SEBAGO TECHNICS

CIVIL ENGINEERING · SURVEYING · LANDSCAPE ARCHITECTURE

TOWN OF ORONO
SITE PLAN APPLICATION

To:

Town of Orono, Maine
Orono Public Works Facility
135 Kelley Road, Orono, Maine

Prepared for:

Town of Orono
59 Main Street
Orono, Maine 04473

STATE OF MAINE
CRAIG A. BURGESS
No. 12638
LICENSED
PROFESSIONAL ENGINEER

Prepared by:
Sebago Technics, Inc.
75 John Roberts Road, Suite 1A
South Portland, Maine 04106

January 2014

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January 17, 2014
11238

Mr. Evan Richert
Town of Orono
59 Main Street
Orono, ME 04473

Site Plan Submittal: Town of Orono Public Works Facility, Kelley Road

Dear Mr. Richert:

Thank you for the opportunity to meet recently and review the Town of Orono's plans for a new Public Works Facility. This is an exciting, important and needed project for the Town to replace an inefficient and antiquated facility that was constructed in 1962. During the past two years, the Town has undertaken a comprehensive planning, programming and site selection search for a new Town Public Works facility. The Town has selected and purchased a 28.5 acre parcel of land located off the Kelley Road and would like to proceed with the design and permitting process.

As we have seen with other communities, Public Works operations often operate from antiquated facilities that make it difficult to provide efficient and effective services to the community. Equipment, needs, responsibilities, operational requirements and practices have changed significantly since the original facility was constructed. The existing Orono Public Works facility located off Penobscot Street is no exception and has gone well beyond its useful design life.

As part of the facility planning and design, we have assembled the following site plan application and submittal for planning staff and board consideration. Simultaneously with the Town Permitting process, we will file a Maine Department of Environmental Protection (Maine DEP) Site Location of Development Act Permit (SLODA).

Project Description: Through a comprehensive site selection and programming process, the Town has selected a 28.5 acre parcel of land located off Kelley Road on the westerly side of the I-95 interchange. This site provides a centralized location for Public Works Operations and has adequate space to meet the development needs.

The project site is undeveloped, wooded and has frontage along the Kelley Road. Access to the site will be gained through a single gated access drive into the property as shown on the enclosed site plan. Development activities will create approximately 4.0 acres of non-revegated surface and 7 acres of overall disturbance.

75 John Roberts Road – Suite 1A, South Portland, ME 04106-6963 • 207-200-2100 • Fax: 207-856-2206

The following provides an overview of the proposed Public Works Facility:

1. A 17,370 square foot public works building with 3,780 square foot mezzanine will comprise the main building. The building will include administration, fleet maintenance and equipment bays (9 total), wash bay, cold storage, parts room, and supporting mechanical facilities.

2. A laminated arch type sand and salt storage building capable of storing up to 4,000 cubic yards of material. The building dimensions are planned to be 80 feet by 100 feet.

3. A small bulk fuel storage and dispensing facility for fleet vehicles including fire and police will be constructed. The fuel storage area will consist of an above ground storage tank (AST) with a total of 3,000 gallons of capacity and placed near the front of the site for security and ease of access. The tank will be double walled to meet regulatory requirements for secondary containment and will be sectioned into 2,000 gallons of diesel fuel and 1,000 gallons of gasoline. An electronic pump fuel dispensing system will be installed. The system will be designed and maintained in compliance with state and federal fuel storage regulations.

4. Exterior parking will be provided for employees, visitors and equipment. In addition, yard space has been provided to accommodate materials such as stone, rock, gravel, pipe and concrete structures utilized in public works projects. During winter conditions, snow storage may occupy some of the yard space and unimproved areas.

Building: The proposed building will consist of a pre-engineered metal building with a concrete foundation and partial masonry façade along the front of the building. The building will include a 17,370 square foot footprint (90 feet by 193 feet) with 3,780 square feet of mezzanine for storage above the administration areas. The interior of the building will include 3,700 square feet of administration space, 8 drive-through bays, wash bay and storage space for public works small equipment, fire and police storage, parks and recreation storage. To accommodate the size of the equipment and interior crane, the clear height inside will be approximately 30 feet. Building construction and design provides for functional and utilitarian facility meeting current and foreseeable needs of the Public Works Department.

Traffic: The project will be a relatively low traffic generator with no specific peak hour due to the nature and type of facility. Typical Public Works operational hours are Monday thru Friday, 6:30 a.m. to 4:00 p.m. Extended time will be needed periodically due to storms and inclement weather when public work crews need to respond for emergencies and storms.

The public works staff consists of 12 personnel including the Director, foreman, mechanics and crews with some seasonal fluctuation. The Town does not anticipate an increase in personnel for the foreseeable future. Traffic generation from the public works facility will include employees, operational vehicles and deliveries.

On a typical work day, the staff will arrive in the early morning, park their vehicles for the day and then leave at the end of the day. The exception is the Public Works Director who makes 3 to 4 vehicle trips during the day. During a typical day, 2 to 3 work crews will load equipment and depart for the day returning 2 to 3 times during the day for additional equipment, materials or their related activities.

During a winter storm event, the Public Works Department deploys 7 plow trucks with sand/salt which run on 1-1/2 hour cycles plowing and then returning to the facility. The number of trips will be variable and dependent on storm duration and intensity. At times the vehicles may make one run or may have to make multiple runs depending on the rate of snow and ice accumulation.

In the summer time, the department will fill the sand/salt shed with winter sand which requires approximately 10 to 12 round trips per day for a period of 30 days which may or may not be on a continuous basis. Other miscellaneous traffic generation includes twice a month fuel deliveries during the summer and weekly fuel deliveries in the winter months. Deliveries for parts and related materials are sporadic and generally occur2 to 3 times a week.

Due to the type of facility, there is no defined peak hour of traffic as traffic is tied to operational needs, which can vary daily and seasonally. The following table provides a general summary of average daily trips assuming a typical work day. Please note that one round trip (in and out) is equal to 2 trip ends.

Vehicle Trip Type	Predicated Trip Ends - Daily
Employees including Public Works Director	32
Crew Trips	18
Misc. Deliveries	4
Total Dailey Trips	52

The trip general table provides a predicted average daily trip generation estimate for a typical work day. Trip generation is expected to vary depending on winter operations and during times when sand is transported to the site and placed in the storage buildings. Each of these activities occur at different times during the year, and therefore, do not overlap.

Landscaping, Lighting and Signage: The project will be constructed within a wooded parcel of land and will retain significant buffers to abutting properties. The design also provides for the retention of a 50 foot or more wooded buffer along the Kelley Road with the exception of the area adjacent to the entrance road. In this area, a planting plan has been prepared to provide screening and buffering.

Lighting will consist of shielded building and pole mounted lights and an externally lighted free standing sign identifying the public works site. Details of the signage, lighting and landscaping are include in the project plans.

Utilities: Utilities servicing the project will include private water and sewer. Underground electrical and communications lines will be installed from a new service pole to be installed at the Kelley Road. The septic system will accommodate 300 gallons per day and will serve the 12 full-time employees at the facility. The water system will include a drilled well and pump to provide potable drinking water. We have spoken with a local well driller and understand wells in the general are typically 200 to 300 feet in depth drilled into bedrock with a varying yield of 2 to 10 gallons per minute. Yields in this range are considered adequate to meet the demand of the facility which is limited to domestic usage. We also anticipate a water treatment system may be required to remove Iron, Manganese and potentially Arsenic all of which will be tested for as part of the well installation.

Stormwater Management and Erosion Control: The project will require a Maine DEP Site Location of Development Act Permit which will include an integrated stormwater management and erosion control plan. Details of this plan are included in the application together with stormwater calculations proposed improvements.

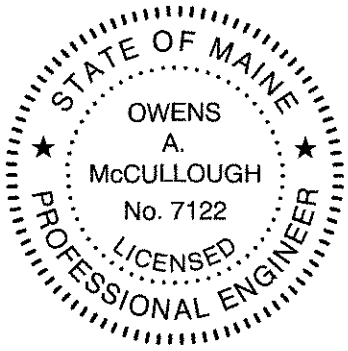
Anticipated Project Schedule: The project has entered the design and permitting phase which is expected to take until the early summer to complete. The Maine DEP Site Location of Development Act (SLODA) permit will be submitted simultaneously with the town application. The SLODA is anticipated to require 4 months to complete allowing for a late winter/spring bid time-line to selection a contractor assuming all approvals are obtained. Construction is estimated to take 9 months allowing for occupancy in February of 2015.

Closure: The proposed Orono Public Works facility is the culmination of nearly two years of planning and searching for an appropriate site that meets a wide range of criteria.

On behalf of the town, we look forward to working with the staff and Planning Board to permit this project. As you consider the application, please contact us if you have any questions.

Sincerely,

SEBAGO TECHNICS, INC.



Owens A. McCullough, P.E. LEED A.P.
Vice President of Engineering and Project Development

OAM:oam/jsf

cc: Sophie Wilson, Town Manager
Rob Yerxa, Public Works Director

TOWN OF ORONO

APPLICATION FOR SITE PLAN REVIEW

Applicant's Name Town of Orono, attn: Rob Yerxa - Public Works Director

Applicant's phone number (207) 866-5062

Postal Address 59 Main Street Orono, ME 04472

Owner's name (if different) _____

Location of Site 135 Kelley Road, Orono, ME 04472

Existing Use of Site Vacant, wooded lot

Tax Map 26 Lot 3 Zone (EDZ) Acres 28.55

Proposed Use New public works facility

A complete application consists of this completed form and the following attachments:

a) Documentation of right, title and/or interest.
b) Attach 15 copies of plan drawn to scale, prepared and sealed by a licensed engineer or registered land surveyor depicting the project as outlined in Section 18-161.
c) Attach a copy of a subsurface wastewater disposal system design or a letter of sewer availability from the Superintendent of Orono's Wastewater Treatment Plant.
d) Payment of applicable fee(s) at time of submission.

This form is to be completed in duplicate and presented to the Code Enforcement Officer at least four weeks prior to the meeting date.

To the best of my knowledge, all information submitted on this application is true and correct. All proposed uses will be in conformance with the application and Site Plan Review Ordinance.

Signed _____ Date 1/13/14
(Applicant)

Date Received:

Date of Hearing:

Fee Paid:

Application approved _____

denied _____

Site Plan Checklist:

1. Application form. A fully executed and signed copy of the application form.
    - *A completed application form is enclosed.*

2. *Fees.* Site plan review fees in the amounts specified by the Town Council
    - *Review fees will not be applied because the Town of Orono is the applicant.*

3. *Copies.* Twelve copies of written materials plus 12 sets of maps or drawings containing the information listed below. The written materials shall be contained in a bound report or a three-ring notebook. The maps or drawings shall be at a scale sufficient to allow review of the items listed under the criteria for approval.
    - *As requested during the Site Plan presubmission meeting on January 13, 2013, seven (7) full size sets and seven (7) half size sets of drawings are enclosed.*

4. General information. The following general information is required:
    a. Name of owner of record and address;
        - *Included in Application form and also on all Site Plans.*

    b. Name of the applicant and address if different;
        - *The owner is the applicant.*

    c. The name of the proposed development;
        - *The name of the proposed development is the Orono Public Works Facility which is shown on all Site Plans.*

    d. Names and addresses of all property owners within 300 feet of the property lines; for University District names and addresses of property owners within 300 feet of the project.
        - *The names and address of all property owners within 300 feet are included as part of **Exhibit 8**.*

    e. Sketch map showing general location of the site within the Town;
        - *A location map is included on Sheet 13 of 15. Also, the cover sheet shows the subject parcel in relationship to the highway and adjacent properties.*

    f. Location map showing the boundaries of all contiguous property under the control of the owner or applicant regardless of whether all or part is being developed at this time;
        - *A location map is included on Sheet 13 of 15. Also, the cover sheet shows the subject parcel in relationship to the highway and adjacent properties.*

    g. The tax map(s) and lot number(s) of the parcel or parcels;
        - *Included in Note 2 on Sheet 2 of 15.*

    h. A copy of the deed to the property, option to purchase the property or other documentation to demonstrate right, title, or interest in the property on the part of the applicant; and
        - *Included as part of **Exhibit 1**.*

i. The name(s), registration number(s), and seal(s) of the land surveyor, architect, engineer, and/or similar professionals assisting with the preparation of the plan.
   - *Engineer seals and signatures are provided on the drawings and other appropriate materials. Sebago Technics served as the prime engineer and surveyors for the project. SW Cole Engineering, Inc. performed the boring program analysis and prepared the geotechnical report.*

5. *Information regarding existing conditions.* The following information regarding existing conditions is required:
   a. Zoning classifications(s) of the property and the location of zoning district boundaries if the property is located in more than one zoning district or abuts a different district;
      - *Included in Note 2 on Sheet 2 of 15.*

   b. The bearings and distances of all property lines of the property to be developed and the source of this information, prepared by a registered land surveyor as a standard boundary survey;
      - *Shown on the Sheet 13 of 15 – Boundary and Existing Conditions Plan.*

   c. Location and size of any existing sewer and water mains, fire hydrants, other water supplies, culverts, and drains on the property to be developed and of any that will serve the development from abutting streets or land;
      - *Shown on the Sheet 13 of 15 – Boundary and Existing Conditions Plan.*

   d. Location, names, and present widths of existing streets and rights-of-way within or adjacent to the proposed development;
      - *Shown on the Sheet 3 of 15 – Site and Landscape Plan.*

   e. The location, dimensions, and ground floor elevations of all existing buildings on the site;
      - *Not applicable. There are no existing buildings on the site.*

   f. The location of buildings on abutting properties and within 100 feet of the property line of the proposed development;
      - *Shown on Sheet 1 of 15 – Cover Sheet.*

   g. The location and dimensions of existing driveways, streets, parking and loading areas, and walkways on the site;
      - *Not applicable. The existing site is presently wooded.*

   h. Location of intersecting roads or driveways within 200 feet of the site;
      - *Shown on Sheet 1 of 15 – Cover Sheet.*

   i. Topography of the site at an appropriate contour interval (1′, 2′, or 5′) depending on the nature of the use and character of the site;
      - *Shown on Sheet 4 of 15 – Grading and Utility Plan and Sheet 13 of 15 – Boundary and Existing Conditions Plan.*

j. Major natural features on the site and including within 250 feet beyond the boundaries of the site, wetlands, streams, ponds, floodplains, groundwater aquifers, significant wildlife habitats including deer wintering areas identified in the 1998 Comprehensive Plan, scenic areas identified in the 1998 Comprehensive Plan, archaeological resources or other important natural features;

- *Shown on Sheet 13 of 15 – Boundary and Existing Conditions Plan. The submittal also includes letters from the Maine Historic Preservation Office and Maine Natural Heritage Program. The project site abuts the Caribou Bog to the south which will include a buffer of retained natural vegetation of more than 500 feet to the bog.*

k. Soils information if on-site sewage disposal is proposed. This information should be detailed enough to allow those portions of the site not suitable for on-site disposal systems to be identified;

- *Included as part of **Exhibit 4**. An on-site soils investigation was completed by a licensed site evaluator (Gary Fullerton, LSE). The submittal includes a completed HHE-200 form depicting the wastewater disposal system design. The generated flows will be relatively small consisting of approximately 12 full time staff. A vehicle wash system will also be installed but will not contribute to the septic system. Wash water will be collected in an onsite holding tank and transported by the Public Works Director to the Wastewater Treatment Plant for disposal.*

l. Location of existing natural drainage ways, storm drainage facilities, including dimensions of culverts, pipes, etc., open drainage courses, wetlands, significant stands of trees, and other important natural features, with a description of such features to be retained;

- *Shown on Sheet 13 of 15 – Boundary and Existing Conditions Plan. As part of the field investigation and planning work, a topographical survey was completed together with a field wetland and vernal pool study. The enclosed plans depict the locations of natural drainage features and wetlands. Project construction will not impact wetlands or onsite streams.*

m. The direction of existing surface water drainage flow across the site;

- **See Waiver List.**

n. The location and dimensions of existing signs;

- *Not applicable. There are no existing signs within the site.*

o. The location and type of all existing exterior lighting;

- *Not applicable. There are no existing lights within the site.*

p. A copy of such covenants or deed restrictions, if any, as are intended to cover all or part of the tract. Such covenants or deed restrictions shall be referenced on the plan;

- *Included as part of **Exhibit 1.** No deed covenants or restrictions are proposed.*

q. The location of recreational trails (including, but not limited to, snowmobile, cross-country ski and biking trails);

- *Not applicable. There are no maintained recreational trails within the subject parcel.*

r. For projects located within the Aquifer Protection Overlay District a groundwater impact analysis prepared in accordance with the requirements of article IV; and
   - *Not applicable. The subject parcel is not located in an Aquifer Protection Overlay District.*

s. Location and type of existing trees of 12-inch caliper DBH (4.5 feet aboveground) or over existing fences and hedges.
   - **See Waiver List.**

6. Information regarding proposed development activity. The following information regarding the proposed development activity is required:
   a. The location of all building setbacks, yards and buffers required by this chapter;
      - *Shown on Sheet 3 of 15 – Site and Landscape Plan. Setback Dimensions are shown on Sheet 2 of 15 – Overall Site Plan. The project has been designed to maintain large wooded buffers. At the project entrance, a site specific landscape plan has been prepared to provide buffering along the Kelley Road at the project entrance.*

   b. The location, dimensions, including heights and ground floor elevations of all proposed buildings on the site and proposed use thereof;
      - *The proposed building locations are depicted on the Sheet 3 - Site and Landscape Plan. Ground floor elevations are shown on Sheet 4 – Grading and Utility Plan. All other building information is included in the architectural drawings (Sheets 14 and 15). The project will consist of two onsite buildings to include a pre-engineered metal building for the Public Works Fleet Operations and a laminated arch structure of sand and salt storage. The facility design and layout was developed from a comprehensive programming effort over the past two years that identified current and future needs. The building design and layout offer drive-thru bays with sufficient heights to accommodate the variety of vehicles that are stored, maintained and operate out of the facility. Public Works facilities by nature need to be utilitarian and accommodate the efficient movement and maintenance of fleet equipment. The Orono Public Works project has been designed with these attributes to provide for town services into the foreseeable future.*

   c. The location and dimensions and materials to be used in the construction of proposed access drives and curb cuts to the lot from public streets;
      - *Included in Sheet 9 of 15 – Site Details. Site plans and submittal information include the locations and dimensions of proposed site and facility improvements along with materials to be utilized.*

   d. Location, dimensions and materials to be used in the construction of proposed pedestrian walkways;
      - *Included in Sheet 9 of 15 – Site Details. Employee and visitor parking will be accommodated adjacent to the office areas included a curbed sidewalk.*

   e. Location and arrangement of proposed off-street parking and loading areas and their appurtenant drives and maneuvering areas;

Depicted on Sheet 3 - Site and Landscape Plan. All parking will be off-street for the project. The design and layout of the facility incorporates parking both indoor and out of doors for all equipment and vehicles.

