STORMWATER RUNOFF EVALUATION

Hilton Garden Inn
Jetport Crossroad
Portland, Maine

General

The following Stormwater Management Plan has been prepared for Widewaters New Castle Portland Company, LLC to evaluate stormwater runoff and erosion control for the proposed Hilton Garden Inn in Portland, Maine. The Hilton Garden Inn is a proposed 88 room hotel on a 8.21 acre parcel located off the Jetport Crossroad in Portland, Maine.

Site Characteristics

The Hilton Garden Inn will be situated along the newly constructed Jetport Crossroad. The ground cover along the front of the property has been disturbed through the recent road construction and consists mostly of grass, brush and small tree growth. The remainder of the site is lightly wooded. The topography slopes in a northwesterly direction to a large delineated wetland area. Drainage travels through the wetland towards Congress Street. Topography indicates some of the drainage is collected in a storm drain system which channelizes in a ditch and passes through Brooklawn Cemetery. Eventually, all the drainage from the site crosses Congress Street via twin 36" culverts.

Soils

Soils information used in the stormwater analysis was obtained from the Cumberland County Medium Intensity Soil Survey. The Cumberland County Medium Intensity Soil Survey Map indicates the predominant site soils as Swanton fine sandy loam and Buxton silt loam. The hydrologic groups (HSG) of the soil are classified by Technical Release TR-55 of the Soil Conservation Service as follows:

Swanton …… D
Buxton …….. D

Watershed and Stormwater Analysis

The project utilized one study point for both the pre and post-development conditions. The study point at Reach 100 comprises the majority of the development area and is located along the wetland delineation line as shown on the attached watershed map.

In the pre-development, the watershed was divided into two subcatchments. Subcatchments 1 and 2 drain westerly to a delineated wetland. The majority of the ground cover is lightly wooded with the exception of the front portion of the lot which has been disturbed by the recent street construction.

The post-development condition was divided into eight subcatchments. Subcatchment 1 will remain similar to the pre-development Subcatchment 1 with the exception of a proposed wet pond (modeled as Pond 1 in Subcatchment 8). Subcatchments 2, 3, 4 and 5 include the majority of the development area, including the building roof, parking lots, sidewalk and vehicle circulation drives. Runoff is collected through a catch basin system and routed to a wet pond for stormwater treatment and detention. The Subcatchment 6 runoff drains to the existing street drainage system. Subcatchment 6 consists mostly of lawn and landscape area totaling 0.13 acre. The flow entering the street will not result in a significant increase (approximately 0.5 cfs for a 25-year flood event). Subcatchment 7 consists of the riprap and grass sloped embankment along the rear property line. Drainage from Subcatchment 7 will discharge directly to the adjacent wetland area. Subcatchment 8 is the area which drains directly into the wet pond.

The following table presents the results of pre- and post-development evaluations. Results in the post-development condition incorporate attenuated runoff due to the treatment/detention pond.

Stormwater Runoff - Summary Table				
Pre-Development		**Peak Runoff Rate (cfs)**		
		2-Year	**10-Year**	**25-Year**
Study Point 1 Reach 100	Subcatchments 1 and 2	3.48	8.05	10.36
Post-Development		**Peak Runoff Rate (cfs)**		
		2-Year	**10-Year**	**25-Year**
Study Point 1 Reach 100	With Detention Composite Subcatchments 1, 2, 3, 4, 5, 7 and 8	2.95	6.34	8.48
	Subcatchment 6	0.22	0.44	0.55
Net Reduction at Reach 100		-0.53	-1.71	-1.88

As depicted in the above summary table, the change in hydraulic characteristics due to development will result in an expected increase in the peak rate of stormwater runoff. In order to mitigate this expected increase, a formal stormwater collection and dual purpose detention pond system will be constructed. The detention pond will collect stormwater runoff through the drainage infrastructure and limit peak discharge rates to at or below pre-development rates. The downstream receiving areas are undeveloped and well vegetated with wetland meadows. There are no signs of erosion.

Although this project is not in a sensitive/threatened region or watershed, staff review comments have asked us to provide for stormwater quality treatment.

The stormwater detention ponds have also been designed to achieve water quality treatment following the guidelines established in the Maine Department of Environmental Protection's Stormwater Management law (sliding scale for TSS removal). Flow control structures have been designed to provide extended detention acting as a wet pond to provide a minimum of 40 percent TSS removal. Discharge points from each of the ponds will include level spreaders to dissipate exit velocity and provide stabilized outlets. The water quality computations are included as Section 5.

Summary

The principal stormwater features include a combination of a level spreader, catch basins, and a wet/detention pond. The majority of the stormwater is collected within the storm drain system and is discharged to the pond. This facility is designed to provide flood control as well as quality treatment.

In order to further reduce the potential for impacts associated with the project's construction, a sediment and erosion control plan has been prepared which outlines the measures to be incorporated before and during the construction of the project.

Permanent erosion control measures have also been included to reduce the potential for long-term effects. These measures include installation of temporary erosion control structures and stabilization measures (both temporary and permanent) as well as revegetation plans. A report has been prepared which outlines this plan and is included on the drawing set.

Prepared by:

SEBAGO TECHNICS, INC.

Danielle D. Betts, P.E.
Sr. Project Engineer

SAG/DDB:jc
October 11, 1999

Erosion & Sedimentation Control Plan

Hilton Garden Inn
Airport Connector Road
Portland, Maine

A. Pre-Construction Phase

Prior to the beginning of any construction, filter fabric fencing shall be staked across the slope(s), on the contour, at or just below the limits of clearing or grubbing, and /or just above any adjacent property line or watercourse to protect against construction related erosion. The placement of silt fences and hay bales shall be completed in accordance with guidelines established in Best Management Practices. This network is to be provided, installed and maintained by the contractor until all exposed slopes have at least 85%-90% vigorous perennial vegetative cover to prevent erosion.

Prior to any construction at the site, representatives of the general contractor, site contractor and the site design engineer shall arrange for and meet with the Director of Public Works and Town Engineer to discuss the scheduling of the site construction. On or before that meeting, the contractor will prepare a detailed schedule and marked up site plan indicating areas and components of the work and key dates showing date of disturbance and completion of the work. Three copies of the schedule and marked up site plan shall be provided to the Town. Special attention shall be given to the 14 day limit of disturbance in the schedule addressing temporary and permanent vegetation measures.

The following erosion control measures shall be followed by the site contractor(s) throughout construction of this project.

B. Construction and Post-Construction Phase

1. Areas undergoing actual construction shall only expose that amount of mineral soil necessary for progressive and efficient site construction and shall not exceed 14 days. Areas that will not be completed (covered and/or finish graded) within fourteen (14) days of disturbance shall be anchored with temporary erosion control within fourteen (14) days of disturbance. Temporary erosion control shall include erosion control mesh, netting, or mulch and as directed by the inspecting engineer. If disturbed areas do not receive final seeding by September 15th of the year of construction, then all disturbed areas shall be hay mulched at a rate of 150 lbs. per 1,000 square feet and seeded with a winter cover crop of Rye at the rate of 3 lbs./1,000 square feet to provide winter protection. The hay mulch shall be anchored with a suitable binder, such as RMB Plus and/or secured with netting for wind protection.

2. All topsoil shall be collected, stockpiled and seeded with Rye at 3 lbs./1,000 square feet and mulched on site and re-used as required. Siltation fencing shall be placed down gradient from stockpiled loam. Loam shall be stockpiled at locations designated by the owner. Designated locations shall be determined prior to or at the pre-construction meeting.

3. All silt fences and/or hay bale barriers shall be installed according to this plan. These shall be maintained during development to remove sediment from runoff water. All the silt fences shall be inspected after any rainfall or runoff event, maintained and cleaned until all areas have at least 85%-90% vigorous perennial vegetative cover of grasses.

4. All areas shall be seeded in accordance with the following vegetation plan.

C. Vegetation Plan

Revegetation measures shall commence immediately upon completion of construction. Disturbed areas shall be mulched and anchored prior to any storm event. If final seeding cannot be accomplished by September 15th, then all disturbed areas shall be hay mulched at a rate of 150 lbs. per 1,000 S. F. and seeded with a winter cover crop of Rye at the rate of 3 lbs./1,000 S.F. to provide winter protection. Hay mulch shall be secured with a suitable binder to include RMB plus and/or erosion control netting as directed by the owner/inspection engineer.

Revegetation measures shall consist of the following:

1. Four inches of loam will be spread over disturbed areas and smoothed to a uniform surface. Loam shall be free of subsoil, clay lumps, stones and other objects over 1" in diameter, and without weeds, roots or other objectionable material.

2. In lieu of soil tests, agricultural limestone shall be spread at the rate of 3 tons per acre. 10-20-20 fertilizer shall be applied at a rate of 800 lbs./acre. These soil amendments shall be incorporated into the soil prior to final seeding.

3. Following seed bed preparation, swale areas, fill areas and back slopes shall be seeded at a rate of 4 lbs./1,000 square feet to a mixture of 35% Creeping Red Fescue, 6% Red Top, 24% Kentucky Bluegrass, 10% Perennial Ryegrass, 20% Annual Ryegrass and 5% White Dutch Clover. The lawn areas will be seeded to a premium turf mixture of Bluegrass and/or Fescue; seeding rate of 3 lbs. per 1,000 square feet.

4. Hay mulch shall be applied to all disturbed areas at the rate of 150 lbs. per 1,000 square feet, or a hydro-application of asphalt, wood or paper fiber will be applied following seeding. A suitable binder, such as RMB Plus and/or erosion control netting will be used on hay mulch for wind control.

5. All hay bale and/or filter fabric barriers will remain in place until seedings have become 85%-90% established and then removed within 10 days.

D. Construction Schedule

Site improvements will most likely begin in the fall of 1999. The following schedule has been prepared based upon an anticipated construction schedule of 6 months:

Schedule

1.	Estimated construction time: 6 months	November 1, 1999 – April 30, 2000
2.	Erosion control measures placed.	November 3, 1999
3.	Site clearing, grubbing, excavation and filling (roadway construction).	November 5, 1999 – December 1999
4.	Drainage and utility improvements.	November 21, 1999 – January 15, 2000
5.	Start final/temporary seedings on prepared areas.	April 15, 2000
6.	Biweekly monitoring of vegetative growth.	April 15, 2000 – September 15, 2000
7.	Re-seeding of areas, if needed.	April 25, 2000 – September 15, 2000
8.	Removal of erosion control devices.	June 1000 – September 2000
9.	Mulch spread for winter erosion control.	October 15, 1999 – April 1, 2000
10.	Detention pond construction.	November 1999 – December 1999

* Dates are subject to change at the discretion of the engineer, depending on construction progress.

E. Inspections/Monitoring

Maintenance measures shall be applied as needed during the entire construction cycle. After each rainfall, the site contractor shall perform a visual inspection of all installed erosion control measures and perform repairs as needed to insure their continuing function.

Following the temporary and/or final seedings, the contractor shall inspect the site semimonthly until the seedings have been established. Established means a minimum of 85%-90% of areas vegetated with vigorous growth. Reseeding shall be carried out by the contractor with follow-up inspections in the event of any failures until vegetation is adequately established.

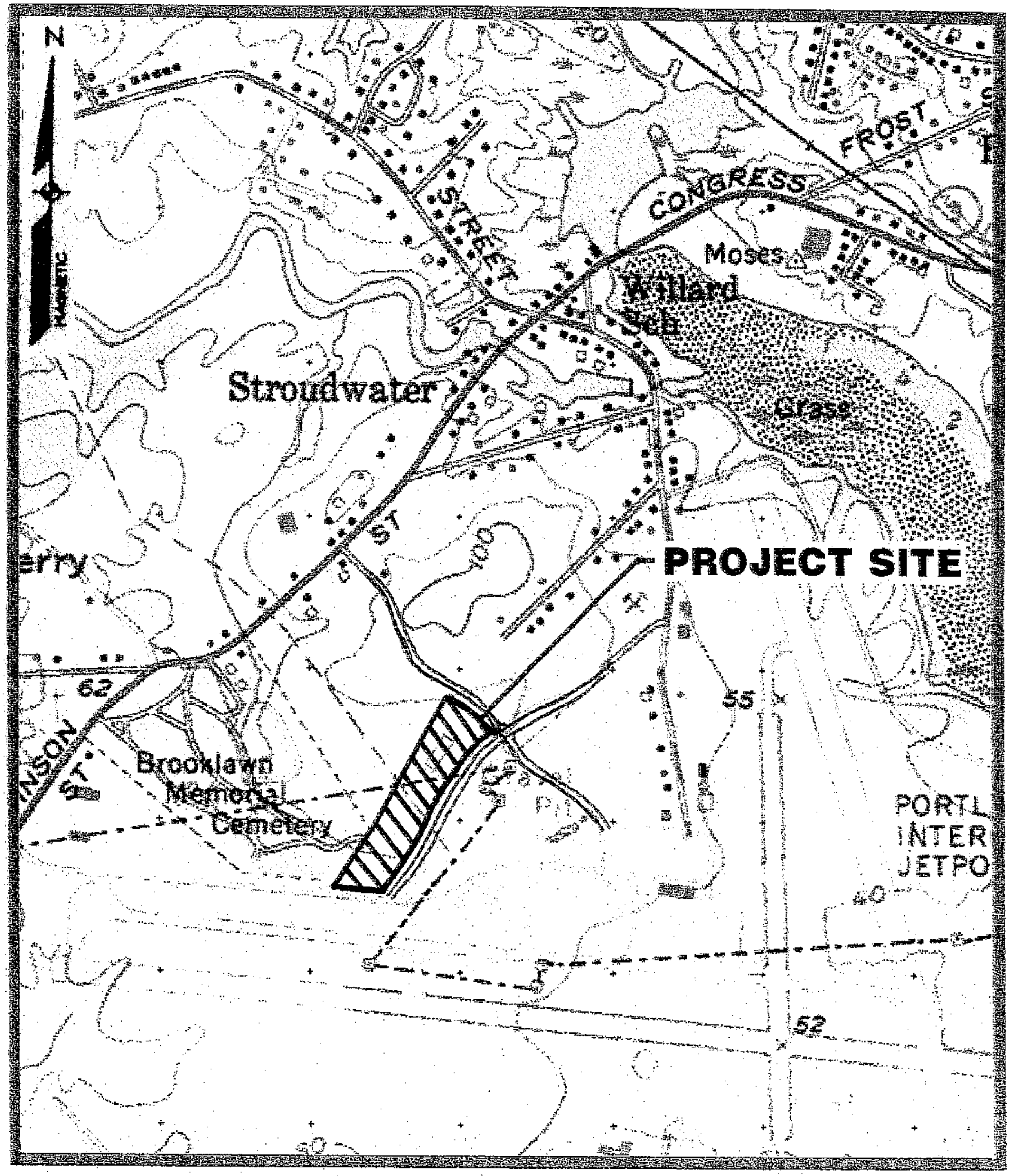
Prepared by:

SEBAGO TECHNICS, INC.

Steven A. Groves
Project Engineer

SAG:jc
August 25, 1999

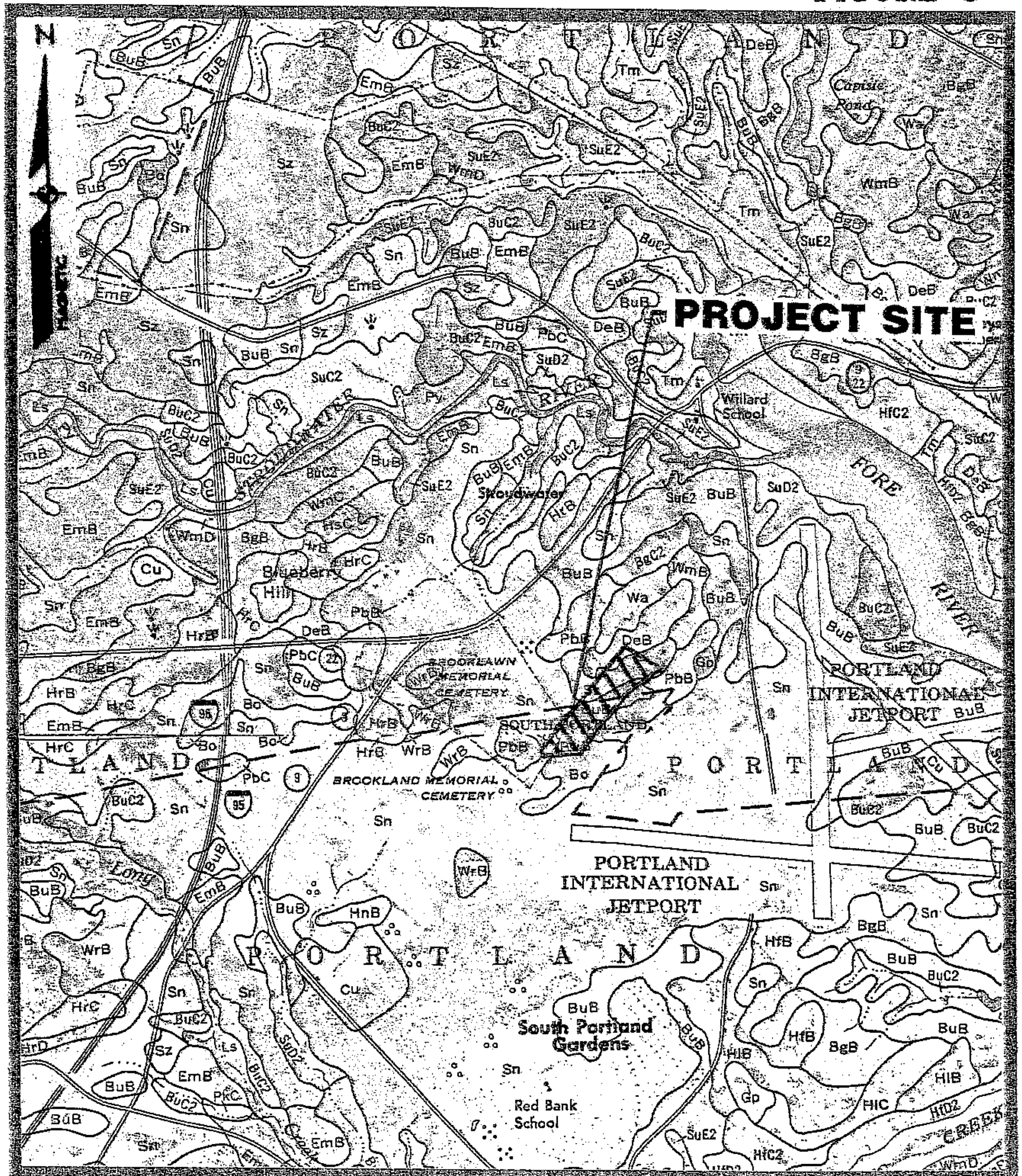
FIGURE 1



SITE LOCATION MAP
U.S.G.S. 7.5 MIN.
SOUTH PORTLAND QUADRANGLE
1" = 1000'

Sebago Technics
Engineering & Planning for the Future

FIGURE 3



MEDIUM INTENSITY SOIL SURVEY

CUMBRELAND COUNTY

SHEETS 81 & 85

SCALE = 1:20,000'

Sebago Technics

Engineering & Planning for the Future

Exhibit 16

Erosion & Sedimentation Control

Exhibit 16

Erosion & Sedimentation Control

A copy of the Erosion & Sedimentation Control narrative is provided in Exhibit 15. Additionally, erosion control locations, details, and notes are provided in the plan set. A signed copy of the Planning Board's Erosion Control Information Sheet is included in this section.

TO: Applicants for Site Plan and Subdivision Review

FROM: Planning Department

SUBJECT: Receipt of Erosion and Sedimentation Control Information - Level Two

Please read the attached material, sign the following statement and return the statement to the Planning Department prior to Planning Board review of your proposed project.

I certify that I have received a packet of information from the City of South Portland, including:

(1) Erosion and Sedimentation control standards for site plan and subdivision review.

(2) Statement on the value of preventing sediment from entering the storm sewer systems and general description of erosion and sedimentation control options deemed acceptable by the Planning Board.

HIlton Garden Inn, Jetport Crossroa
PROJECT

Widewaters New Castle Portland Co. LLC
APPLICANT

Danielle D. Betts
RECIPIENT OF INFORMATION

Sebago Technics Inc.
COMPANY

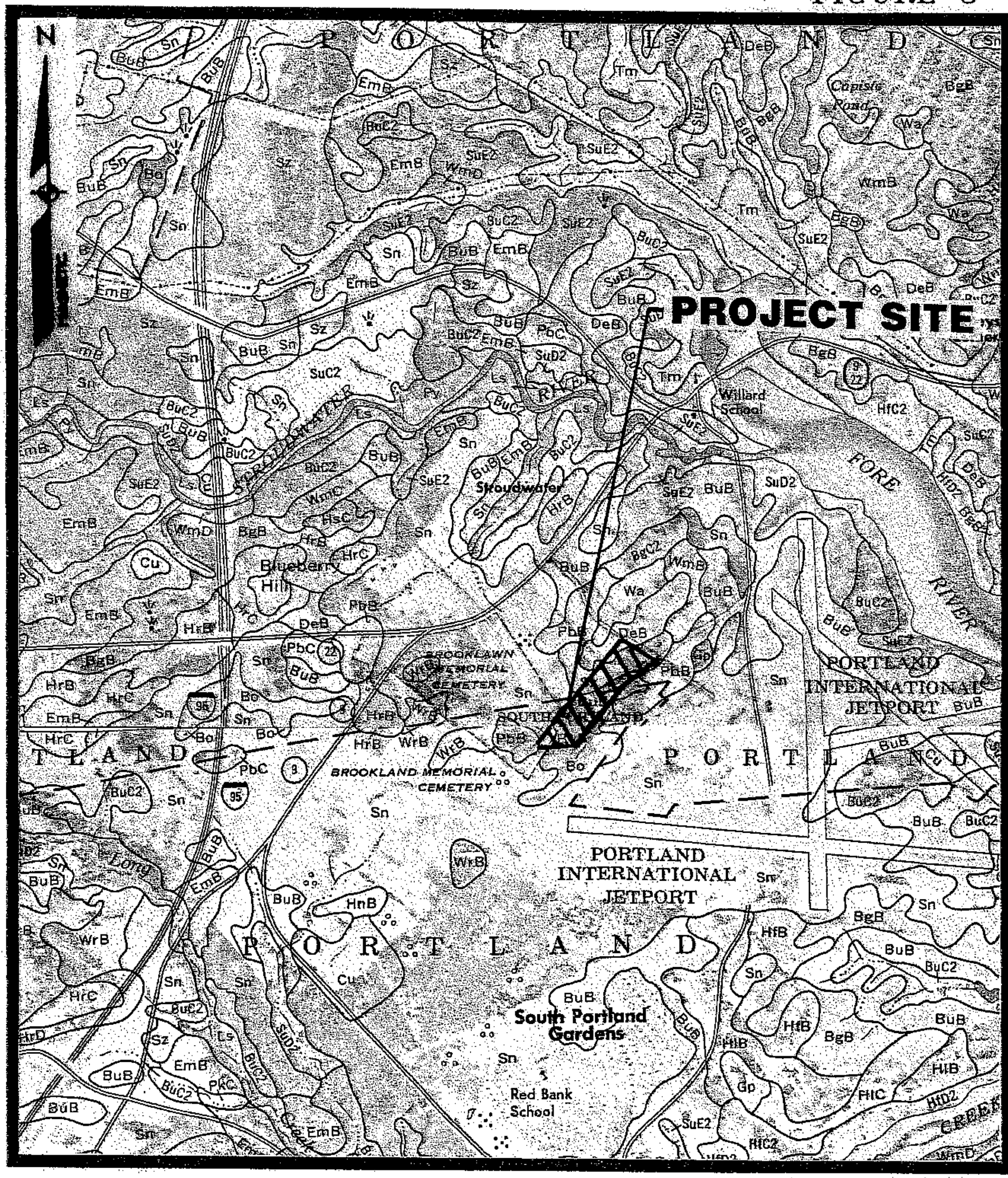
10/1/99
DATE

Danielle D. Betts

Exhibit 17

Soil Report

FIGURE 3



MEDIUM INTENSITY SOIL SURVEY

CUMBRELAND COUNTY

SHEETS 81 & 85

SCALE = 1:20,000'

Sebago Technics

Engineering & Planning for the Future

clay. Reaction in the B3g horizon ranges from neutral to mildly alkaline.

In the Cg horizon hue is 5Y, 5BG, 5G, or 5B; value is 4 or 5; and chroma is 1 or less. The Cg horizon ranges from silty clay loam to clay. In this horizon structure ranges from massive to weak, medium, platy that generally breaks into weak and very weak, very fine, blocky. The mottles range from common to many, fine to medium, and distinct to prominent. This horizon ranges from neutral to mildly alkaline in reaction.

Associated with Biddeford soils in the landscape are Buxton, Scantic, and Suffield soils. Biddeford soils are similar to these soils, but Suffield soils are well drained, Buxton soils are moderately well drained, and Scantic soils are poorly drained.

Biddeford silt loam (Bo).—This is the only Biddeford soil mapped in the county. It is in depressional areas adjacent to or surrounded by Scantic soils and in drainageways near steeper soils that are better drained. Runoff is very slow or ponded and permeability is very slow. Included in mapping are small areas of poorly drained Scantic soils and areas of soils that are sandy throughout.

This soil is too wet for most kinds of farming, but it is suitable for use as pasture if water-tolerant plants are grown. It is not suitable for the production of timber for commercial purposes. Limitations are severe on this soil for community and recreational uses because of wetness and a high water table. This soil is suitable for ponds and shallow-water impoundments for waterfowl and for use as habitat for other wildlife. Capability unit VIw-7; woodland group not suited to growing trees for commercial purposes; wildlife group 4.

Buxton Series

The Buxton series consists of deep, moderately well drained to somewhat poorly drained, gently sloping to moderately sloping, medium-textured soils. These soils formed in silty and clayey marine lacustrine sediment in the central lowland and coastal areas of the county. They are on terraces and plains.

A representative profile of a Buxton soil in a cultivated area has a layer of dark-brown silt loam, 9 inches thick, that overlies a layer of yellowish-brown, friable silt loam. The next 4 inches is light olive-gray, friable silty clay loam. Below this is 22 inches of olive-gray to gray, firm silty clay that has gray, olive, olive-brown, and light olive-brown mottles. The underlying material, at a depth of 38 inches, is olive-gray silty clay that has a few light olive-brown mottles.

The water table is at a depth of 1 to 2½ feet in spring and during periods of heavy precipitation. Depth to bedrock is 5 feet or more. These soils have high available water capacity. Permeability is moderately slow to slow above the fine-textured layer and slow to very slow within it.

Most of the acreage of Buxton soils is used for farming, but many areas are wooded. Common species are white pine, yellow birch, gray birch, ground juniper, and poplar.

Representative profile of Buxton silt loam, 3 to 8 percent slopes, 2.75 miles south-southeast of North Scarboro on macadam road connecting Holmes Road with Beech Ridge Road, 80 feet to 45° east azimuth from N.E.T.&T. Co. pole #8, 70 feet from center of road in Scarboro Township:

Ap—0 to 9 inches, dark-brown (10YR 4/3) silt loam; moderate, fine, granular structure; friable when moist; common roots; strongly acid; abrupt, smooth boundary.

B2—9 to 12 inches, yellowish-brown (10YR 5/6) silt loam; moderate, fine, granular structure; friable when moist; common roots; strongly acid; abrupt, smooth boundary.

A'2—12 to 16 inches, light olive-gray (5Y 6/2) silty clay loam; moderate, fine, subangular blocky structure; friable when moist; some tonguing; medium acid; abrupt, wavy boundary.

B'21—16 to 21 inches, olive-gray (5Y 5/2) silty clay; a few, fine, faint, gray (5Y 5/1) and olive (5Y 5/6) mottles; moderate, medium, blocky structure; slightly firm; tops of prisms in this horizon; a few fine manganese stains on peds; medium acid; clear, smooth boundary.

B'22—21 to 28 inches, olive (5Y 4/3) silty clay; common, fine, distinct, olive-brown (2.5Y 4/4) and gray (5Y 5/1) mottles; moderate to strong, coarse, prismatic structure that parts to moderate, medium and coarse, subangular blocky structure; firm when moist, very sticky when wet; thick, continuous, olive-gray (5Y 5/2) coating on prism faces; a few, thin, black manganese coats on faces of peds; slightly acid; gradual, smooth boundary.

