Fac/Perm/Co ID #	Date	Doc ID#
44-06	11/24/08	6267

PERMIT TO CONSTRUCT LANDFILL NO. 6D-SOUTH CANTON, NORTH CAROLINA

Prepared for

BLUE RIDGE PAPER PRODUCTS INC. – CANTON MILL DIVISION OF EVERGREEN PACKAGING CANTON, NORTH CAROLINA

VOLUME I

NOVEMBER 2008

RECEIVED
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SOLID WASTE SECTION
ASHEVILLE REGIONAL OFFICE

SME
Sevee & Maher Engineers, Inc.
Waste Management and Hydrogeologic Consultants
Cumberland Center, Maine

NORTH CAROLINA PROFESSIONAL SEAL 20589 ENGINEER JOHN E. SEVEE

Fac/Perm/Co ID #	Date	Doc ID#
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Blue Ridge Paper Products Inc. - Canton Mill

November 18, 2008

Mr. Allen Gaither
NCDENR
2090 U.S. Highway 70
Swannanoa, NC 28778

Subject: Landfill No. 6, Permit Number 44-06, Area D-South, Blue Ridge Paper Products, Inc., Canton, North Carolina

Dear Mr.Gaither:

Blue Ridge Paper Products, Inc. (Blue Ridge) is submitting a Permit to Construct for approval by the North Carolina Department of Environment and Natural Resources (NCDENR) to construct Landfill No. 6 Area D-South. The proposed area is located west of the current active landfill area. The project includes the preparation of base grades to allow for the installation of a landfill liner, leachate collection system, pump station and detention basin modifications. Enclosed you will find the design report which includes engineering drawings and specifications. A separate copy of the Erosion and Sediment Control Plan is being submitted under separate cover to the Haywood County Erosion Control Department for approval.

It is our understanding that the Division of Waste Management will invoice Blue Ridge for the permit application fee. If desired, we would be glad to arrange a meeting with the Department and our consultant, Sevee and Maher Engineers, Inc., to present the project.

If you have any questions during your review of the enclosed material, please do not hesitate to contact us.

Sincerely,

James A. Giauque
Waste Compliance & Landfill Supervisor
Blue Ridge Paper Products Inc.
giauqj@blueridgepaper.com
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Paul Dickens
Manager Environmental Affairs
Blue Ridge Paper Products Inc.
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file: 6D-S Gaither 11-18-08
Enclosures
Copy: Derric Brown (Letter Only)
Mike Elmore
Bill vonVitzthume

PERMIT TO CONSTRUCT
LANDFILL NO. 6D-SOUTH
CANTON, NORTH CAROLINA

Prepared for

BLUE RIDGE PAPER PRODUCTS INC. – CANTON MILL
DIVISION OF EVERGREEN PACKAGING
CANTON, NORTH CAROLINA

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EXECUTIVE SUMMARY

Blue Ridge Paper Products Inc. - Canton Mill (Blue Ridge) proposes to construct an extension to the permitted Landfill No. 6. The expansion is identified as Landfill No. 6 Area D-South. Area D-South is located south westerly of the previously permitted active landfill Area A-West. Area A-West is anticipated for closure in 2011. This document is prepared pursuant to North Carolina Department of Environment, Health and Natural Resources' Solid Waste Management Rules - 15A NCAC 13B.

The proposed design of Landfill No. 6 Area D-South includes the following: a geosynthetic liner system for the containment of waste and leachate; a leachate collection system which minimizes leachate head levels upon the liner system; access roadways which provide one-way traffic into and out-of the landfill area; and a clean storm water management system which diverts surface water away from the landfill; thus, reducing total leachate volume.

The detailed design of Landfill No. 6 Area D-South is provided within Volume II of this permit application, and includes a narrative of historical use of the landfill, design considerations, construction considerations, construction schedule, and a construction cost estimate. The design report also includes engineering drawings, exploration logs, engineering calculations, engineering specifications, groundwater modeling information and site specific soil permeability testing, all of which are related to the construction of Area D-South.

1.0 INTRODUCTION

Blue Ridge operates a pulp and paper mill in Canton, North Carolina. Currently, approximately 280,000 cubic yards of production residuals are generated each year that require landfilling. The production residuals consist of boiler fly ash, cinders, dewatered wastewater treatment sludge, lime mud, wood waste, and asbestos containing material. At the present time, these wastes are landfilled at a company-owned landfill in Canton, North Carolina, referred to as Landfill No. 6 (see Figure 1-1). Landfill No. 6 was initially permitted for construction and operation in February 1984 Permit (#44-06).

Landfill No. 6 is divided into eight landfilling areas designated as Areas A through H. Areas A through E are designated for disposal of wastewater treatment sludge (sludge), ash, lime mud, wood waste and asbestos containing material (ACM). Areas F through H are designated for disposal of lime mud. Areas A-East, B, C, F, G, and H have been constructed according to the original design specifications and landfilled to capacity. In addition, Areas A-East, B, C, F, and G have been capped according to the original design. The current operating area, A-West, will reach capacity in early 2011. Upon reaching capacity in Area A-West, the next stage of development is planned for Area D, then Area E.

Based on the waste generation rate, Area D will be subdivided into two units, Area D-South and Area D-North. Each unit will have an anticipated life expectancy of five years.

This document has been prepared to serve as Blue Ridge's solid waste construction permit application for the development of Area D-South of Landfill No. 6. This application has been prepared pursuant to the North Carolina Solid Waste Management Rules, 15A NCAC 13B, Chapters .0100, .0200, and .0500.

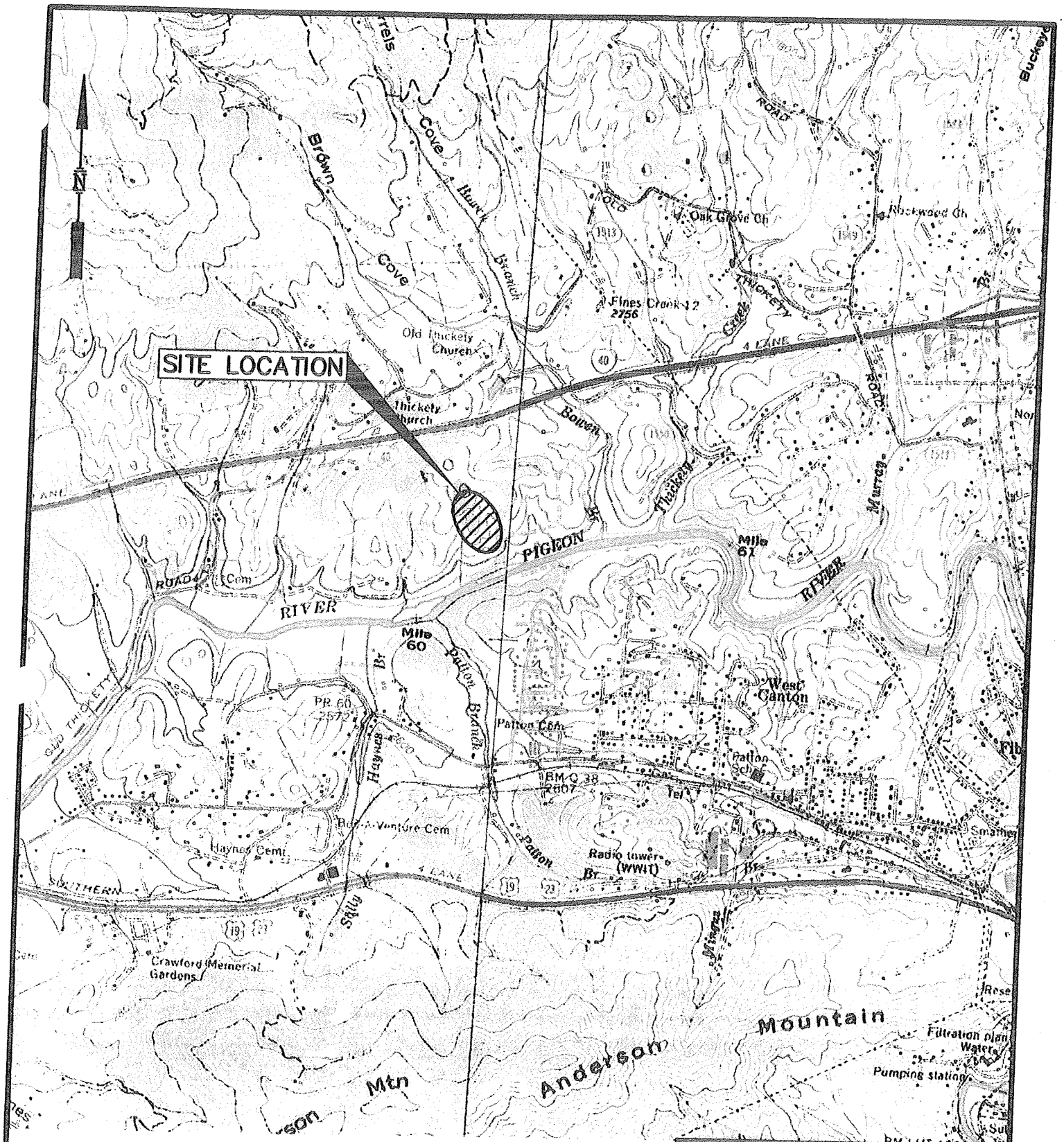
BASE MAP ADAPTED FROM 7.5 MIN USGS TOPO QUADS
CANTON, NC – 1990
CLYDE – 1978

1000 0 2000 4000 FEET

FIGURE 1-1
SITE LOCATION PLAN
BLUE RIDGE PAPER PRODUCTS INC. – CANTON MILL
CANTON, NORTH CAROLINA
LANDFILL NO. 6 EXPANSION

SME
Sevee & Maher Engineers, Inc.

DWG: 6E-SITELOC LMN: NONE CTB: SME-STD REV:



BASE MAP ADAPTED FROM 7.5 MIN USGS TOPO QUADS
CANTON, NC – 1990
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FIGURE 1-1
SITE LOCATION PLAN
BLUE RIDGE PAPER PRODUCTS INC. – CANTON MILL
CANTON, NORTH CAROLINA
LANDFILL NO. 6 EXPANSION

SME

Sevee & Maher Engineers, Inc.

DWG: 6E–SITELOC LMN: NONE CTB: SME–STD REV:

1.1 Application Structure

This application consists of two volumes. Volume I addresses the North Carolina Solid Waste Management Rules. Volume II is the design report for the proposed Area D-South landfill, which includes design and development considerations, leachate management, landfill construction, stormwater and erosion control, and an assessment of environmental impact from the facility.

2.0 SOLID WASTE MANAGEMENT RULES

2.1 Statement of Compliance

The application for Area D-South has been prepared pursuant to and in compliance with the applicable sections of the Solid Waste Management Rules 15A NCAC 13B Chapters .0100, .0200, and .0500.

2.2 Solid Waste Management Rules

This section will address all pertinent issues of the Rules and respond to the Rule and/or refer the reader to the location of the detailed information provided in Volume II - Design Report. Where applicable the Rule will be re-iterated in normal font, all responses or referrals will be in bold type.

2.2.1 Section .0100 - General Provisions. **This application refers to the expansion of Landfill No. 6, a permitted landfill owned and operated by Blue Ridge. Blue Ridge seeks to obtain a construction permit from the North Carolina Department of Environment and Natural Resources, Division of Solid Waste Management (NCDENR-SWM) for the construction of the lined expansion, Area D-South of Blue Ridge Landfill No. 6.**

The general provision requirements of this section of the Rules were approved in the original permitting of Landfill No. 6 and are not re-addressed herein.

2.2.2 Section .0200 - Permits for Solid Waste Management Facilities

> .0201 PERMIT REQUIRED. **A permit is required, and this submittal shall be viewed as an application request, to construct the proposed landfill unit referred to as Landfill No. 6 Area D-South.**

.0202 PERMIT APPLICATION. **This permit application is contained within two documents:**

Volume I- Permit Requirements; and
Volume II - Design Report.

Site and construction plans are included in Appendix A of the Design Report.

A letter from the Haywood County Planning Department, stating the facility meets the requirements of the County zoning ordinance is included in Attachment 1.

The detailed plans and specifications provided within the Design Report bear the imprint of the registration seal of a State of North Carolina professional engineer. Also, the geologic study, prepared within the permit to construct Area D, bears the imprint of the registration of a State of North Carolina professional geologist.

All other pertinent information of the proposed facility is found within the Volume I - Permit Requirements and Volume II - Design Report of this application.

Specific information regarding the proposed construction of Landfill No. 6 Area D-South detailed within the Design Report is addressed in the following sections.

.0203 PERMIT APPROVAL OR DENIAL. **Not applicable.**

.0204 RECORDATION OF LAND DISPOSAL PERMITS. **When granted, Blue Ridge will file the approved, certified copy of the permit in the Haywood County register**

of deeds. The register of deeds will be notified to record the certified copy and index it in the grantor index under Blue Ridge.

When the property is sold, leased, conveyed or transferred in any manner, the deed or other instrument of transfer shall contain in the description section in no smaller type than that used in the body of the deed or instrument a statement that the property has been used as a sanitary landfill and a reference by book and page to the recordation of the permit.

.0205 VARIANCES. **Not applicable.**

2.2.3 Section .0500 - Disposal Sites.

.0501 APPROVED DISPOSAL METHODS. **The sanitary landfill disposal method is referred to within this permit application.**

.0502 OPEN DUMPS. Not Applicable.

.0503 SITING AND DESIGN REQUIREMENTS FOR DISPOSAL SITES. **Siting requirements for Landfill No. 6 Area D were approved as part of Permit No. 44-06. The siting of Landfill No. 6 Area D has not been modified within this application.**

The design of Landfill No. 6 Area D-South is provided within Volume II - Design Report of this application. The permit requirements regarding the design of the site are briefly discussed below with reference to the specific section within the Design Report. The specific requirements, as found within the Solid Waste Management Rules, are provided in normal font with the response and/or reference to the Design Report immediately following in bolded type.

(2) A site shall meet the following design requirements:

(a) The concentration of explosive gases generated by the site shall not exceed:

(i) twenty-five percent of the limit for the gases in site structures (excluding gas control or recovery system components); and

(ii) the lower explosive limit for the gases at the property boundary;

The proposed development of Landfill No. 6 Area D-South will not concentrate explosive gases which exceed twenty-five percent of the limit for the gases in site structures and the lower explosive limit for the gases at the property boundary. The proposed geosynthetic clay liner and 60-mil HDPE, will retard lateral movement of gases during the operational and post-closure life time of the landfill area. The leachate transport pipeline is sealed from the landfill to the leachate pond and from the leachate pond to the wastewater treatment facility.

(b) A site shall not allow uncontrolled public access so as to expose the public to potential health and safety hazards at the disposal site;

The site is accessed via one entrance; the entrance is gated and locked at all times the facility is not in operation. A sign at the entrance states the site is a landfill owned and operated by Blue Ridge for disposal of Blue Ridge waste products, and that no unauthorized entrance is allowed.

(c) A site shall meet the following surface water requirements:

(i) A site shall not cause a discharge of pollutants into waters of the state that is in violation of the requirements of the National Pollutant Discharge Elimination System (NPDES), under Section 402 of the Clean Water Act, as amended, or that is in violation of standards promulgated under G.S. 143-214.1 and G.S. 143-215;

The site shall not cause a discharge of pollutants into waters of the state that are in violation of the NPDES or of standards promulgated under G.S. 143-214.1 and G.S. 143-215. The proposed geosynthetic clay liner and 60-mil HDPE, will contain virtually one-hundred percent of all leachate generated within Area D-South, in addition, the leachate collection system is designed to minimize leachate head levels which contribute significantly to leakage rates of liner systems, refer to Sections 2.0 and 3.0 of the Design Report.

(ii) A site shall not cause a discharge of dredged material or fill material into waters of the state that is in violation of the requirements under Section 404 of the Clean Water Act, as amended, or that is in violation of any state requirements regulating the discharge of dredged or fill material into waters of the state, including wetlands; and

The site will not discharge dredged material or fill material into waters of the state that is in violation of the requirements under Section 404 of the Clean Water Act, as amended, or that is in violation of any state requirements regulating the discharge of dredged or fill material into water of the state, including wetlands. Landfill No. 6 Area D-South does not abut any water body of the state, including wetlands, and the base grades are designed to provide at least five feet of separation between the seasonal high water table and any waste placement. The proposed construction will abide by the Erosion and Sedimentation Control Plan prepared in Attachment 4 of this report. Refer to Section 3.3 of the Design Report for additional Erosion Control measures to be implemented during construction.

(iii) A site shall not cause non-point source pollution of waters of the state that violates assigned water quality standards.

The site will not cause non-point source pollution of waters of the state that violates assigned water quality standards, as determined by groundwater modeling of the site. Refer to Attachment 2.

(d) A site shall meet the following groundwater requirements:

(i) A site, except for landfill clearing and inert debris landfills subject to Rule .0564(8)(e) of this Section, shall be designed so that the bottom elevation of solid waste will be a minimum of four feet above the seasonal high water table;

The site is designed for the bottom elevation of solid waste to be a minimum of five feet above the seasonal high water table. Regional and site-specific groundwater elevations are provided on Figure 5-1 in Attachment 3.

(ii) Operators of new industrial solid waste landfills, lateral expansions of existing industrial solid waste landfills, and industrial solid waste landfills receiving solid waste on or after January 1, 1998 shall submit to the Division a design which satisfies one of the following criteria:

(A) a design that will ensure that the groundwater standards established under 15A NCAC 2L will not be exceeded in the uppermost aquifer at the compliance boundary established by the Division in accordance with 15A NCAC 2L. The design shall be based upon modeling methods acceptable to the Division, which shall include, at a minimum, the following factors:

(I) the hydrogeologic characteristics of the facility and surrounding lands;

(II) the climatic factors of the area; and

(III) the volume and physical and chemical characteristics of the leachate; or

Landfill No. 6 Area D-South includes a base liner system consisting of three components; the upper component is a 60-mil textured HDPE geomembrane, the middle component is a Geosynthetic Clay Liner and the lower component is two feet of compacted site soils. The GCL will be installed in direct and uniform contact with the compacted soil component.

A groundwater model was performed with regard to site climatological data, waste chemical analysis, proposed liner design, and site hydrogeologic information which demonstrates that the proposed design will not cause groundwater standards to be exceeded in the uppermost aquifer at the compliance boundary established by the Division in accordance with 15A NCAC 2L. The groundwater model is presented in Attachment 2.

(B) design with a leachate collection system, a closure cap system, and a composite liner system consisting of two components; the upper component shall consist of a minimum 30-mil flexible membrane (FML), and the lower components shall consist of at least a two-foot layer of compacted soil with a hydraulic conductivity of no more than 1 x 10^{-7} cm/sec. FML components consisting of high density polyethylene (HDPE) shall be at least 60-mil thick. The FML component shall be installed in direct and uniform contact with the compacted soil component.

Not applicable.

(iii) The Division reserves the right to require an applicant to submit a liner design if the groundwater protection demonstration in sub-item (ii) of this paragraph is not satisfactory.

No response.

(iv) Industrial solid waste landfills shall comply with groundwater standards established under 15A NCAC 2L at the compliance boundary.

Groundwater and surface water quality are monitored routinely by Blue Ridge around Landfill No. 6 for compliance to groundwater standards.

(e) A site shall not engage in open burning of solid waste;

The landfill site does not engage in open burning of solid waste.

(f) A site, except a land clearing and inert debris landfill, shall meet the following buffer requirements:

(i) A 50-foot minimum buffer between all property lines and disposal areas;

(ii) A 500-foot minimum buffer between private dwellings and wells and disposal areas; and

(iii) A 50-foot minimum buffer between streams and rivers and disposal areas; and

The site meets the above buffer requirements. Refer to Permit No. 44-06.

(g) Requirements of the Sedimentation Pollution Control Law (15A NCAC 4) shall be met.

Requirements of the Sedimentation Pollution Control Law (15A NCAC 4) will be met. A copy of the Erosion and Sedimentation Control Plan is attached as Attachment 4.

.0504 APPLICATION REQUIREMENTS FOR SANITARY LANDFILLS

1. The following information shall be required for reviewing a site application for a proposed sanitary landfill.

   The information requested within this sub-section has been provided during initial construction permitting of the site. Refer to Permit No. 44-06.

2. The following information shall be required for reviewing a construction plan application for a proposed sanitary landfill:

   a) A map showing existing features to include:

      i) existing topography of the site on a scale of at least 1 inch equals 200 feet with five foot contours;

      Drawing C-101 is included in Appendix A of the Design Report. The horizontal scale of C-101 is 1 inch equals 200 feet and includes 5 foot contours.

      ii) benchmarks;

      Drawing C-101 is included in Appendix A of the Design Report, and includes the location of existing benchmarks.

      iii) springs;

      No known springs are located within the limits of Landfill No. 6 Area D-South however a seep is known to be located within the landfill limits and discussed in the Hydrogeologic Report. The location is shown on Figure 3-1 within that report and included as Attachment 3.

iv) streams;

As can be seen from Drawing C-102 (included in Appendix A of the Design Report) no streams are located within the limits of Landfill No. 6 Area D-South.

v) potential groundwater monitoring sites;

The location of current monitoring points is shown on Figure 3-1 in the Hydrogeologic Report included in Attachment 3.

vi) pertinent geological features;

As part of the field investigation for Areas D and E performed by Sevee & Maher Engineers, Inc., 52 piezometers and 28 borings were installed (P-07-200-series) and can be seen on Figure 3-1 in the Hydrogeologic Report included in Attachment 3. Geologic features of the site are shown in Figures 1 thru 3 of Hydrogeologic Report. Boring logs and rock core logs are in Appendices A and B of the Hydrogeologic Report.

vii) soil boring locations;

Locations of the soil/rock borings are presented in Figure 3-1 of the Hydrogeologic Report included in Attachment 3.

b) A grading plan that provides:

i) proposed excavated contours;

Proposed base grading contours are depicted on Drawing C-103A/B in Appendix A of the Design Report. The plan is shown at a horizontal scale of 1 inch equals 60 feet and a contour interval of 2 feet.

ii) soil boring locations;

Locations of the soil/rock borings are presented in Figure 3-1 of the Hydrogeologic Report included in Attachment 3.

iii) locations and elevations of dikes or trenches;

A containment dike borders the east, west, and south sides of Landfill 6 Area D-South. Trenching will be required in order to install the leachate force main along an existing gravel road within the landfill property limits. Locations and elevations of the containment dike and force main trench are included on Drawings C-103A/B and C-104 in Appendix A of the Design Report.

iv) designated buffer zones;

Designated buffer zones were established during initial permitting of the facility and are not proposed to be affected due to this project.

v) diversion and controlled removal of surface water from the work areas; and

Diversion and controlled removal of surface water from the work areas is accomplished via the construction of a sedimentation basin retrofitted with an outlet control structure located north at the north edge of Area D-South. The outlet control structure bypasses stormwater beneath the Area D-South landfill liner and discharges to an existing stormwater pond. The sedimentation pond, outlet control structure and culvert outlet proposed for use in Landfill No. 6

Area D-South is included in Drawing C-103A in Appendix A of the Design Report.

vi) proposed utilities and structures;

A leachate collection system in the form of perforated piping, pump station and leachate force main are proposed for the development of Landfill No. 6 Area D-South. Temporary structures will include general contractor and engineer site offices to be located prior to construction activities. These permanent and temporary structures are shown in Drawing C-103A/B, C-104, C-105, and C-304 in Appendix A of the Design Report.

c) A construction plan that provides:

i) engineering design for liners and leachate collection systems;

Engineering design for liners and leachate collection systems is provided on Drawings C-103A/B and C-104, in Appendix A of the Design Report. Drawings C-103A/B and C-104 include the base grading system prior to geomembrane installation and the location of proposed leachate collection piping system. Details of the base geomembrane system and the leachate collection system are included on Drawings C-300, C-301, and C-303, in Appendix A of the Design Report. Cross sections of the base geomembrane system and the leachate collection piping system are included on Drawing C-200, in Appendix A of the Design Report.

ii) proposed final contours showing removal of surface water runoff; and

Proposed final contours are shown on Drawing C-105 in Appendix A of the Design Report.

iii) locations of slope drains or other drop structures.

No slope drains of drop structures are proposed.

d) An erosion control plan that identifies the following:

i) locations of temporary erosion control measures (sediment basins, stone filters, terraces, silt fences, etc.);

Locations of temporary erosion control measures for excavating the landfill area to base grades are included in Attachment 4 of this report. The proposed excavating to base grades for this project will abide by the Erosion and Sedimentation Control Plan. Erosion and sedimentation control measures are in this application for review by the NCDENR however have been submitted to the Haywood County Commissioner's office for approval.

ii) locations of permanent erosion control measures (rip-rap, energy dissipaters, ditch stabilization, pipe drain, etc.); and

Construction for this proposed project will include permanent erosion control measures. Seeding will permanently control erosion on all disturbed surfaces not scheduled for landfill liner installation. Final capping (closure) of the landfill will require the installation of riprap drainage paths, seeding and upgrading of existing stormwater culverts. The final capping design will be in the Operations Manual as part of the Operations Permit Request. The location of permanent

erosion control measures for Area D-South are included on Drawing C-103A/B in Appendix A of the Design Report.

iii) seeding specifications and schedules.