f. Location and dimensions of all proposed utilities and easements including sanitary sewerage, water, electricity and fire protection systems;
   - *Shown on Sheet 4 – Grading and Utility Plan. The project will include onsite water and wastewater disposal systems for domestic usage and underground electric/communications from the Kelley Road.*

g. Evidence that the Town's facilities have the wastewater collection and treatment capacity to adequately serve the proposed use, documented by a letter from the Orono Water Pollution Control Facility. The applicant shall provide the superintendent of said facilities with sufficient information to enable the superintendent to render an opinion;
   - *Not applicable. Wastewater will be treated in an onsite subsurface wastewater disposal system. See **Exhibit 4** for compliance.*

h. Soils test pit data if on-site sewage disposal is proposed;
   - *Included as part of **Exhibit 4**.*

i. Evidence that the water company's facilities have the distribution, supply and water treatment capacity to adequately serve the proposed use, documented by a letter from the Orono/Veazie Water District. The applicant shall provide the superintendent of said facilities with sufficient information to enable the superintendent to render an opinion;
   - *Not applicable. The project will be served by an onsite well.*

j. Provisions for handling all solid wastes, including hazardous and special wastes and the location and proposed screening of any on-site collection or storage facilities;
   - *A draft SPCC Plan is enclosed as part of **Exhibit 6.***

k. Location, intensity, type, size and direction of all existing and proposed outdoor lighting;
   - *Lighting cut sheets area included as part of **Exhibit 7**. Location of lighting is shown on the Sheet 4 of 15 – Grading and Utility Plan. Lighting will incorporate cut-off technology.*

l. Location, front view, dimensions, materials, and size of all existing and proposed signs, together with the material for securing the signs, and all permanent outdoor fixtures;
   - *There are no existing signs onsite. Proposed signs include a "public works", handicap, and a stop sign. Details for a handicap sign are included on Sheet 9 of 15 – Site Details. A stop sign will be installed in a similar manner. The "public works" sign*

m. The direction of proposed surface water drainage flow across the site and from the site, with an assessment of impacts on downstream properties such as changes in volume, location or quality of flows;
   - *Shown on Sheet 4 of 15 – Grading and Utility Plan. The project includes a comprehensive stormwater management design including treatment consistent with the MDEP Chapter 500 regulations and will be subject to the MDEP Site Location of Development Act review process.*

n. If the proposed development activity fills, grades and/or excavates one acre or more of soil, a stormwater management plan and erosion control program as described in subsection 18-169 (2);
   - *See **Exhibit 2** for compliance. Also, see Sheet 4 of 5 – Grading and Utility Plan for location of erosion control BMPs and Sheet 7 of 15 – Erosion Control Notes and Details and Sheet for specific construction guidelines.*

o. Proposed landscaping and buffering to include types of vegetation;
   - *Shown on Sheet 3 of 15 – Site and Landscape Plan. The project has been designed to maintain large wooded buffers. At the project entrance, a site specific landscape plan has been prepared to provide buffering along the Kelley Road at the project entrance.*

p. The anticipated beginning and completion dates of construction;
   - *A construction schedule is included in Sheet 7 – Erosion Control Notes and Details. In general, it is anticipated the state and local permitting process together with project bidding and contractor selection will be complete by June of 2014. Construction is expected to take approximately 9 months with occupation of the building in the February of 2015.*

q. An estimate of the daily traffic to be generated by the project; and
   - *A statement is included as part of the cover letter.*

r. Approval block. Space shall be provided on the plan drawing for the signatures of the Orono Planning Board and date, together with the words, "Approved Town of Orono Planning Board".
   - *Included on Sheet 2 of 15 – Overall Site Plan.*

Sec. 18-169. Additional information required of major developments.
Applications for major developments shall include the following additional information:

1. Existing and proposed topography of the site at one-, two-, or five-foot contour intervals or such closer intervals as the Planning Board may determine;
    - *Shown on Sheet 4 of 15 – Grading and Utility Plan and Sheet 13 of 15 – Boundary and Existing Conditions Plan. A controlled site survey was completed including a 2 foot contour interval topographical survey. The survey provided information necessary to develop a site specific grading and drainage plan as depicted on the drawings.*

2. A stormwater management plan and erosion control program showing:
    a. The existing and proposed methods of handling stormwater runoff, which shall comply with the Maine Stormwater Management Law; 38, M.R.S.A. § 420-D, as the same may be amended from time to time, and rules enacted thereto;
        - *See Stormwater Management Report that is enclosed as part of **Exhibit 2**. A comprehensive stormwater management report and facility design has been prepared and integrated into the facility consistent with the MDEP stormwater management regulations.*

    b. The direction flow of the runoff through the use of arrows;
        - *Shown on Sheet 4 of 5 – Grading and Utility Plan.*

    c. The location, elevation, and size of all catch basins, dry wells, drainage ditches, swales, retention basins and storm sewers;
        - *Shown on Sheet 4 of 5 – Grading and Utility Plan.*

    d. Engineering calculations used to determine drainage requirements based upon the 25-year 24-hour storm frequency, if the project will significantly alter the existing drainage pattern due to such factors as the amount of new impervious surfaces (such as paving and building area) being proposed;
        - *Enclosed as part of **Exhibit 2**.*

    e. Methods of controlling erosion and sedimentation during and after construction, which shall comply with the Maine Erosion and Sediment Control Law, 38, M.R.S.A., § 420-C, as the same may be amended from time to time. All earth-moving activities shall employ the applicable best management practices as described in "Maine Erosion and Sediment Control Best Management Practices", published by the Maine Department of Environmental Protection. If an activity is subject to the Maine Department of Environmental Protection's general permit for construction activity, enacted as part of the Maine Pollutant Discharge Elimination System, it shall comply with the standards of that permit. A copy of the permit shall be included with the site plan application; and
        - *See Sheet 4 of 5 – Grading and Utility Plan for location of erosion control BMPs and Sheet 7 of 15 – Erosion Control Notes and Details and Sheet for specific construction guidelines.*

    f. If the proposed development is subject to the requirements of Chapter 13, article IV, Post-Construction Stormwater Monitoring Regulations, a signed maintenance agreement for

the ongoing maintenance and monitoring of stormwater management facilities, substantially in the form of the maintenance agreement included in Chapter 13, article IV.

- *A maintenance agreement is enclosed as part of **Exhibit 2**.*

3. A groundwater impact analysis prepared by a groundwater hydrologist for projects involving common on-site water supply or sewage disposal facilities with a capacity of 2,000 gallons or more per day.
    - *Not applicable. The subsurface wastewater disposal system is designed to handle 300 gallons per day.*

4. A utility plan showing, in addition to provisions for water supply and wastewater disposal, the location and nature of electrical, telephone, and any other utility services to be installed on the site.
    - *Please see Sheet 4 of 15 - Grading and Utility Plan for compliance.*

5. A planting plan and schedule keyed to the site plan and indicating the general species and sizes of trees, shrubs and other plants to be planted on the site.
    - *Shown on Sheet 3 of 15 – Site and Landscape Plan.*

6. A traffic impact analysis demonstrating the impact of the proposed project on the capacity, level of service and safety of adjacent streets.
    - **See Waiver List.**

7. A written statement from a professional engineer as to the adequacy of the water supply in terms of quantity and pressure for both domestic and fire flows, if public water supply is to be utilized.
    - *Please see the statement included as part of Exhibit 7.*

8. The location, width, typical cross-section, grades and profiles of all proposed streets and sidewalks.
    - *Please see Sheet 3 of 15 – Site and Landscape Plan and the site detail sheets for information.*

9. Construction drawings for streets, sanitary sewers, water and storm drainage systems, designed and prepared by a professional engineer registered in the State of Maine.
    - *Included as part of design drawings. Specific drawings include Sheet 4 of 15 – Grading and Utility Plan and Sheet 8 of 15 – Site Details.*

10. The location of any pedestrian ways, lots, easements, open spaces, and other areas to be reserved for or dedicated to public use and/or ownership. For any proposed easement, the developer shall submit the proposed easement language with a signed statement certifying that the easement will be executed upon approval of the development. In the case of any streets or other ways dedicated to public ownership, the developer shall submit a signed statement that he will maintain such streets or ways year-round until such time as they may be accepted by the Town.
    - *Not applicable. As proposed, there will be no pedestrian ways, lots, easements, open spaces, and other areas to be reserved for or dedicated to public use and/or ownership.*

11. Written offers of dedication or conveyance to the municipality, in a form satisfactory to the Town Attorney, of all land included in the streets, highways, easements, parks or other open space dedicated for public use, and copies of agreements or other documents showing the manner in which spaces, title to which is reserved by the developer, are to be maintained.
    - *Not applicable. As proposed, there will be no dedication or conveyance to the municipality.*

12. Cost of the proposed development and evidence of financial capacity to complete it. This evidence should be in the form of a letter from a bank or other source of financing indicating the name of the project, amount of financing proposed, and their interest in financing the project.
    - *An engineer's cost estimate is enclosed as part of* ***Exhibit 7****.*

13. An assessment of the impact of the development on wetlands, streams, ponds, floodplains, archaeological resources and significant wildlife habitats, including review letters from appropriate officials.
    - *Letters from Maine Historic Preservation Commission, Maine Inland Fisheries and Wildlife Department and Maine Natural Areas Program are enclosed as part of Exhibit 8. Overall, development of the site for a public works facility will not trigger additional review and approval by the above State agencies.*

Waiver List:

A. Sec. 18-168 (5) m. - The direction of existing surface water drainage flow across the site.
   - *There are no major or well-defined drainage ways within existing site areas to be developed. A detailed topographical survey including proposed contours and stormwater management plan with watershed mapping has been completed for the project. This information is typical of site development projects and is consistent with the regulatory (MDEP) submittal requirements. We believe the provided information addresses the intent of Sec.18-168 (5) m but are requesting a waiver*

B. Sec. 18-168 (5) s. – Location and type of existing of 12-inch caliper DBH.
   - *The site is currently wooded. The project will require the clearing of a large area to accommodate the project development. In addition, the prior owner as part of the purchase and sell agreement retained the timber harvesting rights within the area to be development. As a result, providing the location of all 12 inch caliper DBH trees on the project site would be a burdensome and expensive undertaking with no appreciable benefit given the retained timber rights and development type. We have developed a site specific limit of disturbance that will maintain significant wooded buffers outside the development area, thereby preserving all tree growth beyond the limit of clearing designated on the drawings.*

Exhibit 1

Evidence of Applicant's Right, Title & Interest / Copies of Existing Deeds & Easements

Bk 13426 Pg60 #40919
12-20-2013 @ 03:53p

QUITCLAIM DEED WITH COVENANT

ANDREW J. PERKINS, of Orono, County of Penobscot, State of Maine (whose mailing address is 167 Kelley Road, Orono, ME 04473), for consideration paid, grants to **TOWN OF ORONO**, a Maine municipality, located in Town of Orono, County of Penobscot, State of Maine (having a mailing address of 59 Main Street, Orono, ME 04473-0130), with Quitclaim Covenant, a certain lot or parcel of land located on the southwesterly sideline of Kelley Road, in the Town of Orono, Maine, Penobscot County, State of Maine, said lot or parcel of land is depicted on a plan entitled "Boundary & Existing Conditions Plan Of Land Owned By Andrew J. Perkins, 167 Kelly Road, Orono, Maine 04473 For The Town Of Orono, Maine, 59 Main Street, Orono, Maine 04473" dated October 3, 2013 and revised through December 5, 2013 by Sebago Technics, Inc., said lot or parcel of land being more particularly bounded and described as follows:

> Beginning at an existing 1" iron bar, 15" above grade on the apparent southwesterly sideline of Kelley Road at land now or formerly of April Fools, Inc. as described in a deed recorded at the Penobscot County Registry of Deeds (PCRD) in Book 9537, Page 242;
>
> Thence S 47°-05'-18" W, along land now or formerly of April Fools Inc., a distance of 82.50 feet to an existing 1" iron bar, 18" above grade, tipped easterly;
>
> Thence S 47°-43'-46" E, along land now or formerly of April Fools Inc., a distance of 65.99 feet to a 5/8" rebar with plastic cap inscribed "STI PLS 2009" set at land now or formerly of Daryle A. Hilton, as described in a deed recorded at the PCRD in Book 12543, Page 162;
>
> Thence S 47°-05'-18" W, along land now or formerly of Daryle A. Hilton and land now or formerly of Gail Marchand and Stanley J. Brown, Personal Representatives of the Estate of Lawrence E. Burney, as described in deeds recorded at the PCRD in Book 10991, Page 142 and Book 6834, Page 351, a distance of 2,541.21 feet to an existing 3/4" rebar, 24" above grade near the Caribou Bog;
>
> Thence continuing S 47°-05'-18" W, along land now or formerly of Daryle A. Hilton and land now or formerly of Gail Marchand and Stanley J. Brown, Personal Representatives of the Estate of Lawrence E. Burney, a distance of approximately 35 feet to the Caribou Bog;

Thence in a general Northwesterly, Easterly and Northwesterly direction along the Caribou Bog and land now or formerly of George H. Hamlin, as described in a deed recorded at the PCRD in Book 765, Page 378 or Owner Unknown approximately 2,138 feet to a point at remaining land of Andrew J. Perkins, as described in a deed recorded at the PCRD in Book 2932, Page 209, a tie line from the last mentioned rebar to this point bears N 14°-33'-01" E, a distance of 1,349.72 feet;

Thence N 47°-05'-18" E, through land of Andrew J. Perkins, a distance of approximately 1,424 feet to an existing 1" iron bar, 22" above grade on the apparent southwesterly sideline of Kelley Road;

Thence S 47°-47'-19" E, along the apparent southwesterly sideline of Kelley Road, a distance of 662.60 feet to the Point Of Beginning.

Also granting all of Grantor's right, title and interest in and to that portion of the northwesterly half of Lot 55, according to Strong's Plan, lying southwesterly of and within the southwesterly extensions of the northwesterly and southeasterly sidelines of the above described parcel, but not that portion lying southwesterly of the land retained by Grantor; this grant being expressly reserved from all covenants of warranty contained in his deed.

The bearings contained herein are based on Grid North, Maine State Plane Coordinate System, East Zone 1801, NAD83.

The herein described lot or parcel of land contains approximately 28.55 acres as measured to the digitized edge of the Caribou Bog, as shown on a boundary plan by Sebago Technics for the Town of Orono dated October 3, 2013 and most recently revised December 5, 2013., Project No. 11238EC , by Charles D. Marchese , PLS # 2009, The premises are conveyed subject to the notes shown on said plan.

The premises conveyed are subject to a restrictive covenant appurtenant to the land retained by Grantor that the Grantee, its successors or assigns may not use the premises as solid waste transfer and/or disposal facility, septic or sewage sludge or composting facility, or hazardous waste storage or disposal facility.

Meaning and intending to describe a portion of the lot or parcel described as "First Parcel" in the deed of Cole Realty, Inc. to Andrew J. Perkins dated November 13, 1978 and recorded at the Penobscot County Registry of Deeds in Book **2932, Page 209.**

WITNESS my HAND and SEAL this 20th day of December, 2013.

Witness

Andrew J. Perkins

STATE OF MAINE
PENOBSCOT, SS.

December 20, 2013

THEN PERSONALLY APPEARED BEFORE ME, the above-named Andrew J. Perkins and acknowledged the foregoing instrument to be his free act and deed.

Notary Public

Thomas A. Russell
(Typed/Printed Name)

Commission Expires:

Maine Real Estate
Transfer Tax Paid

PENOBSCOT COUNTY, MAINE
Register of Deeds

QUITCLAIM DEED WITH COVENANT

ANDREW J. PERKINS, of Orono, County of Penobscot, State of Maine (whose mailing address is 167 Kelley Road, Orono, ME 04473), for consideration paid, grants to **TOWN OF ORONO**, a Maine municipality, located in Town of Orono, County of Penobscot, State of Maine (having a mailing address of 59 Main Street, Orono, ME 04473-0130), with Quitclaim Covenant, a certain lot or parcel of land located on the southwesterly sideline of Kelley Road, in the Town of Orono, Maine, Penobscot County, State of Maine, said lot or parcel of land is depicted on a plan entitled "Boundary & Existing Conditions Plan Of Land Owned By Andrew J. Perkins, 167 Kelly Road, Orono, Maine 04473 For The Town Of Orono, Maine, 59 Main Street, Orono, Maine 04473" dated October 3, 2013 and revised through December 5, 2013 by Sebago Technics, Inc., said lot or parcel of land being more particularly bounded and described as follows:

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STATE OF MAINE
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December 20, 2013

THEN PERSONALLY APPEARED BEFORE ME, the above-named Andrew J. Perkins and acknowledged the foregoing instrument to be his free act and deed.

Notary Public

Thomas A. Russell
(Typed/Printed Name)

Commission Expires:

Maine Real Estate
Transfer Tax Paid

PENOBSCOT COUNTY, MAINE
Register of Deeds

Exhibit 2

Stormwater Management Report

Stormwater Management Report

Orono Public Works Facility
135 Kelley Road, Orono, Maine 04473

A. General

This Stormwater Management Plan has been prepared to address the potential impacts associated with the proposed modification in stormwater runoff characteristics for the Orono Public Works facility. The stormwater management controls that are outlined in this plan have been designed to best suit the proposed development and to comply with applicable regulatory requirements to evaluate the pre- and post-development conditions.

The property consists of approximately 28.55 acres of vacant, wooded land located off the southerly side of Kelley Road in Orono. When completed, the public works facility will consist of approximately 6.65 acres of developed area which will include approximately 4.02 acres of impervious surfaces and 2.70 acres of landscaped areas. New impervious surfaces comprise of a public works building, associated sidewalks, sand and salt shed, concrete aprons, paved areas in trafficked areas and gravel areas for material storage, equipment storage and laydown. Travel lane widths are 30 feet wide or greater to accommodate large work vehicles. Landscaped areas consist of vegetated sideslopes, shallow swales for stormwater conveyance and stormwater best management practices (BMPs) for stormwater detention and treatment.

The project will create greater than three (3) acres of impervious area within the watershed of Pushaw Lake, which is not classified as most-at-risk in Chapter 502, Direct Watersheds Of Lakes Most At Risk From New Development, And Urban Impaired Streams. Therefore, the stormwater management design under a Site Location of Development permit is required to meet Chapter 500 Stormwater Phosphorus Standards and Basic Standards because the site is within a lake watershed. The development proposes to meet the Basic standards by providing Erosion and Sedimentation Control Plan, an Inspection and Maintenance Plan, and a housekeeping plan for use by the contractor/owner during and after construction is complete. The development proposes to meet the Phosphorus Standards by utilizing three (3) underdrained soil filters and two (2) wooded buffers to treat stormwater runoff discharged from the developed site. The Flooding Standard will be met by providing detention of stormwater runoff from the site so that post-developed peak rates of runoff from the 2, 10, and 25-year storm events are less than the pre-developed peak rates at the study point (SP1). Additionally, the project will meet the various requirements outlined in the Town of Orono Code of Ordinances.

740 feet or greater of undisturbed, natural wooded areas will be maintained between the project clearing limits and the Caribou Bog complex. These wooded areas will provide an additional means of capturing containments from stormwater discharged from the project, therefore further enhancing water quality of runoff before ultimately reaching the Caribou.

B. Existing Conditions

Land to be developed for the public works facility expansion are presently undeveloped, with ground cover consisting primarily of woodland. The topography generally varies throughout the project site and consists primarily of moderate slopes, with flatter 4% to 5% slopes on the northerly side of the site along Kelley Road. A majority of stormwater runoff from the undeveloped site drains southwesterly toward wetland areas that are contiguous with the Caribou Bog (Orono Bog) in the southwestern corner of the parcel. The Caribou Bog is a large wetland bog complex that extends easterly and ultimately discharges to Pushaw Lake. Upper limits of the 100-year floodplain associated with the Caribou Bog do not extend into the subject parcel.

C. Proposed Site Improvements

The Town of Orono, Maine is proposing to construct a new public works facility to replace the existing facility on Penobscot Street. Proposed improvements will include approximately 4.02 acres of new impervious areas and 2.70 acres of new landscaped areas. The public works facility will extend approximately 650 feet southwesterly from Kelley Road. Impervious surfaces comprise of the building and associated sidewalks, concrete aprons, paved areas for high volume traffic areas and gravel areas for material storage, equipment storage and laydown. Travel lane widths are 30 feet wide or larger to accommodate large work vehicles. Landscaped areas consist of vegetated sideslopes, shallow swales for stormwater conveyance and stormwater best management practices (BMPs) for stormwater detention and treatment.

