNOUT" SEDIMENTATION HOOD PER DETAIL.
- SILT FENCES SHALL BE INSPECTED, REPAIRED AND CLEANED AS NOTED IN THE EROSION CONTROL NOTES.
- THE CONTRACTOR SHALL REPAIR AND ADD STONE TO THE CONSTRUCTION ENTRANCE AS IT BECOMES SATURATED WITH MUD TO ENSURE THAT IT WORKS AS PLANNED DURING CONSTRUCTION.
- SILT REMOVED FROM AROUND INLETS AND BEHIND THE SILT FENCES SHALL BE PLACED ON A TOPSOIL STOCKPILE AND MIXED INTO IT FOR LATER USE IN LANDSCAPING OPERATIONS.
- EROSION CONTROL NOTES ACCOMPANY THIS PLAN SET AND ARE CONTAINED ON DRAWING 15 OF THIS PLAN SET.
- THE MAINTENANCE SCHEDULE FOR THE CATCH BASIN SEDIMENT SUMPS IS CONTAINED IN THE EROSION CONTROL NOTES INCLUDED ON SHEET 15.
- THE CONTRACTOR IS CAUTIONED THAT FAILURE TO COMPLY WITH THE SEQUENCE OF CONSTRUCTION, EROSION/SEDIMENT CONTROL PLAN, AND OTHER PERMIT REQUIREMENTS BASED UPON ANY THIRD PARTY REVIEW (ie MDEP) MAY RESULT IN MONETARY PENALTIES. THE CONTRACTOR SHALL BE ASSESSED ALL SUCH PENALTIES AT NO COST TO THE OWNER OR PERMITTEE.
- ALL NON-PAVED AREAS DISTURBED DURING CONSTRUCTION SHALL BE LOAMED AND SEEDED, UNLESS OTHERWISE DIRECTED BY THE OWNER.
- ALL DISTURBED AREAS ARE TO RECEIVE A MINIMUM OF 4" OF TOPSOIL PRIOR TO PERMANENT SEEDING.

UTILITIES

ELECTRIC:
CENTRAL MAINE POWER
162 CANCO ROAD
PORTLAND, MAINE 04103
(207) 828-2882
CONTACT: JAMES COUGH

TELEPHONE:
VERIZON
5 DAVIS FARM ROAD
PORTLAND, MAINE 04103
(207) 797-1842
CONTACT: TROY MACDONALD

CABLE:
TIME WARNER CABLE
118 JOHNSON ROAD
PORTLAND, MAINE 04102
(207) 253-2222

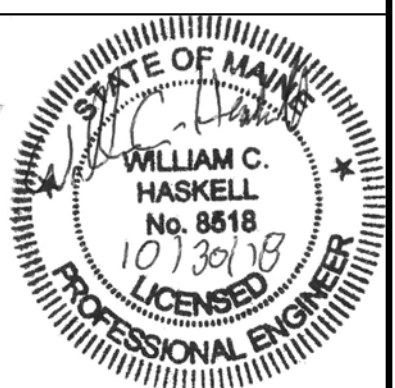
INDEX

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6	OVERALL GRADING, DRAINAGE & EROSION CONTROL PLAN
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CALL BEFORE YOU DIG
1-888-344-7233

PERMITS

TYPE OF PERMIT	GOVERNING BODY	STATUS
MDEP STORMWATER PERMIT AND NRPA PERMIT BY RULE	MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION 312 CANCO ROAD PORTLAND, ME 04103 (207) 822-6300	RECEIVED: 4/3/18
CATEGORY 2 PERMIT	U.S. ARMY CORPS OF ENGINEERS 675 WESTERN AVE #3 MANCHESTER, ME 04351	RECEIVED: 4/9/18
MAJOR SUBDIVISION APPLICATION	TOWN OF CUMBERLAND 280 TUTTLE ROAD CUMBERLAND, MAINE 04021 (207) 829-5559	RECEIVED: 6/19/18



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Rev.	Date	Revision

Subdivision Amendment	9-25-18	WCH
Planning Board Signature	8-1-18	WCH
Preliminary/Final Subdivision Application	5-22-18	WCH
MDEP/ACOE Permitting	12-22-17	WCH
Preliminary Subdivision Application	10-31-17	WCH
Issued For	Date	By

Design: JWA	Draft: LAN	Date: DEC 2017
Checked: WCH	Scale: NTS	Job No.: 3236.01
File Name: 3236-COVER.dwg		
This plan shall not be modified without written permission from GorrillPalmer(GP). Any alterations, authorized or otherwise, shall be at the user's sole risk and without liability to GP.		

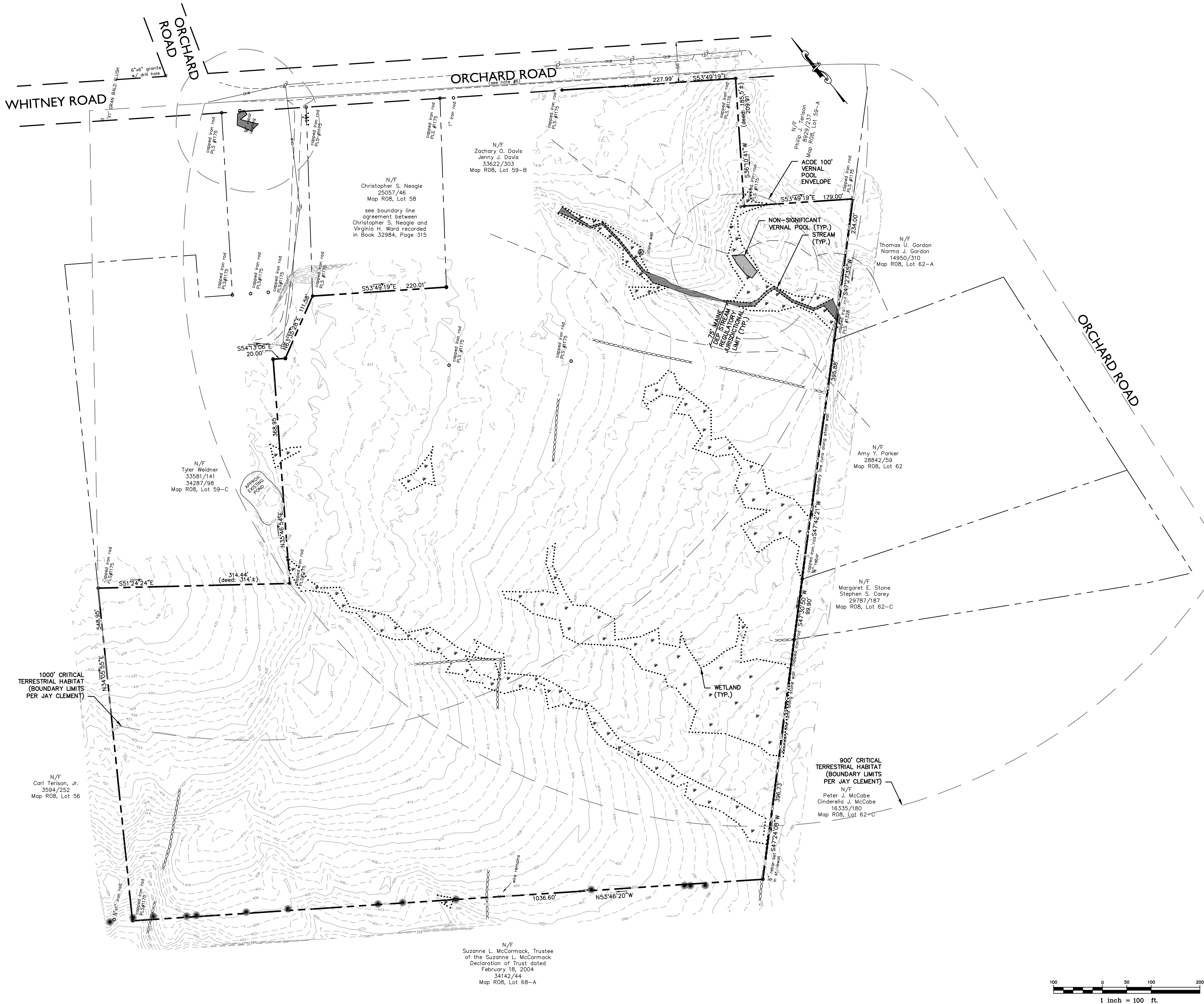


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Drawing Name:	Cover Sheet, General Notes, and Legend
Project:	Orchard Road Subdivision Cumberland, Maine
Client:	TZ Properties Falmouth, Me 04105

Drawing No.
1

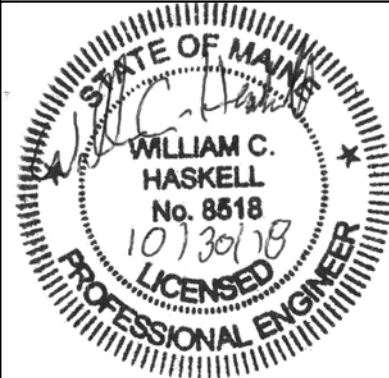
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- LEGEND**
- Monument – found
 - Iron marker – found
 - Iron marker – set (#5 rebar)
 - Property line (abutter)
 - Right of way line
 - Stone wall
 - Edge of pavement
 - Edge of gravel
 - Utility pole
 - Guy wire
 - Overhead utility line
 - N/F
 - 1234/567
 - Dead reference (Book/Page)
 - Tree line
 - Wetlands
 - Coniferous tree w/ barbed wire remains

- NOTES**
- 1) Book and Page references are to the Cumberland County Registry of Deeds unless otherwise noted.
 - 2) Bearings are referenced to grid north, Maine State Plane Coordinate System, NAD83, West Zone.
 - 3) Utility information on this plan is approximate, based on location of visible features. DigSafe and/or the appropriate utilities should be contacted prior to any construction.
 - 4) Property lies within Zone C based on FIRM Community #230162 Panels #0010-B and 0015-B, dated May 19, 1981. It does not lie within a special flood hazard area.
 - 5) Wetlands delineated by others.
 - 6) Orchard Road has a defined width of 4 rods (66 feet) as accepted by the Town of Cumberland on April 10, 1797. Apparent location shown.
 - 7) Not all interior stone walls have been located on the property.

- PLAN REFERENCES**
- 1) Plan of Boundary Survey – Remaining Land Now of Virginia H. Ward – Orchard Road – Made for Virginia H. Ward by Brian Smith at Sitelines, PA dated January 18, 2017. Recorded in Plan Book 217, Page 39.
 - 2) Plan of Settlement Worksheet of Chris S. Neagle & Virginia H. Ward – Common Boundary – Made for Chris S. Neagle by Brian Smith at Sitelines, PA dated December 22, 2015. Recorded in Plan Book 216, Page 25.
 - 3) Plan of Standard Boundary Survey of Land of Robert J. Plamplano and Brenda T. Plamplano made for Brenda T. Plamplano by Sebago Technics dated June 11, 1987 and revised through March 26, 1993. Recorded in Plan Book 199, page 177.
 - 4) Plan of Land on Blanchard Road made for Robert Plamplano by Owen Haskell revised through February 2, 1992. Recorded in Plan Book 192, Page 44.
 - 5) Plan of Standard Boundary Survey on Orchard Road made for Robert A. Milliken by Wayne T. Wood & Co. dated June 1990. Recorded in Plan Book 186, Page 24.



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Subdivision Amendment	9-25-18	WCH
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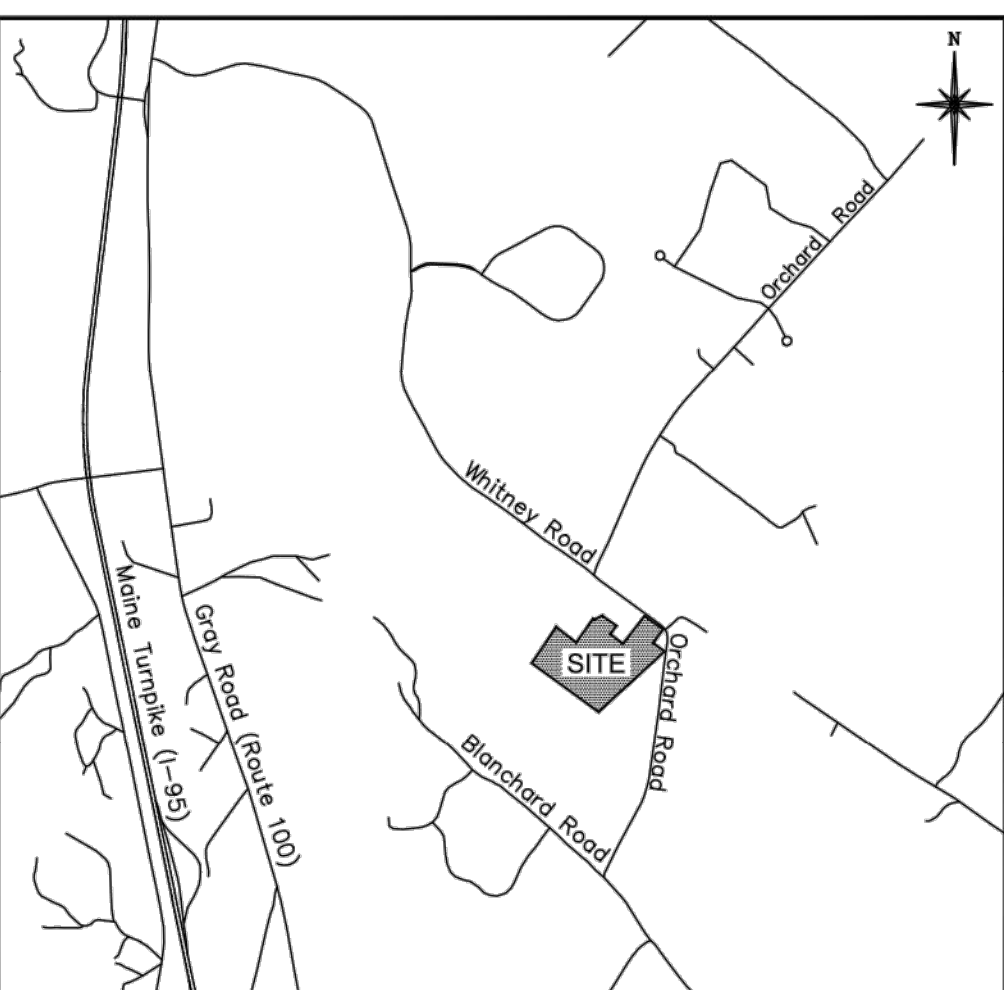
Design: JWA	Draft: LAN	Date: DEC 2017
Checked: WCH	Scale:	Job No.: 3236.01
File Name: 3236-xc.dwg		
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Drawing Name:	Existing Conditions Plan
Project:	Orchard Road Subdivision Cumberland, Maine
Client:	TZ Properties Falmouth, Me 04105

Drawing No.
2



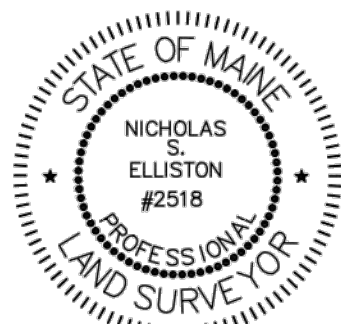
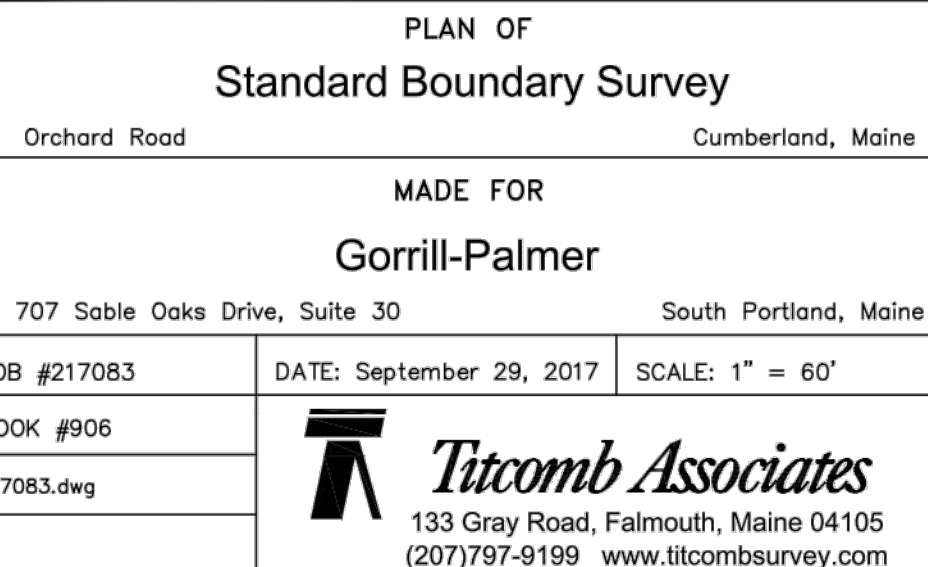
40 Scale

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- 2) Bearings are referenced to grid north, Maine State Plane Coordinate System, NAD83, West Zone.
- 3) Utility information on this plan is approximate, based on location of visible features. DigSafe and/or the appropriate utilities should be contacted prior to any construction.
- 4) Property lies within Zone C based on FIRM Community #230162 Panels 0010-B and 0015-B, dated May 19, 1981. It does not lie within a special flood hazard area.
- 5) Wetlands delineated by others.
- 6) Orchard Road has a defined width of 4 rods (66 feet) as accepted by the Town of Cumberland on April 10, 1797. Apparent location shown.
- 7) Not all interior stone walls have been located on the property.

- 1) Plan of Boundary Survey – Remaining Land Now of Virginia H. Ward – Orchard Road – Made for Virginia H. Ward by Brian Smith at Sitelines, PA dated January 18, 2017. Recorded in Plan Book 210, Page 39.
- 2) Plan of Settlement Worksheet of Chris S. Neagle & Virginia H. Ward – Common Boundary – Made for Chris S. Neagle by Brian Smith at Sitelines, PA dated December 22, 2015. Recorded in Plan Book 216, Page 25.
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1,087,921 Sq. Ft. / 24.98 Acres

TZ Properties, LLC
23 Stormy Brook Rd.
Falmouth, ME 04105
Book 34200, Page 6



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CERTIFICATION

This survey conforms to the current standards of practice set forth by the Maine State Board of Licensure for Land Surveyors.

Nicholas S. Elliston, P.L.S. #2518

State of Maine, Cumberland ss.
Registry of Deeds
Received _____ 20____
at _____m and recorded in
Plan Book _____ Page _____
Attest: _____ Register

N/F
Suzanne L. McCormack, Trustee
of the Suzanne L. McCormack
Declaration of Trust dated
February 18, 2004
34142/44
Map R08, Lot 68-A

SPACE AND BULK STANDARDS		
RR2 ZONE	REQUIRED	PROVIDED
MIN. LOT SIZE (CLUSTER)	60,000 S.F.	> 60,000 S.F.
MIN. FRONTAGE	100'	> 100'
BUILDING SETBACKS		
FRONT	50'	> 50'
SIDE	30' MIN.	≥ 30'
REAR	75' COMBINED	≥ 75'
OPEN SPACE	25%	33.3%

NET RESIDENTIAL DENSITY

GROSS ACREAGE	1,087,735 SF
ACTUAL AREA FOR ROADS AND PARKING	78,884 SF
LAND CUT OFF FROM MAIN PARCEL	0
OTHER AREAS DIFFICULT TO DEVELOP	0
WETLANDS	88,453 SF
FLOOD PLAIN	0
RIGHTS OF WAY OR EASEMENTS	0
RESOURCE PROTECTION DISTRICTS	0
NET RESIDENTIAL ACREAGE	920,398 SF
ALLOWABLE DENSITY	87,120 SF/LOT
ALLOWABLE # OF LOTS	10.6 LOTS

Approved by the Town of Cumberland Planning Board:

Conditions: _____
Signed: _____
Date: _____

Rev.	Date	Revision

Subdivision Amendment	9-25-18	WCH
Planning Board Signature	8-1-18	WCH
Preliminary/Final Subdivision Application	5-22-18	WCH
MDEP/ACOE Permitting	12-22-17	WCH
Preliminary Subdivision Application	10-31-17	WCH
Issued For	Date	By

Design: JWA	Draft: LAN	Date: DEC 2017
Checked: WCH	Scale:	Job No.: 3236.01
File Name: 3236--SUBDIVN_OPTB.dwg		
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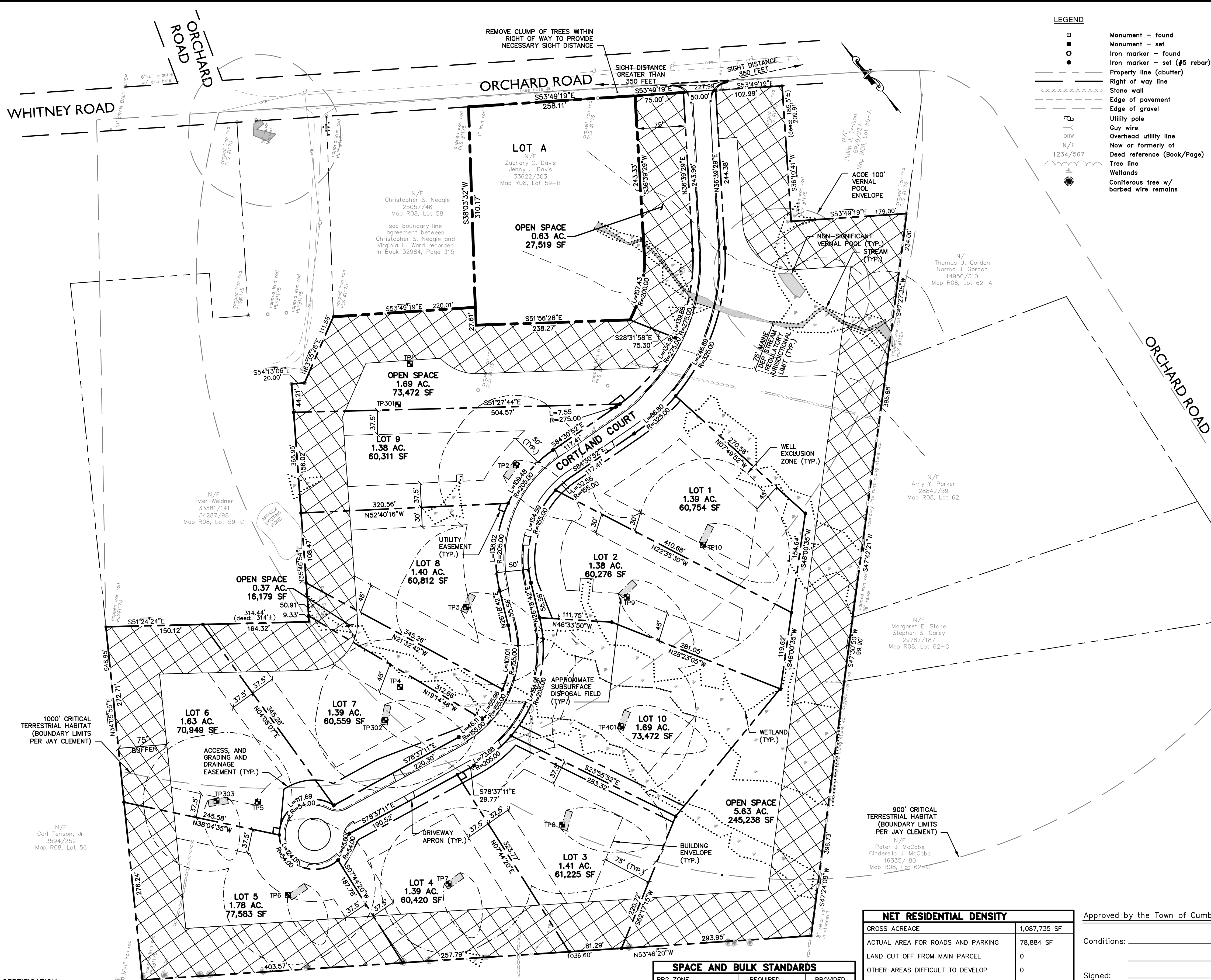


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Drawing Name:	Subdivision Plan
Project:	Orchard Road Subdivision Cumberland, Maine
Client:	TZ Properties Falmouth, Me 04105

Drawing No.

4



SURVEY NOTES

- Boundary Survey prepared by Titcomb Associates in September 2017.
- Book and Page references are to the Cumberland County Registry of Deeds unless otherwise noted.
- Bearings are referenced to grid north, Maine State Plane Coordinate System, NAD83, West Zone.
- Utility information on this plan is approximate, based on location of visible features. DigSafe and/or the appropriate utilities should be contacted prior to any construction.
- Property lies within Zone C based on FIRM Community #230162 Panels #0010-B and 0015-B, dated May 19, 1981. It does not lie within a special flood hazard area.
- Wetland, stream and vernal pool delineation was conducted by TRC Solutions in May 2017.
- Orchard Road has a defined width of 4 rods (66 feet) as accepted by the Town of Cumberland on April 10, 1797. Apparent location shown.
- Not all interior stone walls have been located on the property.
- Owner of record is TZ Properties, LLC recorded in the Cumberland County Registry of Deeds in Book 34200 on Page 67.
- The total lot area is 1,087,735 sq. ft. (24.98 Acres).
- The site is shown on assessor's map R08, lot 59, and is located in the rural residential district (RR2).

CONDITIONS OF APPROVAL

- STANDARD CONDITIONS OF APPROVAL: This approval is dependent upon and limited to the proposals and plans contained in the application and supporting documents submitted by the applicant, any variation from the plans, proposals and supporting documents, except de minimis changes as so determined by the Town Planner which do not effect approval standards, is subject to review and approval of the Planning Board prior to implementation.
- LIMITATION OF APPROVAL: Construction of the improvements covered by any site plan approval must be substantially commenced within twelve (12) months of the date upon which the approval was granted. If construction has not been substantially commenced and substantially completed within the specified period, the approval shall be null and void. The applicant may request an extension of the approval deadline prior to expiration of the period, such request must be in writing and must be made to the Planning Board. The Planning Board may grant up to two (2) 1 year extensions to the periods if the approved plan conforms to the ordinances in effect at the time the extension is granted and any and all federal and state approvals and permits are current.
- If significant modifications are necessary to accommodate future building plans on a lot, then a revised groundwater impact study should be prepared by a qualified Professional Engineer or Certified Geologist licensed in the State of Maine and submitted to the Town.
- Clearing limits shall be flagged and approved by the peer review engineer prior to the preconstruction conference.