Seeding specifications and schedules are included on Drawing C-100 included in Appendix A of the Design Report and in the specifications included in Appendix D of the Design Report. Seeding specifications and schedules are also included in the Operations Manual, to be submitted to the Division as part of the Operations Permit application request.

e) Detailed diagrams showing typical sections of:

i) dikes,

The design of Landfill No. 6 Area D-South includes detailed diagrams showing typical sections and design calculations for the containment dikes.

Detailed diagrams showing typical sections of the landfill, including dikes, are in Drawings C-200, C-300, C-301, C-302, and C-303 in Appendix A of the Design Report.

ii) trenches,

Detailed diagrams showing typical sections of the landfill, including trenches, are in Drawing C-302 in Appendix A of the Design Report.

iii) diversions,

The proposed containment berm located along the north edge of Landfill No. 6 Area D-South area will act to divert

stormwater during landfilling operations. The containment berm is detailed on Drawing C-301 in Appendix A of the Design Report.

iv) sediment basins, and

The area north of the containment berm of Landfill No. 6 Area D-South acts as a sediment basin and includes an outlet structure for the controlled removal of collected storm water. The sediment basin and outlet control structure is detailed on Drawing C-301 in Appendix A of the Design Report.

v) other pertinent details.

The comprehensive design of Landfill No. 6 Area D-South includes details other than those described above. Other pertinent details are located on Engineering Drawings in Appendix A of the Design Report. Some of the details include the following: landfill access roadway detail; landfill perimeter road detail; anchor trench detail; future geomembrane tie-in detail; final closure detail; and intermediate closure detail.

f) A minimum of two cross sections per operational area showing:

i) original elevations,

Refer to Drawing C-200 in Appendix A of the Design Report.

ii) proposed excavated depths,

Refer to Drawing C-200 in Appendix A of the Design Report.

iii) proposed final elevations,

Refer to Drawing C-200 in Appendix A of the Design Report.

iv) groundwater elevation, and

Refer to Drawing C-200 in Appendix A of the Design Report.

v) soil borings.

Refer to fig 4-1 and 4-2 in the Design Hydrogeologic Report which can be found in Attachment 3.

g) Site development showing phases or progression of operation.

An operations manual, not in this design, will be submitted as part of the Operations Permit application for Landfill No. 6 Area D-South. The operations manual will include site development showing phases or progression of operation. Blue Ridge has proven successful operation of this type of landfill as demonstrated in Landfill No. 6 Area A-East and Area A-West.

h) A written report that contains the following:

i) A copy of the deed or other legal description of the landfill site that would be sufficient as a description in an instrument of conveyance and property owner's name;

A copy of the deed is found in Attachment 5.

ii) Name of individual responsible for operation and maintenance of the site;

Mr. Jim Giauque, Environmental Department, is responsible for operation and maintenance of the site.

iii) Projected use of land after completion of the sanitary landfill;

There are no planned uses for the site after closure. Blue Ridge will provide post-closure maintenance such as mowing and contour maintenance.

iv) Anticipated lifetime of the project;

The construction of Landfill No. 6 Area D-South is anticipated to take 16 months, refer to Section 4.0 of the Design Report. According to current landfilling disposal rates obtained from Blue Ridge, the lifespan of the landfill is estimated at approximately five years.

v) Description of systematic usage of area, operation, orderly development and completion of the sanitary landfill;

An operations manual, not in this design, will be submitted prior to the operations of Landfill No. 6 Area D-South. The operations manual will include the systematic usage of the area, operation, orderly development, and completion of the landfill. The Operations Manual will be similar to the Division approved Operations Manual for Landfill No. 6 Area A-East and Area A-West.

vi) Earthwork calculations;

Earthwork calculations are included in Section 2.3 of the Design Report.

vii) Seeding specifications and schedules;

Seeding specifications and schedules are addressed in Section 3.3 of the Design Report and in Specification Section 02270 located in Appendix D of the Design Report.

viii) Calculations for temporary and permanent erosion control measures;

Calculations for temporary and permanent erosion control measures are contained in the Erosion and Sedimentation Control Plan which is located in Attachment 4 of this report.

ix) Any narrative necessary to describe compliance with the Sedimentation Pollution Control Act of 1973 (15A NCAC 4);

Section 3.3 of the Design Report includes a narrative which describes compliance with the Sedimentation Pollution Control Act of 1973.

x) A discussion of compliance with design requirements in Rule .0503(2) of this Section; and

Section 2.0 of the Design Report includes a narrative which describes compliance with design requirements in Rule .0503 (2).

xi) Any other information pertinent to the proposed construction plan.

The comprehensive design of Landfill No. 6 Area D-South includes details other than those described above. Other pertinent details are described within the Design Report. Some of the information includes the following: site history; site location; basis for design; and additional engineering calculations not described or mentioned above.

ATTACHMENT 1

HAYWOOD COUNTY PLANNING DEPARTMENT LETTER

Haywood County Planning Department
Courthouse Annex II
1233 N. Main St., Suite 2-30
Waynesville, NC 28786
(828) 452-6632
(828) 452-6708
Fax (828) 452-6767

RECEIVED
SEP 26 2008
BLUE RIDGE PAPER PRODUCTS INC
BHS DEPARTMENT

Mr. Jim Giauque
Blue Ridge Paper Products Inc.
175 Main Street
Canton, North Carolina 28716

SUB: FEMA Flood Map Determination
Parcel Identification Number **8647-76-6665**
Blue Ridge Paper Landfill Site

Dear Mr. Giauque:

Per your request, the Haywood County Planning Office has reviewed the above parcel identification number for flood hazard information.

Upon review, a portion of the parcel is in the special flood hazard area. A small portion of this parcel is located in Zone A and Zone B per FEMA FIRM Map 370120 0115B effective date July 15, 1984. The majority of the parcel is located in Zone C per FEMA FIRM Map 370120 0115B effective date July 15, 1984. Any development in a Special Flood Hazard Area requires a Flood Development Permit from Haywood County.

Attached please find a copy from FEMA FIRM Map 371020 0115B effective date July 15, 1984.

Haywood County has received new preliminary Flood Insurance Rate Maps from the North Carolina Department of Crime Control and Public Safety. The maps are expected to be effective in late 2009. At such time the new FIRM maps are effective; this letter of flood determination will become void.

Sincerely,

Jodie C. Ferguson

Jodie C. Ferguson
Haywood County
Assistant Planner

Cc: Kris Boyd, Haywood County Planning Director

o determine if flood insurance is available in this community, ontact your insurance agent, or call the National Flood Insurance ogram at (800) 638-6620.

APPROXIMATE SCALE

1000 0 1000 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

HAYWOOD COUNTY, NORTH CAROLINA
(UNINCORPORATED AREAS)

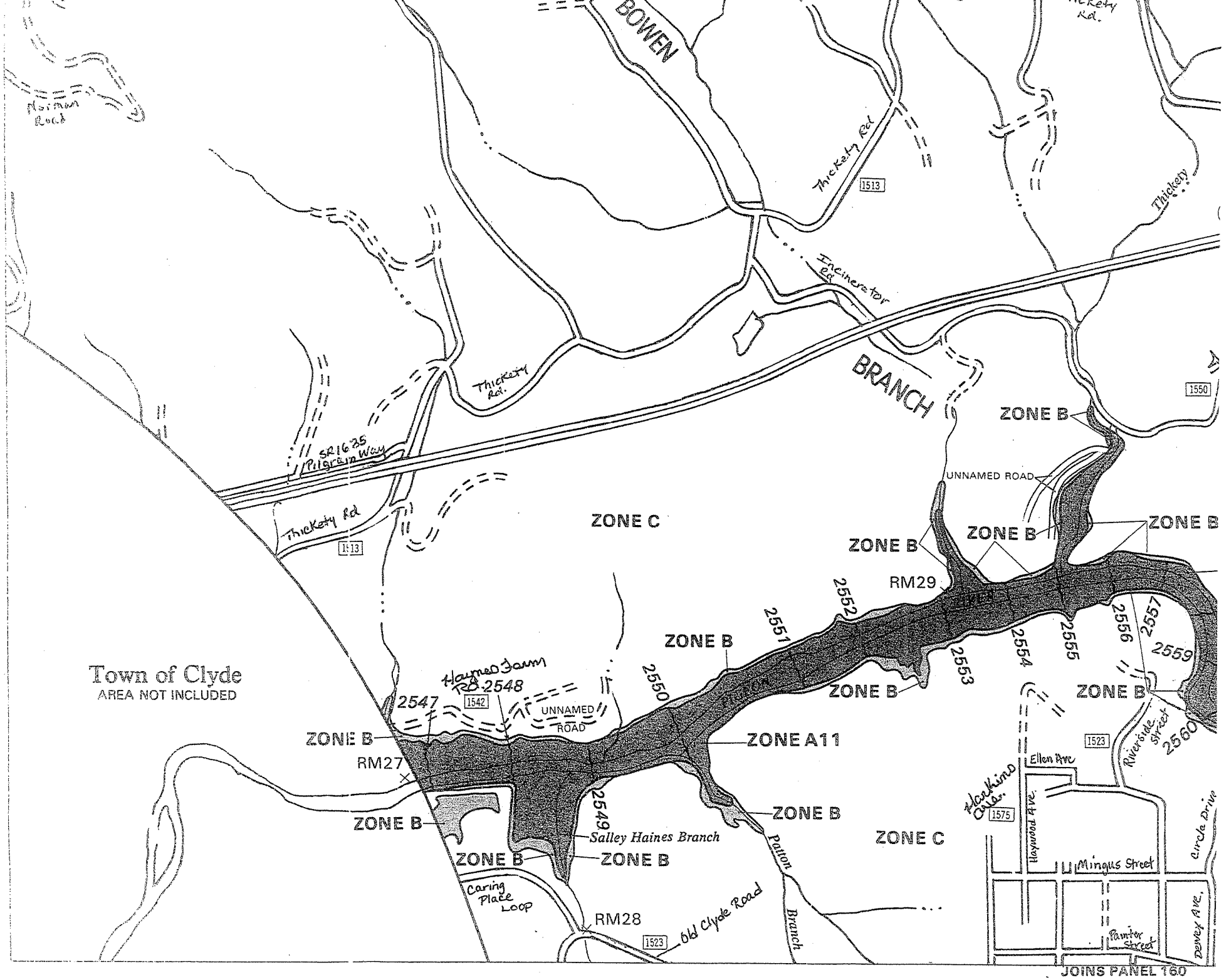
PANEL 115 OF 250

(SEE MAP INDEX FOR PANELS NOT PRINTED)

COMMUNITY-PANEL NUMBER
370120 0115 B

EFFECTIVE DATE:
JULY 15, 1984

Federal Emergency Management Agency



BOWEN
BRANCH
Norman Road
Thickety Rd
1513
Thickety Rd.
Incinerator Rd
Thickety
1550
SR1635 Pilgrim Way
Thickety Rd
1513
ZONE C
ZONE B
UNNAMED ROAD
ZONE B
ZONE B
ZONE B
RM29
2552
2551
2550
2553
2554
2555
2556
2557
2559
2560
ZONE B
ZONE B
ZONE B
Town of Clyde
AREA NOT INCLUDED
Haynes Farm Rd.
2548
2547
1542
UNNAMED ROAD
ZONE B
RM27
ZONE A11
1523
Riverside Street
Ellen Ave
Hankins Cala.
1575
Haywood Ave.
Circle Drive
ZONE B
2549
ZONE B
Salley Haines Branch
ZONE B
ZONE B
ZONE C
Patton Branch
Mingus Street
Caring Place Loop
RM28
1523
Old Clyde Road
Painter Street
Dewey Ave.
JOINS PANEL 160

NOTE:

100% of Development occurs within ZONE C. NO WORK OR LAND DISTURBANCE TO OCCUR IN ZONE B.

NOTES:

MAPPING FOR LANDFILL AREA COMPILED USING PHOTOGRAMMETRIC METHODS FROM AERIAL PHOTOGRAPHY DATED MARCH 5, 2008

LOCATIONS OF OBJECTS SHOWN AND CONTOURS ARE APPROXIMATE. SITE CONDITIONS HAVE CHANGED SINCE THE COMPILATION OF THIS MAP AND STANDARD PRACTICE DICTATES THAT PLANS COMPILED IN THIS MANNER SHOULD BE FIELD VERIFIED, AS THE DESIGN MAY REQUIRE FIELD ADJUSTMENT FOR CONSTRUCTION.

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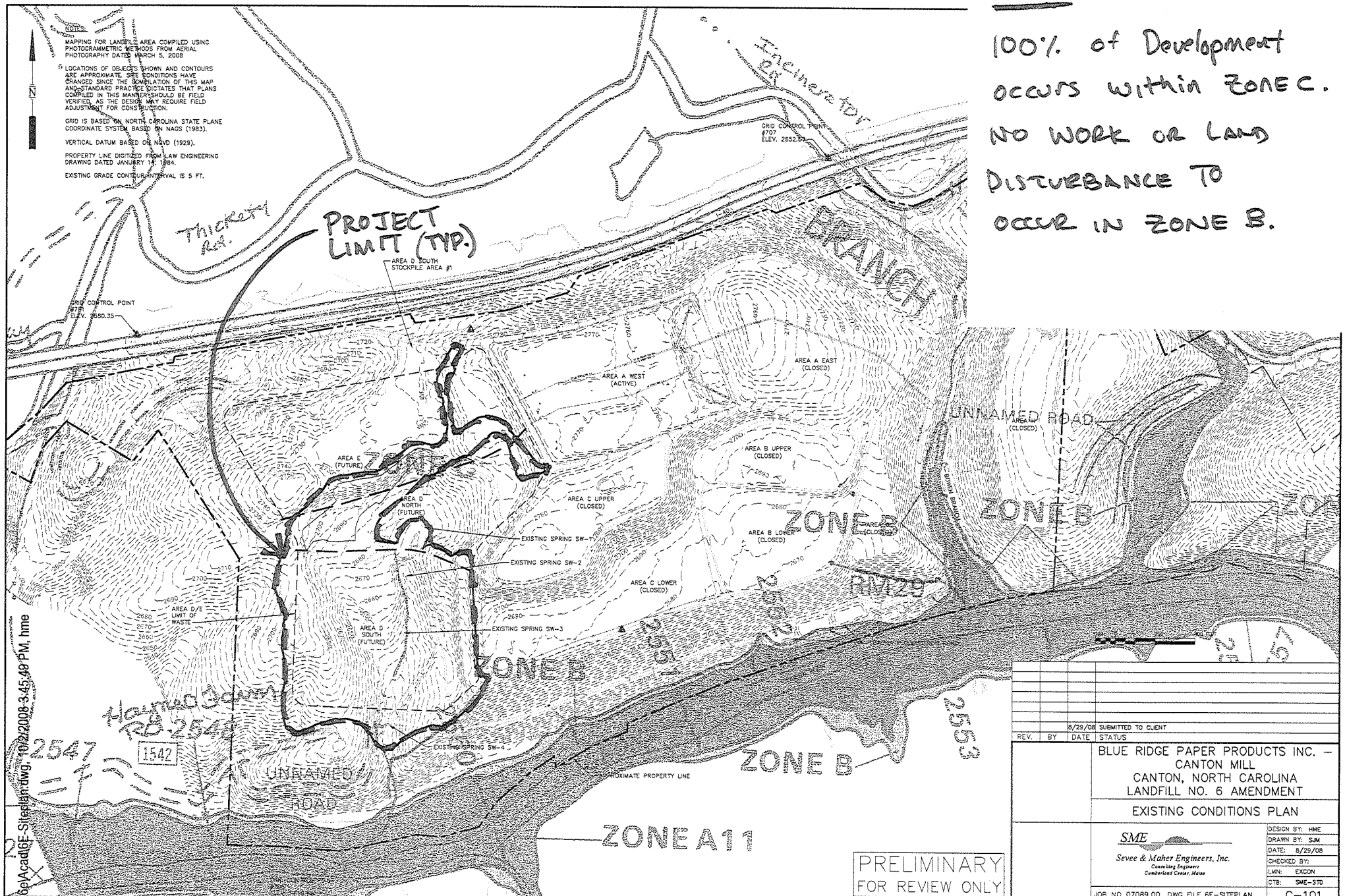
EXISTING GRADE CONTOUR INTERVAL IS 5 FT.



REV.	BY	DATE	STATUS
		8/29/08	SUBMITTED TO CLIENT

BLUE RIDGE PAPER PRODUCTS INC. – CANTON MILL
CANTON, NORTH CAROLINA
LANDFILL NO. 6 AMENDMENT

EXISTING CONDITIONS PLAN

SME
Sevee & Maher Engineers, Inc.
Consulting Engineers
Cumberland Center, Maine

DESIGN BY: HME
DRAWN BY: SJM
DATE: 8/29/08
CHECKED BY:
LMN: EXCON
CTB: SME-STD

JOB NO. 07089.00 DWG FILE 6E-SITEPLAN

C-101

P:\BrppNC\6eAcad\6E-Siteplan.dwg, 10/2/2008 3:45:48 PM, hme

— FEMA MAP OVERLAID ON SITE PLAN —

ATTACHMENT 2

LANDFILL LINER ANALYSIS

ANALYSIS OF LANDFILL LINER SYSTEM

LANDFILL NO. 6
AREA D – SOUTH

Prepared for:

BLUE RIDGE PAPER PRODUCTS INC. –
CANTON MILL
DIVISION OF EVERGREEN PACKAGING
CANTON, NORTH CAROLINA

NOVEMBER 2008

SME

Sevee & Maher Engineers, Inc.
Waste Management and Hydrogeologic Consultants
Cumberland Center, Maine

NORTH CAROLINA PROFESSIONAL SEAL 20589 ENGINEER JOHN E. SEVEE

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ANALYSIS OF LANDFILL LINER SYSTEM
LANDFILL NO. 6 - AREA D SOUTH
BLUE RIDGE PAPER PRODUCTS INC. – CANTON MILL
DIVISION OF EVERGREEN PACKAGING
CANTON, NORTH CAROLINA

EXECUTIVE SUMMARY

Blue Ridge Paper Products Inc. - Canton Mill (Blue Ridge) owns and operates Landfill No. 6 (Permit #44-06) located approximately two miles northwest of the City of Canton in Haywood County, North Carolina. Blue Ridge proposes to begin construction of Area D South located within the permitted Landfill No. 6. Under adopted industrial waste rules, 15A NCAC 13B Section .0503(2)(d)(ii)(A), the State of North Carolina Department of Environment and Natural Resources, Division of Solid Waste requires an assessment of the proposed liner system for Area D South. The assessment is required to estimate potential groundwater quality impact at the downgradient point of compliance.

The potential impact of the proposed landfill on the groundwater was evaluated by modeling the landfill design and site characteristics. The modeling study included the use of the HELP computer model, version 3.05, and a mass balance dilution analysis. The HELP model is a U.S.EPA sponsored model used for evaluating the performance of landfill designs. The HELP model input included: waste characteristics; leachate collection design; landfill liner components; construction quality control; and site climatological data. The HELP model results indicated that the leakage rate from the landfill would be on the order of 0.015 cubic feet/acre/year. The hydrogeologic assessment indicates the groundwater beneath Area D South flows towards the south and into the Pigeon River.

Leachate water samples were obtained from the current active landfill cell, Area A West, and analyzed by a State certified laboratory. The laboratory data for the leachate showed twenty constituents with concentrations above North Carolina's groundwater standards: arsenic, barium,

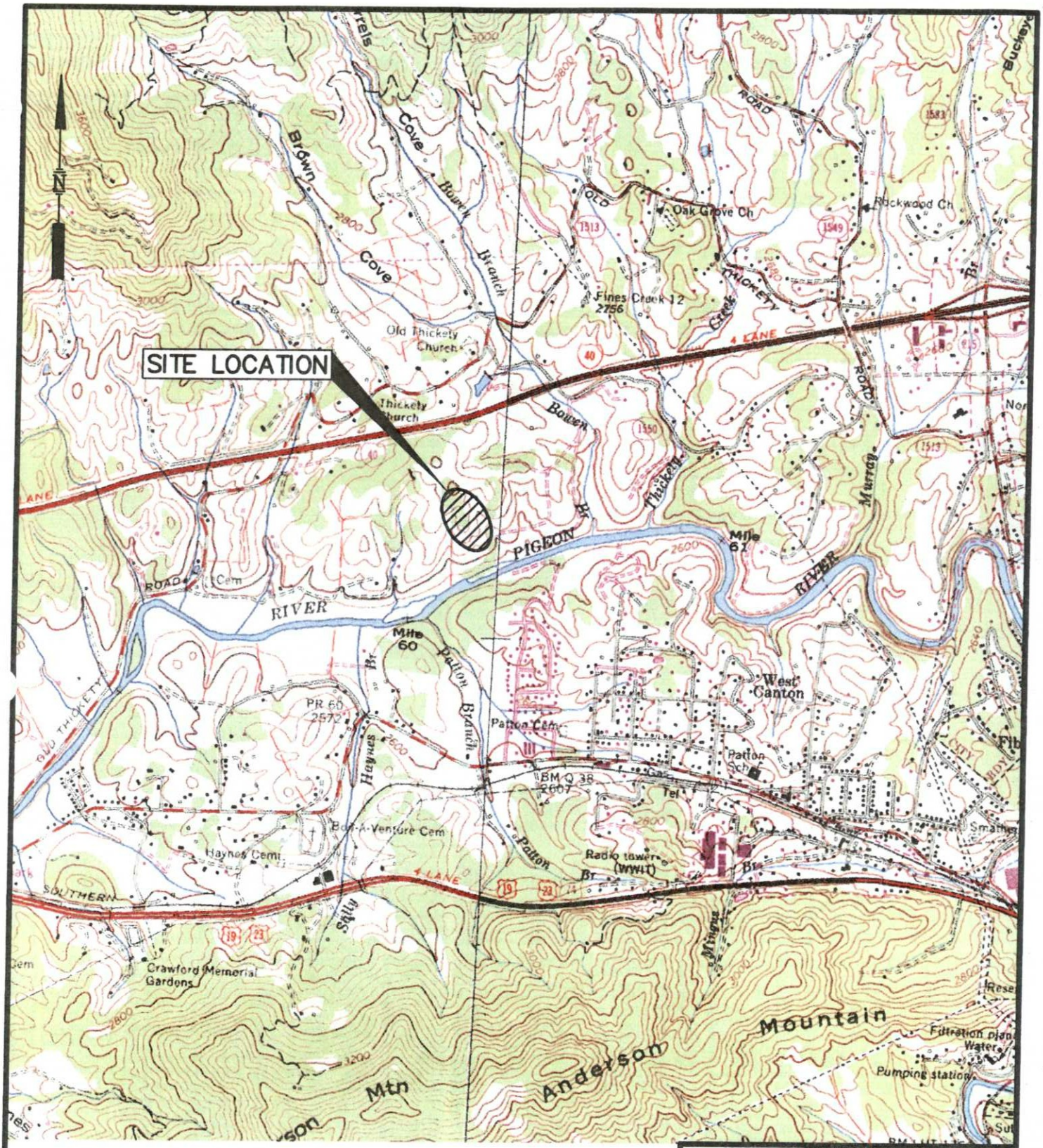
cadmium, chloride, coliform organisms, color, dissolved solids (total), cyanide, fluoride, iron, lead, manganese, nickel, nitrite, phenol, selenium, silver, sulfate, toluene and zinc.

The leakage rate from the HELP model was used along with the leachate water quality data in a mass balance dilution analysis. Given the use of conservative assumptions throughout the evaluation, the results of the mass balance dilution analysis estimated the concentration of constituents to be up to several orders of magnitude below their respective groundwater standards at the model boundary, Pigeon River. Based on the assessment, the landfill liner and leachate collection system proposed for Area D South, will not cause any 2L listed compounds to exceed groundwater standards beyond the landfill property.

1.0 INTRODUCTION

Blue Ridge currently owns and operates Landfill No. 6 located approximately two (2) miles northwest of the City of Canton in Haywood County, North Carolina (refer to Figure 1-1). The site has been in operation since 1984. The original design for the landfill incorporates eight (8) major landfilling areas designated as Areas A through H. Area D is subdivided into two smaller units identified as Area D North and Area D South. Area A West is currently being filled with waste at the time of this writing and areas A East, B, C, F, G, and H have all been constructed, filled with waste, and capped. Areas D and E have not been constructed as of this writing.

The landfill is situated on a rolling to rather steeply sloping parcel of land. Bowen Branch flows through a ravine on the eastern side of the property in a generally north-south direction. Pigeon River bounds the parcel to the south. Area D South is approximately 600 feet north of the Pigeon River and approximately 2,500 feet west of Bowen Branch. Bowen Branch drains into the Pigeon River along the southeastern boundary of the parcel.



BASE MAP ADAPTED FROM 7.5 MIN USGS TOPO QUADS
CANTON, NC – 1990
CLYDE – 1978

1000 0 2000 4000 FEET

FIGURE 1-1
SITE LOCATION PLAN
BLUE RIDGE PAPER PRODUCTS INC. – CANTON MILL
CANTON, NORTH CAROLINA
LANDFILL NO. 6 EXPANSION

SME
Sevee & Maher Engineers, Inc.

DWG: 6E-SITELOC LMN: NONE CTB: SME-STD REV:

P:\Brpp\NC\6e\Acad\6 ELOC.dwg, 9/30/2008 2:08:41 PM, sjm

Blue Ridge is in the process of permitting Area D South for construction. In accordance with 15A NCAC 13B Section .0503(2)(d)(ii)(A) an assessment of the proposed liner system is necessary to estimate potential groundwater quality impact at the downgradient point of compliance, specifically, Pigeon River. Pigeon River is supplied in part by discharge from groundwater (i.e. base flow). Therefore, the river is the nearest receptor of groundwater from the area of the landfill and is the nearest point of compliance for the purpose of this analysis.