D. Soils

Soil information for the site was obtained via the USDA United States Department of Agriculture and Natural Resources Conservation Service's Web Soil Survey. The Hydrologic Soil Group (HSG) of the site soils are classified by Technical Release TR-55 of the Soil Conservation Service as follows:

Soil Type	Symbol	HSG	Drainage Class
Howland	Hv	C	Very stony loam
Monarda	Ms	D	Stony silt loam
Plaisted	Pg/Pr	C	Gravelly silt loam

E. Methodology

The stormwater runoff analysis was developed using the "HydroCAD" computer modeling software, which incorporates the TR-55 and TR-20 methodologies as provided by the Soil Conservation Service of the U.S. Department of Agriculture.

The peak runoff rates were calculated using a 24-hour duration storm event with a Type III rainfall distribution. The rainfall amounts for southeast Cumberland County for the 2-year, 10-year and 25-year storm events are as follows:

Storm Frequency	24-hr Duration Rainfall (in.)
2-yr	2.5
10-yr	3.8
25-yr	4.4

F. Pre-Development Watershed Model

The pre-development watershed model consists of one (1) subcatchment.

Subcatchment 1 (S1) includes a portion of the subject parcel land area that discharges southwesterly to Study Point (SP1). Existing land areas are mainly comprised of paved areas of Kelley Road, grassed areas along the road and woodlands. Since there is not a well-defined drainage way that drains surface water upland areas of the subject parcel, SP1 is modeled as a line that extends east to west across the site.

G. Post-Development Watershed Model

The post-development watershed model consists of ten (10) subcatchments. The on-site ground cover changes to include update landscaping and impervious associated with the building and associated sidewalks, concrete aprons, paved areas and gravel areas.

Subcatchment 10 (S10) includes the majority of the onsite areas to remain undeveloped area as pre-development subcatchment 1. Stormwater is conveyed via sheet flow and shallow concentrated flow southwesterly to Study Point (SP1).

Subcatchment 11 (S11) includes central portions of the developed site that includes a high percentage of impervious areas associated with development. The entire sand and salt shed is contained within S11. Gravel surfaces and paved surfaces will be graded to direct surface runoff as sheet flow to vegetated areas that will convey runoff to Underdrained Soil Filter 2 (UDSF-2).

Subcatchment 12 (S12) includes the majority of the easterly sideslope associated with gravel and paved surfaces to be constructed in fill conditions. Runoff from the developed areas within the subcatchment will be conveyed via sheet flow and shallow to the Level Spreader 1 and Wooded Buffer 1.

Subcatchment 13 (S13) includes the majority of the westerly sideslope associated with gravel and paved surfaces to be constructed in fill conditions. Runoff from the developed areas within the subcatchment will be conveyed via sheet flow and shallow to the Level Spreader 2 and Wooded Buffer 2.

Subcatchment 14 (S14) includes northwesterly portions of the developed site that drain to Underdrained Soil Filter 3 (UDSF-3).

Subcatchment 15 through 19 (S15 – S19) includes northeasterly portions of the developed site that drain to Underdrained Soil Filter 1 (UDSF-1).

H. Stormwater Quality Management (Phosphorus Standard)

A combination of two (2) wooded buffers and three (3) underdrained soil filters are designed to meet MDEP's Phosphorous Standard. With the proposed stormwater management plan, post-treatment phosphorus export is less than 40% of the pre-treatment export which allows a compensation fee be paid in lieu of expanding or installing additional treatment measures. A phosphorous compensation fee will be paid to the Penobscot Soil and Water Conservation District for the appropriate amount. Also, a deed restriction will be recorded prior to the state of construction that limits the use of fertilizer containing fertilizers because the low option export factors (from Table 3.1) are utilized in the phosphorus calculations. Please review the enclosed phosphorous calculations and deed restriction for compliance.

I. Stormwater Quantity Management (Flooding Standard)

The following table summarizes the results of stormwater calculations for the design storm events for the project area. Calculations and computer modeling data sheets are provided with this report.

The HydroCAD model predicts slight decreases in peak flow rates during the 2-, 10- and 25-year storm events at SP1.

Stormwater Peak Discharge Summary Table									
Study Point	2-Year Storm			10-Year Storm			25-Year Storm		
	Pre (cfs)	Post (cfs)	Diff. (cfs)	Pre (cfs)	Post (cfs)	Diff. (cfs)	Pre (cfs)	Post (cfs)	Diff. (cfs)
SP1	3.20	2.50	-0.70	10.11	6.86	-3.25	13.90	12.34	-1.56

J. Inspection & Maintenance

Provisions for periodic inspection and maintenance of the stone berm level spreader, wooded buffers and underdrained soil filters are included in the Inspection, Maintenance, and Housekeeping Plan included in this section of the application.

K. Summary

An Erosion and Sedimentation Control Plan has been developed for the project site placing emphasis on the installation of sedimentation barriers and revegetation to minimize erosion potential from development activities during and after construction. The Erosion Control Plan is incorporated into the design plans and includes the locations of the erosion control provisions (i.e., silt fence, construction entrance) along with a narrative and construction details for reference by the contractor during construction.

The proposed development will include the construction of drainage swales, level spreaders and underdrained soil filters to which the runoff from the majority of impervious and developed areas will be directed. Level spreaders will convey runoff as sheet flow to wooded buffer areas. Underdrained soil filters and wooded buffers provide water quality treatment of stormwater runoff from the site so the post-treatment phosphorus export is less than 40% of the pre-treatment export. Doing so generally satisfies that Phosphorus Standard and allows a compensation be paid in lieu of expanding the stormwater management plan. Based on the modeling data, post-development peak flow rates examined at Study Points SP1 comply with the Flooding Standard because peak flows are maintained or reduced from their corresponding pre-development levels during the 2-year, 10-year, and 25-year storm events.

With incorporation of these measures, no significant impacts to off-site drainage are anticipated due to the development of the subdivision.

Prepared by

SEBAGO TECHNICS, INC.

Craig Burgess

Craig A. Burgess, P.E.
Project Engineer

CAB:jsf

STATE OF MAINE
CRAIG A.
BURGESS
No. 12638
LICENSED
PROFESSIONAL ENGINEER

Attachment A

Water Quality Calculations

Worksheet 1
PPB calculations

Project name: Orono Public Works Facility
Lake name: Pushaw Lake
Town name: Orono

Standard Calculation

Watershed per acre phosphorus budget (Appendix C):	**PAPB**	0.04	lbs P/acre/year
Total acreage of development parcel:	**TA**	28.55	acres
NWI wetland acreage:	**WA**	0	acres
Steep slope acreage:	**SA**	0	acres
Existing developed area		0	acres
Project acreage: A = TA - (WA + SA)	**A**	28.55	acres
Phosphorus Budget: PB = PAPB x A	**PB**	1.14	**lbs P/year**

Small Watershed Adjustment

If Project Acreage (A) is greater than the threshold acreage for the small watershed threshold (SWT, from pertinent lake and town info in the table in Appendix C), calculate an alternative PPB using the analysis below and use this value if it is less than the the Standard Calculation PPB.

Small Watershed Threshold (Appendix C):	**SWT**	278	acres
Project acreage:	**A**	28.55	acres
Allowable increase in town's share of annual phosphorus load to lake (Appendix C):	**FC**	N/A	lbs P/year
Area available for development (Appendix C):	**AAD**	N/A	acres
Ratio of A to AAD (R=A/AAD)	**R**	N/A	

If R < 0.5, **Project Phosphorus Budget** PPB = [(FC x R)/2] + [FC/4]	**PPB**	N/A	**lbs P/year**
If R> 0.5, **Project Phosphorus Budget** PPB = FC x R	**PPB**	N/A	**lbs P/year**

Worksheet 2
Pre-PPE and Post-PPE Calculations

Calculate phosphorus export from development for before and after treatment
Use as many sheets as needed for each development type (commercial, roads, residential lots, etc.)

Project name: Orono Public Works Facility **Development type:** Light Industrial Sheet # 2

Land Surface Type or Lot #(s) with description	Acres	Export Coefficient from Table 3.1	Pre-treatment Algal Av. P Export (lbs P/year)	Treatment Factor for BMP(s) from Chapter 6	Post- treatment Algal Av. P Export (lbs P/year)	Description of BMPs
Impervious Low Export Option						
11S - Pavement/Gravel	1.60	1.25	2.00	0.38	0.77	UDSF-2
11S - Building	0.38	0.50	0.19	0.38	0.07	UDSF-2
12S - Pavement/Gravel	0.23	1.25	0.29	0.40	0.12	WB-1
13S - Pavement/Gravel	0.32	1.25	0.39	0.38	0.15	WB-2
14S - Pavement/Gravel	0.60	1.25	0.75	0.35	0.26	UDSF-3
15S - Pavement/Gravel	0.20	1.25	0.25	0.36	0.09	UDSF-1
16S - Pavement/Gravel	0.13	1.25	0.16	0.36	0.06	UDSF-1
16S - Building	0.08	0.50	0.04	0.36	0.01	UDSF-1
17S - Pavement/Gravel	0.22	1.25	0.27	0.36	0.10	UDSF-1
17S - Building	0.08	0.50	0.04	0.36	0.01	UDSF-1
18S - Pavement/Gravel	0.10	1.25	0.13	0.36	0.05	UDSF-1
18S - Building	0.04	0.50	0.02	0.36	0.01	UDSF-1
19S - Pavement/Gravel	0.04	1.25	0.05	0.36	0.02	UDSF-1
Landscaped Low Export Option						
10S - Landscaped	0.18	0.30	0.06	1.00	0.06	Untreated
11S - Landscaped	0.61	0.30	0.18	0.38	0.07	UDSF-2
12S - Landscaped	0.47	0.30	0.14	0.40	0.06	WB-1
13S - Landscaped	0.27	0.30	0.08	0.38	0.03	WB-2
14S - Landscaped	0.60	0.30	0.18	0.35	0.06	UDSF-3
15S - Landscaped	0.40	0.30	0.12	0.36	0.04	UDSF-1
16S - Landscaped	0.00	0.30	0.00	0.36	0.00	UDSF-1
17S - Landscaped	0.00	0.30	0.00	0.36	0.00	UDSF-1
18S - Landscaped	0.00	0.30	0.00	0.36	0.00	UDSF-1
19S - Landscaped	0.14	0.30	0.04	0.36	0.01	UDSF-1
		Total Pre-PPE (lbs P/year)	5.40	**Total PostPPE (lbs P/year)**	2.05	

Worksheet 4
Project Phosphorus Export Summary

Summarizing the project's algal available phosphorus export (PPE)

Project name: Orono Public Works Facility

Project Phosphorus Budget - Worksheet 1	**PPB**	1.14	lbs P / year
Total Pre-Treatment Phosphorus Export - Worksheet 2	**Pre-PPE**	5.40	lbs P / year
Total Post-Treatment Phosphorus Export - Worksheet 2	**Post-PPE**	2.05	lbs P / year
Total Phosphorus Mitigation Credit - Worksheet 3	**TMC**	N/A	lbs P / year
Project Phosphorus Export (Post-PPE - TMC)	**PPE**	2.05	lbs P / year

Is the Project Phosphorus Export sufficiently reduced?
(PPE< PPB)

0.90 lbs P / year

If PPE is less than or equal to PPB, the project meets its phosphorus budget (neg. #)

OTHERWISE:

Is the Post-Treatment Phosphorus Export less than 40% of the Pre-Treatment Export? It is equivalent to more than 60% removal efficiency.
(Post-PPE < 40% Pre-PPE)

37.93%

If Post-PPE is less than 40% of Pre-PPE, a compensation fee may be appropriate at the cost of $25,000 per pound of phosphorus over budget. The compensation fee option is only available in

The following compensation fee must be paid **$22,608**

SEBAGO TECHNICS, INC.
75 John Roberts Road, Suite 1A
South Portland, ME 04106
(207) 856-0277 FAX (207) 856-2206

JOB	11238		
SHEET NO.	1	OF	4
CALCULATED BY	CAB	DATE	1/16/2014
CHECKED BY	OAM		
FILE NAME	11238 WQC	PRINT DATE	1/16/2014

MDEP Site Location of Development Submission

Note: Buffers are sized in accordance with Chapter 5 of the Maine Department of Environmental Protection BMPs Technical Design Manual, latest revision.

Wooded Buffer 1 (WB-1)				
Type of Buffer :	Buffer with Stone Bermed Level Spreader			
Existing Cover :	Forested			
Soils :	Plaisted, Gravelly Silt Loam			
Buffer Slope :	10.7%			
Buffer Length :	150	feet		
Tributary Area				
Impervious :	10,137	sf		
Landscaped :	20,608	sf		
Per Table 5-5 of Manual for Soil Group C Silt Loam:				
Berm Length per acre of impervious :			120	feet
Berm Length per acre of landscaped :			36	feet
Required Level Spreader Berm Length :			45.0	feet
Provided Level Spreader Berm Length :			45.0	feet
Treatment Factor Calculation				
TF=0.4 * (BMPST/BMPTF)=	**0.40**			
Wooded Buffer 2 (WB-2)				
Type of Buffer :	Buffer with Stone Bermed Level Spreader			
Existing Cover :	Forested			
Soils :	Plaisted, Gravelly Silt Loam			
Buffer Slope :	10.7%			
Buffer Length :	150	feet		
Tributary Area				
Impervious :	13,751	sf		
Landscaped :	11,832	sf		
Per Table 5-5 of Manual for Soil Group C Silt Loam:				
Berm Length per acre of impervious :			120	feet
Berm Length per acre of landscaped :			36	feet
Required Level Spreader Berm Length :			47.7	feet
Provided Level Spreader Berm Length :			50.0	feet
Treatment Factor Calculation				
TF=0.4 * (BMPST/BMPTF)=	**0.38**			

SEBAGO TECHNICS, INC.
75 John Roberts Road, Suite 1A
South Portland, ME 04106
(207) 856-0277 FAX (207) 856-2206

JOB	11238		
SHEET NO.	2	OF	4
CALCULATED BY	CAB	DATE	1/16/2014
CHECKED BY	OAM		
FILE NAME	11238 WQC	PRINT DATE	1/16/2014

MDEP Site Location of Development Submission

Note: Underdrained Soil Filters are sized in accordance with Chapter 7 of the Maine Department of Environmental Protection BMPs Technical Design Manual, latest revision

Treatment Calculations for Proposed Underdrained Soil Filter #1 (UDSF #1)					
Subcatchments tributary to UDSF #1 include 15S thru 19S					
WQV Calculation					
(WQV = Water Quality Volume)					
Total Impervious Area =	38,996.0	sf			
Total Landscaped Area=	23,654.0	sf			
WQV Required= 1" x Impervious Area + 0.4"x Landscape Area =				4,038.1	cf
WQV Provided =	**4,514.0**	cf @ 1.5' depth	(Between elevations 222.0 & 223.5)		
Treatment Factor Calculation					
TF=0.4 * (BMPST/BMPTF)=	**0.36**				
Filterbed Area Calculation					
Filterbed Area Required = 0.05 x Impervious + 0.02 x Landscape =				2422.9	sf
Filterbed Area Provided=	**2,438.5**	sf	(@ elevation 222.0)		
Pre-treatment Sediment Forebay Volume Calculation					
Sand Application Rate=	50.0	cf/acre/year			
Total Impervious Area=	38,996.0	sf			
Tributary to UDSF #1					
Required Pre-treatment Volume=	44.8	cf			
Provided Pre-treatment Volume=	57.0	cf			

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JOB	11238		
SHEET NO.	3	OF	4
CALCULATED BY	CAB	DATE	1/16/2014
CHECKED BY	OAM		
FILE NAME	11238 WQC	PRINT DATE	1/16/2014

MDEP Site Location of Development Submission

Note: Underdrained Soil Filters are sized in accordance with Chapter 7 of the Maine Department of Environmental Protection BMPs Technical Design Manual, latest revision

Treatment Calculations for Proposed Underdrained Soil Filter #2 (UDSF #2)					
Subcatchments tributary to UDSF #2 include 11S					
WQV Calculation					
(WQV = Water Quality Volume)					
Total Impervious Area =	86,308.0	sf			
Total Landscaped Area=	26,385.0	sf			
WQV Required= 1" x Impervious Area + 0.4"x Landscape Area =				8,071.8	cf
WQV Provided =	**8,429.0**	cf @ 1.5' depth	(Between elevations 196.0 & 197.5)		
Treatment Factor Calculation					
TF=0.4 * (BMPST/BMPTF)=	**0.38**				
Filterbed Area Calculation					
Filterbed Area Required = 0.05 x Impervious + 0.02 x Landscape =				4843.1	SF
Filterbed Area Provided=	**4,880.0**	sf	(@ elevation 196.0)		
Pre-treatment Sediment Forebay Volume Calculation					
Sand Application Rate=	50.0	cf/acre/year			
Total Impervious Area	86,308.0	sf			
Tributary to UDSF #1					
Required Pre-treatment Volume=	99.1	cf			
Provided Pre-treatment Volume=	127.0	cf			

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JOB	11238		
SHEET NO.	4	OF	4
CALCULATED BY	CAB	DATE	1/16/2014
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FILE NAME	11238 WQC	PRINT DATE	1/16/2014

MDEP Site Location of Development Submission

Note: Underdrained Soil Filters are sized in accordance with Chapter 7 of the Maine Department of Environmental Protection BMPs Technical Design Manual, latest revision

Treatment Calculations for Proposed Underdrained Soil Filter #3 (UDSF #3)						
Subcatchments tributary to UDSF 3 include 14S						
WQV Calculation						
(WQV = Water Quality Volume)						
Total Impervious Area =	26,031.0	sf				
Total Landscaped Area=	26,321.0	sf				
WQV Required= 1" x Impervious Area + 0.4"x Landscape Area =				3,046.6	cf	
WQV Provided =	**3,493.0**	cf @ 1.5' depth	(Between elevations 216.0 & 217.5)			
Treatment Factor Calculation						
TF=0.4 * (BMPST/BMPTF)=	**0.35**					
Filterbed Area Calculation						
Filterbed Area Required = 0.05 x Impervious + 0.02 x Landscape =				1828.0	SF	
Filterbed Area Provided=	**1,865.0**	sf	(@ elevation 216.0)			
Pre-treatment Sediment Forebay Volume Calculation						
Sand Application Rate=	50.0	cf/acre/year				
Total Impervious Area	26,031.0	sf				
Tributary to UDSF #1						
Required Pre-treatment Volume=	29.9	cf				
Provided Pre-treatment Volume=	32.0	cf				

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JOB General: TR-55 CN - Grave
SHEET NO. 1 OF 3
CALCULATED BY CAB DATE 04/04/13
CHECKED BY DATE
SCALE NTS

Determine: The stand-alone curve number for a gravel surface, not including the right-of-way.

Source: SCS TR-55, 2nd Edition, June 1986 Table 2-2a: Runoff curve numbers for urban areas

Assumption: The CN for gravel (including R.O.W.) is based on a typical road section, assuming 75% gravel surface and 25% open space in good condition for each HSG.