WAIVERS

The following requirements from the subdivision submission checklist and from Appendix D of the subdivision ordinance have received waivers.

- Depiction of trees 10" diameter and larger on the plans.
- Submission of a High Intensity Soil Survey.
- Depiction of soil boundaries from the High Intensity Soil Survey on the plans.
- Depiction of building locations on the plans.
- Installation of temporary markers to outline the proposed development on-site.

PLAN REFERENCES

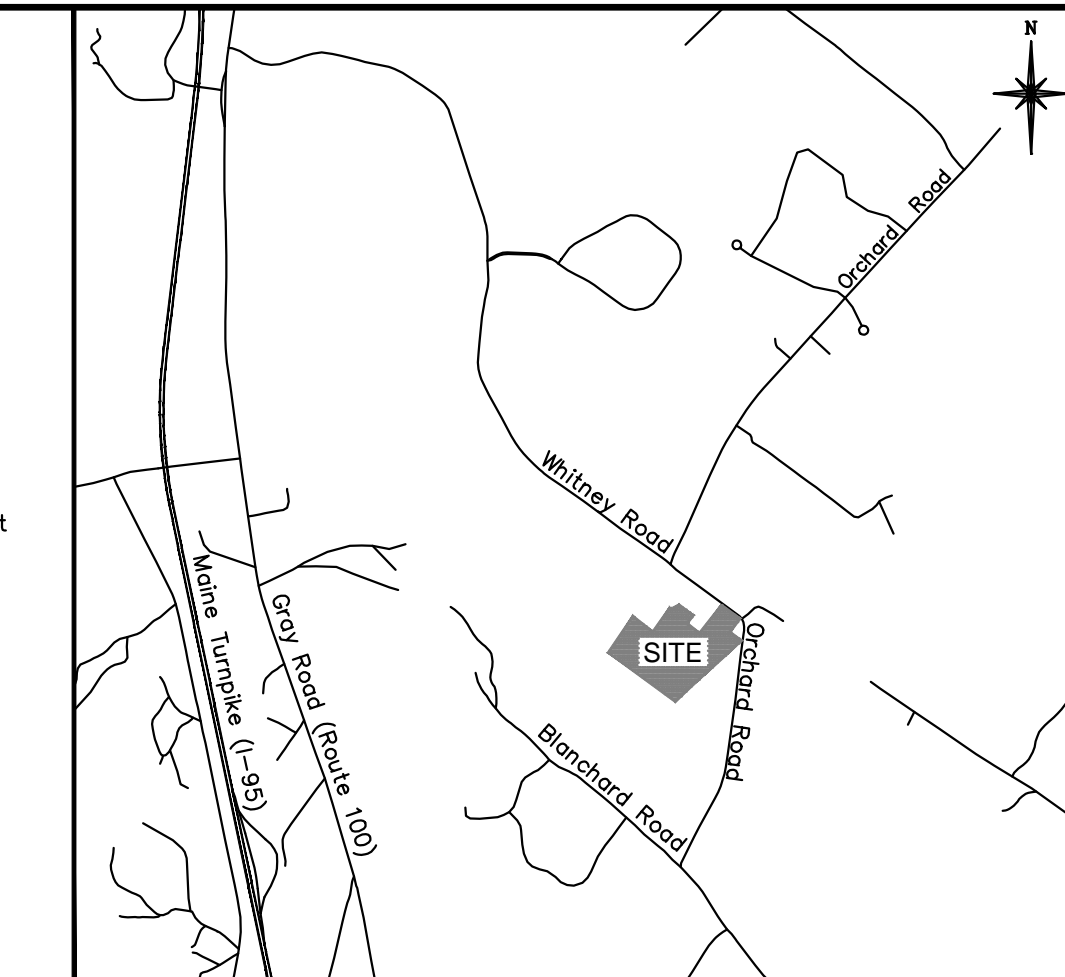
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- Plan of Standard Boundary Survey on Orchard Road made for Robert A. Milliken by Wayne T. Wood & Co. dated June 1990. Recorded in Plan Book 186, Page 24.
- The critical terrestrial habitat limits shown on the plan are used by the Army Corps of Engineers (ACOE) to delineate the habitat zone for the vernal pools. It is assumed by ACOE that organisms within the limits will utilize the vernal pools. These limits are used to determine developed area around each vernal pool.
- The wetlands and vernal pool shown on the plan may not be disturbed, unless permits are received from Maine DEP and US Army Corps of Engineers.
- The open space lot (1.69 acres), that directly abuts N/F Christopher S. Neagle, Map R08 Lot 58 shall be subject to the same restrictions as the perimeter buffer (see Subdivision Note 12 above).
- The Subdivision is subject to the requirements contained within the declaration of protective covenants and common easements, Orchard Road Subdivision, which shall be recorded at the Cumberland County Registry of Deeds.

SUBDIVISION NOTES:

- Coordinate electric service with CMP.
- Transformer and pull box final locations to be determined upon review from CMP.
- Lots shall have individual subsurface wastewater disposal systems.
- Lots shall have individual wells for water supply.
- The parcel is not located within a 100-year flood plain.
- All residential buildings constructed within this subdivision shall be equipped with automatic fire control sprinklers in accordance with chapter 98 article ii of the Town of Cumberland ordinance.
- Septic system test pits completed by Dave Chapman with Sebago Technics in December 2017. Subsurface disposal field sized for four bedroom homes.
- All roadways are proposed to be Public Roads and shall be designed and constructed in accordance with the Town of Cumberland Residential Access Standards.
- The roadways shall be designed in accordance with the Residential Access Roadway Standards:
-Right of way width = 50 feet
-Pavement width = 22 feet
- The approval of this plan by the Planning Board shall not constitute acceptance by the Town of any street, easement, open space area, park, playground, or other recreation area thereon.
- Dug wells or overburden wells are prohibited on site for drinking water supply.
- Restrictions on Buffer Area. The Buffer Area must remain undeveloped in perpetuity. To maintain the ability of the Buffer Area to filter and absorb stormwater, the use of the Buffer Area is hereinafter limited as follows:
 - No soil, loam, peat, sand, gravel, concrete, rock or other mineral substance, refuse, trash, vehicle bodies or parts, rubbish, debris, junk waste, pollutants or other fill material may be placed, stored or dumped on the Buffer Area, nor may the topography of the area be altered or manipulated in any way;
 - No vegetation may be cut or removed from the Buffer area with the exception of dead, dying and dangerous trees.
 - No building or other temporary or permanent structure may be constructed, placed or permitted to remain on the Buffer Area, except for a sign, utility pole or fence;
 - No trucks, cars, dirt bikes, ATVs, bulldozers, backhoes, or other motorized vehicles or mechanical equipment may be permitted on the Buffer Area;
 - Any activity on or use of the Buffer Area inconsistent with the purpose of these Restrictions is prohibited.
- The critical terrestrial habitat limits shown on the plan are used by the Army Corps of Engineers (ACOE) to delineate the habitat zone for the vernal pools. It is assumed by ACOE that organisms within the limits will utilize the vernal pools. These limits are used to determine developed area around each vernal pool.
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VICINITY MAP

No Scale

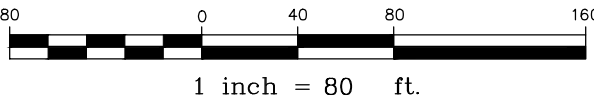




NET RESIDENTIAL DENSITY	
GROSS ACREAGE	1,087,735 SF
ACTUAL AREA FOR ROADS AND PARKING	78,884 SF
LAND CUT OFF FROM MAIN PARCEL	0
OTHER AREAS DIFFICULT TO DEVELOP	0
WETLANDS	88,453 SF
FLOOD PLAIN	0
RIGHTS OF WAY OR EASEMENTS	0
RESOURCE PROTECTION DISTRICTS	0
NET RESIDENTIAL ACREAGE	920,398 SF
ALLOWABLE DENSITY	87,120 SF/LOT
ALLOWABLE # OF LOTS	10.6 LOTS

SPACE AND BULK STANDARDS		
RR2 ZONE	REQUIRED	PROVIDED
MIN. LOT SIZE (CLUSTER)	60,000 S.F.	> 60,000 S.F.
MIN. FRONTAGE	100'	> 100'
BUILDING SETBACKS		
	50'	> 50'
	30' MIN.	≥ 30'
REAR	75' COMBINED	≥ 75'
OPEN SPACE	25%	33.3%

- NOTES:
- WETLAND, STREAM, AND VERNAL POOL DELINEATION WAS CONDUCTED BY TRC SOLUTIONS IN MAY 2017.
 - SURVEY PREPARED BY TITCOMB ASSOCIATES IN SEPTEMBER 2017.
 - THE SITE IS SHOWN ON ASSESSOR'S MAP R08, LOT 59, AND IS LOCATED IN THE RURAL RESIDENTIAL DISTRICT (RR2).
 - COORDINATE ELECTRIC SERVICE WITH CMP.
 - TRANSFORMER AND PULL BOX FINAL LOCATIONS TO BE DETERMINED UPON REVIEW FROM CMP.
 - LOTS SHALL HAVE INDIVIDUAL SUBSURFACE WASTEWATER DISPOSAL SYSTEMS.
 - LOTS SHALL HAVE INDIVIDUAL WELLS FOR WATER SUPPLY.
 - THE PARCEL IS NOT LOCATED WITHIN A 100-YEAR FLOOD PLAIN.
 - ALL RESIDENTIAL BUILDINGS CONSTRUCTED WITHIN THIS SUBDIVISION SHALL BE EQUIPPED WITH AUTOMATIC FIRE CONTROL SPRINKLERS IN ACCORDANCE WITH CHAPTER 96 ARTICLE II OF THE TOWN OF CUMBERLAND ORDINANCE.
 - SEPTIC SYSTEM TEST PITS COMPLETED BY DAVE CHAPMAN WITH SEBAGO TECHNICS IN DECEMBER 2017 AND SEPTEMBER 2018. SUBSURFACE DISPOSAL FIELD SIZED FOR FOUR BEDROOM HOMES.
 - NO TREE CUTTING SHALL OCCUR BETWEEN JUNE 1 AND JULY 31 OF ANY YEAR. TREE CUTTING SHALL OCCUR BETWEEN OCTOBER 16 AND APRIL 19 OF ANY YEAR TO THE EXTENT PRACTICABLE.



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Rev.	Date	Revision

Subdivision Amendment	9-25-18	WCH
Planning Board Signature	8-1-18	WCH
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Checked: WCH	Scale:	Job No.: 3236.01
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Drawing Name:	Overall Layout and Utility Plan
Project:	Orchard Road Subdivision Cumberland, Maine
Client:	TZ Properties Falmouth, Me 04105

Drawing No.
5

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Rev.	Date	Revision

Subdivision Amendment	9-25-18	WCH
Planning Board Signature	8-1-18	WCH
Preliminary/Final Subdivision Application	5-22-18	WCH
MDEP/ACOE Permitting	12-22-17	WCH
Preliminary Subdivision Application	10-31-17	WCH
Issued For	Date	By

Design: JWA	Draft: LAN	Date: DEC 2017
Checked: WCH	Scale:	Job No.: 3236.01
File Name: 3236-PP_OPTB.dwg		
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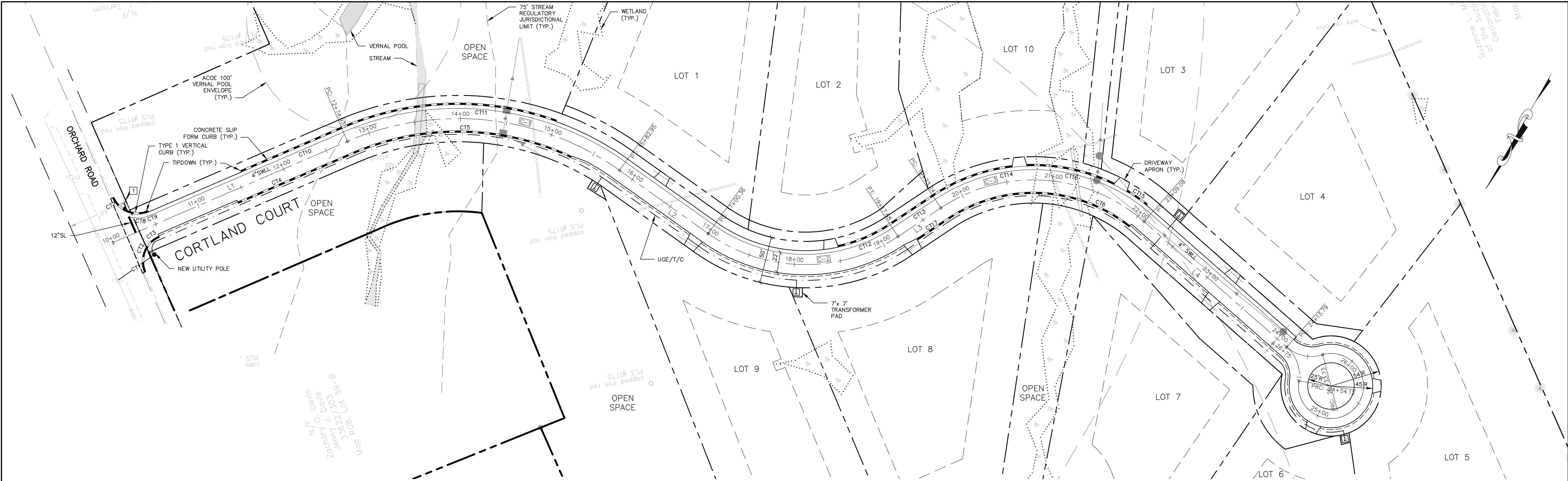


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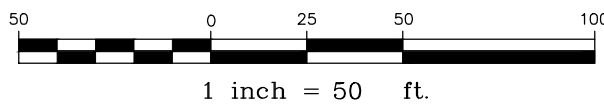
Drawing Name:	Layout and Utility Plan
Project:	Orchard Road Subdivision Cumberland, Maine
Client:	TZ Properties Falmouth, Me 04105

Drawing No.

7



PLAN
SCALE: 1" = 50'



BASELINE LINE TABLE		
LINE NO.	LENGTH	BEARING
L1	274.93	S36°39'29"W
L2	117.41	N84°30'52"W
L3	55.56	S26°18'42"W
L4	204.72	N78°37'11"W

BASELINE CURVE TABLE							
CURVE NO.	LENGTH	RADIUS	TANGENT	DELTA	CHORD BEARING	START STATION	END STATION
C-1	308.02	300.00	169.14	58°49'38"	S66°04'18"W	12+74.93	15+82.95
C-2	217.32	180.00	124.11	69°10'26"	S60°53'55"W	17+00.36	19+17.68
C-3	235.83	180.00	138.29	75°04'07"	S63°50'45"W	19+73.24	22+09.08

CURB TABLE						
CURB ID	STATION/OFFSET FROM	STATION/OFFSET TO	LENGTH (FT)	RADIUS (FT)	CURB TYPE	COMMENT
CT1	10+18.15, 42.95' RT	10+18.43, 38.96' RT	4.00	30.00	TYPE 1 TIP DOWN	
CT2	10+18.43, 38.96' RT	10+44.16, 13.27' RT	39.07	30.00	TYPE 1	
CT3	10+44.16, 13.27' RT	10+48.15, 13.00' RT	4.00	30.00	TYPE 1 TIP DOWN	
CT4	11+40.51, 13.00' RT	12+74.93, 13.00' RT	134.43	-	EXTRUDED CONC.	
CT5	12+74.93, 13.00' RT	15+29.28, 13.00' RT	243.33	287.00	EXTRUDED CONC.	
CT6	19+73.24, 13.00' RT	22+00.00, 13.00' RT	210.38	167.00	EXTRUDED CONC.	
CT7	10+18.31, 44.46' LT	10+18.64, 40.48' LT	4.00	30.00	TYPE 1 TIP DOWN	
CT8	10+18.64, 40.48' LT	10+44.31, 15.27' LT	38.58	30.00	TYPE 1	
CT9	10+44.31, 15.27' LT	10+48.30, 15.00' LT	4.00	30.00	TYPE 1 TIP DOWN	
CT10	11+56.66, 15.00' LT	12+74.93, 15.00' LT	118.27	-	EXTRUDED CONC.	
CT11	12+74.93, 15.00' LT	15+00.00, 15.00' LT	236.32	315.00	EXTRUDED CONC.	
CT12	18+51.02, 15.00' LT	19+17.68, 15.00' LT	61.10	165.00	EXTRUDED CONC.	
CT13	19+17.68, 15.00' LT	19+73.24, 15.00' LT	55.56	-	EXTRUDED CONC.	
CT14	19+73.24, 15.00' LT	21+61.27, 15.00' LT	203.70	195.00	EXTRUDED CONC.	
CT15	21+76.35, 15.00' LT	22+00.00, 15.00' LT	25.62	195.00	EXTRUDED CONC.	
CT16	20+72.53, 15.00' LT	21+61.27, 15.00' LT	97.07	195.00	EXTRUDED CONC.	
CT17	19+33.39, 13.00' RT	19+73.24, 13.00' RT	39.85	-	EXTRUDED CONC.	

CURBING LEGEND

VERTICAL GRANITE TYPE 1 CURB

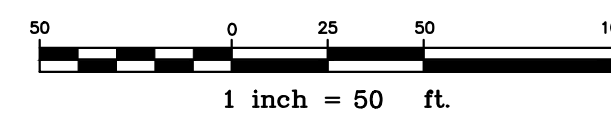
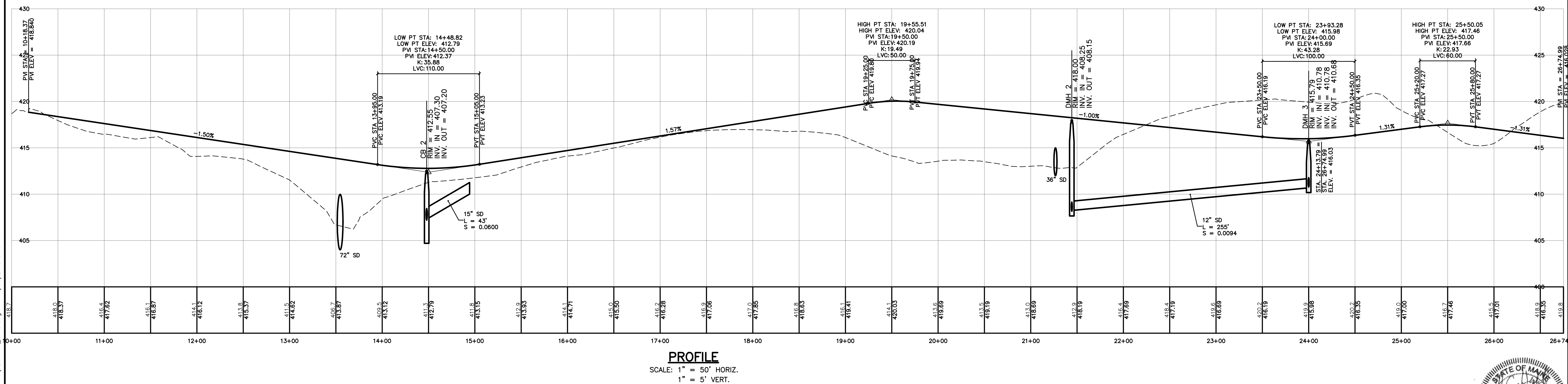
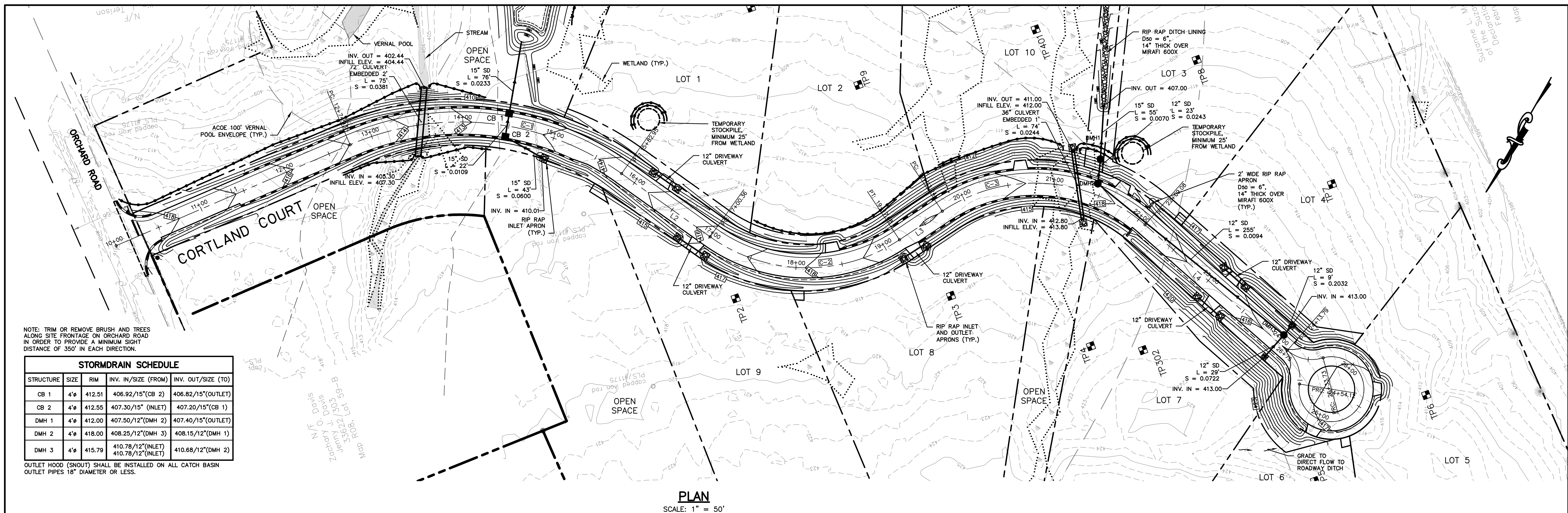
EXTRUDED CONCRETE TYPE 2 CURB

STRIPING LEGEND
SIGNAGE, STRIPING AND PAVEMENT MARKING SHALL BE IN ACCORDANCE WITH THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD) REGARDING SIZE, INSTALLATION, LOCATION & REFLECTIVITY.
12"SL - 12" WIDTH STOP LINE
4"SWLL 4" SOLID WHITE LANE LINE

SIGN LEGEND

R1-1
30"x 30"
1





Rev.	Date	Revision

Subdivision Amendment	9-25-18	WCH
Planning Board Signature	8-1-18	WCH
Preliminary/Final Subdivision Application	5-22-18	WCH
MDEP/ACOE Permitting	12-22-17	WCH
Preliminary Subdivision Application	10-31-17	WCH
Issued For	Date	By