2.0 GUIDELINES FOR ANALYSIS

The landfill liner design was analyzed using State of North Carolina guidelines for industrial solid waste landfills (15A NCAC 13B Section .0503(2)(d)(ii)(A)), to demonstrate the adequacy of the landfill design relative to groundwater quality. Specifically, an analysis of downgradient groundwater quality must show that the design will not allow certain compounds that may be present in landfill leachate to exceed U.S.EPA established groundwater Maximum Contaminant Levels (MCLs) at the relevant point(s) of compliance. The analysis considers the following items:

- The hydrogeologic characteristics of the facility and surrounding land;
- Climatic factors of the area;
- The leachate quality and quantity;
- Leachate leakage to the subsurface (i.e. groundwater); and
- Subsurface transport to the point(s) of compliance.

3.0 LEACHATE QUALITY

Blue Ridge's Landfill No. 6 is permitted for the disposal of boiler fly ash, cinders, dewatered wastewater treatment sludge, lime mud, woodwaste, and asbestos containing material (ACM). The primary source of waste accepted is wastewater treatment sludge that accounts for approximately 60 percent of the waste disposed of at Landfill No. 6.

Results of water quality analyses of the Landfill No. 6 leachate, provided by Pace Analytical, Inc., and Blue Ridge's laboratories in West Nyack, New York and Canton, North Carolina, were reviewed to determine initial leachate concentrations of each compound listed in the Standards from 15A NCAC 2L Section .0202(g). Specifically, analytical results from April 25, 1997, May 21, 1997, October 15, 1996, June 24, 1996, July 7, 1997, November 19, 1997, May 2005, November 2005, May 2006, November 2006, May 2007, November 2007, and May 2008 were referenced. The laboratory results are listed on Table 2-1 and the laboratory analyses are found in Appendix A. From the list of 88 compounds on Table 2-1, 81 were analyzed and reported by the laboratory. The seven compounds not tested include foaming agents, three synthetic organic compounds, gross alpha, and radium. The parameters not tested are not suspected to be present in the leachate based on Blue Ridge's knowledge of the process waste streams. Gross alpha particle activity and radium compounds are typically hydrophobic and not partitioned to the landfill leachate and are not suspected to be present in Blue Ridge's process waste stream. It should also be noted that several of the laboratory reporting limits were higher than the respective groundwater standard, which is not uncommon for these types of samples and analytes. This was due to the characteristics of the sample, e.g. excessive foaming, which required dilution prior to analyzing the sample.

TABLE 2-1

LEACHATE LABORATORY RESULTS

Chemical	Standard[1] (mg/l)	Laboratory Result (mg/l)
Acetone	0.7	*ND (1.0)*
Acrylamide (propenamide)	0.000008	*ND (1.0)*

Chemical	Standard[1] (mg/l)	Laboratory Result (mg/l)
Arsenic	0.05	**1.1**
Barium	2.0	0.1
Benzene	0.001	*ND (0.05)*
Boron	0.315	ND (0.2)
Bromoform (tribromomethane)	0.00443	*ND (0.05)*
Butylbenzyl phthalate	0.10	ND (0.010)
Cadmium	0.00175	**0.1**
Carbofuran	0.035	Not Tested
Carbon tetrachloride	0.000269	*ND (0.05)*
Chlordane	1.0×10^{-4}	*ND (0.004)*
Chloride	250.0	232
Chlorobenzene	0.05	ND (0.05)
Chloroform (trichloromethane)	0.007	*ND (0.05)*
2-Chlorophenol	0.00036	*ND (0.010)*
Chromium	0.05	ND (0.05)
Cis-1,2-dichloroethene	0.07	ND (0.05)
Coliform organisms (total)	1 per 100 milliliters	**6,225**
Color	15 color units	**1,607**
Copper	1.0	ND (0.5)
Cyanide	0.07	0.004
2,4-D (2,4-dichlorophenoxy acetic acid)	0.07	ND (0.012)
1,2-Dibromo-3-chloropropane	2.5×10^{-5}	*ND (0.05)*
Dichlorodifluoromethane (Freon-12; Halon)	1.4	ND (0.050)
1,1-Dichloroethane	0.07	ND (0.05)
1,2-Dichloroethane (ethylene dichloride)	0.00038	*ND (0.05)*
1,1-Dichloroethylene (vinylidene chloride)	0.007	*ND (0.05)*
1,2-Dichloropropane	0.00051	*ND (0.05)*
Di-n-butyl (or dibutyl) phthalate (DBP)	0.7	ND (0.010)
Diethylphthalate (DEP)	5.0	ND (0.010)
Di(2-ethylhexyl) phthalate (DEHP)	0.0025	*ND (0.010)*
Di-n-octyl phthalate	0.14	ND (0.010)
P-dioxane (1,4-diethylene dioxide)	0.007	Not tested
Dioxin	2.2×10^{-10}	ND (1 ppq)
Dissolved solids (total)	500	**18,700**
Diundecyl phthalate (Santicizer 711)	0.14	Not tested
Endrin	0.002	ND (0.0012)
Epichlorohydrin (1-chloro-2,3-epoxypropane)	0.00354	*ND (0.025)*
Ethylbenzene	0.55	*ND (0.05)*
Ethylene dibromide (EDB; 1,2-dibromoethane)	4.0×10^{-7}	*ND (0.00001)*
Ethylene glycol	14.0	*ND (10)*
Fluorene	0.28	ND (0.010)
Fluoride	2.0	**10**
Foaming agents	0.5	Not Tested
Gross alpha (adjusted) particle activity (excluding radium-226 and uranium)	15 pCi/l	Not Tested
Heptachlor	7.8×10^{-6}	*ND (0.001)*
Heptachlor epoxide	3.8×10^{-6}	*ND (0.016)*
Heptane	0.42	ND (0.025)

Chemical	Standard[1] (mg/l)	Laboratory Result (mg/l)
Hexachlorobenzene (perchlorobenzene)	0.00002	*ND (0.010)*
N-hexane	0.42	ND (0.025)
Iron	0.3	**0.5**
Lead	0.015	**0.5**
Lindane	2.0×10^{-4}	*ND (0.001)*
Manganese	0.05	**0.29**
Mercury	0.00105	ND (0.0008)
Metadichlorobenzene (1,3-dichlorobenzene)	0.17	ND (0.010)
Methoxychlor	0.035	ND (0.010)
Methylene chloride (dichloromethane)	0.0046	*ND (0.100)*
Methyl ethyl ketone (MEK; 2-butanone)	4.2	*ND (1.0)*
Methyl tert-butyl ether (MTBE)	0.2	ND (0.025)
Naphthalene	0.021	ND (0.010)
Nickel	0.1	**0.5**
Nitrate	10.0	ND (0.2)
Nitrite	1.0	0.02
Orthodichlorobenzene (1,2-dichlorobenzene)	0.024	*ND (0.05)*
Oxamyl	0.175	Not tested
Paradichlorobenzene	0.0014	*ND (0.05)*
Pentachlorophenol	0.00029	*ND (0.050)*
pH	6.5 - 8.5	7.9
Phenanthrene	0.21	ND (0.010)
Phenol	0.30	0.01
Radium-226 and radium-228 (combined)	5 pCi/l	Not Tested
Selenium	0.05	**0.5**
Silver	0.0175	**0.2**
Styrene (ethenylbenzene)	0.1	ND (0.05)
Sulfate	250.0	**1190**
Tetrachloroethylene (perchloroethylene; PCE)	0.0007	*ND (0.05)*
Toluene (methylbenzene)	1.0	0.054
Toxaphene	3.1×10^{-5}	*ND (0.0024)*
2,4,5-TP (Silvex)	0.05	ND (0.002)
Trans-1,2-dichloroethene	0.1	ND (0.05)
1,1,1-Trichloroethane (methyl chloroform)	0.2	ND (0.05)
Trichloroethylene (TCE)	0.0028	*ND (0.05)*
Trichlorofluoromethane	2.1	ND (0.05)
Vinyl chloride (chloroethylene)	1.5×10^{-5}	*ND (0.100)*
Xylenes (o-, m-, and p-)	0.53	ND (0.05)
Zinc	1.05	0.1

Notes

1. Standards from 15A NCAC 2L Section .0202(g), dated October 25, 1994.

ND Not detected above reporting limit shown in parenthesis.

660 results in bold exceed standard.

ND (0.001) results in italic are reported below detection; however the detection limit exceeds the standard.

From the data reviewed, the compound values that exceeded laboratory detection levels in the leachate were arsenic, barium, cadmium, chloride, coliform organisms, color, dissolved solids (total), cyanide, fluoride, iron, lead, manganese, nickel, nitrite, phenol, selenium, silver, sulfate, toluene and zinc. Of these, arsenic, cadmium, coliform organisms, color, dissolved solids (total), fluoride, iron, lead, manganese, nickel, selenium, silver, and sulfate were the only compounds detected above their groundwater standards listed on Table 2-1 (laboratory results in **Bold**). The compounds used in the HELP model liner analysis included compounds detected above the groundwater standards. In addition, the analysis included compounds where the laboratory results were reported below detection limits, and where the laboratory reporting limits were above the groundwater standards. The compounds meeting the previous condition are shown in *italic* on Table 2-1.

4.0 LEAKAGE TO SUBSURFACE

4.1 Method

To determine the potential quantity or rate of leakage from the landfill under the current design, the U.S.EPA sponsored Hydrologic Evaluation of Landfill Performance (HELP) Model, Version 3.05, was used. The HELP model is a quasi-two-dimensional, deterministic computer-based water budget model developed by the U.S. Army Corps of Engineers' Waterways Experiment Station. The model uses climatologic, soil characteristic and landfill design input data to compute a water balance which includes: runoff; evapotranspiration; infiltration; lateral drainage; and leakage through the liner system.

4.2 Model Input

The HELP model evaluation utilized available rainfall data collected at Canton, North Carolina as obtained from NOAA, and default temperature, solar radiation and evapotranspiration data from Asheville, North Carolina. Climatologic Input data are summarized on the computer output sheets found in Appendix B.

The landfill cross-section input into the HELP model to determine the potential leakage rate from the landfill consisted of five layers. The model layers are described below beginning from the uppermost layer proceeding to the landfill base. The first layer consists of the solid waste which was entered with a hydraulic conductivity of 1.4×10^{-6} cm/sec which is the default data for solid wastes consisting of predominantly papermill wastewater treatment sludge, bottom ash, and lime mud. A washed stone layer is located directly beneath the waste and serves as the leachate collection system along with a series of piping laterals and headers. The hydraulic conductivity of the washed stone was entered as 3.0×10^{-1} cm/sec, which is the default data for a stone or gravel material. An average base slope of 8 percent with a pipe spacing of 200 feet was utilized for the leachate collection layer.

The liner beneath the leachate collection layer in Area D South is proposed to consist of a 60-mil high density polyethylene (HDPE) geomembrane. The liner was represented using a hydraulic conductivity of $2x10^{-13}$ cm/sec, which is the default value for an HDPE geomembrane in the HELP model. A pinhole density and installation defect (i.e. holes in liner) rate of 1 per acre, for each, was selected based on the liner installation specification which includes independent quality assurance testing and liner installation monitoring. A copy of the liner installation specification is included in Appendix D of the Design Report.

The secondary liner on the base of Area D-South beneath the geomembrane layer is proposed to consist of a 240-mil Geosynthetic Clay Liner (GCL) geocomposite. The liner was represented using a hydraulic conductivity of $5x10^{-9}$ cm/sec, which is the accepted value for a GCL geocomposite.

A compacted soil layer is located directly beneath the geocomposite and serves as a separation layer between bedrock and/or groundwater and the geocomposite. The hydraulic conductivity of the soil layer was entered as $5x10^{-5}$ cm/sec. The hydraulic conductivity value for the soil is based on laboratory testing of remolded on-site soils.

4.3 Results of HELP Model

As shown in Appendix B-1, the average annual precipitation at the landfill is equal to 39.7 in/acre/yr. Based on the HELP model, the precipitation is distributed to the environment accordingly:

- 54 percent (21.5 inches) evapotranspires to the atmosphere;
- 23 percent (9.1 inches) runs off the waste into the chimney drain or infiltrates the waste to become leachate and is collected and treated;

- (0.00 inches) leaks through the liner system and enters the groundwater. This amount of leakage to the subsurface (0.015 ft^3/acre/year) was utilized in the analysis of subsurface transport to be discussed below; and
- The remaining water is absorbed into the waste and is classified in the HELP model as "change in water storage".

5.0 SUBSURFACE TRANSPORT

5.1 Site Hydrogeologic Characteristics

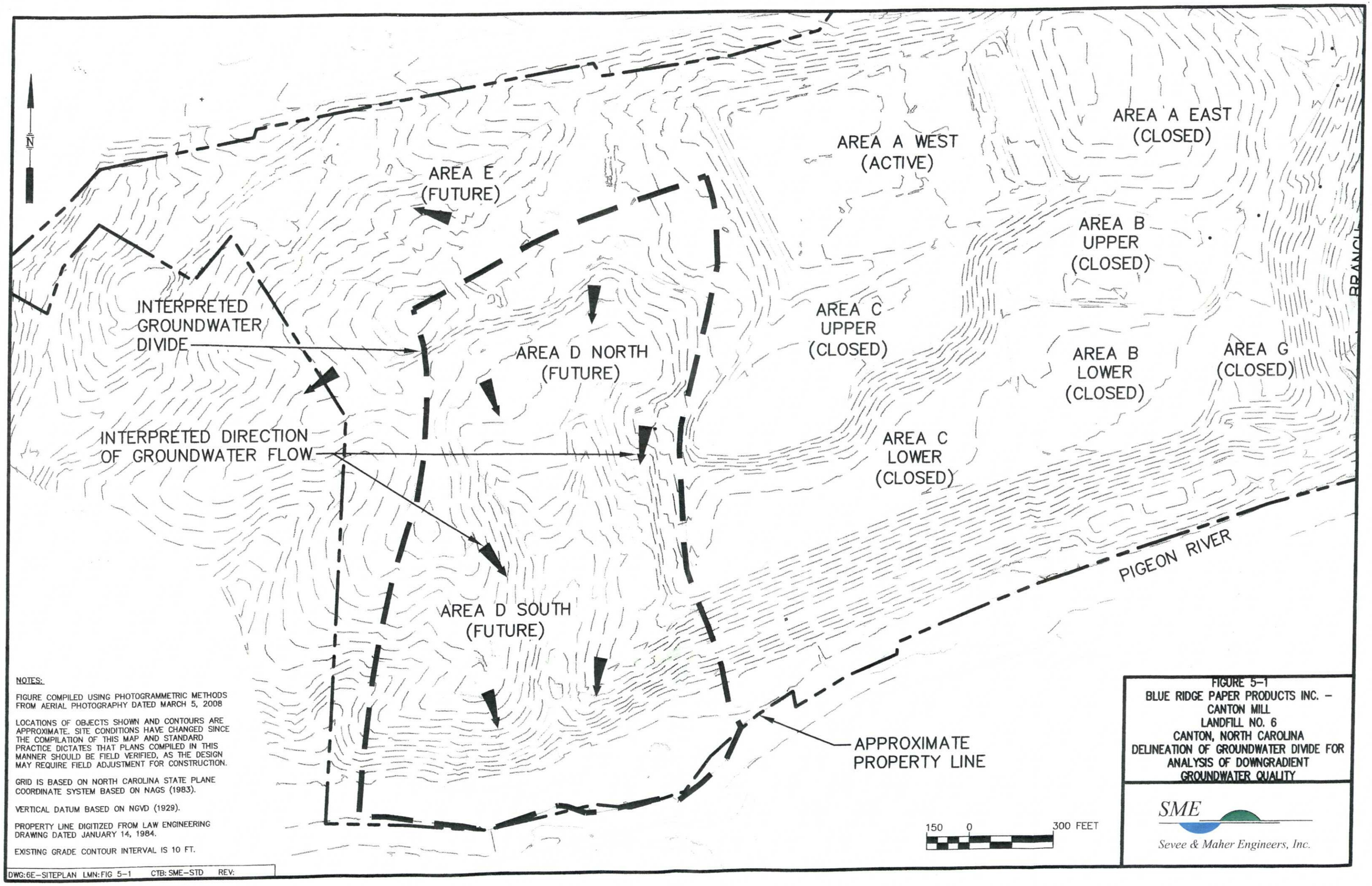
Landfill No. 6 has been the subject of past assessments and site investigations as part of earlier landfill expansion phases. Law Engineering and Testing Company (Law) prepared *Geotechnical Exploration and Evaluation and Conceptual Site Development Recommendations* for the entire Landfill No. 6 site in 1982, which included a detailed description of the interpreted hydrogeologic setting (Law, 1982). Also, Sirrine Environmental Consultants (Sirrine, 1989), Sevee & Maher Engineers, Inc. (SME, 1997), and Roy F. Weston, Inc. (Weston, 1995) have prepared related designs, construction documentation, and hydrogeologic reports which provided hydrogeologic information related to previous expansions at Landfill No. 6. More recently, SME conducted a site investigation in 2007 to characterize the hydrogeology of the proposed Areas D & E landfill expansion area and gather information required by Rule 15A NCAC 13B.0588 of the North Carolina Department of Environment and Natural Resources (DENR) Solid Waste Management Regulations. The hydrogeologic data collected from 52 new piezometers provides the necessary information to be used in modeling the anticipated subsurface transport of leachate, such as, soil hydraulic conductivities, soil types, thicknesses, and waste properties. The installation details for the piezometers are shown on boring logs in Appendix A of the Design Hydrogeologic Report, which is contained in Attachment 3 of Volume I.

Located in the Blue Ridge Physiographic Province of North Carolina, the subsurface lithology reflects the weathering of the igneous and metamorphic parent bedrock. The unconsolidated formation ranged between 10 to over 60 feet within the proposed footprint of Areas D and E, and consisted predominantly of saprolite. Beneath the friable saprolite, a dense (i.e. residual material with blow counts in excess of 50 to over 100 blows per foot), partially-weathered rock (PWR) is often encountered overlying bedrock. The bedrock surface is quite irregular and erratic, even over short horizontal distances, and can be variably weathered and fractured. Alluvial deposits are present locally across the landfill, a function of erosion from sideslopes by surface water and

fluvial processes along the Pigeon River. Mass transport of surficial soils accumulates colluvium downslope in the draws and ravines. The grain size distribution is variable, ranging from silty fine to coarse sands to clayey sandy silts. Mica is commonly encountered, frequently in abundance. Gravel and rock fragments are also present, and are typical in the transitional zone between the saprolite and the bedrock.

The regional groundwater seepage direction is interpreted to be generally to the south as shown in Figure 5-1, towards the Pigeon River, with precipitation recharge being transported primarily in the saprolite. Local groundwater flow directions are controlled more by the geomorphic features of the area, with topographic ridges creating local groundwater divides and groundwater traveling in the direction of downsloping topography. Landfill No. 6 is bounded on the east and west sides by several ridges that appear to run from north to south. Local groundwater flow in Area D is confined by the ridges and moves towards a ravine between the ridges and southerly toward the Pigeon River. A spring discharges to the ravine, where surface water flow rates between 4 to 6 gallons per minute were measured during 2007 site investigation. A groundwater divide in Area E near its border with Area D results in a westerly groundwater flow direction beneath Area E. Water levels measured in nested piezometers indicated groundwater flow in the Areas D and E is primarily horizontal but with slight downward gradients beneath the ridges and slight upward gradients beneath the draws. An upward component to groundwater flow in the northern portion of Area D was also evident (P-07-211A and B).

SME conducted in situ slug tests in 46 piezometers within and surrounding Areas D and E to calculate the hydraulic conductivity of the unconsolidated unit and the underlying bedrock. The results of this testing are summarized in Table 5-1.



NOTES:

FIGURE COMPILED USING PHOTOGRAMMETRIC METHODS FROM AERIAL PHOTOGRAPHY DATED MARCH 5, 2008

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PROPERTY LINE DIGITIZED FROM LAW ENGINEERING DRAWING DATED JANUARY 14, 1984.

EXISTING GRADE CONTOUR INTERVAL IS 10 FT.

DWG:6E-SITEPLAN LMN:FIG 5-1 CTB: SME-STD REV:

FIGURE 5-1
BLUE RIDGE PAPER PRODUCTS INC. –
CANTON MILL
LANDFILL NO. 6
CANTON, NORTH CAROLINA
DELINEATION OF GROUNDWATER DIVIDE FOR
ANALYSIS OF DOWNGRADIENT
GROUNDWATER QUALITY

SME
Sevee & Maher Engineers, Inc.

P:\Brp\NC\6e\Acad\6E-Siteplan.dwg, 10/1/2008 11:51:48 AM, hme

TABLE 5-1

SUMMARY OF IN SITU HYDRAULIC CONDUCTIVITY TESTS FROM AREAS D & E

Groundwater Zone Screened	Number of Piezometers Tested	In Situ Hydraulic Conductivity			
		Range		Geometric Mean	
		(cm/sec)		(cm/sec)	(ft/day)
Reworked Residual Soil	1	-	2.3E-04	-	0.6
Alluvium	1	-	1.2E-03	-	3.5
Colluvium	3	3.0E-05	3.1E-02	5.7E-04	1.6
Saprolite	8	6.3E-07	2.2E-03	9.1E-05	0.3
PWR	10	4.8E-06	6.0E-03	1.4E-04	0.4
Fractured Bedrock	10	1.7E-05	5.5E-03	3.5E-04	1.0
Competent Bedrock	12	8.2E-10	1.5E-03	1.4E-05	0.04

The saprolite and PWR have similar hydraulic conductivities. Under the prevailing horizontal seepage gradient (0.06 to 0.07) and effective porosity of 0.3, groundwater movement through the saprolite and PWR would be in the order of 30 feet per year through the shallow groundwater flow system beneath Area D and E. The calculated travel time for groundwater to reach the Pigeon River from the boundary of Area D is in the order of 6 years. Shallow groundwater leaving Area E is calculated to reach the western property boundary of Landfill No. 6 in about 12 years.

5.2 Numerical Analysis of Downgradient Groundwater Quality

The downgradient point of compliance was determined by reviewing hydrogeologic reports prepared for the site and preparing a groundwater potentiometric map with water levels obtained from the wells around the perimeter of the site and the P-07-200-series piezometers in Area D South. Based on the data it was concluded that groundwater within Area D South flows southerly toward Pigeon River.

To determine potential groundwater concentrations in the downgradient vicinity of Pigeon River (i.e. discharging water), a mass balance dilution analysis was performed. A groundwater-shed was delineated based on measured groundwater levels and topographical information to include the landfill and upgradient areas that drain toward the landfill and eventually into Pigeon River.

The recharge rate to groundwater beyond the landfill limits was estimated using the HELP model. Based on the Canton, North Carolina precipitation data obtained from NOAA, precipitation recharge rates were calculated to be approximately 11 inches per year by the HELP model, see Appendix B. Therefore, a precipitation recharge rate of 11 inches per year was assumed through the entire watershed, excluding the Area D South Landfill. The estimated leakage rate for Area D South during operations is 0.015 cubic feet/acre/year based on HELP modeling results.

The initial leachate concentrations were determined by the laboratory results discussed in Section 2.0. The parameters that were included in the analysis with below detection results were set at one-half the detection limit. Results of the mass balance dilution analysis indicate that the compounds in the leachate will have no effect in the groundwater above 2L standards at the point of discharge to Pigeon River. Calculations are contained in Appendix C.

The mass balance analysis shows that leachate constituent concentrations are reduced by several orders-of-magnitude from their original values (and therefore significantly less than their respective groundwater standards) prior to reaching Pigeon River. Because the above analysis results in such low concentrations in the groundwater, and the leachate is free of most of the compounds listed in Table 2-1, a more detailed groundwater transport analysis is not necessary. Consideration of complex geochemical processes (soil adsorption, precipitation, decay, and dispersion), and the influence of solute velocity and concentration stability, would tend to further decrease the predicted concentrations of leachate constituents in groundwater in the Pigeon River.

6.0 CONCLUSIONS

Blue Ridge is proposing to construct Landfill No. 6 Area D South with a liner system consisting of a 5-foot thick soil layer meeting a hydraulic conductivity of less than or equal to $5x10^{-5}$ cm/sec, overlain by a 240-mil GCL geocomposite and 60-mil HDPE geomembrane, and leachate collection system. The hydrogeologic assessment for Landfill No. 6 Area D South indicates the groundwater beneath Area D South will flow towards the south and into Pigeon River.

The model inputs which included hydrogeologic characteristics of the site, climatic factors, and characteristics of the leachate, show the proposed landfill liner system for Landfill No. 6 Area D South will meet the criteria of 15A NCAC 13B Section .0503(2)(d)(ii)(A). Specifically, the landfill liner system for Area D South will not cause groundwater concentrations of leachate compounds to exceed groundwater standards beyond the landfill property.