B'3—28 to 38 inches, olive (5Y 4/3) silty clay; common, fine, distinct, light olive-brown (2.5Y 5/6) mottles; moderate to strong, very coarse, prismatic structure; firm when moist, very sticky when wet; thick, continuous, gray (5Y 5/1) coatings on prism faces; a few, thin, black manganese films on faces of peds; slightly acid; abrupt, smooth boundary.

C—38 to 60 inches, olive-gray (5Y 4/2) silty clay; a few, fine, distinct, light olive-brown (2.5Y 5/6) mottles; weak, coarse, blocky structure becoming massive in lower part; firm when moist, very sticky when wet; thick, continuous, gray (5Y 5/1) films on ped faces and in some pores; some, thin, very dusky red (2.5YR 2/2) manganese coats; slightly acid to neutral.

The solum ranges from 24 to 50 inches in thickness. Depth to mottling ranges from 15 to 24 inches. The solum ranges from very strongly acid to neutral in reaction, and the C horizon ranges from slightly acid to neutral in reaction.

Associated with Buxton soils in the landscape are Hartland, Elmwood, Melrose, Suffield, Scantic, Biddeford, and Hollis soils. Buxton soils are similar to these soils, but Hartland and Suffield soils are well drained, Scantic soils are poorly drained, and Biddeford soils are very poorly drained. The subsoil of Buxton soil is finer textured than that of Hartland soils. Also, Hollis soils are shallow and Melrose and Elmwood soils are fine sandy loam over silty clay.

Buxton silt loam, 3 to 8 percent slopes (BuB).—This soil has the profile described as representative of the series. It is on terraces adjacent to natural drainageways, streams and rivers, and on plains. Included in mapping are small areas of a soil that has a few large stones or boulders on the surface and areas of a soil that has a thinner surface layer. Also included are small areas of Hartland, Hollis, Scantic, and Suffield soils.

This soil is likely to become cloddy if cultivated when wet, and it is very hard when dry. During periods of heavy rainfall, this soil is subject to ponding in places. This Buxton soil can be used for hay, pasture, row crops, or woodland. White pines and white spruce are suitable for planting. Limitations are severe on this soil for community and recreational uses because of a seasonal high water table, seasonal wetness, and slow to very slow permeability. Capability unit IIw-7; woodland group 4o1; wildlife group 2.

Buxton silt loam, 8 to 15 percent slopes, eroded (BuC2).—This soil is on the sides of terraces adjacent to drainageways, streams, and rivers. Above a depth of 12 inches, its layers are thinner and lighter than those in the profile described as representative of the series, but the two profiles otherwise are similar. Included in mapping are small areas of Hartland, Scantic, and Suffield soils.

This Buxton soil is likely to be cloddy if cultivated when wet, and it is very hard when dry. This soil is suited to hay, pasture, row crops, or woodland. If it is used for row crops or as woodland, the hazard of erosion is high. For woodland use white pine and white spruce are suitable for planting, but the hazard of erosion is moderate, and the equipment limitations are moderate. A seasonal high water table, seasonal wetness, and slow to very slow permeability severely limit the use of this soil for many community and recreational developments. Capability unit IIIew–7; woodland group 5c1; wildlife group 1.

Canaan Series

The Canaan series consists of shallow, somewhat excessively drained, gently sloping to very steep, moderately coarse textured soils that have few to many rock outcrops. These soils formed in granitic glacial till. They are on uplands in the western and northwestern parts of the county.

A representative profile of a Canaan soil in a wooded area has a layer of organic litter, about 3 inches thick, that overlies a surface layer of gray sandy loam 4 inches thick. The upper 8 inches of the subsoil is dark reddish-brown to strong-brown, friable sandy loam. The lower 6 inches of the subsoil is yellowish-brown, friable gravelly sandy loam. Below a depth of 18 inches is granitic bedrock.

Depth to bedrock is 12 to 18 inches. Permeability is moderately rapid in these soils. Available water capacity is low.

A few areas of Canaan soils are used for farming, but most areas are wooded. Common species are white pine, balsam fir, and northern hardwoods.

Representative profile of Canaan sandy loam, 8 to 15 percent slopes, along State Route 124 in Sebago Township:

O1—3 inches to 2, recent accumulation of hardwood and softwood leaves.

O2—2 inches to 0, partially decomposed leaves.

A2—0 to 4 inches, gray (5YR 5/1) sandy loam; weak, very fine, granular structure; friable when moist; many roots; very strongly acid; abrupt, wavy boundary.

B21h—4 to 5 inches, dark reddish-brown (2.5YR 3/4) sandy loam; weak, fine, granular structure; friable when moist; many roots; very strongly acid; abrupt, broken boundary.

B22ir—5 to 12 inches, strong-brown (7.5YR 5/6) sandy loam; weak, very fine, granular structure; friable when moist; common roots; very strongly acid; abrupt, wavy boundary.

B23—12 to 18 inches, yellowish-brown (10YR 5/6) gravelly sandy loam; weak, very fine, granular structure; friable when moist; common roots; 20 percent coarse fragments; strongly acid; abrupt, wavy boundary.

R—18 inches, granitic bedrock.

The solum ranges from 9 to 18 inches in thickness. Reaction ranges from very strongly acid to medium acid throughout the profile.

The content of coarse fragments ranges from 0 to 25 percent in the B21h, B22ir, and B23 horizons. In the B21h horizon hue is 2.5YR or 5YR, value is 1 to 4, and chroma is 3 to 6. In the B22ir horizon hue is 2.5YR to 7.5YR, value is 3 to 5, and chroma is 4 to 6.

Associated with Canaan soils in the landscape are Hermon, Hollis, Peru, Ridgebury, and Whitman soils. Canaan soils have about 2 percent organic matter in the B21h horizon and have a mean annual soil temperature of less than 47° F, but Hollis soils have less than 2 percent organic matter in the B21h horizon and have a mean annual soil temperature of more than 47° F. Hermon soils are deep, and Peru soils are deep and moderately well drained. The deep Ridgebury soils are poorly drained, and Whitman soils are very poorly drained.

Canaan sandy loam, 3 to 8 percent slopes (CaB).—This soil is on the crests of hills and ridges. Runoff is slow, and available water capacity is low. Included in mapping are small areas of Hermon and Peru soils.

This Canaan soil is suitable for hay, pasture, row crops, or woodland. If it is cultivated, erosion is a hazard. This soil does not respond well to fertilizer, and it becomes droughty during dry periods. For woodland, white spruce and white pine are suitable for planting, but seedling mortality is severe, and the windthrow hazard is moderate because of shallowness to bedrock. Also, shallowness to bedrock severely limits the use of this soil for community and recreational developments. Capability unit IIIe–1; woodland group 4d1; wildlife group 6.

Canaan sandy loam, 8 to 15 percent slopes (CaC).—This soil has the profile described as representative of the series. It is on the middle and upper parts of hills. Runoff is medium to rapid on this soil. Available water capacity is low. Included in mapping are small areas of Hermon and Peru soils. Also included are a few areas that have stones on the surface.

This soil is suitable for hay, pasture, row crops, and woodland. If it is used for row crops the hazard of erosion is high. This soil does not respond well to fertilizer, and it is droughty during dry periods. For woodland use, white pine and white spruce are suitable for planting, but seedling mortality is high. Also, susceptibility to windthrow is moderate because of shallowness to bedrock. Shallowness to bedrock also limits the use of this soil for most community and recreational developments. Capability unit IVe–1; woodland group 4d1; wildlife group 6.

Canaan very rocky sandy loam, 3 to 8 percent slopes (CeB).—This soil is dominantly on the crests of wooded hills. Depth to bedrock is about 16 inches, but the profile otherwise is similar to the one described as representative of the series. Runoff is medium, and available water capacity is low. Included in mapping are small areas of Hermon and Peru soils. Also included are a few areas that have stones on the surface.

This Canaan soil is suitable for permanent pasture or woodland. For woodland use white pine and white spruce are suited, but seedling mortality is severe. Also, equipment limitations are moderate because of many rock outcrops, and susceptibility to windthrow is moderate because of shallowness to bedrock. Shallowness to bedrock and rock outcrops severely limit the use of this soil for most community and recreational purposes. Capability unit VIs–1; woodland group 4x1; wildlife group 8.

Canaan very rocky sandy loam, 8 to 20 percent slopes (CeC).—This soil is in steep, dominantly wooded moist; many roots; slightly acid; abrupt, wavy boundary.

B22—9 to 15 inches, grayish-brown (2.5Y 5/2) silt loam; weak, coarse, granular structure; friable when moist; common roots; slightly acid; abrupt, irregular boundary.

B23—15 to 23 inches, grayish-brown (2.5Y 5/2) silt loam, weak, coarse, granular structure; friable when moist; a few roots; slightly acid; abrupt, wavy boundary.

IIB3—23 to 33 inches, olive-gray (5Y 5/2) on ped faces, olive-gray (5Y 4/2) in ped interiors, and olive (5Y 4/3) where crushed silty clay; weak, coarse, prismatic structure, that parts to strong, medium, subangular blocky structure; firm when in place, friable when moved, sticky and plastic when wet; light olive-brown (2.5Y 5/4) and dark grayish-brown (2.5Y 5/2) very fine sand and silt coatings on prism faces; slightly acid; clear, wavy boundary.

IIC—33 to 60 inches, light olive-gray (5Y 6/2) on ped faces; olive (5Y 4/3) in ped interiors, and olive-gray (5Y 4/2) when crushed silty clay; weak, coarse, prismatic structure; firm when in place, friable when moved, sticky and plastic when wet; olive (5Y 4/4) very fine sand and silt coatings on prism faces; slightly acid.

The thickness of the silty layer over the contrasting more clayey layer ranges from 18 to 40 inches. Reaction ranges from strongly acid to slightly acid in the upper part of the solum, to a depth of about 23 inches, and from medium acid to neutral in the lower part of the solum.

In undisturbed areas an A1 horizon, 1 to 2 inches thick, is present. It is dark gray (10YR 3/1) or very dark brown (10YR 3/2). In places, undisturbed areas have a 1- to 2-inch A2 horizon. In the B21 horizon hue is 10YR, 7.5YR, or 2.5Y; value is 4 or 5; and chroma ranges from 4 to 8. In the B22, B23, IIB3, and IIC horizons hue is 2.5Y or 5Y, value ranges from 4 to 6, and chroma ranges from 2 to 4. The IIB3 and IIC horizons range from silty clay to silty clay loam.

Associated with Suffield soils in the landscape are Biddeford, Buxton, and Scantic soils. Suffield soils are similar to these soils, but Buxton soils are moderately well drained to somewhat poorly drained, Scantic soils are poorly drained, and Biddeford soils are very poorly drained.

Suffield silt loam, 8 to 15 percent slopes, eroded (SuC2).—This soil has the profile described as representative of the series. It is on the sides of terraces adjacent to streams, rivers, and drainageways. Runoff is medium to rapid. Included in mapping are small areas of less steep Buxton soils. Also included are small areas of Hartland and Belgrade soils.

This Suffield soil can be used for cultivated crops, hay, pasture, and woodland. If it is cultivated, erosion is a severe hazard. Steepness of slope moderately limits the use of equipment for cultivated crops and hay. For woodland use, white pine, red pine, white spruce, and larch are suitable for planting, but seedling mortality is moderate. In addition, equipment limitations are moderate because of steepness of slope, and the erosion hazard is moderate. Because of slow permeability in the clay layers, this soil has very severe limitations for use as homesites where septic tank systems must be installed for the disposal of sewage. Steepness of slope is a moderate limitation on this soil for use as golf courses. Capability unit IIIe-7; woodland group 5c1; wildlife group 1.

Suffield silt loam, 15 to 25 percent slopes, eroded (SuD2).—This soil is on the sides of dissected terraces adjacent to streams, rivers, and drainageways. It has a profile similar to the one described as representative of the series, except that its surface layer and the upper part of its subsoil are thinner. Runoff is rapid.

This Suffield soil can be used for pasture and woodland. It is too steep for cultivated crops and hay. For woodland use, white pine, red pine, white spruce, and larch are suitable for planting, but seedling mortality is moderate. In addition, equipment limitations are severe because of steepness of slope. The erosion hazard is severe. Because of slow permeability in the clay layers and steepness of slope, this soil has very severe limitations for use as homesites where septic tank systems must be installed for the disposal of sewage. Limitations are very severe for most recreational uses, principally because of steepness of slope. Capability unit IVe-7; woodland group 5c2; wildlife group 10.

Suffield silt loam, 25 to 45 percent slopes, eroded (SuE2).—This soil is on the lower part of the slopes of strongly dissected terraces adjacent to streams, rivers, and drainageways. It has a profile similar to the one described as representative of the series, except that its surface layer and the upper part of its subsoil are thinner. Runoff is very rapid.

This Suffield soil is too steep for farming. It is suitable for use as woodland. White pine, red pine, white spruce, and larch are suitable for planting. If used for this purpose, seedling mortality is moderate, equipment limitations are severe, mainly because of steepness of slope, and the erosion hazard is severe. Because of slow permeability in the clay layers and steepness of slope, this soil has very severe limitations for use as homesites where septic tank systems are needed for disposal of sewage. Limitations are very severe for most recreational uses, principally because of steepness of slope. Capability unit VIe-7; woodland group 5c2; wildlife group 10.

Swanton Series

The Swanton series consists of deep, nearly level, poorly drained to somewhat poorly drained soils. These soils formed in moderately coarse textured sediment of glaciofluvial origin over fine-textured sediment of marine and lacustrine origin. They are in depressions in the coastal part of the county.

A representative profile of a Swanton soil in a cultivated area has a surface layer of dark grayish-brown fine sandy loam, 9 inches thick, that is underlain by 5 inches of light olive-gray, friable fine sandy loam that has light olive-brown mottles. The upper 5 inches of the subsoil is olive-gray, friable fine sandy loam that contains olive-brown mottles. It is underlain by 9 inches of olive, friable fine sandy loam that has yellowish-brown mottles and by 4 inches of light olive-gray, friable fine sandy loam that has yellowish-brown mottles. The lower 13 inches of the subsoil is olive, firm silty clay that contains olive-brown mottles. The substratum, at a depth of 45 inches, is olive, firm silty clay that contains light olive-brown mottles.

A water table is at a depth of 1 foot during most of the year. Depth to bedrock is 5 feet or more.

A few areas of Swanton soils were formerly farmed, but most areas are now wooded. Common species are speckled alder, red maple, American elm, gray birch, and white pine.

Representative profile of Swanton fine sandy loam, 1,000 feet south of the North Yarmouth-Yarmouth town line and 1,000 feet east of Sligo Road in Yarmouth Township:

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) fine sandy loam; moderate, fine, granular structure; friable when moist; many roots; strongly acid; abrupt, smooth boundary.

A2g—9 to 14 inches, light olive-gray (5Y 6/2) fine sandy loam; common, medium, distinct, light olive-brown (2.5Y 5/6) mottles; weak, very fine, granular structure; friable when moist; many roots; strongly acid; abrupt, wavy boundary.

B21g—14 to 19 inches, olive-gray (5Y 5/2) fine sandy loam; many, coarse, distinct, light olive-brown (2.5Y 5/6) mottles; weak, very fine, granular structure; friable when moist; strongly acid; clear, wavy boundary.

B22g—19 to 28 inches, olive (5Y 5/4) fine sandy loam; common, coarse, distinct, yellowish-brown (10YR 5/8) mottles; moderate, medium, subangular blocky structure; friable when moist; strongly acid; clear, wavy boundary.

A'2g—28 to 32 inches, light olive-gray (5Y 6/2) fine sandy loam; common, coarse, distinct, yellowish-brown (10YR 5/8) mottles; weak, thin, platy structure; friable when moist; strongly acid; abrupt, wavy boundary.

IIB'g—32 to 45 inches, olive (5Y 5/3) silty clay; common, medium, distinct, olive-brown (2.5Y 4/4) mottles; weak, medium, platy structure; firm when moist; a few silt films and black stains on faces of peds; slightly acid; clear, wavy boundary.

IICg—45 to 60 inches, olive (5Y 4/3) silty clay; common, medium, distinct, light olive-brown (2.5Y 5/4) mottles; weak, thick, platy structure; firm when moist; a few silt films and black stains on faces of peds; neutral.

The moderately coarse textured material ranges from 18 to 40 inches in thickness. Reaction ranges from strongly acid to medium acid in the moderately coarse textured material and from medium acid to neutral in the finer textured material.

In the Ap horizon hue is 10YR or 7.5YR, value is 2 to 4, and chroma is 1 or 2. In undisturbed areas an A1 horizon is similar in color and in texture to the Ap horizon, but it is thinner. In the B2g horizons hue ranges from 10YR to 5Y, value ranges from 3 to 5, and chroma ranges from 1 to 4. The B2g horizons range from fine sandy loam to sandy loam.

Associated with Swanton soils in the landscape are Elmwood, Melrose, and Whately soils. Swanton soils are similar to these soils, but Melrose soils are well drained, Elmwood soils are moderately well drained, and Whately soils are very poorly drained.

Swanton fine sandy loam (Sz).—This is the only Swanton soil mapped in the county. It is in depressional areas. Included in mapping are small areas of Elmwood, Scantic, and Whately soils.

Permeability is moderate to moderately rapid above the fine-textured material and very slow within it. Runoff is slow, and available water capacity is high. This soil is wet throughout the year, and it receives large quantities of runoff from surrounding soils when it rains.

This Swanton soil can be used for row crops, hay and pasture, and as woodland if drainage is provided. Locating suitable drainage outlets is a concern of management. For woodland use, white pine and white spruce are suitable for planting, but seedling mortality is severe. In addition, equipment limitations are severe because of wetness, and the windthrow hazard is severe because the roots of most plants are restricted to the zone above the water table. This soil has very severe limitations for most community uses, principally because of a high water table. It also has very severe limitations for all recreational uses, principally because of excess wetness and a high water table. This soil is well suited to habitat for wetland wild life and to small ponds. Capability unit IIIw–8; wood land group 5w1; wildlife group 3.

Tidal Marsh

Tidal marsh (Tm) is adjacent to the coast, mostly i the Dunstan marshes (Scarboro) and near Cousins Rive (Yarmouth). The areas are nearly level. This land typ has an organic surface layer that extends to a depth o about 2 feet. Below this layer, to a depth of 5 feet o more, are layers of grayish-brown silt, clay, and sand tha vary in thickness. Vegetation consists mainly of grasse that can tolerate salt.

Runoff is slow on this land type. Tidal marsh is subjec to flooding daily by tidal water. It is not suitable fo farming because of a high concentration of salt. Tida marsh is useful mainly as feeding and breeding areas fo birds and other wildlife. Capability unit VIIIw–99 woodland group, not suited to growing trees for commer cial purposes; wildlife group 14.

Walpole Series

The Walpole series consists of deep, nearly level, poorl drained to somewhat poorly drained, moderately coars textured to coarse textured soils. These soils formed i glacial outwash sediment. They are in lowland areas ad jacent to eskers (horsebacks) in the central, northern and western parts of the county.

A representative profile of a Walpole soil in a culti vated area has a surface layer of very dark grayish-brow fine sandy loam 8 inches thick. The subsoil is 12 inches o light brownish-gray, friable fine sandy loam that ha strong-brown and light olive-gray mottles in the uppe part and brownish-yellow mottles in the lower part. Th substratum, at a depth of 20 inches, is light yellowish brown to olive-gray, friable to loose loamy sand and grav elly loamy sand that has strong-brown and dark-brow mottles.

A water table is at a depth of 1 foot in spring an during periods of heavy precipitation. Depth to bedroc is 5 feet or more.

Many areas of Walpole soils are wooded, but a fe areas are used for farming. Common species are Amer can elm, red maple, white pine, eastern hemlock, balsa fir, and white spruce.

Representative profile of Walpole fine sandy loam, mile south on U.S. Highway No. 302 from the junctic with Methodist Road and 100 feet east of the road Westbrook Township:

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) fi sandy loam; moderate, medium, granular structur friable when moist; many roots; strongly acid; a rupt, wavy boundary.

B21—8 to 14 inches, light brownish-gray (10YR 6/2) fi sandy loam; common, fine, distinct, strong-brov (7.5YR 5/6) and light olive-gray (5Y 6/2) mottle weak, medium, granular structure; friable wh moist; common roots; strongly acid; abrupt, wa boundary.

B22—14 to 20 inches, light brownish-gray (2.5Y 6/2) fi sandy loam; many, fine, distinct, brownish-yell (10YR 6/8) mottles; weak, fine, granular structur friable when moist; very few roots; strongly aci clear, wavy boundary.

REPORT

of a

GEOTECHNICAL ENGINEERING EVALUATION

for the

PROPOSED HILTON GARDEN INN
PORTLAND, MAINE

THE WIDEWATERS GROUP
5786 WIDEWATERS PARKWAY
DEWITT, NEW YORK

STATE OF MAINE
JOHN
P.
STOPEN
6759
REGISTERED
PROFESSIONAL ENGINEER

prepared by
JOHN P. STOPEN ENGINEERING PARTNERSHIP
450 South Salina Street
Syracuse, New York

September 1999
JPSEP #1-99074.00

JOHN P. STOPEN ENGINEERING PARTNERSHIP

PRINCIPALS: JOHN P. STOPEN, P.E. / ROLF LEININGER, Ph.D., P.E. / JOHN SODJA, P.E. / JAMES F. KAPLAN, P.E.
JAMES P. STEWART, Ph.D., P.E. CHRISTOPHER H. PITULEJ, ASSOCIATE

September 24, 1999

The Widewaters Group
5786 Widewaters Parkway
Dewitt, NY 13214

ATTN: Mr. Steven Ranieri

RE: Report of Subsurface Investigation and Evaluations
Proposed Hilton Garden Inn
Jetport Cross Road
Portland, Maine
#1-99074.00

Dear Mr. Ranieri:

This report documents our subsurface investigation for the proposed Hilton Garden Inn in Portland, Maine. It also describes our geotechnical engineering evaluations and recommendations for the design and construction of the building foundation.

Our evaluations showed most of the building could be supported on conventional shallow foundations, but the northern corner of the building would require subgrade improvement or a deep foundation system to avoid excessive settlement from consolidation of a soft clay layer.

Our conclusions were based on the findings and evaluations that follow.

1. SITE DESCRIPTION

The site is on Jetport Cross Road just west of the intersection with Jetport Access Road in Portland. The Jetport Cross Road was constructed in May 1999 and connects the Jetport Access Road north of the site and the Airport Access Road south of the site. The southern portion of the site extends into South Portland. The Portland International Jetport is less than one-fourth mile east of the site.

At the time of our study, the site was undeveloped with mostly wooded land on the north half of the site. The site is surrounded by undeveloped lots and the Brooklawn Memorial Park Cemetery, which is located to the west. Based on the "Grading, Drainage, and Utility Plan", by Sebago Technics, dated July 23, 1999, the northern end of the site is bordered by wetlands.

Jetport Cross Road sloped down from east to west from Elevation 79 ft to Elevation 74 ft. The highest area of the site is about Elevation 80 ft and occurs along a low knoll running diagonally through the site from east to west. Ground level drops to about Elevation 73 ft at the southwest corner of the site and drops to about Elevation 69 ft at the north corner of the site.

During the site investigation, about 2 ft of standing water was observed in the low area near the southwest corner.

Two major oil pipelines pass through the western end of the site. The 12-inch and 18-inch diameter pipelines were reported to be buried about 3 feet deep.

2. PROJECT DESCRIPTION

The proposed building will consist of a three-story building with wood frame bearing walls and wood joist and plywood floors. Maximum anticipated wall loads are 4 kips per foot. The building will have a footprint of about 15,000 sq feet.

To achieve the proposed finished floor level of Elevation 80 ft, the existing grades must be raised within most of the building area and up to 11 ft on the north side near the wetlands. The existing grades at the front entrance of the building near the southwest corner of the site must be raised by up to 7 ft.

The proposed paved parking areas in the east, west, and southwest portions of the site require filling up to 9 ft. Grades above the oil pipelines must be raised as much as 5 ft. Although most of the development requires fill, the grades near Jetport Cross Road will be lowered by 1 to 2 ft.

3. LOCAL GEOLOGY

The site is located in the USGS Portland West quadrangle. The Stroudwater River flows east-west about one-half mile north of the site. The brook from the wetlands north and west of the site flows into the river. The Fore River is located less than one mile east of the site. According to the 1978 USGS topo map, there is an abandoned gravel pit less than one-fourth mile east.

According to the Cumberland County Soil Survey, the site is between different land forms. Although most of the soils in the higher areas are derived from glacial till and glaciofluvial deposits, an area of marine lacustrine deposits was mapped in the low wetlands area near the north building corner.

According to the U.S. Army Corps of Engineers, the site is located in Seismic Zone 2A.

4. SUBSURFACE INVESTIGATIONS AND FINDINGS

Subsurface investigations were performed between May and August 1999. The investigations consisted of excavating 12 test pits, drilling 9 standard test borings, and drilling 1 undisturbed sample boring. Boring locations were as shown on the attached Subsurface Investigation Plan. Soil and groundwater conditions were as shown on the attached Logs.

The initial test pit excavations indicated that the north corner of the building might be underlain by a compressible clay layer at depths greater than 10 ft. A second investigation by borings confirmed the presence and thickness of the compressible layer beneath the north corner of the proposed building. A third and final investigation by borings determined the extent of the clay and obtained undisturbed samples for laboratory compression testing.

The investigations showed that most of the existing ground was covered with 2 to 4 inches of topsoil with small to medium-sized roots. Up to 6 to 12 inches of topsoil was observed, however, at TP99-4 and TP99-5 in the low area of the site.

The subsoils consisted of glaciofluvial or marine lacustrine soils overlying glacial till. The texture, consistency, and thickness of the deposits varied across the proposed building footprint. Deposits of sand and sandy silt with gravel were found to the south and west of the building. The sand and sandy silt layer dropped down to the north and east and graded to compressible marine lacustrine deposits of silt and clay in the low area at the north corner of the building.

As shown on the attached Subsurface Investigation Plan, test pits covered the proposed building footprint. At test pits

TP99-1, 6, 7, and 8 on the southwest side, gray-brown fine to medium sand with layers of coarse sand and fine gravel were observed. The cobbles and boulders were observed at the bottom of test pits TP99-6, 7, and 8 at depths of 5 to 6 ft or between Elevation 69 ft and Elevation 71 ft. Excavation in the boulders was difficult with the large HITACHI excavator with 4 ft wide bucket, indicating they were densely packed.

The next line of test pits to the east (TP99-2, 9, and 10) showed a 2 to 3-ft-thick layer of gray-brown fine to medium sand below the topsoil and the sand layer gradually graded with depth to sandy silt with trace of clay. At test pits TP99-3, 4, and 5 to the north of the proposed building, a 3 to 4 ft thick layer of gray silt with trace of fine sand was observed below the topsoil. The silt layer graded with depth to stiff clayey silt at the bottom of the test pits at depths of 5 to 6 ft, or below Elevation 64 ft.

Since the dense glacial soils were not encountered in TP99-3, 4, and 5, borings were drilled in that area to determine whether the stiff clayey silt layer was underlain by a compressible soft clay layer. Borings B99-1 and 2 indicated the topsoil was underlain by 3 to 5 ft of silty fine sand with trace of clay and organics. Below that was 5 to 7 ft of stiff clayey silt or silt and clay with sand layers. At depths of 10 ft below the existing ground, a 3 to 6 ft thick soft to very soft gray clay and silt layer was found. Dense glacial till was encountered below the soft clay layer. Auger refusal was reached at depths of 16 to 22 ft below the existing ground surface, which was between Elevation 46 ft and Elevation 53 ft. The liquid limit of the soft clay layer varied between 26 and 33 and plasticity index varied between 10 and 19. The natural water content was 5 to 11 percent higher than the liquid limit, indicating its potential compressibility.

After our preliminary evaluation indicated that the soft layer could possibly consolidate several inches after construction of the facilities, Borings B99-2A, 3, 4, 5, and 7 were drilled to define the layer's extent. The borings confirmed the compressible layer was limited to the northern corner. The compressible layer was not observed at B99-3 and 7; it was only 1.5 ft thick at B99-5; it was 5 ft thick at B99-4 and 2A.

Undisturbed tube samples were obtained with an Osterberg-type piston sampler from offset Boring B99-1A. The 3-inch-diameter tube samples were taken from depths of 10 ft to 12 ft and 12.5 ft to 14.5 ft. The tube samples indicated the layer was fairly uniform silty clay with no apparent varves. A 2-inch-thick seam of higher plasticity clay was observed at the bottom of the sample taken at 14.5 ft.