Design: JWA	Draft: LAN	Date: DEC 2017
Checked: WCH	Scale:	Job No.: 3236.01
File Name: 3236--PP_OPTB.dwg		
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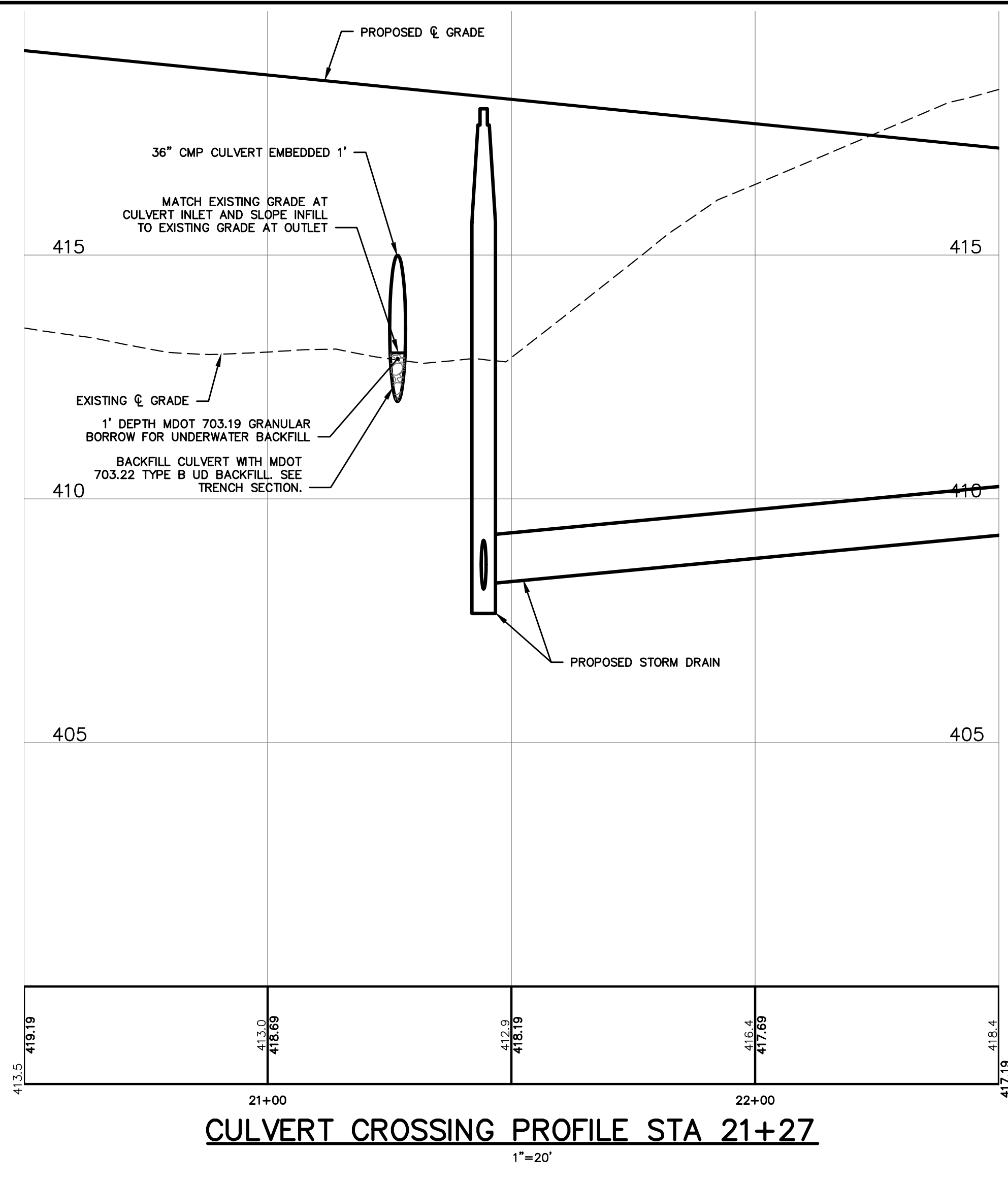
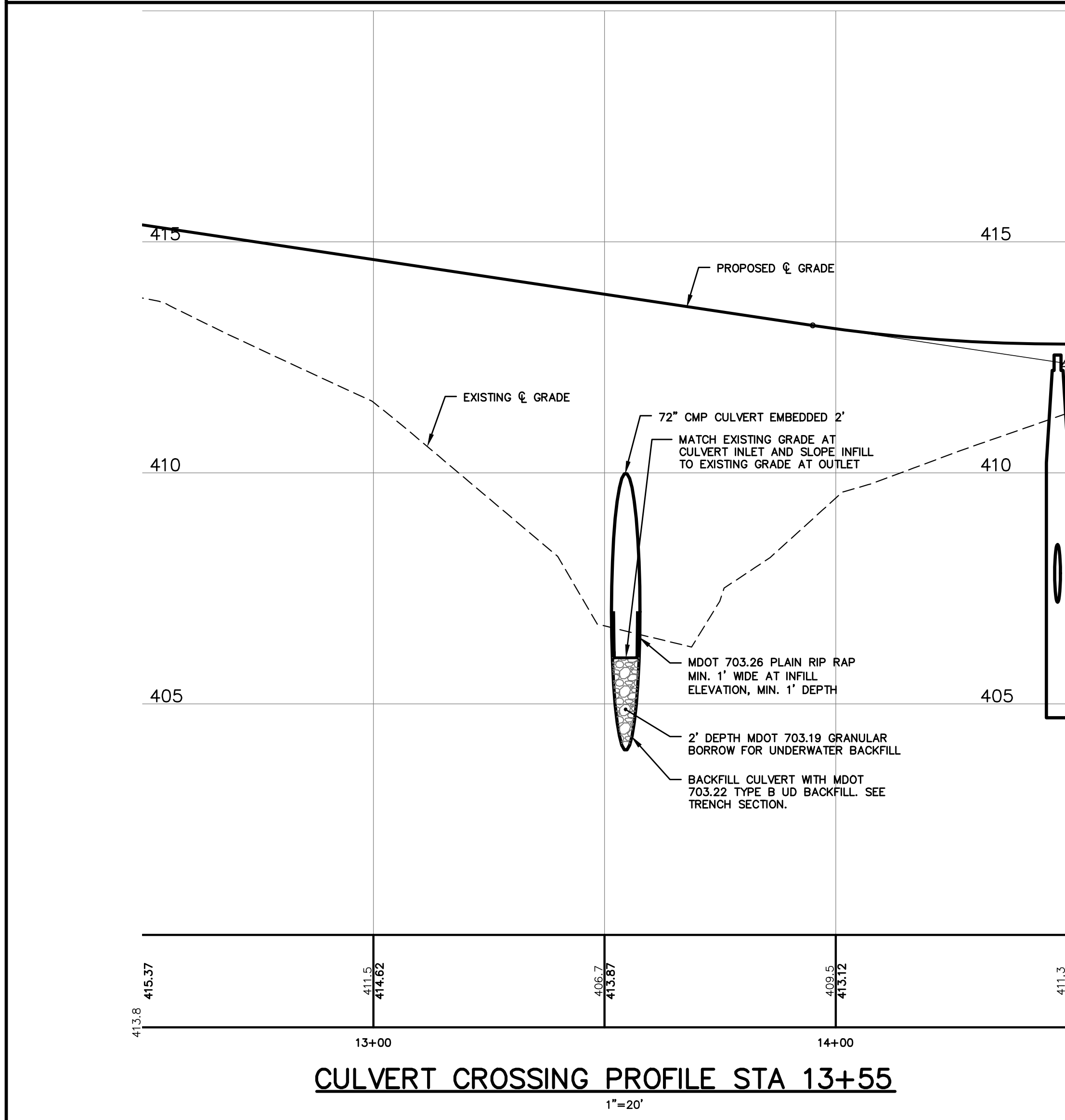
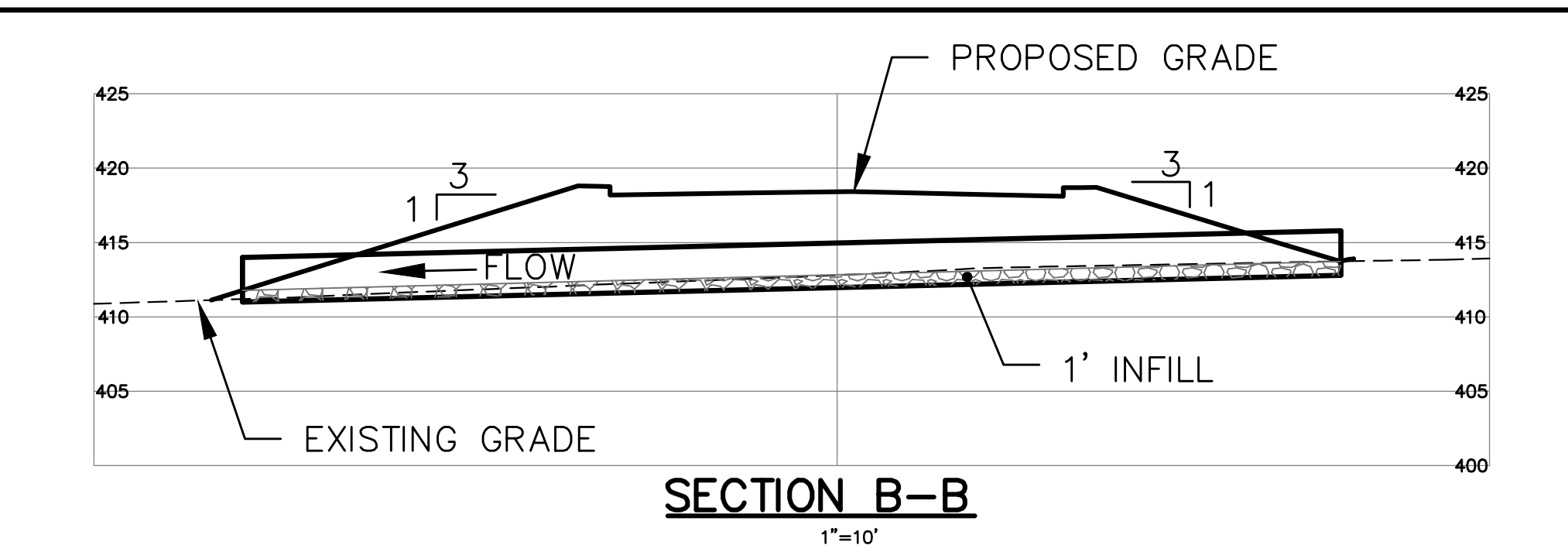
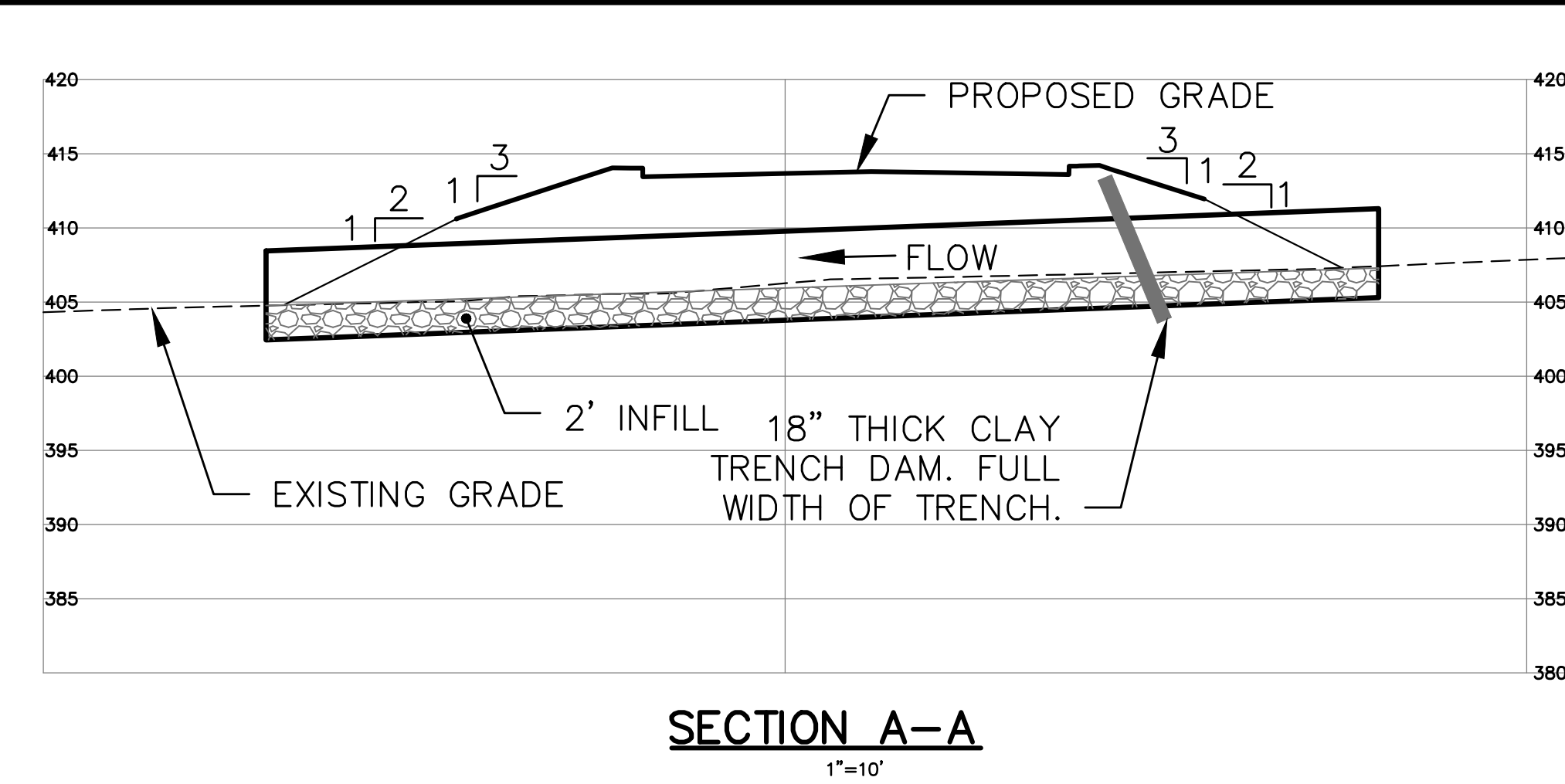
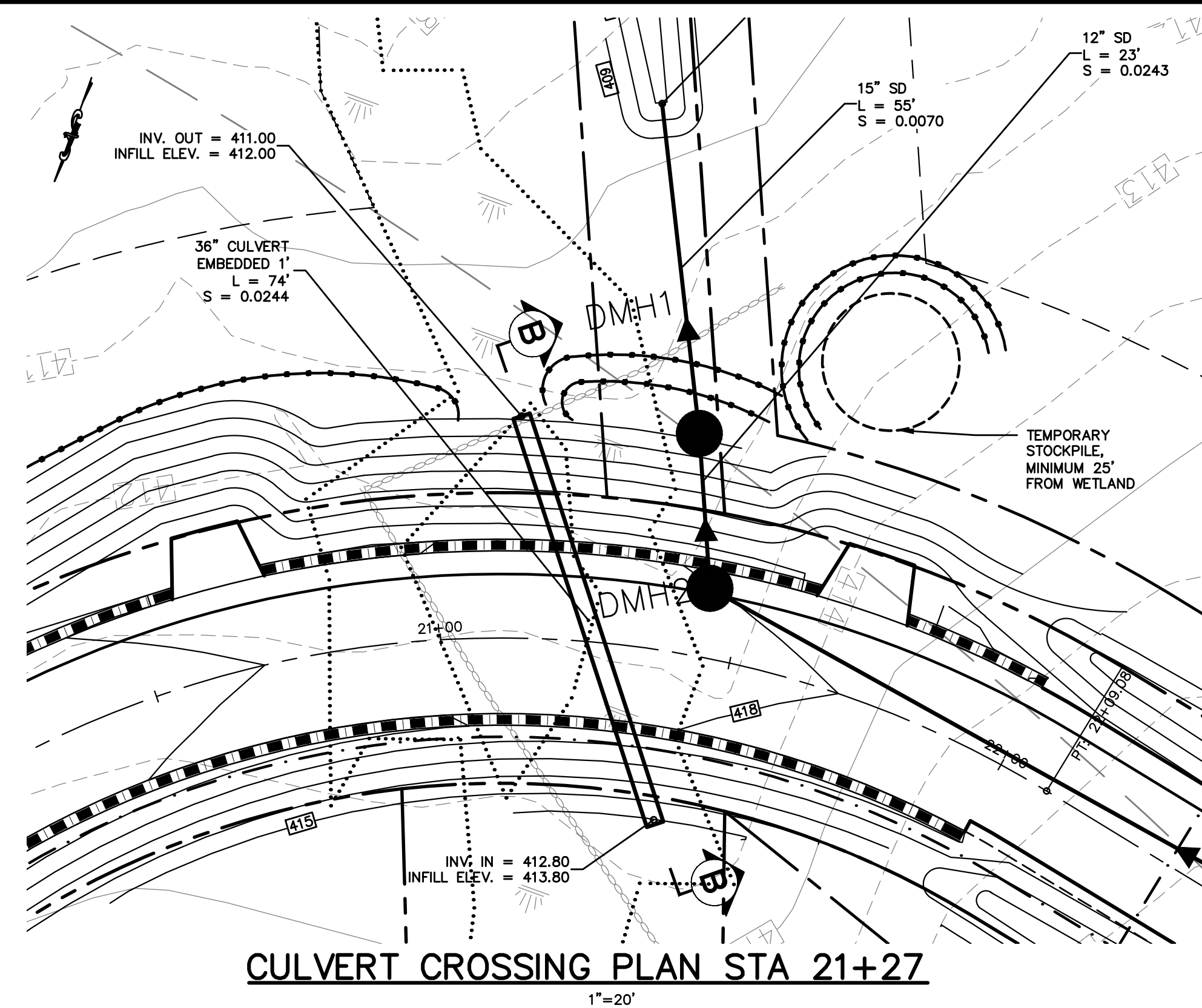
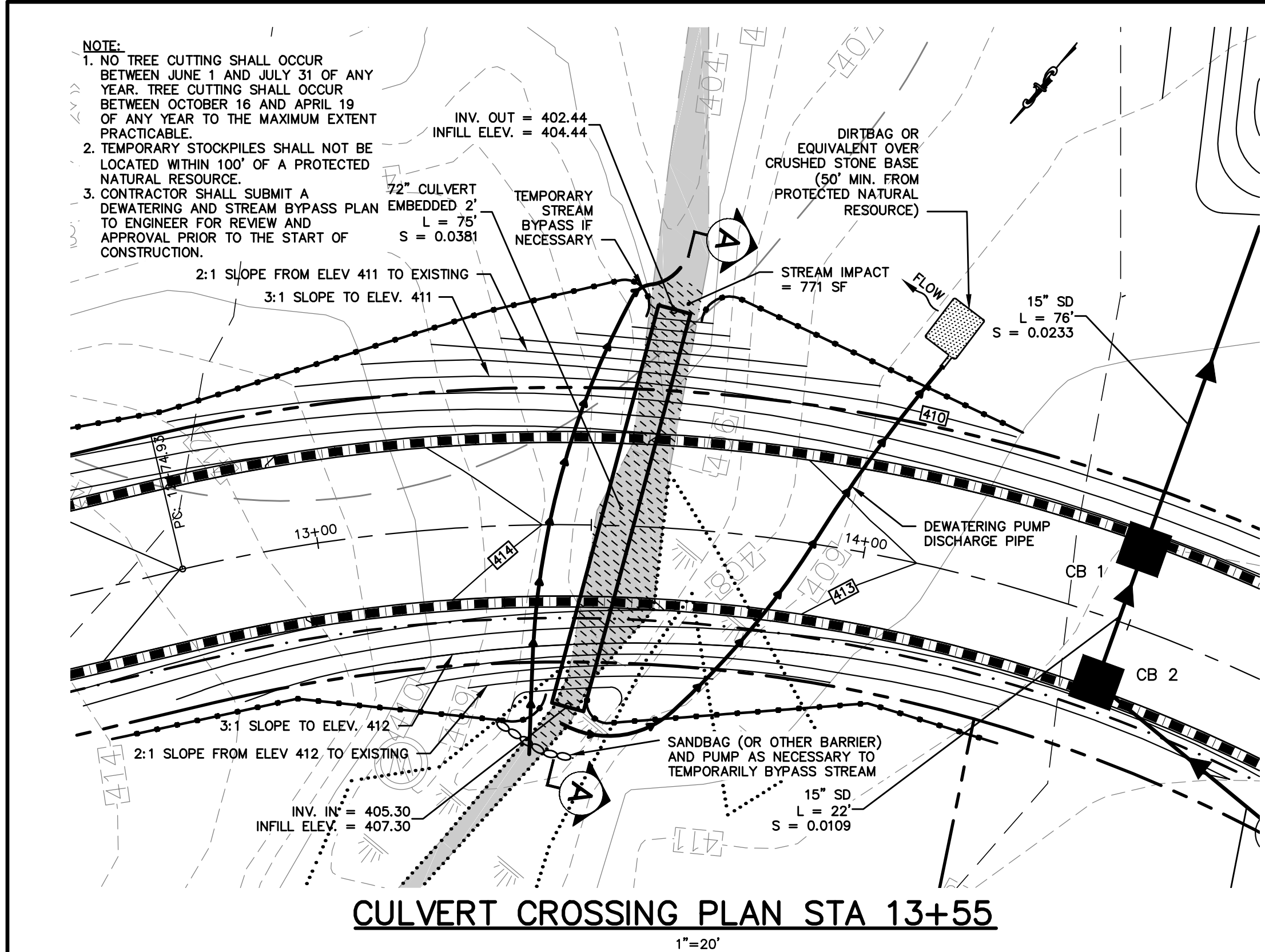


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Drawing Name:	Grading and Drainage Plan and Profile
Project:	Orchard Road Subdivision Cumberland, Maine
Client:	TZ Properties Falmouth, Me 04105

Drawing No.

8



Rev.	Date	Revision

Subdivision Amendment	9-25-18	WCH
Planning Board Signature	8-1-18	WCH
Preliminary/Final Subdivision Application	5-22-18	WCH
MDEP/ACOE Permitting	12-22-17	WCH
Preliminary Subdivision Application	10-31-17	WCH
Issued For	Date	By

Design: JWA	Draft: LAN	Date: DEC 2017
Checked: WCH	Scale: AS SHOWN	Job No.: 3236.01
File Name: 3236-CULVERT_OPTB.dwg		

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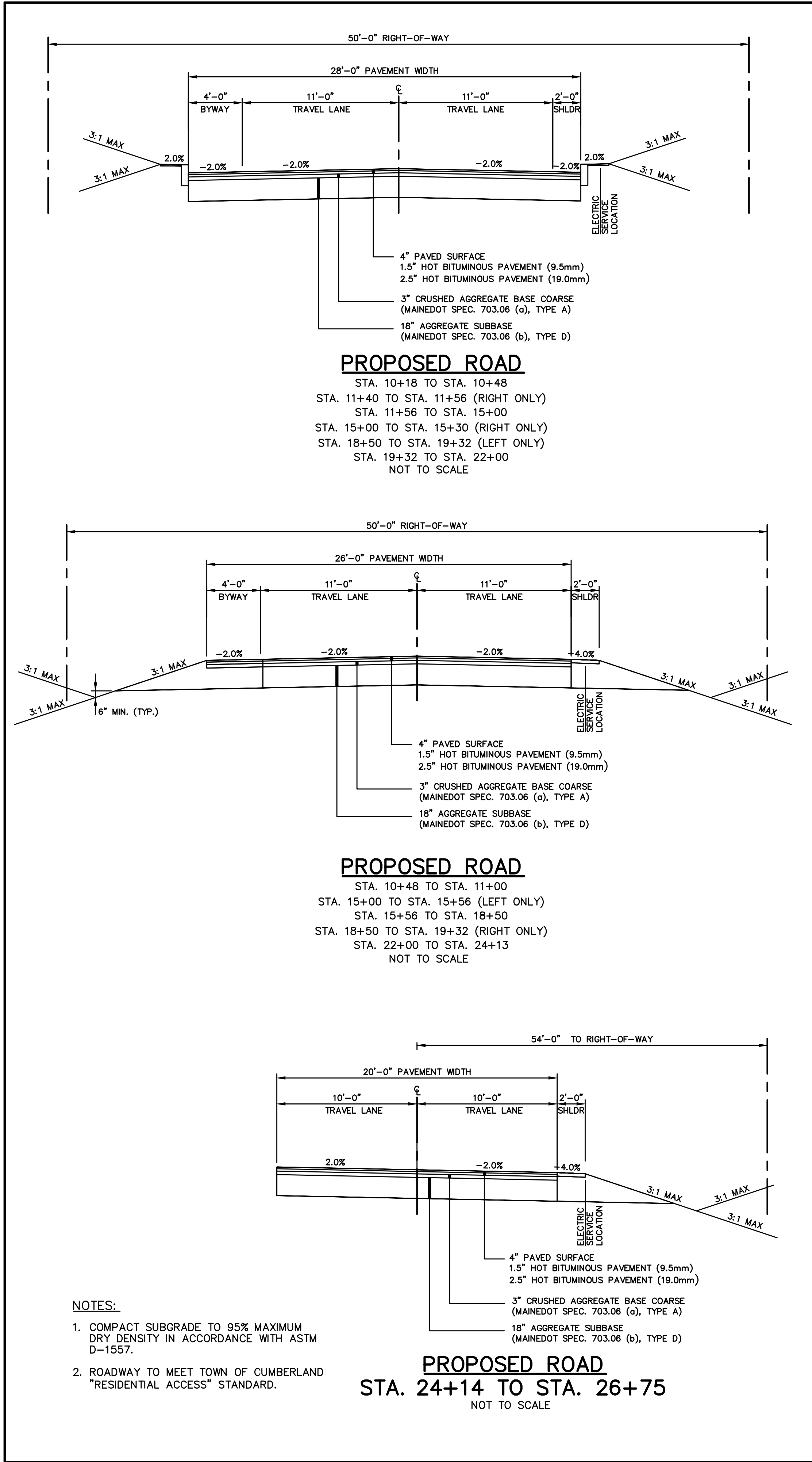
Relationships. Responsiveness. Results.
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Drawing Name:	Culvert Crossing Details
Project:	Orchard Road Subdivision Cumberland, Maine
Client:	TZ Properties Falmouth, Me 04105