- This is determined by an analysis of the similar category of "Paved; open ditches (including ROW.)
- x = % pavement and y = % open space (good), $x + y = 1$
- Given at HSG A, CN for pavement = 98 and grass = 39

$$98x + 39y = 83 \sim \text{Paved (with ROW)}$$

$$y = 1 - x$$

$$98x + 39(1-x) = 83$$

$$98x - 39x = 83 - 39$$

$$59x = 44$$

$$x = 0.746 \approx 75\%$$

$$y = 1 - x = 25\%$$

Calculations: for gravel curve number as stand-alone surface

① HSG 'A' G = curve number for gravel @ 75% area

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JOB General: TR-55 CN-Gravel
SHEET NO. 2 OF 3
CALCULATED BY CAB DATE 04/04/13
CHECKED BY DATE
SCALE NTS

CN for open space (good) = 39
@ 25 % area

$0.75G + 0.25(39) = 76$

$G = (76 - 0.25(39)) / 0.75$

$G = 88.33 \approx \underline{88}$

② HSG 'B'

$0.75G + 0.25(61) = 85$

$G = 93.00 = \underline{93}$

③ HSG 'C'

$0.75G + 0.25(74) = 89$

$G = 94.00 = \underline{94}$

④ HSG 'D'

$0.75G + 0.25(80) = 91$

$G = 94.67 \approx \underline{95}$

Summary:

Surface	HSG 'A'	'B'	'C'	'D'
Gravel	88	93	94	95

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Sheet 3 of 3

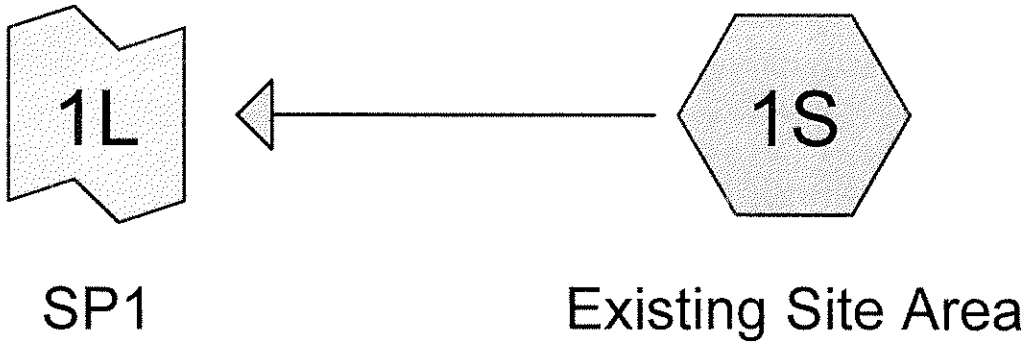
Table 2-2a.—Runoff curve numbers for urban areas[1]

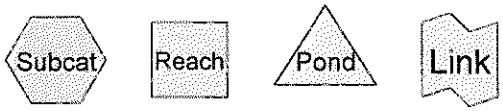
Cover description		Curve numbers for hydrologic soil group—			
Cover type and hydrologic condition	Average percent impervious area[2]	A	B	C	D
Fully developed urban areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.)[3]:					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only)[4]		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
1/8 acre or less (town houses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
Developing urban areas					
Newly graded areas (pervious areas only, no vegetation)[5]		77	86	91	94
Idle lands (CN's are determined using cover types similar to those in table 2-2c).					

[1]Average runoff condition, and $I_a = 0.2S$.
[2]The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. CN's for other combinations of conditions may be computed using figure 2-3 or 2-4.
[3]CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.
[4]Composite CN's for natural desert landscaping should be computed using figures 2-3 or 2-4 based on the impervious area percentage (CN = 98) and the pervious area CN. The pervious area CN's are assumed equivalent to desert shrub in poor hydrologic condition.
[5]Composite CN's to use for the design of temporary measures during grading and construction should be computed using figure 2-3 or 2-4, based on the degree of development (impervious area percentage) and the CN's for the newly graded pervious areas.

Attachment B

Pre-Development Stormwater Modeling





Drainage Diagram for 11238 Drainage Conditions
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Area Listing (selected nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
555,062	70	Woods, Good, HSG C (1S)
5,209	71	Meadow, non-grazed, HSG C (1S)
5,929	98	Existing Pavement (1S)
566,200		**TOTAL AREA**

Summary for Subcatchment 1S: Existing Site Area

Runoff = 13.90 cfs @ 12.41 hrs, Volume= 75,651 cf, Depth= 1.60"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR Rainfall=4.40"

	Area (sf)	CN	Description
*	5,929	98	Existing Pavement
	5,209	71	Meadow, non-grazed, HSG C
	555,062	70	Woods, Good, HSG C
	566,200	70	Weighted Average
	560,271		Pervious Area
	5,929		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	100	0.0400	0.10		**Sheet Flow, A-B, SHEET** Woods: Light underbrush n= 0.400 P2= 3.00"
10.5	850	0.0730	1.35		**Shallow Concentrated Flow, B-C, SHALLOW** Woodland Kv= 5.0 fps
27.3	950	Total			

Summary for Link 1L: SP1

Inflow Area = 566,200 sf, 1.05% Impervious, Inflow Depth = 1.60" for 25-YR event
Inflow = 13.90 cfs @ 12.41 hrs, Volume= 75,651 cf
Primary = 13.90 cfs @ 12.41 hrs, Volume= 75,651 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Existing Site Area Runoff Area=566,200 sf 1.05% Impervious Runoff Depth=0.46"
Flow Length=950' Tc=27.3 min CN=70 Runoff=3.20 cfs 21,480 cf

Link 1L: SP1 Inflow=3.20 cfs 21,480 cf
Primary=3.20 cfs 21,480 cf

Total Runoff Area = 566,200 sf Runoff Volume = 21,480 cf Average Runoff Depth = 0.46"
98.95% Pervious = 560,271 sf 1.05% Impervious = 5,929 sf

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

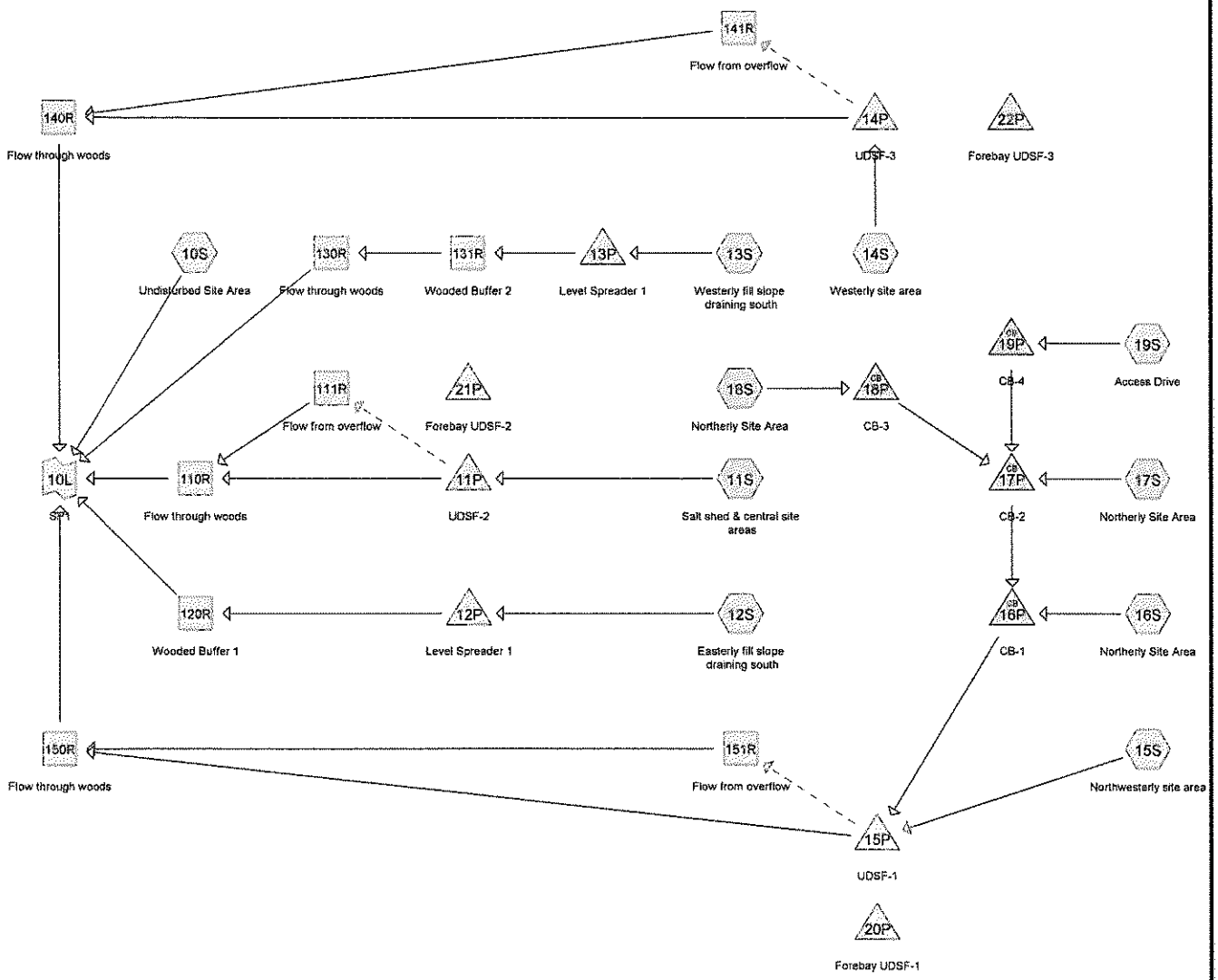
Subcatchment 1S: Existing Site Area Runoff Area=566,200 sf 1.05% Impervious Runoff Depth=1.20"
Flow Length=950' Tc=27.3 min CN=70 Runoff=10.11 cfs 56,529 cf

Link 1L: SP1 Inflow=10.11 cfs 56,529 cf
Primary=10.11 cfs 56,529 cf

Total Runoff Area = 566,200 sf Runoff Volume = 56,529 cf Average Runoff Depth = 1.20"
98.95% Pervious = 560,271 sf 1.05% Impervious = 5,929 sf

Attachment C

Post-Development Stormwater Modeling



Subcat Reach Pond Link

Drainage Diagram for 11238 Drainage Conditions
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Area Listing (selected nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
264,025	70	Woods, Good, HSG C (10S,14S,15S,19S)
4,203	71	Meadow, non-grazed, HSG C (10S,14S,15S,19S)
108,890	74	New Grass cover, Good, HSG C (10S,11S,12S,13S,14S,15S,19S)
1,024	74	New Landscaped Island (13S,14S,18S)
6,874	86	New Riprap Area (11S)
55,276	94	New Gravel, HSG C (11S,12S,13S,14S)
5,940	98	Existing Pavement (10S,14S,15S,19S)
25,386	98	New Building (11S,16S,17S,18S)
4,400	98	New Concrete Apron (11S,16S,17S)
1,190	98	New Dumpster Area (17S)
87,418	98	New Pavement (11S,12S,13S,14S,15S,16S,17S,18S,19S)
1,553	98	New Sidewalk (11S,13S,14S,17S,18S)
566,179		**TOTAL AREA**

Summary for Subcatchment 10S: Undisturbed Site Area

Runoff = 5.51 cfs @ 12.41 hrs, Volume= 29,987 cf, Depth= 1.60"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR Rainfall=4.40"

	Area (sf)	CN	Description
*	1,380	98	Existing Pavement
	1,464	71	Meadow, non-grazed, HSG C
	213,605	70	Woods, Good, HSG C
*	7,988	74	New Grass cover, Good, HSG C
	224,437	70	Weighted Average
	223,057		Pervious Area
	1,380		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.0	100	0.0450	0.10		**Sheet Flow, A-B, SHEET** Woods: Light underbrush n= 0.400 P2= 3.00"
11.2	850	0.0640	1.26		**Shallow Concentrated Flow, B-C, SHALLOW** Woodland Kv= 5.0 fps
27.2	950	Total			

Summary for Subcatchment 11S: Salt shed & central site areas

Runoff = 10.55 cfs @ 12.07 hrs, Volume= 32,915 cf, Depth= 3.50"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR Rainfall=4.40"

	Area (sf)	CN	Description
*	16,693	98	New Building
*	2,200	98	New Concrete Apron
*	34,920	94	New Gravel, HSG C
*	405	98	New Sidewalk
*	32,090	98	New Pavement
*	19,511	74	New Grass cover, Good, HSG C
*	6,874	86	New Riprap Area
	112,693	92	Weighted Average
	61,305		Pervious Area
	51,388		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, TC Time < 5 mins**

Summary for Subcatchment 12S: Easterly fill slope draining south

Runoff = 2.19 cfs @ 12.07 hrs, Volume= 6,530 cf, Depth= 2.55"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR Rainfall=4.40"

	Area (sf)	CN	Description
*	8,564	98	New Pavement
*	1,573	94	New Gravel, HSG C
*	20,608	74	New Grass cover, Good, HSG C
	30,745	82	Weighted Average
	22,181		Pervious Area
	8,564		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, TC Time < 5 mins**

Summary for Subcatchment 13S: Westerly fill slope draining south

Runoff = 2.06 cfs @ 12.07 hrs, Volume= 6,207 cf, Depth= 2.91"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR Rainfall=4.40"

	Area (sf)	CN	Description
*	10,103	98	New Pavement
*	3,595	94	New Gravel, HSG C
*	53	98	New Sidewalk
*	11,730	74	New Grass cover, Good, HSG C
*	102	74	New Landscaped Island
	25,583	86	Weighted Average
	15,427		Pervious Area
	10,156		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, TC Time < 5 mins**

Summary for Subcatchment 14S: Westerly site area

Runoff = 3.19 cfs @ 12.28 hrs, Volume= 14,712 cf, Depth= 2.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR Rainfall=4.40"

	Area (sf)	CN	Description
*	15,188	94	New Gravel, HSG C
*	10,207	98	New Pavement
*	636	98	New Sidewalk
*	25,535	74	New Grass cover, Good, HSG C
*	786	74	New Landscaped Island
*	1,347	98	Existing Pavement
	845	71	Meadow, non-grazed, HSG C
	17,167	70	Woods, Good, HSG C
	71,711	81	Weighted Average
	59,521		Pervious Area
	12,190		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	100	0.0400	0.10		**Sheet Flow, A-B, SHEET** Woods: Light underbrush n= 0.400 P2= 3.00"
0.7	35	0.0300	0.87		**Shallow Concentrated Flow, B-C, SHALLOW** Woodland Kv= 5.0 fps
2.7	485	0.0410	3.04		**Shallow Concentrated Flow, C-D, SHALLOW** Grassed Waterway Kv= 15.0 fps
20.2	620	Total			

Summary for Subcatchment 15S: Northwesterly site area

Runoff = 2.18 cfs @ 12.30 hrs, Volume= 10,229 cf, Depth= 2.05"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR Rainfall=4.40"

	Area (sf)	CN	Description
*	8,873	98	New Pavement
*	17,596	74	New Grass cover, Good, HSG C
*	2,008	98	Existing Pavement
	1,456	71	Meadow, non-grazed, HSG C
	29,933	70	Woods, Good, HSG C
	59,866	76	Weighted Average
	48,985		Pervious Area
	10,881		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	100	0.0400	0.10		**Sheet Flow, A-B, SHEET** Woods: Light underbrush n= 0.400 P2= 3.00"
3.9	240	0.0420	1.02		**Shallow Concentrated Flow, B-C, SHALLOW** Woodland Kv= 5.0 fps
20.7	340	Total			

Summary for Subcatchment 16S: Northerly Site Area

Runoff = 0.96 cfs @ 12.07 hrs, Volume= 3,246 cf, Depth= 4.16"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR Rainfall=4.40"

	Area (sf)	CN	Description
*	3,648	98	New Building
*	800	98	New Concrete Apron
*	4,906	98	New Pavement
	9,354	98	Weighted Average
	9,354		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, TC Time < 5 mins**

Summary for Subcatchment 17S: Northerly Site Area

Runoff = 1.32 cfs @ 12.07 hrs, Volume= 4,489 cf, Depth= 4.16"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR Rainfall=4.40"

	Area (sf)	CN	Description
*	3,356	98	New Building
*	1,400	98	New Concrete Apron
*	1,190	98	New Dumpster Area
*	6,886	98	New Pavement
*	103	98	New Sidewalk
	12,935	98	Weighted Average
	12,935		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, TC Time < 5 mins**

Summary for Subcatchment 18S: Northerly Site Area

Runoff = 0.63 cfs @ 12.07 hrs, Volume= 2,099 cf, Depth= 4.05"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR Rainfall=4.40"

	Area (sf)	CN	Description
*	1,689	98	New Building
*	4,039	98	New Pavement
*	356	98	New Sidewalk
*	136	74	New Landscaped Island
	6,220	97	Weighted Average
	136		Pervious Area
	6,084		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, TC Time < 5 Mins**

Summary for Subcatchment 19S: Access Drive

Runoff = 0.78 cfs @ 12.08 hrs, Volume= 2,327 cf, Depth= 2.21"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR Rainfall=4.40"

	Area (sf)	CN	Description
*	1,750	98	New Pavement
*	5,922	74	New Grass cover, Good, HSG C
*	1,205	98	Existing Pavement
	438	71	Meadow, non-grazed, HSG C
	3,320	70	Woods, Good, HSG C
	12,635	78	Weighted Average
	9,680		Pervious Area
	2,955		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, TC Time < 5 mins**

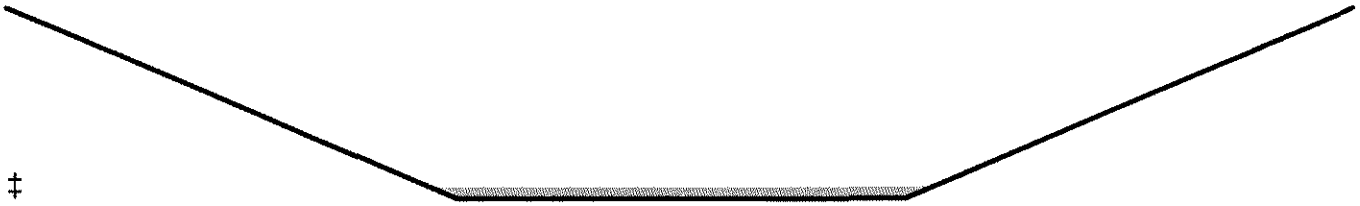
Summary for Reach 110R: Flow through woods

Inflow Area = 112,693 sf, 45.60% Impervious, Inflow Depth > 3.50" for 25-YR event
Inflow = 3.48 cfs @ 12.35 hrs, Volume= 32,854 cf
Outflow = 3.47 cfs @ 12.35 hrs, Volume= 32,854 cf, Atten= 0%, Lag= 0.4 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.05 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 0.80 fps, Avg. Travel Time= 1.5 min

Peak Storage= 119 cf @ 12.35 hrs, Average Depth at Peak Storage= 0.06'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 506.97 cfs

25.00' x 1.00' deep channel, n= 0.050 Scattered brush, heavy weeds
Side Slope Z-value= 25.0 '/' Top Width= 75.00'
Length= 70.0' Slope= 0.2000 '/'
Inlet Invert= 192.00', Outlet Invert= 178.00'



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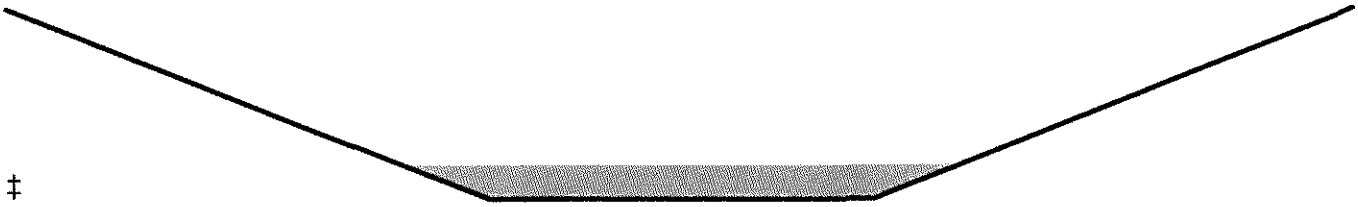
Summary for Reach 111R: Flow from overflow