APPENDIX A

LEACHATE LABORATORY RESULTS

Canton Mill, Canton NC
Area 6D South
Mass Balance Calculation for 2L Standard

GIVEN:

Watershed Area (Acres)	51	
Landfill Area- Open Base (Acres)	11	
Landfill Area- Open Side (Acres)	5	
Precipitation Recharge (in/yr)	10.7	HELP Model (Groundwater Recharge)
Landfill Leakage Rate-Base (cf/ac/yr)	0.015	HELP Model (Leakage through liner - 6D-South Base)
Landfill Leakage Rate-Side (cf/ac/yr)	2.039	HELP Model (Leakage through cap - 6D-South Side)

Groundwater Recharge throughout watershed less landfill area (cf/yr) 1359435

Leakage from landfill (cf/yr) 10

Determine concentration at Pigeon River:

Concentration(Pigeon River)=((Concentration(Lab)*Leakage Rate)/(GW Recharge + Leakage Rate))

Chemical	Laboratory Standard (mg/l)		Laboratory Result (mg/l)	Estimated Concentration at Pigeon River (mg/l)	Standard Met
Acetone	0.7	ND	1	3.8E-06	ok
Acrylamide (propenamide)	0.000008	ND	1	3.8E-06	ok
Arsenic	0.05		1.015	7.7E-06	ok
Barium	2		0.126	Below Standard	ok
Benzene	0.001	ND	0.05	1.9E-07	ok
Boron	0.315	ND	0.2	Below Standard	ok
Bromoform (tribromomethane)	0.00443	ND	0.05	1.9E-07	ok
Butylbenzyl phthalate	0.1	ND	0.01	Below Standard	ok
Cadmium	0.00175		0.039	3.0E-07	ok
Carbofuran	0.035		NT		
Carbon tetrachloride	0.000269	ND	0.05	1.9E-07	ok
Chlordane	1.00E-04	ND	0.004	1.5E-08	ok
Chloride	250		242.9	Below Standard	ok
Chlorobenzene	0.05	ND	0.05	1.9E-07	ok
Chloroform (trichloromethane)	0.007	ND	0.05	1.9E-07	ok
2-Chlorophenol	0.00036	ND	0.01	3.8E-08	ok
Chromium	0.05		0.131	1.0E-06	ok
Cis-1,2-dichloroethene	0.07	ND	0.05	Below Standard	ok
Coliform organisms (total)	1		6225	0	ok
Color (Color Units)	15		1607	1.2E-02	ok
Copper	1		0.113	Below Standard	ok
Cyanide	0.07		0.004	Below Standard	ok
2,4-D (2,4-dichlorophenoxy acetic acid)	0.07	ND	0.012	Below Standard	ok
1,2-Dibromo-3-chloropropane	2.50E-05	ND	0.05	1.9E-07	ok
Dichlorodifluoromethane (Freon-12; Halon)	1.4	ND	0.05	Below Standard	ok
1,1-Dichloroethane	0.07	ND	0.05	Below Standard	ok
1,2-Dichloroethane (ethylene dichloride)	0.00038	ND	0.05	1.9E-07	ok
1,1-Dichloroethylene (vinylidene chloride)	0.007	ND	0.05	1.9E-07	ok
1,2-Dichloropropane	0.00051	ND	0.05	1.9E-07	ok
Di-n-butyl (or dibutyl) phthalate (DBP)	0.7	ND	0.01	Below Standard	ok
Diethylphthalate (DEP)	5	ND	0.01	Below Standard	ok
Di(2-ethylhexyl) phthalate (DEHP)	0.0025	ND	0.01	3.8E-08	ok
Di-n-octyl phthalate	0.14	ND	0.01	Below Standard	ok
P-dioxane (1,4-diethylene dioxide)	0.007		NT		
Dioxin	2.2E-10	ND	1.00E-09	3.8E-15	ok
Dissolved solids (total)	500		17,553	1.3E-01	ok
Diundecyl phthalate (Santicizer 711)	0.14		NT		
Endrin	0.002	ND	0.0012	Below Standard	ok
Epichlorohydrin (1-chloro-2,3-epoxypropane)	0.00354	ND	0.025	9.5E-08	ok
Ethylbenzene	0.55	ND	0.05	Below Standard	ok
Ethylene dibromide (EDB; 1,2-dibromoethane)	4.00E-07	ND	0.00001	3.8E-11	ok
Ethylene glycol	14	ND	10	Below Standard	ok
Fluorene	0.28	ND	0.01	Below Standard	ok
Fluoride	2		6.6	5.0E-05	ok
Foaming agents	0.5		NT		
Gross alpha (adjusted) particle activity (excluding radium-226 and uranium)	15 pCi/l		NT		
Heptachlor	7.80E-06	ND	0.001	3.8E-09	ok
Heptachlor epoxide	3.80E-06	ND	0.016	6.1E-08	ok
Heptane	0.42	ND	0.025	Below Standard	ok
Hexachlorobenzene (perchlorobenzene)	2.00E-05	ND	0.01	3.8E-08	ok
N-hexane	0.42	ND	0.025	Below Standard	ok

Lindane	0.0002	ND	0.001	3.8E-09	ok
Manganese	0.05		2	1.5E-05	ok
Mercury	0.00105		0.0007	Below Standard	ok
Metadichlorobenzene (1,3-dichlorobenzene)	0.17	ND	0.01	Below Standard	ok
Methoxychlor	0.035	ND	0.01	Below Standard	ok
Methylene chloride (dichloromethane)	0.0046	ND	0.1	3.8E-07	ok
Methyl ethyl ketone (MEK; 2-butanone)	4.2	ND	1	Below Standard	ok
Methyl tert-butyl ether (MTBE)	0.2	ND	0.025	Below Standard	ok
Naphthalene	0.021	ND	0.01	Below Standard	ok
Nickel	0.1		0.86	6.6E-06	ok
Nitrate	10	ND	0.245	Below Standard	ok
Nitrite	1		0.023	Below Standard	ok
Orthodichlorobenzene (1,2-dichlorobenzene)	0.024	ND	0.05	1.9E-07	ok
Oxamyl	0.175		NT		
Paradichlorobenzene	0.0014	ND	0.05	1.9E-07	ok
Pentachlorophenol	0.00029	ND	0.05	1.9E-07	ok
pH	6.5 - 8.5		8		ok
Phenanthrene	0.21	ND	0.01	Below Standard	ok
Phenol	0.3		0.016	Below Standard	ok
Radium-226 and radium-228 (combined)	5 pCi/l		NT		
Selenium	0.05		0.194	1.5E-06	ok
Silver	0.0175		0.066	5.0E-07	ok
Styrene (ethenylbenzene)	0.1	ND	0.05	Below Standard	ok
Sulfate	250		1165	8.9E-03	ok
Tetrachloroethylene (perchloroethylene; PCE)	0.0007	ND	0.05	1.9E-07	ok
Toluene (methylbenzene)	1		0.054	Below Standard	ok
Toxaphene	3.10E-05	ND	0.0024	9.1E-09	ok
2,4,5-TP (Silvex)	0.05	ND	0.002	Below Standard	ok
Trans-1,2-dichloroethene	0.1	ND	0.05	Below Standard	ok
1,1,1-Trichloroethane (methyl chloroform)	0.2	ND	0.05	Below Standard	ok
Trichloroethylene (TCE)	0.0028	ND	0.05	1.9E-07	ok
Trichlorofluoromethane	2.1	ND	0.05	Below Standard	ok
Vinyl chloride (chloroethylene)	1.50E-05	ND	0.1	3.8E-07	equal
Xylenes (o-, m-, and p-)	0.53	ND	0.05	Below Standard	ok
Zinc	1.05		0.153	Below Standard	ok

NOTES:
1. ND - Not Detected above indicated reporting limit
2. Initial concentration for "Not Detected" compounds set at one-half of the reporting limit.
3. Standards from 15A NCAC 2L Section .0202(g), dated Dec. 1, 2005

indicates reported average for May-2005-2008

	Landfill Leachate							
Field Parameters	**May-05**	**Nov-05**	**May-06**	**Nov-06**	**May-07**	**Nov-07**	**May-08**	AVG
Depth to water (feet)	na	na	na	na	na	na	na	
pH (pH units)	7.8	7.9	8.2	8.0	8.1	8.1	7.9	8.0
Specific Conductance at 25°C (umhos/cm)	21660	23910	1124	26200	24390	25140	22340	
Temperature (°C)	25.3	24.5	21.2	11.1	25.3	23.5	25.3	
Turbidity (NTUs)	28	32	12	na	12	20	36	
Analytical Parameters (mg/L)								
Arsenic	2.1	0.026	1.5	0.5	0.679	1.2	1.1	1.015
Barium	0.04	0.05	0.04	< 0.1	<0.5	0.05	<0.10	<0.126
BOD,5-Day	272	164	106	104	116	57	120	
Cadmium	< 0.01	< 0.01	< 0.01	< 0.04	<0.05	<0.05	<0.10	<0.039
Calcium	43	29	45	33	28	31	48	
Chloride	184	334	179	447	157	167	232	242.9
Chromium	< 0.02	< 0.05	< 0.1	< 0.1	<0.10	<0.05	<0.50	<0.131
COD	659	487	274	401	545	328	427	
Copper	< 0.02	< 0.02	< 0.02	< 0.08	<0.10	<0.05	<0.50	<0.113
Fluoride	< 10	< 10	1.0	< 5.0	<5.0	<5.0	<10	< 6.6
Iron	0.12	0.06	< 0.5	< 0.5	<5.0	<0.25	<0.50	<0.99
Lead	< 0.01	< 0.05	< 0.05	< 0.08	<0.10	<0.05	<0.50	<0.12
Magnesium	150	150	120	160	150	170	170	
Manganese	0.17	0.13	0.18	0.34	0.127	0.16	0.29	2
Mercury	< 0.0004	< 0.0004	< 0.0004	< 0.001	<0.0010	<0.0008	<0.0008	<.0007
Nickel	0.04	< 0.04	0.03	< 0.1	<0.10	<0.05	<0.50	<.86
Nitrate/Nitrite as N	na	na	na	na	na	0.20	0.29	.245
Nitrite as N	0.02	0.02	< 0.02	< 0.02	0.04	<0.020	<0.02	<.023
Phosphate	na	na	na	na	na	190	170	
Potassium	400	440	250	440	490	490	490	
Selenium	< 0.05	< 0.05	< 0.05	< 0.08	<0.10	0.53	<0.50	<.194
Silver	< 0.01	< 0.01	< 0.01	< 0.08	<0.10	<0.05	<0.20	.066
Sodium	5560	6700	3200	6700	7500	8600	5800	
Sulfate	503	910	813	1430	1720	1590	1190	1165
Total Dissolved Solids	16500	17100	7170	21700	21000	20,700	18700	17553
Total Organic Carbon	90	118	50	94	75	85	126	
Total Organic Halides	0.64	0.493	0.209	0.191	0.518	0.191	0.647	
Total Recoverable Phenols	0.046	< 0.01	0.014	< 0.01	<0.015	<0.010	<0.010	<.016
Zinc	< 0.05	< 0.05	< 0.02	< 0.25	<0.5	<0.10	<0.10	<.153

file:LF Leachate Analysis 2005-08

APPENDIX B

HELP MODEL
B-1 LEAKAGE THROUGH LINER-BASE
B-2 LEAKAGE THOUGH LINER-SIDE
B-3 GROUNDWATER RECHARGE

B-1 LEAKAGE THROUGH LINER-BASE

6D Base
x 11 Acres


```
******************************************************************************
******************************************************************************
**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                  HELP MODEL VERSION 3.05a  (5 JUNE 1996)                  **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                    USAE WATERWAYS EXPERIMENT STATION                     **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************


PRECIPITATION DATA FILE:     C:\HELP3\BRPP\NC60BASE.D4
TEMPERATURE DATA FILE:       C:\help3\BRPP\NC60BASE.D7
SOLAR RADIATION DATA FILE:   C:\help3\BRPP\NC60BASE.D13
EVAPOTRANSPIRATION DATA:     C:\help3\BRPP\NC60BASE.D11
SOIL AND DESIGN DATA FILE:   C:\Help3\BRPP\NC60BASE.D10
OUTPUT DATA FILE:            C:\Help3\BRPP\NC60BASE.OUT


TIME:  12:54     DATE:   7/17/2008


******************************************************************************

     TITLE:  BRPP - LANDFILL 6D SOUTH - NO CAP 60-FT WASTE ON BASE

******************************************************************************


     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                  LAYER  1
                                  --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER   0
          THICKNESS                  =    720.00   INCHES
          POROSITY                   =      0.4000 VOL/VOL
          FIELD CAPACITY             =      0.3600 VOL/VOL
          WILTING POINT              =      0.2800 VOL/VOL
          INITIAL SOIL WATER CONTENT =      0.3672 VOL/VOL
          EFFECTIVE SAT. HYD. COND.  =  0.139999997000E-05 CM/SEC


                                  LAYER  2
                                  --------

                     TYPE 2 - LATERAL DRAINAGE LAYER
```

```
              MATERIAL TEXTURE NUMBER  21
THICKNESS                    =     15.00   INCHES
POROSITY                     =      0.3970 VOL/VOL
FIELD CAPACITY               =      0.0320 VOL/VOL
WILTING POINT                =      0.0130 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.0320 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.300000012000     CM/SEC
SLOPE                        =      8.00   PERCENT
DRAINAGE LENGTH              =    200.0    FEET


                        LAYER  3
                        --------

            TYPE 4 - FLEXIBLE MEMBRANE LINER
              MATERIAL TEXTURE NUMBER  35
THICKNESS                    =      0.06   INCHES
POROSITY                     =      0.0000 VOL/VOL
FIELD CAPACITY               =      0.0000 VOL/VOL
WILTING POINT                =      0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.199999996000E-12 CM/SEC
FML PINHOLE DENSITY          =      1.00   HOLES/ACRE
FML INSTALLATION DEFECTS     =      1.00   HOLES/ACRE
FML PLACEMENT QUALITY        =  3 - GOOD


                        LAYER  4
                        --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                    =      0.24   INCHES
POROSITY                     =      0.7500 VOL/VOL
FIELD CAPACITY               =      0.7470 VOL/VOL
WILTING POINT                =      0.4000 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.7470 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.499999997000E-08 CM/SEC


                        LAYER  5
                        --------

              TYPE 3 - BARRIER SOIL LINER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                    =     60.00   INCHES
POROSITY                     =      0.4710 VOL/VOL
FIELD CAPACITY               =      0.3420 VOL/VOL
WILTING POINT                =      0.2100 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.4710 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.499999987000E-04 CM/SEC
```

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER	=	90.00	
FRACTION OF AREA ALLOWING RUNOFF	=	0.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	8.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	3.166	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	3.200	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	2.240	INCHES
INITIAL SNOW WATER	=	2.623	INCHES
INITIAL WATER IN LAYER MATERIALS	=	293.318	INCHES
TOTAL INITIAL WATER	=	295.941	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
ASHEVILLE NORTH CAROLINA

STATION LATITUDE	=	35.26	DEGREES
MAXIMUM LEAF AREA INDEX	=	0.00	
START OF GROWING SEASON (JULIAN DATE)	=	96	
END OF GROWING SEASON (JULIAN DATE)	=	298	
EVAPORATIVE ZONE DEPTH	=	8.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	7.60	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	71.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	75.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	84.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	77.00	%

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ASHEVILLE NORTH CAROLINA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.28	3.52	4.27	3.34	3.52	3.28
4.48	4.23	3.00	2.65	2.69	3.05

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ASHEVILLE NORTH CAROLINA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
36.80	39.10	46.40	55.70	63.30	69.80
73.20	72.60	66.90	56.00	46.40	39.30

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING

NC60BASE.OUT
COEFFICIENTS FOR ASHEVILLE NORTH CAROLINA
AND STATION LATITUDE = 35.26 DEGREES

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 15

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	3.08	3.43	3.81	3.13	4.04	3.51
	4.03	3.94	2.52	2.24	2.86	3.14
STD. DEVIATIONS	1.33	1.85	2.32	1.66	1.36	1.47
	1.52	1.79	1.45	1.26	2.00	1.73
RUNOFF						
TOTALS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATIONS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION						
TOTALS	0.780	1.028	1.656	2.174	2.836	3.071
	2.916	2.482	1.640	1.100	1.212	0.565
STD. DEVIATIONS	0.394	0.555	1.306	2.108	2.821	3.049
	2.920	2.473	1.760	1.179	0.781	0.339
LATERAL DRAINAGE COLLECTED FROM LAYER 2						
TOTALS	0.7210	0.5925	0.5919	0.6148	0.6989	0.7255
	0.7553	0.8516	0.9315	0.9150	0.8870	0.7734
STD. DEVIATIONS	0.5048	0.4737	0.5305	0.4921	0.5207	0.4624
	0.4821	0.4013	0.2996	0.3471	0.3335	0.5046
PERCOLATION/LEAKAGE THROUGH LAYER 3						
TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH LAYER 5						
TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 3

AVERAGES	0.0344	0.0311	0.0282	0.0303	0.0334	0.0358
	0.0360	0.0406	0.0459	0.0437	0.0437	0.0369
STD. DEVIATIONS	0.0241	0.0250	0.0253	0.0243	0.0248	0.0228
	0.0230	0.0192	0.0148	0.0166	0.0164	0.0241

DAILY AVERAGE HEAD ON TOP OF LAYER 5

AVERAGES	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

****

****

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 15

	INCHES		CU. FEET	PERCENT
PRECIPITATION	39.73	(4.479)	144205.4	100.00
RUNOFF	0.000	(0.0000)	0.00	0.000
EVAPOTRANSPIRATION	21.459	(17.8486)	77896.57	54.018
LATERAL DRAINAGE COLLECTED FROM LAYER 2	9.05838	(4.46032)	32881.914	22.80214
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.00000	(0.00000)	0.015	0.00001
AVERAGE HEAD ON TOP OF LAYER 3	0.037	(0.018)		
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.00000	(0.00000)	0.015	0.00001
AVERAGE HEAD ON TOP OF LAYER 5	0.000	(0.000)		
CHANGE IN WATER STORAGE	9.034	(18.3931)	32791.62	22.740

****

****

PEAK DAILY VALUES FOR YEARS 1 THROUGH 15

	(INCHES)	(CU. FT.)
PRECIPITATION	2.99	10853.700
RUNOFF	0.000	0.0000
DRAINAGE COLLECTED FROM LAYER 2	0.04762	172.86519
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.000000	0.00006
AVERAGE HEAD ON TOP OF LAYER 3	0.070	
MAXIMUM HEAD ON TOP OF LAYER 3	0.139	
LOCATION OF MAXIMUM HEAD IN LAYER 2 (DISTANCE FROM DRAIN)	2.1 FEET	
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.000000	0.00006
AVERAGE HEAD ON TOP OF LAYER 5	0.000	
SNOW WATER	122.47	444571.0310

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.3958
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.2800

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

****

****

FINAL WATER STORAGE AT END OF YEAR 15

LAYER	(INCHES)	(VOL/VOL)
1	279.6013	0.3883
2	0.4888	0.0326
3	0.0000	0.0000
4	0.1793	0.7470
5	28.2600	0.4710
SNOW WATER	122.914	

****

MONTHLY PRECIPITATION STATS FOR CANTON, N.C. (d:\cpc\nc\stats2.txt)
DATE: 01/13/97

SOURCE: RAINFALL DATA FROM NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION.
MONTHLY AVERAGES BASED ON 63 YEARS OF RECORD (1931-1993).
MISSING MONTHLY DATA WAS NOT INCLUDED IN MONTHLY AVERAGES.

JAN	NUMBER OF YEARS OF DATA	=	61
	MONTHLY AVERAGE (inches)	=	3.3
FEB	NUMBER OF YEARS OF DATA	=	62
	MONTHLY AVERAGE (inches)	=	3.5
MAR	NUMBER OF YEARS OF DATA	=	63
	MONTHLY AVERAGE (inches)	=	4.3
APR	NUMBER OF YEARS OF DATA	=	63
	MONTHLY AVERAGE (inches)	=	3.3
MAY	NUMBER OF YEARS OF DATA	=	61
	MONTHLY AVERAGE (inches)	=	3.5
JUN	NUMBER OF YEARS OF DATA	=	62
	MONTHLY AVERAGE (inches)	=	3.3
JUL	NUMBER OF YEARS OF DATA	=	62
	MONTHLY AVERAGE (inches)	=	4.5
AUG	NUMBER OF YEARS OF DATA	=	61
	MONTHLY AVERAGE (inches)	=	4.2
SEP	NUMBER OF YEARS OF DATA	=	62
	MONTHLY AVERAGE (inches)	=	3.0
OCT	NUMBER OF YEARS OF DATA	=	62
	MONTHLY AVERAGE (inches)	=	2.6
NOV	NUMBER OF YEARS OF DATA	=	62
	MONTHLY AVERAGE (inches)	=	2.7
DEC	NUMBER OF YEARS OF DATA	=	62
	MONTHLY AVERAGE (inches)	=	3.0

TABLE 1. DEFAULT LOW DENSITY SOIL CHARACTERISTICS

Soil Texture Class			Total Porosity vol/vol	Field Capacity vol/vol	Wilting Point vol/vol	Saturated Hydraulic Conductivity cm/sec
HELP	USDA	USCS				
1	CoS	SP	0.417	0.045	0.018	1.0×10^{-2}
2	S	SW	0.437	0.062	0.024	5.8×10^{-3}
3	FS	SW	0.457	0.083	0.033	3.1×10^{-3}
4	LS	SM	0.437	0.105	0.047	1.7×10^{-3}
5	LFS	SM	0.457	0.131	0.058	1.0×10^{-3}
6	SL	SM	0.453	0.190	0.085	7.2×10^{-4}
7	FSL	SM	0.473	0.222	0.104	5.2×10^{-4}
8	L	ML	0.463	0.232	0.116	3.7×10^{-4}
9	SiL	ML	0.501	0.284	0.135	1.9×10^{-4}
10	SCL	SC	0.398	0.244	0.136	1.2×10^{-4}
11	CL	CL	0.464	0.310	0.187	6.4×10^{-5}
12	SiCL	CL	0.471	0.342	0.210	4.2×10^{-5}
13	SC	SC	0.430	0.321	0.221	3.3×10^{-5}
14	SiC	CH	0.479	0.371	0.251	2.5×10^{-5}
15	C	CH	0.475	0.378	0.251	2.5×10^{-5}
21	G	GP	0.397	0.032	0.013	3.0×10^{-1}

SUB-BASE →

Leachate Collection Layer →

a = constant representing the effects of various fluid constants and gravity, 21 cm^3/sec

ϕ = total porosity, vol/vol

θ_r = residual volumetric water content, vol/vol

ψ_b = bubbling pressure, cm

λ = pore-size distribution index, dimensionless

A more detailed explanation of Equation 11 can be found in Appendix A of the HELP program Version 3 User's Guide and the cited references.

TABLE 2. MODERATE AND HIGH DENSITY DEFAULT SOILS

Soil Texture Class			Total Porosity vol/vol	Field Capacity vol/vol	Wilting Point vol/vol	Saturated Hydraulic Conductivity cm/sec
HELP	USDA	USCS				
22	L (Moderate)	ML	0.419	0.307	0.180	1.9×10^{-5}
23	SiL (Moderate)	ML	0.461	0.360	0.203	9.0×10^{-6}
24	SCL (Moderate)	SC	0.365	0.305	0.202	2.7×10^{-6}
25	CL (Moderate)	CL	0.437	0.373	0.266	3.6×10^{-6}
26	SiCL (Moderate)	CL	0.445	0.393	0.277	1.9×10^{-6}
27	SC (Moderate)	SC	0.400	0.366	0.288	7.8×10^{-7}
28	SiC (Moderate)	CH	0.452	0.411	0.311	1.2×10^{-6}
29	C (Moderate)	CH	0.451	0.419	0.332	6.8×10^{-7}
16	Liner Soil (High)		0.427	0.418	0.367	1.0×10^{-7}
17	Bentonite (High)		0.750	0.747	0.400	3.0×10^{-9}

aste Product
ity, Field
pacity & Wilting

3.5.2 Default Waste Characteristics

Table 4 provides a summary of default moisture retention values for various waste layers. Municipal waste properties provided in Tchobanoglous et al. (1977) and Equations 6 and 7 were used to determine the total porosity, field capacity, and wilting point of a well compacted municipal waste. The field capacity and wilting point were calculated using Tchobanoglous et al.'s high and low water content values, respectively. Oweis et al. (1990) provided information on the in-situ saturated hydraulic conductivity of municipal waste. Zeiss and Major (1993) described the moisture flow through

The saturated hydraulic conductivities of the ash and slag wastes were taken directly from the references. The saturated hydraulic conductivities of the coal burning electric plant ashes at maximum dry density were determined in-situ and the maximum dry density municipal solid waste incinerator ash and fine copper slag values were determined by laboratory methods. The saturated hydraulic conductivities of various other waste materials are provided in Table 5. Similar to default soils, the HELP program uses Equation 8 to adjust the saturated hydraulic conductivities of the default wastes in the top half of the evaporative zone to account for root penetration.

A more detailed explanation of the calculation procedure used for the ash and slag wastes can be found in Appendix A of the HELP program Version 3 User's Guide. Like the soil properties, the default waste properties were determined using empirical equations developed from soil data. Therefore, these values should not be used in place of a detailed laboratory and field testing program.