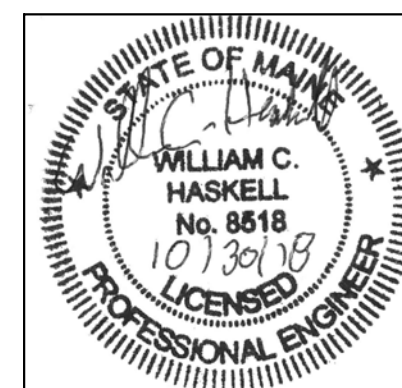
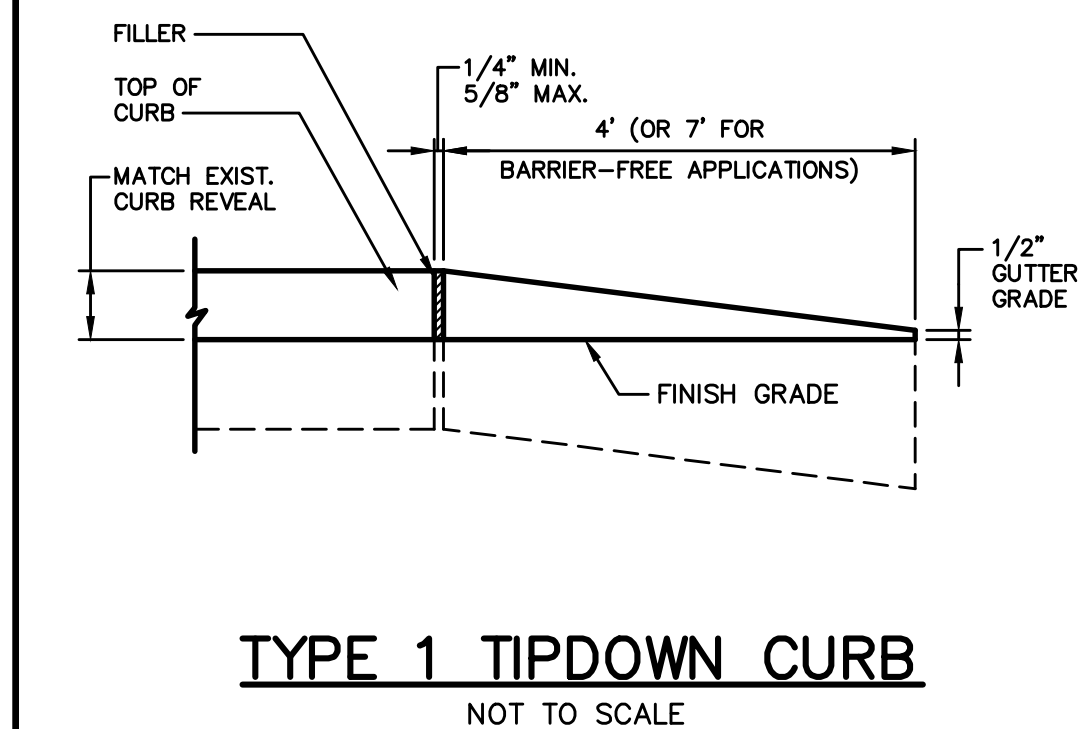
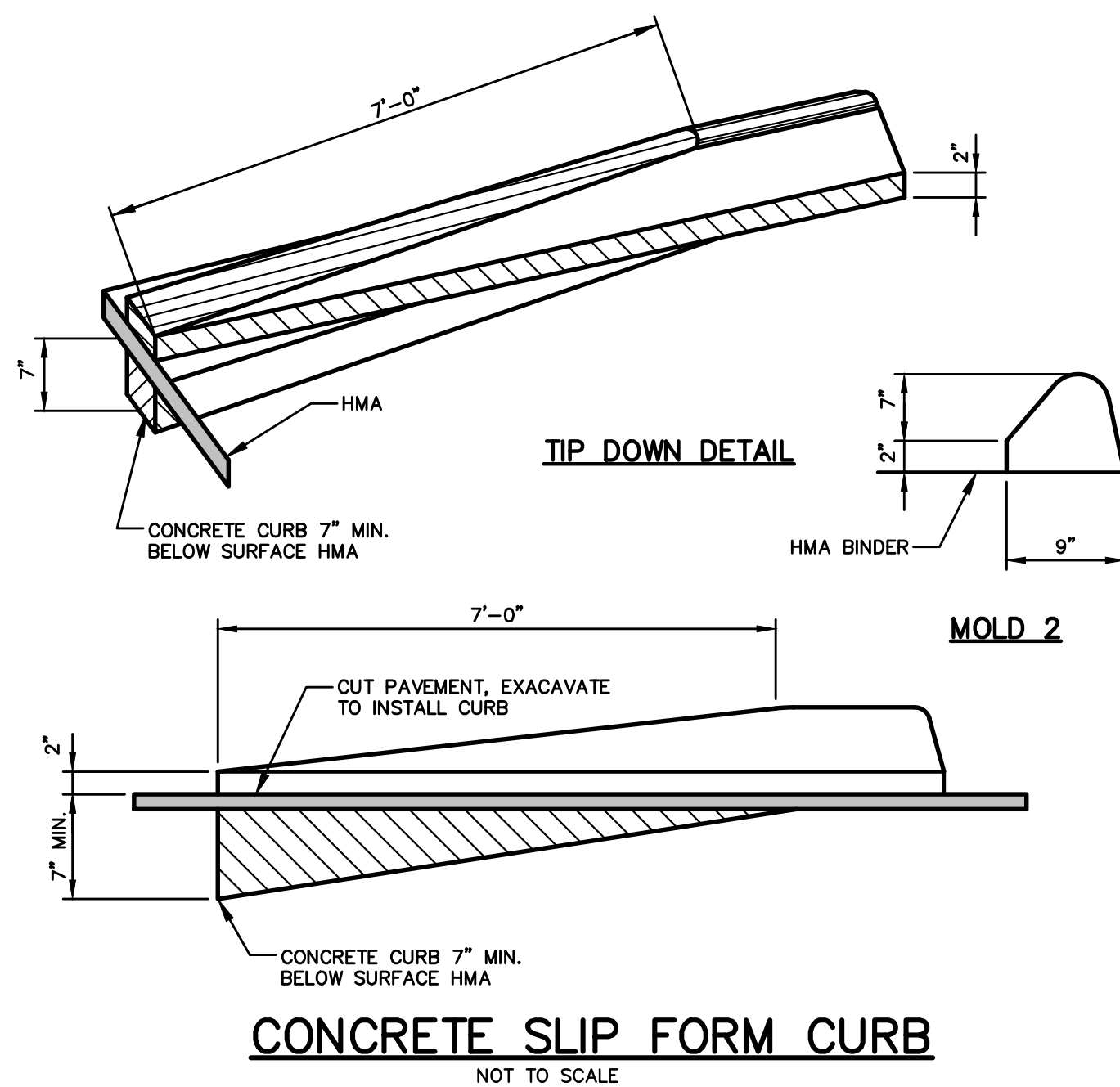
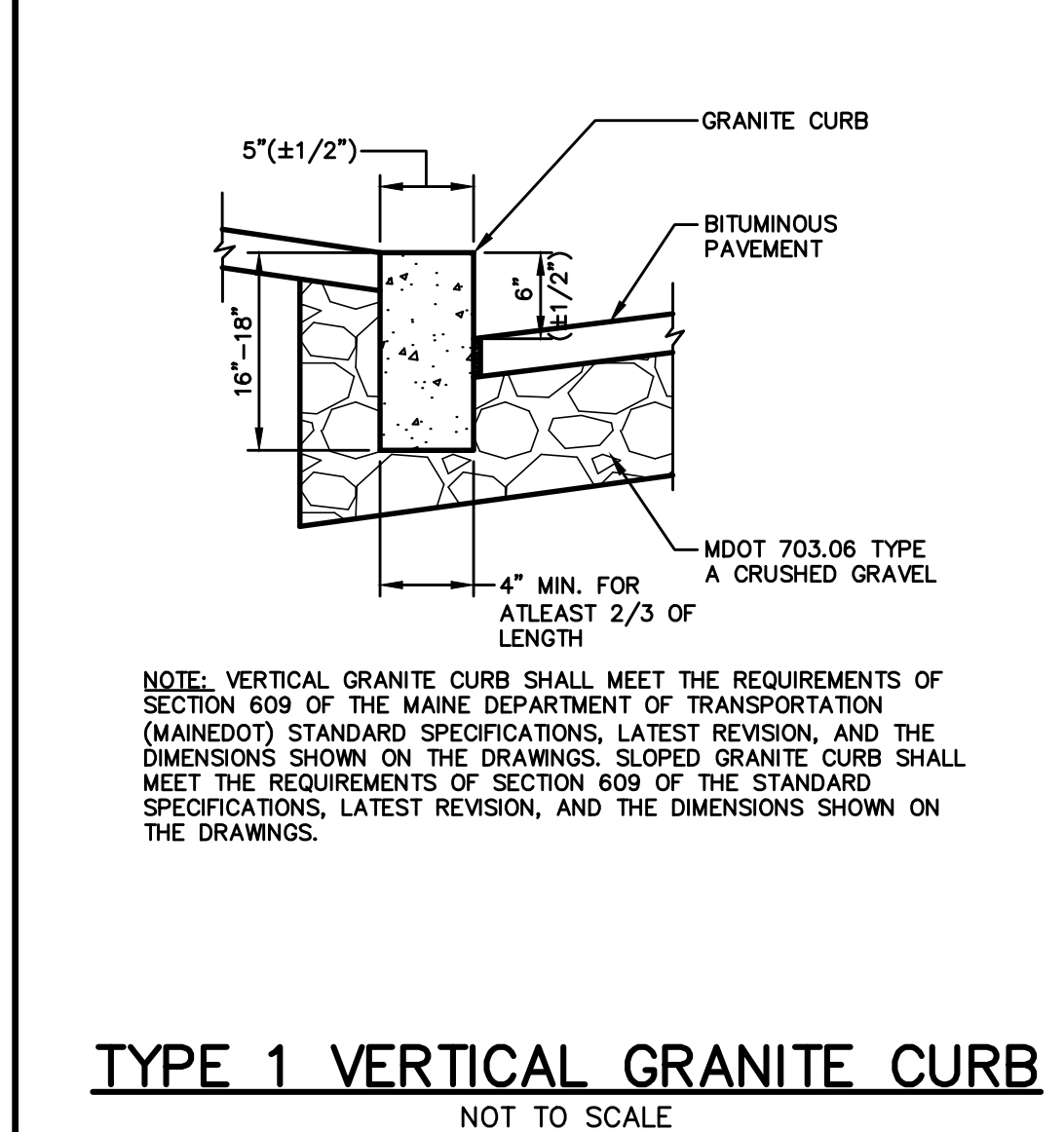
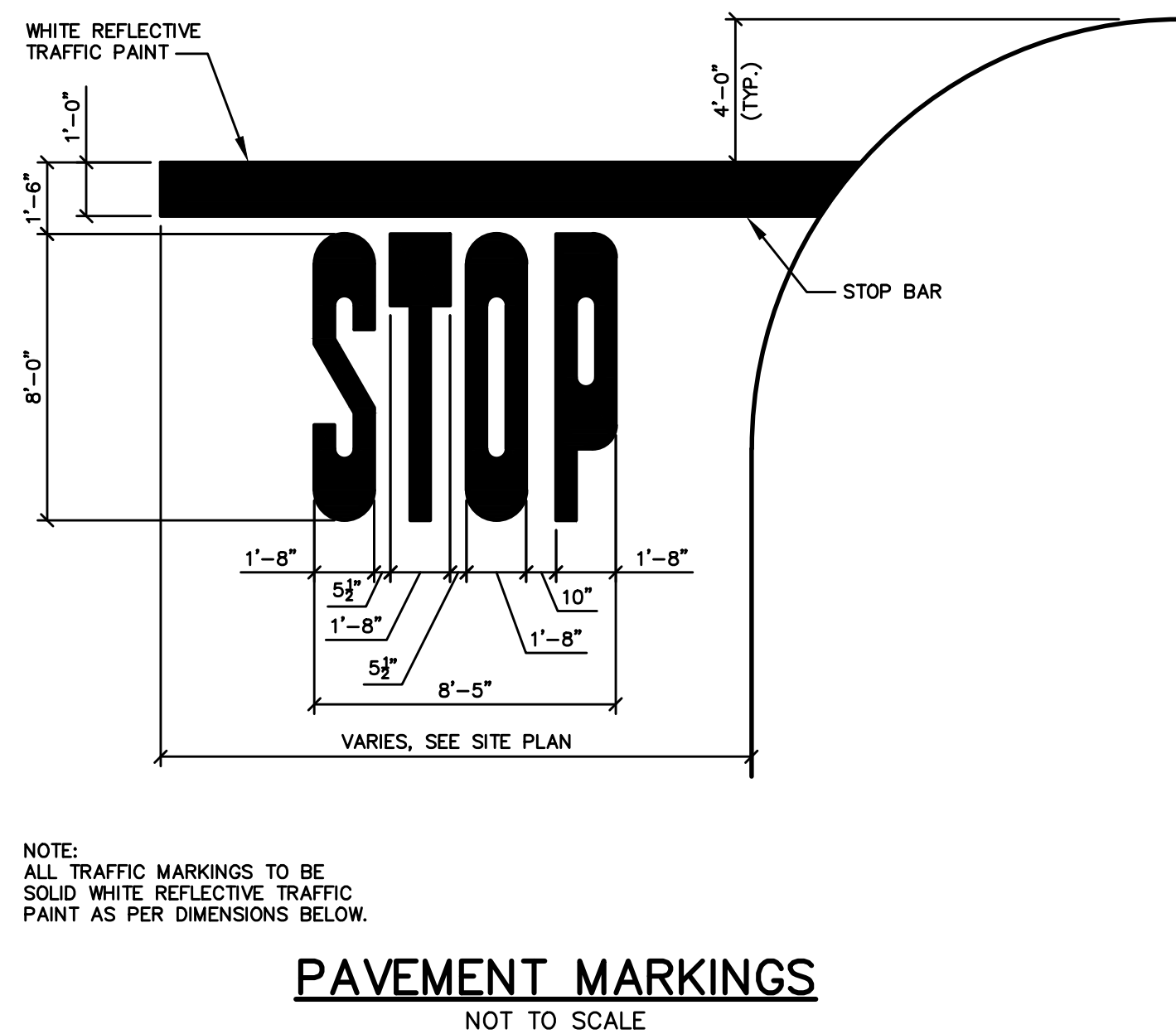
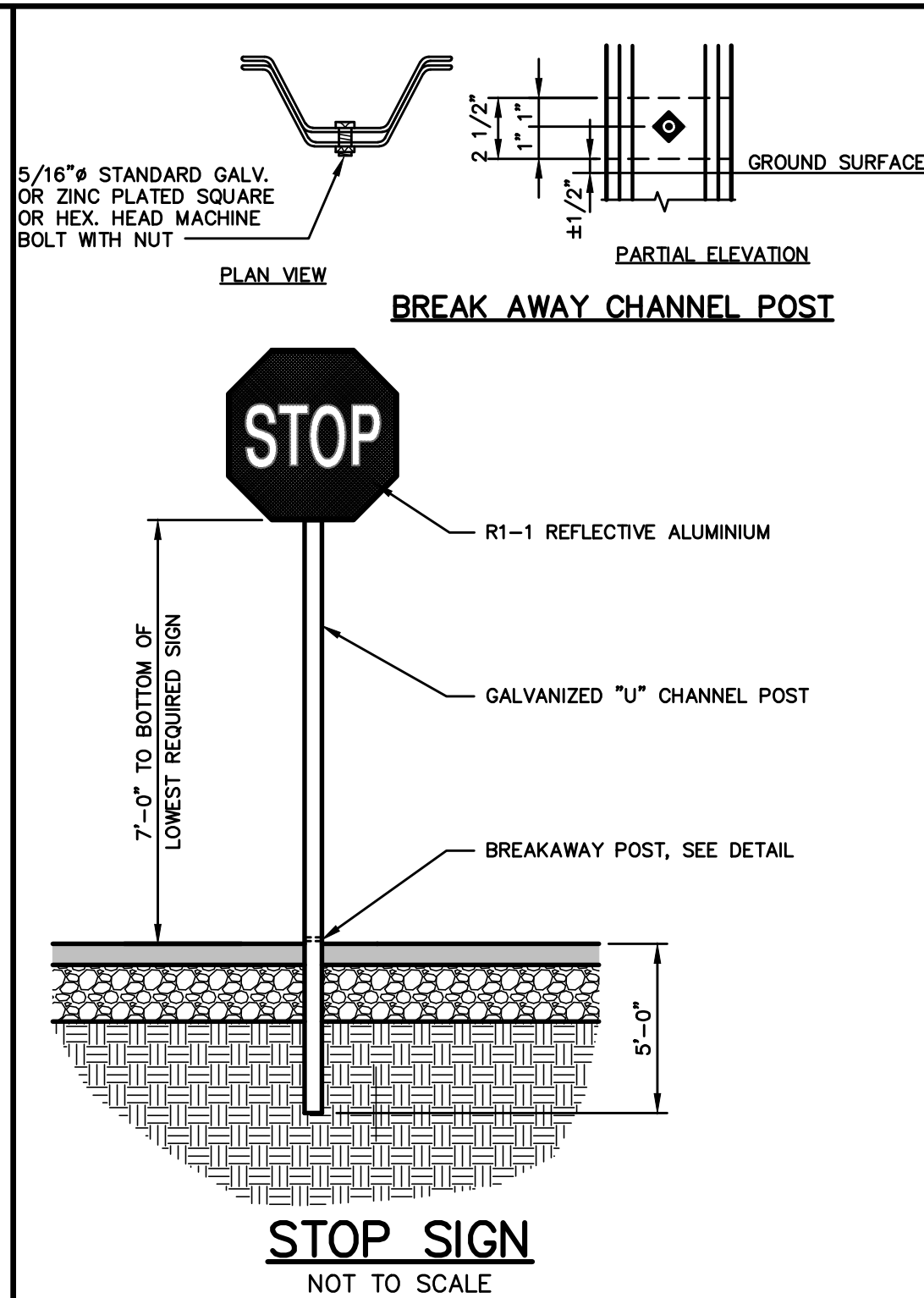
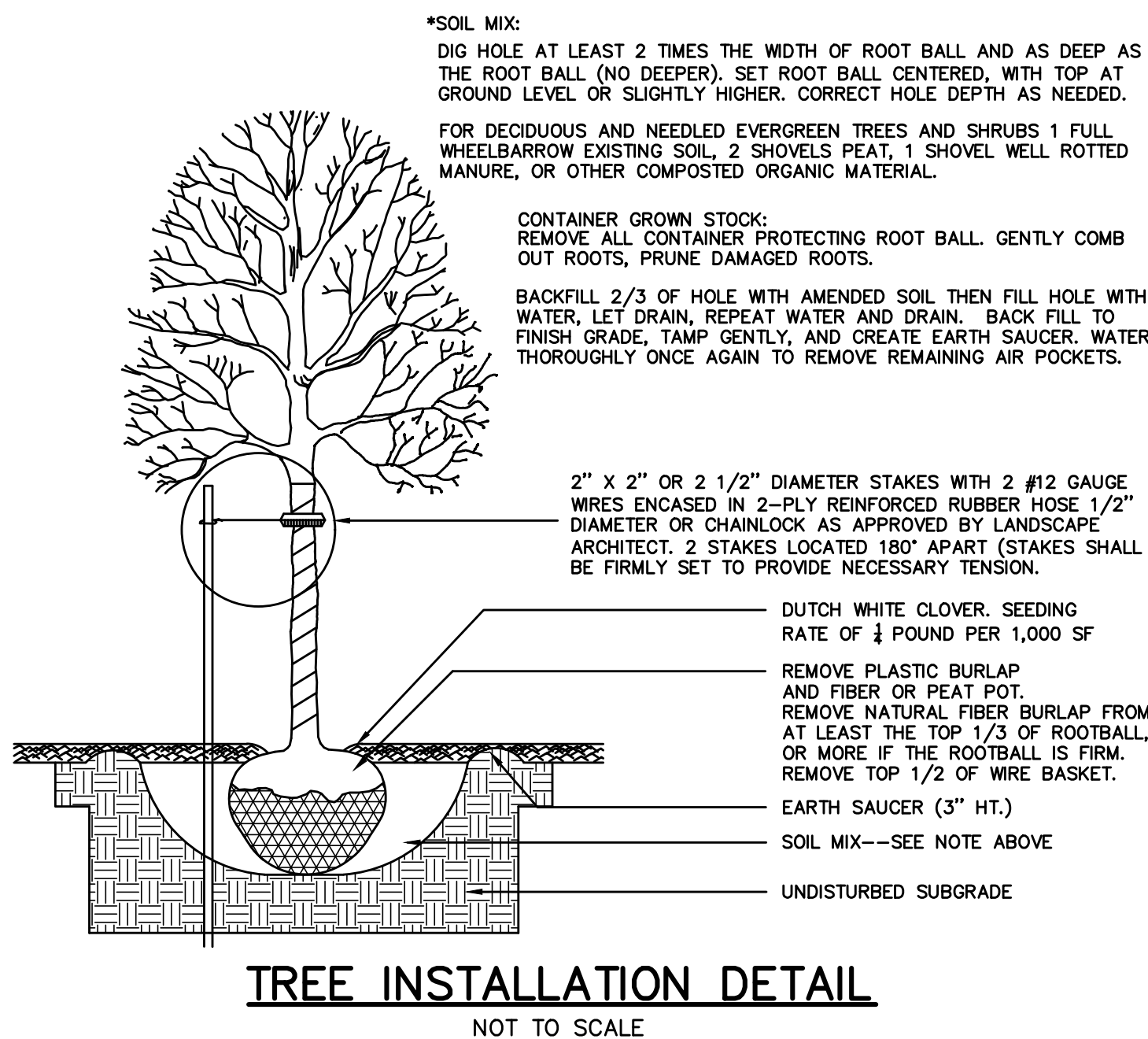
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9

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GENERAL PLANTING NOTES

1. ALL PLANT MATERIAL INSTALLED SHALL MEET THE SPECIFICATIONS OF "AMERICAN STANDARDS FOR NURSERY STOCK BY THE AMERICAN ASSOCIATION OF NURSERYMEN".
2. ALL PLANT MATERIAL SHALL BE FREE FROM INSECTS AND DISEASE.
3. ALL PLANTING SHALL BE DONE IN ACCORDANCE WITH ACCEPTABLE HORTICULTURAL PRACTICES. THIS IS TO INCLUDE PROPER PLANTING MIX, PLANT BED AND TREE PIT PREPARATION, PRUNING, STAKING OR GUYING WRAPPING, SPRAYING, FERTILIZATION, PLANTING AND ADEQUATE MAINTENANCE UNTIL ACCEPTANCE FROM THE OWNER.
4. ALL GRASS, OTHER VEGETATION AND DEBRIS SHALL BE REMOVED FROM ALL PLANTING AREAS PRIOR TO PLANTING.
5. EXISTING TREES TO BE PRESERVED SHALL BE PROTECTED DURING CONSTRUCTION AND SHALL BE THE RESPONSIBILITY OF THE GENERAL CONTRACTOR.
6. ANY DEVIATION FROM THE LANDSCAPE PLAN, INCLUDING PLANT LOCATION, SELECTION, SIZE, QUANTITY, OR CONDITION SHALL BE REVIEWED AND APPROVED BY THE OWNER (AND MUNICIPAL AUTHORITY, IF APPLICABLE) PRIOR TO INSTALLATION ON SITE.
7. DAMAGE TO EXISTING SITE IMPROVEMENTS DURING INSTALLATION OF LANDSCAPE MATERIAL SHALL BE THE RESPONSIBILITY OF THE LANDSCAPE CONTRACTOR.
8. CONTRACTOR SHALL COORDINATE INSPECTION OF PLANT MATERIAL AND LOCATIONS WITH OWNER PRIOR TO INSTALLATION. ALL PLANT MATERIAL SHALL BE ON-SITE AND PLACED BEFORE INSPECTION CAN BE COMPLETED. A MINIMUM OF 48 HOUR NOTIFICATION SHALL BE REQUIRED.
9. MAINTENANCE REQUIREMENTS: PRUNE DEAD OR DAMAGED BRANCHES POST INSTALLATION AND WATER AS REQUIRED UNTIL PROJECT COMPLETION AND ACCEPTANCE BY OWNER.
10. WATERING: ALL PLANTINGS SHALL BE THOROUGHLY WATERED UPON INSTALLATION, AND THEN WEEKLY WHENEVER ANY DRY SPELLS OCCUR, UNTIL ACCEPTANCE BY OWNER.
11. LANDSCAPE CONTRACTOR OR PLANT SUPPLIER SHALL GUARANTEE PLANTS AND PROVIDE REPLACEMENTS FOR TWO YEARS FROM INSTALLATION.



Rev.	Date	Revision

Subdivision Amendment	9-25-18	WCH
Planning Board Signature	8-1-18	WCH
Preliminary/Final Subdivision Application	5-22-18	WCH
MDP/ACOE Permitting	12-22-17	WCH
Preliminary Subdivision Application	10-31-17	WCH
Issued For	Date	By

Design: dWA	Draft: tAN	Date: 08/08/2017
Checked: WCH	Scale: NTS	Job No.: 3236.01
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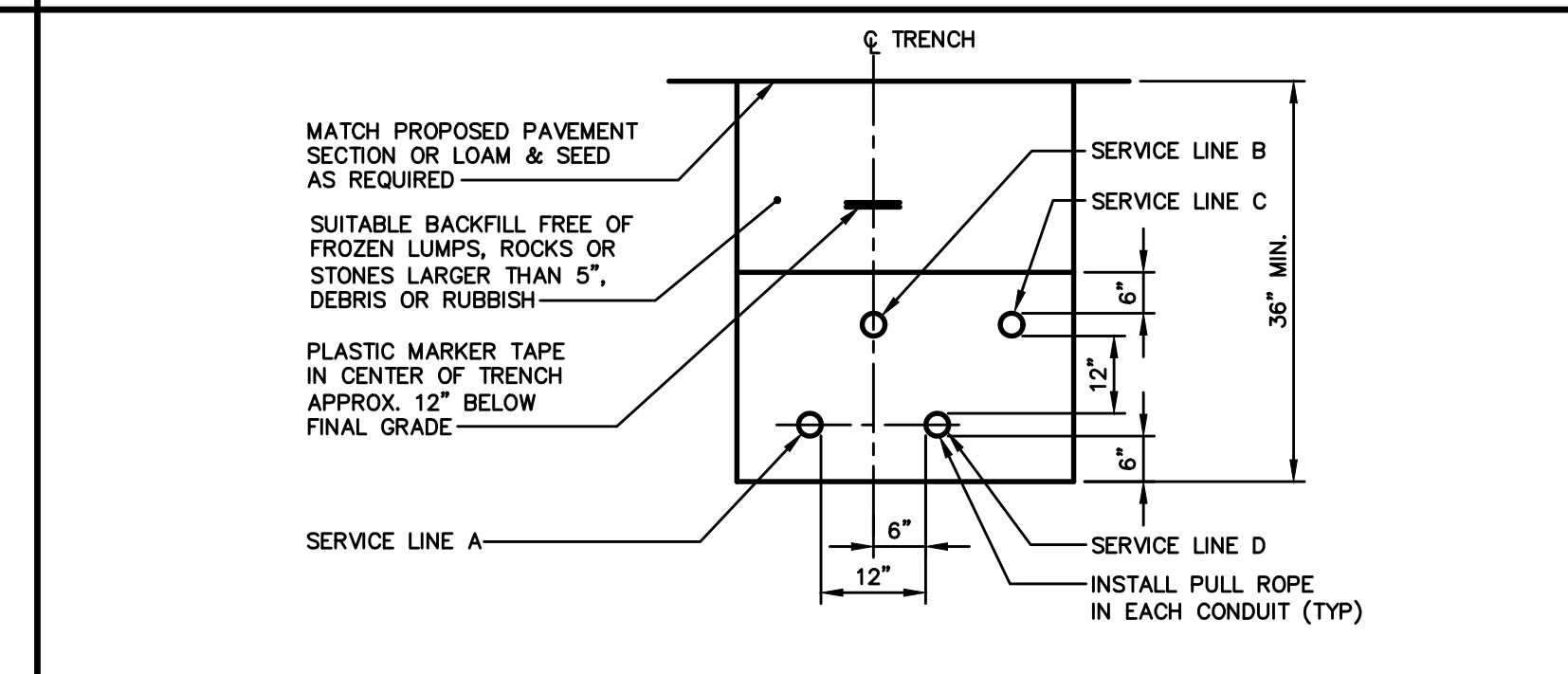


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Drawing Name:	Site Details
Project:	Orchard Road Subdivision Cumberland, Maine
Client:	TZ Properties Falmouth, Me 04105