Inflow	=	2.99 cfs @	12.34 hrs, Volume=	5,974 cf	
Outflow	=	2.99 cfs @	12.35 hrs, Volume=	5,974 cf,	Atten= 0%, Lag= 0.3 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.70 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 1.17 fps, Avg. Travel Time= 0.9 min

Peak Storage= 67 cf @ 12.35 hrs, Average Depth at Peak Storage= 0.09'
Bank-Full Depth= 0.50', Capacity at Bank-Full= 79.14 cfs

10.00' x 0.50' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 25.0 '/' Top Width= 35.00'
Length= 60.0' Slope= 0.0917 '/'
Inlet Invert= 197.50', Outlet Invert= 192.00'



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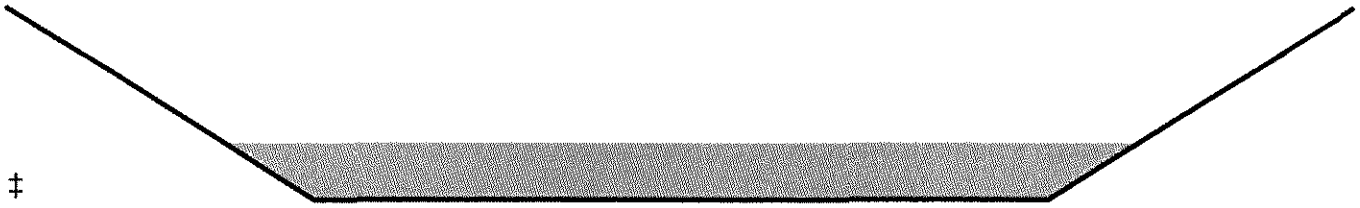
Summary for Reach 120R: Wooded Buffer 1

Inflow Area =		30,745 sf, 27.85% Impervious, Inflow Depth = 2.07" for 25-YR event			
Inflow	=	2.08 cfs @	12.08 hrs, Volume=	5,312 cf	
Outflow	=	1.57 cfs @	12.15 hrs, Volume=	5,312 cf,	Atten= 25%, Lag= 4.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.32 fps, Min. Travel Time= 7.9 min
Avg. Velocity = 0.07 fps, Avg. Travel Time= 34.8 min

Peak Storage= 745 cf @ 12.15 hrs, Average Depth at Peak Storage= 0.15'
Bank-Full Depth= 0.50', Capacity at Bank-Full= 13.67 cfs

30.00' x 0.50' deep channel, n= 0.400 Sheet flow: Woods+light brush
Side Slope Z-value= 25.0 '/' Top Width= 55.00'
Length= 150.0' Slope= 0.1067 '/'
Inlet Invert= 196.00', Outlet Invert= 180.00'



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Summary for Reach 130R: Flow through woods

Inflow Area = 25,583 sf, 39.70% Impervious, Inflow Depth = 2.49" for 25-YR event
Inflow = 1.54 cfs @ 12.14 hrs, Volume= 5,309 cf
Outflow = 1.53 cfs @ 12.15 hrs, Volume= 5,309 cf, Atten= 1%, Lag= 0.7 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.08 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 0.31 fps, Avg. Travel Time= 3.7 min

Peak Storage= 99 cf @ 12.15 hrs, Average Depth at Peak Storage= 0.05'
Bank-Full Depth= 0.50', Capacity at Bank-Full= 98.06 cfs

30.00' x 0.50' deep channel, n= 0.050 Scattered brush, heavy weeds
Side Slope Z-value= 25.0 '/' Top Width= 55.00'
Length= 70.0' Slope= 0.0857 '/'
Inlet Invert= 190.00', Outlet Invert= 184.00'

‡

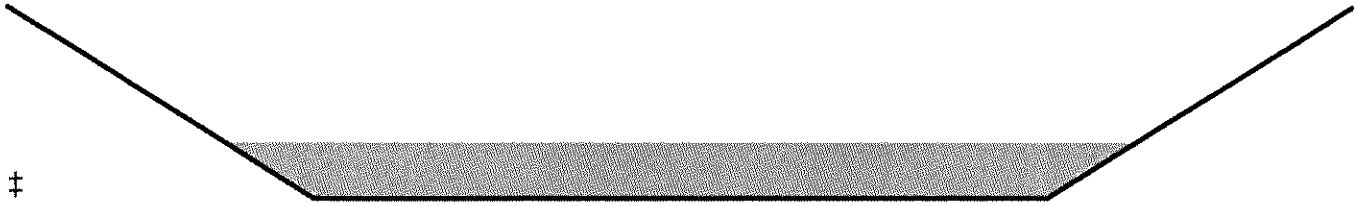
Summary for Reach 131R: Wooded Buffer 2

Inflow Area = 25,583 sf, 39.70% Impervious, Inflow Depth = 2.49" for 25-YR event
Inflow = 1.99 cfs @ 12.08 hrs, Volume= 5,309 cf
Outflow = 1.54 cfs @ 12.14 hrs, Volume= 5,309 cf, Atten= 23%, Lag= 3.8 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.31 fps, Min. Travel Time= 8.0 min
Avg. Velocity = 0.07 fps, Avg. Travel Time= 35.1 min

Peak Storage= 736 cf @ 12.14 hrs, Average Depth at Peak Storage= 0.15'
Bank-Full Depth= 0.50', Capacity at Bank-Full= 13.67 cfs

30.00' x 0.50' deep channel, n= 0.400 Sheet flow: Woods+light brush
Side Slope Z-value= 25.0 '/' Top Width= 55.00'
Length= 150.0' Slope= 0.1067 '/'
Inlet Invert= 206.00', Outlet Invert= 190.00'



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Summary for Reach 140R: Flow through woods

Inflow Area = 71,711 sf, 17.00% Impervious, Inflow Depth > 2.46" for 25-YR event
Inflow = 1.66 cfs @ 12.65 hrs, Volume= 14,697 cf
Outflow = 1.53 cfs @ 12.72 hrs, Volume= 14,697 cf, Atten= 8%, Lag= 4.4 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.15 fps, Min. Travel Time= 5.1 min
Avg. Velocity = 0.49 fps, Avg. Travel Time= 11.9 min

Peak Storage= 464 cf @ 12.72 hrs, Average Depth at Peak Storage= 0.05'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 331.89 cfs

25.00' x 1.00' deep channel, n= 0.050 Scattered brush, heavy weeds
Side Slope Z-value= 25.0 '/' Top Width= 75.00'
Length= 350.0' Slope= 0.0857 '/'
Inlet Invert= 213.00', Outlet Invert= 183.00'

‡

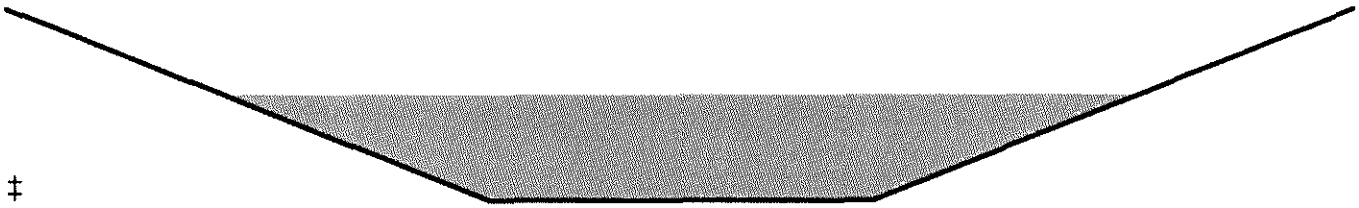
Summary for Reach 141R: Flow from overflow

Inflow = 1.56 cfs @ 12.59 hrs, Volume= 3,475 cf
Outflow = 1.45 cfs @ 12.65 hrs, Volume= 3,475 cf, Atten= 7%, Lag= 3.6 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.31 fps, Min. Travel Time= 3.5 min
Avg. Velocity = 0.08 fps, Avg. Travel Time= 12.9 min

Peak Storage= 304 cf @ 12.65 hrs, Average Depth at Peak Storage= 0.28'
Bank-Full Depth= 0.50', Capacity at Bank-Full= 4.86 cfs

10.00' x 0.50' deep channel, n= 0.400 Sheet flow: Woods+light brush
Side Slope Z-value= 25.0 '/' Top Width= 35.00'
Length= 65.0' Slope= 0.0615 '/'
Inlet Invert= 217.00', Outlet Invert= 213.00'



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Summary for Reach 150R: Flow through woods

Inflow Area =	101,010 sf, 41.79% Impervious, Inflow Depth > 2.66" for 25-YR event				
Inflow =	2.82 cfs @	12.46 hrs, Volume=	22,365 cf		
Outflow =	2.54 cfs @	12.55 hrs, Volume=	22,364 cf, Atten= 10%, Lag= 5.4 min		

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.38 fps, Min. Travel Time= 6.1 min
Avg. Velocity = 0.50 fps, Avg. Travel Time= 16.5 min

Peak Storage= 924 cf @ 12.55 hrs, Average Depth at Peak Storage= 0.07'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 324.62 cfs

25.00' x 1.00' deep channel, n= 0.050 Scattered brush, heavy weeds
Side Slope Z-value= 25.0 '/' Top Width= 75.00'
Length= 500.0' Slope= 0.0820 '/'
Inlet Invert= 219.00', Outlet Invert= 178.00'

‡

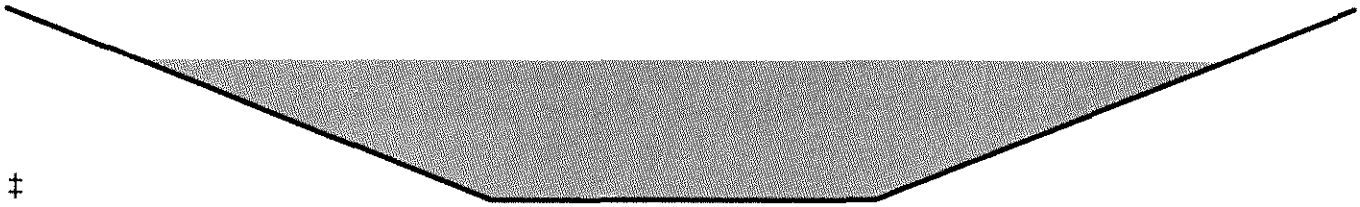
Summary for Reach 151R: Flow from overflow

Inflow =	2.66 cfs @	12.41 hrs, Volume=	6,321 cf	
Outflow =	2.55 cfs @	12.46 hrs, Volume=	6,321 cf, Atten= 4%, Lag= 3.0 min	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.36 fps, Min. Travel Time= 3.0 min
Avg. Velocity = 0.10 fps, Avg. Travel Time= 11.1 min

Peak Storage= 456 cf @ 12.46 hrs, Average Depth at Peak Storage= 0.37'
Bank-Full Depth= 0.50', Capacity at Bank-Full= 4.86 cfs

10.00' x 0.50' deep channel, n= 0.400 Sheet flow: Woods+light brush
Side Slope Z-value= 25.0 '/' Top Width= 35.00'
Length= 65.0' Slope= 0.0615 '/'
Inlet Invert= 223.00', Outlet Invert= 219.00'



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Summary for Pond 11P: UDSF-2

Inflow Area =	112,693 sf,	45.60% Impervious,	Inflow Depth =	3.50"	for 25-YR event
Inflow =	10.55 cfs @	12.07 hrs,	Volume=	32,915 cf	
Outflow =	3.48 cfs @	12.34 hrs,	Volume=	32,854 cf,	Atten= 67%, Lag= 16.4 min
Primary =	0.49 cfs @	12.35 hrs,	Volume=	26,880 cf	
Secondary =	2.99 cfs @	12.34 hrs,	Volume=	5,974 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 197.68' @ 12.35 hrs Surf.Area= 6,995 sf Storage= 13,064 cf
Flood Elev= 198.00' Surf.Area= 8,174 sf Storage= 15,505 cf

Plug-Flow detention time= 236.2 min calculated for 32,845 cf (100% of inflow)
Center-of-Mass det. time= 235.1 min (1,021.0 - 785.9)

Volume	Invert	Avail.Storage	Storage Description
#1	193.67'	15,505 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)		Wet.Area (sq-ft)
193.67	4,881	320.0	30.0	0	0		4,881
194.00	4,881	320.0	30.0	483	483		4,987
195.99	4,881	320.0	30.0	2,914	3,397		5,623
196.00	4,881	320.0	100.0	49	3,446	←	5,627
197.00	5,868	338.8	100.0	5,367	8,813		6,666
197.50	6,384	348.2	100.0	3,062	11,875	←	7,208
198.00	8,174	401.1	100.0	3,630	15,505		10,367

Permanent Pool Volume = 11,875 - 3,446 = 8,429 CF

Device	Routing	Invert	Outlet Devices
#1	Primary	193.67'	**6.0" x 40.0' long Underdrain Discharge Pipe** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 192.00' S= 0.0417 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior
#2	Device 1	193.67'	**4.0" x 124.0' long Underdrains X 4.00** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 193.67' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior
#3	Device 2	193.67'	**3.000 in/hr Filtration over Surface area**
#4	Secondary	197.50'	**20.0' long x 6.0' 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 3.00 3.50 4.00 4.50 5.00 5.50
Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=0.49 cfs @ 12.35 hrs HW=197.68' TW=192.06' (Dynamic Tailwater)
└─**1=Underdrain Discharge Pipe** (Passes 0.49 cfs of 1.45 cfs potential flow)
└─**2=Underdrains** (Passes 0.49 cfs of 1.24 cfs potential flow)
└─**3=Filtration** (Exfiltration Controls 0.49 cfs)

Secondary OutFlow Max=2.99 cfs @ 12.34 hrs HW=197.68' TW=197.59' (Dynamic Tailwater)
└─**4=Broad-Crested Rectangular Weir** (Weir Controls 2.99 cfs @ 0.84 fps)

Summary for Pond 12P: Level Spreader 1

Inflow Area =	30,745 sf, 27.85% Impervious, Inflow Depth = 2.55" for 25-YR event				
Inflow =	2.19 cfs @	12.07 hrs,	Volume=	6,530 cf	
Outflow =	2.09 cfs @	12.08 hrs,	Volume=	6,047 cf,	Atten= 4%, Lag= 0.3 min
Discarded =	0.01 cfs @	12.14 hrs,	Volume=	735 cf	
Primary =	2.08 cfs @	12.08 hrs,	Volume=	5,312 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 196.15' @ 12.14 hrs Surf.Area= 778 sf Storage= 901 cf
Flood Elev= 196.50' Surf.Area= 921 sf Storage= 1,195 cf

Plug-Flow detention time= 111.0 min calculated for 6,046 cf (93% of inflow)
Center-of-Mass det. time= 73.0 min (893.7 - 820.8)

Volume	Invert	Avail.Storage	Storage Description
#1	194.00'	1,195 cf	**Depression (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
194.00	142	99.4	0	0	142
196.00	718	130.8	786	786	762
196.50	921	140.3	409	1,195	977

Device	Routing	Invert	Outlet Devices
#1	Primary	196.00'	**30.0' long x 2.0' breadth Level Spreader Lip** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#2	Discarded	194.00'	**0.500 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 12.14 hrs HW=196.15' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=1.79 cfs @ 12.08 hrs HW=196.14' TW=196.13' (Dynamic Tailwater)
└─**1=Level Spreader Lip** (Weir Controls 1.79 cfs @ 0.42 fps)

Summary for Pond 13P: Level Spreader 1

Inflow Area =	25,583 sf, 39.70% Impervious, Inflow Depth = 2.91" for 25-YR event				
Inflow =	2.06 cfs @	12.07 hrs,	Volume=	6,207 cf	
Outflow =	2.00 cfs @	12.08 hrs,	Volume=	5,864 cf,	Atten= 3%, Lag= 0.2 min
Discarded =	0.01 cfs @	12.13 hrs,	Volume=	555 cf	
Primary =	1.99 cfs @	12.08 hrs,	Volume=	5,309 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 206.15' @ 12.13 hrs Surf.Area= 569 sf Storage= 646 cf
Flood Elev= 206.50' Surf.Area= 681 sf Storage= 864 cf

Plug-Flow detention time= 88.7 min calculated for 5,864 cf (94% of inflow)
Center-of-Mass det. time= 58.5 min (866.9 - 808.4)

Volume	Invert	Avail.Storage	Storage Description
#1	204.00'	864 cf	**Depression (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
204.00	97	69.4	0	0	97
206.00	523	100.8	563	563	555
206.50	681	110.3	300	864	723

Device	Routing	Invert	Outlet Devices
#1	Primary	206.00'	**30.0' long x 2.0' breadth Level Spreader Lip** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#2	Discarded	204.00'	**0.500 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 12.13 hrs HW=206.15' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=1.72 cfs @ 12.08 hrs HW=206.14' TW=206.13' (Dynamic Tailwater)
└**1=Level Spreader Lip** (Weir Controls 1.72 cfs @ 0.41 fps)

Summary for Pond 14P: UDSF-3

Inflow Area =	71,711 sf, 17.00% Impervious, Inflow Depth = 2.46" for 25-YR event				
Inflow =	3.19 cfs @	12.28 hrs,	Volume=	14,712 cf	
Outflow =	1.77 cfs @	12.59 hrs,	Volume=	14,697 cf,	Atten= 45%, Lag= 18.7 min
Primary =	0.21 cfs @	12.59 hrs,	Volume=	11,222 cf	
Secondary =	1.56 cfs @	12.59 hrs,	Volume=	3,475 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 217.66' @ 12.59 hrs Surf.Area= 2,982 sf Storage= 5,283 cf
Flood Elev= 218.00' Surf.Area= 3,336 sf Storage= 6,347 cf

Plug-Flow detention time= 226.0 min calculated for 14,697 cf (100% of inflow)

Center-of-Mass det. time= 225.4 min (1,063.2 - 837.8)

Volume	Invert	Avail.Storage	Storage Description
#1	213.67'	6,347 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
213.67	1,865	197.7	30.0	0	0	1,865
214.00	1,865	197.7	30.0	185	185	1,930
215.99	1,865	197.7	30.0	1,113	1,298	2,324
216.00	1,865	197.7	100.0	19	1,317 ←	2,326
217.00	2,486	216.5	100.0	2,168	3,485	2,979
217.50	2,818	226.0	100.0	1,325	4,810 ←	3,331
218.00	3,336	257.7	100.0	1,537	6,347	4,558

Permanent Pool Volume = 4,810 - 1,317 = 3,493 CF

Device	Routing	Invert	Outlet Devices
#1	Primary	213.67'	**6.0" x 75.0' long Underdrain Discharge Pipe** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 213.00' S= 0.0089 '/' Cc= 0.900 n= 0.015 Corrugated PE, smooth interior
#2	Device 1	213.67'	**4.0" x 75.0' long Underdrains X 3.00** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 213.67' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior
#3	Device 2	213.67'	**3.000 in/hr Filtration over Surface area**
#4	Secondary	217.50'	**10.0' long x 6.0' 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 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=0.21 cfs @ 12.59 hrs HW=217.66' TW=213.03' (Dynamic Tailwater)
└─**1=Underdrain Discharge Pipe** (Passes 0.21 cfs of 1.03 cfs potential flow)
└─**2=Underdrains** (Passes 0.21 cfs of 1.16 cfs potential flow)
└─**3=Filtration** (Exfiltration Controls 0.21 cfs)