TABLE 5. SATURATED HYDRAULIC CONDUCTIVITY OF WASTES

Waste Material	Saturated Hydraulic Conductivity cm/sec*	Reference
Stabilized Incinerator Fly Ash	8.8×10^{-5}	Poran and Ahtchi-Ali (1989)
High-Density Pulverized Fly Ash	2.5×10^{-5}	Swain (1979)
Solidified Waste	4.0×10^{-2}	Rushbrook et al. (1989)
Electroplating Sludge	1.6×10^{-5}	Bartos and Palermo (1977)
Nickel/Cadmium Battery Sludge	3.5×10^{-6}	"
Inorganic Pigment Sludge	5.0×10^{-6}	"
Brine Sludge - Chlorine Production	8.2×10^{-5}	"
Calcium Fluoride Sludge	3.2×10^{-5}	"
Waste Product: High Ash Papermill Sludge	1.4×10^{-6}	Perry and Schultz (1977)

* - Determined by laboratory methods.

3.5.3 Default Geosynthetic Material Characteristics

Table 6 provides a summary of default properties for various geosynthetic materials. The values were extracted from Geotechnical Fabrics Report--1992 Specifiers Guide (Industrial Fabrics Association International, 1991) and Giroud and Bonaparte (1985).

3.6 SOIL MOISTURE INITIALIZATION

The soil moisture of the layers may be initialized by the user or the program. If initialized by the program, the soil moisture is initialized near steady-state using a three step procedure. The first step sets the soil moisture of all liners to porosity or saturation and the moisture of all other layers to field capacity.

In the second step the program computes a soil moisture for each layer below the top liner system. These soil moistures are computed to yield an unsaturated hydraulic conductivity equal to 85% of the lowest effective saturated hydraulic conductivity of all

TABLE 6. DEFAULT GEOSYNTHETIC MATERIAL CHARACTERISTICS

Geosynthetic Material Description		Saturated Hydraulic Conductivity cm/sec
HELP	Geosynthetic Material	
20	Drainage Net (0.5 cm)	$1.0 \times 10^{+1}$
34	Drainage Net (0.6 cm)	$3.3 \times 10^{+1}$
35	High Density Polyethylene (HDPE) Membrane	2.0×10^{-13}
36	Low Density Polyethylene (LDPE) Membrane	4.0×10^{-13}
37	Polyvinyl Chloride (PVC) Membrane	2.0×10^{-11}
38	Butyl Rubber Membrane	1.0×10^{-12}
39	Chlorinated Polyethylene (CPE) Membrane	4.0×10^{-12}
40	Hypalon or Chlorosulfonated Polyethylene (CSPE) Membrane	3.0×10^{-12}
41	Ethylene-Propylene Diene Monomer (EPDM) Membrane	2.0×10^{-12}
42	Neoprene Membrane	3.0×10^{-12}

Liner →

B-2 LEAKAGE THROUGH LINER-SIDE

6D SIDE

x 5 Acres

NC60SIDE.OUT

```
******************************************************************************
******************************************************************************
**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                  HELP MODEL VERSION 3.05a  (5 JUNE 1996)                  **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                    USAE WATERWAYS EXPERIMENT STATION                     **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************


PRECIPITATION DATA FILE:     C:\HELP3\BRPP\NC60SIDE.D4
TEMPERATURE DATA FILE:       C:\help3\BRPP\NC60SIDE.D7
SOLAR RADIATION DATA FILE:   C:\help3\BRPP\NC60SIDE.D13
EVAPOTRANSPIRATION DATA:     C:\help3\BRPP\NC60SIDE.D11
SOIL AND DESIGN DATA FILE:   C:\Help3\BRPP\NC60SIDE.D10
OUTPUT DATA FILE:            C:\Help3\BRPP\NC60SIDE.OUT


TIME:  11:42     DATE:   7/15/2008


******************************************************************************

     TITLE:  BRPP - LANDFILL 6D SOUTH - NO CAP 60-FT WASTE ON SIDE

******************************************************************************


     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                  LAYER  1
                                  --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER   0
          THICKNESS                    =    720.00   INCHES
          POROSITY                     =      0.4000 VOL/VOL
          FIELD CAPACITY               =      0.3600 VOL/VOL
          WILTING POINT                =      0.2800 VOL/VOL
          INITIAL SOIL WATER CONTENT   =      0.3672 VOL/VOL
          EFFECTIVE SAT. HYD. COND.    =  0.139999997000E-05 CM/SEC


                                  LAYER  2
                                  --------

                     TYPE 2 - LATERAL DRAINAGE LAYER
```

```
                MATERIAL TEXTURE NUMBER  21
THICKNESS                    =     12.00   INCHES
POROSITY                     =      0.3970 VOL/VOL
FIELD CAPACITY               =      0.0320 VOL/VOL
WILTING POINT                =      0.0130 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.0320 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.300000012000     CM/SEC
SLOPE                        =     50.00   PERCENT
DRAINAGE LENGTH              =    300.0    FEET


                        LAYER  3
                        --------

             TYPE 4 - FLEXIBLE MEMBRANE LINER
               MATERIAL TEXTURE NUMBER  35
THICKNESS                    =      0.06   INCHES
POROSITY                     =      0.0000 VOL/VOL
FIELD CAPACITY               =      0.0000 VOL/VOL
WILTING POINT                =      0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.199999996000E-12 CM/SEC
FML PINHOLE DENSITY          =      1.00   HOLES/ACRE
FML INSTALLATION DEFECTS     =      1.00   HOLES/ACRE
FML PLACEMENT QUALITY        =  3 - GOOD


                        LAYER  4
                        --------

               TYPE 3 - BARRIER SOIL LINER
               MATERIAL TEXTURE NUMBER   0
THICKNESS                    =     60.00   INCHES
POROSITY                     =      0.4710 VOL/VOL
FIELD CAPACITY               =      0.3420 VOL/VOL
WILTING POINT                =      0.2100 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.4710 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.499999987000E-04 CM/SEC


          GENERAL DESIGN AND EVAPORATIVE ZONE DATA
          ----------------------------------------

 NOTE:  SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER              =     90.00
FRACTION OF AREA ALLOWING RUNOFF     =      0.0    PERCENT
AREA PROJECTED ON HORIZONTAL PLANE   =      1.000  ACRES
EVAPORATIVE ZONE DEPTH               =      8.0    INCHES
INITIAL WATER IN EVAPORATIVE ZONE    =      3.166  INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE   =      3.200  INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE   =      2.240  INCHES
INITIAL SNOW WATER                   =      2.623  INCHES
INITIAL WATER IN LAYER MATERIALS     =    293.043  INCHES
TOTAL INITIAL WATER                  =    295.666  INCHES
TOTAL SUBSURFACE INFLOW              =      0.00   INCHES/YEAR
```

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
ASHEVILLE NORTH CAROLINA

STATION LATITUDE	=	35.26	DEGREES
MAXIMUM LEAF AREA INDEX	=	0.00	
START OF GROWING SEASON (JULIAN DATE)	=	96	
END OF GROWING SEASON (JULIAN DATE)	=	298	
EVAPORATIVE ZONE DEPTH	=	8.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	7.60	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	71.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	75.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	84.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	77.00	%

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ASHEVILLE NORTH CAROLINA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.28	3.52	4.27	3.34	3.52	3.28
4.48	4.23	3.00	2.65	2.69	3.05

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ASHEVILLE NORTH CAROLINA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
36.80	39.10	46.40	55.70	63.30	69.80
73.20	72.60	66.90	56.00	46.40	39.30

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ASHEVILLE NORTH CAROLINA
AND STATION LATITUDE = 35.26 DEGREES

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 15

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC

PRECIPITATION

TOTALS	3.08	3.43	3.81	3.13	4.04	3.51
	4.03	3.94	2.52	2.24	2.86	3.14
STD. DEVIATIONS	1.33	1.85	2.32	1.66	1.36	1.47
	1.52	1.79	1.45	1.26	2.00	1.73

RUNOFF

TOTALS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATIONS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

EVAPOTRANSPIRATION

TOTALS	0.780	1.028	1.656	2.174	2.836	3.071
	2.916	2.482	1.640	1.100	1.212	0.565
STD. DEVIATIONS	0.394	0.555	1.306	2.108	2.821	3.049
	2.920	2.473	1.760	1.179	0.781	0.339

LATERAL DRAINAGE COLLECTED FROM LAYER 2

TOTALS	0.7201	0.5914	0.5917	0.6156	0.6989	0.7264
	0.7559	0.8531	0.9314	0.9153	0.8848	0.7734
STD. DEVIATIONS	0.5045	0.4743	0.5294	0.4924	0.5199	0.4623
	0.4817	0.4006	0.2980	0.3481	0.3353	0.5058

PERCOLATION/LEAKAGE THROUGH LAYER 4

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0001	0.0001	0.0001	0.0001	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 3

AVERAGES	0.0103	0.0093	0.0084	0.0091	0.0100	0.0107
	0.0108	0.0121	0.0137	0.0130	0.0130	0.0110
STD. DEVIATIONS	0.0072	0.0075	0.0075	0.0072	0.0074	0.0068
	0.0068	0.0057	0.0044	0.0049	0.0049	0.0072

****

****

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 15

	INCHES	CU. FEET	PERCENT

PRECIPITATION	39.73	(4.479)	144205.4	100.00
RUNOFF	0.000	(0.0000)	0.00	0.000
EVAPOTRANSPIRATION	21.459	(17.8486)	77896.57	54.018
LATERAL DRAINAGE COLLECTED FROM LAYER 2	9.05824	(4.45906)	32881.406	22.80179
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.00056	(0.00026)	2.039	0.00141
AVERAGE HEAD ON TOP OF LAYER 3	0.011	(0.005)		
CHANGE IN WATER STORAGE	9.033	(18.3962)	32790.10	22.738

****

****

PEAK DAILY VALUES FOR YEARS 1 THROUGH 15

	(INCHES)	(CU. FT.)
PRECIPITATION	2.99	10853.700
RUNOFF	0.000	0.0000
DRAINAGE COLLECTED FROM LAYER 2	0.04795	174.07599
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000003	0.01037
AVERAGE HEAD ON TOP OF LAYER 3	0.021	
MAXIMUM HEAD ON TOP OF LAYER 3	0.034	
LOCATION OF MAXIMUM HEAD IN LAYER 2 (DISTANCE FROM DRAIN)	0.0 FEET	
SNOW WATER	122.47	444571.0310

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.3958
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.2800

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

****

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0
*****************************************************************************

                 FINAL WATER STORAGE AT END OF YEAR   15
    ------------------------------------------------------------------------
                  LAYER        (INCHES)       (VOL/VOL)
                  -----        --------       ---------
                    1          279.6013         0.3883

                    2            0.3865         0.0322

                    3            0.0000         0.0000

                    4           28.2600         0.4710

                SNOW WATER     122.914

*****************************************************************************
*****************************************************************************
```

B-3 GROUNDWATER RECHARGE

6D - Recharge
x 35 Acres

RECHARGE.OUT

```
******************************************************************************
******************************************************************************
**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                  HELP MODEL VERSION 3.05a  (5 JUNE 1996)                 **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                    USAE WATERWAYS EXPERIMENT STATION                     **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
******************************************************************************
******************************************************************************


PRECIPITATION DATA FILE:      C:\HELP3\BRPP\RECHARGE.D4
TEMPERATURE DATA FILE:        C:\help3\BRPP\RECHARGE.D7
SOLAR RADIATION DATA FILE:    C:\help3\BRPP\RECHARGE.D13
EVAPOTRANSPIRATION DATA:      C:\help3\BRPP\RECHARGE.D11
SOIL AND DESIGN DATA FILE:    C:\Help3\BRPP\RECHARGE.D10
OUTPUT DATA FILE:             C:\Help3\BRPP\RECHARGE.OUT


TIME:  13:20      DATE:    7/15/2008


******************************************************************************

     TITLE:  BRPP - LANDFILL 6D SOUTH - RECHARGE TO GROUNDWATER

******************************************************************************


     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                  LAYER  1
                                  --------

                  TYPE 1 - VERTICAL PERCOLATION LAYER
                      MATERIAL TEXTURE NUMBER  12
        THICKNESS                    =    240.00   INCHES
        POROSITY                     =      0.4710 VOL/VOL
        FIELD CAPACITY               =      0.3420 VOL/VOL
        WILTING POINT                =      0.2100 VOL/VOL
        INITIAL SOIL WATER CONTENT   =      0.3667 VOL/VOL
        EFFECTIVE SAT. HYD. COND.    =  0.419999997000E-04 CM/SEC
      NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  4.20
               FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.