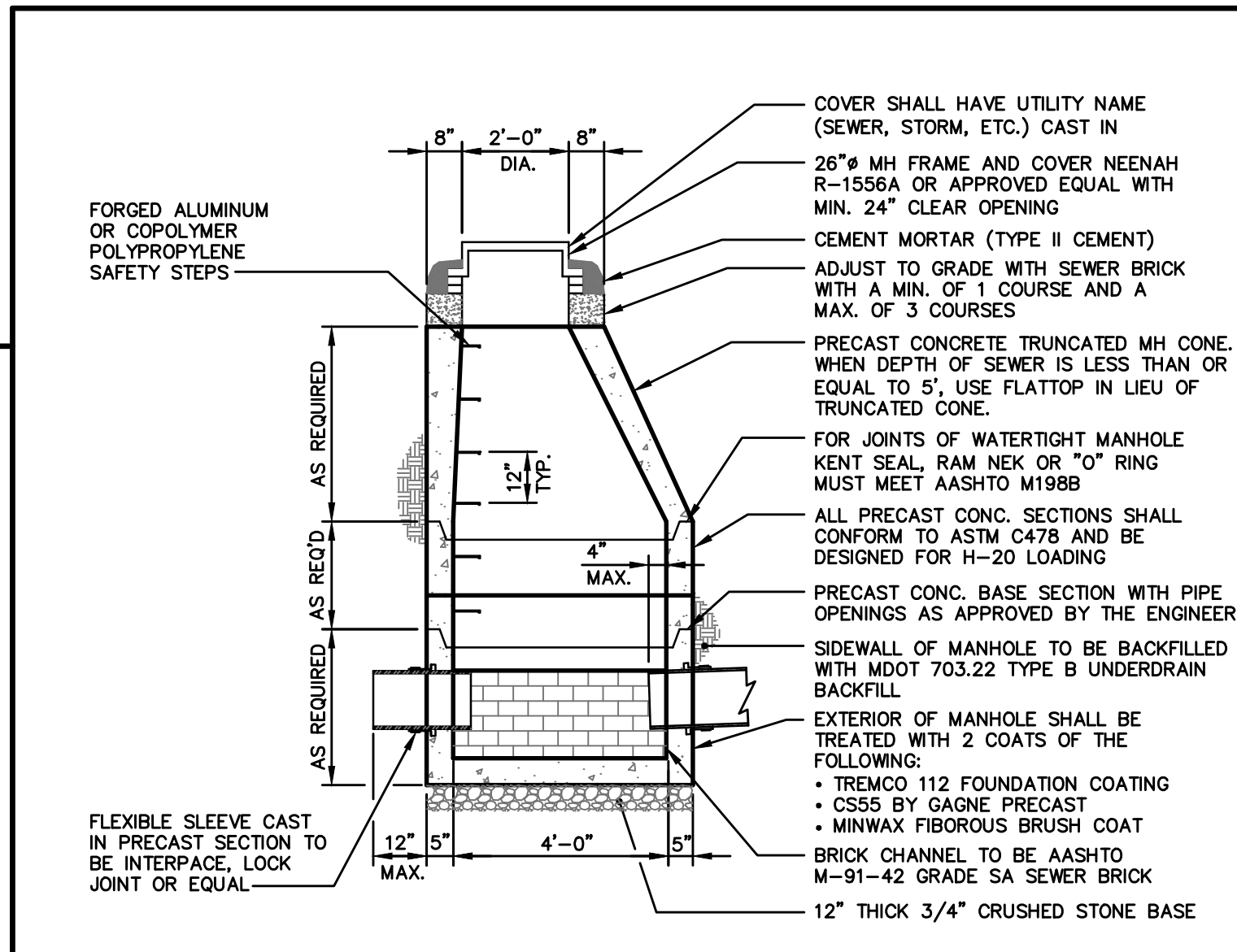
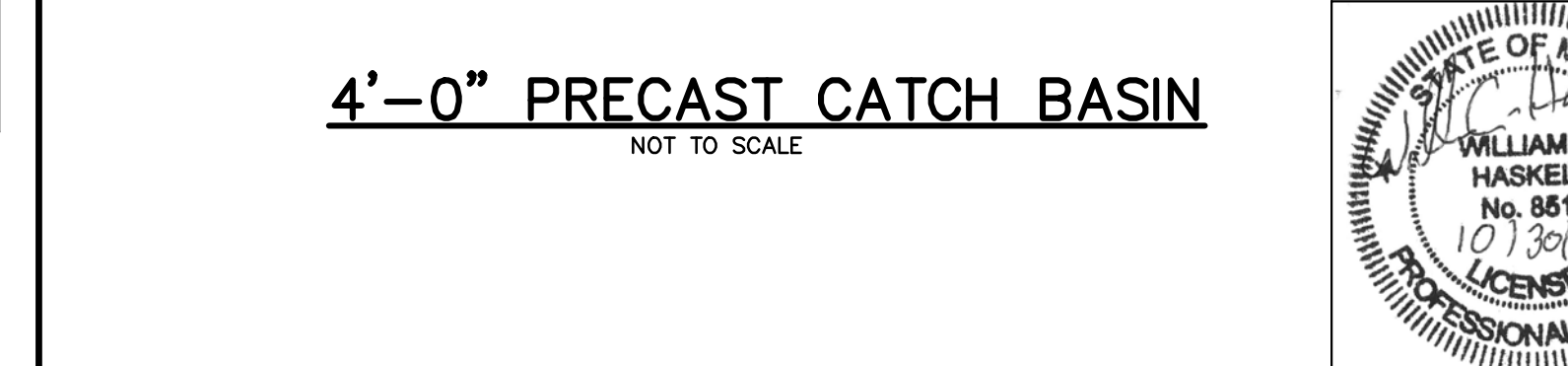
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10

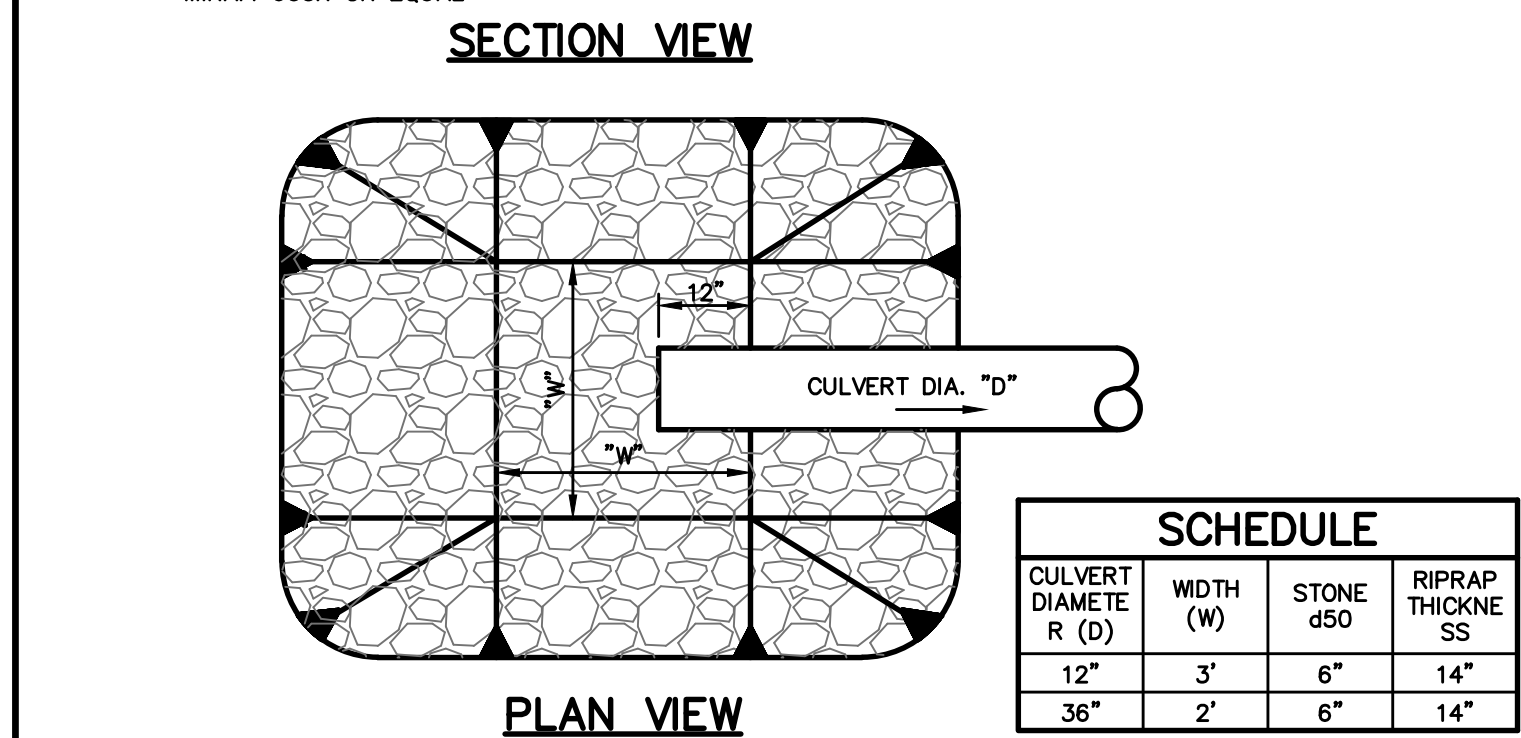


NOTE:
ONE CONDUIT CAPPED FOR SPARE, PROVIDE GALVANIZED STEEL
LONG SWEEP AT RISER POLE AND EXTEND GALVANIZED CONDUIT
TO 10" ABOVE GRADE AT POLE WITH STAND-OFF BRACKETS.

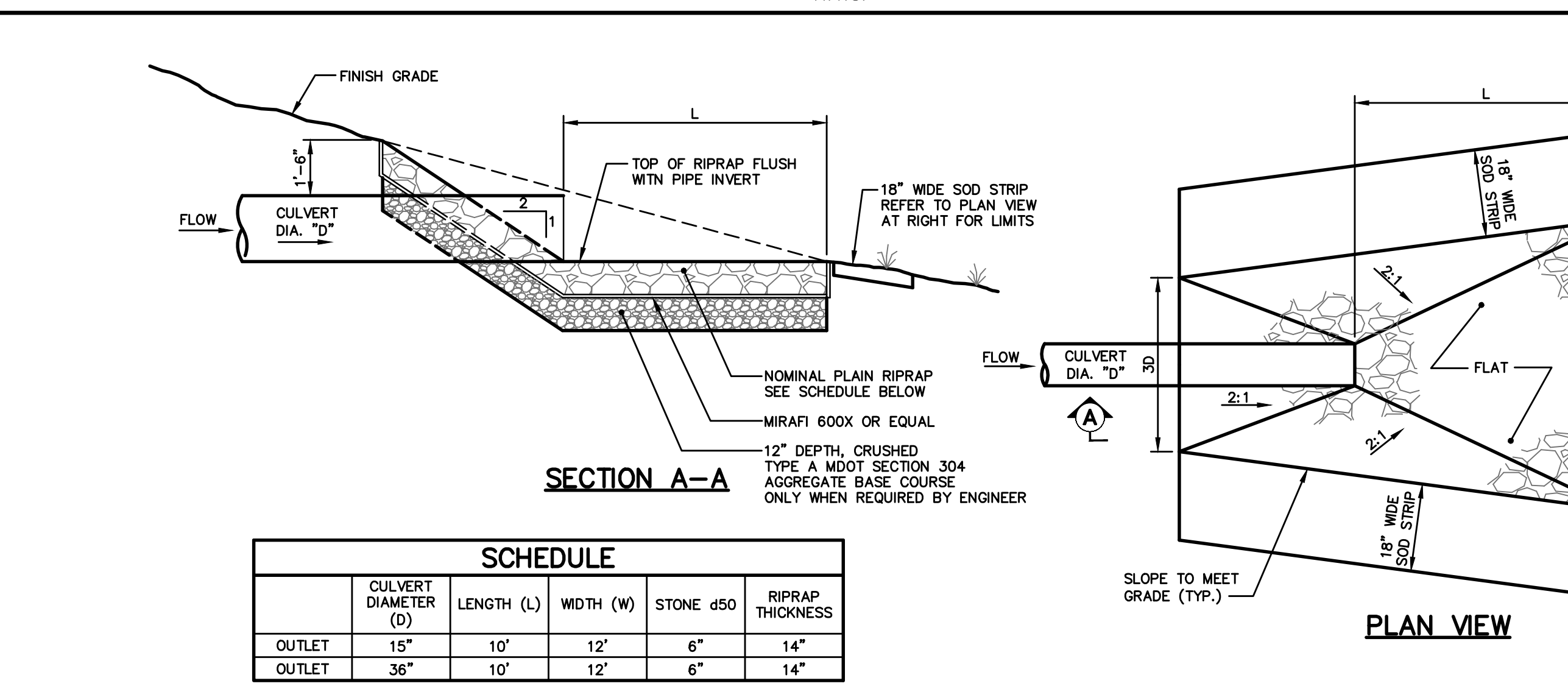
NOT TO SCALE



NOT TO SCALE



NOT TO SCALE



NOT TO SCALE

NOTE:

1. BRACING AND SHEETING OR OTHER TRENCH PROTECTION SHALL BE PROVIDED TO MEET APPLICABLE STATE AND FEDERAL STANDARDS. ALL SUCH TRENCH PROTECTION IS THE RESPONSIBILITY OF THE CONTRACTOR.
2. INSTALL WARNING TAPE DIRECTLY ABOVE UTILITIES AT FINISH GRADE.

COVER	PIPE	(1)	(1) COVER BETWEEN 2' AND 3' INCHES
	DRAIN		INCLUDE 4" RIGID PIPE
	WATER		COVER BETWEEN 3' AND 4' INCHES
	SEWER		INCLUDE 2" RIGID PIPE

CULVER

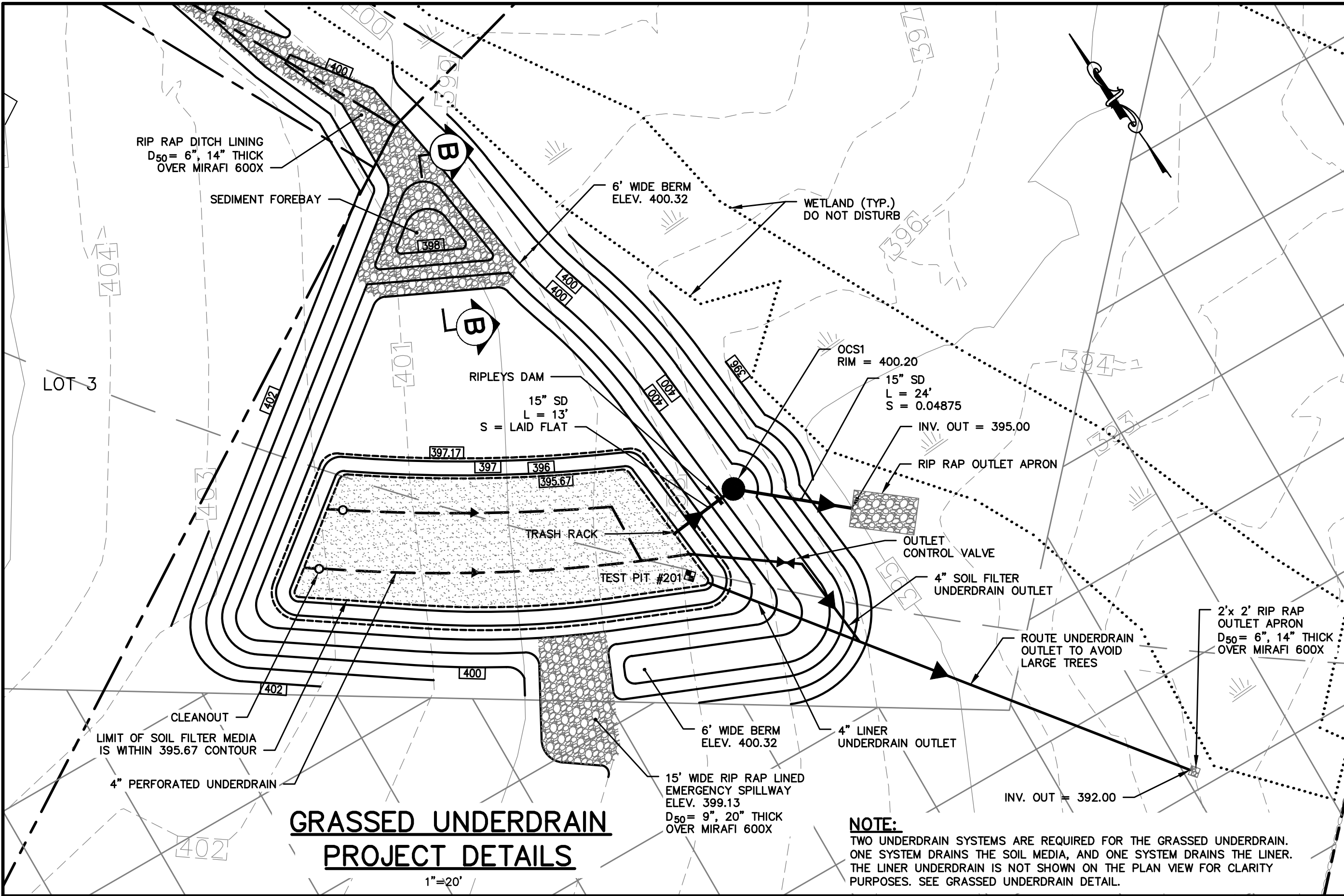
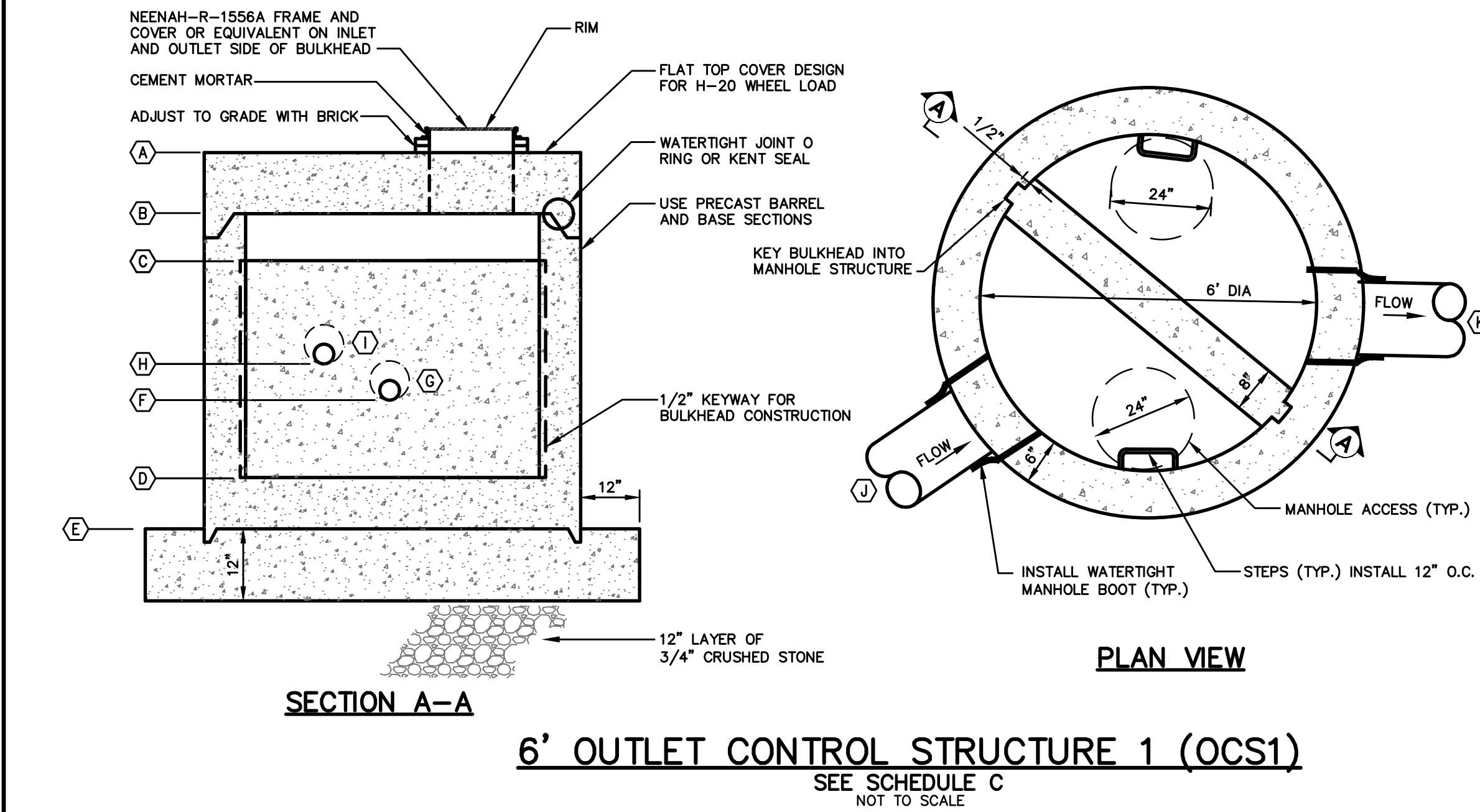


Table 1 Loamy Coarse Sand	
SIEVE SIZE	% PASSING BY WEIGHT
#10	85-100
#20	70-100
#60	15-40
#200	8-15
#200 CLAY SIZE	<2.0

Table 2 MEDOT Specifications for Underdrain Type B (MEDOT #703.22)	
SIEVE SIZE	% PASSING BY WEIGHT
1"	90-100
1/2"	75-100
#4	50-100
#20	15-80
#50	0-15
#200	0-5

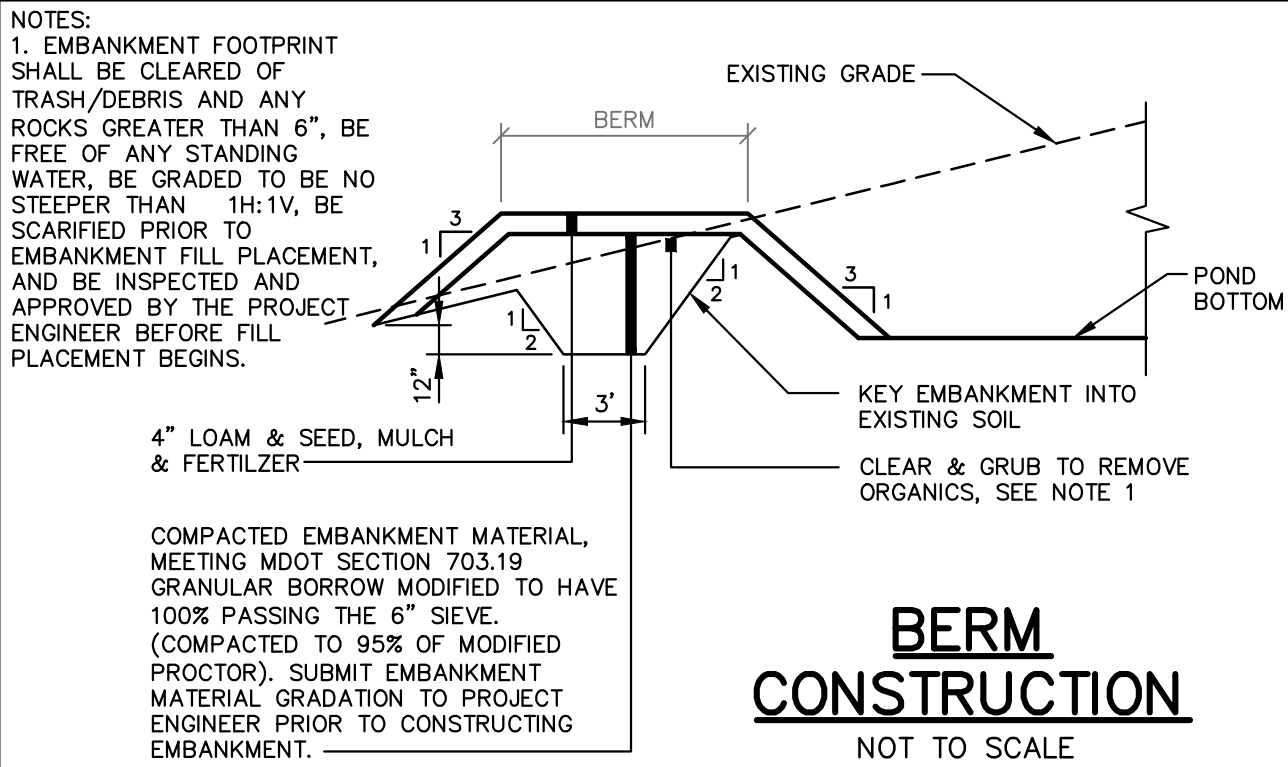
Table 3 Sandy Loam Topsoil	
SIEVE SIZE	% PASSING BY WEIGHT
#4	75-95
#10	60-90
#40	35-65
#200	20-70
#200 CLAY SIZE	<2.0

SCHEDULE C	
ITEM DESCRIPTION	ELEVATION
A TOP OF STRUCTURE	400.32
B UNDERSIDE TOP SLAB	399.65
C TOP CONCRETE BULKHEAD	399.12
D MANHOLE INVERT	395.67
E BOTTOM OF STRUCTURE	394.67
F ORIFICE INVERT	397.17
G ORIFICE DIAMETER	6"
H ORIFICE INVERT	397.68
I ORIFICE DIAMETER	4"
J PIPE DIAMETER	15"
K INVERT IN	395.67
L PIPE DIAMETER	15"
M INVERT OUT	397.00