Secondary OutFlow Max=1.56 cfs @ 12.59 hrs HW=217.66' TW=217.26' (Dynamic Tailwater)
└─**4=Broad-Crested Rectangular Weir** (Weir Controls 1.56 cfs @ 0.96 fps)

Summary for Pond 15P: UDSF-1

Inflow Area =	101,010 sf,	41.79% Impervious,	Inflow Depth =	2.66"	for 25-YR event
Inflow =	4.73 cfs @	12.08 hrs,	Volume=	22,390 cf	
Outflow =	2.93 cfs @	12.41 hrs,	Volume=	22,365 cf,	Atten= 38%, Lag= 19.6 min
Primary =	0.27 cfs @	12.41 hrs,	Volume=	16,044 cf	
Secondary =	2.66 cfs @	12.41 hrs,	Volume=	6,321 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 223.73' @ 12.41 hrs Surf.Area= 3,889 sf Storage= 7,101 cf
Flood Elev= 224.00' Surf.Area= 4,231 sf Storage= 8,192 cf

Plug-Flow detention time= 205.1 min calculated for 22,365 cf (100% of inflow)
Center-of-Mass det. time= 204.4 min (1,010.0 - 805.6)

Volume	Invert	Avail.Storage	Storage Description
#1	219.67'	8,192 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
219.67	2,438	245.5	30.0	0	0	2,438
220.00	2,438	245.5	30.0	241	241	2,519
221.99	2,438	245.5	30.0	1,455	1,697	3,008
222.00	2,438	245.5	100.0	24	1,721 ←	3,010
223.00	3,203	264.3	100.0	2,812	4,533	3,814
223.50	3,607	273.8	100.0	1,702	6,235 ←	4,243
224.00	4,231	305.1	100.0	1,957	8,192	5,692

Permanent Pool Volume = 6,235 - 1,721 = 4,514 CF

Device	Routing	Invert	Outlet Devices
#1	Primary	219.67'	**6.0" x 75.0' long Underdrain Discharge Pipe** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 219.00' S= 0.0089 '/' Cc= 0.900 n= 0.015 Corrugated PE, smooth interior
#2	Device 1	219.67'	**4.0" x 100.0' long Underdrain X 3.00** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 219.67' S= 0.0000 '/' Cc= 0.900 n= 0.013
#3	Device 2	219.67'	**3.000 in/hr Filtration over Surface area**
#4	Secondary	223.50'	**10.0' long x 6.0' 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 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=0.27 cfs @ 12.41 hrs HW=223.73' TW=219.05' (Dynamic Tailwater)
└─**1=Underdrain Discharge Pipe** (Passes 0.27 cfs of 1.04 cfs potential flow)
└─**2=Underdrain** (Passes 0.27 cfs of 1.03 cfs potential flow)
└─**3=Filtration** (Exfiltration Controls 0.27 cfs)

Secondary OutFlow Max=2.66 cfs @ 12.41 hrs HW=223.73' TW=223.35' (Dynamic Tailwater)
└─**4=Broad-Crested Rectangular Weir** (Weir Controls 2.66 cfs @ 1.15 fps)

Summary for Pond 16P: CB-1

Inflow Area =	41,144 sf,	76.14% Impervious,	Inflow Depth =	3.55"	for 25-YR event
Inflow =	3.68 cfs @	12.07 hrs, Volume=	12,161 cf		
Outflow =	3.68 cfs @	12.07 hrs, Volume=	12,161 cf,	Atten= 0%,	Lag= 0.0 min
Primary =	3.68 cfs @	12.07 hrs, Volume=	12,161 cf		

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 231.42' @ 12.07 hrs
Flood Elev= 235.00' ✓

Device	Routing	Invert	Outlet Devices
#1	Primary	229.30'	**12.0" x 165.0' long Storm Drain** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 228.00' S= 0.0079 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=3.68 cfs @ 12.07 hrs HW=231.41' TW=222.80' (Dynamic Tailwater)
└**1=Storm Drain** (Barrel Controls 3.68 cfs @ 4.69 fps)

Summary for Pond 17P: CB-2

Inflow Area =	31,790 sf, 69.12% Impervious, Inflow Depth = 3.37" for 25-YR event				
Inflow =	2.73 cfs @	12.07 hrs,	Volume=	8,915 cf	
Outflow =	2.73 cfs @	12.07 hrs,	Volume=	8,915 cf,	Atten= 0%, Lag= 0.0 min
Primary =	2.73 cfs @	12.07 hrs,	Volume=	8,915 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 232.34' @ 12.08 hrs
Flood Elev= 235.00' ✓

Device	Routing	Invert	Outlet Devices
#1	Primary	229.90'	**12.0" x 98.0' long Storm Drain** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 229.40' S= 0.0051 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=2.67 cfs @ 12.07 hrs HW=232.30' TW=231.41' (Dynamic Tailwater)
└**1=Storm Drain** (Outlet Controls 2.67 cfs @ 3.40 fps)

Summary for Pond 18P: CB-3

Inflow Area =	6,220 sf, 97.81% Impervious, Inflow Depth = 4.05" for 25-YR event				
Inflow =	0.63 cfs @	12.07 hrs,	Volume=	2,099 cf	
Outflow =	0.63 cfs @	12.07 hrs,	Volume=	2,099 cf,	Atten= 0%, Lag= 0.0 min
Primary =	0.63 cfs @	12.07 hrs,	Volume=	2,099 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 232.38' @ 12.09 hrs
Flood Elev= 235.25' ✓

Device	Routing	Invert	Outlet Devices
#1	Primary	230.25'	**12.0" x 41.0' long Storm Drain** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 230.00' S= 0.0061 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=0.00 cfs @ 12.07 hrs HW=232.18' TW=232.30' (Dynamic Tailwater)
└**1=Storm Drain** (Controls 0.00 cfs)

Summary for Pond 19P: CB-4

Inflow Area = 12,635 sf, 23.39% Impervious, Inflow Depth = 2.21" for 25-YR event
Inflow = 0.78 cfs @ 12.08 hrs, Volume= 2,327 cf
Outflow = 0.78 cfs @ 12.08 hrs, Volume= 2,327 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.78 cfs @ 12.08 hrs, Volume= 2,327 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 232.41' @ 12.09 hrs
Flood Elev= 235.40' ✓

Device	Routing	Invert	Outlet Devices
#1	Primary	230.40'	**12.0" x 82.0' long Storm Drain** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 230.00' S= 0.0049 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=0.00 cfs @ 12.08 hrs HW=232.30' TW=232.32' (Dynamic Tailwater)
↑—**1=Storm Drain** (Controls 0.00 cfs)

Summary for Pond 20P: Forebay UDSF-1

Routing by Dyn-Stor-Ind method
Peak Elev= 0.00' @ 0.00 hrs Surf.Area= 0 sf Storage= 0 cf
Flood Elev= 224.00' Surf.Area= 100 sf Storage= 57 cf

Plug-Flow detention time= (not calculated)
Center-of-Mass det. time= (not calculated)

Volume	Invert	Avail.Storage	Storage Description
#1	222.00'	57 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
222.00	0	0	0
223.00	71	36	36
223.25	100	21	57

Summary for Pond 21P: Forebay UDSF-2

Routing by Dyn-Stor-Ind method
Peak Elev= 0.00' @ 0.00 hrs Surf.Area= 0 sf Storage= 0 cf
Flood Elev= 224.00' Surf.Area= 445 sf Storage= 127 cf

Plug-Flow detention time= (not calculated)
Center-of-Mass det. time= (not calculated)

Volume	Invert	Avail.Storage	Storage Description
#1	196.75'	127 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
196.75	0	0	0
197.00	284	36	36
197.25	445	91	127

Summary for Pond 22P: Forebay UDSF-3

Routing by Dyn-Stor-Ind method
Peak Elev= 0.00' @ 0.00 hrs Surf.Area= 0 sf Storage= 0 cf
Flood Elev= 224.00' Surf.Area= 73 sf Storage= 32 cf

Plug-Flow detention time= (not calculated)
Center-of-Mass det. time= (not calculated)

Volume	Invert	Avail.Storage	Storage Description
#1	216.25'	32 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
216.25	0	0	0
217.00	45	17	17
217.25	73	15	32

Summary for Link 10L: SP1

Inflow Area = 566,179 sf, 22.23% Impervious, Inflow Depth > 2.34" for 25-YR event
Inflow = 12.34 cfs @ 12.43 hrs, Volume= 110,523 cf
Primary = 12.34 cfs @ 12.43 hrs, Volume= 110,523 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 10S: Undisturbed Site Area Runoff Area=224,437 sf 0.61% Impervious Runoff Depth=0.46"
Flow Length=950' Tc=27.2 min CN=70 Runoff=1.27 cfs 8,515 cf

Subcatchment 11S: Salt shed & central Runoff Area=112,693 sf 45.60% Impervious Runoff Depth=1.69"
Tc=5.0 min CN=92 Runoff=5.27 cfs 15,900 cf

Subcatchment 12S: Easterly fill slope Runoff Area=30,745 sf 27.85% Impervious Runoff Depth=1.00"
Tc=5.0 min CN=82 Runoff=0.84 cfs 2,557 cf

Subcatchment 13S: Westerly fill slope Runoff Area=25,583 sf 39.70% Impervious Runoff Depth=1.24"
Tc=5.0 min CN=86 Runoff=0.89 cfs 2,651 cf

Subcatchment 14S: Westerly site area Runoff Area=71,711 sf 17.00% Impervious Runoff Depth=0.94"
Flow Length=620' Tc=20.2 min CN=81 Runoff=1.18 cfs 5,632 cf

Subcatchment 15S: Northwesterly site area Runoff Area=59,866 sf 18.18% Impervious Runoff Depth=0.69"
Flow Length=340' Tc=20.7 min CN=76 Runoff=0.67 cfs 3,465 cf

Subcatchment 16S: Northerly Site Area Runoff Area=9,354 sf 100.00% Impervious Runoff Depth=2.27"
Tc=5.0 min CN=98 Runoff=0.54 cfs 1,770 cf

Subcatchment 17S: Northerly Site Area Runoff Area=12,935 sf 100.00% Impervious Runoff Depth=2.27"
Tc=5.0 min CN=98 Runoff=0.74 cfs 2,448 cf

Subcatchment 18S: Northerly Site Area Runoff Area=6,220 sf 97.81% Impervious Runoff Depth=2.16"
Tc=5.0 min CN=97 Runoff=0.35 cfs 1,122 cf

Subcatchment 19S: Access Drive Runoff Area=12,635 sf 23.39% Impervious Runoff Depth=0.79"
Tc=5.0 min CN=78 Runoff=0.26 cfs 830 cf

Reach 110R: Flow through woods Avg. Depth=0.02' Max Vel=0.90 fps Inflow=0.39 cfs 15,853 cf
n=0.050 L=70.0' S=0.2000 '/' Capacity=506.97 cfs Outflow=0.39 cfs 15,852 cf

Reach 111R: Flow from overflow Avg. Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0 cf
n=0.030 L=60.0' S=0.0917 '/' Capacity=79.14 cfs Outflow=0.00 cfs 0 cf

Reach 120R: Wooded Buffer 1 Avg. Depth=0.05' Max Vel=0.15 fps Inflow=0.44 cfs 1,387 cf
n=0.400 L=150.0' S=0.1067 '/' Capacity=13.67 cfs Outflow=0.21 cfs 1,387 cf

Reach 130R: Flow through woods Avg. Depth=0.02' Max Vel=0.63 fps Inflow=0.38 cfs 1,796 cf
n=0.050 L=70.0' S=0.0857 '/' Capacity=98.06 cfs Outflow=0.38 cfs 1,796 cf

Reach 131R: Wooded Buffer 2 Avg. Depth=0.06' Max Vel=0.19 fps Inflow=0.86 cfs 1,796 cf
n=0.400 L=150.0' S=0.1067 '/' Capacity=13.67 cfs Outflow=0.38 cfs 1,796 cf

Reach 140R: Flow through woods Avg. Depth=0.01' Max Vel=0.49 fps Inflow=0.15 cfs 5,621 cf
n=0.050 L=350.0' S=0.0857 '/' Capacity=331.89 cfs Outflow=0.15 cfs 5,621 cf

Reach 141R: Flow from overflow Avg. Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0 cf
n=0.400 L=65.0' S=0.0615 '/' Capacity=4.86 cfs Outflow=0.00 cfs 0 cf

Reach 150R: Flow through woods Avg. Depth=0.02' Max Vel=0.55 fps Inflow=0.21 cfs 9,616 cf
n=0.050 L=500.0' S=0.0820 '/' Capacity=324.62 cfs Outflow=0.21 cfs 9,616 cf

Reach 151R: Flow from overflow Avg. Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0 cf
n=0.400 L=65.0' S=0.0615 '/' Capacity=4.86 cfs Outflow=0.00 cfs 0 cf

Pond 11P: UDSF-2 Peak Elev=196.74' Storage=7,297 cf Inflow=5.27 cfs 15,900 cf
Primary=0.39 cfs 15,853 cf Secondary=0.00 cfs 0 cf Outflow=0.39 cfs 15,853 cf

Pond 12P: Level Spreader 1 Peak Elev=196.05' Storage=820 cf Inflow=0.84 cfs 2,557 cf
Discarded=0.01 cfs 691 cf Primary=0.44 cfs 1,387 cf Outflow=0.45 cfs 2,078 cf

Pond 13P: Level Spreader 1 Peak Elev=206.07' Storage=598 cf Inflow=0.89 cfs 2,651 cf
Discarded=0.01 cfs 514 cf Primary=0.86 cfs 1,796 cf Outflow=0.86 cfs 2,310 cf

Pond 14P: UDSF-3 Peak Elev=216.53' Storage=2,383 cf Inflow=1.18 cfs 5,632 cf
Primary=0.15 cfs 5,621 cf Secondary=0.00 cfs 0 cf Outflow=0.15 cfs 5,621 cf

Pond 15P: UDSF-1 Peak Elev=222.84' Storage=4,018 cf Inflow=2.13 cfs 9,634 cf
Primary=0.21 cfs 9,616 cf Secondary=0.00 cfs 0 cf Outflow=0.21 cfs 9,616 cf

Pond 16P: CB-1 Peak Elev=230.19' Inflow=1.88 cfs 6,169 cf
12.0" x 165.0' Culvert Outflow=1.88 cfs 6,169 cf

Pond 17P: CB-2 Peak Elev=230.71' Inflow=1.35 cfs 4,399 cf
12.0" x 98.0' Culvert Outflow=1.35 cfs 4,399 cf

Pond 18P: CB-3 Peak Elev=230.78' Inflow=0.35 cfs 1,122 cf
12.0" x 41.0' Culvert Outflow=0.35 cfs 1,122 cf

Pond 19P: CB-4 Peak Elev=230.83' Inflow=0.26 cfs 830 cf
12.0" x 82.0' Culvert Outflow=0.26 cfs 830 cf

Pond 20P: Forebay UDSF-1 Peak Elev=0.00' Storage=0 cf

Pond 21P: Forebay UDSF-2 Peak Elev=0.00' Storage=0 cf

Pond 22P: Forebay UDSF-3 Peak Elev=0.00' Storage=0 cf

Link 10L: SP1 Inflow=2.50 cfs 42,787 cf
Primary=2.50 cfs 42,787 cf

Total Runoff Area = 566,179 sf Runoff Volume = 44,888 cf Average Runoff Depth = 0.95"
77.77% Pervious = 440,292 sf 22.23% Impervious = 125,887 sf

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 10S: Undisturbed Site Area Runoff Area=224,437 sf 0.61% Impervious Runoff Depth=1.20"
Flow Length=950' Tc=27.2 min CN=70 Runoff=4.02 cfs 22,408 cf

Subcatchment 11S: Salt shed & central Runoff Area=112,693 sf 45.60% Impervious Runoff Depth=2.92"
Tc=5.0 min CN=92 Runoff=8.88 cfs 27,466 cf

Subcatchment 12S: Easterly fill slope Runoff Area=30,745 sf 27.85% Impervious Runoff Depth=2.03"
Tc=5.0 min CN=82 Runoff=1.74 cfs 5,209 cf

Subcatchment 13S: Westerly fill slope Runoff Area=25,583 sf 39.70% Impervious Runoff Depth=2.37"
Tc=5.0 min CN=86 Runoff=1.68 cfs 5,044 cf

Subcatchment 14S: Westerly site area Runoff Area=71,711 sf 17.00% Impervious Runoff Depth=1.95"
Flow Length=620' Tc=20.2 min CN=81 Runoff=2.53 cfs 11,680 cf

Subcatchment 15S: Northwesterly site area Runoff Area=59,866 sf 18.18% Impervious Runoff Depth=1.59"
Flow Length=340' Tc=20.7 min CN=76 Runoff=1.67 cfs 7,917 cf

Subcatchment 16S: Northerly Site Area Runoff Area=9,354 sf 100.00% Impervious Runoff Depth=3.57"
Tc=5.0 min CN=98 Runoff=0.82 cfs 2,779 cf

Subcatchment 17S: Northerly Site Area Runoff Area=12,935 sf 100.00% Impervious Runoff Depth=3.57"
Tc=5.0 min CN=98 Runoff=1.14 cfs 3,843 cf

Subcatchment 18S: Northerly Site Area Runoff Area=6,220 sf 97.81% Impervious Runoff Depth=3.45"
Tc=5.0 min CN=97 Runoff=0.54 cfs 1,790 cf

Subcatchment 19S: Access Drive Runoff Area=12,635 sf 23.39% Impervious Runoff Depth=1.73"
Tc=5.0 min CN=78 Runoff=0.61 cfs 1,820 cf

Reach 110R: Flow through woods Avg. Depth=0.04' Max Vel=1.47 fps Inflow=1.45 cfs 27,408 cf
n=0.050 L=70.0' S=0.2000 '/' Capacity=506.97 cfs Outflow=1.45 cfs 27,408 cf

Reach 111R: Flow from overflow Avg. Depth=0.05' Max Vel=1.85 fps Inflow=0.99 cfs 2,253 cf
n=0.030 L=60.0' S=0.0917 '/' Capacity=79.14 cfs Outflow=0.99 cfs 2,253 cf

Reach 120R: Wooded Buffer 1 Avg. Depth=0.12' Max Vel=0.28 fps Inflow=1.64 cfs 4,007 cf
n=0.400 L=150.0' S=0.1067 '/' Capacity=13.67 cfs Outflow=1.11 cfs 4,007 cf

Reach 130R: Flow through woods Avg. Depth=0.04' Max Vel=0.99 fps Inflow=1.21 cfs 4,159 cf
n=0.050 L=70.0' S=0.0857 '/' Capacity=98.06 cfs Outflow=1.20 cfs 4,159 cf

Reach 131R: Wooded Buffer 2 Avg. Depth=0.13' Max Vel=0.29 fps Inflow=1.62 cfs 4,159 cf
n=0.400 L=150.0' S=0.1067 '/' Capacity=13.67 cfs Outflow=1.21 cfs 4,159 cf

Reach 140R: Flow through woods Avg. Depth=0.03' Max Vel=0.80 fps Inflow=0.62 cfs 11,666 cf
n=0.050 L=350.0' S=0.0857 '/' Capacity=331.89 cfs Outflow=0.58 cfs 11,666 cf

Reach 141R: Flow from overflow Avg. Depth=0.14' Max Vel=0.22 fps Inflow=0.46 cfs 1,261 cf
n=0.400 L=65.0' S=0.0615 '/' Capacity=4.86 cfs Outflow=0.42 cfs 1,261 cf