              GENERAL DESIGN AND EVAPORATIVE ZONE DATA
                                Page 1
```

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER	=	76.00	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	18.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	6.873	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	8.478	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	3.780	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	87.997	INCHES
TOTAL INITIAL WATER	=	87.997	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
ASHEVILLE NORTH CAROLINA

STATION LATITUDE	=	35.26	DEGREES
MAXIMUM LEAF AREA INDEX	=	3.00	
START OF GROWING SEASON (JULIAN DATE)	=	96	
END OF GROWING SEASON (JULIAN DATE)	=	298	
EVAPORATIVE ZONE DEPTH	=	18.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	7.60	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	71.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	75.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	84.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	77.00	%

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ASHEVILLE NORTH CAROLINA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.28	3.52	4.27	3.34	3.52	3.28
4.48	4.23	3.00	2.65	2.69	3.05

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ASHEVILLE NORTH CAROLINA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
36.80	39.10	46.40	55.70	63.30	69.80
73.20	72.60	66.90	56.00	46.40	39.30

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING

RECHARGE.OUT
COEFFICIENTS FOR ASHEVILLE NORTH CAROLINA
AND STATION LATITUDE = 35.26 DEGREES

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 15

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	3.08	3.43	3.81	3.13	4.04	3.51
	4.03	3.94	2.52	2.24	2.86	3.14
STD. DEVIATIONS	1.33	1.85	2.32	1.66	1.36	1.47
	1.52	1.79	1.45	1.26	2.00	1.73
RUNOFF						
TOTALS	0.120	0.237	0.021	0.002	0.007	0.003
	0.000	0.020	0.006	0.001	0.047	0.015
STD. DEVIATIONS	0.256	0.749	0.035	0.006	0.017	0.013
	0.002	0.072	0.018	0.003	0.099	0.036
EVAPOTRANSPIRATION						
TOTALS	1.087	1.468	2.539	3.058	4.240	3.753
	3.735	2.987	2.581	1.628	0.957	0.725
STD. DEVIATIONS	0.254	0.352	0.293	0.807	0.960	1.052
	1.303	0.791	0.865	0.760	0.262	0.167
PERCOLATION/LEAKAGE THROUGH LAYER 1						
TOTALS	0.3576	0.6212	1.1902	1.5507	1.5604	1.3816
	1.0708	0.8494	0.6233	0.6314	0.5573	0.3598
STD. DEVIATIONS	0.1747	0.6016	0.6666	0.9943	0.7052	0.5194
	0.2989	0.2304	0.2220	0.2837	0.2608	0.2202

****

****

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 15

	INCHES		CU. FEET	PERCENT
PRECIPITATION	39.73	(4.479)	144205.4	100.00
RUNOFF	0.481	(0.8836)	1744.89	1.210
EVAPOTRANSPIRATION	28.758	(3.0128)	104391.06	72.391

PERCOLATION/LEAKAGE THROUGH LAYER 1	10.75359 (3.50507)	39035.547	27.06941
CHANGE IN WATER STORAGE	-0.266 (3.1046)	-966.14	-0.670

****

****

PEAK DAILY VALUES FOR YEARS 1 THROUGH 15

	(INCHES)	(CU. FT.)
PRECIPITATION	2.99	10853.700
RUNOFF	0.928	3368.7964
PERCOLATION/LEAKAGE THROUGH LAYER 1	0.223098	809.84460
SNOW WATER	5.37	19489.3320

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.4306
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.2100

****

****

FINAL WATER STORAGE AT END OF YEAR 15

LAYER	(INCHES)	(VOL/VOL)
1	84.0051	0.3500
SNOW WATER	0.000	

****
****

APPENDIX C

DILUTION ANALYSIS CALCULATIONS

Dilution Analysis Calculations
Blue Ridge
Cell 6D South
Canton, NC

Comp. by HME

Checked by _____

Date 9/25/08

Job Number: 07089.00

$A_{ws} := 2.215 \cdot 10^6$ Watershed Area, sq.ft

$A_{lf} := 6.995 \cdot 10^5$ Landfill Area, sq.ft $\frac{A_{lf}}{43560} = 16.06$ Landfill Area, acres

$w := 10.75$ Precipitation Recharge, in/yr (HELP Model)

$L_{lf} := 2.04$ Landfill Leakage Rate, cu.ft/acre/yr (HELP Model)

$C_{Asi} := 1.1$ Initial Arsenic Concentration in Landfill Leachate, mg/L

$C_{Cdi} := 0.1$ Initial Cadmium Concentration in Landfill Leachate, mg/L

$Q_{ws} := \frac{w}{12} \cdot (A_{ws} - A_{lf})$ $Q_{ws} = 1.36 \cdot 10^6$ Groundwater Recharge Throughout Watershed, cu. ft./yr

$Q_{lf} := L_{lf} \cdot \frac{A_{lf}}{43560}$ $Q_{lf} = 32.76$ Groundwater Recharge From Landfill, cu. ft./yr

$C_{As} := \frac{C_{Asi} \cdot Q_{lf}}{Q_{lf} + Q_{ws}}$ $C_{As} = 2.65 \cdot 10^{-5}$ Groundwater Arsenic Concentration, mg/L at Pigeon River

$C_{Cd} := \frac{C_{Cdi} \cdot Q_{lf}}{Q_{lf} + Q_{ws}}$ $C_{Cd} = 2.41 \cdot 10^{-6}$ Groundwater Cadmium Concentration, mg/L at Pigeon River

ATTACHMENT 3
DESIGN HYDROGEOLOGIC REPORT

HYDROGEOLOGIC REPORT

LANDFILL NO. 6
AREAS D AND E

BLUE RIDGE PAPER PRODUCTS INC. – CANTON MILL
DIVISION OF EVERGREEN PACKAGING
CANTON, NORTH CAROLINA

NOVEMBER 2008

SME

Sevee & Maher Engineers, Inc.
Waste Management and Hydrogeologic Consultants
Cumberland Center, Maine

NORTH CAROLINA PROFESSIONAL SEAL 20589 ENGINEER JOHN E. SEVEE

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DESIGN HYDROGEOLOGIC REPORT
LANDFILL NO. 6 – AREAS D AND E
BLUE RIDGE PAPER PRODUCTS INC. – CANTON MILL
DIVISION OF EVERGREEN PACKAGING
CANTON, NORTH CAROLINA

1.0 INTRODUCTION

1.1 Purpose and Scope

This Design Hydrogeologic Report contains the results of a 2007 site investigation, which gathered information required by Rule 15A NCAC 13B.0538 of the North Carolina Department of Environment and Natural Resources (NCDENR) Solid Waste Management Regulations (DENR, 2007). Blue Ridge Paper Products Inc. - Canton Mill (Blue Ridge) retained Sevee & Maher Engineers, Inc. (SME) to prepare this Design Hydrogeologic Report in support of the application for the Permit to Construct Areas D and E of Landfill No. 6. Hydrogeologic data collected in support of a design for the development of Areas D and E will ensure compliance with the required vertical separation and foundation standards specified in Rule 15A NCAC 13B.0540. The site investigation focused on the following tasks specific to the landfill development: (1) identifying the nature of the surficial geology and its physical properties, (2) characterizing the nature of the bedrock beneath the site, (3) identifying the hydrogeologic and lithologic units, and (4) describing the groundwater flow regime.

These tasks were achieved by a scope of work that included:

- Review of previous results from hydrogeologic and geotechnical site investigations associated with earlier developmental phases of the existing landfill;

- Physical property testing of surficial unconsolidated deposits collected from split-spoon samples retrieved during the drilling of borings in the proposed landfill expansion Areas D and E;

- Coring and outcrop mapping to determine the nature and structure of the bedrock geology;

- The installation of 52 piezometers in 28 borings to measure groundwater elevations and the hydraulic properties of the various geologic formations,

- Water level monitoring to allow interpretation of groundwater flow directions, horizontal and vertical groundwater hydraulic gradients, and the range of seasonal groundwater fluctuation; and,

- In situ slug hydraulic conductivity testing to be used to estimate the rates of groundwater flow.

1.2 Report Organization

The Design Hydrogeologic Report is divided into five sections. Section 2.0 provides a summary of background information; including description of the site and physical setting, and the regional hydrogeology. The technical approach to complete the various tasks in the Site Investigation is detailed in Section 3.0. Site geologic and hydrogeologic characteristics are discussed in Sections 4.0 and 5.0, respectively. Conclusions of the hydrogeologic evaluation around the proposed Areas D and E landfill expansion are presented in Section 6.0.

2.0 BACKGROUND SITE INFORMATION

Landfill No. 6 (the 'Site") has been the subject of past assessments and site investigations as part of earlier landfill expansion phases. Law Engineering and Testing Company (Law) prepared *Geotechnical Exploration and Evaluation and Conceptual Site Development Recommendations* for the entire Landfill No. 6 site in 1982, which included a detailed description of the interpreted hydrogeologic setting (Law, 1982). Also, Sirrine Environmental Consultants (Sirrine, 1989), Sevee & Maher Engineers, Inc. (SME, 1995), and Roy F. Weston, Inc. (Weston, 1995) have prepared related designs, construction documentation, and hydrogeologic reports which provide additional hydrogeologic information related to previous expansions at Landfill No. 6. This section of the report presents a brief description of the landfill and surrounding area, physical setting and its regional hydrogeology.

2.1 Site Location

Landfill No. 6 is located about two miles northwest of the City of Canton in Haywood County, North Carolina as shown in Figure 2-1. The landfill has been operating since 1984 under various owners. The original design of the Landfill No. 6 incorporated eight major landfill areas designated as Areas A through H, and an Asbestos-Containing Material cell. The proposed Areas D and E development areas are located west of Area A, the current active cell, and Area C, which closed in about 1997. Interstate Highway I-40 and the Pigeon River border the Site to the north and south, respectively. The property adjacent to the western side of the proposed development area is privately owned.

2.2 Physical Setting

The topography across Landfill No. 6 reflects its location in a valley between the northeast-southwest trending Blue Ridge Mountains. The valley is defined by Chambers Mountain (approximate elevation 4509 feet NGVD), about 2 miles northwest of the Site and Anderson Mountain (3680 feet NGVD) 1.5 miles to the south. Ground surface elevation slopes downward to the south from approximately 2,800 feet NGVD in the northeast portion of Areas D and E to

BASE MAP ADAPTED FROM 7.5 MIN USGS TOPO QUADS
CANTON, NC – 1990
CLYDE – 1978

1000 0 2000 4000 FEET

FIGURE 2-1
SITE LOCATION
BLUE RIDGE PAPER PRODUCTS INC. –
CANTON MILL
CANTON, NC
LANDFILL NO. 6 – AREA D AND E

SME
Sevee & Maher Engineers, Inc.

DWG: 6E-SITELOC LMN: NONE CTB: SME-STD REV: 8/29/08

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less than 2,600 feet NGVD along the westerly-flowing Pigeon River. Area D is bounded by two nearly parallel ridges trending north-south, which locally slope downward to a ravine containing an unnamed creek supplied by a spring. The unnamed creek discharges to the Pigeon River downstream of the Area D boundary. Area E occupies a smaller area in the higher topography adjacent to the northern limit of Area D. The local topography across Area E slopes downward toward the west-northwest forming a ravine adjacent to the northern limit of its proposed development area. Another spring discharges to a sideslope beyond the northwest corner of Area E flows into a westerly trending drainage ditch. During our field investigation, a drilled water supply well was observed in Area E as shown on Figure 3-1

2.3 Regional Geology and Hydrogeology

Located in the Blue Ridge Physiographic Province of North Carolina, the subsurface geology reflects the weathering of the igneous and metamorphic parent bedrock, which forms the unconsolidated residuum. The soil composition is variable, ranging from silty fine to coarse sands to clayey sandy silts. Mica is commonly encountered, frequently in abundance. Gravel and rock fragments are also present. The profile of the partially weathered rock and bedrock rock is quite irregular and erratic, even over short horizontal distances. Alluvial deposits are present locally across the Site, a function of erosion from sideslopes by surface water and fluvial processes along the Pigeon River. Mass transport of surficial soils accumulates colluvium downslope in the draws and ravines.

The regional groundwater seepage direction is interpreted to be generally to the south, towards the Pigeon River, with recharge being transported primarily in the saprolite. Local groundwater flow directions are controlled more by the geomorphic features of the area, with topographic ridges creating local groundwater divides and groundwater traveling in the direction of downsloping topography. The Site is bounded on the east and west sides by several ridges that appear to run from the north to south. Local groundwater flow in this area is confined by the ridges and flows toward the draws between the ridges southerly toward Pigeon River. Based on general groundwater theory (Fetter, 1988) and the geomorphology of the Site, groundwater flow

in this area is anticipated to be primarily horizontal but with slight downward gradients beneath the ridges and slight upward gradients beneath the draws.

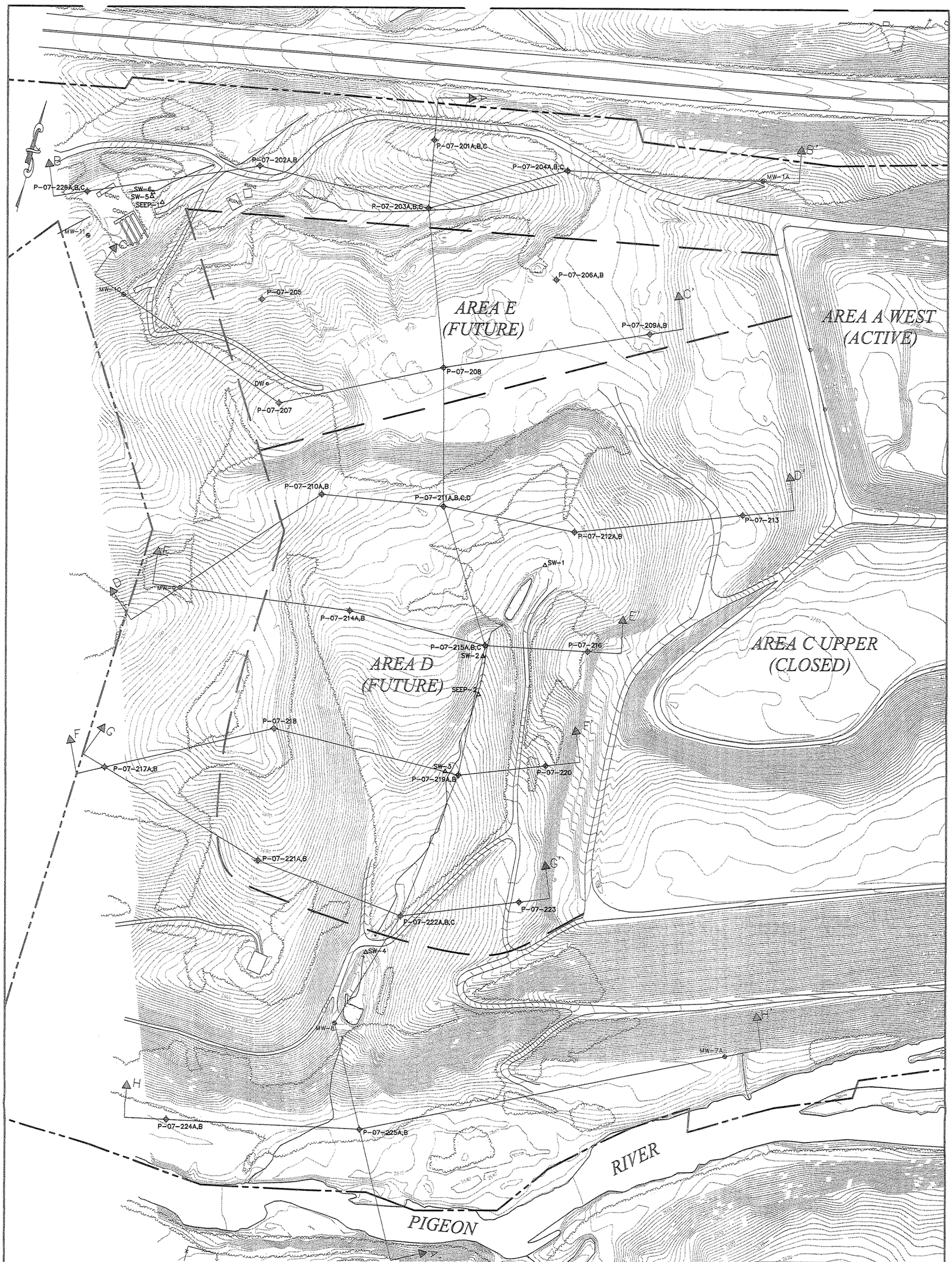
3.0 SITE INVESTIGATION

The methods and procedures utilized to accomplish the scope of the site investigation in support of the design hydrogeologic report for the development of Areas D and E of Landfill No. 6 are presented in this section. The focus of the investigation was to collect data needed to ensure vertical separation requirements are satisfied for establishing the liner base grades, and to understand the local hydrogeologic flow regime to design an effective groundwater monitoring system for the proposed development areas.

3.1 Piezometer Installations

A total of 52 piezometers, designated as the P-07-200-series, were installed in 28 borings drilled between August and October 2007. Extra piezometers were added to the program beyond the number specified in the Work Plan to provide additional vertical characterization of the bedrock. The locations of the P-07-200-series piezometers are shown in Figure 3-1, which also includes six older monitoring wells (MW-1A, and MW-7A through MW-11) positioned around the perimeter of the expansion area and numerous soil borings (AP- and B-series) drilled during previous site studies. NCDENR requires a minimum 4-foot separation between the bottom of the secondary liner at the base of the landfill, and the seasonal-high groundwater table and bedrock surface. Therefore, the majority of these borings were located within the footprint of Areas D and E; although, a few piezometers were installed beyond the limit of the proposed landfill development area to refine groundwater flow directions moving off-site.

Borings for the P-07-200-series piezometers ranged in depth from 13 feet to 191 feet below ground surface (bgs). Multilevel piezometers were installed in most locations to screen distinct lithologic units (residual soil, saprolite, partially weathered rock, fractured and competent bedrock) and to provide a means to measure vertical groundwater piezometric gradients beneath the proposed landfill expansion area. The unconsolidated formation (i.e., soils) was drilled with 4.25-inch inside diameter hollow-stem augers to the depth of auger refusal at each location, except at P-07-201. Samples of the unconsolidated formation were collected at 5-foot intervals during Standard Penetration Sampling (SPT) in general accordance with American Society for



LEGEND

EXISTING MONITORING WELL/PIEZOMETER LOCATION

FORMER DRILLED WELL LOCATION

SEEP OR SURFACE WATER SAMPLING LOCATION

A A' GEOLOGIC PROFILE LOCATION

FIGURE 3-1
EXPLORATION LOCATIONS
BLUE RIDGE PAPER PRODUCTS INC. –
CANTON MILL
CANTON, NC
AMENDMENT TO PERMIT
LANDFILL NO. 6
AREA D AND E

SME
Sevee & Maher Engineers, Inc.
Consulting Engineers
Cumberland Center, Maine

DWG: CantonFinalTopo LMN: E-BORINGS CTB: E-BORINGS REV: 8/27/08

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Testing and Materials (ASTM) D 1586 for geologic logging (ASTM, 2008). Rock core samples were collected with a dual-tube HQ (2.5-inch inside diameter) diamond bit core barrel following procedures described in ASTM D 2113 (ASTM, 2006a). Descriptive soil boring and bedrock core logs were prepared from visual logging of the retrieved soil and rock core samples, which are compiled in Appendices A and B, respectively.

Multilevel clusters containing 2 to 3 piezometers per boring were installed at several locations. To differentiate between multiple instruments within a boring location, an "A" suffix designated the deepest piezometer, and successively shallower piezometers with a "B", "C", and "D", as needed. For example, P-07-201A signifies the deepest piezometer, P-07-201B an intermediate depth piezometer, and P-07-201C the shallow piezometer at the boring B-07-201 location. Each piezometer was constructed with ¾-inch inside diameter flush-joint Schedule 40 polyvinylchloride (PVC) riser and a 5 to 10-foot-long PVC 0.01-inch wide slotted well screen per ASTM D 5092 (ASTM, 2004). A washed filter sand pack extended a minimum 1 to 2 feet above the top of the well screen and the remaining annular space sealed with either solid bentonite chips or a hydrated powdered bentonite grout. A steel protective surface casing secured with a keyed padlock was installed around the portion of the riser pipe extending above the ground surface, and a well tag identifying the piezometer affixed to the protective casing. Drilling services were provided by A.E. Drilling Services, LLC of Greenville, SC, who are certified for drilling in North Carolina. Water for drilling was obtained from Blue Ridge and consisted of water suitable for potable use. Details of the boring and piezometer installations are summarized in Table 3-1. Piezometer installation diagrams are also included on the descriptive soil logs in Appendix A.

3.2 Elevation and Position Survey

The ground surface elevation and horizontal coordinates of each boring and piezometer was surveyed to a minimum accuracy of within 0.1 foot and 1 foot, respectively, using existing site benchmarks and control points. The top elevation of the PVC piezometer riser pipe was surveyed to the nearest 0.01 foot. Elevations were referenced to National Geodetic Vertical Datum (NGVD, 1929). Horizontal locations were reported relative to the North Carolina State

TABLE 3-1

EXPLORATION DETAILS
LANDFILL NO. 6 EXPANSION
AREAS D & E

Piezometer Designation	Groundwater Zone Screened	Auger Refusal	Bottom of Exploration	Survey Details				Well Screen Interval			Filter Pack Interval					Piezometer Designation
				Northing	Easting	Top of Riser	Ground	Top	Bottom	Length	Top		Bottom		Length	
		ft bgs	ft bgs	NAD	NAD	ft NGVD	ft NGVD	ft bgs	ft bgs	ft	ft bgs	ft NGVD	ft bgs	ft NGVD	ft	
P-07-201A	PWR	NR	100	677403.1639	845744.6775	2710.88	2707.7	95	100	5	93	2614.7	100	2607.7	7	P-07-201A
P-07-201B	PWR			677403.1588	845744.7920	2710.87		62	67	5	59.5	2648.2	67.5	2640.2	8	P-07-201B
P-07-201C	Saprolite			677403.2731	845744.6894	2710.88		23	38	15	18	2689.7	38.5	2669.2	20.5	P-07-201C
P-07-202A	PWR	71.7	79.7	677235.2826	845357.8528	2659.40	2656.4	60	70	10	58	2598.4	71	2585.4	13	P-07-202A
P-07-202B	Saprolite			677235.2102	845357.8239	2659.44		5	15	10	3	2653.4	16	2640.4	13	P-07-202B
P-07-203A	Comp Bedrock	33	84.5	677243.0505	845774.1812	2687.82	2684.7	74.5	84.5	10	72	2612.7	84.5	2600.2	12.5	P-07-203A
P-07-203B	Frac Bedrock			677243.0600	845774.1352	2687.83		39.5	44.5	5	38.5	2646.2	45	2639.7	6.5	P-07-203B
P-07-203C	Saprolite			677243.1609	845774.0388	2687.84		5	15	10	3	2681.7	16.5	2668.2	13.5	P-07-203C
P-07-204A	Frac Bedrock	72.5	125.7	677414.9752	846070.8072	2726.76	2724.1	110	120	10	108	2616.1	120.5	2603.6	12.5	P-07-204A
P-07-204B	PWR			677415.1785	846070.8543	2726.83		67	72	5	65.9	2658.2	72.5	2651.6	6.6	P-07-204B
P-07-204C	Saprolite			677414.8612	846070.8439	2726.84		35	45	10	30	2694.1	45	2679.1	15	P-07-204C
P-07-205	PWR	69.5	80.5	676928.7049	845445.8882	2712.46	2709.4	48	68	20	44	2665.4	69	2640.4	25	P-07-205
P-07-206A	Frac Bedrock	55	85	677161.6960	846112.8119	2739.13	2736.0	65	75	10	63	2673.0	75	2661.0	12	P-07-206A
P-07-206B	PWR			677161.7230	846112.7980	2739.15		35	45	10	30	2706.0	45	2691.0	15	P-07-206B