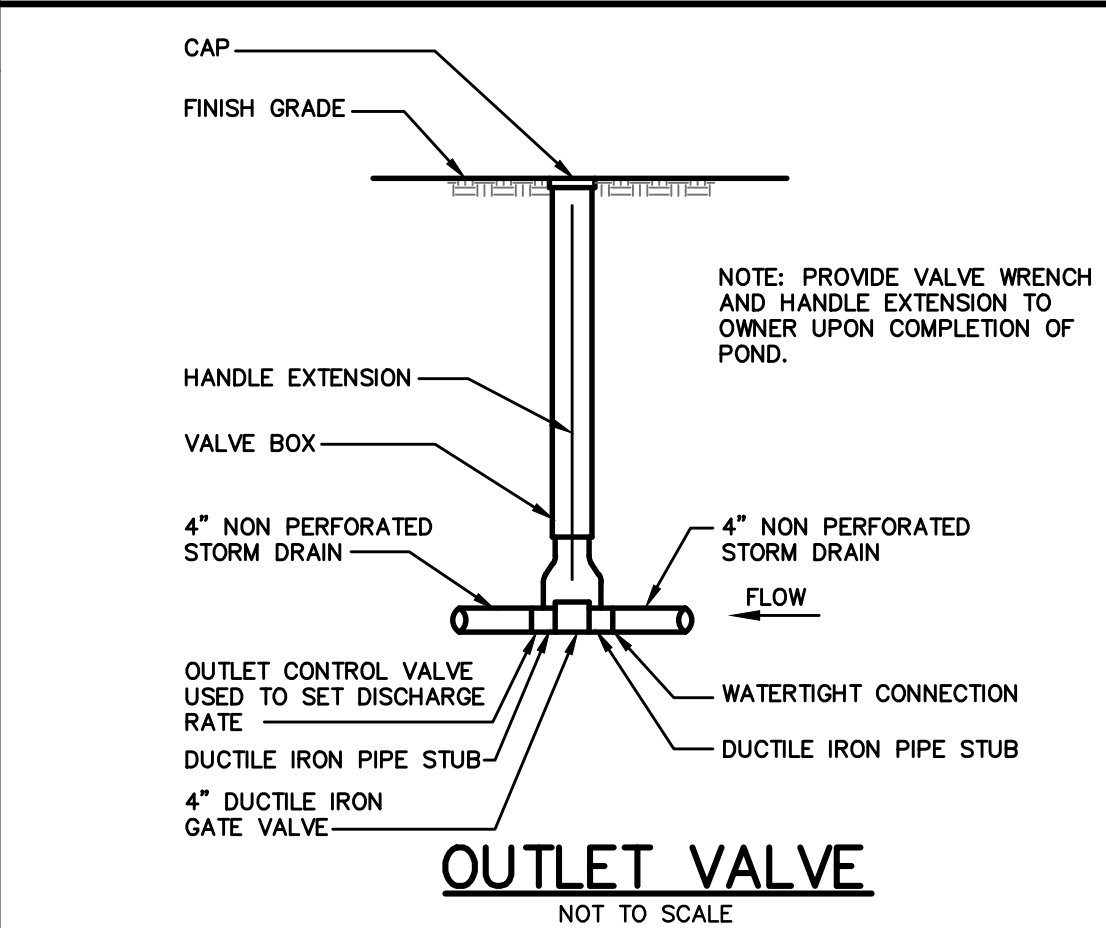
CONSTRUCTION OVERSIGHT

- INSPECTION OF THE FILTER BASIN SHALL BE PROVIDED FOR EACH PHASE OF CONSTRUCTION BY THE DESIGN ENGINEER WITH REQUIRED REPORTING TO THE DEP. AT A MINIMUM, INSPECTIONS WILL OCCUR:
1. AFTER PRELIMINARY CONSTRUCTION OF THE FILTER GRADES AND ONCE THE UNDERDRAIN PIPES ARE INSTALLED BUT NOT BACKFILLED.
 2. AFTER THE DRAINAGE LAYER IS CONSTRUCTED AND PRIOR TO THE INSTALLATION OF THE FILTER MEDIA.
 3. AFTER THE FILTER MEDIA HAS BEEN INSTALLED AND SEEDING.
 4. AFTER ONE YEAR TO INSPECT HEALTH OF THE VEGETATION AND MAKE CORRECTIONS.
 5. ALL MATERIAL USED FOR THE CONSTRUCTION OF THE FILTER BASIN WILL BE APPROVED BY THE DESIGN ENGINEER AFTER TESTS BY A CERTIFIED LABORATORY SHOW THAT THEY ARE PASSING DEP SPECIFICATIONS.
- NOTE: CONTRACTOR SHALL NOTIFY PROJECT ENGINEER 48 HOURS PRIOR TO THE MILESTONES LISTED ABOVE TO ALLOW FOR INSPECTION.



SCHEDULE B - EMBANKMENT SCHEDULE	
ITEM DESCRIPTION	DIMENSION/ELEVATION
A POND BASE ELEVATION	395.67
B PEAK ELEVATION - CHANNEL PROTECTION VOLUME	397.17
C PEAK ELEVATION - 2 YEAR STORM	397.55
D PEAK ELEVATION - 10 YEAR STORM	398.38
E PEAK ELEVATION - 25 YEAR STORM	399.12
F TOP OF BERM	400.32

TYPICAL POND CROSS SECTION



GRASSED UNDERDRAIN NOTES:

SOIL SPECIFICATIONS:

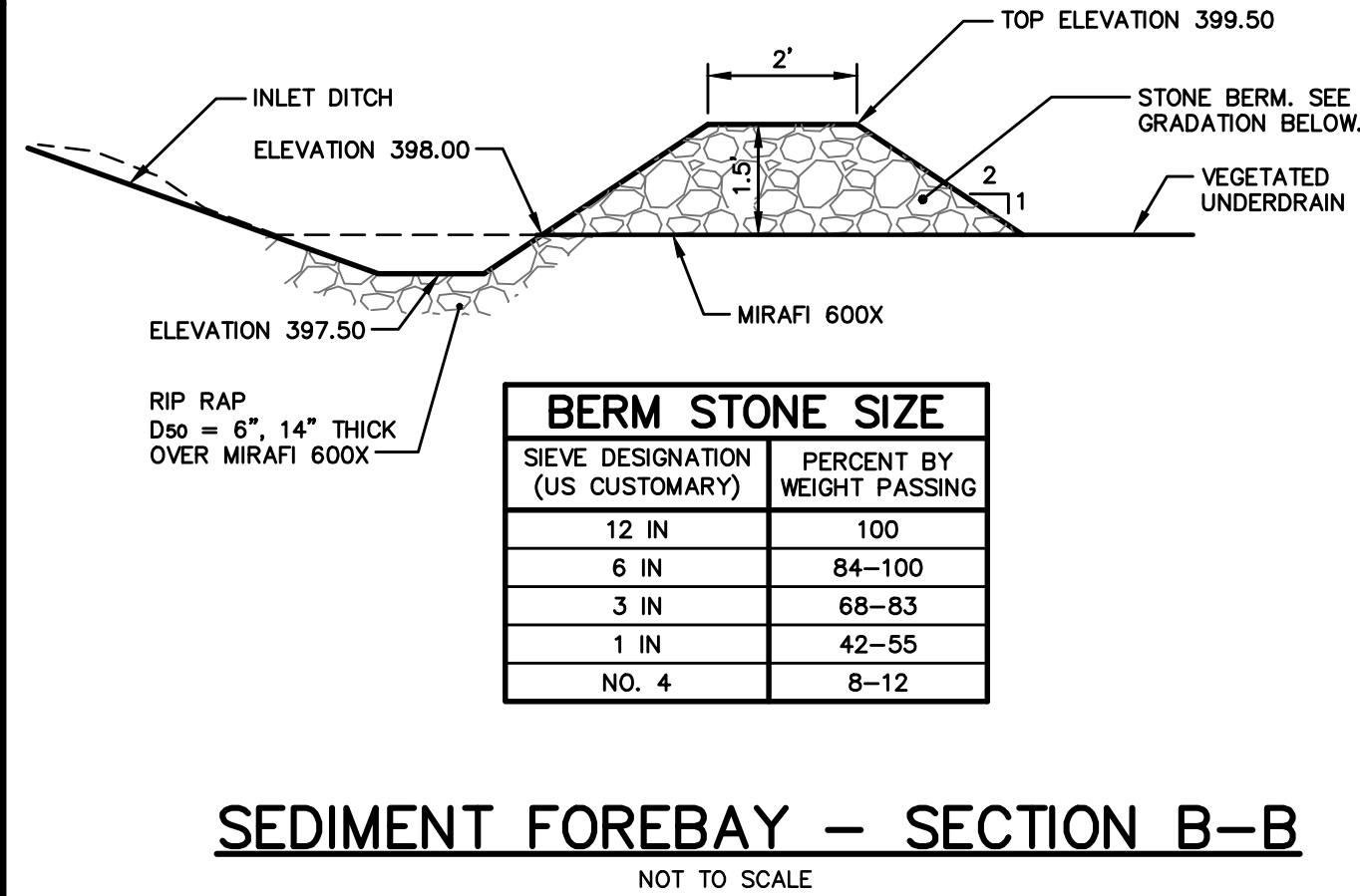
1. THE SOIL FILTER MEDIA SHALL BE A LAYERED SYSTEM CONSISTING OF THE FOLLOWING FROM THE BOTTOM:
 - A. 12" OF LOAMY COARSE SAND, SEE TABLE 1.
 - B. 2" LAYER OF TOPSOIL (SEE "C" BELOW) ROTOTILLED INTO THE LOAMY COARSE SAND LAYER.
 - C. 6" OF NON-CLAYEY, LOAMY TOPSOIL SUCH AS USDA SANDY LOAM TOPSOIL WITH 5-8% HUMIFIED ORGANIC MATTER. SUPERHUMUS OR EQUIVALENT MAY BE ADDED TO THE TOPSOIL TO INCREASE ORGANIC CONTENT, SEE TABLE 3.
2. SOIL FILTER MEDIA MIXTURE SHALL HAVE A PERMEABILITY OF 2.4 IN./HR. TO 4 IN./HR UPON COMPACTION BETWEEN 90% AND 92% STANDARD PROCTOR (ASTM D698).

SUBMITTALS:

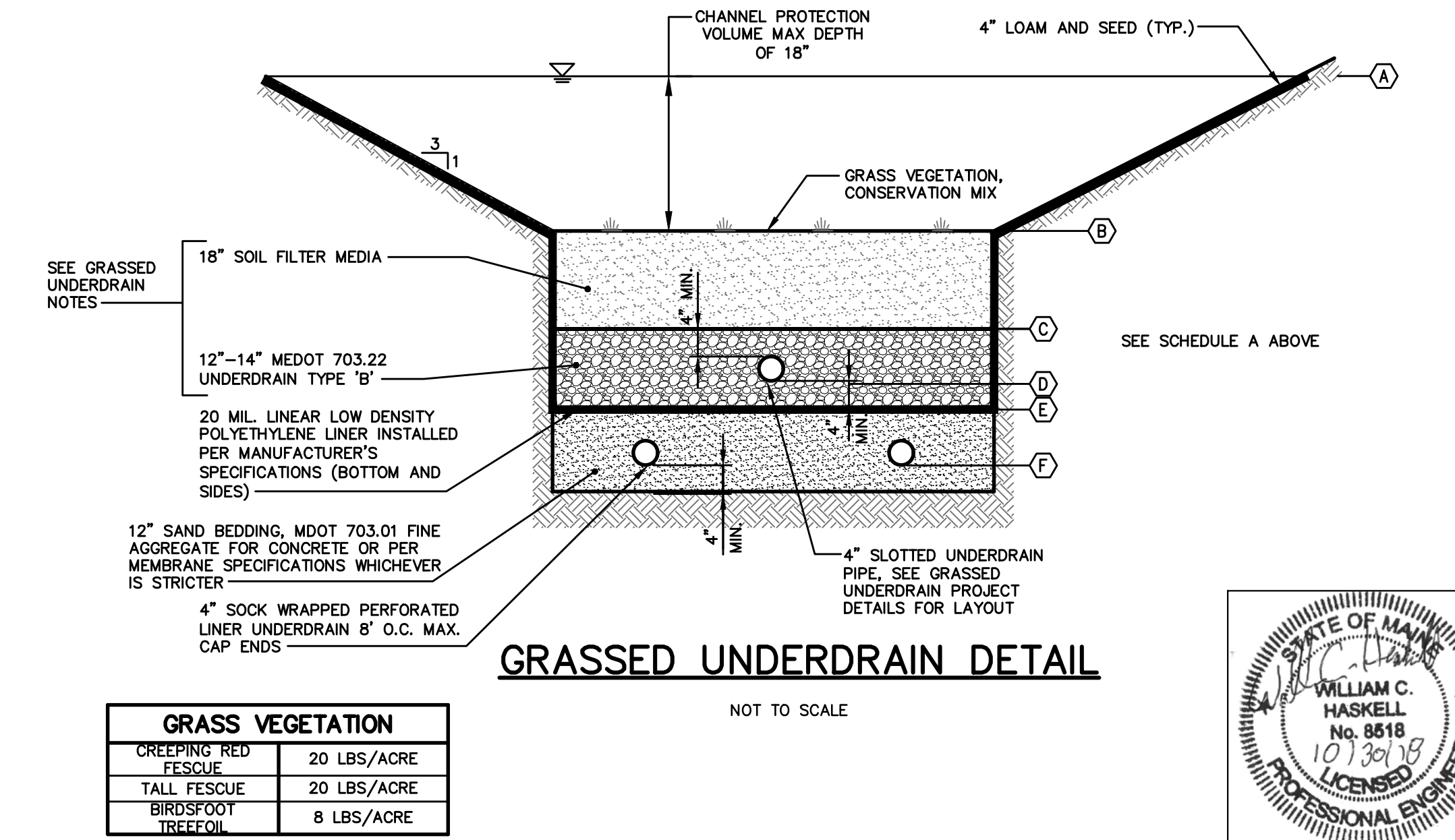
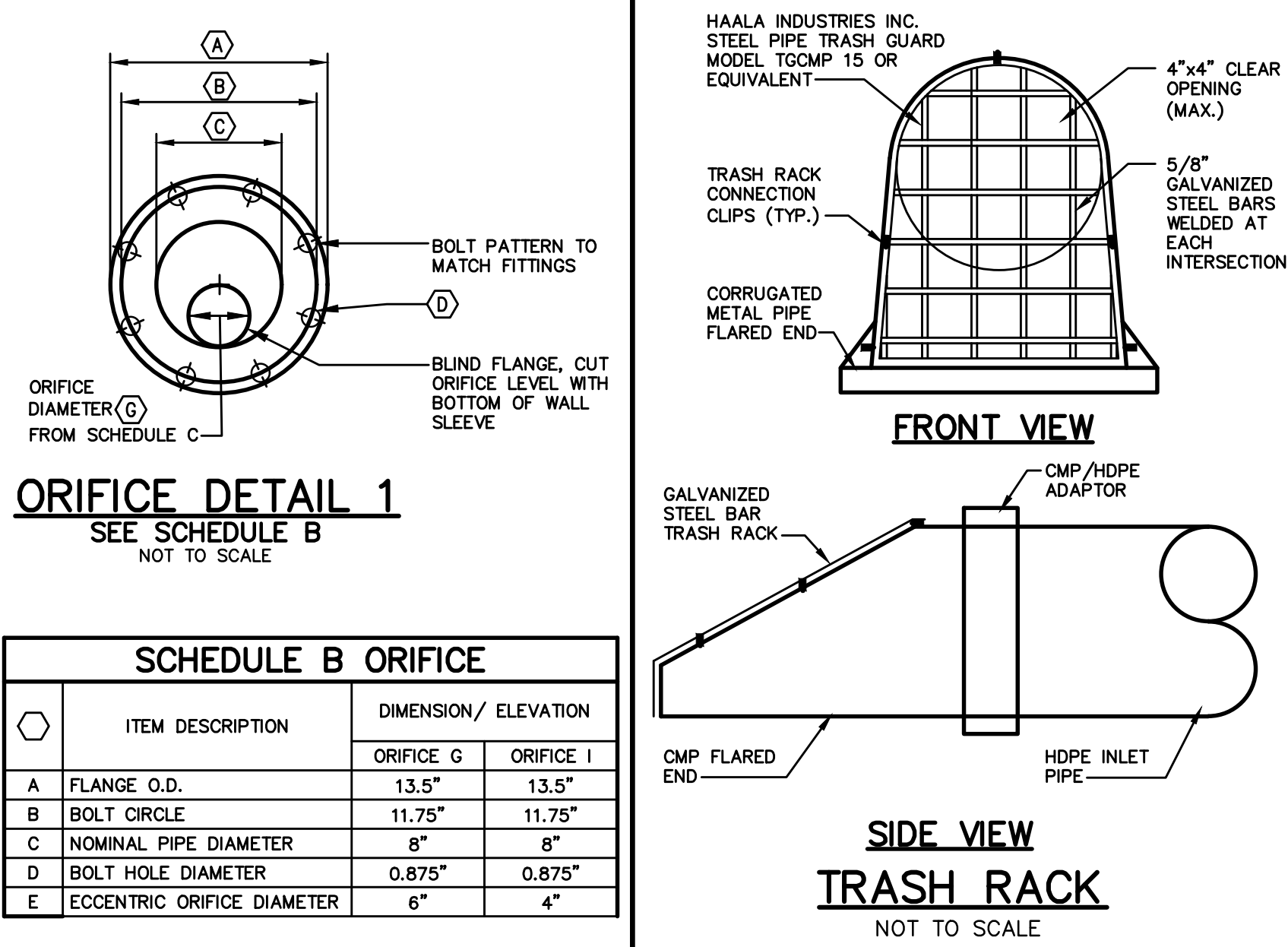
1. SUBMIT RESULTS OF FIELD AND LABORATORY TESTING TO PROJECT ENGINEER.
2. SUBMIT 75 lb. SAMPLE OF EACH TYPE OF MATERIAL: SUBMIT IN AIR TIGHT CONTAINERS TO PROJECT ENGINEER.
3. THE FOLLOWING MATERIAL SHALL BE SUBMITTED:
 - A. SAND.
 - B. UNDERDRAIN BEDDING MATERIAL.
4. PERFORM A SIEVE ANALYSIS CONFORMING TO ASTM C136 - STANDARD TEST METHOD FOR SIEVE ANALYSIS OF FINE AND COARSE AGGREGATES; 1996a ON EACH TYPE OF THE SAMPLE MATERIAL AND SUBMIT RESULTS TO PROJECT ENGINEER.
5. PERFORM A PERMEABILITY TEST ON THE SOIL FILTER MEDIA MIXTURE CONFORMING TO ASTM D2434 WITH THE MIXTURE COMPACTED TO 90% TO 92% OF MAXIMUM DRY DENSITY BASED ON ASTM D698. SUBMIT RESULTS TO THE PROJECT ENGINEER.
6. PERFORM ONE COMPACTION DENSITY TEST ON THE IN PLACE SOIL FILTER FOR EVERY 2,000 SQUARE FEET OF FILTER SURFACE AREA. TEST SHALL CONFORM TO ASTM D 2922 - STANDARD TEST METHODS FOR DENSITY OF SOIL AND SOIL-AGGREGATE IN PLACE BY NUCLEAR METHODS (SHALLOW DEPTH); 1996. SUBMIT RESULTS TO THE PROJECT ENGINEER.

CONSTRUCTION:

1. SOIL FILTER MEDIA AND UNDERDRAIN BEDDING MATERIAL SHALL BE COMPACTED TO BETWEEN 90% AND 92% STANDARD PROCTOR.
2. PERFORATED UNDERDRAIN PIPE SHALL BE 4" SLOTTED PIPE. SPACED 15 FEET ON CENTER MAXIMUM.
3. TRIBUTARY AREAS SHALL BE STABILIZED PRIOR TO INSTALLATION OF THE SOIL FILTER MEDIA MIXTURE AND UNDERDRAIN. STABILIZED IS DEFINED AS PAVED IF IN A PARKING AREA OR ROADWAY, AND 90% GRASS CATCH IF IN A VEGETATED AREA.
4. OUTFLOW OF THE VEGETATED UNDERDRAIN SHALL BE CONTROLLED BY A 4" DUCTILE IRON GATE VALVE WITH VALVE WRENCH AND EXTENSION (AVAILABLE FROM E.J. PRESCOTT OR EQUIVALENT). A THREE PIECE VALVE BOX (AVAILABLE FROM E.J. PRESCOTT OR EQUIVALENT) SHALL BE INSTALLED OVER THE VALVE.
5. ALL EQUIPMENT USED WITHIN THE LIMITS OF THE VEGETATED UNDERDRAIN SHALL BE LOW GROUND PRESSURE VEHICLES (LESS THAN 2.0 PSI) WHEN FULLY LOADED.
6. UPON COMPLETION OF THE INSTALLATION OF THE SOIL FILTER MEDIA AND THE ESTABLISHMENT OF A 90% CATCH OF GRASS OVER THE FILTER MEDIA, THE CONTRACTOR SHALL FLOOD THE GRASSED UNDERDRAIN TO THE DESIGN ELEVATION WITH CLEAN WATER AND ADJUST THE VALVE TO OBTAIN A 24 HOUR TO 32 HOUR RELEASE TIME.



SCHEDULE A	
ITEM DESCRIPTION	GRASSED UNDERDRAIN DIMENSION/ELEVATION
A CHANNEL PROTECTION VOLUME STAGE	397.17
B TOP SOIL FILTER	395.67
C TOP UNDERDRAIN BEDDING STONE	394.17
D PIPE INVERT: 4" PERF. UD	393.50
E BOTTOM UNDERDRAIN BEDDING	393.17
F LINER UNDERDRAIN INVERT	392.50



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Issued For	Date	By

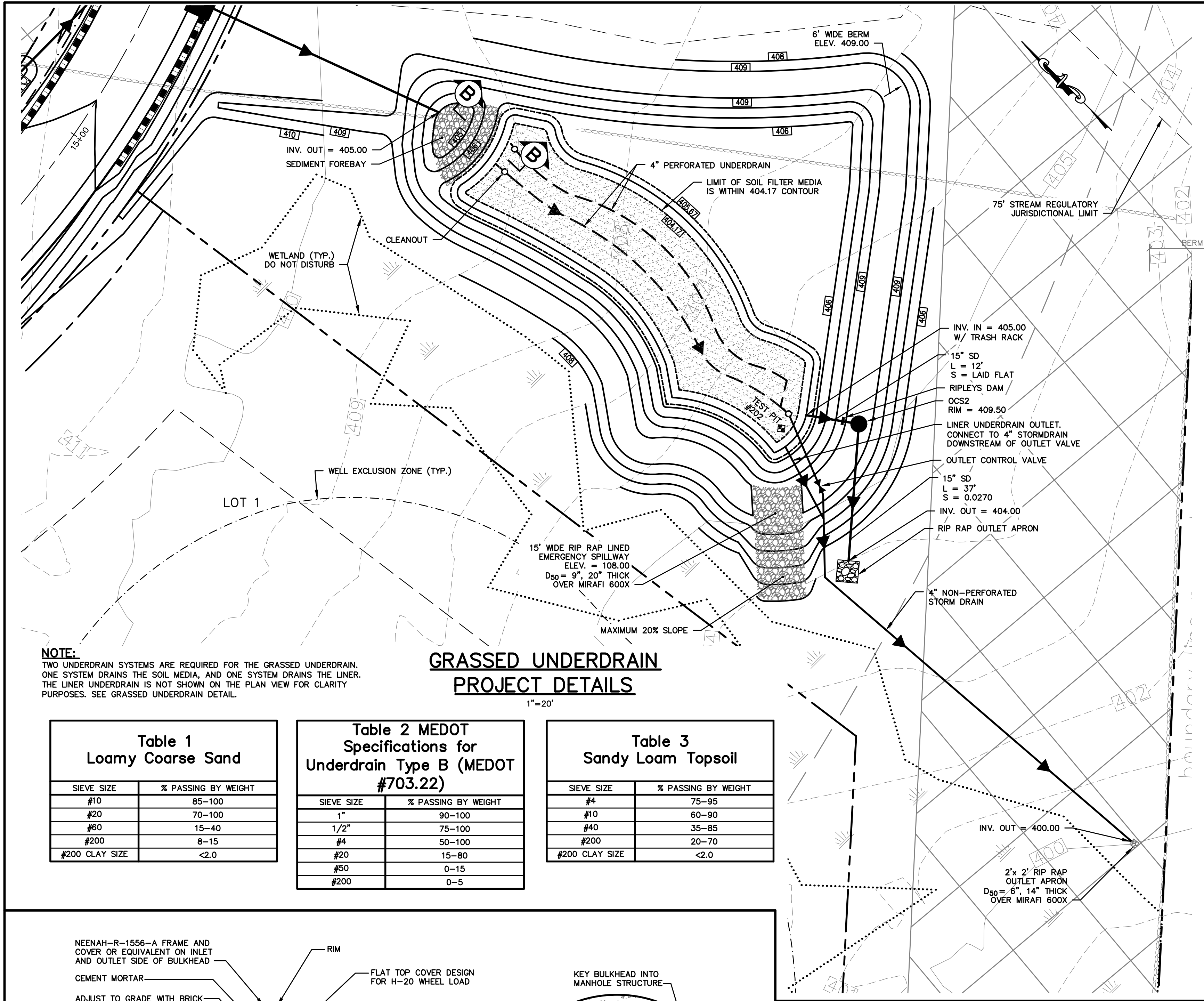
Design: JWA	Draft: LAN	Date: DEC 2017
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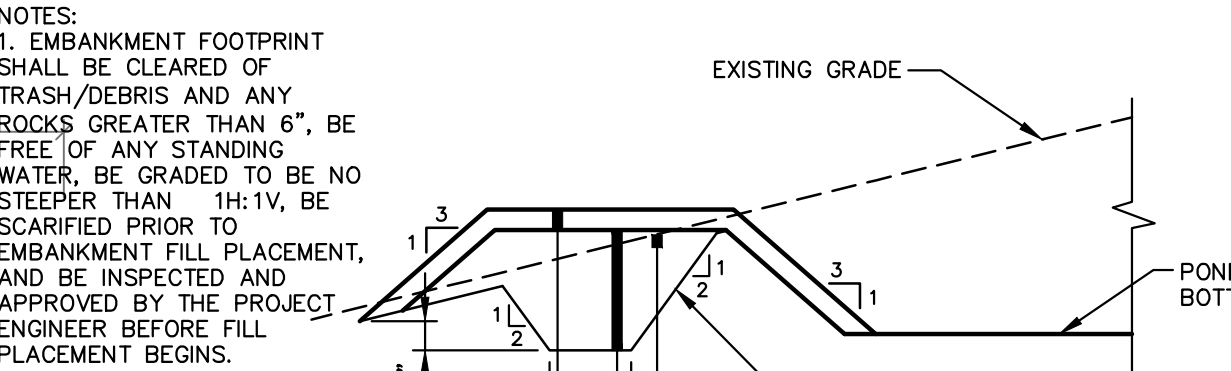
Drawing Name:	Grassed Underdrain Filter #1 Plan and Details
Project:	Orchard Road Subdivision Cumberland, Maine
Client:	TZ Properties Falmouth, Me 04105

Drawing No.	12
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CONSTRUCTION OVERSIGHT

- INSPECTION OF THE FILTER BASIN SHALL BE PROVIDED FOR EACH PHASE OF CONSTRUCTION BY THE DESIGN ENGINEER WITH REQUIRED REPORTING TO THE DEP. AT A MINIMUM, INSPECTIONS WILL OCCUR:
- AFTER PRELIMINARY CONSTRUCTION OF THE FILTER GRADES AND ONCE THE UNDERDRAIN PIPES ARE INSTALLED BUT NOT BACKFILLED.
 - AFTER THE DRAINAGE LAYER IS CONSTRUCTED AND PRIOR TO THE INSTALLATION OF THE FILTER MEDIA.
 - AFTER THE FILTER MEDIA HAS BEEN INSTALLED AND SEEDING.
 - AFTER ONE YEAR TO INSPECT HEALTH OF THE VEGETATION AND MAKE CORRECTIONS.
 - ALL MATERIAL USED FOR THE CONSTRUCTION OF THE FILTER BASIN WILL BE APPROVED BY THE DESIGN ENGINEER AFTER TESTS BY A CERTIFIED LABORATORY SHOW THAT THEY ARE PASSING DEP SPECIFICATIONS.
- NOTE: CONTRACTOR SHALL NOTIFY PROJECT ENGINEER 48 HOURS PRIOR TO THE MILESTONES LISTED ABOVE TO ALLOW FOR INSPECTION.