A laboratory consolidation test was performed on the sample from 13.5 ft depth. The estimated preconsolidation pressure was 2,200 psf. When compared to the existing effective vertical stress, the soft clay layer was overconsolidated by about 1,200 psf. The attached test curve shows the coefficients of compression and recompression with respect to strain were about 0.215 and 0.045, respectfully. The coefficient of secondary compression with respect to strain was estimated to be 0.007. The testing indicated the coefficient consolidation for the anticipated loading was about 0.2 ft^2/day.

Groundwater level was observed to slope down to the north between Elevation 68 ft and Elevation 63 ft, at depths of 5 to 6 ft below the existing ground surface. Groundwater was not observed at test pits TP99-6, TP99-7, and TP99-8 at the south west corner. Groundwater levels are expected to vary seasonally and therefore could rise higher, or fall lower, than observed.

5. GEOTECHNICAL ENGINEERING EVALUATIONS

5.1 GENERAL

The subsurface investigation results confirmed the presence of compressible soil below the proposed north corner of the building, designated as "Area A", on the attached Subsurface Investigation Plan. The primary geotechnical concern for the proposed building is ground settlement after construction within "Area A" from the weight of up to 11 ft of fill necessary for the proposed regrading. The footprint of building "Area A" was estimated to be about 4,000 sq feet. Outside of Area A, the proposed building could be supported on conventional shallow foundations and the building floor could be constructed as a concrete slab-on-grade.

Our evaluation determined that ground settlement after construction within "Area A" could be as much as 2.5 inches at the northern building corner. The settlement estimates were based on values of soil compressibility measured from consolidation testing. The settlement estimate includes about 1.7 inches within eight months of construction and an additional 0.8 inches of secondary settlement that would accumulate slowly over the next 50 years. Building settlement outside of "Area A" would be less than one inch.

5.2 SELECTION OF FOUNDATION SYSTEM

Based on our experience, the magnitude of expected differential settlement within "Area A" exceeds that commonly accepted for similar building types because of potential damage to interior and exterior finishes. It should be of interest to note that the estimated values of total and differential settlement could probably be accommodated without distress of the building frame. Nevertheless, special treatment of "Area A" will be required.

Our evaluations showed that the building outside of "Area A" could be supported on conventional shallow foundations, but there were these six options to treat "Area A":

1. Option 1 - Preloading (with a waiting period) "Area A" with temporary surcharge fill and perhaps with vertical drains to accelerate settlement.

2. Option 2 - Removing and replacing the compressible soft clay layer within "Area A" at depths of 13 to 16 ft below the existing ground with structural fill before regrading the site.

3. Option 3 - Utilizing a deep foundation system throughout Area A consisting of driven or auger cast piles or drilled piers approximately 30 ft long and structurally supporting the first level floor.

4. Option 4 - Removing up to 8 ft of existing soil at Area A and replacing with light weight fill and raising grades within "Area A" using light weight fill.

5. Option 5 - Improving the subgrade within "Area A" using the proprietary Geopier system, or other methods.

6. Option 6 - Shifting the building location to avoid "Area A" thereby allowing use of a conventional shallow foundation system for the entire building.

We understand Options 1 and 6 are probably not feasible because of the development constraints. Our preliminary estimates showed Option 5 would be significantly more expensive than the other options. Options 2 and 3 were comparable in cost. The

JOHN P. STOPEN
ENGINEERING PARTNERSHIP

feasibility of Option 4 depends greatly on the availability and cost of lightweight fill for this particular site. The best option could be selected based on detailed design and cost analyses. It is worthy to note that Option 2 would be the simplest for design and construction and may therefore be the method of choice, but the potential savings for Options 3 and 4 will be worth serious evaluation.

Option 2 requires removal of about 5,000 c.y. of material and replacement with structural fill. The excavation would remove the 2 to 5 ft of compressible soft clay found in borings at depths of 13 to 16 ft. The excavation bottom footprint would be about 5,500 sq feet and would be about 10 ft below the groundwater level.

Option 3 requires installing deep foundations to support the building and first level floor throughout "Area A". A crawl space in "Area A" may be an advantage if this option is used.

Option 4 would be similar to Option 2, except less excavation would be required (estimated to be less than 1,000 c.y.) but, about 2500 c.y. of expensive light weight fill and backfill would be required. Light weight fill would require in place unit weight of 70 pcf or less. As stated earlier, the feasibility of this approach depends on the cost and availability of light weight fill.

6. GEOTECHNICAL ENGINEERING RECOMMENDATIONS

We have assumed that either Option 2 or 3 will be chosen. We are prepared to provide supplemental design input for other options if required. Design and construction according to Options 2 and 3 should be as follows:

A. SITE PREPARATION OF BUILDING AREA

1. Remove existing trees and old grub pile from building and surrounding areas.

2. Clear, grub and strip top soil and remove significant root structures within proposed building and to at least 10 ft beyond.

A.1 "Area A" for Option 2

3. Before raising the grades within "Area A," remove the soft clay layer at depths of 13 to 16 ft below the existing

ground surface. Excavate deeper and extend the area within the building footprint if necessary to remove the soft clay layer more than 18 inches thick.

4. Estimated bottom of excavation is expected to slope down to the north and to vary between Elevation 56 ft at the west end or Elevation 60 ft at the south end and Elevation 53 ft at the north end.

5. After subgrade approval by Engineer's Representative, cover the excavation with compacted structural fill and raise grades with structural fill.

A.2 "Area A" for Option 3

6. Raise grades with structural fill.

7. Prepare a working pad for staging deep foundation installation.

A.3 Outside "Area A"

8. Raise grades outside "Area A" using structural fill.

9. Structural fill to consist of granular material having maximum size of 2 inches and compacted to at least 93% of maximum modified proctor density as determined by ASTM D1557 procedure.

B. FOUNDATION DESIGN AND CONSTRUCTION

B.1 Outside "Area A" for Option 3 and for entire building for Option 2

1. Shallow foundations to bear on stable structural fill placed during the site preparation work or on existing natural subgrade.

2. Minimum width of column footings to be 36 inches; minimum width of wall footings to be 24 inches.

3. Footings requiring protection from frost heave to bear at least 48 inches below finished grade.

4. Proportion column and wall footings for a maximum allowable net bearing stress of 4 ksf.

5. Footing subgrade to be stable, free of loose or disturbed material and to be approved by the Engineer's Representative at the time construction.

6. If unsuitable subgrade is encountered at bearing level, undercut subgrade and replace with well-compacted stable structural fill before constructing footings.

B.2 Inside and transition to "Area A" for Option 3

7. Building within "Area A" to be supported on deep foundations bearing in dense glacial till encountered in test borings below Elevation 50 to 53 ft.

8. Deep foundation design to account for negative skin friction according to the Fellenius Unified Method using ß = 0.30 for drained condition, and as described in the 1992 Canadian Foundation Engineering Manual, Chapter 20.2.5.

9. Design driven piles for maximum load of 40 tons or less, based on static capacity analyses and for a factor of safety of 3.0.

10. Driven piles to consist of either timber, steel H-piles, or augercast piles.

11. Drilled piers to have minimum diameter of 3 ft. Drilled pier capacity to be based on allowable end-bearing of 20 ksf on dense glacial till.

12. Pile caps and grade beams requiring frost protection to extend at least 4 ft below finished grade.

13. Backfill pile caps and grade beams with compacted structural fill.

C. BUILDING FLOOR AND UTILITIES

C.1 Outside "Area A" for Option 3 and for entire building for Option 2

1. Construct concrete slab-on-grade floor on a subbase course consisting of at least 6 inches of well-compacted stable fine gravel subbase.

2. Furnish a vapor barrier beneath the slab if impermeable floor finishes are used.

JOHN P. STOPEN
ENGINEERING PARTNERSHIP

3. Floor thickness may be designed based on a coefficient of subgrade reaction, k=150 pci.

C.2 Inside and transition to "Area A" for Option 3

4. Construct structural floor inside and transition to "Area A."

5. Design utilities below floor to accommodate differential settlement between ground and pile-supported structure within building and at building perimeter.

6. Entry areas to the north and east to be designed to accommodate expected differential settlement beyond building.

7. Magnitude of differential settlement must be evaluated after building plans are set and will depend on whether a crawl space is constructed beneath the floor.

D. SITE PREPARATION OF PAVEMENT AREA

1. Protect buried facilities including the oil pipelines.

2. Remove existing trees from proposed pavement areas.

3. Drain existing standing water and remove the muck at the southwest corner of the site. Confirm the suitability of the subgrade by Engineer's Representative. Repair unstable subgrade as appropriate.

4. Clear, grub and strip top soil and remove significant root structures in paved areas and prepare proposed subgrade.

5. Raise grades after subgrade approval by Engineer's Representative.

6. Natural subgrade on the northeast may be sensitive, therefore, use methods and means to preserve the strength of the subgrade.

7. Structural fill in pavement areas to raise the grades to be compacted to at least 93 percent of the modified proctor maximum density as determined by ASTM D 1557 procedure.

8. Structural fill at pavement subgrade level and to 12 inches below to be compacted to at least 95 percent of the modified proctor maximum density.

JOHN P. STOPEN
ENGINEERING PARTNERSHIP

9. Structural fill beneath pavement subbase to consist of suitable on-site soil or imported borrow as approved by Engineer.

Please contact the writers if you require further evaluations or details about this study.

Sincerely,

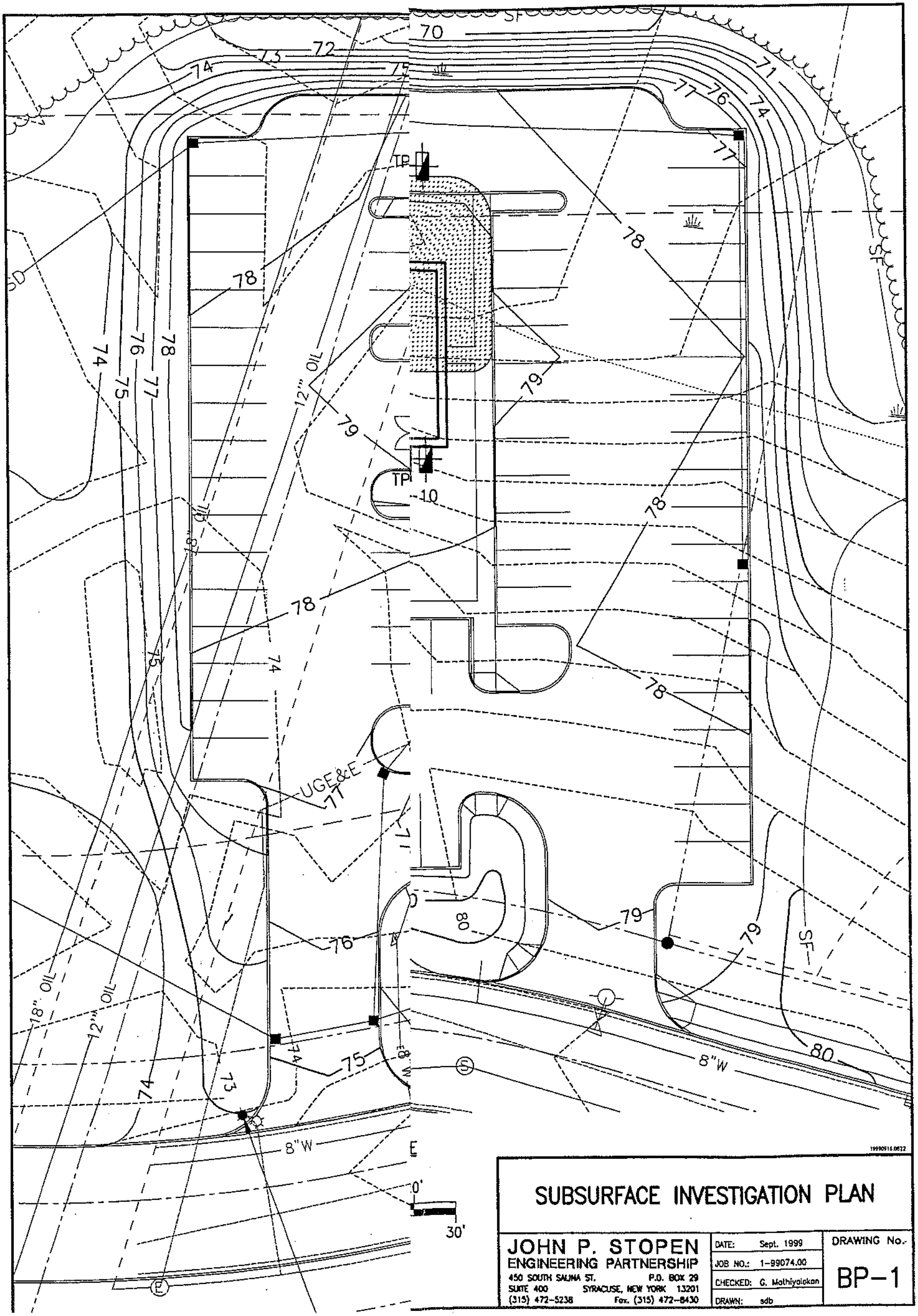
JOHN P. STOPEN ENGINEERING PARTNERSHIP

GEETHANJALI P. MATHIYALAKAN, P.E.
Geotechnical Engineer

JAMES P. STEWART, P.E.
Geotechnical Engineer

GPM/JPS/sh

Attachments: Subsurface Investigation Plan
Consolidation Test Results
Atterberg Test Results
Test Pit and Boring Logs

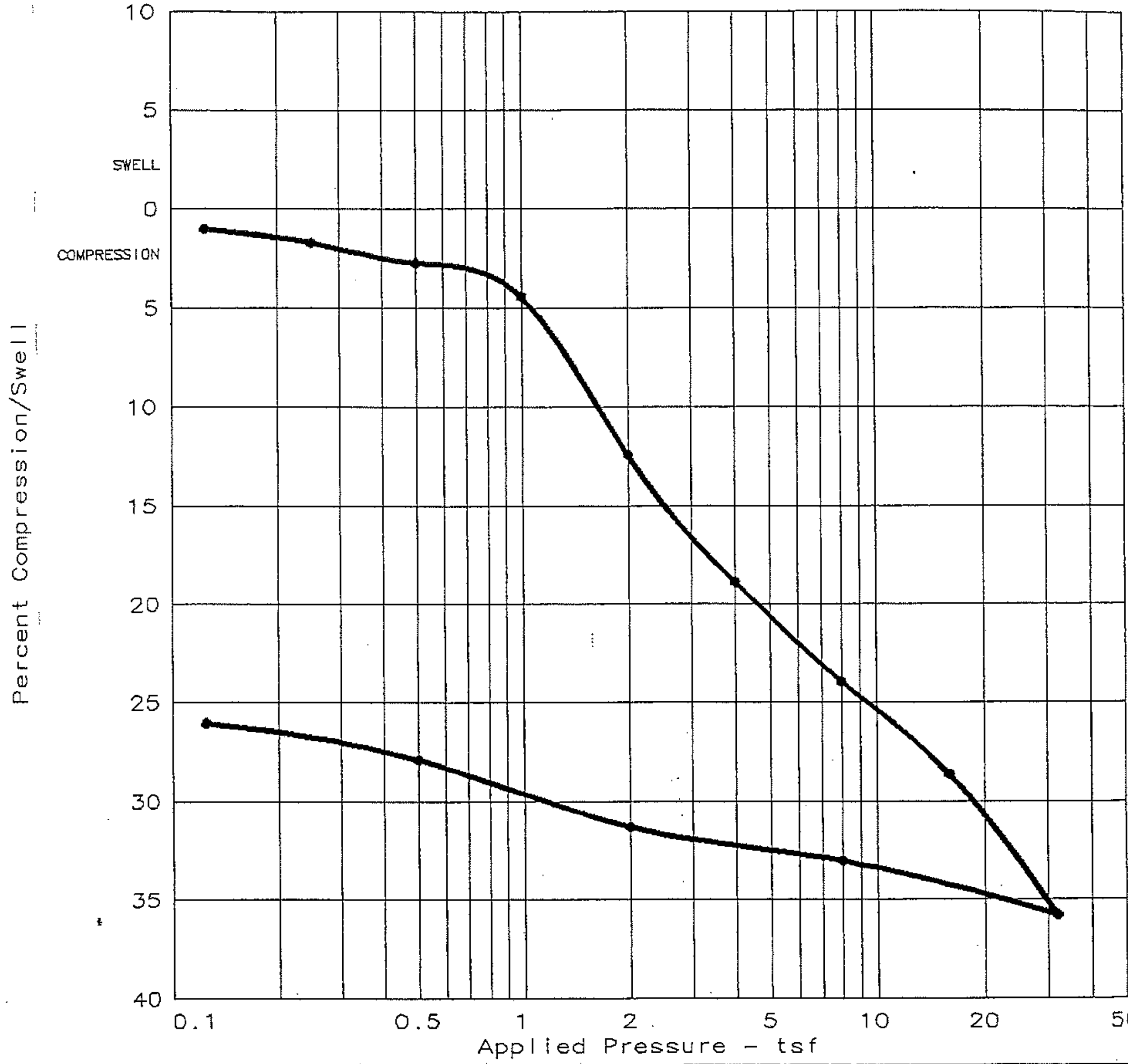


SUBSURFACE INVESTIGATION PLAN

JOHN P. STOPEN ENGINEERING PARTNERSHIP 450 SOUTH SALINA ST. SUITE 400 P.O. BOX 29 SYRACUSE, NEW YORK 13201 (315) 472-5238 Fax. (315) 472-8430	DATE: Sept. 1999 JOB NO.: 1-99074.00 CHECKED: G. Mathiyalakan DRAWN: sdb	DRAWING No. BP-1

Consolidation Test Results

CONSOLIDATION TEST REPORT



Natural Saturation	Natural Moisture	Dry Dens. (pcf)	LL	PI	Sp.Gr.	Initial void ratio
99.3 %	49.6 %	71.8	47	25	2.700	1.3475

TEST RESULTS	MATERIAL DESCRIPTION
	Dark gray silty clay

Project No.: 9854083
Project: Hilton Hotel - Portland, Maine
Location: B99-1A, Tube No. 42,
12.5 - 14.5 ft.
Date: Sept. 14, 1999

Remarks:

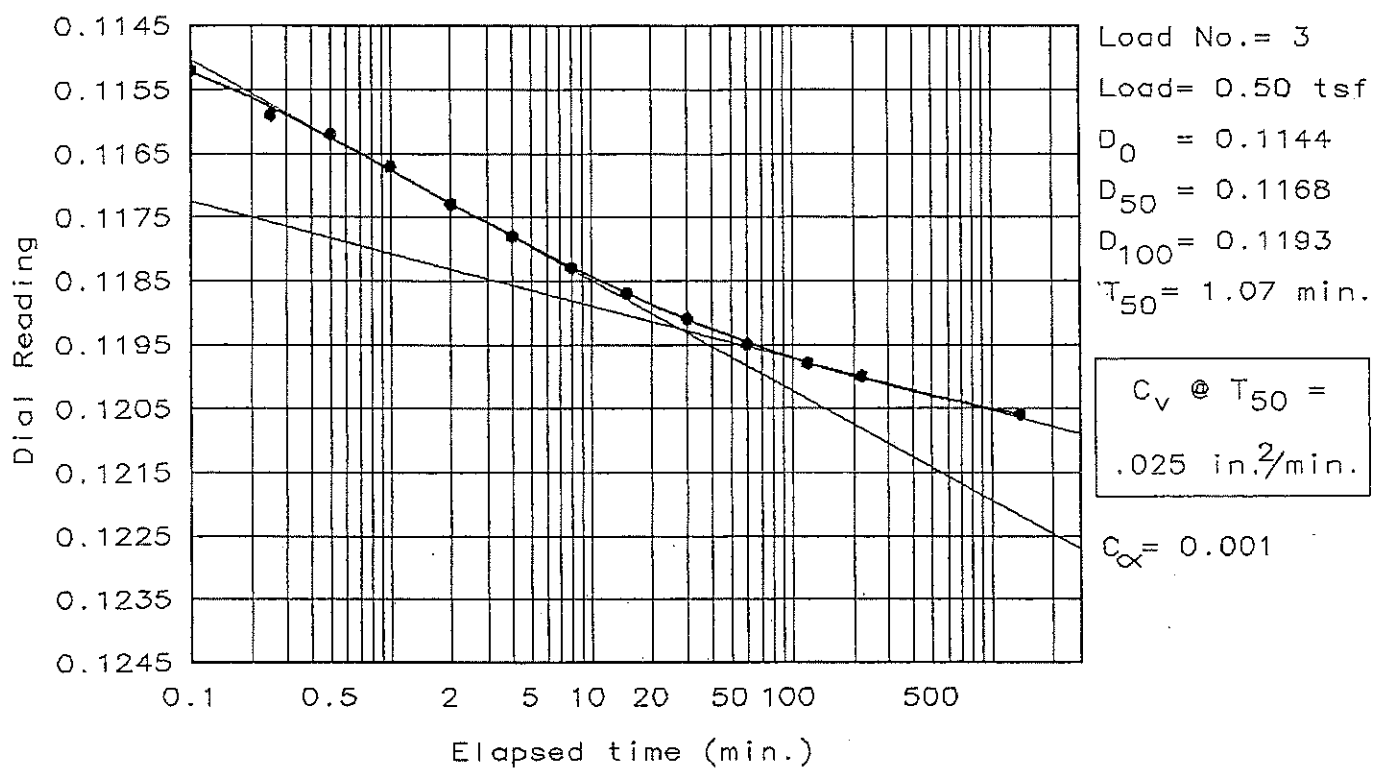
CONSOLIDATION TEST REPORT

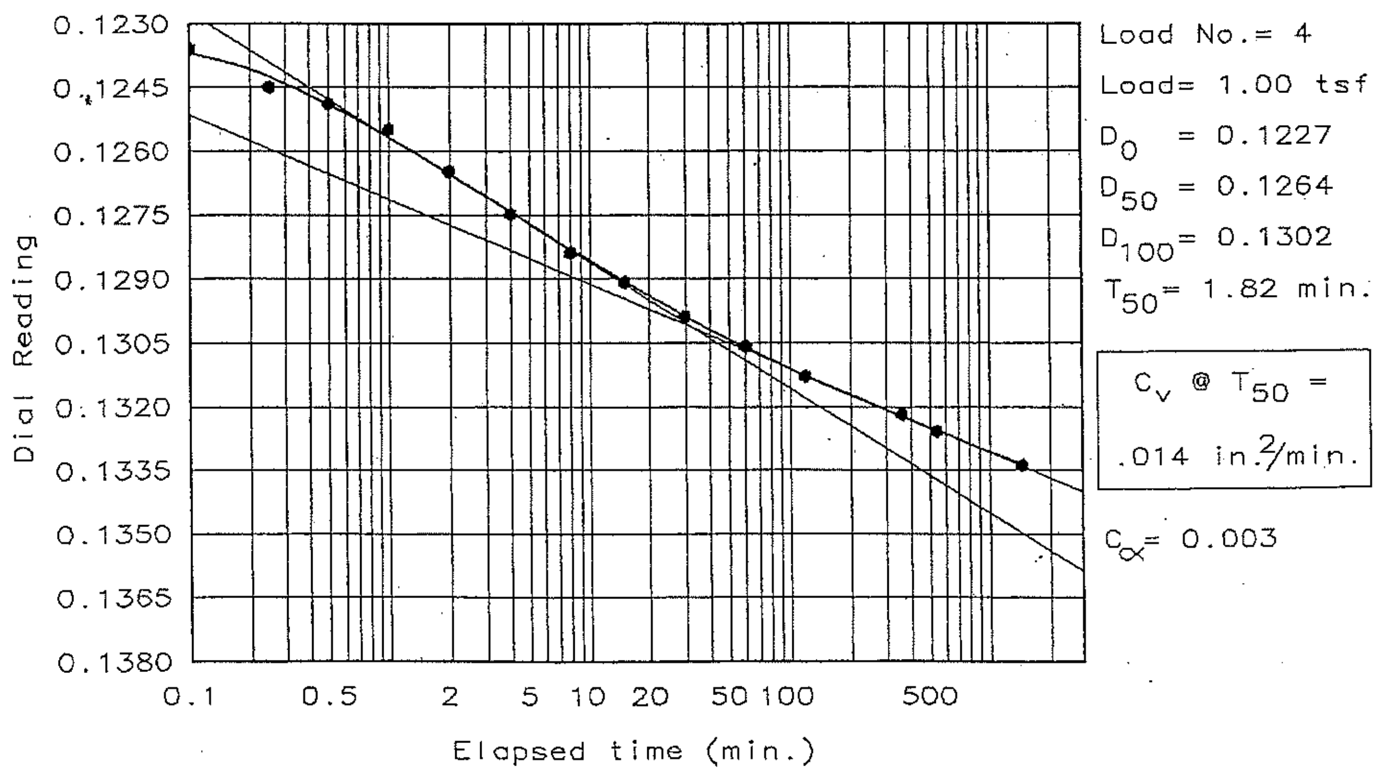
MAXIM TECHNOLOGIES

Fig. No. 99588

Dial Reading vs. Time

Project No.: 9854083
Project: Hilton Hotel - Portland, Maine
Location: B99-1A, Tube No. 42,
12.5 - 14.5 ft.
Date: Sept. 14, 1999