P-07-207	Frac Bedrock	56.5	99	676701.6315	845550.6178	2759.17	2756.0	69	89	20	66	2690.0	89.3	2666.7	23.3	P-07-207
P-07-208	PWR	61	75.5	676885.8079	845908.0699	2734.46	2731.1	40	60	20	35	2696.1	61	2670.1	26	P-07-208
P-07-209A	Frac Bedrock	35	65	677093.1797	846364.3950	2743.84	2741.2	50.3	60.3	10	48.5	2692.7	60.3	2680.9	11.8	P-07-209A
P-07-209B	PWR			677093.2866	846364.3669	2743.87		25	35	10	22	2719.2	35	2706.2	13	P-07-209B
P-07-210A	Frac Bedrock	58.5	70	676517.6159	845705.7408	2710.28	2706.9	60	65	5	59.2	2647.7	65.8	2641.1	6.6	P-07-210A
P-07-210B	Saprolite			676517.4986	845705.6204	2710.28		20	30	10	15	2691.9	30	2676.9	15	P-07-210B
P-07-211A	Comp Bedrock	28.5	190.0	676569.4565	846008.4699	2692.15	2689.0	180	190	10	178	2511.0	190	2499.0	12	P-07-211A
P-07-211B	Comp Bedrock	29.5	85.8	676569.5742	845994.8276	2693.24	2689.9	80.8	85.8	5	77	2612.9	85.8	2604.1	8.8	P-07-211B
P-07-211C	Frac Bedrock			676569.3462	845994.7995	2693.25		50	55.5	5.5	47.5	2642.4	55.5	2634.4	8	P-07-211C
P-07-211D	Saprolite			676569.5885	845994.7572	2693.22		19	29	10	14	2675.9	29	2660.9	15	P-07-211D
P-07-212A	Frac Bedrock	17	35	676594.4210	846313.4389	2680.15	2677.0	28	30	2	27	2650.0	30	2647.0	3	P-07-212A
P-07-212B	Colluvium			676594.4955	846313.3807	2680.14		8	16	8	6	2671.0	16	2661.0	10	P-07-212B
P-07-213	Frac/Comp Bedrock	32	75	676736.3133	846690.9671	2743.70	2741.2	55	75	20	51	2690.2	75	2666.2	24	P-07-213
P-07-214A	Comp Bedrock	51	60.5	676270.1494	845840.3718	2678.42	2675.4	55.5	60.5	5	54.5	2620.9	60.5	2614.9	6	P-07-214A
P-07-214B	Saprolite			676270.3549	845840.4588	2678.43		25	40	15	20	2655.4	40	2635.4	20	P-07-214B
P-07-215A	Comp Bedrock	24	65	676276.0518	846171.9990	2654.09	2650.8	55	65	10	53.5	2597.3	65	2585.8	11.5	P-07-215A
P-07-215B	Colluvium			676275.8221	846171.8597	2654.05		23	24.3	1.3	22.4	2628.4	24.3	2626.5	1.9	P-07-215B
P-07-215C	Colluvium	NR	13	676278.8230	846175.9232	2653.73	2651.0	4	13	9	2	2649.0	13	2638.0	11	P-07-215C
P-07-216	Comp Bedrock	17	69	676329.5463	846416.9002	2709.20	2706.9	48.3	68.3	20	45	2661.9	68.3	2638.6	23.3	P-07-216
P-07-217A	Comp Bedrock	51	191	675758.8171	845373.8905	2687.66	2685.1	171	191	20	169.7	2515.4	191	2494.1	21.3	P-07-217A
P-07-217B	Frac Bedrock			675758.9235	845373.8229	2687.65		55	70	15	50	2635.1	70	2615.1	20	P-07-217B
P-07-218	PWR	65	75.3	675954.2876	845740.9641	2704.00	2701.1	55	70	15	50	2651.1	70	2631.1	20	P-07-218
P-07-219A	Saprolite	53.5	70	675962.7969	846193.1569	2630.96	2627.6	49	54	5	48	2579.6	54	2573.6	6	P-07-219A
P-07-219B	Colluvium			675962.8405	846193.3337	2630.97		5	15	10	3.5	2624.1	15.5	2612.1	12	P-07-219B

TABLE 3-1 (Continued)

EXPLORATION DETAILS
LANDFILL NO. 6 EXPANSION
AREAS D & E

Piezometer Designation	Groundwater Zone Screened	Auger Refusal	Bottom of Exploration	Survey Details				Well Screen Interval			Filter Pack Interval					Piezometer Designation
				Northing	Easting	Top of Riser	Ground	Top	Bottom	Length	Top		Bottom		Length	
		ft bgs	ft bgs	NAD	NAD	ft NGVD	ft NGVD	ft bgs	ft bgs	ft	ft bgs	ft NGVD	ft bgs	ft NGVD	ft	
P-07-220	Frac Bedrock	28	50.3	676038.9535	846392.2988	2670.34	2666.9	31	41	10	26	2640.9	41	2625.9	15	P-07-220
P-07-221A	Comp Bedrock	62	75	675641.9546	845783.2830	2680.33	2677.2	70	75	5	69	2608.2	75	2602.2	6	P-07-221A
P-07-221B	PWR			675641.8003	845783.1619	2680.31		61	66	5	56.3	2620.9	66	2611.2	9.7	P-07-221B
P-07-222A	Comp Bedrock	61	111	675605.5136	846145.9747	2612.75	2610.6	100.6	110.6	10	94	2516.6	111	2499.6	17	P-07-222A
P-07-222B	PWR			675605.6146	846146.0447	2612.77		55	60	5	53	2557.6	60.5	2550.1	7.5	P-07-222B
P-07-222C	Reworked Soil			675605.5745	846145.9208	2612.75		5	15	10	3	2607.6	15.5	2595.1	12.5	P-07-222C
P-07-223	Saprolite	42	50	675710.9611	846415.6202	2651.29	2648.0	30.5	45.5	15	25.5	2622.5	45.5	2602.5	20	P-07-223
P-07-224A	Comp Bedrock	24.5	90	674990.5303	845734.7240	2541.00	2537.9	70	90	20	68	2469.9	90	2447.9	22	P-07-224A
P-07-224B	Alluvium			674990.3613	845734.0662	2541.04		5	15	10	3	2534.9	15.5	2522.4	12.5	P-07-224B
P-07-225A	Comp Bedrock	11	49.8	675089.1787	846187.3338	2541.56	2538.5	44.5	48.5	4	43.5	2495.0	49.5	2489.0	6	P-07-225A
P-07-225B	Alluv/Frac Bedrock			675088.8715	846187.3671	2541.58		5	15	10	3	2535.5	15	2523.5	12	P-07-225B
P-07-226A	Comp Bedrock	45.5	95.1	677066.7523	844974.7760	2648.80	2645.6	85.1	95.1	10	83	2562.6	95.1	2550.5	12.1	P-07-226A
P-07-226B	Frac Bedrock			677066.6834	844974.8157	2648.80		50	53	3	49	2596.6	53.5	2592.1	4.5	P-07-226B
P-07-226C	Saprolite			677066.7140	844974.9192	2648.82		10	20	10	4.3	2641.3	20.5	2625.1	16.2	P-07-226C

Abbreviations:
ft - feet
ft bgs - feet below ground surface
ft NGVD - feet National Geoditic Vertical Datum (1929)
NAD - North American Datum (1927)
NR - not reached

Groundwater Zone Screened Codes:
Alluv - Alluvium
PWR - Partially Weathered Rock (Augered)
Frac Bedrock - Fractured Bedrock (Cored)
Comp Bedrock - Competent Bedrock (Cored)

Plane Coordinate System (1983). Surveying services for the project were performed by Lattimore and Peeler Surveying, a Registered Land Surveyor firm located in Lawndale, NC.

3.3 Water Level Monitoring

Groundwater levels were measured during the drilling program, and periodically after all the new piezometers were installed to evaluated whether static water levels had been attained. Thereafter, water level monitoring in the new piezometers and several existing site wells within and near the footprint of Areas D and E have continued on a monthly basis since October 2007. Groundwater levels were measured to the nearest 0.01 foot from the top of the PVC piezometer riser pipes, and referenced to NGVD elevations. The water level data was used to determine annual groundwater fluctuation and the seasonal-high water table for the Areas D and E landfill development. The range of waters levels and the amount of their fluctuation is summarized in Table 3-2. Plots of the water levels over the period monitored by location are contained in Appendix C.

3.4 Surface Water Monitoring

Six monitoring points were established to collect surface water flow rates during the field investigation. Locations SW-1 through SW-4 were positioned along the base of the ravine in Area D. Monitoring points SW-5 and SW-6 were located downslope of the northwest corner of Area E. Two seeps were also identified in the field. Seep-1 flowed downslope toward location SW-5 and Seep-2 originates in the Area D ravine about 125 feet south of piezometer cluster P-07-215A, B, and C. Locations of the surface water and seep locations are shown in Figure 3-1. Flow measurements were obtained at surface water locations by directing surface water through a 4-inch diameter PVC pipe, or an existing culvert (SW-4), and collecting it in a container of known volume over a recorded period to time. Flow rate measurements are presented in Section 5.5 of this report.

TABLE 3-2

GROUNDWATER LEVELS
LANDFILL NO. 6 EXPANSION
AREAS D & E

Piezometer Designation	Groundwater Zone Screened	Screened Interval Top (bgs)	Screened Interval Bottom (bgs)	Screened Interval Length (ft)	Sand Pack Interval Top (bgs)	Sand Pack Interval Bottom (bgs)	Sand Pack Interval Length (ft)	Range of Groundwater Depths October 2007 through July 2008 (ft - bgs)	Total Fluctuation (ft)
P-07-201A	PWR	95 -	100	5	93 -	100	7	37.30 - 39.61	2.31
P-07-201B	PWR	62 -	67	5	59.5 -	67.5	8	37.37 - 39.41	2.04
P-07-201C	Saprolite	23 -	38	15	18 -	38.5	20.5	36.53 - 38.46	1.93
P-07-202A	PWR	60 -	70	10	58 -	71	13	7.69 - 9.13	1.44
P-07-202B	Saprolite	5 -	15	10	3 -	16	13	5.46 - 7.41	1.95
P-07-203A	Comp Bedrock	74.5 -	84.5	10	72 -	84.5	12.5	7.72 - 9.39	1.67
P-07-203B	Frac Bedrock	39.5 -	44.5	5	38.5 -	45	6.5	11.65 - 13.60	1.95
P-07-203C	Saprolite	5 -	15	10	3 -	16.5	13.5	10.36 - 12.32	1.96
P-07-204A	Frac Bedrock	110 -	120	10	108 -	120.5	12.5	35.65 - 37.62	1.97
P-07-204B	PWR	67 -	72	5	65.9 -	72.5	6.6	35.42 - 37.38	1.96
P-07-204C	Saprolite	35 -	45	10	30 -	45	15	34.95 - 37.01	2.06
P-07-205	PWR	48 -	68	20	44 -	69	25	53.33 - 55.09	1.76
P-07-206A	Frac Bedrock	65 -	75	10	63 -	75	12	41.25 - 43.71	2.46
P-07-206B	PWR	35 -	45	10	30 -	45	15	38.46 - 41.15	2.69
P-07-207	Frac Bedrock	69 -	89	20	66 -	89.3	23.3	77.05 - 78.94	1.89
P-07-208	PWR	40 -	60	20	35 -	61	26	43.52 - 46.08	2.56
P-07-209A	Frac Bedrock	50.3 -	60.3	10	48.5 -	60.3	11.8	33.19 - 35.32	2.13
P-07-209B	PWR	25 -	35	10	22 -	35	13	30.65 - 32.75	2.10
P-07-210A	Frac Bedrock	60 -	65	5	59.2 -	65.8	6.6	32.20 - 34.27	2.07
P-07-210B	Saprolite	20 -	30	10	15 -	30	15	Dry	
P-07-211A	Comp Bedrock	180 -	190	10	178 -	190	12	15.76 - 19.48	3.72
P-07-211B	Comp Bedrock	80.8 -	85.8	5	77 -	85.8	8.8	17.40 - 21.21	3.81
P-07-211C	Frac Bedrock	50 -	55	5	47.5 -	55.5	8	24.33 - 29.20	4.87
P-07-211D	Saprolite	19 -	29	10	14 -	28	14	24.33 - 29.21	4.88
P-07-212A	Frac Bedrock	28 -	30	2	27 -	30	3	12.20 - 19.47	7.27
P-07-212B	Colluvium	8 -	16	8	6 -	16	10	11.64 - 17.48	5.84
P-07-213	Frac/Comp Bedrock	55 -	75	20	51 -	75	24	54.35 - 58.54	4.19
P-07-214A	Comp Bedrock	55.5 -	60.5	5	54.5 -	60.5	6	25.99 - 28.17	2.18
P-07-214B	Saprolite	25 -	40	15	20 -	40	20	26.20 - 28.36	2.16
P-07-215A	Comp Bedrock	55 -	65	10	53.5 -	65	11.5	11.18 - 13.45	2.27
P-07-215B	Colluvium	23 -	24	1	22.4 -	24.3	1.9	10.13 - 11.83	1.70
P-07-215C	Colluvium	4 -	13	9	2 -	13	11	10.92 - 12.67	1.75
P-07-216	Comp Bedrock	48.3 -	68.3	20	45 -	68.3	23.3	51.56 - 54.73	3.17
P-07-217A	Comp Bedrock	171 -	191	20	169.7 -	191	21.3	72.39 - 74.06	1.67
P-07-217B	Frac Bedrock	55 -	70	15	50 -	70	20	57.71 - 57.96	0.25
P-07-218	PWR	55 -	70	15	50 -	70	20	57.71 - 61.40	3.69
P-07-219A	Saprolite	49 -	59	10	48 -	54	6	7.86 - 9.40	1.54
P-07-219B	Colluvium	5 -	15	10	3.5 -	15.5	12	7.73 - 8.83	1.10
P-07-220	Frac Bedrock	31 -	41	10	26 -	41	15	Dry	
P-07-221A	Comp Bedrock	70 -	75	5	69 -	75	6	Static condition not reached	
P-07-221B	PWR	61 -	66	5	56.3 -	66	9.7	57.88 - 59.50	1.62
P-07-222A	Comp Bedrock	100.6 -	110.6	10	94 -	111	17	17.83 - 20.11	2.28
P-07-222B	PWR	55 -	60	5	53 -	60.5	7.5	6.74 - 7.68	0.94
P-07-222C	Reworked Soil	5 -	15	10	3 -	15.5	12.5	7.11 - 8.01	0.90
P-07-223	Saprolite	30.5 -	45.5	15	25.5 -	45.5	20	38.34 - 39.47	1.13
P-07-224A	Comp Bedrock	70 -	90	20	68 -	90	22	8.74 - 10.12	1.38
P-07-224B	Alluvium	5 -	15	10	3 -	15.5	12.5	10.85 - 12.28	1.43
P-07-225A	Comp Bedrock	44.5 -	49.5	5	43.5 -	48.5	5	5.28 - 8.25	2.97
P-07-225B	Alluv/Frac Bedrock	5 -	15	10	3 -	15	12	6.09 - 9.64	3.55
P-07-226A	Comp Bedrock	85 -	95	10	83 -	95.1	12.1	16.22 - 18.78	2.56
P-07-226B	Frac Bedrock	50 -	53	3	49 -	53.5	4.5	16.36 - 19.07	2.71
P-07-226C	Saprolite	10 -	20	10	4.3 -	20.5	16.2	15.55 - 18.16	2.61
MW-1A	Bedrock	102.9 -	122.9	20	57.8 -	70.8	13	56.88 - 60.94	4.06
MW-7A	Bedrock	13.5 -	23.5	10	10.8 -	23.5	12.7	10.04 - 11.66	1.62
MW-8	Bedrock	17.7 -	27.7	10	7 -	27.7	20.7	10.80 - 12.00	1.20
MW-9	Bedrock	44.8 -	64.8	20	41 -	64.8	23.8	39.51 - 41.28	1.77
MW-10	Bedrock	54 -	74	20	52.4 -	74	21.6	38.48 - 39.87	1.39
MW-11	Saprolite	10.4 -	20.4	10	10 -	20.4	10.4	11.68 - 14.67	2.99

Groundwater Zone Screened Codes:
- Alluv - Alluvium
- PWR - Partially Weathered Rock (Augered)
- Frac Bedrock - Fractured Bedrock (Cored)
- Comp Bedrock - Competent Bedrock (Cored)
- Bedrock - Core logs not available, condition of bedrock not known

Abbreviations:
- ft - feet
- ft bgs - feet below ground surface

Plane Coordinate System (1983). Surveying services for the project were performed by Lattimore and Peeler Surveying, a Registered Land Surveyor firm located in Lawndale, NC.

3.3 Water Level Monitoring

Groundwater levels were measured during the drilling program, and periodically after all the new piezometers were installed to evaluated whether static water levels had been attained. Thereafter, water level monitoring in the new piezometers and several existing site wells within and near the footprint of Areas D and E have continued on a monthly basis since October 2007. Groundwater levels were measured to the nearest 0.01 foot from the top of the PVC piezometer riser pipes, and referenced to NGVD elevations. The water level data was used to determine annual groundwater fluctuation and the seasonal-high water table for the Areas D and E landfill development. The range of waters levels and the amount of their fluctuation is summarized in Table 3-2. Plots of the water levels over the period monitored by location are contained in Appendix C.

3.4 Surface Water Monitoring

Six monitoring points were established to collect surface water flow rates during the field investigation. Locations SW-1 through SW-4 were positioned along the base of the ravine in Area D. Monitoring points SW-5 and SW-6 were located downslope of the northwest corner of Area E. Two seeps were also identified in the field. Seep-1 flowed downslope toward location SW-5 and Seep-2 originates in the Area D ravine about 125 feet south of piezometer cluster P-07-215A, B, and C. Locations of the surface water and seep locations are shown in Figure 3-1. Flow measurements were obtained at surface water locations by directing surface water through a 4-inch diameter PVC pipe, or an existing culvert (SW-4), and collecting it in a container of known volume over a recorded period to time. Flow rate measurements are presented in Section 5.5 of this report.

3.5 In Situ Hydraulic Conductivity Testing

Rising- or failing-head slug tests were conducted in most of the P-07-200-series piezometers to measure the in situ hydraulic conductivity of the overburden and bedrock in the area investigated. The static water level in piezometers was displacement at the start of the test using one of the following procedures: (1) removing a solid metal rod placed below the level of static water [rising head], (2) pumping a volume of water out of the piezometer [rising head], or (3) adding a volume of water to the piezometer [falling head]. Water level displacement during the recovery period was measured with an automated pressure transducer. Slug test data was reduced and analyzed with AQTESOVL™ computer software package, and the hydraulic conductivity calculated following the methods of Cooper et al., 1967 or Bouwer and Rice, 1973. Calculated hydraulic conductivities for the zones monitored are compiled in Table 3-3, and are also notated on the soil boring logs in Appendix A. Plots of the normalized head over time for each test are presented in Appendix D.

3.6 Laboratory Testing for Physical Properties of Soils

Representative samples of the unconsolidated formation (i.e., residual soil, alluvium, colluvium, and saprolite) were transported after preservation to the SME geotechnical laboratory to determine grain size and natural moisture content. Grain size analyses were performed in accordance with ASTM D 422 (ASTM, 2007) on split-spoon samples retrieved from the borings. The distribution of grain size by geologic soil unit is summarized in Table 3-4. Grain size distribution curves are shown in Appendix E, and SME boring logs in Appendix A are annotated with the fraction passing the U.S. No. 200 sieve size (i.e., percent fines).

Gravimetric water contents from saturated split-spoon samples obtained from below the groundwater table were determined (ASTM Method D 2216, [ASTM, 2005]), and from these measurements total porosities were calculated (Lambe and Whitman, 1969). In order to calculate the total porosity of the saprolite, the soil that comprised most of the unconsolidated

TABLE 3-3

IN SITU HYDRAULIC CONDUCTIVITY TESTING
LANDFILL NO. 6 EXPANSION
AREAS D & E

Groundwater Zone Screened	Piezometer Designation	Well Screen Interval Depth			In Situ Hydraulic Conductivity		
		Top	Bottom	Length	Well	Geometric Mean	
		ft-bgs	ft-bgs	ft-bgs	cm/sec	cm/sec	ft/day
Reworked Soil	P-07-222C	5	15	10	1.8E-04	-	0.5 (1)
Alluvium	P-07-224B	5	15	10	1.2E-03	-	3.5 (1)
Alluv/Frac Bedrock	P-07-225B	5	15	10	5.7E-04	-	1.6 (1)
Colluvium	P-07-215B	23	24.3	1.3	3.1E-02	5.7×10^{-4}	1.6
	P-07-215C	4	13	9	2.0E-04		
	P-07-219B	5	15	10	3.0E-05		
Saprolite	P-07-201C	23	38	15	9.4E-06	1.2×10^{-4}	0.3
	P-07-202B	5	15	10	2.3E-05		
	P-07-203C	5	15	10	4.6E-04		
	P-07-204C	35	45	10	3.0E-04		
	P-07-211D	19	29	10	2.2E-03		
	P-07-214B	25	40	15	7.5E-06		
	P-07-219A	49	54	5	1.1E-03		
	P-07-226C	10	20	10	8.7E-05		
PWR	P-07-201A	95	100	5	3.7E-05	1.3×10^{-4}	0.4
	P-07-202A	60	70	10	4.8E-06		
	P-07-204B	67	72	5	3.6E-04		
	P-07-205	48	68	20	1.7E-05		
	P-07-206B	35	45	10	1.3E-03		
	P-07-208	40	60	20	4.4E-05		
	P-07-209B	25	35	10	6.0E-03		
	P-07-218	55	70	15	1.3E-04		
	P-07-221B	61	66	5	1.6E-04		
	P-07-222B	55	60	5	1.7E-04		
Fractured Bedrock	P-07-203B	39.5	44.5	5	1.7E-05	3.1×10^{-4}	0.9
	P-07-204A	110	120	10	1.3E-03		
	P-07-206A	65	75	10	3.6E-04		
	P-07-207	69	89	20	1.3E-03		
	P-07-209A	50.3	60.3	10	4.5E-05		
	P-07-210A	60	65	5	3.4E-05		
	P-07-212A	28	30	2	3.3E-03		
	P-07-213	55	75	20	4.2E-03		
	P-07-217B	55	70	15	4.0E-04		
	P-07-226B	50	53	3	1.1E-04		
Competent Bedrock	P-07-203A	74.5	84.5	10	3.0E-04	1.3×10^{-5}	0.04
	P-07-211A	180	190	10	4.5E-05		
	P-07-211B	80.8	85.8	5	3.9E-05		
	P-07-214A	55.5	60.5	5	2.6E-05		
	P-07-215A	55	65	10	1.1E-04		
	P-07-216	48.3	68.3	20	1.5E-03		
	P-07-217A	171	191	20	1.1E-05		
	P-07-221A	70	75	5	8.2E-10		
	P-07-222A	100.6	110.6	10	1.6E-09		
	P-07-224A	70	90	20	7.8E-04		
	P-07-225A	44.5	48.5	4	5.2E-06		
	P-07-226A	85.1	95.1	10	2.1E-04		

Note:
1. Value for individual well.

Abbreviations:
cm/ses - centimeters per second
ft/day - feet per day
ft - bgs - feet below ground surface

TABLE 3-4

SUMMARY OF LABORATORY GRAIN SIZE ANALYSIS
LANDFILL NO. 6 EXPANSION
AREAS D & E

Boring	Sample	Depth (ft)	Lithologic Unit	Natural MC (%)	Percent Grain Size Distribution						USCS Classification	
						Sand						
					Gravel	Coarse	Medium	Fine	Total	Silt (clay)	Symbol	Description
B-07-224	3D	10-12	Alluvium	11.2	62.1	6.1	13.7	13.3	33.1	4.8	GW	Well-graded gravel with sand
B-07-225	1D	4-6		45.9	0	0	3.5	66.6	70.1	29.9	SM	Silty sand
B-07-225	2D	9-11		14.1	35.5	12.7	21.4	22.2	56.3	8.2	SW-SM	Well-graded sand with silt and gravel
B-07-215	4D	19-21	Colluvium	40	0.5	4.7	20	32.8	57.5	42.0	SM	Silty sand
B-07-219	2D	9-11		50.7	4.4	6.6	21.4	35.5	63.5	32.1	SM	Silty sand
B-07-203	1D	0-1	Reworked Soil	29.8	0.2	1.7	11.2	16.3	29.2	70.6	ML	Silt with sand
B-07-215	Bag	0-4		15.1	9.6	10.1	20.9	23.0	54.0	36.4	SM	Silty sand
B-07-204	2D	5-7	Residual Soil	24.3	0.2	3.4	18.1	27.2	48.7	51.1	ML	sandy silt
B-07-218	2D	4-6		24.3	0.6	1.6	13.6	21.2	36.4	63.0	ML	sandy silt
B-07-226	2D	5-7		21.7	0.8	4.9	16.2	21.2	42.3	56.9	ML	sandy silt
B-07-201	4D	19-21	Saprolite	17.3	0.1	1.7	17.2	39.4	58.3	41.6	SM	Silty sand
B-07-201	9D	44-46		14.2	0	2	27.4	40.7	70.1	29.9	SM	Silty sand
B-07-207	4D	15-17		7.9	0.9	3.4	25.3	40.5	69.2	29.9	SM	Silty sand
B-07-207	7D	30-32		6.8	0	1.8	33.6	37.7	73.1	26.9	SM	Silty sand
B-07-208	2D	9-11		14.9	2.2	13.2	25.6	25.3	64.1	33.7	SM	Silty sand
B-07-208	6D	29-31		20.8	1.4	12.8	29.5	19.2	61.5	37.1	SM	Silty sand
B-07-209	3D	9-11		5.5	44.4	9.2	18.1	17.5	44.8	10.8	SW-SM	Well-graded sand with silt and gravel
B-07-219	7D	34-36		13.3	5.4	8.4	23.3	37.7	69.4	25.2	SM	Silty sand
B-07-221	3D	5-7		14.2	0	0.1	15.8	41.2	57.1	42.9	SM	Silty sand
B-07-226	5D	20-22		16.3	2.5	8.7	25.7	32.6	67.0	30.5	SM	Silty sand
B-07-201	16D	79-79.6	PWR	5.4	0.3	3.2	27.4	37.3	67.9	31.8	SM	Silty sand
B-07-213	5D	19-21		12.2	0.8	5.1	21.4	24.6	51.1	48.1	SM	Silty sand
B-07-220	5D	20-22		11.9	20.8	13.8	22.9	24.8	61.5	17.7	SM	Silty sand with gravel
B-07-222	9D	45-46		13.4	0	1.8	33.6	42.9	78.3	21.7	SM	Silty sand

Mean Percent Moisture Content and Grain Size Distribution for Soil Units

Alluvium (1)	46	0	0	4	67	70	30	SM	silty sand
Alluvium (2)	13	49	9	18	18	45	7	GW-GM	well-graded gravel with silt and sand
Colluvium	45	2	6	21	34	61	37	SM	silty sand
Reworked Soil	22	5	6	16	20	42	54	ML	sandy silt
Residual Soil	23	1	3	16	23	42	57	ML	sandy silt
Saprolite	13	6	6	24	33	63	31	SM	silty sand
PWR	11	5	6	26	32	65	30	SM	silty sand

Abbreviations:

MC - moisture content

PWR - partially-weathered rock

USCS - Unified Soil Classification System

Notes:

1. Shallow alluvium