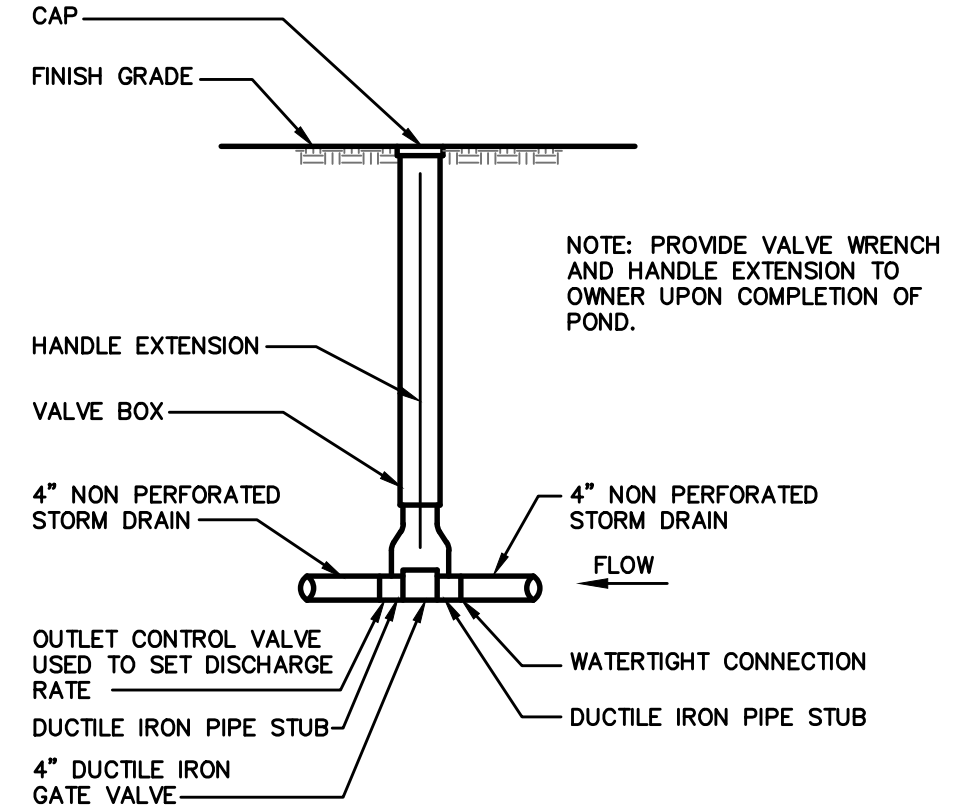


BERM CONSTRUCTION

SCHEDULE B - EMBANKMENT SCHEDULE	
ITEM DESCRIPTION	DIMENSION/ELEVATION
(A) POND BASE ELEVATION	404.17
(B) PEAK ELEVATION - CHANNEL PROTECTION VOLUME	405.67
(C) PEAK ELEVATION - 2 YEAR STORM	406.34
(D) PEAK ELEVATION - 10 YEAR STORM	407.10
(E) PEAK ELEVATION - 25 YEAR STORM	407.70
(F) TOP OF BERM	409.00

TYPICAL POND CROSS SECTION

NOT TO SCALE



OUTLET VALVE

NOT TO SCALE

GRASSED UNDERDRAIN NOTES:

SOIL SPECIFICATIONS:

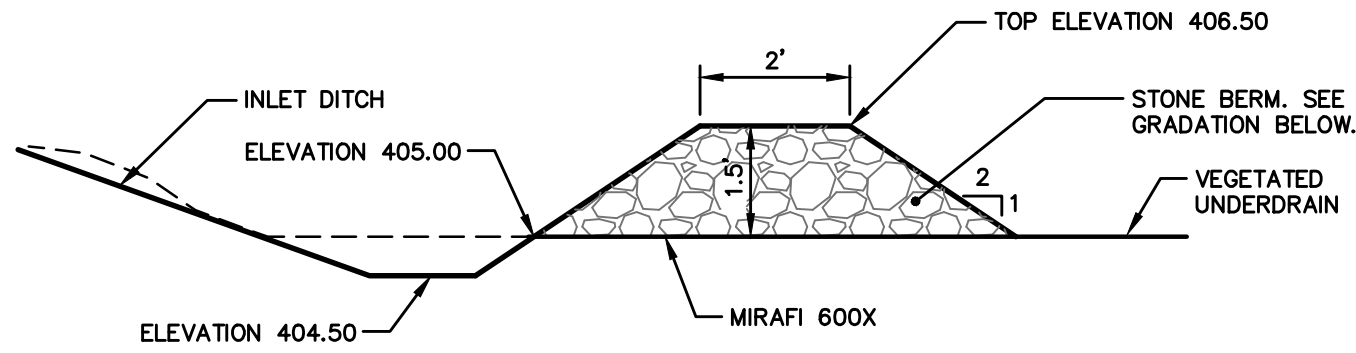
- THE SOIL FILTER MEDIA SHALL BE A LAYERED SYSTEM CONSISTING OF THE FOLLOWING FROM THE BOTTOM:
 - 12" OF LOAMY COARSE SAND, SEE TABLE 1.
 - 2" LAYER OF TOPSOIL (SEE "C" BELOW) ROTOTILLED INTO THE LOAMY COARSE SAND LAYER.
 - 6" OF NON-CLAYEY, LOAMY TOPSOIL SUCH AS USDA SANDY LOAM TOPSOIL WITH 5-8% HUMIFIED ORGANIC MATTER. SUPERHUMUS OR EQUIVALENT MAY BE ADDED TO THE TOPSOIL TO INCREASE ORGANIC CONTENT, SEE TABLE 3.
- SOIL FILTER MEDIA MIXTURE SHALL HAVE A PERMEABILITY OF 2.4 IN./HR. TO 4 IN./HR UPON COMPACTION BETWEEN 90% AND 92% STANDARD PROCTOR (ASTM D698).

SUBMITTALS:

- SUBMIT RESULTS OF FIELD AND LABORATORY TESTING TO PROJECT ENGINEER.
- SUBMIT 75 lb. SAMPLE OF EACH TYPE OF MATERIAL: SUBMIT IN AIR TIGHT CONTAINERS TO PROJECT ENGINEER.
- THE FOLLOWING MATERIAL SHALL BE SUBMITTED:
 - SAND.
 - UNDERDRAIN BEDDING MATERIAL.
- PERFORM A SIEVE ANALYSIS CONFORMING TO ASTM C136 - STANDARD TEST METHOD FOR SIEVE ANALYSIS OF FINE AND COARSE AGGREGATES; 1996g ON EACH TYPE OF THE SAMPLE MATERIAL AND SUBMIT RESULTS TO PROJECT ENGINEER.
- PERFORM A PERMEABILITY TEST ON THE SOIL FILTER MEDIA MIXTURE CONFORMING TO ASTM D2434 WITH THE MIXTURE COMPACTED TO 90% TO 92% OF MAXIMUM DRY DENSITY BASED ON ASTM D698. SUBMIT RESULTS TO THE PROJECT ENGINEER.
- PERFORM ONE COMPACTION DENSITY TEST ON THE IN PLACE SOIL FILTER FOR EVERY 2,000 SQUARE FEET OF FILTER SURFACE AREA. TEST SHALL CONFORM TO ASTM D 2922 - STANDARD TEST METHOD FOR DENSITY OF SOIL AND SOIL-AGGREGATE IN PLACE BY NUCLEAR METHODS (SHALLOW DEPTH); 1996. SUBMIT RESULTS TO THE PROJECT ENGINEER.

CONSTRUCTION:

- SOIL FILTER MEDIA AND UNDERDRAIN BEDDING MATERIAL SHALL BE COMPACTED TO BETWEEN 90% AND 92% STANDARD PROCTOR.
- PERFORATED UNDERDRAIN PIPE SHALL BE 4" SLOTTED PIPE. SPACED 15 FEET ON CENTER MAXIMUM.
- TRIBUTARY AREAS SHALL BE STABILIZED PRIOR TO INSTALLATION OF THE SOIL FILTER MEDIA MIXTURE AND UNDERDRAIN. STABILIZED IS DEFINED AS PAVED IF IN A PARKING AREA OR ROADWAY, AND 90% GRASS CATCH IF IN A VEGETATED AREA.
- OUTFLOW OF THE VEGETATED UNDERDRAIN SHALL BE CONTROLLED BY A 4" DUCTILE IRON GATE VALVE WITH VALVE WRENCH AND EXTENSION (AVAILABLE FROM E.J. PRESCOTT OR EQUIVALENT). A THREE PIECE VALVE BOX (AVAILABLE FROM E.J. PRESCOTT OR EQUIVALENT) SHALL BE INSTALLED OVER THE VALVE.
- ALL EQUIPMENT USED WITHIN THE LIMITS OF THE VEGETATED UNDERDRAIN SHALL BE LOW GROUND PRESSURE VEHICLES (LESS THAN 2.0 PSI) WHEN FULLY LOADED.
- UPON COMPLETION OF THE INSTALLATION OF THE SOIL FILTER MEDIA AND THE ESTABLISHMENT OF A 90% CATCH OF GRASS OVER THE FILTER MEDIA, THE CONTRACTOR SHALL FLOOD THE GRASSED UNDERDRAIN TO THE DESIGN ELEVATION WITH CLEAN WATER AND ADJUST THE VALVE TO OBTAIN A 24 HOUR TO 32 HOUR RELEASE TIME.



BERM STONE SIZE	
SIEVE DESIGNATION (US CUSTOMARY)	PERCENT BY WEIGHT PASSING
12 IN	100
6 IN	84-100
3 IN	68-83
1 IN	42-55
NO. 4	8-12

SEDIMENT FOREBAY - SECTION B-B

NOT TO SCALE

Table 1
Loamy Coarse Sand

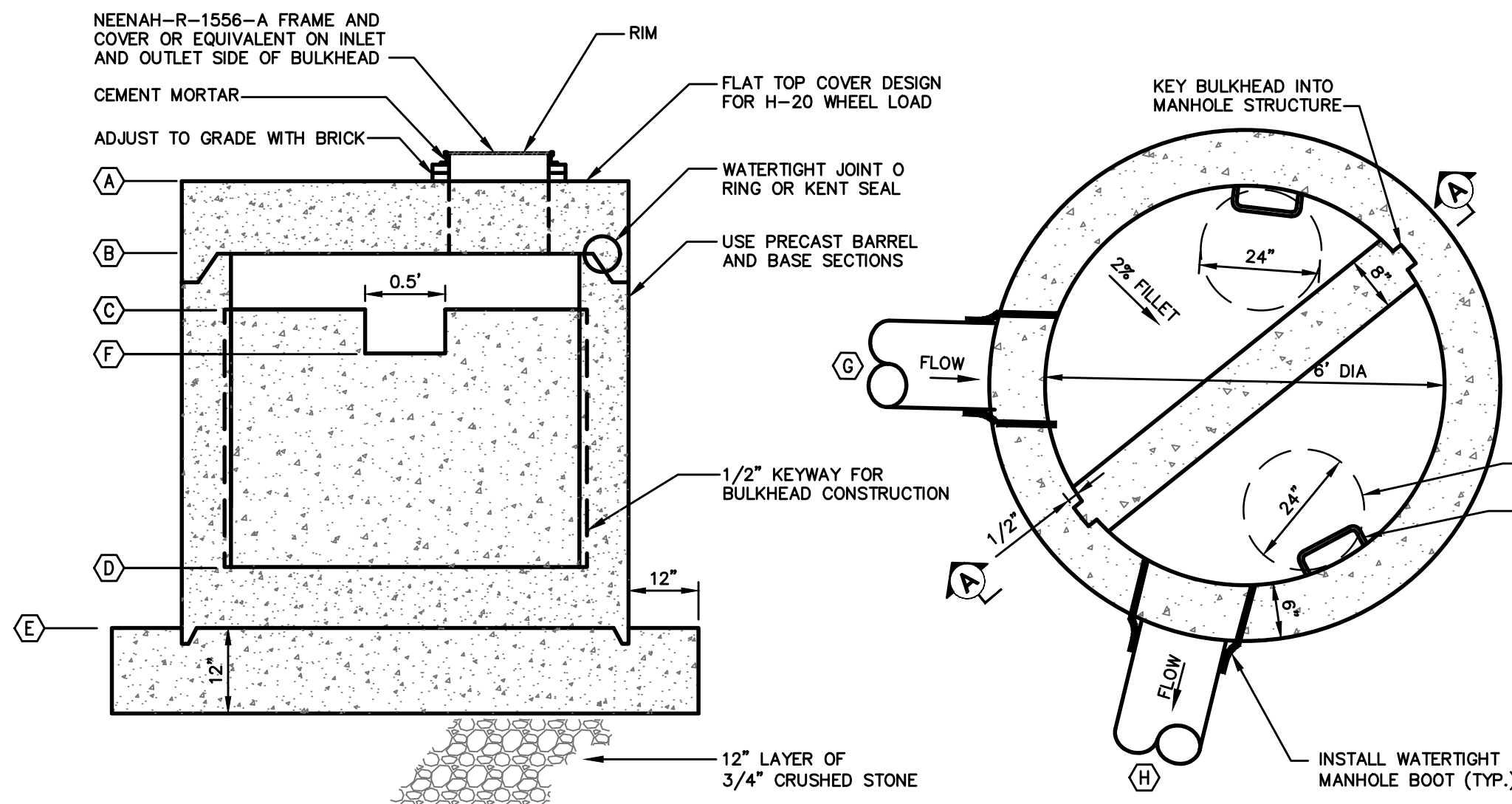
SIEVE SIZE	% PASSING BY WEIGHT
#10	85-100
#20	70-100
#60	15-40
#200	8-15
#200 CLAY SIZE	<2.0

Table 2 MEDOT
Specifications for
Underdrain Type B (MEDOT
#703.22)

SIEVE SIZE	% PASSING BY WEIGHT
1"	90-100
1/2"	75-100
#4	50-100
#20	15-80
#50	0-15
#200	0-5

Table 3
Sandy Loam Topsoil

SIEVE SIZE	% PASSING BY WEIGHT
#4	75-95
#10	60-90
#40	35-85
#200	20-70
#200 CLAY SIZE	<2.0



SECTION A-A

PLAN VIEW

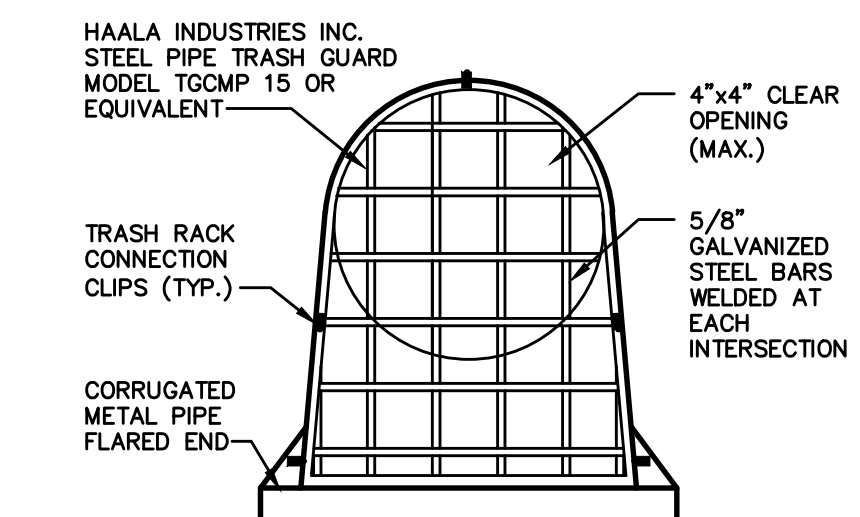
6' OUTLET CONTROL STRUCTURE 1 (OCS1)

SEE SCHEDULE C

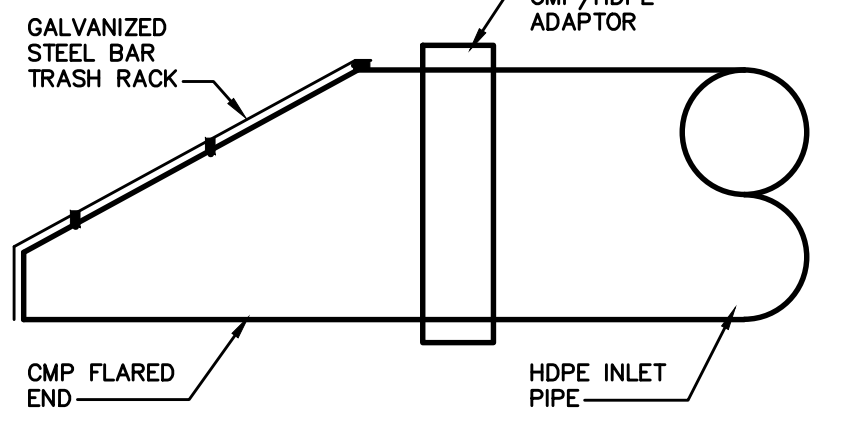
NOT TO SCALE

SCHEDULE A	
ITEM DESCRIPTION	GRASSED UNDERDRAIN DIMENSION/ ELEVATION
A CHANNEL PROTECTION VOLUME STAGE	405.67
B TOP SOIL FILTER	404.17
C TOP UNDERDRAIN BEDDING STONE	402.67
D PIPE INVERT: 4" PERF. UD	402.00
E BOTTOM UNDERDRAIN BEDDING	401.67
F LINER UNDERDRAIN INVERT	401.00

SCHEDULE C	
ITEM DESCRIPTION	ELEVATION
A TOP OF STRUCTURE	409.32
B UNDERSIDE TOP SLAB	408.65
C TOP CONCRETE BULKHEAD	408.00
D MANHOLE INVERT	405.00
E BOTTOM OF STRUCTURE	404.00
F WEIR CREST	405.90
G PIPE DIAMETER	15"
H INVERT IN	405.00
I PIPE DIAMETER	15"
J INVERT OUT	405.00

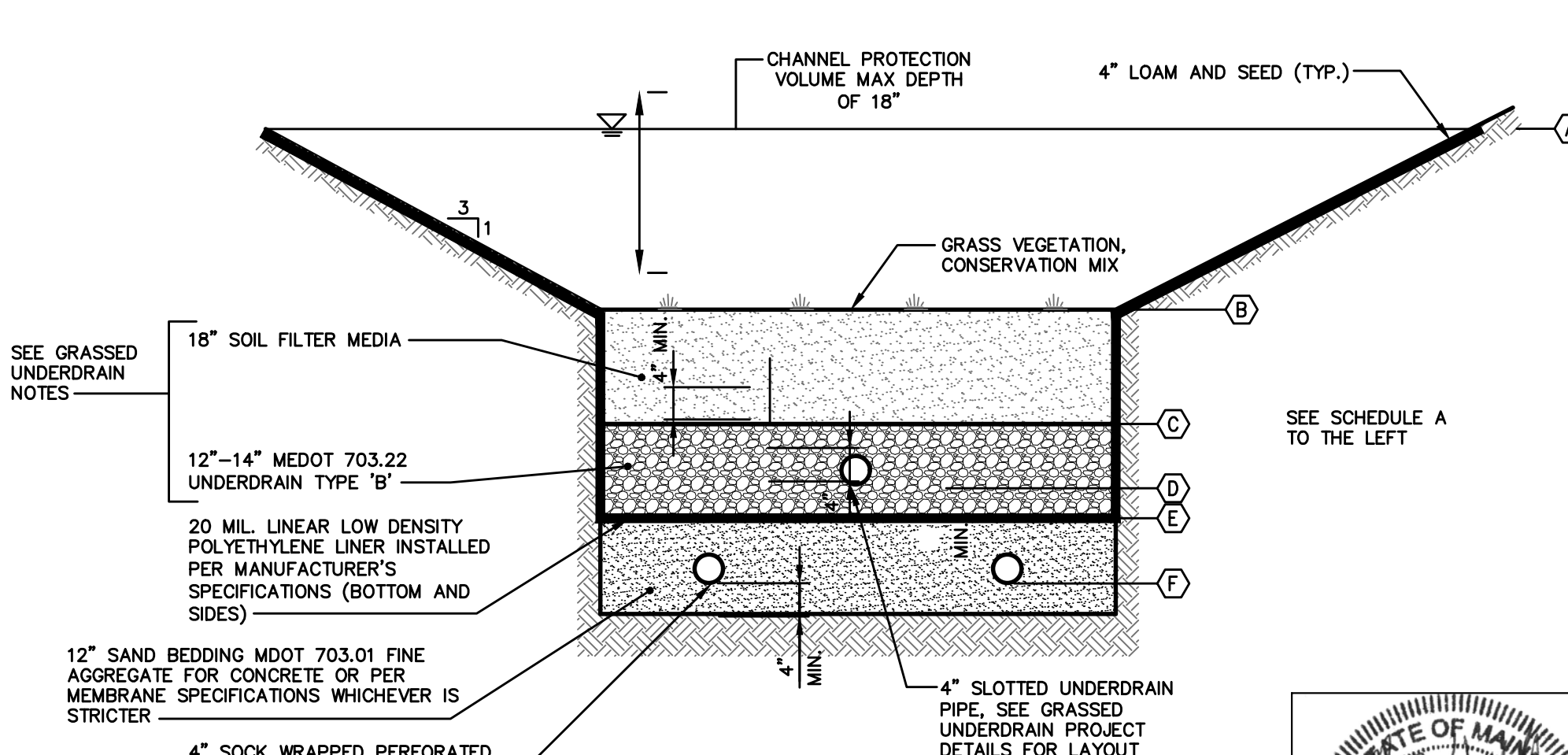


FRONT VIEW



SIDE VIEW
TRASH RACK

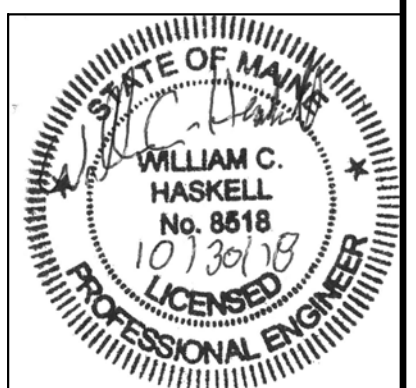
NOT TO SCALE



GRASSED UNDERDRAIN DETAIL

NOT TO SCALE

GRASS VEGETATION	
CREeping RED FESCUE	20 LBS/ACRE
TALL FESCUE	20 LBS/ACRE
BIRDFOOT TREFOIL	8 LBS/ACRE



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Rev.	Date	Revision

Subdivision Amendment	9-25-18	WCH
Planning Board Signature	8-1-18	WCH
Preliminary/Final Subdivision Application	5-22-18	WCH
MDEP/ACOE Permitting	12-22-17	WCH
Preliminary Subdivision Application	10-31-17	WCH
Issued For	Date	By

Design: JWA	Draft: LAN	Date: DEC 2017
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Drawing Name:	Grassed Underdrain Filter #2 Plan and Details
Project:	Orchard Road Subdivision Cumberland, Maine
Client:	TZ Properties Falmouth, Me 04105

Drawing No.
13

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1.3.5 Erosion Control Measures and Site Stabilization

The primary emphasis of the erosion/sedimentation control plan, which will be implemented for this project, is as follows:

- Development of a careful construction sequence.
- Rapid revegetation of denuded areas to minimize the period of soil exposure.
- Rapid stabilization of drainage paths to avoid rill and gully erosion.
- The use of on-site measures to capture sediment (hay bales/ stone check dams/silt fence, etc.)

The following temporary and permanent erosion and sediment control devices will be implemented as part of the site development. These devices shall be installed as indicated on the plans or as described within this report. For further reference, see the latest edition of the Maine Erosion and Sediment Control Practices Field Guide for Contractors.

A. Dewatering

Water from construction trench dewatering shall pass first through a filter bag or secondary containment structure (e.g. hay bale lined pool) prior to discharge. The discharge site shall be selected to avoid flooding, icing, and sediment discharges to a protected resource. In no case shall the filter bag or containment structure be located within 50 feet of a protected natural resource.

B. Inspection and Monitoring

Maintenance measures shall be applied as needed during the entire construction season. After each rainfall, snow storm or period of thawing and runoff, the site contractor shall perform a visual inspection of all installed erosion control measures and perform repairs as needed to insure their continuous function. Following the temporary and/or final seeding and mulching, the contractor shall in the spring inspect and repair any damages and/or unestablished spots. Established vegetative cover means a minimum of 90% of areas vegetated with vigorous growth.

The following standards must be met during construction.