Reach 150R: Flow through woods Avg. Depth=0.05' Max Vel=1.07 fps Inflow=1.46 cfs 18,126 cf
n=0.050 L=500.0' S=0.0820 '/' Capacity=324.62 cfs Outflow=1.30 cfs 18,125 cf

Reach 151R: Flow from overflow Avg. Depth=0.25' Max Vel=0.29 fps Inflow=1.28 cfs 3,155 cf
n=0.400 L=65.0' S=0.0615 '/' Capacity=4.86 cfs Outflow=1.20 cfs 3,155 cf

Pond 11P: UDSF-2 Peak Elev=197.59' Storage=12,441 cf Inflow=8.88 cfs 27,466 cf
Primary=0.46 cfs 25,155 cf Secondary=0.99 cfs 2,253 cf Outflow=1.45 cfs 27,408 cf

Pond 12P: Level Spreader 1 Peak Elev=196.12' Storage=879 cf Inflow=1.74 cfs 5,209 cf
Discarded=0.01 cfs 721 cf Primary=1.64 cfs 4,007 cf Outflow=1.65 cfs 4,728 cf

Pond 13P: Level Spreader 1 Peak Elev=206.13' Storage=635 cf Inflow=1.68 cfs 5,044 cf
Discarded=0.01 cfs 542 cf Primary=1.62 cfs 4,159 cf Outflow=1.63 cfs 4,702 cf

Pond 14P: UDSF-3 Peak Elev=217.57' Storage=5,017 cf Inflow=2.53 cfs 11,680 cf
Primary=0.20 cfs 10,405 cf Secondary=0.46 cfs 1,261 cf Outflow=0.66 cfs 11,666 cf

Pond 15P: UDSF-1 Peak Elev=223.64' Storage=6,762 cf Inflow=3.87 cfs 18,149 cf
Primary=0.26 cfs 14,971 cf Secondary=1.28 cfs 3,155 cf Outflow=1.54 cfs 18,126 cf

Pond 16P: CB-1 Peak Elev=230.88' Inflow=3.11 cfs 10,233 cf
12.0" x 165.0' Culvert Outflow=3.11 cfs 10,233 cf

Pond 17P: CB-2 Peak Elev=231.53' Inflow=2.28 cfs 7,453 cf
12.0" x 98.0' Culvert Outflow=2.28 cfs 7,453 cf

Pond 18P: CB-3 Peak Elev=231.56' Inflow=0.54 cfs 1,790 cf
12.0" x 41.0' Culvert Outflow=0.54 cfs 1,790 cf

Pond 19P: CB-4 Peak Elev=231.57' Inflow=0.61 cfs 1,820 cf
12.0" x 82.0' Culvert Outflow=0.61 cfs 1,820 cf

Pond 20P: Forebay UDSF-1 Peak Elev=0.00' Storage=0 cf

Pond 21P: Forebay UDSF-2 Peak Elev=0.00' Storage=0 cf

Pond 22P: Forebay UDSF-3 Peak Elev=0.00' Storage=0 cf

Link 10L: SP1 Inflow=6.86 cfs 87,773 cf
Primary=6.86 cfs 87,773 cf

Total Runoff Area = 566,179 sf Runoff Volume = 89,956 cf Average Runoff Depth = 1.91"
77.77% Pervious = 440,292 sf 22.23% Impervious = 125,887 sf

Attachment D

Inspection, Maintenance, and Housekeeping Plan

INSPECTION, MAINTENANCE, AND HOUSEKEEPING PLAN

Orono Public Works Facility
135 Kelley Road, Orono, Maine 04473

Introduction

The following plan outlines the anticipated inspection and maintenance procedures for the erosion and sedimentation control measures as well as stormwater management facilities for the Orono Public Works facility at 135 Kelley Road in Orono, Maine. This plan also outlines several housekeeping requirements that shall be followed during and after construction. These procedures shall be followed in order to ensure the intended function of the designed measures and to prevent unreasonably adverse impacts to the surrounding environment.

The procedures outlined in this Inspection, Maintenance and Housekeeping Plan are provided as an overview of the anticipated practices to be used on this site. In some instances, additional measures may be required due to unexpected conditions. For additional detail on any of the erosion and sedimentation control measures or stormwater management devices to be utilized on this project, refer to the most recently revised edition of the "Maine Erosion and Sedimentation Control BMP" manual and/or the "Stormwater Management for Maine: Best Management Practices" manual as published by the Maine Department of Environmental Protection (MDEP).

During Construction

1. **Inspection:** During the construction process, it is the Contractor's responsibility to comply with the inspection and maintenance procedures outlined in this section. These responsibilities include inspecting disturbed and impervious areas, erosion control measures, materials storage areas that are exposed to precipitation, and locations where vehicles enter or exit the site. These areas shall be inspected at least once a week as well as before and after a storm event, and prior to completing permanent stabilization measures. A person with knowledge of erosion and stormwater control, including the standards and conditions in any applicable permits, shall conduct the inspections.

2. **Maintenance:** All measures shall be maintained in an effective operating condition until areas are permanently stabilized. If Best Management Practices (BMPs) need to be maintained or modified, additional BMPs are necessary, or other corrective action is needed, implementation must be completed within 7 calendar days and prior to any storm event (rainfall).

3. **Documentation:** A log summarizing the inspections and any corrective action taken must be maintained on-site. 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, material storage areas, and vehicle access points to the site. Major observations must include BMPs that need maintenance, BMPs that failed to operate as designed or proved inadequate for a particular location, and locations 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 the appropriate regulatory agency 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.

4. **Specific Inspection and Maintenance Tasks:** The following is a list of erosion control and stormwater management measures and the specific inspection and maintenance tasks to be performed during construction.

A. Sediment Barriers:

- Hay bale barriers, silt fences, and filter berms shall be inspected immediately after each rainfall and at least daily during prolonged rainfall.
- If the fabric on a silt fence or filter barrier should decompose or become ineffective prior to the end of the expected usable life and the barrier is still necessary, it shall be replaced.
- Sediment deposits should be removed after each storm event. They must be removed before deposits reach approximately one-half the height of the barrier.
- Filter berms shall be reshaped as needed.
- Any sediment deposits remaining in place after the silt fence or filter barrier is no longer required should be dressed to conform to the existing grade, prepared, and seeded.

B. Riprap Materials:

- Once a riprap installation has been completed, it should require very little maintenance. It shall, however, be inspected periodically to determine if high flows have caused scour beneath the riprap or dislodged any of the stone.

C. Erosion Control Blankets:

- Inspect these reinforced areas semi-annually and after significant rainfall events for slumping, sliding, seepage, and scour. Pay close attention to unreinforced areas adjacent to the erosion control blankets, which may experience accelerated erosion.
- Review all applicable inspection and maintenance procedures recommended by the specific blanket manufacturer. These tasks shall be included in addition to the requirements of this plan.

D. Stabilized Construction Entrances/Exits:

- The exit shall be maintained in a condition that will prevent tracking of sediment onto public rights-of-way.
- When the control pad becomes ineffective, the stone shall be removed along with the collected soil material. The entrance should then be reconstructed.
- Areas that have received mud-tracking or sediment deposits shall be swept or washed. Washing shall be done on an area stabilized with aggregate, which drains into an approved sediment-trapping device (not into storm drains, ditches, or waterways).

E. Temporary Seed and Mulch:

- Mulched areas should be inspected after rain events to check for rill erosion.
- If less than 90% of the soil surface is covered by mulch, additional mulch shall be applied in bare areas.

- In applications where seeding and mulch have been applied in conjunction with erosion control blankets, the blankets must be inspected after rain events for dislocation or undercutting.
- Mulch shall continue to be reapplied until 95% of the soil surface has established temporary vegetative cover.

F. Stabilized Temporary Drainage Swales:

- Sediment accumulation in the swale shall be removed once the cross section of the swale is reduced by 25%.
- The swales shall be inspected after rainfall events. Any evidence of sloughing of the side slopes or channel erosion shall be repaired and corrective action should be taken to prevent reoccurrence of the problem.
- In addition to the stabilized lining of the channel (i.e. erosion control blankets), stone check dams may be needed to further reduce channel velocity.

5. **Housekeeping:** The following general performance standards apply to the proposed project.

A. Spill prevention: Controls must be used to prevent pollutants from being discharged from materials on-site, including storage practices to minimize exposure of the materials to stormwater, and appropriate spill prevention, containment, and response planning and implementation.

B. Groundwater protection: During construction, liquid petroleum products and other hazardous materials with the potential to contaminate groundwater may not be stored or handled in areas of the site draining to an infiltration area. An "infiltration area" is any area of the site that by design or as a result of soils, topography and other relevant factors, accumulates runoff that infiltrates into the soil. Dikes, berms, sumps, and other forms of secondary containment that prevent discharge to groundwater may be used to isolate portions of the site for the purposes of storage and handling of these materials.

C. Fugitive sediment and dust: Actions must be taken to insure that activities do not result in noticeable erosion of soils or fugitive dust emissions during or after construction. Oil may not be used for dust control.

D. Debris and other materials: Litter, construction debris, and chemicals exposed to stormwater must be prevented from becoming a pollutant source.

E. Trench or foundation dewatering: Trench dewatering is the removal of water from trenches, foundations, cofferdams, ponds, and other areas within the construction area that retain water after excavation. In most cases, the collected water is heavily silted and hinders correct and safe construction practices. The collected water must be removed from the ponded area, either through gravity or pumping, and must be spread through natural wooded buffers or removed to areas that are specifically designed to collect the maximum amount of sediment possible, like a cofferdam sedimentation basin. Avoid allowing the water to flow over disturbed areas of the site. Equivalent measures may be taken if approved.

Post-Construction

1. **Inspection:** After construction, it is the responsibility of the owner or assigned heirs to comply with the inspection and maintenance procedures outlined in this section. All measures must be maintained in effective operating condition. The owner or operator of a BMP shall hire a qualified post-construction stormwater inspector to at least annually, inspect the BMPs, including but not limited to any parking areas, catch basins, drainage swales, detention basins and ponds, pipes and related structures, in accordance with all municipal and state inspection, cleaning and maintenance requirements of the approved post-construction stormwater management plan.

2. **Specific Inspection and Maintenance Tasks:** The following is a list of permanent erosion control and stormwater management measures and the inspection and maintenance tasks to be performed after construction. If the BMP requires maintenance, repair or replacement to function as intended by the approved post-construction stormwater management plan, the owner or operator of the BMP shall take corrective action(s) to address the deficiency or deficiencies as soon as possible after the deficiency is discovered and shall provide a record of the deficiency and corrective action(s) to the department of public services ("DPS") in the annual report

   A. Vegetated Areas:
   - Inspect vegetated areas, particularly slopes and embankments, early in the growing season or after heavy rains 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.

   B. Ditches, Swales and Other Open Channels:
   - Inspect ditches, swales, level spreaders and other open stormwater channels in the spring, in the late fall, and after heavy rains to remove any obstructions to flow. Remove accumulated sediments and debris, remove woody vegetative growth that could obstruct flow, and repair any erosion of the ditch lining.
   - Vegetated ditches must 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 in areas where any underlying filter fabric or underdrain gravel is showing through the stone or where stones have dislodged.

   C. Culverts:
   - Inspect culverts in the spring, in the late fall, and after heavy rains to remove any obstructions to flow.
   - Remove accumulated sediments and debris at the inlet, at the outlet, and within the conduit.
   - Inspect and repair any erosion damage at the culvert's inlet and outlet.

D. Removal of Winter Sand:

- 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 or other acceptable method.

E. Underdrained Soil Filter:

- During the first year, the basin shall be inspected semi-annually and following major storm events.
- Debris and sediment buildup shall be removed from the forebay and basin as needed. Mowing of a grassed basin can occur semiannually to a height no less than 6 inches. Any bare area or erosion rills shall be repaired with new filter media or sandy loam then seeded and mulched. Maintaining good grass cover will minimize clogging with fine sediments and if ponding exceeds 48 hours, the top of the filter bed must be rototilled to reestablish the soil's filtration capacity.
- The soil filter should be inspected after every major storm in the first year to be sure it is functioning properly. Thereafter, the filter should be inspected at least once every six months to ensure that it is draining within 48 hours following a one inch storm or greater. Following storms that fill the system and overflow is observed, the soil filter should drain in no less than 36 to 60 hours. If the system drains too fast, an orifice may need to be added on the underdrain outlet or, if already present, may need to be modified.
- Soil Filter Replacement: The top several inches of the filter shall be replaced with fresh material when water ponds on the surface of the bed for more than 72 hours. Removed sediments should be disposed of in an acceptable manner.
- Sediment Removal: Sediment and plant debris should be removed from the pretreatment structure at least annually.
- Mowing: If mowing is desired, only handheld string trimmers or push-mowers are allowed on the filter (no tractor) and the grass bed should be mowed no more than 2 times per growing season to maintain grass heights of no less than 6 inches.
- Fertilization: Fertilization of the underdrained filter area should be avoided unless absolutely necessary to establish vegetation.
- Harvesting and Weeding: Harvesting and pruning of excessive growth will need to be done occasionally. Weeding to control unwanted or invasive plants may also be necessary.

F. Stone Bermed Level Lip Spreader:

- The level spreader pool should be inspected after rainfall events for sediment accumulation and debris that may reduce its capacity. Sediment and debris buildup should be removed once the volume of the pool has been reduced by 25%.
- The 18" stone berm must be constructed so that flows slowly seep through the berm into a sheet flow through the receiving buffer. Repair or reconstruction of the berm is required when flow from the spreader becomes channelized.
- Do not store snow removed from the street and/or parking lot within the area of a level spreader.

G. Wooded Buffer Areas:

- Remove dead wood and debris with minimal disturbance. Monitor for bypass and channelization; repair as it is occurring and remove sediment build-up to assure sheet flow conditions. Replant trees and bushes if needed. Perform monitoring on a semi-annual basis.

3. Documentation:

A. The owner or operator of a BMP or a qualified post-construction stormwater inspector hired by that person, shall, on or by June 30 of each year, provide a completed and signed certification to DPS in a form provided by DPS, certifying that the person has inspected the BMP(s) and that they are adequately maintained and functioning as intended by the approved post-construction stormwater management plan, or that they required maintenance or repair, including the record of the deficiency and corrective action(s) taken.

B. A log summarizing the inspections and any corrective action taken must be maintained. 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 controls. Major observations must include BMPs that need maintenance, BMPs that failed to operate as designed or proved inadequate for a particular location, and locations 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 the appropriate regulatory agency upon request. A sample "Stormwater Inspection and Maintenance Form" has been included as Attachment 1 of this Inspection, Maintenance, and Housekeeping Plan.

4. Duration of Maintenance: Perform maintenance as described and required for any associated permits unless and until the system is formally accepted by a municipality or quasi-municipal district, or is placed under the jurisdiction of a legally created association that will be responsible for the maintenance of the system. If a municipality or quasi-municipal district chooses to accept a stormwater management system, or a component of a stormwater system, it must provide a letter to the MDEP stating that it assumes responsibility for the system. The letter must specify the components of the system for which the municipality or district will assume responsibility, and that the municipality or district agrees to maintain those components of the system in compliance with MDEP standards. Upon such assumption of responsibility, and approval by the MDEP, the municipality, quasi-municipal district, or association becomes a co-permittee for this purpose only and must comply with all terms and conditions of the permit.

Attachments

Attachment 1 – Sample Stormwater Inspection and Maintenance Log Form

ATTACHMENT 1
STORMWATER INSPECTION AND MAINTENANCE LOG

Orono Public Works Facility
167 Kelley Road, Orono, Maine 04473

This log is intended to accompany the Inspection, Maintenance and Housekeeping Plan for the Orono Public Works Facility at 167 Kelley Road in Orono, Maine. The following items shall be checked, cleaned and maintained on a regular basis as specified in the Maintenance Plan and as described in the table below. This log shall be kept on file for a minimum of five (5) years and shall be available for review by the municipality. Qualified personnel familiar with drainage systems and soils shall perform all inspections. Attached is a copy of the construction and post-construction maintenance logs.

	INSPECTOR NAME	DATE PERFORMED	SUGGESTED INTERVAL
Vegetated Areas			
Inspect all slopes and embankments			Annually
Replant bare areas or areas with sparse growth			Annually
Gravel Surfaces			
Clear accumulated winter sand			Annually
Remove sediment along edges and in pockets			Annually
Ditches & Swales			
Remove any obstructions and accumulated sediments and debris			Monthly
Repair any erosion of ditch lining			Annually
Mow vegetated ditches			Annually
Remove woody vegetation growing through riprap			Annually
Repair any slumping side slopes			Annually
Replace riprap where stones have dislodged			Annually
Culverts			
Remove accumulated sediments and debris at the inlet, outlet, within conduit			Annually
Repair any erosion at inlet and outlet			Annually
Sump Depth			Annually
Underdrained Soil Filter			
Remove sediment & debris			Monthly
Remove weeds			Monthly (during growing season)
Erosion (side slopes, embankment)			Monthly
Inspection after major storm to verify proper function			Bi-Annually

	Mowed			As-needed (during growing season)
Stone-Bermed Level Spreader				
	Remove sediment			Monthly
	Check for evidence of channelized flow over berm			Monthly
	Erosion (side slopes, embankment)			Monthly
	Mowed			Semi-Annually
Wooded Buffer				
	Remove dead tree limbs			Annually
	Check for evidence of channelized flow through wooded buffer area			Annually

Attachment E

Sample Buffer Language

Wooded buffer, no disturbance

DECLARATION OF RESTRICTIONS (Wooded Buffer, No Disturbance)

THIS DECLARATION OF RESTRICTIONS is made this _____day of _____ , 20___, by _____, _____,
(name) (street address)
_____, _____County, Maine, _____ , (herein referred to as the
(city or town) (county) (zipcode)
"Declarant", pursuant to a permit received from the Maine Department of Environmental Protection under the Stormwater Management Law, to preserve a buffer area on a parcel of land near _____, _____ .
(road name) (known feature and/or town)

WHEREAS, the Declarant holds title to certain real property situated in _____, Maine
(town)
described in a deed from _____to _____, dated
(name) (name of Declarant)
_____, 20____, and recorded in Book ____ Page ____ at the _____County Registry of Deeds, herein referred to as the "property"; and

WHEREAS, Declarant desires to place certain restrictions, under the terms and conditions herein, over a portion of said real property (hereinafter referred to as the "Restricted Buffer") described as follows: (Note: Insert description of restricted buffer location here)

WHEREAS, pursuant to the Stormwater Management Law, 38 M.R.S.A. Section 420-D and Chapter 500 of rules promulgated by the Maine Board of Environmental Protection ("Stormwater Management Rules"), Declarant has agreed to impose certain restrictions on the Restricted Buffer Area as more particularly set forth herein and has agreed that these restrictions may be enforced by the Maine Department of Environmental Protection or any successor (hereinafter the "MDEP"),

NOW, THEREFORE, the Declarant hereby declares that the Restricted Buffer Area is and shall forever be held, transferred, sold, conveyed, occupied and maintained subject to the conditions and restrictions set forth herein. The Restrictions shall run with the Restricted Buffer Area and shall be binding on all parties having any right, title or interest in and to the Restricted Buffer Area, or any portion thereof, and their heirs, personal representatives, successors, and assigns. Any present or future owner or occupant of the Restricted Buffer Area or any portion thereof, by the acceptance of a deed of conveyance of all or part of the Covenant Area or an instrument conveying any interest therein, whether or not the deed or instrument shall so express, shall be deemed to have accepted the Restricted Buffer Area 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 Restricted Buffer Area. Unless the owner of the Restricted Buffer Area, or any successors or assigns, obtains the prior written approval of the MDEP, the Restricted Buffer Area must remain undeveloped in perpetuity. To maintain the ability of the Restricted Buffer Area to filter and absorb stormwater, and to maintain compliance with the Stormwater Management Law and the permit

issued thereunder to the Declarant, the use of the Restricted 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 will be placed, stored or dumped on the Restricted Buffer Area, nor shall the topography of the area be altered or manipulated in any way;

b. No trees may be cut or sprayed with biocides except for the normal maintenance of dead, windblown or damaged trees and for pruning of tree branches below a height of 12 feet provided two thirds of the tree's canopy is maintained;

c. No undergrowth, ground cover vegetation, leaf litter, organic duff layer or mineral soil may be disturbed except that one winding path, that is no wider than six feet and that does not provide a downhill channel for runoff, is allowed through the area;

d. No building or other temporary or permanent structure may be constructed, placed or permitted to remain on the Restricted Buffer Area, except for a sign, utility pole or fence;

e. No trucks, cars, dirt bikes, ATVs, bulldozers, backhoes, or other motorized vehicles or mechanical equipment may be permitted on the Restricted Buffer Area;

f. Any level lip spreader directing flow to the Restricted Buffer Area must be regularly inspected and adequately maintained to preserve the function of the level spreader.