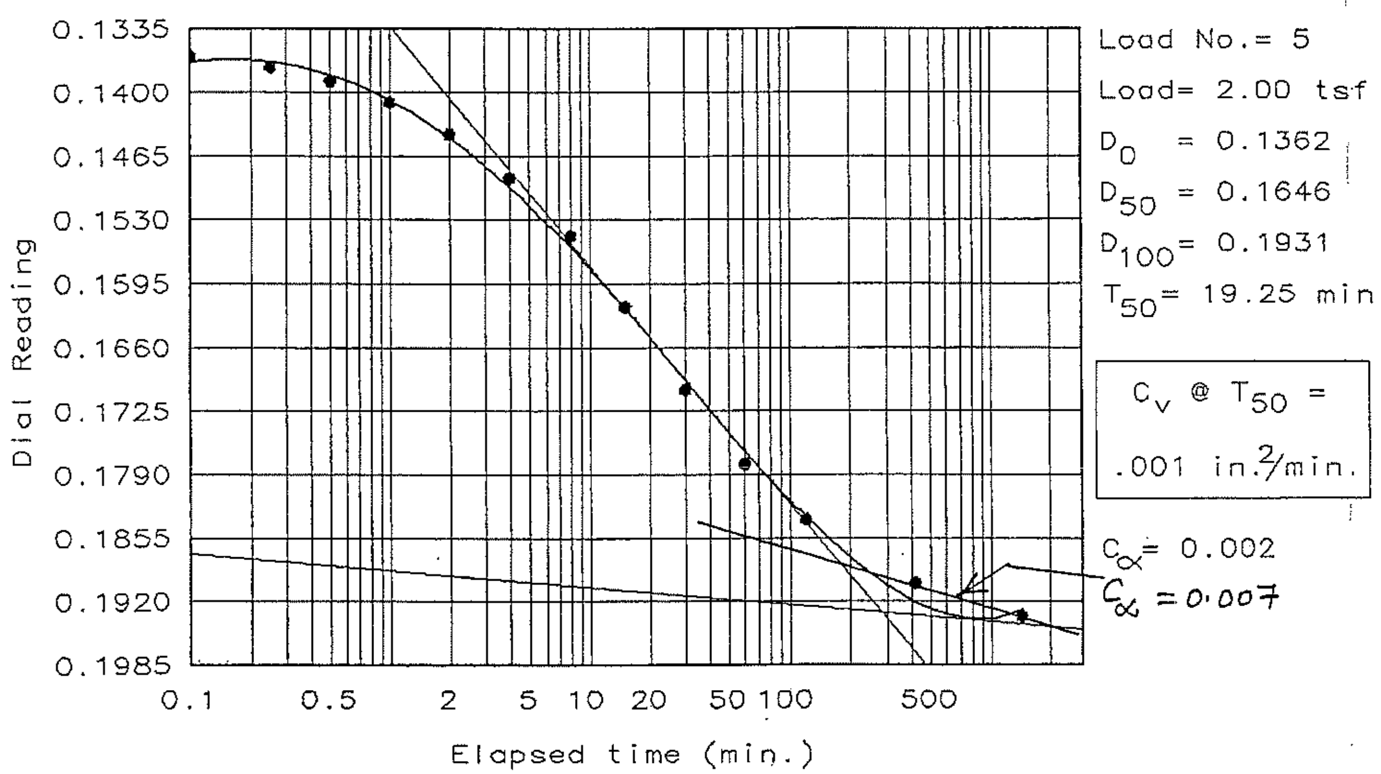


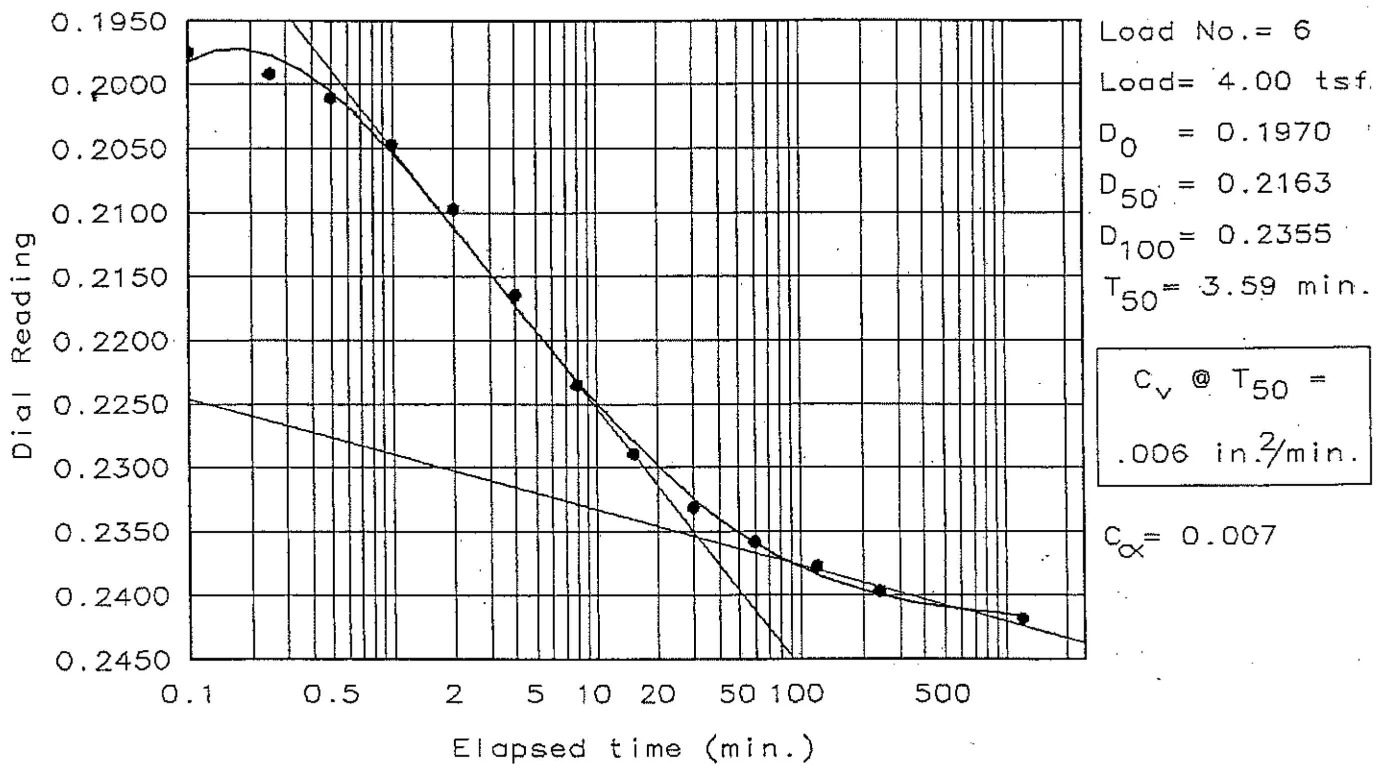


MAXIM TECHNOLOGIES

Dial Reading vs. Time

Project No.: 9854083
Project: Hilton Hotel - Portland, Maine
Location: B99-1A, Tube No. 42,
12.5 - 14.5 ft.
Date: Sept. 14, 1999



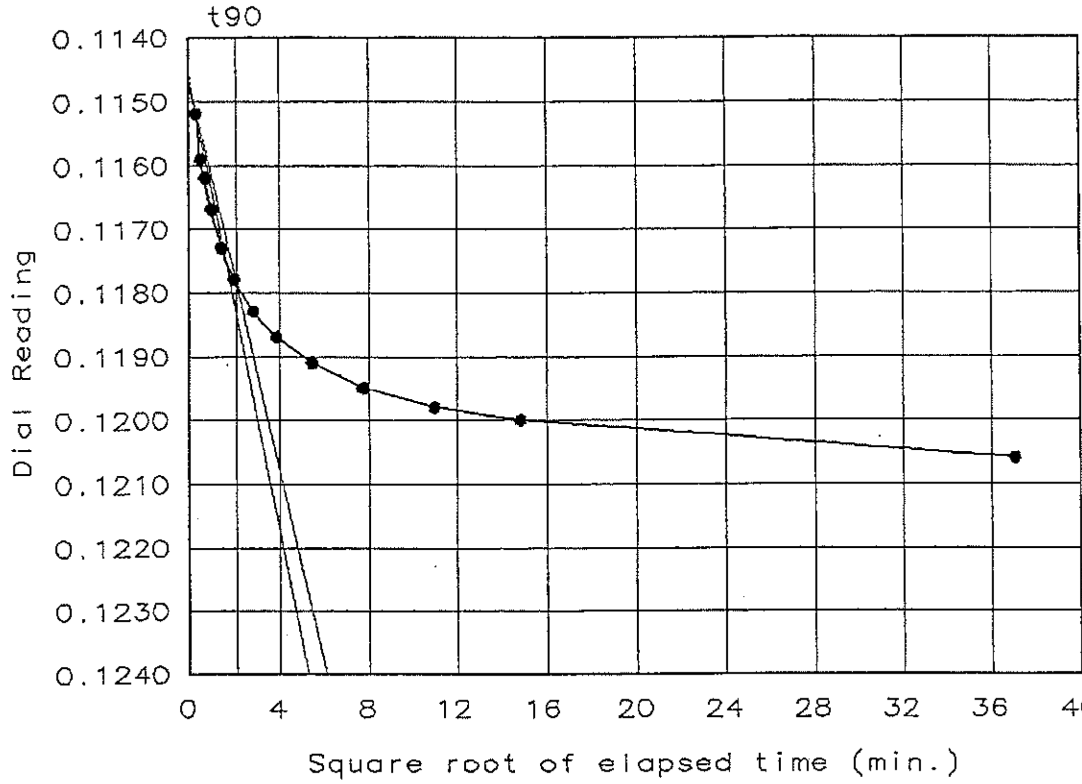


MAXIM TECHNOLOGIES

Dial Reading vs. Time

Project No.: 9854083
Project: Hilton Hotel - Portland, Maine
Location:

Date: Sept. 14, 1999



Load No.= 3

Load= 0.50 tsf

D_0 = 0.1146

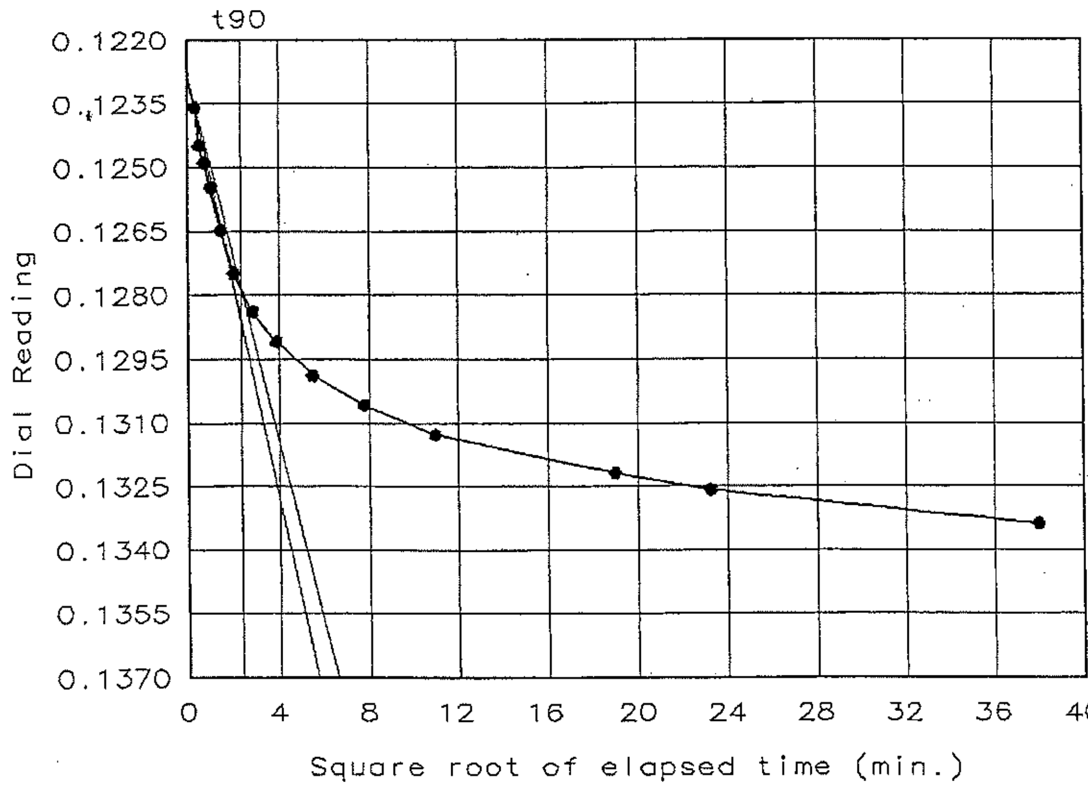
D_{90} = 0.1179

D_{100}= 0.1182

T_{90}= 4.36 min.

C_v @ T_{90} =

.026 in.²/min.



Load No.= 4

Load= 1.00 tsf

D_0 = 0.1228

D_{90} = 0.1278

D_{100}= 0.1284

T_{90}= 5.38 min.

C_v @ T_{90} =

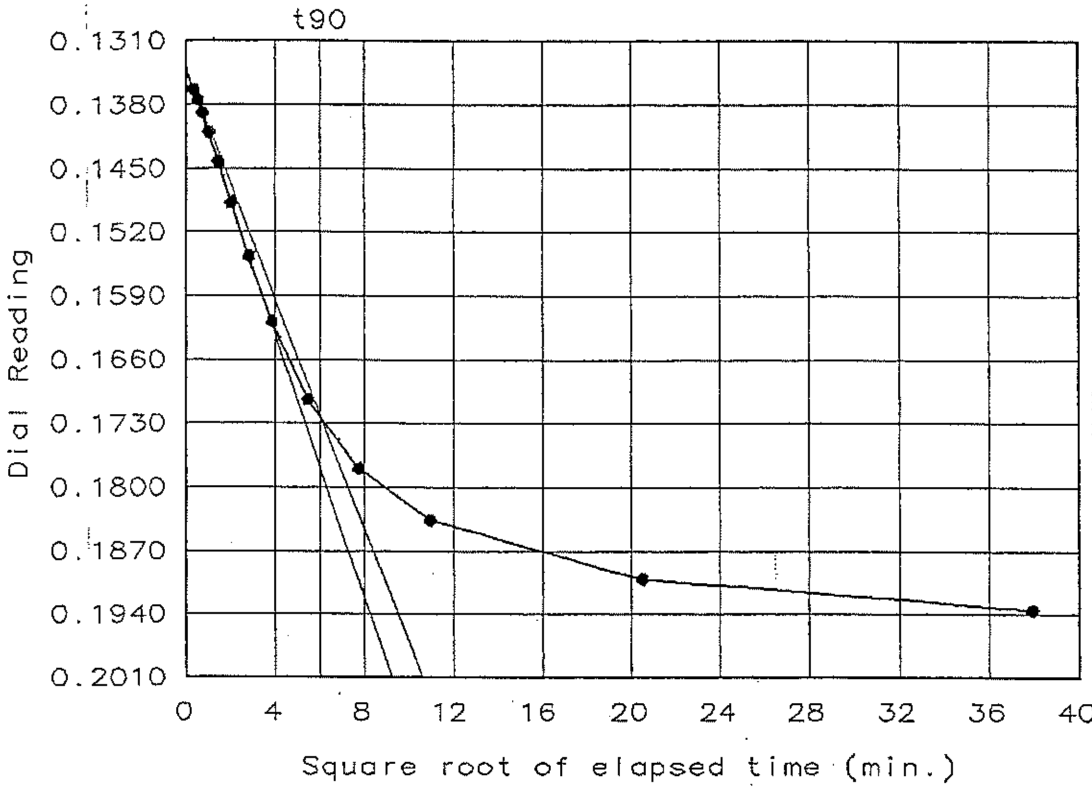
.021 in.²/min.

MAXIM TECHNOLOGIES

Dial Reading vs. Time

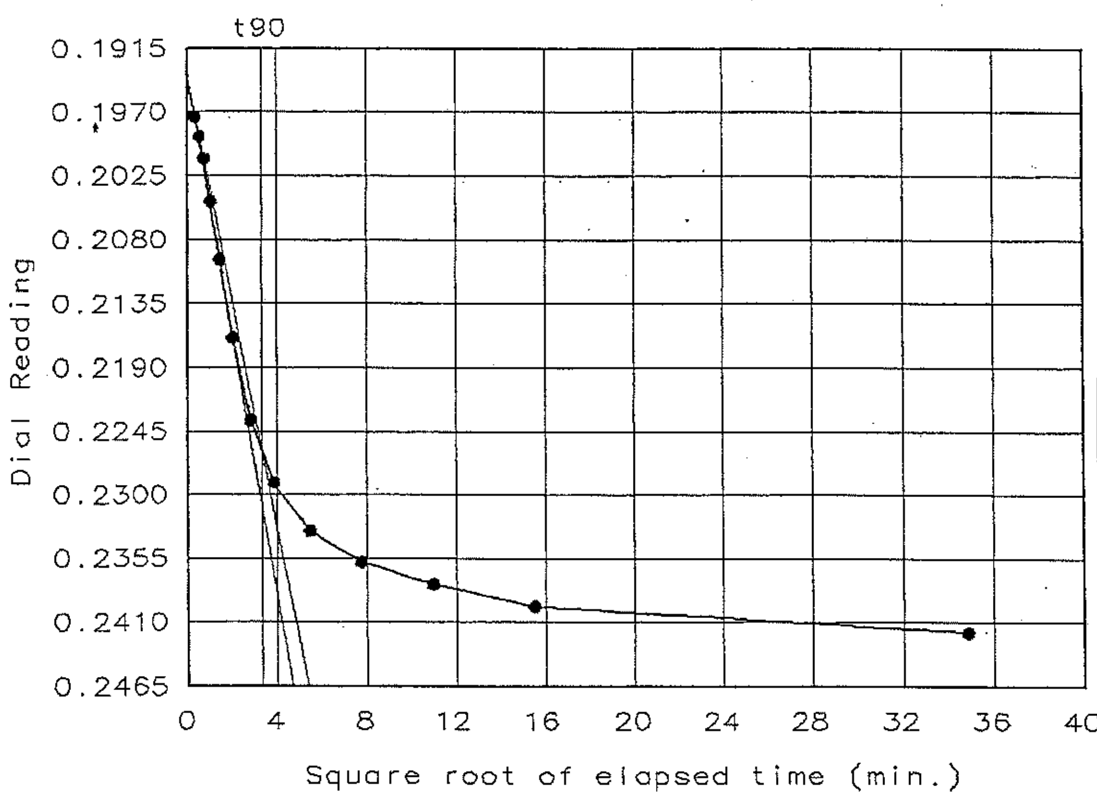
Project No.: 9854083
Project: Hilton Hotel - Portland, Maine
Location:

Date: Sept. 14, 1999



Load No.= 5
Load= 2.00 tsf
D_0 = 0.1341
D_{90} = 0.1723
D_{100} = 0.1765
T_{90} = 36.49 min.

C_v @ T_{90} = .003 in.²/min.



Load No.= 6
Load= 4.00 tsf
D_0 = 0.1940
D_{90} = 0.2259
D_{100} = 0.2295
T_{90} = 10.73 min.

C_v @ T_{90} = .008 in.²/min.

MAXIM TECHNOLOGIES

Atterberg Test Results

parratt wolff inc

July 16, 1999

L-99016
Laboratory Testing
Widewaters Hotel
Portland, ME
JPSEP Job No. #99074.00

ATTERBERG LIMITS
ASTM D4318

Lab ID#	Sample.	Depth (feet)	Plastic Limit	Liquid Limit	Plasticity Index	Water Content
12082	B-99-1 6D	10.0 - 12.0	20	39	19	44.2
12083	B-99-1 7D	12.0 - 14.0	16	26	10	37.3
12084	B-99-2 6D	10.0 - 12.0	18	33	15	37.8

99016.WPS

RECEIVED
JUL 19 1999
JOHN P. STOPEN, P.E.

RECEIVED
JUL 1 4 1999
JOHN P. STOPEN, P.E

Test pit and Boring Logs

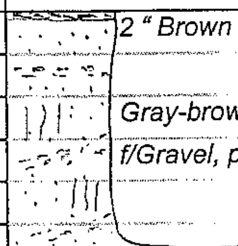
JOHN P. STOPEN ENGINEERING PARTNERSHIP

450 South Salina Street P.O. Box 29 Syracuse, NY 13201 (315)472-5238

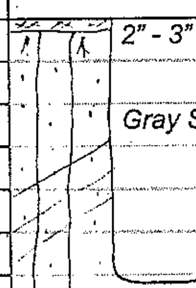
TEST PIT LOGS

Client	*Widewaters*	Date	*5/26/99*
Project	*Proposed Hilton Garden Inn*	Datum	*Project*
Location	*Portland, Maine*	Weather	*65's, occasional rain*
Job No.	*199074.00*	Observer	*GPM*

Test Pit No. *TP99-1* Elevation *72.8 ft* Water *5 ft (seep at 3.5 ft)*

depth	moisture	pocket pen	w	Description
	moist			 *2 " Brown Top Soil, SILT, Sand with small roots*
		4.0		
3	*wet*			*Gray-brown f/m SAND, layers of coarse sand and*
		4.0		*f/Gravel, pockets of gray mottles with Silt, trace Clay*
5	*wet*			
				Note: 1. <1" - 2" Tile Probe Penetration at the bottom
10				*2. Hole stayed open with vertical sides.*
				3. Occasional smearing effect on the sides.

Test Pit No. *TP99-2* Elevation *70.8 ft* Water *seep at 4 ft*

depth	moisture	pocket pen	w	Description
	moist			 *2" - 3" Topsoil with small roots*
		2.5		
				Gray SILT, little f/Sand, trace Clay
	wet			
5		*3.0*		
6				
				Note: 1. 2" Tile Probe Penetration at the bottom
10				*2. Hole stayed open with vertical sides.*
				3. Smearing effect on sides.
				4. Sensitive subgrade to wet conditions.

JOHN P. STOPEN ENGINEERING PARTNERSHIP

450 South Salina Street P.O. Box 29 Syracuse, NY 13201 (315)472-5238

TEST PIT LOGS

Client	Widewaters	Date	5/26/99
Project	Proposed Hilton Garden Inn	Datum	Project
Location	Portland, Maine	Weather	65's, occasional rain
Job No.	199074.00	Observer	GPM

Test Pit No. TP99-3 Elevation 69.0 ft Water V. slow seep at 4.0 ft

depth	moisture	pocket pen	w	Description
	moist			3 " Brown Top Soil with small roots
3	moist	3.0 - 3.5		Gray SILT, little to trace f/Sand, trace clay
		1.5 - 2.5		
5	wet			(graded to Clayey SILT at the bottom)
				Note: 1. 2" Tile Probe Penetration at the bottom
10				2. Hole stayed open with vertical sides.
				3. Smearing effect on sides.
				4. Sensitive subgrade to wet conditions.

Test Pit No. TP99-4 Elevation 68.6 ft Water V. slow seep at 4 ft

depth	moisture	pocket pen	w	Description
	moist			6" Topsoil with small to medium roots
				Gray SILT, little to trace f/Sand, trace Clay
	wet	3.0 - 3.5		
5				
6				Gray SILT & CLAY
				Note: 1. 2" Tile Probe Penetration at the bottom
10				2. Hole stayed open with vertical sides.
				3. Smearing effect on sides.
				4. Sensitive subgrade to wet conditions.

JOHN P. STOPEN ENGINEERING PARTNERSHIP

450 South Salina Street P.O. Box 29 Syracuse, NY 13201 (315)472-5238

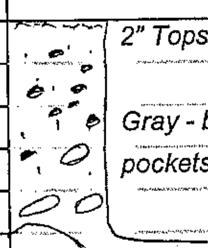
TEST PIT LOGS

Client	Widewaters	Date	5/26/99
Project	Proposed Hilton Garden Inn	Datum	Project
Location	Portland, Maine	Weather	65's, occasional rain
Job No.	199074.00	Observer	GPM

Test Pit No. TP99-5 Elevation 67.6 ft Water Not observed

depth	moisture	pocket pen	w	Description
	moist			 6" - 12 " Top Soil with small to medium roots
3	moist	2.5		Gray SILT, little to trace f/Sand, trace clay
		3.0		(layers of fine Sand)
5	moist to wet			Gray SILT & CLAY (at the bottom)
				Note: 1. 2" Tile Probe Penetration at the bottom
10				2. Hole stayed open with vertical sides.
				3. Smearing effect on sides.
				4. Sensitive subgrade to wet conditions.

Test Pit No. TP99-6 Elevation 74.5 ft Water Not observed

depth	moisture	pocket pen	w	Description
	damp			 2" Topsoil with small roots
				Gray - brown f/m SAND, little to some Gravel,
	damp			pockets of 6" - 12 " cobbles, boulder at bottom.
5				
6				
				Note: 1. No Tile Probe Penetration at the bottom
10				2. Hole stayed open with vertical sides.
				3. Bottom Excavation was hard with the large
				HITACHI 4 ft wide bucket Excavator.

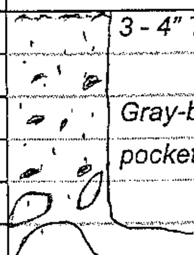
JOHN P. STOPEN ENGINEERING PARTNERSHIP

450 South Salina Street P.O. Box 29 Syracuse, NY 13201 (315)472-5238

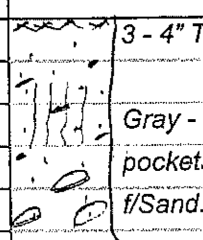
TEST PIT LOGS

Client	*Widewaters*	Date	*5/26/99*
Project	*Proposed Hilton Garden Inn*	Datum	*Project*
Location	*Portland, Maine*	Weather	*65's, occasional rain*
Job No.	*199074.00*	Observer	*GPM*

Test Pit No. *TP99-7* Elevation *76.3 ft* Water *Not observed*

depth	moisture	pocket pen	w	Description
				 *3 - 4" Top Soil with small to medium roots*
	damp			
3		*2.5*		*Gray-brown f/m SAND, little to some Gravel,*
		3.0		*pockets of cobbles, boulder at bottom.*
5	*damp*			
				Note: 1. No Tile Probe Penetration at the bottom.
10				*2. Hole stayed open with vertical sides.*
				3. Excavation was hard at the bottom.

Test Pit No. *TP99-8* Elevation *76.3 ft* Water *Not observed*

depth	moisture	pocket pen	w	Description
	damp			 *3 - 4" Topsoil with small to roots*
				Gray - brown f/m SAND, little to some Gravel,
	damp			*pockets of 6" - 12 " cobbles, occasional layers of Silt and*
5				*f/Sand.*
6				
				Note: 1. 1" - 2" Tile Probe Penetration at the bottom
10				*2. Hole stayed open with vertical sides.*
				3. Occasional smearing effect on the sides.

JOHN P. STOPEN ENGINEERING PARTNERSHIP

450 South Salina Street P.O. Box 29 Syracuse, NY 13201 (315)472-5238

TEST PIT LOGS

Client: *Widewaters*
Project: *Proposed Hilton Garden Inn*
Location: *Portland, Maine*
Job No.: *199074.00*

Date: *5/26/99*
Datum: *Project*
Weather: *65's, occasional rain*
Observer: *GPM*

Test Pit No. *TP99-9* Elevation *71.9 ft* Water *Seep at 3.5 ft*

depth	moisture	pocket pen	w	Description
	moist			3 - 4 " Top Soil with small to medium roots
3	moist			Gray - brown f/m SAND, little c/Sand, occasional 3" - 4"
		2.5 - 3.0		cobbles, graded with depth to layers of SILT, and Sand.
5	wet			
				Note: 1. 2" Tile Probe Penetration at the bottom
10				2. Hole stayed open with vertical sides.

Test Pit No. *TP99-10* Elevation *73.4 ft* Water *Seep at 3.5 ft*

depth	moisture	pocket pen	w	Description
	damp			3 - 4" Top soil with small roots
				Gray - brown f/ SAND, and Silt, little Gravel,
	wet			gradually graded to SILT, and Sand with trace of Clay.
5				
6				
				Note: 1. 2" Tile Probe Penetration at the bottom
10				2. Hole stayed open with vertical sides.
				3. Sensitive subgrade to wet conditions.

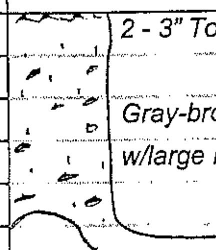
JOHN P. STOPEN ENGINEERING PARTNERSHIP

450 South Salina Street P.O. Box 29 Syracuse, NY 13201 (315)472-5238

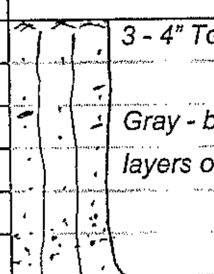
TEST PIT LOGS

Client	Widewaters	Date	5/26/99
Project	Proposed Hilton Garden Inn	Datum	Project
Location	Portland, Maine	Weather	65's, occasional rain
Job No.	199074.00	Observer	GPM

Test Pit No. TP99-11 Elevation 78.5 ft Water Not observed

depth	moisture	pocket pen	w	Description
				 2 - 3" Top Soil with small to medium roots.
	damp			
3				Gray-brown f/m SAND, little to some Gravel,
				w/large boulder at bottom.
5	damp			
				Note: 1. No Tile Probe Penetration at the bottom.
10				2. Hole stayed open with vertical sides.
				3. Excavation was hard at the bottom.

Test Pit No. TP99-12 Elevation 81.0 ft Water Seep at 3.5 to 4.5 ft

depth	moisture	pocket pen	w	Description
	damp			 3 - 4" Topsoil with small to roots
				Gray - brown SILT, little to trace f/Sand, trace Gravel,
		3.0		layers of f/SAND, and Silt.
5	wet			
6				
				Note: 1. 1" - 2" Tile Probe Penetration at the bottom
10				2. Hole stayed open with vertical sides.
				3. Smearing effect on the sides.
				4. Sensitive subgrade to wet conditions.