- (a) Inspection and corrective action. Inspect disturbed and impervious areas, erosion control measures, materials storage areas that are exposed to precipitation, and locations where vehicles enter or exit the site. Inspect these areas at least once a week as well as before and within 24 hours after a storm event (rainfall), and prior to completing permanent stabilization measures. A person with knowledge of erosion and stormwater control, including the standards and conditions in the permit, shall conduct the inspections.
- (b) Maintenance. If best management practices (BMPs) need to be repaired, the repair work should be initiated upon discovery of the problem but no later than the end of the next workday. If additional BMPs or significant repair of BMPs are necessary, implementation must be completed within 7 calendar days and prior to any storm event (rainfall). All measures must be maintained in effective operating condition until areas are permanently stabilized.
- (c) Documentation. Keep a log (report) summarizing the inspections and any corrective action taken. The log must include the name(s) and qualifications of the person making the inspections, the date(s) of the inspections, and major observations about the operation and maintenance of erosion and sedimentation controls, materials storage areas, and vehicles access points to the parcel. Major observations must include BMPs that need maintenance, BMPs that failed to operate as designed or proved inadequate for a particular location, and location(s) where additional BMPs are needed. For each BMP requiring maintenance, BMP needing replacement, and location needing additional BMPs, note in the log the corrective action taken and when it was taken.

The log must be made accessible to MDEP and Town of Cumberland staff and a copy must be provided upon request. The permittee shall retain a copy of the log for a period of at least three years from the completion of permanent stabilization.

C. Temporary Erosion Control Measures

The following measures are planned as temporary erosion/sedimentation control measures during construction:

1. Crushed stone--stabilized construction entrance shall be placed at the entrance from Orchard Road.
2. Siltation fence or wood waste compost berms shall be installed downstream of any disturbed areas to trap runoff-- borne sediments until grass areas are revegetated. The silt fence and/or wood waste compost berms shall be installed per the details provided in this package and inspected at least once a week and before and immediately after a storm event of 0.5 inches or greater, and at least daily during prolonged rainfall. Repairs shall be made if there are any signs of erosion or sedimentation below the fence or berm line. If there are signs of undercutting at the center or edges, or impounding of large volumes of water behind the fence or berm, the barrier shall be replaced with a stone check dam. Wood waste compost berms are not to be used adjacent to wetland areas that are not to be disturbed.
3. Straw or hay mulch including hydroseeding is intended to provide cover for denuded or seeded areas until revegetation is established. Mulch placed between April 15th and October 15th on slopes of less than 15 percent shall be anchored by applying water; mulch placed on slopes of equal to or steeper than 15 percent shall be covered by a fabric netting and anchored with staples in accordance with manufacturer's recommendation. Fabric netting and staples shall be used on disturbed areas within 50' of lakes, streams, and wetlands regardless of the upstream slope. Mulch placed between October 15th and April 15th on slopes equal to or steeper than 8 percent shall be covered with a fabric netting and anchored with staples in accordance with the manufacturer's recommendations. Slopes steeper than 3:1 and equal to or flatter than 2:1, which are to be revegetated, shall receive curlex blankets by American Excelsior or equal. Slopes steeper than 2:1 shall receive riprap as noted on the plans. The mulch application rate for both temporary and permanent seeding is 75 lbs per 1000 sf as identified in the seeding plan. Mulch shall not be placed over snow.
4. Temporary stockpiles of stumps, grubbing, or common excavation will be protected as follows:
 - a) Temporary stockpiles shall not be located within 100 feet of any wetlands which will not be disturbed and shall be located away from drainage swales.
 - b) Stockpiles shall be stabilized within 7 days by either temporarily seeding the stockpile by a hydroseed method containing an emulsified mulch tackifier or by covering the stockpile with mulch, such as hay, straw, or erosion control mix.
 - c) Stockpiles shall be surrounded by sedimentation barrier at the time of formation.
5. All denuded areas that are within 100 feet of an undisturbed wetland, which have been rough graded and are not located within a building pad, parking area, or access drive subbase area, shall receive mulch or erosion control mesh fabric within 48 hours of initial disturbance of soil. All areas within 100 feet of an undisturbed wetland shall be mulched prior to any predicted rain event regardless of the 48 hour window. In other areas, the time period may be extended to 7 days.
6. For work, which is conducted between October 15th and April 15th of any calendar year, all denuded areas, shall be covered with hay mulch or erosion control mix, applied at twice the normal application rate and anchored with a fabric netting. The time period for applying mulch shall be limited to 2 days for all areas.
7. Orchard Road shall be swept to control mud and dust as necessary. Additional stone shall be added to the stabilized construction entrance to minimize the tracking of material off the site and onto the surrounding roadways.
8. During grubbing operations stone check dams shall be installed at any evident concentrated flow discharge points and as directed on the Erosion Control Plans.
9. Silt fencing with a minimum stake spacing of 6 feet shall be used, unless the fence is supported by wire fence reinforcement of minimum 14 gauge and with a maximum mesh spacing of 6 inches, in which case stakes may be spaced a maximum of 10 feet apart. The bottom of the fence shall be anchored. A double row of silt fence shall be used adjacent to wetlands.
10. Wood waste compost/bark berms may be used in lieu of siltation fencing. Berms shall be removed and spread in a layer not to exceed 3" thick once upstream areas are completed and a 90% catch of vegetation is attained.
11. Storm drain catch basin inlet protection shall be provided through the use of stone sediment barriers or approved sediment bags (such as Silt Sack). Installation details are provided in the plan set. The barriers shall be inspected after each rainfall and repairs made as necessary. Sediment shall be removed and the barrier restored to its original dimensions when the sediment has accumulated to ½ the design depth of the barrier. The barrier shall be removed when the tributary drainage area has been stabilized.
12. Water and/or calcium chloride shall be furnished and applied in accordance with MDOT specifications -- Section 637 -- Dust Control.
13. Loam and seed is intended to serve, as the primary permanent revegetative measure for all denuded areas not provided with other erosion control measures, such as riprap. Application rates are provided in the seeding plan. Seeding shall not occur over snow.

D. Permanent Erosion Control Measures

The following permanent erosion control measures have been designed as part of the Erosion/Sedimentation Control Plan:

1. All areas disturbed during construction, but not subject to other restoration (paving, riprap, etc.) will be loamed, limed, fertilized, mulched, and seeded. Fabric netting, anchored with staples, shall be placed over the mulch in areas as noted in Temporary Erosion Control Measures paragraph 3 of this report. All areas within 100 feet of an undisturbed wetland shall be mulched prior to any predicted rain event regardless of the 48 hour window. Native topsoil shall be stockpiled and reused for final restoration when it is of sufficient quality.
2. All storm drain pipe outlets shall have riprap aprons at their outlet to protect the outlet and receiving channel from scour and deterioration. Installation details are provided in the plan set. The aprons shall be installed and stabilized to the extent practicable prior to directing runoff to the tributary pipe or culvert.
3. Catch basins shall be provided with sediment sumps and inlet hoods (the Snout) for all outlet pipes that are 18" in diameter or less.

1.4 Implementation Schedule

The following construction sequence shall be required to insure the effectiveness of the erosion and sedimentation control measures are optimized: It is anticipated that construction of the Subdivision roadway and related infrastructure will commence in Spring of 2018 and be completed by Winter of 2018.

Note: For all grading activities, the contractor shall exercise extreme caution not to overexpose the site, this shall be accomplished by limiting the disturbed area.

1. Install stabilized construction entrance at the intersection of the proposed roadway and Orchard Road.
2. Install perimeter silt fence and/or wood waste berms prior to grubbing respective areas.
3. Clear and grub roadway and stormwater management areas using caution not to overexpose the site. Install stone check dams at any evident concentrated flow discharge points.
4. Commence earthwork and grading to subgrade.

5. Commence installation of drainage appurtenances.
6. Commence construction grassed underdrained soil filter.
7. Commence installation of electric/cable/telephone lines.
8. Complete remaining earthwork operations.
9. Complete installation of catch basins and appurtenances.
10. Install sub--base and base gravel within roadway.
11. Install curbing along the streets as needed.
12. Install base course paving for roadway.
13. Loam, lime, fertilize, seed and mulch disturbed areas.
14. Install surface course paving for roadway. Stripe per plan.
15. Once the site is stabilized and a 90% catch of vegetation has been obtained, remove all temporary erosion control measures.
16. Touch up loam and seed.

Note: All denuded areas not subject to final paving, riprap, or gravel shall be revegetated.

Prior to construction of the project, the contractor shall submit to the owner a schedule for the completion of the work, which will satisfy the following criteria:

1. The above construction sequence should generally be completed in the specified order; however, several separate items may be constructed simultaneously. Work must also be scheduled or phased to reduce the extent of the exposed areas as specified below. The intent of this sequence is to provide for erosion control and to have structural measures such as silt fence areas and construction entrances in place before large areas of land are denuded.
2. The work shall be conducted in sections which shall:
 - a) Limit the amount of exposed area to those areas in which work is expected to be undertaken during the proceeding 30 days.
 - b) Revegetate disturbed areas as rapidly as possible. All areas shall be permanently stabilized within 7 days of final grading or before a storm event; or temporarily stabilized within 48 hours of initial disturbance of soil for areas within 100 feet of an undisturbed wetland and 7 days for all other areas. Areas within 100 feet of an undisturbed wetland shall be mulched prior to any predicted rain event regardless of the 48 hour window.
 - c) Incorporate planned inlets and drainage system as early as possible into the construction phase. The ditches shall be immediately lined or revegetated as soon as their installation is complete.

1.5 Erosion, Sedimentation and Stabilization Control Plan

The Erosion Control Plan is included in the plan set.

1.6 Details and Specifications

The Erosion Control details and specifications are included in the plan set.

1.7 Winter Stabilization Plan

The winter construction period is from November 1 through April 15. If the construction site is not stabilized with pavement, a road gravel base, 75% mature vegetation cover or riprap by November 15 then the site needs to be protected with over--winter stabilization. An area considered open is any area not stabilized with pavement; vegetation, mulching, erosion control mats, riprap or gravel base on a road.

Winter excavation and earthwork shall be completed such that any area left exposed can be controlled by the contractor. Limit the exposed area to those areas in which work is expected to be under taken during the proceeding 15 days and that can be mulched in one day prior to any snow event.

All areas shall be considered to be denuded until the subbase gravel is installed in roadway/parking areas or the areas of future loam and seed have been loamed, seeded and mulched. Hay and straw mulch rate shall be a minimum of 150 lbs./1,000 s.f. (3 tons/acre) and shall be properly anchored.

The contractor shall install any added measures which may be necessary to control erosion/sedimentation from the site dependent upon the actual site and weather conditions. Continuation of earthwork operations on additional areas shall not begin until the exposed soil surface on the area being worked has been stabilized, in order to minimize areas without erosion control protection.

1. Soil Stockpiles
Stockpiles of soil or subsoil shall be mulched for over winter protection with hay or straw at twice the normal rate or at 150 lbs/1,000 s.f. (3 tons per acre) or with a four--inch layer of woodwaste erosion control mix. This shall be done within 24 hours of stocking and re--established prior to any rainfall or snowfall. Any soil stockpile shall not be placed (even covered with hay or straw) within 100 feet from any natural resources.

2. Natural Resource Protection
Any areas within 100 feet from any natural resources, if not stabilized with a minimum of 75% mature vegetation catch, shall be mulched by December 1 and anchored with plastic netting or protected with erosion control mats. During winter construction, a double line of sediment barriers (i.e. silt fence backed with hay bales or erosion control mix) shall be placed between any natural resource and the disturbed area. Projects crossing the natural resource shall be protected a minimum distance of 100 feet on either side from the resource. Existing projects not stabilized by December 1 shall be protected with the second line of sediment barrier to ensure functionality during the spring thaw and rains.

3. Sediment Barriers
During frozen conditions, sediment barriers shall consist of woodwaste filter berms as frozen soil prevents the proper installation of hay bales and sediment silt fences.

4. Mulching
An area shall be considered denuded until areas of future loam and seed have been loamed, seeded and mulched. Hay and straw mulch shall be applied at a rate of 150 lb. per 1,000 square feet or 3 tons/acre (twice the normal accepted rate of 75--lbs./1,000 s.f. or 1.5 tons/acre) and shall be properly anchored. Mulch shall not be spread on top of snow. The snow shall be removed down to a one--inch depth or less prior to application. After each day of final grading, the area shall be properly stabilized with anchored hay or straw or erosion control matting. An area shall be considered to have been stabilized when exposed surfaces have been either mulched with straw or hay at a rate of 150 lb. per 1,000 square feet (3 tons/acre) and adequately anchored that ground surface is not visible though the mulch.

Between the dates of November 1 and April 15, all mulch shall be anchored by peg line, mulch netting, asphalt emulsion chemical, or wood cellulose fiber. When ground surface is not visible through the mulch then cover is sufficient. After November 1st, mulch and anchoring of all bare soil shall occur at the end of each final grading workday.

5. Mulching on Slopes and Ditches
Slopes shall not be left exposed for any extended time of work suspension unless fully mulched and anchored with peg and netting or with erosion control blankets. Mulching shall be applied at a rate of 230 lbs/1,000 s.f. on all slopes greater than 8%.

Mulch netting shall be used to anchor mulch in all drainage ways with a slope greater than 3% for slopes exposed to direct winds and for all other slopes greater than 8%. Erosion control blankets shall be used in lieu of mulch in all drainage ways with slopes greater than 8%. Erosion control mix can be used to substitute erosion control blankets on all slopes except ditches.

6. Seeding
Between the dates of October 15 and April 1st, loam or seed will not be required. During periods of above freezing temperatures finished areas shall be fine graded and either protected with mulch or temporarily seeded and mulched until such time as the final treatment can be applied. If the date is after November 1st and if the exposed area has been loamed, final graded with a uniform surface, then the area may be dormant seeded at a rate of 3 times higher than specified for permanent seed and then mulched. Dormant seeding may be selected to be placed prior to the placement of mulch and fabric netting anchored with staples. If dormant seeding is used for the site, all disturbed areas shall receive 4" of loam and seed at an application rate of 5 lbs/1,000 s.f. All areas seeded during the winter shall be inspected in the spring for adequate catch. All areas insufficiently vegetated (less than 75% catch) shall be revegetated by replacing loam, seed and mulch. If dormant seeding is not used for the site, all disturbed areas shall be revegetated in the spring.

Standards for Timely Stabilization of Construction Sites During Winter

1. Standard for the timely stabilization of ditches and channels --- The applicant shall construct and stabilize all stone--lined ditches and channels on the site by November 15. The applicant shall construct and stabilize all grass--lined ditches and channels on the site by September 1. If the applicant fails to stabilize a ditch or channel to be grass--lined by September 1, then the applicant will take one of the following actions to stabilize the ditch for late fall and winter.

Install a sod lining in the ditch --- The applicant shall line the ditch with properly installed sod by October 1. Proper installation includes the applicant pinning the sod onto the soil with wire pins, rolling the sod to guarantee contact between the sod and underlying soil, watering the sod to promote root growth into the disturbed soil, and anchoring the sod with jute or plastic mesh to prevent the sod strips from sloughing during flow conditions.

Install a stone lining in the ditch ---The applicant shall line the ditch with stone riprap by November 15. The applicant shall hire a registered professional engineer to determine the stone size and lining thickness needed to withstand the anticipated flow velocities and flow depths within the ditch. If necessary, the applicant shall regrade the ditch prior to placing the stone lining so to prevent the stone lining from reducing the ditch's cross--sectional area.

2. Standard for the timely stabilization of disturbed slopes --- The applicant shall construct and stabilize stone--covered slopes by November 15. The applicant shall seed and mulch all slopes to be vegetated by September 1. The department shall consider any area having a grade greater than 15% to be a slope. If the applicant fails to stabilize any slope to be vegetated by September 1, then the applicant shall take one of the following actions to stabilize the slope for late fall and winter.

Stabilize the soil with temporary vegetation and erosion control mats --- By September 1 the applicant shall seed the disturbed slope with winter rye at a seeding rate of 3 pounds per 1,000 square feet and apply erosion control mats over the mulched slope. The applicant shall monitor growth of the rye over the next 30 days. If the rye fails to grow at least three inches or cover at least 75% of the disturbed slope by November 1, then the applicant shall cover the slope with a layer of woodwaste compost as described in item iii of this standard or with stone riprap as described in item iv of this standard.

Stabilize the slope with sod --- The applicant shall stabilize the disturbed slope with properly installed sod by September 1. Proper installation includes the applicant pinning the sod onto the slope with wire pins, rolling the sod to guarantee contact between the sod and underlying soil, and watering the sod to promote root growth into the disturbed soil. The applicant shall not use late--season sod installation to stabilize slopes having a grade greater than 33% (3h:1V).

Stabilize the slope with woodwaste compost --- The applicant shall place a six--inch layer of woodwaste compost on the slope by November 15. Prior to placing the woodwaste compost, the applicant shall remove any snow accumulation on the disturbed slope. The applicant shall not use woodwaste compost to stabilize slopes having grades greater than 50% (2h:1V) or having groundwater seeps on the slope face.

Stabilize the slope with stone riprap --- The applicant shall place a layer of stone riprap on the slope by November 15. The applicant shall hire a registered professional engineer to determine the stone size needed for stability and to design a filter layer for underneath the riprap.

3. Standard for the timely stabilization of disturbed soils --- By September 15 the applicant shall seed and mulch all disturbed soils on areas having a slope less than 15%. If the applicant fails to stabilize these soils by this date, then the applicant shall take one of the following actions to stabilize the soil for late fall and winter.

Stabilize the soil with temporary vegetation --- By September 1 the applicant shall seed the disturbed soil with winter rye at a seeding rate of 3 pounds per 1000 square feet, lightly mulch the seeded soil with hay or straw at 75 pounds per 1000 square feet, and anchor the mulch with plastic netting. The applicant shall monitor growth of the rye over the next 30 days. If the rye fails to grow at least three inches or cover at least 75% of the disturbed soil before November 1, then the applicant shall mulch the area for over--winter protection as described below.

Stabilize the soil with sod --- The applicant shall stabilize the disturbed soil with properly installed sod by September 15. Proper installation includes the applicant pinning the sod onto the soil with wire pins, rolling the sod to guarantee contact between the sod and underlying soil, and watering the sod to promote root growth into the disturbed soil.

Stabilize the soil with mulch --- By November 15 the applicant shall mulch the disturbed soil by spreading hay or straw at a rate of at least 150 pounds per 1000 square feet on the area so that no soil is visible through the mulch. Prior to applying the mulch, the applicant shall remove any snow accumulation on the disturbed area. Immediately after applying the mulch, the applicant will anchor the mulch with plastic netting to prevent wind from moving the mulch off the disturbed soil.

1.8 Maintenance of facilities

The stormwater facilities will be maintained by the Applicant, TZ Properties, LLC or their assigned heirs. The contract documents will require the contractor to designate a person responsible for maintenance of the sedimentation control measures during construction as required by the Erosion Control Report. Long--term operation/maintenance recommended for the stormwater facilities is presented below.

The responsible party may contract with such professionals, as may be necessary in order to comply with this provision and may rely on the advice of such professionals in carrying out its duty hereunder, provided, that the following operation and maintenance procedures are hereby established as a minimum for compliance with this section. A maintenance log of the inspections shall be kept by the responsible party.

Inspection and Maintenance Frequency and Corrective Measures:

The following areas, facilities, and measures will be inspected and the identified deficiencies will be corrected. Clean--out must include the removal and legal disposal of any accumulated sediments and debris.

Catch Basins:

Inspect catch basins 2 times per year (preferably in Spring and Fall) to ensure that the catch basins are working in their intended fashion and that they are free of debris. Clean structures when sediment depths reach 12" from invert of outlet. If the basin outlet is designed with a hood to trap floatable materials (i.e. Snout), check to ensure watertight seal is working. At a minimum, remove floating debris and hydrocarbons at the time of the inspection.

Culverts:

Inspect culverts 2 times per year (preferably in Spring and Fall) to ensure that the culverts are working in their intended fashion and that they are free of debris. Remove any obstructions to flow; remove accumulated sediments and debris at the inlet, at the outlet, and within the conduit and repair any erosion damage at the culvert's inlet and outlet.

Inlet/Outlet Control Structures:

Inspect structures and piping 2 times per year (preferably in Spring and Fall) to ensure that the structures are working in their intended fashion and that they are free of debris. Remove any obstructions to flow; remove accumulated sediments and debris within the structure.

Stormdrain Outlets:

Inspect outlets 2 times per year (preferably in Spring and Fall) to ensure that the outlets are working in their intended fashion and that they are free of debris. Remove any obstructions to flow; remove accumulated sediments and debris at the outlet and within the conduit. Repair any erosion damage at the stormdrain outlet.

Soil Filter -- Bio-Filteration:

Inspect all upstream pre--treatment measures 2 times per year (preferably in Spring and Fall) for sediment and floatables accumulation. Remove and dispose of any sediments or debris.

Surface (Underdrain Pond, Swale or Bio-Filter):
The soil filter will be inspected within the first three months after construction; thereafter the filter will be inspected 2 times per year (preferably in Spring and Fall) to ensure that the filter is draining within 24 to 48 hours of a rain event equivalent to 1" or more. Adjustments will be made to the outlet valve to ensure that the grassed underdrained soil filter drains within 24 to 48 hours. Failure to drain in 72 hours will require part or all of the soil filter media to be removed and replaced with new material meeting the soil filter gradation. The facilities will be inspected after major storms and any identified deficiencies will be corrected. Harvesting and weeding of excessive growth shall be performed as needed. Inspect for unwanted or invasive plants and remove as necessary.

Vegetated Areas:

Inspect slopes and embankments early in the growing season to identify active or potential erosion problems. Replant bare areas or areas with sparse growth. Where fill erosion is evident, armor the area with an appropriate lining or divert the erosive flows to on--site areas able to withstand the concentrated flows. The facilities will be inspected after major storms and any identified deficiencies will be corrected.

Ditches, Swales and other Open Stormwater Channels:

Inspect 2 times per year (preferably in Spring and Fall) to ensure they are working in their intended fashion and that they are free of sediment and debris. Remove any obstructions to flow, including accumulated sediments and debris and vegetated growth. Repair any erosion of the ditch lining. Vegetated ditches will be mowed at least annually or otherwise maintained to control the growth of woody vegetation and maintain flow capacity. Any woody vegetation growing through riprap linings must also be removed. Repair any slumping side slopes as soon as practicable. If the ditch has a riprap lining, replace riprap on areas where any underlying filter fabric or underdrain gravel is showing through the stone or where stones have dislodged. Correct any erosion of the channel's bottom or sideslopes. The facilities shall be inspected after major storms and any identified deficiencies shall be corrected.

Roadways and Parking Surfaces: Clean accumulations of winter sand in parking lots and along roadways at least once a year, preferably in the spring. Accumulations on pavement may be removed by pavement sweeping. Accumulations of sand along road shoulders may be removed by grading excess sand to the pavement edge and removing it manually or by a front--end loader. Repair potholes and other roadway obstructions and hazards. Plowing and sanding of paved areas shall be performed as necessary to maintain vehicular traffic safety.

Recertification

As part of the Stormwater Permit, the applicant is required to meet the standards in Appendix B of the Chapter 500 Rules. Appendix B states that a project must submit a certification of the following to the department within three months of the expiration of each five--year interval from the date of issuance of the permit.

- (a) Identification and repair of erosion problems. All areas of the project site have been inspected for areas of erosion, and appropriate steps have been taken to permanently stabilize these areas.
- (b) Inspection and repair of stormwater control system. All aspects of the stormwater control system have been inspected for damage, wear, and malfunction, and appropriate steps have been taken to repair or replace the system, or portions of the system.
- (c) Maintenance. The erosion and stormwater maintenance plan for the site is being implemented as written, or modifications to the plan have been submitted to and approved by the department, and the maintenance log is being maintained.
- (d) Proprietary Systems. All proprietary systems have been maintained according to the manufacturer's recommendations. Where required by the Department, the permittee shall execute a 5--year maintenance contract with a qualified professional for the coming 5--year interval. The maintenance contract must include provisions for routine inspections, cleaning, and general maintenance.

Housekeeping

As part of the Stormwater Permit, the applicant is required to meet the standards in Appendix C of the Chapter 500 Rules. The following procedures are hereby established as a minimum for compliance with this section. For further information on the procedures listed below, refer to Chapter 500 rules -- Appendix C.

Spill Prevention:

Appropriate spill prevention, containment, and response planning/implementation shall be used to prevent pollutants from being discharged from materials on site.

Groundwater Protection:

During construction, hazardous materials with the potential to contaminate groundwater shall not be stored or handled in areas of the site which drain to an infiltration area.

Fugitive Sediment and Dust:

Appropriate measures shall be taken to ensure that activities do not result in noticeable erosion of the soils and water and/or calcium chloride shall be used to ensure that activities do not result in fugitive dust emissions during or after construction.

Debris and Other Materials:

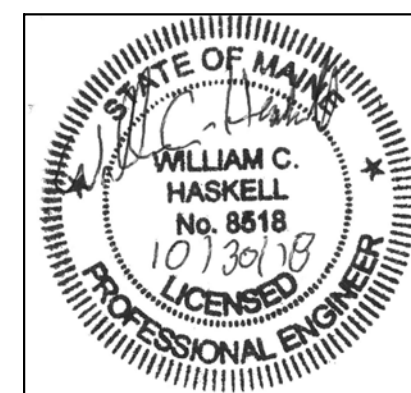
Litter, construction debris, and chemicals exposed to stormwater must be prevented from becoming a pollutant source.

Trench or Foundation De--watering:

Water collected through the process of trenching and/or de--watering must be removed from the ponded area, and must be spread through natural wooded buffers or other areas that are specifically designed to collect the maximum amount of sediment possible.

Non--stormwater Discharges:

Identify and prevent contamination by non--stormwater discharges.



Rev.	Date	Revision

Subdivision Amendment	9--25--18	WCH
Planning Board Signature	8--1--18	WCH
Preliminary/Final Subdivision Application	5--22--18	WCH
MDEP/ACOE Permitting	12--22--17	WCH
Preliminary Subdivision Application	10--31--17	WCH
Issued For	Date	By

Design: JWA	Draft: LAN	Date: DEC 2017
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