Any activity on or use of the Restricted Buffer Area inconsistent with the purpose of these Restrictions is prohibited. Any future alterations or changes in use of the Restricted Buffer Area must receive prior approval in writing from the MDEP. The MDEP may approve such alterations and changes in use if such alterations and uses do not impede the stormwater control and treatment capability of the Restricted Buffer Area or if adequate and appropriate alternative means of stormwater control and treatment are provided.

2. Enforcement. The MDEP may enforce any of the Restrictions set forth in Section 1 above.

3. Binding Effect. The restrictions set forth herein shall be binding on any present or future owner of the Restricted Buffer Area. If the Restricted 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 Restricted Buffer Area is included within such owner's property.

4. Amendment. Any provision contained in this Declaration may be amended or revoked only by the recording of a written instrument or instruments specifying the amendment or the revocation signed by the owner or owners of the Restricted Buffer Area and by the MDEP.

5. Effective Provisions of Declaration. Each provision of this Declaration, and any agreement, promise, covenant and undertaking to comply with each provision of this Declaration, shall be deemed a land use restriction running with the land as a burden and upon the title to the Restricted Buffer Area.

6. Severability. Invalidity or unenforceability of any provision of this Declaration in whole or in part shall not affect the validity or enforceability of any other provision or any valid and enforceable part of a provision of this Declaration.

7. Governing Law. This Declaration shall be governed by and interpreted in accordance with the laws of the State of Maine.

_____
(NAME)

STATE OF MAINE, _____County, dated _____, 20__.
(County) (date)

Personally appeared before me the above named _____, who swore to the truth of the foregoing to the best of (his/her) knowledge, information and belief and acknowledged the foregoing instrument to be (his/her) free act and deed.

_____
Notary Public

_____

Exhibit 3

Geotechnical Report
by S.W. Cole Engineering, Inc.

REPORT

January 17, 2014
13-0625 S

Explorations and Geotechnical Engineering Services

Proposed Public Works Facility
Kelly Road
Orono, Maine

PREPARED FOR:
Sebago Technics, Inc.
Owens A. McCullough, P.E.
75 John Roberts Road – Suite 1A
South Portland, ME 04106-6963

S.W.COLE
ENGINEERING, INC.

- *Geotechnical Engineering*
- *Construction Materials Testing*
- *GeoEnvironmental Services*
- *Ecological Services*

www.swcole.com

PREPARED BY:
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Sheet 1	Exploration Location Plan
Sheets 2 to 11	Exploration Logs
Sheet 12	Key to the Notes and Symbols
Sheets 13 to 15	Laboratory Test Results
Sheet 16	Underdrain Detail
Appendix A	Auger Probe Data

S.W.COLE
ENGINEERING, INC.

www.swcole.com

13-0625 S

January 17, 2014

Sebago Technics, Inc.
Attention: Mr. Owens A. McCullough, P.E.
75 John Roberts Road – Suite 1A
South Portland, ME 04106-6963

Subject: Explorations and Geotechnical Engineering Services
Proposed Public Works Facility
Kelly Road
Orono, Maine

Dear Owens:

In accordance with our Agreement dated October 10, 2013, we have made a geotechnical evaluation for the proposed Public Works Facility in Orono, Maine. This report summarizes our findings and geotechnical recommendations, and its contents are subject to the limitations set forth in Attachment A.

1.0 INTRODUCTION

1.1 Scope and Purpose

The purpose of the work was to explore subsurface conditions at the site in order to provide geotechnical recommendations relative to foundations and earthwork associated with the proposed construction. Our scope of services included test boring and auger probe explorations, soils laboratory testing, a geotechnical evaluation of the findings relative to the proposed construction and preparation of this report.

1.2 Proposed Construction

The site is a wooded parcel of land on the southwesterly side of Kelly Road, approximately ¼ mile west of its intersection with Interstate 95. The Grading and Utility Plan, dated December 16, 2013, indicates the site slopes downward southwesterly from Kelly Road with ground surface elevations generally varying from about 244 to 190 feet (project datum). Existing grades within the proposed new building construction area vary from about elevation 236 to 218 feet.

We understand the proposed Public Works Facility will include:

- Public Works Building: A single story, pre-engineered steel framed structure occupying a footprint of approximately 193 by 90 feet. Based on the proposed grading plan, we understand the building will have a finish floor elevation at 236.0 feet, requiring a tapered raise in grade approaching 7 feet to attain ground floor slab subgrade.

- Sand/Salt Shed: An unheated, high-bay, clear-span structure occupying a plan area of about 100 by 80 foot is planned south of the Public Works Building with a finished floor elevation of 225.0 feet. Based on the proposed grading plan, we understand cuts approaching 3 feet and fills approaching 7 feet will be needed to attain slab subgrade. We understand the north wall of the Sand/Salt Shed will retain approximately 9 feet of soil.

- Paved and Gravel Areas: A paved access drive, parking area and equipment yard are proposed around the Public Works Building and Sand/Salt Shed. Based on the proposed grading plan, we understand tapered cuts approaching 6 feet and tapered fills approaching 12 feet will be needed to establish bottom of pavement gravel grade. A gravel surface laydown yard is proposed on the west side of the site. The south, east and west edges of pavement will have fill slopes where pavement gravels can daylight to drain. The northerly edge is situated at the toe of a cut slope.

- Stormwater Management Areas: Underdrained soil filters are proposed along the south, east and west edges of the paved area.

Proposed and existing site features are shown on the "Exploration Location Plan," attached as Sheet 1.

2.0 EXPLORATION AND TESTING

2.1 Exploration

Ten test borings (B-1 through B-10) and eight auger probes (P-1 through P-8) were drilled by Maine Test Borings of Hermon, Maine working under subcontract to S. W.

Cole Engineering, Inc. (S.W.COLE) during the period October 14 through 16, 2013. S.W.COLE selected the test boring locations, while Sebago Technics, Inc. (STI) selected the auger probe locations. S.W.COLE located the explorations using a mapping grade GPS unit. The approximate exploration locations are shown on Sheet 1.

Logs of the explorations are attached as Sheets 2 through 11. A key to the notes and symbols used on the logs is attached as Sheet 12. A tabulation of probe elevations is included in Appendix A. Ground surface elevations shown on the logs were estimated based on topographic information shown on Sheet 1.

2.2 Testing

The borings were advanced using hollow-stem augers with split-spoon samples obtained where shown on the logs using Standard Penetration Test (SPT) methods. SPT blow counts are shown on the logs.

Soil samples retrieved from the test borings were visually classified in our laboratory. We performed three gradation tests and nine moisture content tests on selected samples to assist in our evaluation. Gradation test results are attached as Sheets 13 through 15. Moisture content test results are presented on the logs.

3.0 SUBSURFACE CONDITIONS

3.1 Soil and Bedrock

Beneath surficial topsoil/forest duff, the test borings encountered a medium dense to dense mixture of brown silt, sand and gravel with numerous cobbles and boulders (glacial till). Based on the laboratory gradation test results, the fine contents of the glacial till range from approximately 45 to 65 percent by weight.

With the exception of Boring B-3, each of the borings encountered refusals at depths varying from 8 to 16 feet below the ground surface. Boring B-3 was advanced to a depth of 17.0 feet without encountering refusal. Fairly shallow refusals were initially encountered in Borings B-1, B-8 and B-9; however, each of these explorations were carried deeper upon relocation as shown on the boring logs, which suggests that the

initial refusals are indicative of cobbles or boulders. Each of the eight auger probes were advanced to a depth of 10 feet without encountering refusal. For more detailed descriptions of the subsurface findings, please refer to the attached logs.

3.2 Groundwater

The native glacial till encountered was generally moist and it is likely that groundwater becomes perched on top of the relatively impervious glacial till encountered just below the ground surface. Groundwater levels will fluctuate seasonally and in response to precipitation and snowmelt.

4.0 EVALUATION AND RECOMMENDATIONS

4.1 General Findings

Based on the subsurface findings and our understanding of the proposed construction, the site appears feasible for the proposed Public Works Facility. The principal geotechnical considerations for design and construction are:

- Spread footing foundations and on-grade floor slabs appear suitable. Upon removal of topsoil/forest duff and loose surficial soils, the explorations indicate the exposed subgrades will be medium dense to dense glacial till that is suitable for foundation support; however, these soils are sensitive to strength loss when disturbed and highly moisture sensitive. We recommend excavation to subgrade be completed with a smooth-edged bucket and footing subgrades be protected with a layer of crushed stone wrapped in geotextile fabric.

- Test boring and probe data suggest that bedrock is likely below expected excavation levels in the building area. We caution that it is possible there are local areas of shallow bedrock and excavation work may encounter large boulders that will be difficult to dislodge by mechanical means. We recommend a contingency for bedrock/boulder removal by blasting be included in the construction documents.

- Perimeter foundation drains are needed to control groundwater in the building area. We recommend that underdrains be installed within crushed stone bedding below footing levels.

- Site soils are frost susceptible with poor drainage characteristics. Consequently, these soils are unsuitable for reuse in building construction, but may be suitable for reuse for compacted fills to raise pavement area grades during the drier, non-freezing months of Summer and Fall. Reuse of on-site soils is considered unfeasible during seasonally wet and freezing weather of Spring and Winter.

- Considering the Sand/Salt Shed will be unheated, we recommend that all existing soils be removed to the design frost depth of 5.0 feet below finish grade beneath the entire structure and replaced with non-frost susceptible Structural Fill to mitigate potential frost heaving beneath a concrete floor slab. If an asphalt paved floor is used, overexcavation and replacement with Structural Fill is not required.

- We recommend a perimeter underdrain be installed under the edge of pavement at the toe of the cut slope planned along the north edge of pavement. The pipe should be installed to at least the design frost depth of 5.0 feet. The underdrain may consist of a Maine DOT Type B (MDOT 605.04) underdrain discharging to a gravity outlet.

4.2 Site Preparation

Site preparation should begin with the construction of an erosion control system to protect drainage ways and areas outside the construction limits. All topsoil/forest duff and loose surficial soils must be removed beneath building, pavement and fill areas. The limits of stripping and grubbing should extend to the perimeter of the proposed construction limits. The soils that will be exposed will be subject to erosion. As much vegetation as possible should remain adjacent to the construction site to reduce the potential for erosion.

4.3 Excavation and Dewatering

Excavation work will generally encounter glacial till soils that can undergo substantial strength loss when subjected to construction traffic and excavation activities, particularly during periods of precipitation. Care must be exercised during construction to reduce disturbance of the bearing soils. Should the subgrade become yielding or difficult to work, disturbed areas should be excavated and backfilled with compacted Structural Fill.

The Contractor should anticipate the need for dewatering excavations, particularly during and following periods of precipitation. Ditching with gravity drainage, and sumping and pumping should be adequate.

Excavations must be properly shored and/or sloped in accordance with OSHA trenching regulations to prevent sloughing and caving of the sidewalls during construction. Care must be taken to preclude undermining adjacent structures, utilities and roadways as needed.

4.4 Foundation Design

Test boring data indicate that building subgrades will consist of medium dense to dense glacial till. We recommend that footings be cast on at least 6 inches of compacted crushed stone fully wrapped in non-woven geotextile fabric such as Mirafi 160N, or equivalent.

For foundations bearing on properly prepared subgrades, we recommend the following geotechnical parameters for design consideration:

- Design Frost Depth = 5.0 feet
- Net Allowable Foundation Bearing Pressure = 4.0 ksf or less
- Seismic Soil Site Class = C (IBC 2009)
- Base Friction Factor = 0.40
- Total Unit Weight of Backfill = 130 pcf (compacted Structural Fill)
- At-Rest Lateral Earth Pressure Coefficient = 0.5 (compacted Structural Fill)
- Internal Friction Angle of Backfill = 30° (compacted Structural Fill)

The northerly wall of the Sand/Salt Shed will retain approximately 9 feet of soil and should be designed considering at-rest lateral earth pressures. We anticipate total and differential post-construction settlement will be within tolerable limits for the proposed buildings.

4.5 Foundation Drainage

We recommend that exterior perimeter underdrains be provided within the fabric wrapped crushed stone layer beneath perimeter footings. Underdrain pipes should have perforations of 1/4 to 5/8 inch oriented downward. The underdrains must have positive gravity outlets protected from freezing, clogging and backflow. General underdrain details are shown on Sheet 16.

4.6 Slabs-On-Grade

On-grade floor slabs in heated areas may be designed using a subgrade reaction modulus of 120 pci (pounds per cubic inch) provided the slab is underlain by at least 12-inches of compacted Structural Fill placed over properly prepared subgrades. On-grade slabs in unheated areas may also be designed using a subgrade reaction of modulus of 120 pci provided the slabs are underlain by compacted Structural Full to a depth of 5 feet below finished grade. The structural engineer or concrete consultant must design steel reinforcing and joint spacing appropriate to slab thickness and function.

Where moisture sensitive floor coverings will be installed over concrete floor slabs, we recommend installation of a sub-slab vapor retarder to reduce the potential for floor covering damage from moisture. The vapor retarder must have a permeance that is less than the floor cover or surface treatment that is applied to the slab. The vapor retarder must have sufficient durability to withstand direct contact with the sub-slab base material and construction activity. The vapor retarder material should be placed according to the manufacturer's recommended method, including the taping and lapping of all joints and wall connections. The architect and/or flooring consultant should select the vapor retarder products compatible with flooring and adhesive materials.

The floor slab should be appropriately cured using moisture retention methods after casting. Typical floor slab curing methods should be used for at least 7 days. The

architect or flooring consultant should assign curing methods consistent with current applicable American Concrete Institute (ACI) procedures with consideration of curing method compatibility to proposed surface treatments, flooring and adhesive materials.

4.7 Entrance Slabs and Sidewalks

Entrance slabs and sidewalks adjacent to the buildings must be designed to reduce the effects of differential frost action between adjacent pavement, doorways, and entrances. We recommend that non-frost susceptible Structural Fill be provided to a depth of at least 5.0 feet below the top of entrance slabs. This thickness of Structural Fill should extend the full width of the entrance slabs and outward at least 5.0 feet, thereafter transitioning up to the bottom of the adjacent sidewalk or pavement gravels at a 3H:1V or flatter slope. General details of this frost transition zone are attached on Sheet 16.

4.8 Fill Materials and Compaction

We recommend the following fill and backfill materials:

Granular Borrow: Imported fills to raise grades in pavement and building areas should be sand or silty sand meeting the requirements of MDOT Standard Specification 703.19 Granular Borrow.

Structural Fill: Clean, non-frost susceptible sand and gravel meeting the gradation requirements for Structural Fill as given below.

Structural Fill	
Sieve Size	**Percent Finer by Weight**
4 inch	100
3 inch	90 to 100
¼ inch	25 to 90
#40	0 to 30
#200	0 to 5

Structural Fill is recommended for use as:

- Backfill for foundations, frost walls and retaining walls
- Backfill within frost transition zones below entrance slabs and sidewalks

- 12-inch thick layer below slab-on-grade in heated areas
- Non-frost susceptible fill to frost depth beneath unheated floor slabs

Underdrain Aggregates: Crushed Stone, used beneath footings and for foundations underdrain aggregate, should meet the requirements of MDOT Standard Specifications 703.22 "Underdrain Backfill Type C." Clean Sand, used for pavement underdrains, should meet the requirements of MDOT Standard Specifications 703.22 "Underdrain Backfill Type B."

Reuse of On-Site Soils: The On-Site Soils are expected to be predominantly fined-grained glacial till that is wet of optimum moisture content needed for compaction. The on-site soils are considered unsuitable for reuse in building areas, but may be reused in pavement areas provided they are at a compactable moisture content at the time of construction. These soils are moisture and frost susceptible and therefore best reused during the drier months of Summer and Fall; the on-site soils are considered unsuitable during wet and freezing weather typical of Spring and Winter.

Placement and Compaction: Fill should be placed in horizontal lifts and compacted such that the desired density is achieved throughout the lift thickness with 3 to 5 passes of the compaction equipment. Loose lift thicknesses for grading, fill and backfill activities should not exceed 12 inches. We recommend that fill and backfill in building and paved areas be compacted to at least 95 percent of its maximum dry density as determined by ASTM D-1557 (Modified Proctor). We recommend that backfill for retaining walls be compacted to between 90 to 95 percent of ASTM D-1557 to avoid over-stressing the wall. Crushed Stone should be compacted to at least 100 percent of its dry rodded unit weight per ASTM C-29.

4.9 Pavement Considerations

Based on the subsurface findings and our understanding of proposed construction, we anticipate that pavement subgrades will consist of fine-grained glacial till. We recommend installation of a woven geotextile fabric below pavement gravels to separate pavement gravels from the fine-grained subgrade soils.

As discussed, the edge of pavement north of the proposed Public Works Building will be situated at the toe of a cut slope. We recommend installation of an MDOT Type B Underdrain under the edge of pavement as illustrated on Sheet 1. The underdrain pipe should be 4-inch diameter slotted HDPE pipe enveloped in MDOT Type B Underdrain Sand extending up to the bottom of pavement gravels. For the east, west and south edges of pavement, we recommend daylighting the pavement gravels to the fill slope for positive drainage of the pavement gravels.

4.10 Weather Considerations

Construction activity should be limited during wet and freezing weather and the site soils may require drying before construction activities may continue. The contractor should anticipate the need for water to temper fills in order to facilitate compaction during dry weather. If construction takes place during cold weather, subgrades, foundations and floor slabs must be protected during freezing conditions. Concrete and fill must not be placed on frozen soil; and once placed, the concrete and soil beneath the structure must be protected from freezing.

4.11 Design Review and Construction Testing

S.W.COLE should be retained to review the final design and specifications to determine that our earthwork and foundation recommendations have been properly interpreted and implemented.

A soils and concrete testing program should be implemented during construction to observe compliance with the design concepts, plans, and specifications. S.W.COLE is available to provide subgrade observations for foundations as well as testing services for soils, concrete, asphalt, steel and spray-applied fireproofing construction materials.

5.0 CLOSURE

It has been a pleasure to be of assistance to you with this phase of your project. If you have any questions or we may be of further assistance, please do not hesitate to contact us.

Sincerely,

S. W. Cole Engineering, Inc.

STATE OF MAINE
ANTHONY J. HERSH
No. 7675
LICENSED PROFESSIONAL ENGINEER

Anthony J. Hersh, P.E.
Senior Geotechnical Engineer

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