AINE TEST BORINGS, INC.
·REWER, MAINE 04412

CLIENT: JOHN STOPEN ENGINEERING

SHEET 1 OF 1

HOLE NO. B99-1

LER: ARK GUNNING

PROJECT NAME: HILTON GARDEN

LINE & STATION

JOB NUMBER: 27

LOCATION: PORTLAND, ME

OFFSET

ND WATER OBSERVATIONS

FT. AFTER HOURS

FT. AFTER HOURS

	CASING	SAMPLER	CORE BARREL
TYPE	HSA	SS	
SIZE I.D.	2 1/2"	1 3/8"	
HAMMER WT.		140	
HAMMER FALL		16"	

DATE START: 06/24/99

DATE FINISH: 06/24/99

SURFACE ELEVATION: 68.8 ft

SING OWS	SAMPLE NO.	O.D.	PEN.	REC.	DEPTH @ BOT.	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	VANE READING	DEPTH	STRATUM DESCRIPTION
										0.5	LOAM
	1D	2"	24"	0.9'	2.0	2	4	4	8	0.7	BLACK SILTY FINE SAND, TRACE OF ORGANICS
										2.2	TAN FINE SILTY FINE SAND
	2D	2"	24"	2.0'	4.0	10	9	11	12	5.0	BROWN GRAY MOTTLED SILTY FINE SAND, TRACE OF CLAY, TRACE OF ORGANICS
	3D	2"	24"	1.8'	6.0	9	10	13	15	7.0	OLIVE BROWN FINE SANDY SILT, SOME CLAY, SOME MED. BROWN SAND LAYERS
	4D	2"	24"	2.0'	8.0	4	5	7	7	9.8	OLIVE BROWN FINE SANDY SILTY CLAY, TRACE F GRAVEL
	5D	2"	24"	1.5'	10.0	4	5	7	8		GRAY SILTY CLAY
	6D	2"	24"	2.0'	12.0	WOH	1	1	1	13.0	
	7D	2"	24"	2.0'	14.0	WOH	WOH	1	1	15.0	GRAY SILTY CLAY, SOME MEDIUM SAND LAYERS
	8D	2"	24"	2.0'	16.0	WOH	2	2	2	17.0	GRAY SILTY CLAYEY GRAVELLY SAND
	9D	2"	24"	1.5'	18.0	2	6	14	24	18.0	BROWN SILTY CLAYEY GRAVELLY SAND
	10D	2"	24"	0.8'	20.0	10	23	26	26	21.5	BROWN GRAVELLY SAND, TRACE OF SILT
	11D	2"	24"	0.6'	22.0	21	20	29	39	22.2	GRAY SILTY FINE SAND, SOME COARSE SAND
	12D	2"	3"	0.2'	22.2	100				22.3	WEATHERED ROCK
											REFUSAL @ 22.3'

SAMPLES
D = SPLIT SPOON
C 2" SHELBY TUBE
S 3" SHELBY TUBE
P = 3½" SHELBY TUBE

SOIL CLASSIFIED BY:
[XX] DRILLER-VISUALLY
[ ] SOIL TECHNICIAN-VISUALLY
[ ] LABORATORY TESTS

REMARKS:
WATER @ 5.9'
CAVED @ 16.5'

HOLE NO. B99-1

AINE TEST BORINGS, INC.
?REWER, MAINE 04412

CLIENT: JOHN STOPEN ENGINEERING

SHEET 1 OF 1

HOLE NO. B99-2

LER: ARK GUNNING

PROJECT NAME: PROPOSED HILTON GARDENS INN

LINE & STATION

OB NUMBER

LOCATION: PORTLAND, ME

OFFSET

ND WATER OBSERVATIONS

FT. AFTER HOURS

FT. AFTER HOURS

	CASING	SAMPLER	CORE BARREL
TYPE	HSA	SS	
SIZE I.D.	2 1/2"	1 3/8"	
HAMMER WT.		140	
HAMMER FALL		30"	

DATE START: 06/25/99

DATE FINISH: 06/25/99

SURFACE ELEVATION: 71.0 ft

SING OWS	SAMPLE NO.	O.D.	PEN.	REC.	DEPTH @ BOT.	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	VANE READING	DEPTH	STRATUM DESCRIPTION
										0.7	LOAM
	1D	2"	24"	2.0'	2.0	1	6	8	10		
										3.0	TAN SILTY FINE SAND, TRACE OF ORGANICS
	2D	2"	24"	2.0'	4.0	6	10	13	17		
										5.5	BROWN GRAY MOTTLED FINE SANDY SILTY CLAY
	3D	2"	24'	2.0'	6.0	10	15	15	18		
	4D	2"	24"	0.6'	8.0	4	6	11	10		OLIVE BROWN MOTTLED SILTY CLAY, TRACE OF FINE SAND
										9.0	
	5D	2"	24"	0.9'	10.0	7	11	10	9	9.8	BROWN SILTY CLAY, TRACE OF FINE SAND
	6D	2"	24"	2.0'	12.0	WOH	1	2	2		GRAY SILTY CLAY
										13.0	
	7D	2"	24"	2.0'	14.0	2	2	13	12	13.8	BROWN SLTY CLAYEY SAND
	8D	2"	19'	1.6'	15.6	11	13	16	100	15.6	GRAY SILTY F-M SAND
											REFUSAL @ 15.8'

SAMPLES
D = SPLIT SPOON
C 2" SHELBY TUBE
S 3" SHELBY TUBE
P = 3½" SHELBY TUBE

SOIL CLASSIFIED BY:
[XX] DRILLER-VISUALLY
[ ] SOIL TECHNICIAN-VISUALLY
[ ] LABORATORY TESTS

REMARKS:
WATER @ 12.8'
CAVED @ 12.0'

HOLE NO. B99-2

AINE TEST BORINGS, INC. PREWER, MAINE 04412	CLIENT JOHN STOPEN ENGINEERING	SHEET 1 OF 1 HOLE NO. B99-1A
LLER IKE PORTER	PROJECT NAME PROPOSED HILTON GARDEN INN	LINE & STATION
OB NUMBER 27A	LOCATION PORTLAND, ME	OFFSET

ND WATER OBSERVATIONS

FT. AFTER HOURS

FT. AFTER HOURS

	CASING	SAMPLER	CORE BARREL
TYPE	HW		
SIZE I.D.	4"		
HAMMER WT.	300		
HAMMER FALL	16"		

DATE START	DATE FINISH
08/12/99	08/12/99

SURFACE ELEVATION 68.9 ft

SING OWS	SAMPLE NO.	O.D.	PEN.	REC.	DEPTH @ BOT.	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	VANE READING	DEPTH	STRATUM DESCRIPTION
GER										0.8	TOPSOIL
										2.0	BROWN SILTY FINE SAND
29											BROWN MOTTLED SILTY CLAY WITH SAND LAYERS
	1S	3"	24"	1.8'	12.0						
	2S	3"	24"	2.0'	14.5					14.5	
											BOTTOM OF BORING @ 14.5'

SAMPLES
D = SPLIT SPOON
C 2" SHELBY TUBE
S 3" SHELBY TUBE
P = 3½" SHELBY TUBE

SOIL CLASSIFIED BY:
[XX] DRILLER-VISUALLY
[ ] SOIL TECHNICIAN-VISUALLY
[ ] LABORATORY TESTS

REMARKS:
OPEN
WATER @ 3.4' WITH 12.5' CASING
WATER @ 5.2' WITH NO CASING

HOLE NO. B99-1A

AINE TEST BORINGS, INC.
REWER, MAINE 04412

CLIENT: JOHN STOPEN ENGINEERING

SHEET 1 OF 1

HOLE NO. B99-2A

LER: KE PORTER

PROJECT NAME: PROPOSED HILTON GARDEN INN

LINE & STATION

B NUMBER: N/A

LOCATION: PORTLAND, ME

OFFSET

D WATER OBSERVATIONS

FT. AFTER HOURS

FT. AFTER HOURS

	CASING	SAMPLER	CORE BARREL
TYPE	HSA	SS	
SIZE I.D.	2 1/2"	1 3/8"	
HAMMER WT.		140	
HAMMER FALL		30"	

DATE START	DATE FINISH
08/11/99	08/11/99

SURFACE ELEVATION: 70.0 ft

ING WS	SAMPLE NO.	O.D.	PEN.	REC.	DEPTH @ BOT.	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	~~VANE READING~~ 18-24	DEPTH	STRATUM DESCRIPTION
										0.8	TOPSOIL
	1D	2"	24"	2.0	2.0	4	13	16	18	4.0	BROWN SILTY SAND
	2D	2"	24"	1.8'	7.0	3	10	12	12	9.0	BROWN MOTTLED SILTY CLAY
	3D	2"	24"	1.9'	10.0	1	3	3	3		
	4D	2"	24"	2.0	12.0	WOH	WOH	WOH	1		GRAY SILTY CLAY
	5D	2"	24"	2.0'	14.0	WOR	1	WOH	1	15.4	
	6D	2"	24"	2.0'	16.0	WOR	WOH	13	3	17.0	GRAY SILTY SAND, TRACE OF GRAVEL
	7D	2"	24"	1.8'	18.0	WOR	WOH	1	13	17.9	GRAY SILTY CLAY
	8D	2"	24"		20.0	4	9	13	11	20.0	BROWN SILTY SANDY GRAVEL

BOTTOM OF BORING @ 20.0'

SAMPLES
D = SPLIT SPOON
C = 2" SHELBY TUBE
S = 3" SHELBY TUBE
P = 3½" SHELBY TUBE

SOIL CLASSIFIED BY:
- XX DRILLER-VISUALLY
- SOIL TECHNICIAN-VISUALLY
- LABORATORY TESTS

REMARKS:
CAVED DRY @ 3.9'
WATER @ 6.8' IN AUGERS

HOLE NO. B99-2A

AINE TEST BORINGS, INC. REWER, MAINE 04412	CLIENT JOHN STOPEN ENGINEERING	SHEET 1 OF 1 HOLE NO. B99-3	
LER KE PORTER	PROJECT NAME PROPOSED HILTON GARDEN INN	LINE & STATION	
OB NUMBER 7A	LOCATION PORTLAND, ME	OFFSET	

ND WATER OBSERVATIONS		CASING	SAMPLER	CORE BARREL	DATE START	DATE FINISH
FT. AFTER HOURS	TYPE	HSA	SS		08/10/99	08/10/99
	SIZE I.D.	2 1/2"	1 3/8"		SURFACE ELEVATION	
FT. AFTER HOURS	HAMMER WT.		140		72.5 ft	
	HAMMER FALL		30"			

SAMPLE NO.	O.D.	PEN.	REC.	DEPTH @ BOT.	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	~~VANE READING~~ 18-24	DEPTH	STRATUM DESCRIPTION
									0.3	TOPSOIL
1D	2"	24"	1.6'	2.0	2	9	22	23	2.0	BROWN SILTY SAND WITH TRACE OF GRAVEL
2D	2"	24"	2.0	7.0	19	21	17	21		GRAY SILTY GRAVELLY SAND WITH COBBLES
3D	2"	24"		10.0	43	28	22	24		
4D	2"	24"	1.7'	12.0	18	4	15	32	12.0	
5D	2"	24"	1.2'	14.0	13	35	46	16		BROWN SILTY F-M SAND WITH GRAVEL
									15.3	
6D	2"	24"	2.0'	16.0	5	21	38	71	15.7	GRAY SILTY GRAVELLY SAND
7D	2"	20"	1.6'	17.7	9	34	31	50	17.7	BROWN SILTY GRAVELLY SAND
									18.4	COBBLE
									18.7	BROWN SILTY GRAVELLY SAND
7D	2"	24"	2.0'	20.5	11	8	10	18		GRAY SILTY GRAVELLY SAND
8D	2"	18"	1.3'	22.0	3	13	72		22.0	
										BOTTOM OF BORING @ 22.0'

SAMPLES
D = SPLIT SPOON
2" SHELBY TUBE
3" SHELBY TUBE
P = 3½" SHELBY TUBE

SOIL CLASSIFIED BY:
- [XX] DRILLER-VISUALLY
- [ ] SOIL TECHNICIAN-VISUALLY
- [ ] LABORATORY TESTS

REMARKS:
CAVED @ 10.0'
WATER @ 9.4'
WET @ 10.0'

HOLE NO. B99-3

IAINE TEST BORINGS, INC.
?REWER, MAINE 04412

CLIENT	JOHN STOPEN ENGINEERING
SHEET	1 OF 1
HOLE NO.	B99-4
ILLER	IKE PORTER
PROJECT NAME	PROPOSED HILTON GARDEN INN
LINE & STATION	
JOB NUMBER	.27A
LOCATION	PORTLAND, ME
OFFSET	

JND WATER OBSERVATIONS

FT. AFTER HOURS

FT. AFTER HOURS

	CASING	SAMPLER	CORE BARREL
TYPE	HSA	SS	
SIZE I.D.	2 1/2"	1 3/8"	
HAMMER WT.		140	
HAMMER FALL		30"	

DATE START	DATE FINISH
08/11/99	08/11/99

SURFACE ELEVATION 70.3 ft

SING OWS	SAMPLE NO.	O.D.	PEN.	REC.	DEPTH @ BOT.	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	~~VANE READING~~ 18-24	DEPTH	STRATUM DESCRIPTION
										0.8	TOPSOIL
	1D	2"	24"	1.8	2.0	4	7	16	26		BROWN SILTY GRAVELLY SAND
										5.0	
	2D	2"	24"	2.0'	7.0	3	8	8	9		BROWN MOTTLED CLAYEY SILTY SAND, TRACE OF GRAVEL
										9.2	
	3D	2"	24"	1.9'	10.0	1	3	3	5	10.7	BROWN MOTTLED SILTY CLAY
	4D	2"	24"	2.0'	12.0	1	2	1	1		
	5D	2"	24"	2.0'	14.0	WOR	WOH	WOH	WOH		GRAY SILTY CLAY
	6D	2"	24"	2.0	16.0	WOR	WOR	WOH	WOH	17.5	
	7D	2"	24"	2.0'	18.0	WOR	WOR	7	12		
										19.0	BROWN SILTY COARSE SANDY GRAVEL
	8D	2"	24"	1.6'	20.0	7	9	10	10		GRAY SILTY COARSE SANDY GRAVEL (TILL)
	9D	2"	24"	1.4'	22.0	3	10	15	25	22.0	
											BOTTOM OF BORING @ 22.0'

SAMPLES

D = SPLIT SPOON

C 2" SHELBY TUBE

S 3" SHELBY TUBE

P = 3½" SHELBY TUBE

SOIL CLASSIFIED BY:

- [XX] DRILLER-VISUALLY
- [ ] SOIL TECHNICIAN-VISUALLY
- [ ] LABORATORY TESTS

REMARKS:

CAVED @ 14.4' WATER @ 6.4'
WATER @ 10.0' WITH 20.0' AUGERS
WATER @ 8.0' WITH 10.0' AUGERS

HOLE NO. B99-4

AINE TEST BORINGS, INC.
?REWER, MAINE 04412

CLIENT: JOHN STOPEN ENGINEERING

SHEET 1 OF 1

HOLE NO. B99-5

LLER: IKE PORTER

PROJECT NAME: PROPOSED HILTON GARDEN INN

LINE & STATION

IOB NUMBER: 27A

LOCATION: PORTLAND, ME

OFFSET

ND WATER OBSERVATIONS

FT. AFTER HOURS

FT. AFTER HOURS

	CASING	SAMPLER	CORE BARREL
TYPE	HSA	SS	
SIZE I.D.	2 1/2"	1 3/8"	
HAMMER WT.		140	
HAMMER FALL		30"	

DATE START: 08/10/99

DATE FINISH: 08/10/99

SURFACE ELEVATION: 71.9 ft

SING OWS	SAMPLE NO.	O.D.	PEN.	REC.	DEPTH @ BOT.	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	~~VANE READING~~ 18-24	DEPTH	STRATUM DESCRIPTION
										0.4	TOPSOIL
	1D	2"	24"	2.0'	2.0	5	14	11	12	1.8	BROWN SILTY GRAVELLY SAND
											BROWN MOTTLED SILTY CLAY
	2D	2"	24"	2.0	7.0	6	11	13	10		
										9.3	
	3D	2"	24"	2.0'	10.0	6	3	2	2	10.4	GRAY SILTY CLAY
										11.8	BROWN SILTY CLAY WITH SAND LAYERS
	4D	2"	24"	2.0'	12.0	WOR	WOH	WOH	18		BROWN SILTY F-C SAND WITH TRACE OF GRAVEL
	5D	2"	24"	1.4'	14.0	DROPPED RODS			10		
										15.0	
	6D	2"	24"	1.8'	16.0	46	30	29	31	16.0	BROWN SILTY COARSE SANDY GRAVEL
											BOTTOM OF BORING @ 16.0'

SAMPLES
D = SPLIT SPOON
C 2" SHELBY TUBE
S 3" SHELBY TUBE
P = 3½" SHELBY TUBE

SOIL CLASSIFIED BY:
[XX] DRILLER-VISUALLY
[ ] SOIL TECHNICIAN-VISUALLY
[ ] LABORATORY TESTS

REMARKS:
CAVED @ 9.8' WATER @ 5.9'
8/11/99 WATER @ 6.2' WITH 12.0'

HOLE NO. B99-5

AINE TEST BORINGS, INC. BREWER, MAINE 04412	CLIENT JOHN STOPEN ENGINEERING	SHEET 1 OF 1 HOLE NO. B99-6
...LER IKE PORTER	PROJECT NAME PROPOSED HILTON GARDEN INN	LINE & STATION
JOB NUMBER .27A	LOCATION PORTLAND, ME	OFFSET

...ND WATER OBSERVATIONS

FT. AFTER HOURS

FT. AFTER HOURS

	CASING	SAMPLER	CORE BARREL
TYPE	HSA	SS	
SIZE I.D.	2 1/2"	1 3/8"	
HAMMER WT.		140	
HAMMER FALL		30"	

DATE START	DATE FINISH
08/12/99	08/12/99

SURFACE ELEVATION 69.0 ft

...SING ...OWS	SAMPLE NO.	O.D.	PEN.	REC.	DEPTH @ BOT.	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	~~VANE READING~~ 18-24	DEPTH	STRATUM DESCRIPTION
										0.6	TOPSOIL
	1D	2"	24"	1.8'	2.0	3	8	13	13	1.6	BROWN SILTY FINE SAND
	2D	2"	24"	2.0'	4.0	13	15	21	24		BROWN MOTTLED SILTY CLAY WITH SAND LAYERS
	3D	2"	24"	1.8'	6.0	19	26	28	23	6.0	
										6.9	BROWN SILTY SAND, TRACE OF GRAVEL
	4D	2"	24"	2.0'	8.0	24	19	16	14	7.8	GRAY MOTTLED SILTY CLAY
										8.0	GRAY SILTY CLAY
	5D	2"	24"	1.6'	10.0	8	6	4	4	10.0	GRAY SILTY CLAY, FULL OF SEA SHELLS

BOTTOM OF BORING @ 10.0'

SAMPLES
D = SPLIT SPOON
... 2" SHELBY TUBE
... 3" SHELBY TUBE
P = 3½" SHELBY TUBE

SOIL CLASSIFIED BY:
XX DRILLER-VISUALLY
SOIL TECHNICIAN-VISUALLY
LABORATORY TESTS

REMARKS:
OPEN
WATER @ 7.9'

HOLE NO. B99-6

AINE TEST BORINGS, INC.
BREWER, MAINE 04412

CLIENT	SHEET 1 OF 1
JOHN STOPEN ENGINEERING	HOLE NO. B99-7

LLER	PROJECT NAME	LINE & STATION
IKE PORTER	PROPOSED HILTON GARDEN INN	

JOB NUMBER	LOCATION	OFFSET
27A	PORTLAND, ME	

IND WATER OBSERVATIONS

FT. AFTER HOURS

FT. AFTER HOURS

	CASING	SAMPLER	CORE BARREL
TYPE	HSA	SS	
SIZE I.D.	2 1/2"	1 3/8"	
HAMMER WT.		140	
HAMMER FALL		30"	

DATE START	DATE FINISH
08/11/99	08/11/99

SURFACE ELEVATION 72.9 ft

SING OWS	SAMPLE					BLOWS PER 6" ON SAMPLER			~~VANE READING~~	DEPTH	STRATUM DESCRIPTION
	NO.	O.D.	PEN.	REC.	DEPTH @ BOT.	0-6	6-12	12-18	18-24		
										0.3	TOPSOIL
	1D	2"	24"	0.6'	2.0	3	11	21	32		BROWN SILTY FINE SAND
										5.0	
	2D	2"	24"	1.4'	7.0	5	10	12	12		BROWN MOTTLED SILTY CLAY
										9.8	
	3D	2"	24"	0.9'	10.0	4	5	4	6	10.0	GRAY SILTY CLAY
	4D	2"	24"	1.6'	12.0	2	2	4	4		GRAY SILTY CLAY, TRACE OF GRAVEL
										13.7	
	5D	2"	24"	1.8'	14.0	4	9	33	20	14.0	BROWN SILTY GRAVELLY SAND
											BOTTOM OF BORING @ 14.0'

SAMPLES
D = SPLIT SPOON
2" SHELBY TUBE
3" SHELBY TUBE
P = 3½" SHELBY TUBE

SOIL CLASSIFIED BY:
[XX] DRILLER-VISUALLY
[ ] SOIL TECHNICIAN-VISUALLY
[ ] LABORATORY TESTS

REMARKS:
WATER IN AUGERS @ 13.4'
CAVED DRY @ 7.4'

HOLE NO. B99-7

Exhibit 18

G.I.S. Coordinates

98386

Exhibit 18

G.I.S. Coordinates

Enclosed is a disk containing G.I.S. Coordinates for three corners of the site perimeter. Additionally, the Site Plan within the plan set depicts the coordinate pairs for the three lot corners.

Exhibit 19

Approvals From Other Agencies

98386

Exhibit 19

Approvals from Other Agencies

The following permit approvals are anticipated for this project:

Permit	Agency	Status
Site Plan	City of Portland	In review; approval anticipated 10/20/99.
Natural Resources Protection Act, Tier 1 Wetland Alterations Permit	Maine Department of Environmental Protection	In review; approval anticipated 11/5/99.

A copy of the permits will be provided to the City of South Portland upon approvals.

Exhibit 20

Request For Amount of Performance Guarantees

Sebago Technics

Engineering & Planning for the Future

October 12, 1999
98386

Jeffrey Jordan, City Manager
City of South Portland
P. O. Box 9422
South Portland, ME 04106

<u>Performance Guarantee - Hilton Garden Inn, Portland International Jetport</u>

Dear Mr. Jordan:

On behalf of the Widewaters New Castle Portland Company, LLC, Sebago Technics has prepared a site plan application submittal for a proposed 88 room Hilton Garden Inn. The proposed hotel will be located off the Jetport Crossroad on an 8.21 acre parcel. The parcel is split by the Portland/South Portland municipal line, although most of the hotel will be in Portland.

This letter has been included in the site plan application package as a formal request to provide the required performance guarantee for this project.

If you have any questions or need additional information, please give me a call.

Sincerely,

SEBAGO TECHNICS, INC.

Danielle D. Betts, P.E.
Sr. Project Engineer

DDB:jc

cc: Kevin Kane, The Widewaters Group

One Chabot Street P.O. Box 1339 Westbrook, Maine [illegible]

Exhibit 21

Compliance With Standards

Compliance with Standards

The project site is located in the General Commercial (GC) Zone. This zone has no specific performance standards associated with it. Additionally, since this site is not located in a Shoreland Area or Resource Protection District, specific standards associated with these areas are not applicable to this site. Therefore, this project is subject to site plan standards specified in Article XVIII – Site Plan Review. The applicant believes this project to be in conformance with the site plan standards established in this article. The exhibits and plan sheets submitted as part of this application address each requirement and provide support of how this project complies with the site plan standards.

Exhibit 23

Maintenance of Private Utilities, Facilities, Open Space

Exhibit 23

Maintenance of Private Utilities, Facilities & Open Space

The maintenance of the facility and on-site utility services will be the responsibility of New Castle Hotels. New Castle Hotels is a leading independent operator of full service hotels, resorts and conference centers in the United States and Canada. The firm, which is privately owned, was founded in 1980.

New Castle Hotels owns, operates and develops hotels and resorts under Marriott, Westin, Hilton, Sheraton, Promus and independent flags. Including projects under development, New Castle Hotels currently owns and/operates 20 hotels in 9 states and 3 Canadian provinces. The company has controlling equity positions in eight hotels and has minority participation in seven others. Hotel properties in the firm's portfolio have 4,380 rooms, employ over 3,000 persons, and generate an annual revenue of over $150 million.

Exhibit 24

Property Owners Within 500 Feet

Exhibit 24

LIST OF PROPERTY OWNERS WITHIN 500 FEET

Tax Map Number	Lot Number
46	2C
46	7
46	5
46	6
46	3E
46	1
46	3F

Exhibit 26

Nuisances

Exhibit 26

Nuisances

No potential nuisances are anticipated with this proposed development.

Exhibit 27

Construction Site Circulation Plan

98386

Exhibit 27

Construction Site Circulation Plan

Initially, vehicles will park along the edge of the Jetport Crossroad until sufficient construction has occurred on site to provide a gravel area for all construction personnel. The location of these parking areas will change depending on the schedule of construction; however, the location will be within areas proposed as parking or access areas for the developed site.

Attachment A

24" x 36" Site Design Drawings

24" x 36" Site Design Drawings have been provided under separate cover.

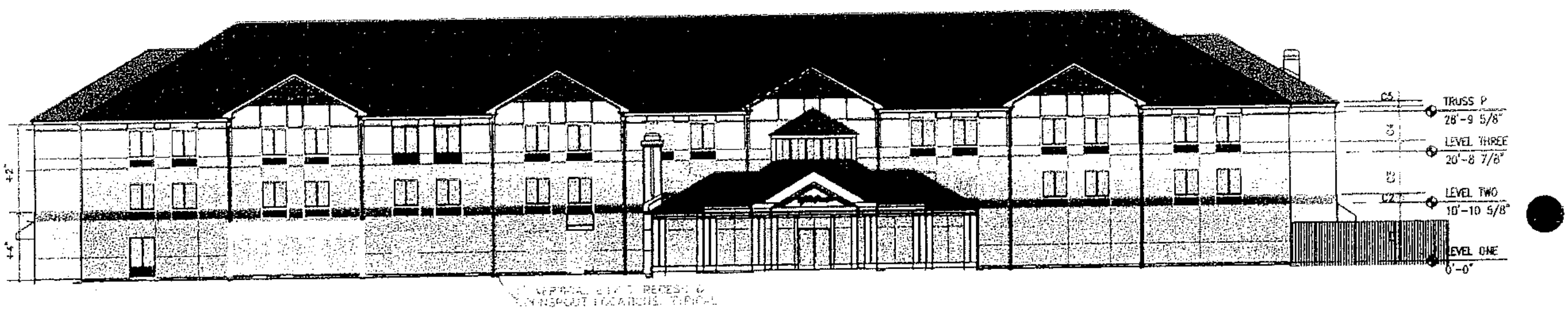
Attachment B

Color Building Elevations

LOW-RISE

Hilton GARDEN INNS

(88 Rooms - 3 Stories)



East (front) Elevation

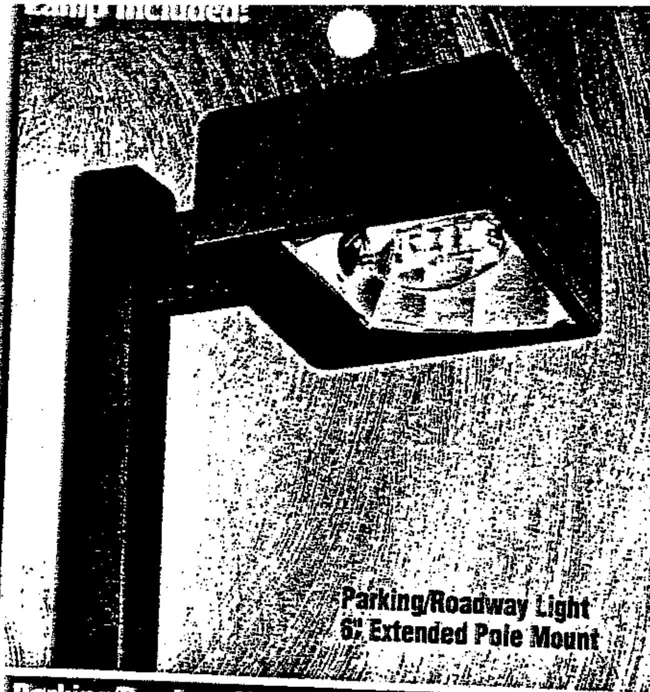
West (rear) Elevation

NOTE: +2", +4", ETC. INDICATES THICKNESS OF E.I.F.S. FROM FACE OF EXTERIOR SHEATHING

NOTE: C1, C2, ETC. DENOTES COLOR BAND CHANGES OF E.I.F.S.

Attachment C

Light Fixture Details



The 12" housin‑ ‑f the Parking/Roadw... ght has a Type III asymmetric distribution pattern. The 16" housing has field-adjustable Type II or Type III optics. The 22" housing has Type II asymmetric distribution. Ideally suited for roadway applications, parking areas or for building mounted security lighting.

Parking/Roadway Light Order Information

Housing Size (sq.)	Wattage/ Lamp	Catalog Number	Prepay Price	Mounting Code (Insert Code at * in Catalog #)	Prepay Adder
12"	26W Fluor.	MPR*226-1	$104	1 = 1-1/2" Close Pole Mount	$6
12"	50W MH	MPR*405-D	$148	2 = 6" Extended Pole Mount	$10
12"	70W MH	MPR*407-D	$144	3 = 2" Adjustable Fitter	$18
12"	100W MH	MPR*410-D	$144	4 = Yoke Mount	$8
12"	175W MH	MPR*417-M	$122	5 = 1/2" Adjustable Fitter	$8
16"	175W MH	PR*417-M	$152	(12" housing only)	
16"	250W MH	PR*425-M	$156	X = Round Tube Off-Center	
16"	400W MH	PR*440-M	$164	Tenon Mount (16" housing only)	$86
22"	1000W MH	PR*499-M	$264	(For 2-3/8" or 3" O.D.)	
12"	35W HPS	MPR*503-1	$110	M = Round Tube Off-Center	
12"	50W HPS	MPR*505-D	$122	Direct Mount (16" housing only)	$74
12"	70W HPS	MPR*507-M	$122	W = Wall Mount	$16
12"	100W HPS	MPR*510-M	$126	8 = Without Mounting (hardware)	$2
12"	150W HPS	MPR*515-M	$128	(factory-drilled)	
16"	250W HPS	PR*525-M	$168		
16"	400W HPS	PR*540-M	$176		
22"	1000W HPS	PR*599-M	$314		

Options: (factory-installed)

Description	Change Suffix To	Add After Suffix	Prepay Adder
120V Reactor ballast (50–150W HPS 12" housing only)	1		deduct $10
277V ballast (26W Fluorescent)	2		no adder
480V ballast (175–1000W MH & 70–1000W HPS only)	5		no adder
Tri-tap ballast (70–1000W MH & 70–1000W HPS only) (Canada only)	T		no adder
Single Fuse (120V, Dual-tap or Tri-tap)		F	$8
Dual Fuse (480V or Multi-tap)		F	$16
2-Level (250–400W HPS only) (Pages 52–53)	voltage suffix	H	$54
Quartz Standby (includes 100W Q lamp) (non delay-relay type)		Q	$44
Button Photocell* (Factory-installed with all mountings other than 2" Adjustable Fitter) (except: 1000W w/120V; all 480V)	voltage suffix	P	$12
External Photocell* (factory-installed)			
For fixtures w/1000W, 120V	1	P	$18
For fixtures w/480V	5	P	$22

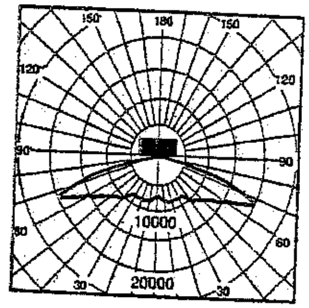
Button Photocell* Field-installed in fixtures with 2" Adjustable Fitter	Catalog #	Prepay Adder
For fixtures w/120V (except 1000W)	PC-1	$8
For fixtures w/208, 240 or 277V	PC-2	$8
For fixtures w/347V	PC-6	$8

***Note:** All fixtures with factory-installed photocell will be supplied with single voltage ballast.

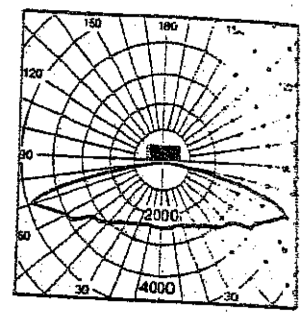
Accessories: (field-installed) (Page 73)

	12" housing	Price	16" housing	Price	22" housing	Prepay Price
Wire Guard	FWG-12	$10	FWG-16	$12	not available	
Backlight Shield	SBL-12	$4	SBL-16	$4	SBL-22	$6

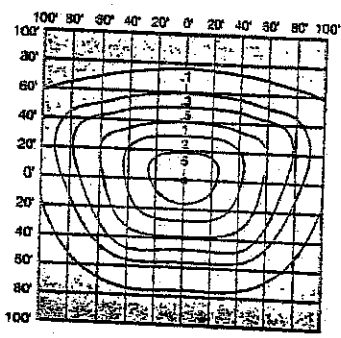
NOTE: When using multiple 22" sq. housings at 90° configuration, a special 12" arm is required; consult factory for availability and pricing.



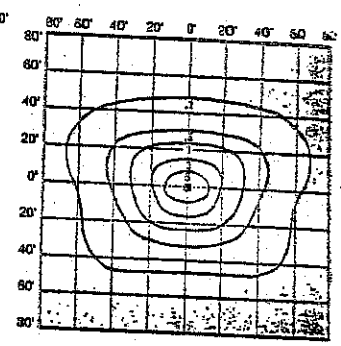
Typical Candlepower Distribution of 400W HPS Parking/Roadway Light.



Typical Candlepower Distribution of 150W HPS Parking/Roadway Light.



Isofootcandle plot of one 400W HPS Parking/Roadway light at 30' mounting height, and 0° tilt above horizontal.

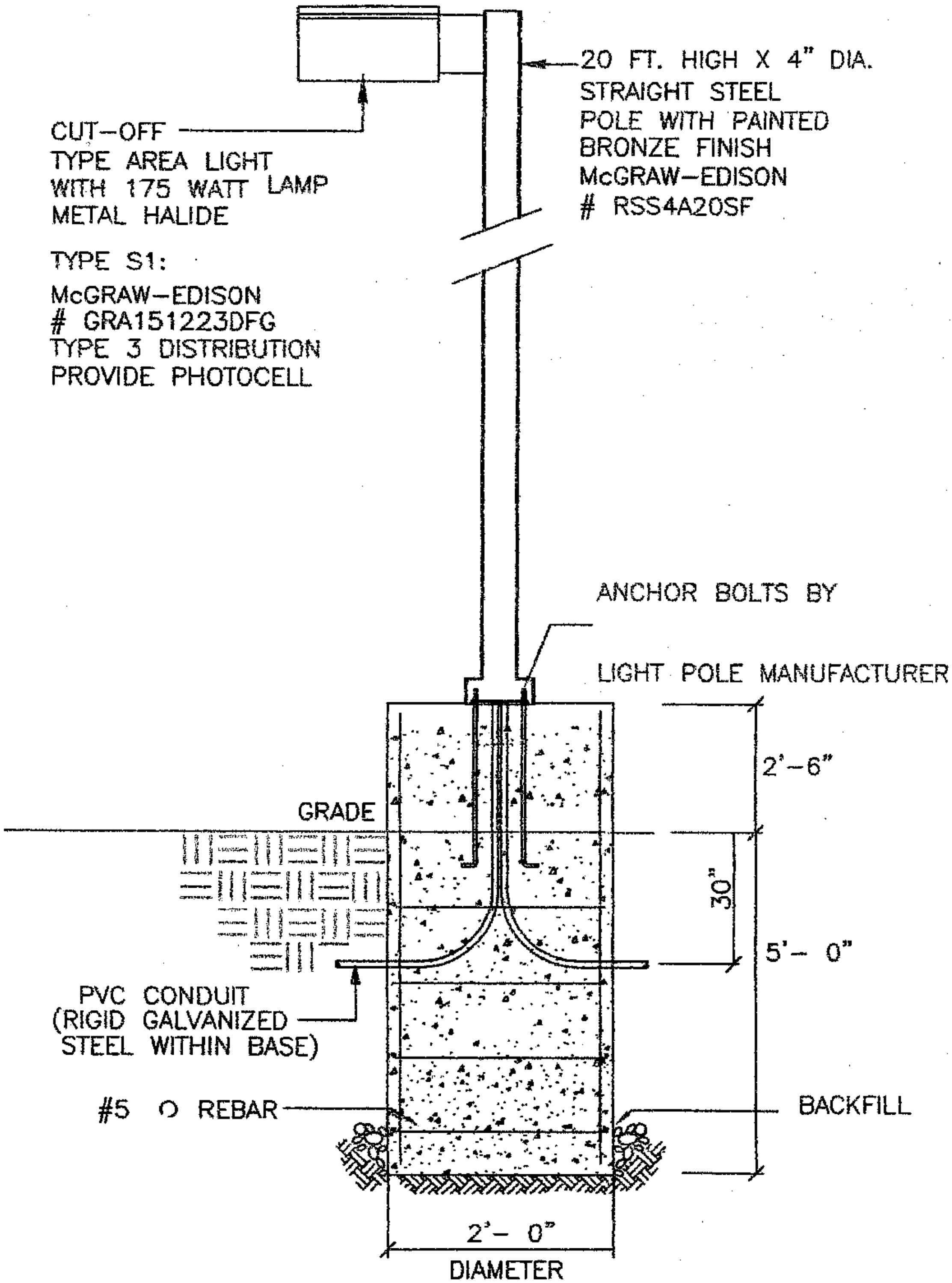


Isofootcandle plot of one 150W HPS Parking/Roadway Light at 20' mounting height, and 0° tilt above horizontal.

Specification Sheets: BULLETIN MPR1-12", BULLETIN MPR2-12", BULLETIN MPR3-12", BULLETIN MPR4-12", BULLETIN MPR6-12", BULLETIN MPRW-12", BULLETIN PR1-16", BULLETIN PR2-16", BULLETIN PR3-16", BULLETIN PR4-16", BULLETIN PRK-16", BULLETIN PRM-16", BULLETIN PRW-16", BULLETIN PR1-22", BULLETIN PR2-22", BULLETIN PR3-22", BULLETIN PR4-22"

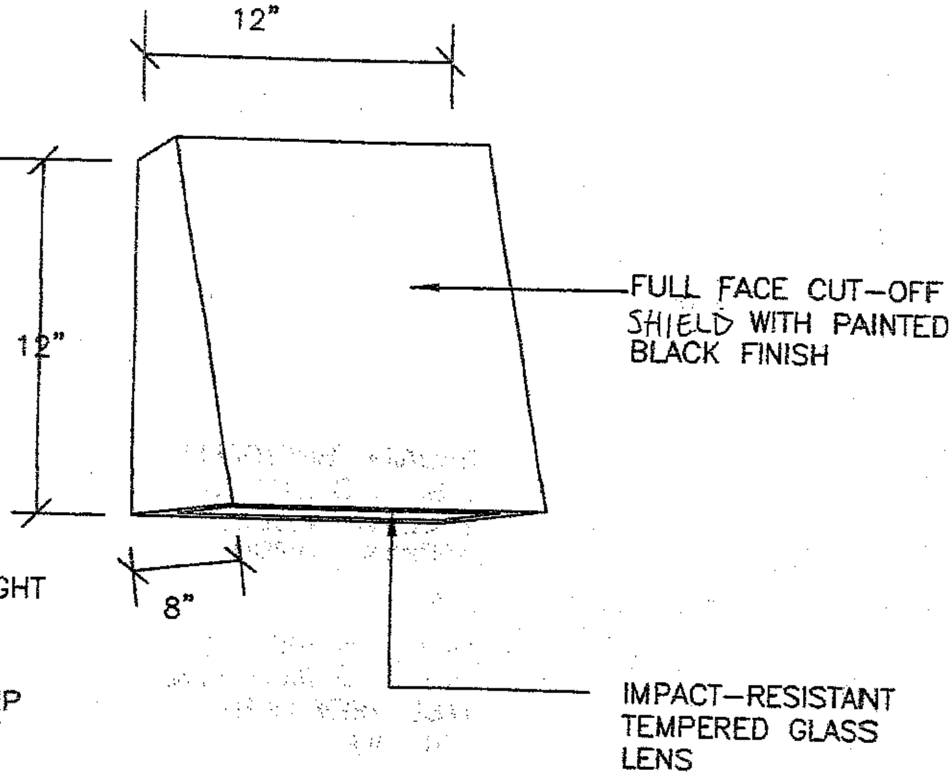
2-Level Option (250 thru 400W HPS) .... Pages 52–53
Optical Systems .... Pages 52–53
Mountings .... Pages 58–59
Catalog Number Logic/Voltage Suffix Key .... Page 60
Mounting Alternatives .... Page 61
Accessories .... Page 72
Mounting Brackets .... Page 73
Poles .... Pages 74–75
.... Pages 76–77

TOLL-FREE HELPLINE!
Have a question about your order?
Call Customer Service at (800) 236-7000



TYPES S1 DETAIL - PARKING LOT & ACCESS DRIVES

NOT TO SCALE



WALL MOUNTED LIGHT
CUT-OFF
TYPE AREA LIGHT
WITH 70 WATT
METAL HALIDE LAMP

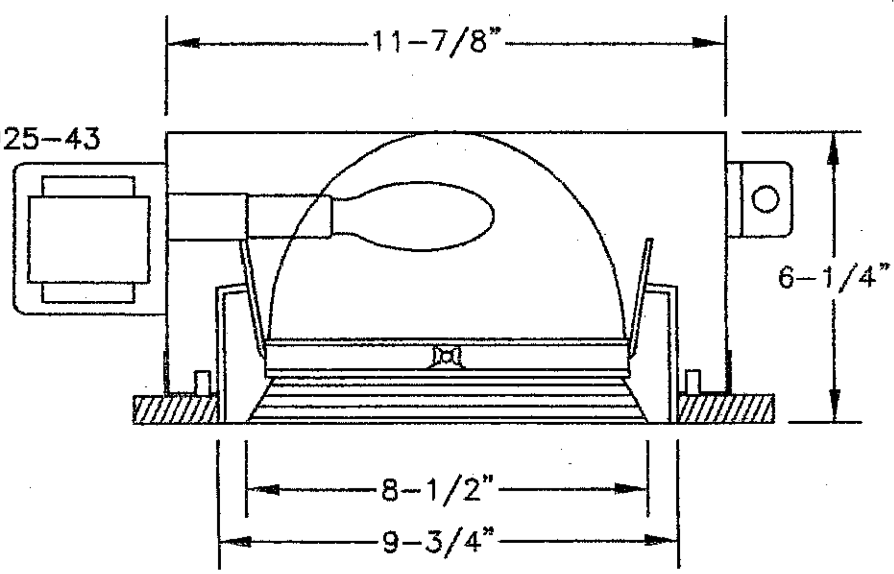
GUTH
SND-12-70-MH-1

TYPE S2 DETAIL - BUILDING MOUNTED (REAR WALL)

NOT TO SCALE

RECESSED LIGHT
WITH 70 WATT
METAL HALIDE

KIRLIN
CAT. NO. RR50925-43



TYPE S3 DETAIL - PORTE COCHERE

NOT TO SCALE

Sebago Technics

Engineering & Planning for the Future

Stormwater Runoff Evaluation/ Erosion & Sediment Control Plan

Widewaters New Castle Portland Company, LLC
5786 Widewaters Parkway
P. O. Box 3
Dewitt, NY 13214-0003

October 1999

prepared by:

Sebago Technics, Inc.
One Chabot Street
P. O. Box 1339
Westbrook, ME 04098-1339

TABLE OF CONTENTS

Section 1

- **Stormwater Management/ Erosion & Sediment Control Narrative**
- **U.S.G.S. Map**
- **Medium and High Intensity Soil Information**

STORMWATER RUNOFF EVALUATION

Hilton Garden Inn
Jetport Crossroad
Portland, Maine

General

The following Stormwater Management Plan has been prepared for Widewaters New Castle Portland Company, LLC to evaluate stormwater runoff and erosion control for the proposed Hilton Garden Inn in Portland, Maine. The Hilton Garden Inn is a proposed 88 room hotel on a 8.21 acre parcel located off the Jetport Crossroad in Portland, Maine.

Site Characteristics

The Hilton Garden Inn will be situated along the newly constructed Jetport Crossroad. The ground cover along the front of the property has been disturbed through the recent road construction and consists mostly of grass, brush and small tree growth. The remainder of the site is lightly wooded. The topography slopes in a northwesterly direction to a large delineated wetland area. Drainage travels through the wetland towards Congress Street. Topography indicates some of the drainage is collected in a storm drain system which channelizes in a ditch and passes through Brooklawn Cemetery. Eventually, all the drainage from the site crosses Congress Street via twin 36" culverts.

Soils

Soils information used in the stormwater analysis was obtained from the Cumberland County Medium Intensity Soil Survey. The Cumberland County Medium Intensity Soil Survey Map indicates the predominant site soils as Swanton fine sandy loam and Buxton silt loam. The hydrologic groups (HSG) of the soil are classified by Technical Release TR-55 of the Soil Conservation Service as follows:

Swanton ...... D
Buxton .... D

Watershed and Stormwater Analysis

The project utilized one study point for both the pre and post-development conditions. The study point at Reach 100 comprises the majority of the development area and is located along the wetland delineation line as shown on the attached watershed map.

In the pre-development, the watershed was divided into two subcatchments. Subcatchments 1 and 2 drain westerly to a delineated wetland. The majority of the ground cover is lightly wooded with the exception of the front portion of the lot which has been disturbed by the recent street construction.

The post-development condition was divided into eight subcatchments. Subcatchment 1 will remain similar to the pre-development Subcatchment 1 with the exception of a proposed wet pond (modeled as Pond 1 in Subcatchment 8). Subcatchments 2, 3, 4 and 5 include the majority of the development area, including the building roof, parking lots, sidewalk and vehicle circulation drives. Runoff is collected through a catch basin system and routed to a wet pond for stormwater treatment and detention. The Subcatchment 6 runoff drains to the existing street drainage system. Subcatchment 6 consists mostly of lawn and landscape area totaling 0.13 acre. The flow entering the street will not result in a significant increase (approximately 0.5 cfs for a 25-year flood event). Subcatchment 7 consists of the riprap and grass sloped embankment along the rear property line. Drainage from Subcatchment 7 will discharge directly to the adjacent wetland area. Subcatchment 8 is the area which drains directly into the wet pond.

The following table presents the results of pre- and post-development evaluations. Results in the post-development condition incorporate attenuated runoff due to the treatment/detention pond.

Stormwater Runoff - Summary Table				
Pre-Development		**Peak Runoff Rate (cfs)**		
		2-Year	**10-Year**	**25-Year**
Study Point 1 Reach 100	Subcatchments 1 and 2	3.48	8.05	10.36
Post-Development		**Peak Runoff Rate (cfs)**		
		2-Year	**10-Year**	**25-Year**
Study Point 1 Reach 100	With Detention Composite Subcatchments 1, 2, 3, 4, 5, 7 and 8	2.95	6.34	8.48
	Subcatchment 6	0.22	0.44	0.55
Net Reduction at Reach 100		-0.53	-1.71	-1.88

As depicted in the above summary table, the change in hydraulic characteristics due to development will result in an expected increase in the peak rate of stormwater runoff. In order to mitigate this expected increase, a formal stormwater collection and dual purpose detention pond system will be constructed. The detention pond will collect stormwater runoff through the drainage infrastructure and limit peak discharge rates to at or below pre-development rates. The downstream receiving areas are undeveloped and well vegetated with wetland meadows. There are no signs of erosion.

Although this project is not in a sensitive/threatened region or watershed, staff review comments have asked us to provide for stormwater quality treatment.

The stormwater detention ponds have also been designed to achieve water quality treatment following the guidelines established in the Maine Department of Environmental Protection's Stormwater Management law (sliding scale for TSS removal). Flow control structures have been designed to provide extended detention acting as a wet pond to provide a minimum of 40 percent TSS removal. Discharge points from each of the ponds will include level spreaders to dissipate exit velocity and provide stabilized outlets. The water quality computations are included as Section 5.

Summary

The principal stormwater features include a combination of a level spreader, catch basins, and a wet/detention pond. The majority of the stormwater is collected within the storm drain system and is discharged to the pond. This facility is designed to provide flood control as well as quality treatment.

In order to further reduce the potential for impacts associated with the project's construction, a sediment and erosion control plan has been prepared which outlines the measures to be incorporated before and during the construction of the project.

Permanent erosion control measures have also been included to reduce the potential for long-term effects. These measures include installation of temporary erosion control structures and stabilization measures (both temporary and permanent) as well as revegetation plans. A report has been prepared which outlines this plan and is included on the drawing set.

Prepared by:

SEBAGO TECHNICS, INC.

Danielle D. Betts, P.E.
Sr. Project Engineer

SAG/DDB:jc
October 11, 1999

Erosion & Sedimentation Control Plan

Hilton Garden Inn
Airport Connector Road
Portland, Maine

A. Pre-Construction Phase

Prior to the beginning of any construction, filter fabric fencing shall be staked across the slope(s), on the contour, at or just below the limits of clearing or grubbing, and /or just above any adjacent property line or watercourse to protect against construction related erosion. The placement of silt fences and hay bales shall be completed in accordance with guidelines established in Best Management Practices. This network is to be provided, installed and maintained by the contractor until all exposed slopes have at least 85%-90% vigorous perennial vegetative cover to prevent erosion.

Prior to any construction at the site, representatives of the general contractor, site contractor and the site design engineer shall arrange for and meet with the Director of Public Works and Town Engineer to discuss the scheduling of the site construction. On or before that meeting, the contractor will prepare a detailed schedule and marked up site plan indicating areas and components of the work and key dates showing date of disturbance and completion of the work. Three copies of the schedule and marked up site plan shall be provided to the Town. Special attention shall be given to the 14 day limit of disturbance in the schedule addressing temporary and permanent vegetation measures.

The following erosion control measures shall be followed by the site contractor(s) throughout construction of this project.

B. Construction and Post-Construction Phase

1. Areas undergoing actual construction shall only expose that amount of mineral soil necessary for progressive and efficient site construction and shall not exceed 14 days. Areas that will not be completed (covered and/or finish graded) within fourteen (14) days of disturbance shall be anchored with temporary erosion control within fourteen (14) days of disturbance. Temporary erosion control shall include erosion control mesh, netting, or mulch and as directed by the inspecting engineer. If disturbed areas do not receive final seeding by September 15th of the year of construction, then all disturbed areas shall be hay mulched at a rate of 150 lbs. per 1,000 square feet and seeded with a winter cover crop of Rye at the rate of 3 lbs./1,000 square feet to provide winter protection. The hay mulch shall be anchored with a suitable binder, such as RMB Plus and/or secured with netting for wind protection.

2. All topsoil shall be collected, stockpiled and seeded with Rye at 3 lbs./1,000 square feet and mulched on site and re-used as required. Siltation fencing shall be placed down gradient from stockpiled loam. Loam shall be stockpiled at locations designated by the owner. Designated locations shall be determined prior to or at the pre-construction meeting.

3. All silt fences and/or hay bale barriers shall be installed according to this plan. These shall be maintained during development to remove sediment from runoff water. All the silt fences shall be inspected after any rainfall or runoff event, maintained and cleaned until all areas have at least 85%-90% vigorous perennial vegetative cover of grasses.

4. All areas shall be seeded in accordance with the following vegetation plan.

C. Vegetation Plan

Revegetation measures shall commence immediately upon completion of construction. Disturbed areas shall be mulched and anchored prior to any storm event. If final seeding cannot be accomplished by September 15th, then all disturbed areas shall be hay mulched at a rate of 150 lbs. per 1,000 S. F. and seeded with a winter cover crop of Rye at the rate of 3 lbs./1,000 S.F. to provide winter protection. Hay mulch shall be secured with a suitable binder to include RMB plus and/or erosion control netting as directed by the owner/inspection engineer.

Revegetation measures shall consist of the following:

1. Four inches of loam will be spread over disturbed areas and smoothed to a uniform surface. Loam shall be free of subsoil, clay lumps, stones and other objects over 1" in diameter, and without weeds, roots or other objectionable material.

2. In lieu of soil tests, agricultural limestone shall be spread at the rate of 3 tons per acre. 10-20-20 fertilizer shall be applied at a rate of 800 lbs./acre. These soil amendments shall be incorporated into the soil prior to final seeding.

3. Following seed bed preparation, swale areas, fill areas and back slopes shall be seeded at a rate of 4 lbs./1,000 square feet to a mixture of 35% Creeping Red Fescue, 6% Red Top, 24% Kentucky Bluegrass, 10% Perennial Ryegrass, 20% Annual Ryegrass and 5% White Dutch Clover. The lawn areas will be seeded to a premium turf mixture of Bluegrass and/or Fescue; seeding rate of 3 lbs. per 1,000 square feet.

4. Hay mulch shall be applied to all disturbed areas at the rate of 150 lbs. per 1,000 square feet, or a hydro-application of asphalt, wood or paper fiber will be applied following seeding. A suitable binder, such as RMB Plus and/or erosion control netting will be used on hay mulch for wind control.

5. All hay bale and/or filter fabric barriers will remain in place until seedings have become 85%-90% established and then removed within 10 days.

D. Construction Schedule

Site improvements will most likely begin in the fall of 1999. The following schedule has been prepared based upon an anticipated construction schedule of 6 months:

Schedule

1.	Estimated construction time: 6 months	November 1, 1999 – April 30, 2000
2.	Erosion control measures placed.	November 3, 1999
3.	Site clearing, grubbing, excavation and filling (roadway construction).	November 5, 1999 – December 1999
4.	Drainage and utility improvements.	November 21, 1999 – January 15, 2000
5.	Start final/temporary seedings on prepared areas.	April 15, 2000
6.	Biweekly monitoring of vegetative growth.	April 15, 2000 – September 15, 2000
7.	Re-seeding of areas, if needed.	April 25, 2000 – September 15, 2000
8.	Removal of erosion control devices.	June 1000 – September 2000
9.	Mulch spread for winter erosion control.	October 15, 1999 – April 1, 2000
10.	Detention pond construction.	November 1999 – December 1999

* Dates are subject to change at the discretion of the engineer, depending on construction progress.

E. **Inspections/Monitoring**

Maintenance measures shall be applied as needed during the entire construction cycle. After each rainfall, the site contractor shall perform a visual inspection of all installed erosion control measures and perform repairs as needed to insure their continuing function.

Following the temporary and/or final seedings, the contractor shall inspect the site semimonthly until the seedings have been established. Established means a minimum of 85%-90% of areas vegetated with vigorous growth. Reseeding shall be carried out by the contractor with follow-up inspections in the event of any failures until vegetation is adequately established.

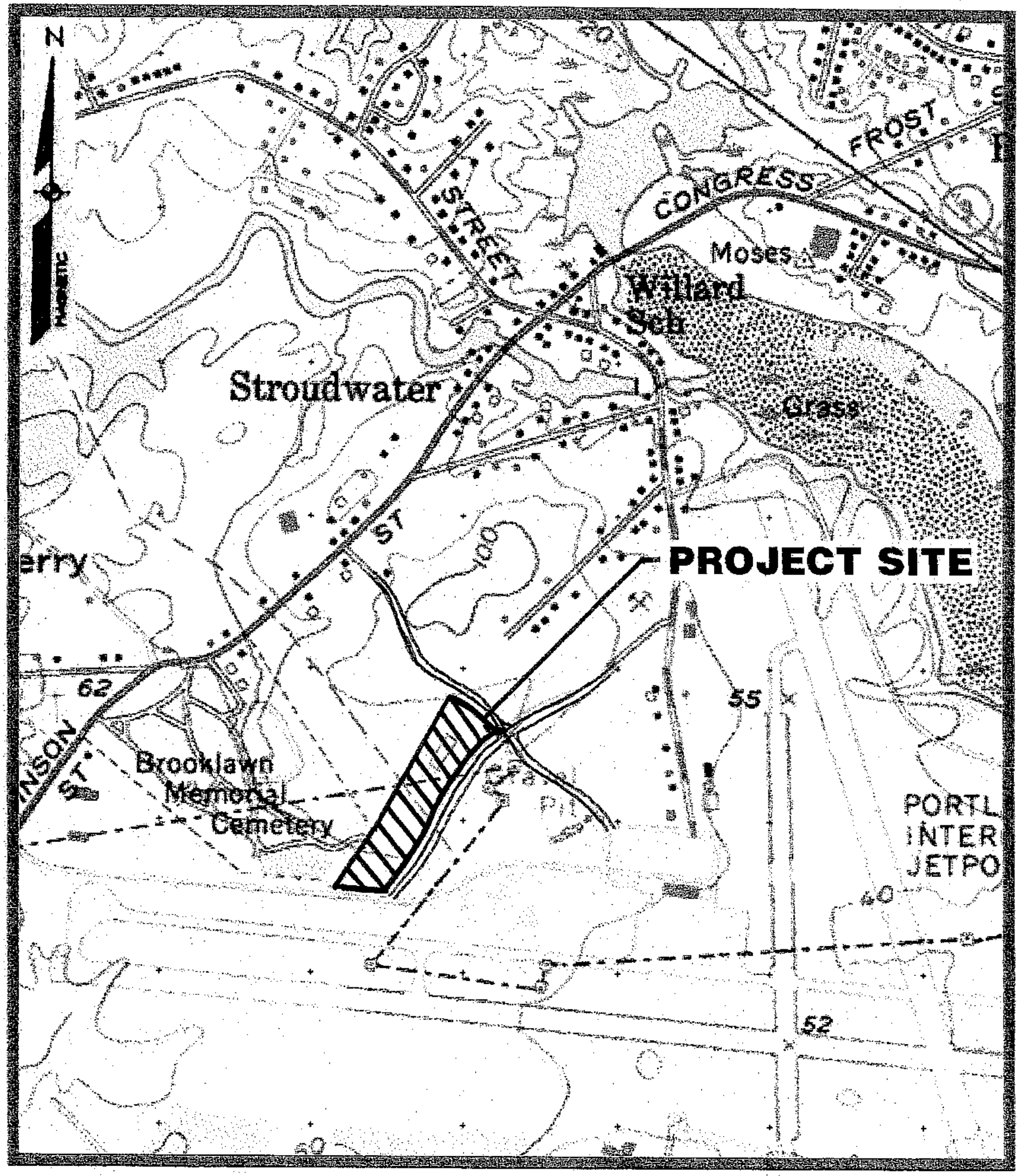
Prepared by:

SEBAGO TECHNICS, INC.

Steven A. Groves
Project Engineer

SAG:jc
August 25, 1999

FIGURE 1



SITE LOCATION MAP

U.S.G.S. 7.5 MIN.

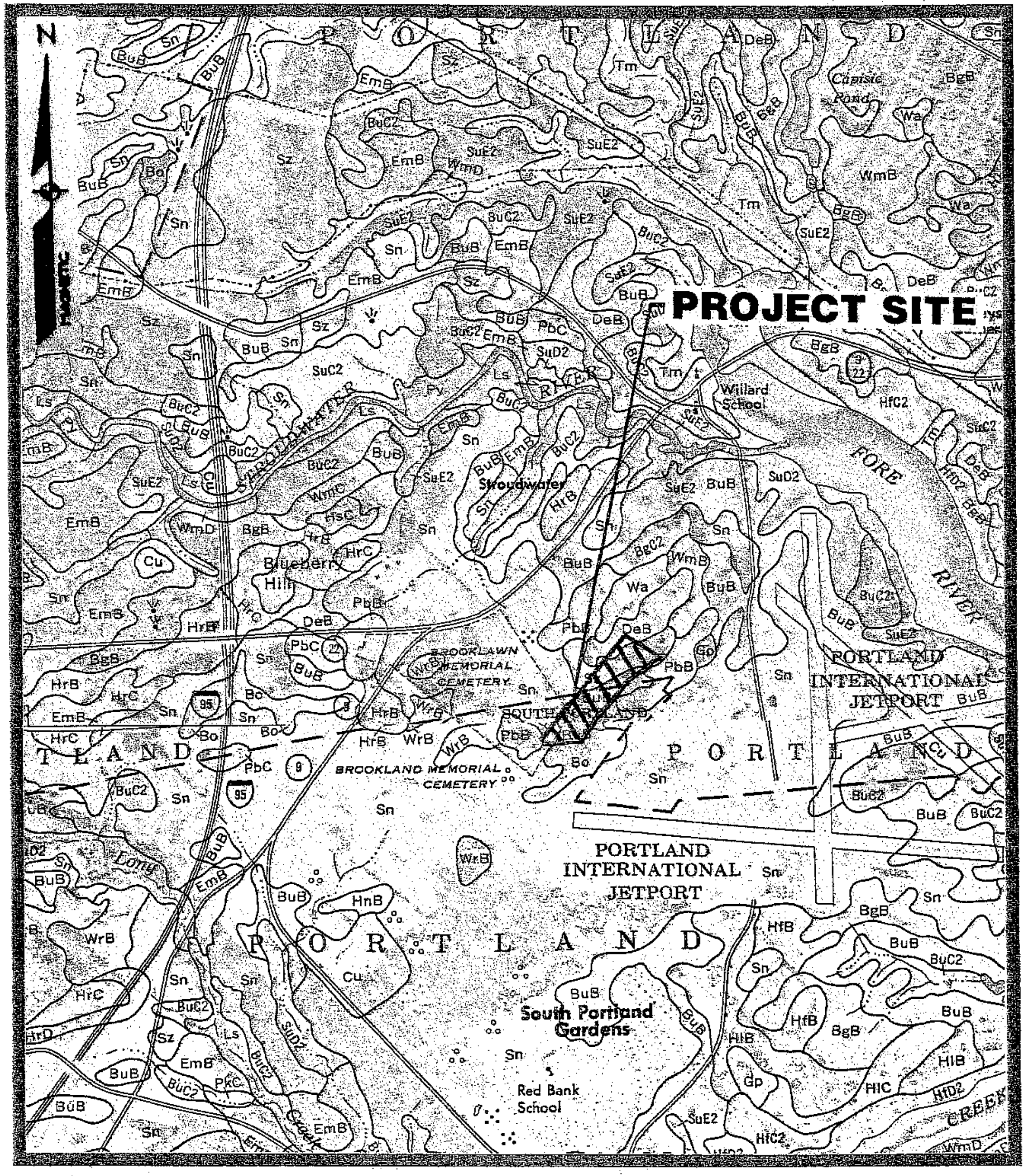
SOUTH PORTLAND QUADRANGLE

1" = 1000'

Sebago Technics

Engineering & Planning for the Future

FIGURE 3



MEDIUM INTENSITY SOIL SURVEY

CUMBRELAND COUNTY

SHEETS 81 & 85

SCALE = 1:20,000'

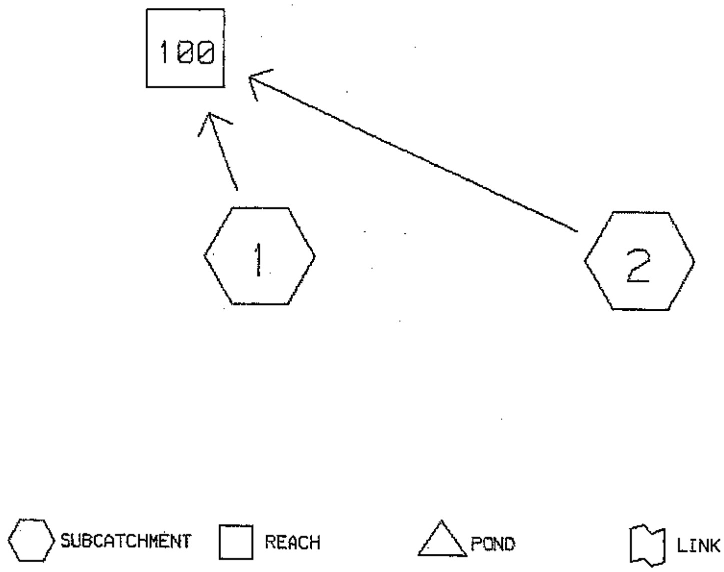
Sebago Technics

Engineering & Planning for the Future

Section 2

Peak Rates of Runoff: Pre-Developed Condition

WATERSHED ROUTING



SUBCATCHMENT 1

PEAK= 2.35 CFS @ 12.41 HRS, VOLUME= .28 AF

ACRES	CN	
3.48	77	brush fair cond "D" soils

SCS TR-20 METHOD
TYPE III 24-HOUR
RAINFALL= 3.00 IN
SPAN= 10-20 HRS, dt=.1 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	Segment ID:	23.5
Woods: Light underbrush n=.4 L=120' P2=3 in s=.025 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	Segment ID:	6.8
Woodland Kv=5 L=335' s=.027 '/' V=.82 fps		
	Total Length= 455 ft Total Tc=	30.3

SUBCATCHMENT 2

PEAK= 1.27 CFS @ 12.59 HRS, VOLUME= .18 AF

ACRES	CN	
2.25	77	Brush fair cond."D" soils

SCS TR-20 METHOD
TYPE III 24-HOUR
RAINFALL= 3.00 IN
SPAN= 10-20 HRS, dt=.1 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	Segment ID:	22.2
Woods: Light underbrush n=.4 L=100' P2=3 in s=.02 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	Segment ID:	1.8
Woodland Kv=5 L=140' s=.071 '/' V=1.33 fps		
SHALLOW CONCENTRATED/UPLAND FLOW	Segment ID:	19.7
Woodland Kv=5 L=550' s=.0087 '/' V=.47 fps		
	Total Length= 790 ft Total Tc=	43.7

REACH 100

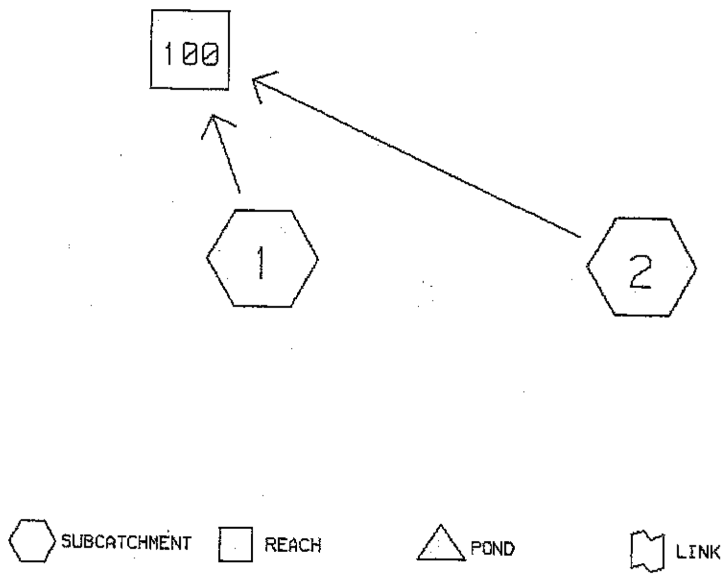
Not described

```
 Qin =  3.48 CFS @ 12.46 HRS,  VOLUME=   .46 AF
 Qout=  3.48 CFS @ 12.46 HRS,  VOLUME=   .46 AF,  ATTEN=  0%,  LAG=    0.0 MIN
```

DEPTH (FT)	END AREA (SQ-FT)	DISCH (CFS)

- METHOD
PEAK DEPTH= 0.00 FT
PEAK VELOCITY= 0.0 FPS
TRAVEL TIME = 0.0 MIN
SPAN= 10-20 HRS, dt=.1 HRS

WATERSHED ROUTING



SUBCATCHMENT 1

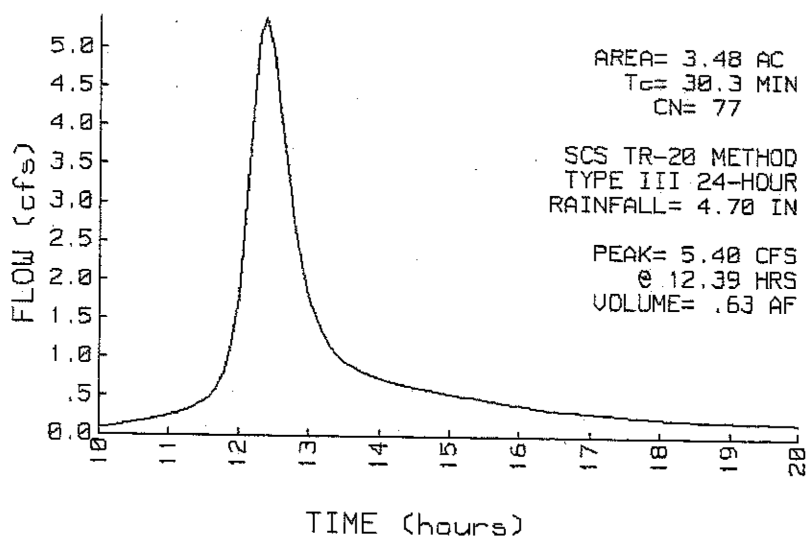
PEAK= 5.40 CFS @ 12.39 HRS, VOLUME= .63 AF

ACRES	CN	
3.48	77	brush fair cond "D" soils

SCS TR-20 METHOD
TYPE III 24-HOUR
RAINFALL= 4.70 IN
SPAN= 10-20 HRS, dt=.1 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW Woods: Light underbrush n=.4 L=120' P2=3 in s=.025 '/'	Segment ID:	23.5
SHALLOW CONCENTRATED/UPLAND FLOW Woodland Kv=5 L=335' s=.027 '/' V=.82 fps	Segment ID:	6.8
	Total Length= 455 ft Total Tc=	30.3

SUBCATCHMENT 1 RUNOFF



SUBCATCHMENT 2

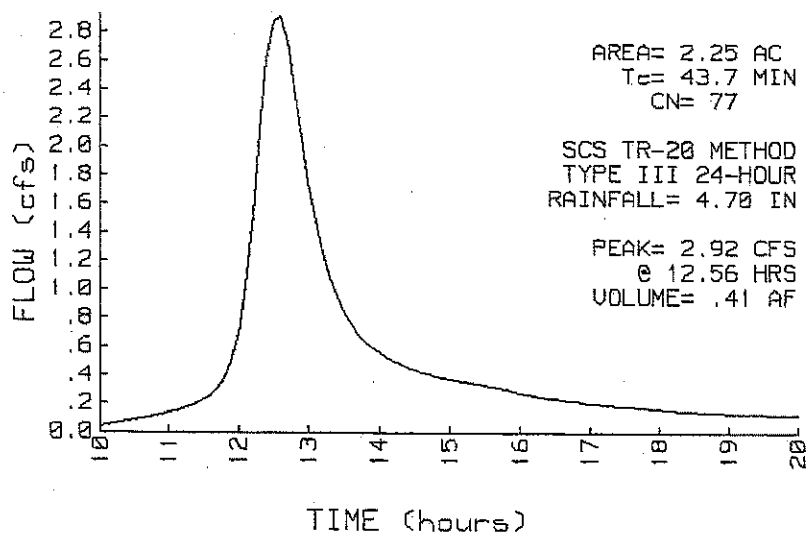
PEAK= 2.92 CFS @ 12.56 HRS, VOLUME= .41 AF

ACRES	CN	
2.25	77	Brush fair cond."D" soils

SCS TR-20 METHOD
TYPE III 24-HOUR
RAINFALL= 4.70 IN
SPAN= 10-20 HRS, dt=.1 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**Segment ID:**	22.2
Woods: Light underbrush n=.4 L=100' P2=3 in s=.02 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	**Segment ID:**	1.8
Woodland Kv=5 L=140' s=.071 '/' V=1.33 fps		
SHALLOW CONCENTRATED/UPLAND FLOW	**Segment ID:**	19.7
Woodland Kv=5 L=550' s=.0087 '/' V=.47 fps		
	Total Length= 790 ft Total Tc=	43.7

SUBCATCHMENT 2 RUNOFF



REACH 100

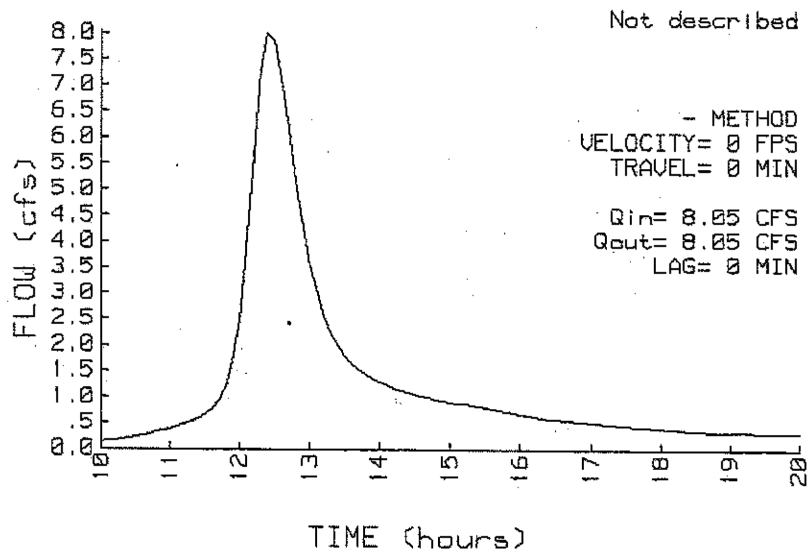
Not described

Qin = 8.05 CFS @ 12.43 HRS, VOLUME= 1.04 AF
Qout= 8.05 CFS @ 12.43 HRS, VOLUME= 1.04 AF, ATTEN= 0%, LAG= 0.0 MIN

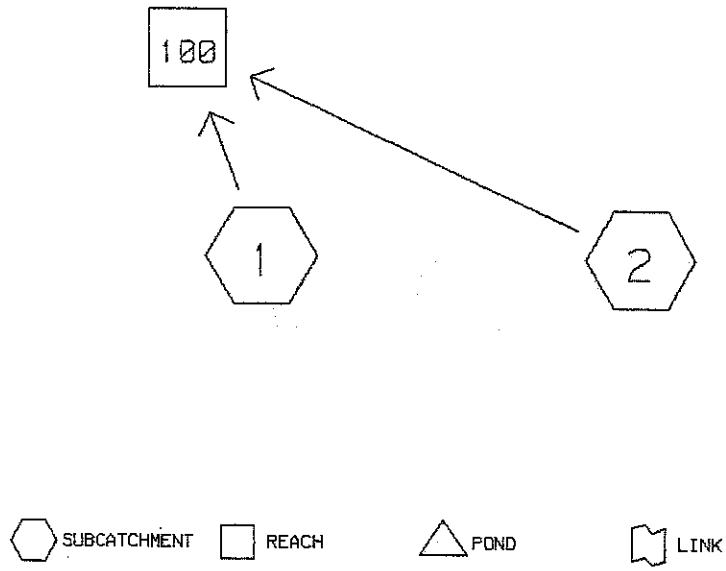
DEPTH (FT)	END AREA (SQ-FT)	DISCH (CFS)

- METHOD
PEAK DEPTH= 0.00 FT
PEAK VELOCITY= 0.0 FPS
TRAVEL TIME = 0.0 MIN
SPAN= 10-20 HRS, dt=.1 HRS

REACH 100 INFLOW & OUTFLOW



WATERSHED ROUTING



SUBCATCHMENT 1

PEAK= 6.95 CFS @ 12.38 HRS, VOLUME= .81 AF

ACRES	CN	
3.48	77	brush fair cond "D" soils

SCS TR-20 METHOD
TYPE III 24-HOUR
RAINFALL= 5.50 IN
SPAN= 10-20 HRS, dt=.1 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	Segment ID:	23.5
Woods: Light underbrush n=.4 L=120' P2=3 in s=.025 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	Segment ID:	6.8
Woodland Kv=5 L=335' s=.027 '/' V=.82 fps		
	Total Length= 455 ft Total Tc=	30.3

SUBCATCHMENT 2

PEAK= 3.76 CFS @ 12.56 HRS, VOLUME= .52 AF

ACRES	CN	
2.25	77	Brush fair cond."D" soils

SCS TR-20 METHOD
TYPE III 24-HOUR
RAINFALL= 5.50 IN
SPAN= 10-20 HRS, dt=.1 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	Segment ID:	22.2
Woods: Light underbrush n=.4 L=100' P2=3 in s=.02 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	Segment ID:	1.8
Woodland Kv=5 L=140' s=.071 '/' V=1.33 fps		
SHALLOW CONCENTRATED/UPLAND FLOW	Segment ID:	19.7
Woodland Kv=5 L=550' s=.0087 '/' V=.47 fps		
	Total Length= 790 ft Total Tc=	43.7

REACH 100

Not described

Qin = 10.36 CFS @ 12.43 HRS, VOLUME= 1.33 AF
Qout= 10.36 CFS @ 12.43 HRS, VOLUME= 1.33 AF, ATTEN= 0%, LAG= 0.0 MIN

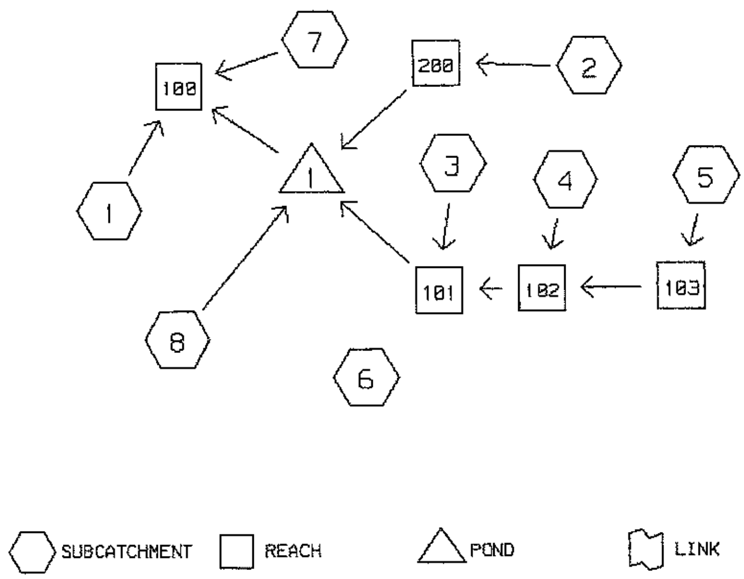
DEPTH (FT)	END AREA (SQ-FT)	DISCH (CFS)

- METHOD
PEAK DEPTH= 0.00 FT
PEAK VELOCITY= 0.0 FPS
TRAVEL TIME = 0.0 MIN
SPAN= 10-20 HRS, dt=.1 HRS

Section 3

Peak Rates of Runoff: Developed Condition

WATERSHED ROUTING



SUBCATCHMENT 1	=	->	REACH 100
SUBCATCHMENT 2	=	->	REACH 200
SUBCATCHMENT 3	=	->	REACH 101
SUBCATCHMENT 4	=	->	REACH 102
SUBCATCHMENT 5	=	->	REACH 103
SUBCATCHMENT 6	=	->	
SUBCATCHMENT 7	=	->	REACH 100
SUBCATCHMENT 8	=	->	POND 1
REACH 100	=	->	
REACH 101	=	->	POND 1
REACH 102	=	->	REACH 101
REACH 103	=	->	REACH 102
REACH 200	=	->	POND 1
POND 1	=	->	REACH 100

SUBCATCHMENT 1

PEAK= 1.95 CFS @ 12.41 HRS, VOLUME= .23 AF

ACRES	CN		
2.88	77	brush fair cond."d' soils	SCS TR-20 METHOD TYPE III 24-HOUR RAINFALL= 3.00 IN SPAN= 10-20 HRS, dt=.1 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**Segment ID:**	23.5
Woods: Light underbrush n=.4 L=120' P2=3 in s=.025 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	**Segment ID:**	6.8
Woodland Kv=5 L=335' s=.027 '/' V=.82 fps		
	Total Length= 455 ft Total Tc=	30.3

SUBCATCHMENT 2

PEAK= 1.26 CFS @ 11.99 HRS, VOLUME= .08 AF

ACRES	CN		
.41	98	impervious surface	SCS TR-20 METHOD
.04	80	lawn good cond."d" soils	TYPE III 24-HOUR
.45	96		RAINFALL= 3.00 IN SPAN= 10-20 HRS, dt=.1 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**Segment ID:**	1.0
Smooth surfaces n=.011 L=65' P2=3 in s=.015 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	**Segment ID:**	.5
Paved Kv=20.3282 L=70' s=.015 '/' V=2.49 fps		
	Total Length= 135 ft Total Tc=	1.5

SUBCATCHMENT 3

PEAK= 1.01 CFS @ 11.99 HRS, VOLUME= .07 AF

ACRES	CN		
.31	98	impervious surface area	SCS TR-20 METHOD
.05	80	lawn good cond. "d" soils	TYPE III 24-HOUR
.36	96		RAINFALL= 3.00 IN SPAN= 10-20 HRS, dt=.1 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**Segment ID:**	1.3
Smooth surfaces n=.011 L=90' P2=3 in s=.015 '/'		
CIRCULAR CHANNEL	**Segment ID:**	.3
12" Diameter a=.79 sq-ft Pw=3.1' r=.25' s=.005 '/' n=.01 V=4.17 fps L=75' Capacity=3.3 cfs		
	Total Length= 165 ft Total Tc=	1.6

SUBCATCHMENT 4

PEAK= 1.59 CFS @ 12.01 HRS, VOLUME= .11 AF

ACRES	CN		
.40	98	impervious surface area	SCS TR-20 METHOD
.28	80	lawn good cond."d" soils	TYPE III 24-HOUR
.68	91		RAINFALL= 3.00 IN
			SPAN= 10-20 HRS, dt=.1 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	Segment ID:	3.9
Grass: Short n=.15 L=30'	P2=3 in s=.02 '/'	
TR-55 SHEET FLOW	Segment ID:	.4
Smooth surfaces n=.011 L=35'	P2=3 in s=.037 '/'	
	Total Length= 65 ft Total Tc=	4.3

SUBCATCHMENT 5

PEAK= 1.56 CFS @ 11.99 HRS, VOLUME= .10 AF

ACRES	CN		
.48	98	impervious surface area	SCS TR-20 METHOD
.07	80	lawn good cond. 'd" soils	TYPE III 24-HOUR
.55	96		RAINFALL= 3.00 IN
			SPAN= 10-20 HRS, dt=.1 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	Segment ID:	1.4
Smooth surfaces n=.011 L=105'	P2=3 in s=.017 '/'	
CIRCULAR CHANNEL	Segment ID:	1.0
15" Diameter a=1.23 sq-ft Pw=3.9'	r=.313'	
s=.005 '/' n=.01 V=4.84 fps L=288'	Capacity=5.9 cfs	
	Total Length= 393 ft Total Tc=	2.4

SUBCATCHMENT 6

PEAK= .22 CFS @ 12.02 HRS, VOLUME= .02 AF

ACRES	CN		
.10	80	lawn/landscape area "d" soils	SCS TR-20 METHOD
.03	98	pavement	TYPE III 24-HOUR
.13	84		RAINFALL= 3.00 IN
			SPAN= 10-20 HRS, dt=.1 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	Segment ID:	4.2
Grass: Dense n=.24 L=40'	P2=3 in s=.075 '/'	

SUBCATCHMENT 7

PEAK= .19 CFS @ 12.41 HRS, VOLUME= .02 AF

ACRES	CN		
.24	80	rip rap and grass slope area	SCS TR-20 METHOD TYPE III 24-HOUR RAINFALL= 3.00 IN SPAN= 10-20 HRS, dt=.1 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**Segment ID:**	1.3
Grass: Dense n=.24 L=20' P2=3 in	s=.33 '/'	
SHALLOW CONCENTRATED/UPLAND FLOW	**Segment ID:**	29.8
Woodland Kv=5 L=800' s=.008 '/'	V=.45 fps	
	Total Length= 820 ft Total Tc=	31.1

SUBCATCHMENT 8

PEAK= .95 CFS @ 12.01 HRS, VOLUME= .06 AF

ACRES	CN		
.20	100	permanent pool area	SCS TR-20 METHOD
.24	80	lawn good condition, "d" soils	TYPE III 24-HOUR
.44	89		RAINFALL= 3.00 IN SPAN= 10-20 HRS, dt=.1 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**Segment ID:**	4.2
Grass: Dense n=.24 L=40' P2=3 in	s=.075 '/'	

REACH 100

Not described

Qin = 2.95 CFS @ 12.41 HRS, VOLUME= .62 AF
Qout= 2.95 CFS @ 12.41 HRS, VOLUME= .62 AF, ATTEN= 0%, LAG= 0.0 MIN

DEPTH (FT)	END AREA (SQ-FT)	DISCH (CFS)

- METHOD
PEAK DEPTH= 0.00 FT
PEAK VELOCITY= 0.0 FPS
TRAVEL TIME = 0.0 MIN
SPAN= 10-20 HRS, dt=.1 HRS

REACH 101

Qin = 3.86 CFS @ 12.01 HRS, VOLUME= .27 AF
Qout= 3.72 CFS @ 12.02 HRS, VOLUME= .27 AF, ATTEN= 4%, LAG= .6 MIN

DEPTH (FT)	END AREA (SQ-FT)	DISCH (CFS)
0.0	0.0	0.00
.1	.1	.12
.3	.2	.52
.4	.3	1.16
.9	.9	4.97
1.0	1.1	5.80
1.1	1.2	6.33
1.2	1.2	6.39
1.2	1.2	6.33
1.3	1.2	5.94

15" PIPE

n= .01
LENGTH= 106 FT
SLOPE= .005 FT/FT

STOR-IND+TRANS METHOD
PEAK DEPTH= .72 FT
PEAK VELOCITY= 5.2 FPS
TRAVEL TIME = .3 MIN
SPAN= 10-20 HRS, dt=.1 HRS

REACH 102

Qin = 3.01 CFS @ 12.01 HRS, VOLUME= .20 AF
Qout= 2.88 CFS @ 12.02 HRS, VOLUME= .20 AF, ATTEN= 4%, LAG= .6 MIN

DEPTH (FT)	END AREA (SQ-FT)	DISCH (CFS)
0.0	0.0	0.00
.1	.1	.12
.3	.2	.52
.4	.3	1.16
.9	.9	4.97
1.0	1.1	5.80
1.1	1.2	6.33
1.2	1.2	6.39
1.2	1.2	6.33
1.3	1.2	5.94

15" PIPE

n= .01
LENGTH= 103 FT
SLOPE= .005 FT/FT

STOR-IND+TRANS METHOD
PEAK DEPTH= .61 FT
PEAK VELOCITY= 4.9 FPS
TRAVEL TIME = .3 MIN
SPAN= 10-20 HRS, dt=.1 HRS

REACH 103

Qin = 1.56 CFS @ 11.99 HRS, VOLUME= .10 AF
Qout= 1.43 CFS @ 12.01 HRS, VOLUME= .10 AF, ATTEN= 9%, LAG= .9 MIN

DEPTH (FT)	END AREA (SQ-FT)	DISCH (CFS)
0.0	0.0	0.00
.1	0.0	.07
.2	.1	.29
.3	.2	.64
.7	.6	2.74
.8	.7	3.20
.9	.7	3.49
.9	.8	3.52
1.0	.8	3.49
1.0	.8	3.28

12" PIPE

n= .01
LENGTH= 194 FT
SLOPE= .005 FT/FT

STOR-IND+TRANS METHOD
PEAK DEPTH= .46 FT
PEAK VELOCITY= 4.2 FPS
TRAVEL TIME = .8 MIN
SPAN= 10-20 HRS, dt=.1 HRS

REACH 200

Qin = 1.26 CFS @ 11.99 HRS, VOLUME= .08 AF
Qout= 1.19 CFS @ 12.00 HRS, VOLUME= .08 AF, ATTEN= 6%, LAG= .7 MIN

DEPTH (FT)	END AREA (SQ-FT)	DISCH (CFS)
0.0	0.0	0.00
.1	0.0	.07
.2	.1	.29
.3	.2	.64
.7	.6	2.74
.8	.7	3.20
.9	.7	3.49
.9	.8	3.52
1.0	.8	3.49
1.0	.8	3.28

12" PIPE

n= .01
LENGTH= 160 FT
SLOPE= .005 FT/FT

STOR-IND+TRANS METHOD
PEAK DEPTH= .41 FT
PEAK VELOCITY= 4.0 FPS
TRAVEL TIME = .7 MIN
SPAN= 10-20 HRS, dt=.1 HRS

POND 1

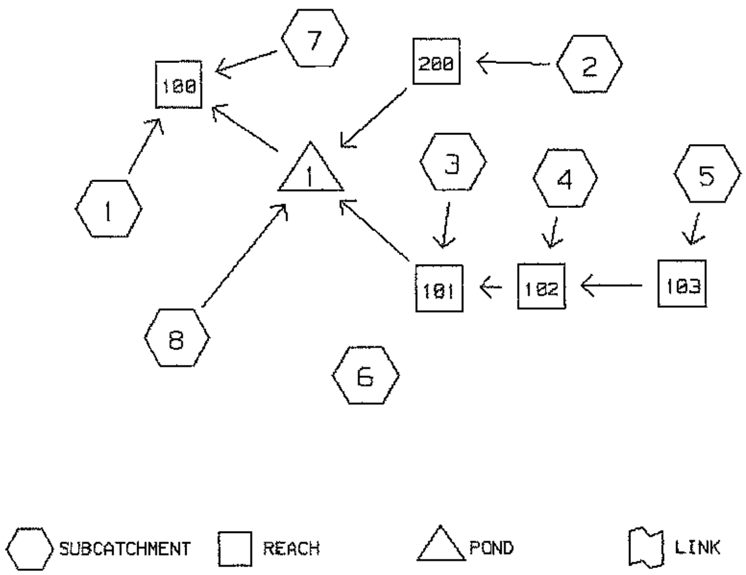
Qin = 5.84 CFS @ 12.01 HRS, VOLUME= .41 AF
Qout= .82 CFS @ 12.60 HRS, VOLUME= .36 AF, ATTEN= 86%, LAG= 35.5 MIN

ELEVATION (FT)	AREA (AC)	INC.STOR (AF)	CUM.STOR (AF)
70.0	.20	0.00	0.00
71.0	.23	.22	.22
72.0	.27	.25	.47

STOR-IND METHOD
PEAK STORAGE = .22 AF
PEAK ELEVATION= 71.0 FT
FLOOD ELEVATION= 73.0 FT
START ELEVATION= 70.0 FT
SPAN= 10-20 HRS, dt=.1 HRS
Tdet= 156.4 MIN (.36 AF)

#	ROUTE	INVERT	OUTLET DEVICES
1	P	70.0'	**6" ORIFICE/GRATE** Q=.6 PI r^2 SQR(2g) SQR(H-r)
2	P	71.0'	**60 DEG V-NOTCH WEIR** Q=2.53 TAN(Theta/2) H^2.5
3	P	71.8'	**4' SHARP-CRESTED RECTANGULAR WEIR** Q=C L H^1.5 C=3.27+.4 H/1.8 L=Length-2(.1 H)

WATERSHED ROUTING



SUBCATCHMENT 1	=	->	REACH 100
SUBCATCHMENT 2	=	->	REACH 200
SUBCATCHMENT 3	=	->	REACH 101
SUBCATCHMENT 4	=	->	REACH 102
SUBCATCHMENT 5	=	->	REACH 103
SUBCATCHMENT 6	=	->	
SUBCATCHMENT 7	=	->	REACH 100
SUBCATCHMENT 8	=	->	POND 1
REACH 100	=	->	
REACH 101	=	->	POND 1
REACH 102	=	->	REACH 101
REACH 103	=	->	REACH 102
REACH 200	=	->	POND 1
POND 1	=	->	REACH 100

SUBCATCHMENT 1

PEAK= 4.47 CFS @ 12.39 HRS, VOLUME= .52 AF

ACRES	CN	
2.88	77	brush fair cond."d' soils

SCS TR-20 METHOD
TYPE III 24-HOUR
RAINFALL= 4.70 IN
SPAN= 10-20 HRS, dt=.1 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**Segment ID:**	23.5
Woods: Light underbrush n=.4 L=120' P2=3 in s=.025 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	**Segment ID:**	6.8
Woodland Kv=5 L=335' s=.027 '/' V=.82 fps		
	Total Length= 455 ft Total Tc=	30.3

SUBCATCHMENT 2

PEAK= 2.02 CFS @ 11.99 HRS, VOLUME= .13 AF

ACRES	CN	
.41	98	impervious surface
.04	80	lawn good cond."d" soils
.45	96	

SCS TR-20 METHOD
TYPE III 24-HOUR
RAINFALL= 4.70 IN
SPAN= 10-20 HRS, dt=.1 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**Segment ID:**	1.0
Smooth surfaces n=.011 L=65' P2=3 in s=.015 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	**Segment ID:**	.5
Paved Kv=20.3282 L=70' s=.015 '/' V=2.49 fps		
	Total Length= 135 ft Total Tc=	1.5

SUBCATCHMENT 3

PEAK= 1.62 CFS @ 11.99 HRS, VOLUME= .11 AF

ACRES	CN	
.31	98	impervious surface area
.05	80	lawn good cond. "d" soils
.36	96	

SCS TR-20 METHOD
TYPE III 24-HOUR
RAINFALL= 4.70 IN
SPAN= 10-20 HRS, dt=.1 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**Segment ID:**	1.3
Smooth surfaces n=.011 L=90' P2=3 in s=.015 '/'		
CIRCULAR CHANNEL	**Segment ID:**	.3
12" Diameter a=.79 sq-ft Pw=3.1' r=.25'		
s=.005 '/' n=.01 V=4.17 fps L=75' Capacity=3.3 cfs		
	Total Length= 165 ft Total Tc=	1.6

SUBCATCHMENT 4

PEAK= 2.76 CFS @ 12.01 HRS, VOLUME= .18 AF

ACRES	CN		
.40	98	impervious surface area	SCS TR-20 METHOD
.28	80	lawn good cond."d" soils	TYPE III 24-HOUR
.68	91		RAINFALL= 4.70 IN
			SPAN= 10-20 HRS, dt=.1 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	Segment ID:	3.9
Grass: Short n=.15 L=30' P2=3 in s=.02 '/'		
TR-55 SHEET FLOW	Segment ID:	.4
Smooth surfaces n=.011 L=35' P2=3 in s=.037 '/'		
	Total Length= 65 ft Total Tc=	4.3

SUBCATCHMENT 5

PEAK= 2.52 CFS @ 11.99 HRS, VOLUME= .16 AF

ACRES	CN		
.48	98	impervious surface area	SCS TR-20 METHOD
.07	80	lawn good cond. 'd" soils	TYPE III 24-HOUR
.55	96		RAINFALL= 4.70 IN
			SPAN= 10-20 HRS, dt=.1 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	Segment ID:	1.4
Smooth surfaces n=.011 L=105' P2=3 in s=.017 '/'		
CIRCULAR CHANNEL	Segment ID:	1.0
15" Diameter a=1.23 sq-ft Pw=3.9' r=.313'		
s=.005 '/' n=.01 V=4.84 fps L=288' Capacity=5.9 cfs		
	Total Length= 393 ft Total Tc=	2.4

SUBCATCHMENT 6

PEAK= .44 CFS @ 12.01 HRS, VOLUME= .03 AF

ACRES	CN		
.10	80	lawn/landscape area "d" soils	SCS TR-20 METHOD
.03	98	pavement	TYPE III 24-HOUR
.13	84		RAINFALL= 4.70 IN
			SPAN= 10-20 HRS, dt=.1 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	Segment ID:	4.2
Grass: Dense n=.24 L=40' P2=3 in s=.075 '/'		

SUBCATCHMENT 7

PEAK= .41 CFS @ 12.39 HRS, VOLUME= .05 AF

ACRES	CN	
.24	80	rip rap and grass slope area

SCS TR-20 METHOD
TYPE III 24-HOUR
RAINFALL= 4.70 IN
SPAN= 10-20 HRS, dt=.1 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**Segment ID:**	1.3
Grass: Dense n=.24 L=20' P2=3 in s=.33 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	**Segment ID:**	29.8
Woodland Kv=5 L=800' s=.008 '/' V=.45 fps		
	Total Length= 820 ft Total Tc=	31.1

SUBCATCHMENT 8

PEAK= 1.71 CFS @ 12.01 HRS, VOLUME= .11 AF

ACRES	CN	
.20	100	permanent pool area
.24	80	lawn good condition, "d" soils
.44	89	

SCS TR-20 METHOD
TYPE III 24-HOUR
RAINFALL= 4.70 IN
SPAN= 10-20 HRS, dt=.1 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**Segment ID:**	4.2
Grass: Dense n=.24 L=40' P2=3 in s=.075 '/'		

REACH 100

Not described

Qin = 6.34 CFS @ 12.40 HRS, VOLUME= 1.18 AF
Qout= 6.34 CFS @ 12.40 HRS, VOLUME= 1.18 AF, ATTEN= 0%, LAG= 0.0 MIN

DEPTH (FT)	END AREA (SQ-FT)	DISCH (CFS)

- METHOD
PEAK DEPTH= 0.00 FT
PEAK VELOCITY= 0.0 FPS
TRAVEL TIME = 0.0 MIN
SPAN= 10-20 HRS, dt=.1 HRS

REACH 101

Qin = 6.44 CFS @ 12.01 HRS, VOLUME= .45 AF
Qout= 6.19 CFS @ 12.02 HRS, VOLUME= .45 AF, ATTEN= 4%, LAG= .6 MIN

DEPTH (FT)	END AREA (SQ-FT)	DISCH (CFS)
0.0	0.0	0.00
.1	.1	.12
.3	.2	.52
.4	.3	1.16
.9	.9	4.97
1.0	1.1	5.80
1.1	1.2	6.33
1.2	1.2	6.39
1.2	1.2	6.33
1.3	1.2	5.94

15" PIPE

n= .01
LENGTH= 106 FT
SLOPE= .005 FT/FT

STOR-IND+TRANS METHOD
PEAK DEPTH= 1.11 FT
PEAK VELOCITY= 5.4 FPS
TRAVEL TIME = .3 MIN
SPAN= 10-20 HRS, dt=.1 HRS

REACH 102

Qin = 5.07 CFS @ 12.01 HRS, VOLUME= .34 AF
Qout= 4.86 CFS @ 12.02 HRS, VOLUME= .34 AF, ATTEN= 4%, LAG= .5 MIN

DEPTH (FT)	END AREA (SQ-FT)	DISCH (CFS)
0.0	0.0	0.00
.1	.1	.12
.3	.2	.52
.4	.3	1.16
.9	.9	4.97
1.0	1.1	5.80
1.1	1.2	6.33
1.2	1.2	6.39
1.2	1.2	6.33
1.3	1.2	5.94

15" PIPE

n= .01
LENGTH= 103 FT
SLOPE= .005 FT/FT

STOR-IND+TRANS METHOD
PEAK DEPTH= .87 FT
PEAK VELOCITY= 5.4 FPS
TRAVEL TIME = .3 MIN
SPAN= 10-20 HRS, dt=.1 HRS

REACH 103

Qin = 2.52 CFS @ 11.99 HRS, VOLUME= .16 AF
Qout= 2.31 CFS @ 12.01 HRS, VOLUME= .16 AF, ATTEN= 8%, LAG= .9 MIN

DEPTH (FT)	END AREA (SQ-FT)	DISCH (CFS)
0.0	0.0	0.00
.1	0.0	.07
.2	.1	.29
.3	.2	.64
.7	.6	2.74
.8	.7	3.20
.9	.7	3.49
.9	.8	3.52
1.0	.8	3.49
1.0	.8	3.28

12" PIPE

n= .01
LENGTH= 194 FT
SLOPE= .005 FT/FT

STOR-IND+TRANS METHOD
PEAK DEPTH= .64 FT
PEAK VELOCITY= 4.6 FPS
TRAVEL TIME = .7 MIN
SPAN= 10-20 HRS, dt=.1 HRS

REACH 200

Qin = 2.02 CFS @ 11.99 HRS, VOLUME= .13 AF
Qout= 1.92 CFS @ 12.00 HRS, VOLUME= .13 AF, ATTEN= 5%, LAG= .7 MIN

DEPTH (FT)	END AREA (SQ-FT)	DISCH (CFS)
0.0	0.0	0.00
.1	0.0	.07
.2	.1	.29
.3	.2	.64
.7	.6	2.74
.8	.7	3.20
.9	.7	3.49
.9	.8	3.52
1.0	.8	3.49
1.0	.8	3.28

12" PIPE

n= .01
LENGTH= 160 FT
SLOPE= .005 FT/FT

STOR-IND+TRANS METHOD
PEAK DEPTH= .55 FT
PEAK VELOCITY= 4.4 FPS
TRAVEL TIME = .6 MIN
SPAN= 10-20 HRS, dt=.1 HRS

POND 1

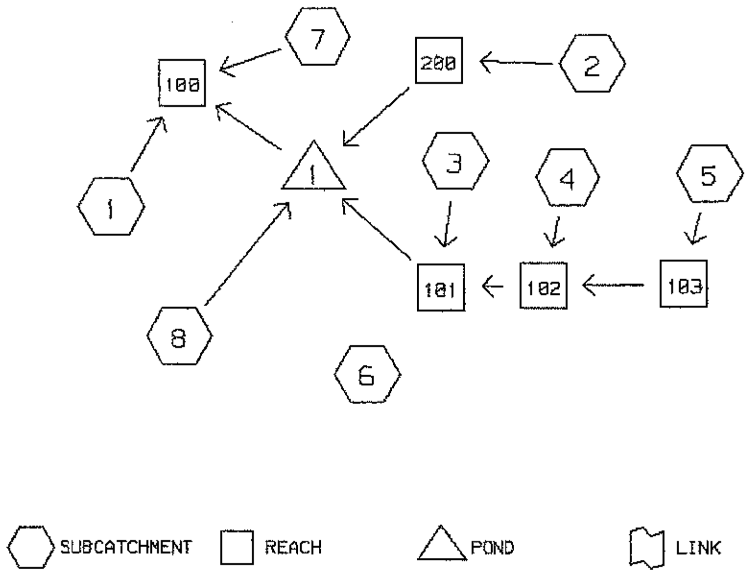
Qin = 9.80 CFS @ 12.01 HRS, VOLUME= .69 AF
Qout= 1.50 CFS @ 12.55 HRS, VOLUME= .61 AF, ATTEN= 85%, LAG= 32.1 MIN

ELEVATION (FT)	AREA (AC)	INC.STOR (AF)	CUM.STOR (AF)
70.0	.20	0.00	0.00
71.0	.23	.22	.22
72.0	.27	.25	.47

STOR-IND METHOD
PEAK STORAGE = .36 AF
PEAK ELEVATION= 71.6 FT
FLOOD ELEVATION= 73.0 FT
START ELEVATION= 70.0 FT
SPAN= 10-20 HRS, dt=.1 HRS
Tdet= 162.4 MIN (.6 AF)

#	ROUTE	INVERT	OUTLET DEVICES
1	P	70.0'	**6" ORIFICE/GRATE** Q=.6 PI r^2 SQR(2g) SQR(H-r)
2	P	71.0'	**60 DEG V-NOTCH WEIR** Q=2.53 TAN(Theta/2) H^2.5
3	P	71.8'	**4' SHARP-CRESTED RECTANGULAR WEIR** Q=C L H^1.5 C=3.27+.4 H/1.8 L=Length-2(.1 H)

WATERSHED ROUTING



SUBCATCHMENT 1	=	->	REACH 100
SUBCATCHMENT 2	=	->	REACH 200
SUBCATCHMENT 3	=	->	REACH 101
SUBCATCHMENT 4	=	->	REACH 102
SUBCATCHMENT 5	=	->	REACH 103
SUBCATCHMENT 6	=	->	
SUBCATCHMENT 7	=	->	REACH 100
SUBCATCHMENT 8	=	->	POND 1
REACH 100	=	->	
REACH 101	=	->	POND 1
REACH 102	=	->	REACH 101
REACH 103	=	->	REACH 102
REACH 200	=	->	POND 1
POND 1	=	->	REACH 100

SUBCATCHMENT 1

PEAK= 5.75 CFS @ 12.38 HRS, VOLUME= .67 AF

ACRES	CN	
2.88	77	brush fair cond."d' soils

SCS TR-20 METHOD
TYPE III 24-HOUR
RAINFALL= 5.50 IN
SPAN= 10-20 HRS, dt=.1 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**Segment ID:**	23.5
Woods: Light underbrush n=.4 L=120' P2=3 in s=.025 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	**Segment ID:**	6.8
Woodland Kv=5 L=335' s=.027 '/' V=.82 fps		
	Total Length= 455 ft Total Tc=	30.3

SUBCATCHMENT 2

PEAK= 2.38 CFS @ 11.99 HRS, VOLUME= .16 AF

ACRES	CN	
.41	98	impervious surface
.04	80	lawn good cond."d" soils
.45	96	

SCS TR-20 METHOD
TYPE III 24-HOUR
RAINFALL= 5.50 IN
SPAN= 10-20 HRS, dt=.1 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**Segment ID:**	1.0
Smooth surfaces n=.011 L=65' P2=3 in s=.015 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	**Segment ID:**	.5
Paved Kv=20.3282 L=70' s=.015 '/' V=2.49 fps		
	Total Length= 135 ft Total Tc=	1.5

SUBCATCHMENT 3

PEAK= 1.91 CFS @ 11.99 HRS, VOLUME= .12 AF

ACRES	CN	
.31	98	impervious surface area
.05	80	lawn good cond. "d" soils
.36	96	

SCS TR-20 METHOD
TYPE III 24-HOUR
RAINFALL= 5.50 IN
SPAN= 10-20 HRS, dt=.1 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**Segment ID:**	1.3
Smooth surfaces n=.011 L=90' P2=3 in s=.015 '/'		
CIRCULAR CHANNEL	**Segment ID:**	.3
12" Diameter a=.79 sq-ft Pw=3.1' r=.25'		
s=.005 '/' n=.01 V=4.17 fps L=75' Capacity=3.3 cfs		
	Total Length= 165 ft Total Tc=	1.6

SUBCATCHMENT 4

PEAK= 3.30 CFS @ 12.01 HRS, VOLUME= .22 AF

ACRES	CN	
.40	98	impervious surface area
.28	80	lawn good cond."d" soils
.68	91	

SCS TR-20 METHOD
TYPE III 24-HOUR
RAINFALL= 5.50 IN
SPAN= 10-20 HRS, dt=.1 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	Segment ID:	3.9
Grass: Short n=.15 L=30' P2=3 in s=.02 '/'		
TR-55 SHEET FLOW	Segment ID:	.4
Smooth surfaces n=.011 L=35' P2=3 in s=.037 '/'		
	Total Length= 65 ft Total Tc=	4.3

SUBCATCHMENT 5

PEAK= 2.97 CFS @ 11.99 HRS, VOLUME= .19 AF

ACRES	CN	
.48	98	impervious surface area
.07	80	lawn good cond. 'd" soils
.55	96	

SCS TR-20 METHOD
TYPE III 24-HOUR
RAINFALL= 5.50 IN
SPAN= 10-20 HRS, dt=.1 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	Segment ID:	1.4
Smooth surfaces n=.011 L=105' P2=3 in s=.017 '/'		
CIRCULAR CHANNEL	Segment ID:	1.0
15" Diameter a=1.23 sq-ft Pw=3.9' r=.313'		
s=.005 '/' n=.01 V=4.84 fps L=288' Capacity=5.9 cfs		
	Total Length= 393 ft Total Tc=	2.4

SUBCATCHMENT 6

PEAK= .55 CFS @ 12.01 HRS, VOLUME= .04 AF

ACRES	CN	
.10	80	lawn/landscape area "d" soils
.03	98	pavement
.13	84	

SCS TR-20 METHOD
TYPE III 24-HOUR
RAINFALL= 5.50 IN
SPAN= 10-20 HRS, dt=.1 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	Segment ID:	4.2
Grass: Dense n=.24 L=40' P2=3 in s=.075 '/'		

SUBCATCHMENT 7

PEAK= .52 CFS @ 12.38 HRS, VOLUME= .06 AF

ACRES	CN		
.24	80	rip rap and grass slope area	SCS TR-20 METHOD TYPE III 24-HOUR RAINFALL= 5.50 IN SPAN= 10-20 HRS, dt=.1 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**Segment ID:**	1.3
Grass: Dense n=.24 L=20' P2=3 in s=.33 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	**Segment ID:**	29.8
Woodland Kv=5 L=800' s=.008 '/' V=.45 fps		
	Total Length= 820 ft Total Tc=	31.1

SUBCATCHMENT 8

PEAK= 2.07 CFS @ 12.01 HRS, VOLUME= .14 AF

ACRES	CN		
.20	100	permanent pool area	SCS TR-20 METHOD TYPE III 24-HOUR
.24	80	lawn good condition, "d" soils	RAINFALL= 5.50 IN
.44	89		SPAN= 10-20 HRS, dt=.1 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**Segment ID:**	4.2
Grass: Dense n=.24 L=40' P2=3 in s=.075 '/'		

REACH 100

Not described

Qin = 8.48 CFS @ 12.40 HRS, VOLUME= 1.45 AF
Qout= 8.48 CFS @ 12.40 HRS, VOLUME= 1.45 AF, ATTEN= 0%, LAG= 0.0 MIN

DEPTH (FT)	END AREA (SQ-FT)	DISCH (CFS)

- METHOD
PEAK DEPTH= 0.00 FT
PEAK VELOCITY= 0.0 FPS
TRAVEL TIME = 0.0 MIN
SPAN= 10-20 HRS, dt=.1 HRS

REACH 101

Qin = 7.63 CFS @ 12.01 HRS, VOLUME= .53 AF
Qout= 6.07 CFS @ 12.06 HRS, VOLUME= .53 AF, ATTEN= 20%, LAG= 2.8 MIN

DEPTH (FT)	END AREA (SQ-FT)	DISCH (CFS)
0.0	0.0	0.00
.1	.1	.12
.3	.2	.52
.4	.3	1.16
.9	.9	4.97
1.0	1.1	5.80
1.1	1.2	6.33
1.2	1.2	6.39
1.2	1.2	6.33
1.3	1.2	5.94

15" PIPE

n= .01
LENGTH= 106 FT
SLOPE= .005 FT/FT

STOR-IND+TRANS METHOD
PEAK DEPTH= 1.25 FT
PEAK VELOCITY= 5.4 FPS
TRAVEL TIME = .3 MIN
SPAN= 10-20 HRS, dt=.1 HRS

REACH 102

Qin = 6.02 CFS @ 12.01 HRS, VOLUME= .41 AF
Qout= 5.77 CFS @ 12.02 HRS, VOLUME= .41 AF, ATTEN= 4%, LAG= .5 MIN

DEPTH (FT)	END AREA (SQ-FT)	DISCH (CFS)
0.0	0.0	0.00
.1	.1	.12
.3	.2	.52
.4	.3	1.16
.9	.9	4.97
1.0	1.1	5.80
1.1	1.2	6.33
1.2	1.2	6.39
1.2	1.2	6.33
1.3	1.2	5.94

15" PIPE

n= .01
LENGTH= 103 FT
SLOPE= .005 FT/FT

STOR-IND+TRANS METHOD
PEAK DEPTH= 1.01 FT
PEAK VELOCITY= 5.5 FPS
TRAVEL TIME = .3 MIN
SPAN= 10-20 HRS, dt=.1 HRS

REACH 103

Qin = 2.97 CFS @ 11.99 HRS, VOLUME= .19 AF
Qout= 2.72 CFS @ 12.01 HRS, VOLUME= .19 AF, ATTEN= 8%, LAG= .9 MIN

DEPTH (FT)	END AREA (SQ-FT)	DISCH (CFS)
0.0	0.0	0.00
.1	0.0	.07
.2	.1	.29
.3	.2	.64
.7	.6	2.74
.8	.7	3.20
.9	.7	3.49
.9	.8	3.52
1.0	.8	3.49
1.0	.8	3.28

12" PIPE

n= .01
LENGTH= 194 FT
SLOPE= .005 FT/FT

STOR-IND+TRANS METHOD
PEAK DEPTH= .72 FT
PEAK VELOCITY= 4.7 FPS
TRAVEL TIME = .7 MIN
SPAN= 10-20 HRS, dt=.1 HRS

REACH 200

Qin = 2.38 CFS @ 11.99 HRS, VOLUME= .16 AF
Qout= 2.26 CFS @ 12.00 HRS, VOLUME= .16 AF, ATTEN= 5%, LAG= .7 MIN

DEPTH (FT)	END AREA (SQ-FT)	DISCH (CFS)
0.0	0.0	0.00
.1	0.0	.07
.2	.1	.29
.3	.2	.64
.7	.6	2.74
.8	.7	3.20
.9	.7	3.49
.9	.8	3.52
1.0	.8	3.49
1.0	.8	3.28

12" PIPE

n= .01
LENGTH= 160 FT
SLOPE= .005 FT/FT

STOR-IND+TRANS METHOD
PEAK DEPTH= .62 FT
PEAK VELOCITY= 4.6 FPS
TRAVEL TIME = .6 MIN
SPAN= 10-20 HRS, dt=.1 HRS

POND 1

Qin = 10.26 CFS @ 12.02 HRS, VOLUME= .82 AF
Qout= 2.27 CFS @ 12.48 HRS, VOLUME= .72 AF, ATTEN= 78%, LAG= 27.4 MIN

ELEVATION (FT)	AREA (AC)	INC.STOR (AF)	CUM.STOR (AF)
70.0	.20	0.00	0.00
71.0	.23	.22	.22
72.0	.27	.25	.47

STOR-IND METHOD
PEAK STORAGE = .42 AF
PEAK ELEVATION= 71.8 FT
FLOOD ELEVATION= 73.0 FT
START ELEVATION= 70.0 FT
SPAN= 10-20 HRS, dt=.1 HRS
Tdet= 154.3 MIN (.72 AF)

#	ROUTE	INVERT	OUTLET DEVICES
1	P	70.0'	**6" ORIFICE/GRATE** Q=.6 PI r^2 SQR(2g) SQR(H-r)
2	P	71.0'	**60 DEG V-NOTCH WEIR** Q=2.53 TAN(Theta/2) H^2.5
3	P	71.8'	**4' SHARP-CRESTED RECTANGULAR WEIR** Q=C L H^1.5 C=3.27+.4 H/1.8 L=Length-2(.1 H)

Section 4

Watershed Maps (Pre and Post-Development)