2. Deep alluvium

saturated formation beneath Areas D and E, SME determined the saprolite's specific gravity by ASTM Method D 854 (ASTM, 2006b). The specific gravity testing revealed a value of 2.87 for the saprolite, which is within the range typical from soils containing micas. Results of the moisture content measurements and calculated total porosities are presented in Appendix F. Laboratory worksheets are also contained in Appendix F. The water contents are listed on the boring logs in Appendix A.

3.7 Bedrock Outcrop Fracture Mapping

Bedrock structural features influence the rate and direction of groundwater flow through the bedrock groundwater system. SME mapped structural features at three rock outcrops: Outcrop 1 and 2 were located in the eastern portion of Landfill No. 6 in the vicinity of the Bowen Branch, and Outcrop 3 along the Pigeon River south of Areas D & E. Strike and dip measurements representing 41 fractures were obtained from three bedrock outcrops, which should be fairly representative of the bedrock structure at Areas D & E. Strike and dip measurements are compiled in Table 3-5.

TABLE 3-5

BEDROCK OUTCROP FRACTURE MEASUREMENTS

Outcrop 1		Outcrop 2		Outcrop 3	
Strike	Dip	Strike	Dip	Strike	Dip
N77°E	79°SE	N299°W	30°NE	N348°W	78°NE
N79°E	86°SE	N324°W	36°NE	N40°E	85°NW
N54°E	88°SE	N325°W	52°NE	N350°W	80°NE
N72°E	82°SE	N328°W	42°NE	N343°W	82°NE
N84°E	82°NW	N55°E	50°SE	N319°W	70°NE
N314°W	79°NE	N64°E	57°SE	N8°E	76°SE
N295°W	87°SW	N316°W	66°NE	N332°W	85°NW
		N338°W	61°NE	N43°E	81°NE
		N324°W	64°NE	N84°E	83°SE
		N336°W	55°NE	N90°E	83°N
		N326°W	69°NE	N348°W	22°SW
		N61°E	40°SE	N348°W	20°SW
		N284°W	56°NE	N274°W	87°SW
		N332°W	60°NE	N78°E	76°SE
		N313°W	61°NE	N79°E	77°SE
		N34°E	87°SE	N338°W	23°SE
		N24°E	81°SE	N89°E	87°NW

Notes:

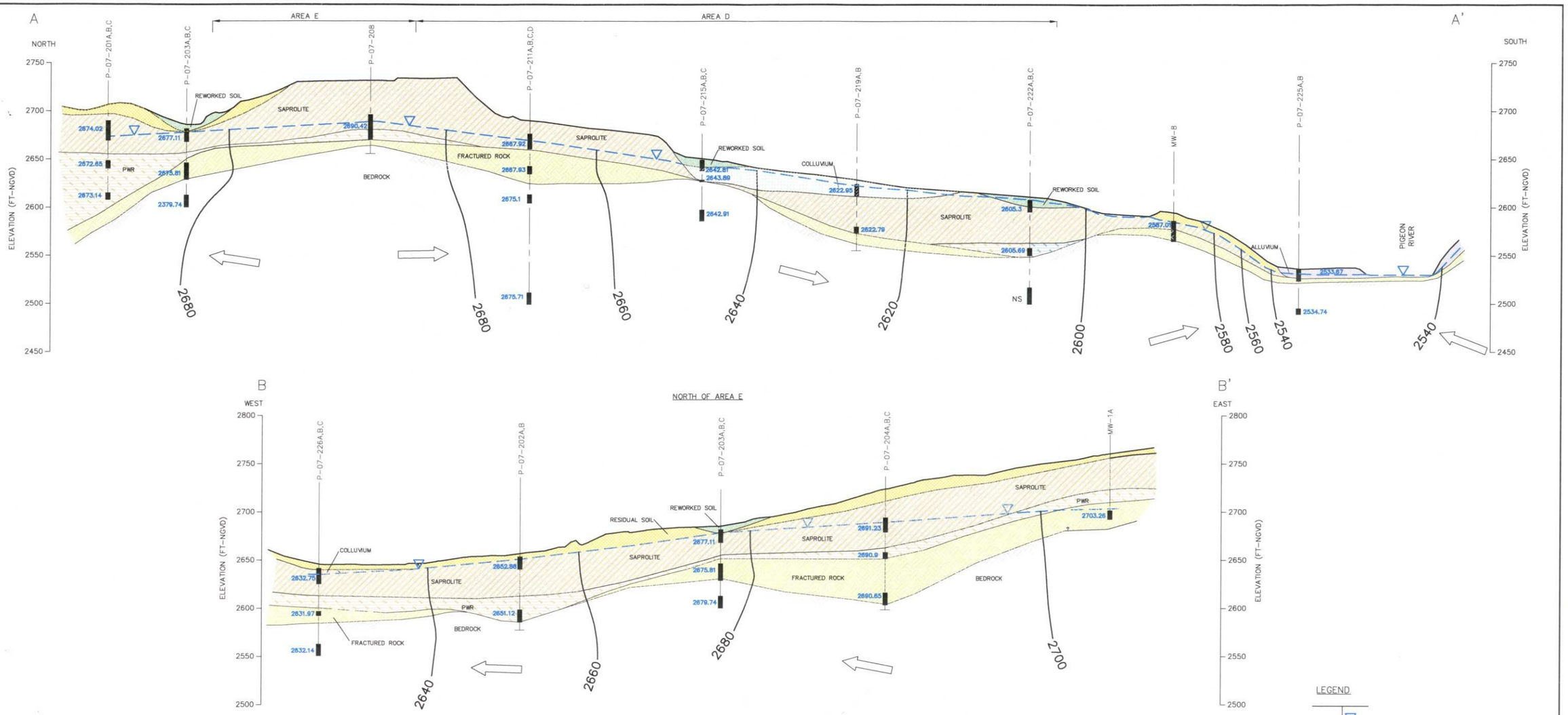
Strike - degrees relative to True North; Dip - degrees from horizontal

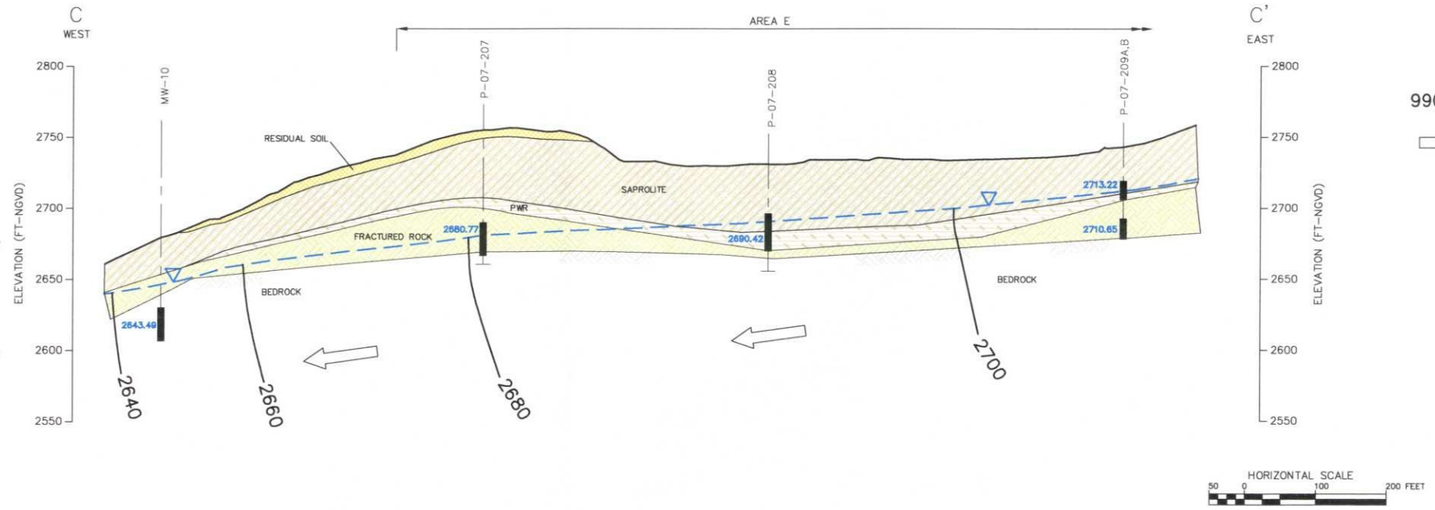
4.0 SITE GEOLOGIC CHARACTERISTICS

The geology within the proposed Areas D and E landfill expansion is described in this section of the report based on the information collected during the 2007 hydrogeologic investigation. Historical information gathered during earlier studies of the area has also been reviewed and utilized where appropriate to arrive at our interpretation of the geologic characteristics of the Site.

4.1 Surficial Geology

The surficial geology encountered in borings drilled for the hydrogeologic investigation consisted of alluvial and colluvial deposits, residuum or residual soil, and saprolite. Residual soil and saprolite were also used as fill in parts of Areas D and E. The unconsolidated materials in the split-spoon samples retrieved during this hydrogeologic investigation were consistent with the geology described by others in the previous drilling programs at Landfill No. 6 (Law, 1982; Sirrine, 1989; SME, 1995; and Weston, 1995. Alluvium was present along the floodplain of the Pigeon River associated with fluvial processes transporting and depositing sediments along the river banks from upstream origins. Mass movement of unconsolidated surficial material from the ridges has formed zones of colluvium along sideslopes and the base of slopes in some ravines. Weathering of the underlying parent bedrock has produced a relatively thin layer of residual soil over an extensive zone of saprolite beneath the proposed landfill development areas. The residual soil has been weathered to a greater degree than the saprolite, since the saprolite still exhibits the relic structure of the parent bedrock in some places. However, the boundary between the residual soil and the saprolite often was not definite because of the variable and gradational weathering of the different types of minerals comprising the bedrock. Cobble-sized pieces of decomposing bedrock imbedded in the deeper saprolite were also evident during drilling of some of the borings. After refusal was encountered with hollow-stem augers, rock cores were collected from most of the locations to confirm the depth of contact with the bedrock surface. A series of interpretive geologic profiles through the proposed landfill development Areas D and E are illustrated in Figures 4-1 and 4-2. The locations and orientations of the geologic profiles are shown on Figure 3-1. It is apparent from Figures 4-1 and 4-2 that the





GEOLOGIC DESCRIPTION

- REWORKED SOIL – RESIDUAL SOIL AND SAPROLITE REDISTRIBUTED ON-SITE DURING GRADING OR CONSTRUCTION ACTIVITIES.
- ALLUVIUM – LOOSE, UNIFORM SILTY FINE SAND (BECOMING GRAVELLY WITH DEPTH) ASSOCIATED WITH THE FLOODPLAIN OF THE PIGEON RIVER.
- COLLUVIUM – LOOSE TO MEDIUM DENSE SILTY SAND ASSOCIATED WITH MASS TRANSPORT OF RESIDUAL SOIL/SAPROLITE DOWNSLOPE.
- RESIDUAL SOIL – FIRM TO STIFF SANDY SILT RESULTING FROM THE CONTINUED WEATHERING OF SAPROLITE. LACKS THE RELICT STRUCTURE OF THE SAPROLITE.
- SAPROLITE – LOOSE TO DENSE, FRIABLE, SILTY SAND EXHIBITING RELICT FEATURES OF THE BEDROCK PARENT MATERIAL. RELATIVE DENSITY INCREASING WITH DEPTH.
- PARTIALLY WEATHERED ROCK (PWR) – TRANSITIONAL ZONE BETWEEN FRIABLE SAPROLITE AND FRACTURED ROCK/BEDROCK. VERY DENSE (N-VALUES GREATER THAN 50). RELICT STRUCTURE OF PARENT BEDROCK EVENT.
- FRACTURED ROCK – MODERATELY TO SEVERELY FRACTURED BEDROCK HAVING AN RQD TYPICALLY LESS THAN 75%.
- BEDROCK – COARSE-GRAINED MICA SCHIST INTERLAYERED WITH FINE TO MEDIUM-GRAINED, BIOTITE GNEISS AND OCCASIONAL METAGRAYWACKE. COMPETENT RQD EXCEEDING 75%.

LEGEND

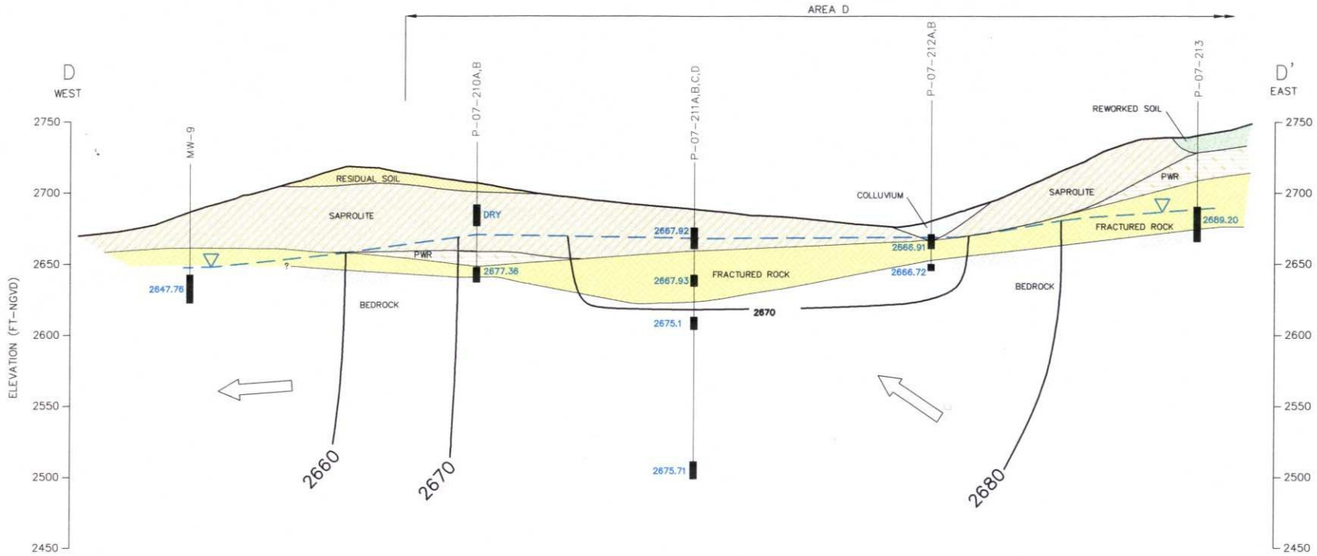
- INTERPRETED WATER TABLE ELEVATION
- PIEZOMETER/WELL SCREEN INTERVAL
- BOTTOM OF EXPLORATION
- 990 — INTERPRETIVE VERTICAL EQUIPOTENTIAL CONTOUR IN FEET – NGVD
- GENERALIZED GROUNDWATER FLOW DIRECTION
- NS — ELEVATION IN WELL/PIEZOMETER NOT STABILIZED

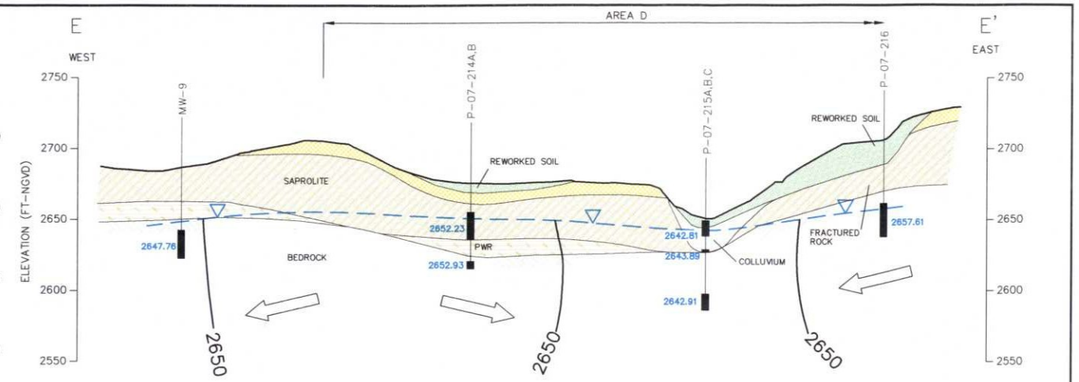
HORIZONTAL SCALE
50 0 100 200 FEET

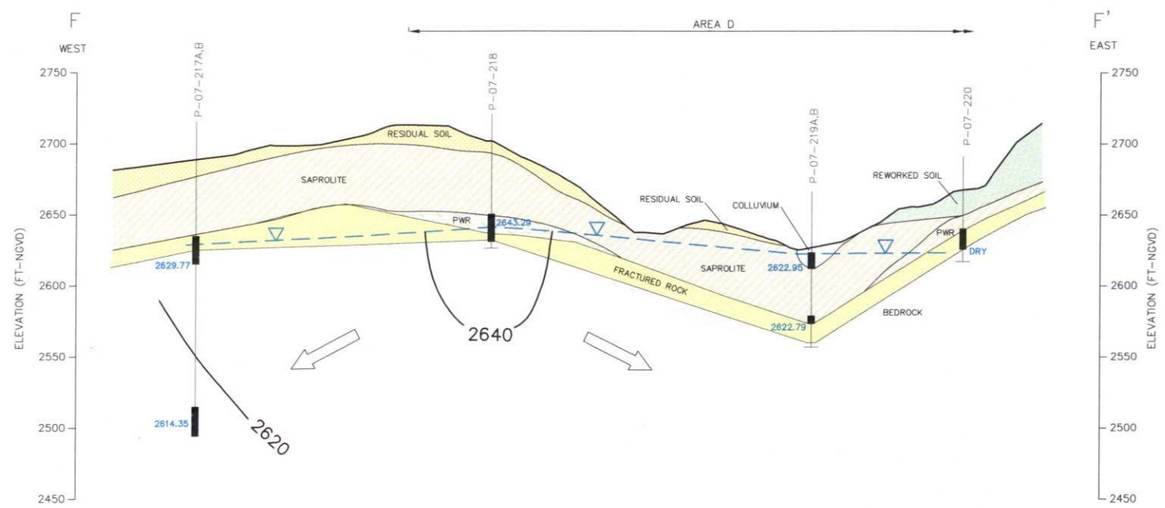
FIGURE 4-1
INTERPRETIVE GEOLOGIC PROFILES
BLUE RIDGE PAPER PRODUCTS INC. –
CANTON MILL
CANTON, NC
LANDFILL NO. 6
AREA D AND E

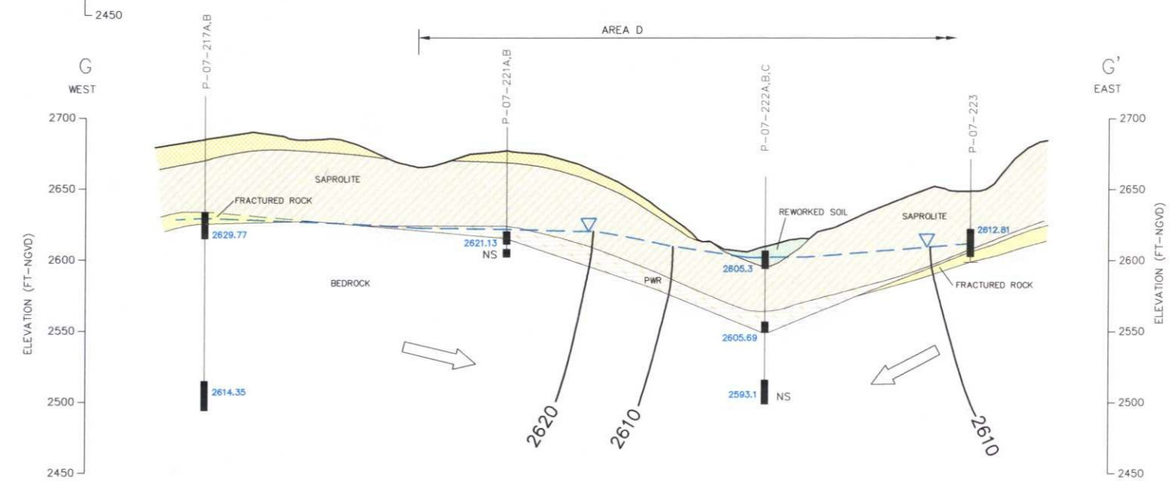
SME
Sevee & Maher Engineers, Inc.
Consulting Engineers
Cumberland Center, Maine

WG:CANTONFINALTOPO LMN:PROF CTB:PROF REV: 8/21/08









LEGEND

INTERPRETED WATER TABLE ELEVATION

PIEZOMETER/WELL SCREEN INTERVAL

BOTTOM OF EXPLORATION

990 — INTERPRETIVE VERTICAL EQUIPOTENTIAL CONTOUR IN FEET – NGVD

GENERALIZED GROUNDWATER FLOW DIRECTION

NS — ELEVATION IN WELL/PIEZOMETER NOT STABILIZED

GEOLOGIC DESCRIPTION

REWORKED SOIL – RESIDUAL SOIL AND SAPROLITE REDISTRIBUTED ON-SITE DURING GRADING OR CONSTRUCTION ACTIVITIES.

ALLUVIUM – LOOSE, UNIFORM SILTY FINE SAND (BECOMING GRAVELLY WITH DEPTH) ASSOCIATED WITH THE FLOODPLAIN OF THE PIGEON RIVER.

COLLUVIUM – LOOSE TO MEDIUM DENSE SILTY SAND ASSOCIATED WITH MASS TRANSPORT OF RESIDUAL SOIL/SAPROLITE DOWNSLOPE.

RESIDUAL SOIL – FIRM TO STIFF SANDY SILT RESULTING FROM THE CONTINUED WEATHERING OF SAPROLITE. LACKS THE RELICT STRUCTURE OF THE SAPROLITE.

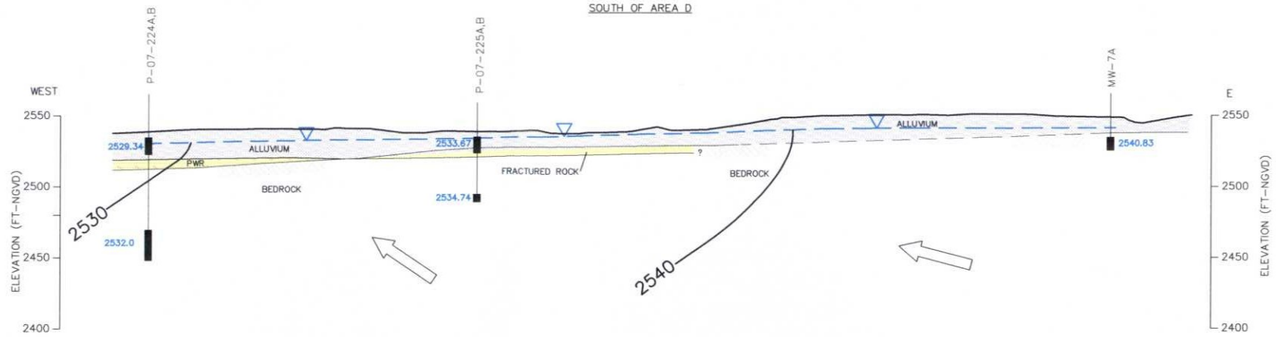
SAPROLITE – LOOSE TO DENSE, FRIABLE, SILTY SAND EXHIBITING RELICT FEATURES OF THE BEDROCK PARENT MATERIAL. RELATIVE DENSITY INCREASING WITH DEPTH.

PARTIALLY WEATHERED ROCK (PWR) – TRANSITIONAL ZONE BETWEEN FRIABLE SAPROLITE AND FRACTURED ROCK/BEDROCK. VERY DENSE (N-VALUES GREATER THAN 50). RELICT STRUCTURE OF PARENT BEDROCK EVENT.

FRACTURED ROCK – MODERATELY TO SEVERELY FRACTURED BEDROCK HAVING AN RQD TYPICALLY LESS THAN 75%.

BEDROCK – COARSE-GRAINED MICA SCHIST INTERLAYERED WITH FINE TO MEDIUM-GRAINED, BIOTITE GNEISS AND OCCASIONAL METAGRAYWACKE. COMPETENT RQD EXCEEDING 75%.

SOUTH OF AREA D



HORIZONTAL SCALE
50 0 100 200 FEET

FIGURE 4-2
INTERPRETIVE GEOLOGIC PROFILES
BLUE RIDGE PAPER PRODUCTS INC. –
CANTON MILL
CANTON, NC
LANDFILL NO. 6
AREA D AND E

SME
Sevee & Maher Engineers, Inc.
Consulting Engineers
Cumberland Center, Maine

DWG: CANTONFINALTOPO LMN: PROF CTB: PROF REV: 8/21/08

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saprolite represents the predominant soil formation beneath Areas D and E. Bedrock depth is variable due to localized mineral weathering processes. The profiles also show the presence of partially weathered to highly fractured bedrock zones underlying the saprolite, forming a nearby continuous layer above the more competent, unweathered deeper bedrock.

The total thickness of the unconsolidated formation (i.e., alluvium, colluvium, residual soils, and saprolite) in the proposed landfill No. 6 Areas D and E ranged from about 10 feet to over 60 feet. The thickest amount of soil was found between the northern boundary of Area E and the service road to its north (e.g., B07-201, -202, and -204), while the least thickness along the floodplain adjacent to the Pigeon River (e.g., B07-225). Less than 20 feet of soil was present in the central eastern portion of Area D. The total depth of soil over bedrock increased to over 60 feet towards the southwest and northwest portion of the Areas D and E, respectively.

Most of the unconsolidated formation within the footprint of proposed landfill development area consisted of saprolite, which averaged a thickness of about 45 feet among the borings drilled for the hydrogeologic investigation. The saprolite was visually identified in the field as consisting primarily of micaceous silty sand. Grain size analysis from split-spoon samples characterized the material as a medium to fine sand with a modest silt or clay content (i.e., based on percent passing the No. 200 U.S. standard sieve size averaging about 30 percent as shown on Table 3-4). Based on the grain size distribution of the saprolite, the material is classified as silty sand according to the Unified Soil Classification System (USCS). Its relative density ranged from loose to very dense based on SPT N-values (blow counts) recorded during split-spoon sampling of soils. Blow counts generally increased with depth to over 50 per foot in the deeper saprolite, which indicates the transitional zone of "partially-weathered rock" (PWR) overlying bedrock referred to in earlier descriptions of the area geology (Law, 1982). The PWR was penetrated with the hollow-stem augers and its grain size distribution was essentially the same as the less dense, saprolite.

A residuum or residual soil overlies the saprolite in about 30 percent of the borings drilled for the investigation. The thickness of the residual soil was much less than the saprolite, ranging from less than 5 feet to no more than 15 feet. The prior excavation of surficial soil from the proposed landfill expansion area to serve as cover material for other active landfill cells likely has reduced the amount of residual soil within Areas D and E. The fines content of the residual soil was about twice that of the saprolite, and averaged about 57 percent. The residual soil is classified (USCS) as a sandy silt or clay based on its grain size distribution. As mentioned previously, with continued weathering of the saprolite, the relict structure of the parent rock is no longer evident in the residual soil. The relative density of the residual soil was comparatively lower than the saprolite. The SPT N-values of the residual soil ranged from about 4 to 17 blow counts per foot.

Alluvial deposits were encountered in B07-224 and B07-225, which were drilled in the floodplain adjacent to the Pigeon River to the south of the proposed landfill expansion area. The shallow alluvium consisted of loose, uniform silty fine sand having a fines content of about 30 percent (e.g., the 4- to 6–foot deep sample from B07-225 in Table 3-4). In contrast, the coarser-grain fraction was notably greater in the deeper soil samples than the shallow alluvium. The deeper alluvium had a combined coarse sand and gravel content averaging almost 60 percent with only 7 percent fines. The vertical variation in the grain size of these deposits can be likely attributed to distinct depositional environments that contributed to the formation of the floodplain over time.

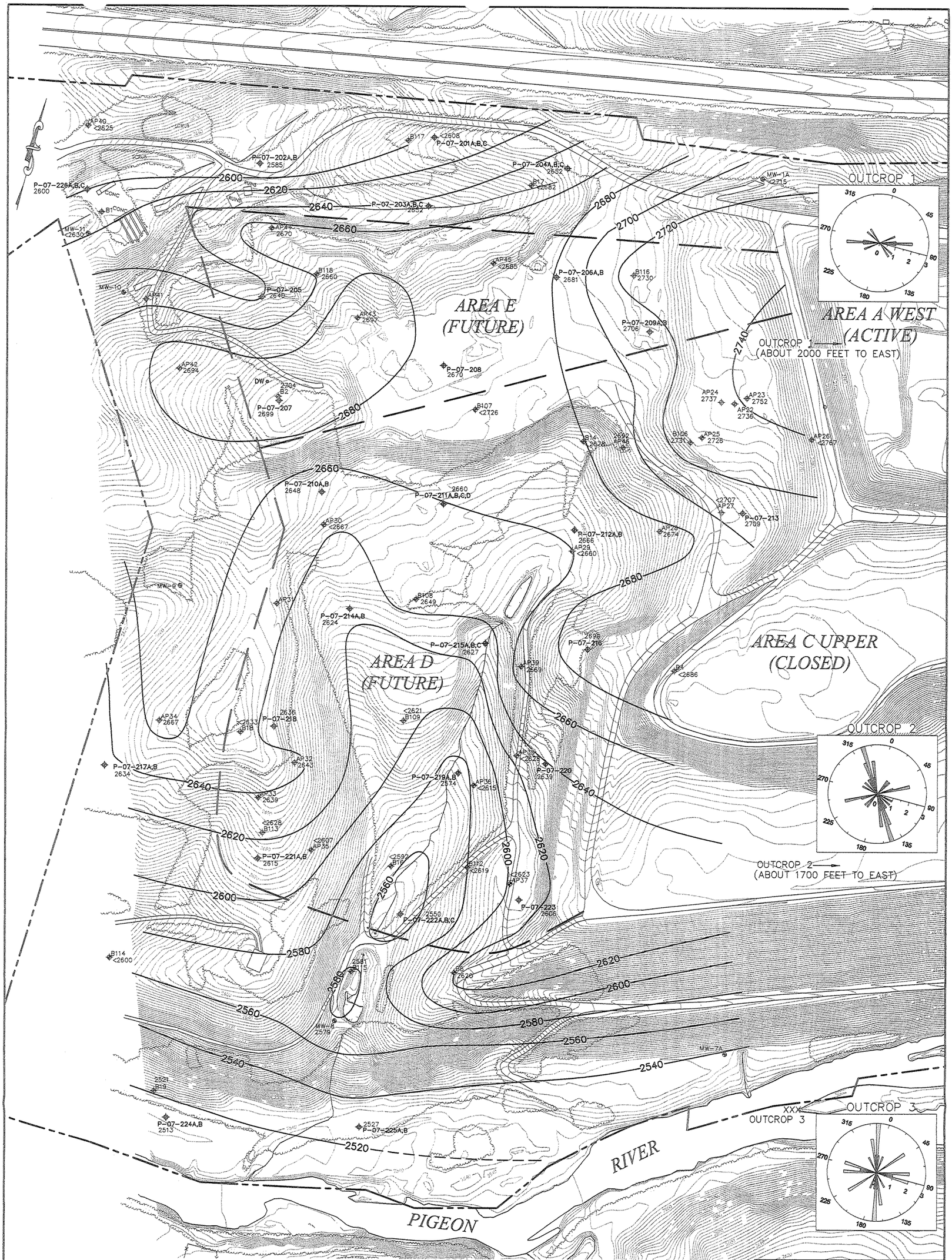
A silty sand colluvium was associated with three borings drilled along a sideslope (B07-212) and base (B07-215 and B07-219) of the ravine that bisects the southern portion of Area D. Approximately 12 to 19 feet of colluvium was encountered in these three borings, which directly overlaid the bedrock in B07-212 and B07-215. A lesser amount (less than 5 feet) of colluvium was also present in a smaller ravine just beyond the northwest limit of Area E (B07-226). The grain size analysis indicate a particle distribution very similar to the saprolite, which is likely the source of the material that was transported downslope under gravity, accumulating in these areas. The relative density of the colluvium ranged from loose to medium dense based on SPT N-values.

Surficial soils in portions of Areas D and E have been modified as a result of site activities (e.g. grading or construction). Reworked soils consisted of redistributed residual soil and saprolite, and ranged in thickness from less than 5 feet to over 15 feet. Borings encountering the most reworked soil (B07-213, B07-216, B07-220, and B07-222) are located in near service roads that access Area D.

4.2 Bedrock

Three outcrops were mapped to obtain structural information about planar fractures in the bedrock exposed at the surface of the Site, and measurements of their strike and dip are summarized in Table 3-5. The distribution of the bedrock fracture data for each outcrop is also summarized on fracture rose diagrams in Figure 4-3. Two sets of fractures are suggested based on the mapped strikes illustrated on the rose diagrams. Each outcrop contained an easterly to northeasterly-oriented set of fractures having an average strike of about N70°E. These fractures are often associated with mineral foliation. A nearly perpendicular set of fractures striking northwest approximately N330°W was observed in Outcrops 2 and 3. Close to 70 percent of the observed fractures were steeply dipping at an angle of 60° or more. A previous geotechnical investigation for Area A of Landfill No. 6 reported the predominant strike of mineral foliation and foliation joints of N45°E to N80°E approximately parallel to the Pigeon River and dipping 75° or more southeasterly toward the river (Sirrine, 1989). Our observations were also consistent with regional reported bedrock fractures, jointing, and foliation (Merschat and Wiener, 1988) as well as the other site studies (Sirrine, 1989).

Bedrock cores recovered for the hydrogeologic investigation were logged as gray to dark gray, coarse-grained mica schist interlayered with fine to medium-grained, white to light gray biotite gneiss and occasional metagraywacke typical of the Ash Metamorphic Suite, which have been mapped to underlie the landfill site (Merschat and Wiener, 1988). Accessory minerals associated with the bedrock included biotite, muscovite, garnet, quartz and plagioclase feldspar. Regional deformation was expressed as zones of overturned folds visible observed along the core. The



LEGEND

⊕	EXISTING MONITORING WELL/PIEZOMETER LOCATION
2527	ELEVATION OF BEDROCK SURFACE IN FEET–NGVD
2620	INTERPRETED BEDROCK SURFACE CONTOUR ELEVATION IN FEET–NGVD
XXX	OUTCROP

50 0 100 200 FEET

DWG: CantonFinalTopo LMN: BEDROCK CTB: BEDROCK REV: 8/27/08

FIGURE 4–3
INTERPRETIVE BEDROCK SURFACE
BLUE RIDGE PAPER PRODUCTS INC. –
CANTON MILL
CANTON, NC
AMENDMENT TO PERMIT
LANDFILL NO. 6
AREA D AND E

SME
Sevee & Maher Engineers, Inc.
Consulting Engineers
Cumberland Center, Maine

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degree of foliation varied between schistose and gneissic with depth, with fracturing occurring along the plane of foliation, which ranged from about 30 degrees to near vertical along the core.

Approximately one thousand feet of bedrock core was collected, which had Rock Quality Designations (RQDs) ranging from 0 to 100 percent. Collectively, the rock core averaged an RQD of 69 percent, indicative of relatively competent but fractured bedrock. Most of the fracturing was associated with the upper portion of the bedrock. Bedrock was identified as fractured on the geologic profiles if the RQD of the retrieved core was less than 75 percent. Rock core in this zone averaged an RQD of about 35 percent. The fractured bedrock was extensive adjacent to the northeastern portion of Area E (B-07-204), and in part of the proposed landfill expansion along the common boundary between Area D (B07-211) and Area E (B07-207) as shown in Figures 4-1 and 4-2. The zone of weathered, more fractured bedrock becomes thinner moving southward across Area D and towards the west and northwest part of Area E.

The RQD of the underlying competent bedrock averaged about 89 percent. Depth to competent, unweathered bedrock ranged from about 11 to 73 feet in the borings drilled for this hydrogeologic investigation. Competent bedrock was not reached in B07-204, located north of Area E, and the boring terminated at a depth of 100 feet. A review of the historical borings revealed a boring (AP39) in Area D where an auger refusal was reached at 4.5 feet. An interpretive contour map depicting the top of the bedrock surface beneath Areas D and E was generated from the B07-200-series borings (confirmed by rock coring), supplemented with the available historical bedrock elevations (based on drilling refusal) reported in earlier site investigations. Figure 4-3 shows the bedrock surface is highest in the northeastern part of Areas D and E, where its elevation reaches about 2750 feet NGVD. The surface slopes downward beneath Area D moving southward towards the Pigeon River and from the flanks of the ravine, decreasing about 200 feet in elevation. The bedrock surface elevation decreases to about 2650 feet NGVD moving westward beneath Area E, and more steeply to the northwest just beyond the proposed landfill expansion limit. A knob of bedrock is present in the southwest portion of Area E, which results in the bedrock surface topography sloping downward around its perimeter. Along the ridges near the east and west boundary line of the Areas D and E proposed

landfill expansion area, the top of the bedrock surface elevation is above the observed water table. The design for the liner system accounted for the bedrock in these areas by adding five feet to the bedrock surface elevation to maintain the minimum four foot vertical separation required in Rule 15A NCAC 13B.0504.

5.0 SITE HYDROGEOGIC CHARACTERISTICS

This section of the report describes the hydrogeologic setting of Areas D and e. Information gathered during the 2007 field investigation and laboratory physical property testing, along with relevant data from previous site studies, was utilized to refine the understanding of the hydrogeology beneath Areas D and E in support of the proposed landfill design.

5.1 Hydrogeologic Setting

The movement of surface water and groundwater through the flow system is controlled by geology and topography. Landfill No. 6 lies within the southern portion of the Blue Ridge Physiographic Province, situated within a broad valley between northeast-southwest trending ridges of the Blue Ridge Mountains. The surficial geology consists primarily of saprolite that serves as a reservoir to recharge the underlying crystalline bedrock, which transmits groundwater through fractures and joints. A transition zone of variably weathered and fractured bedrock, the so-called weathered bedrock, often separates the saprolite and PWR from the deeper, competent bedrock. Differences in the physical characteristics of these geologic media affect their hydraulic properties that govern the movement of groundwater after precipitation infiltrates the ground surface.

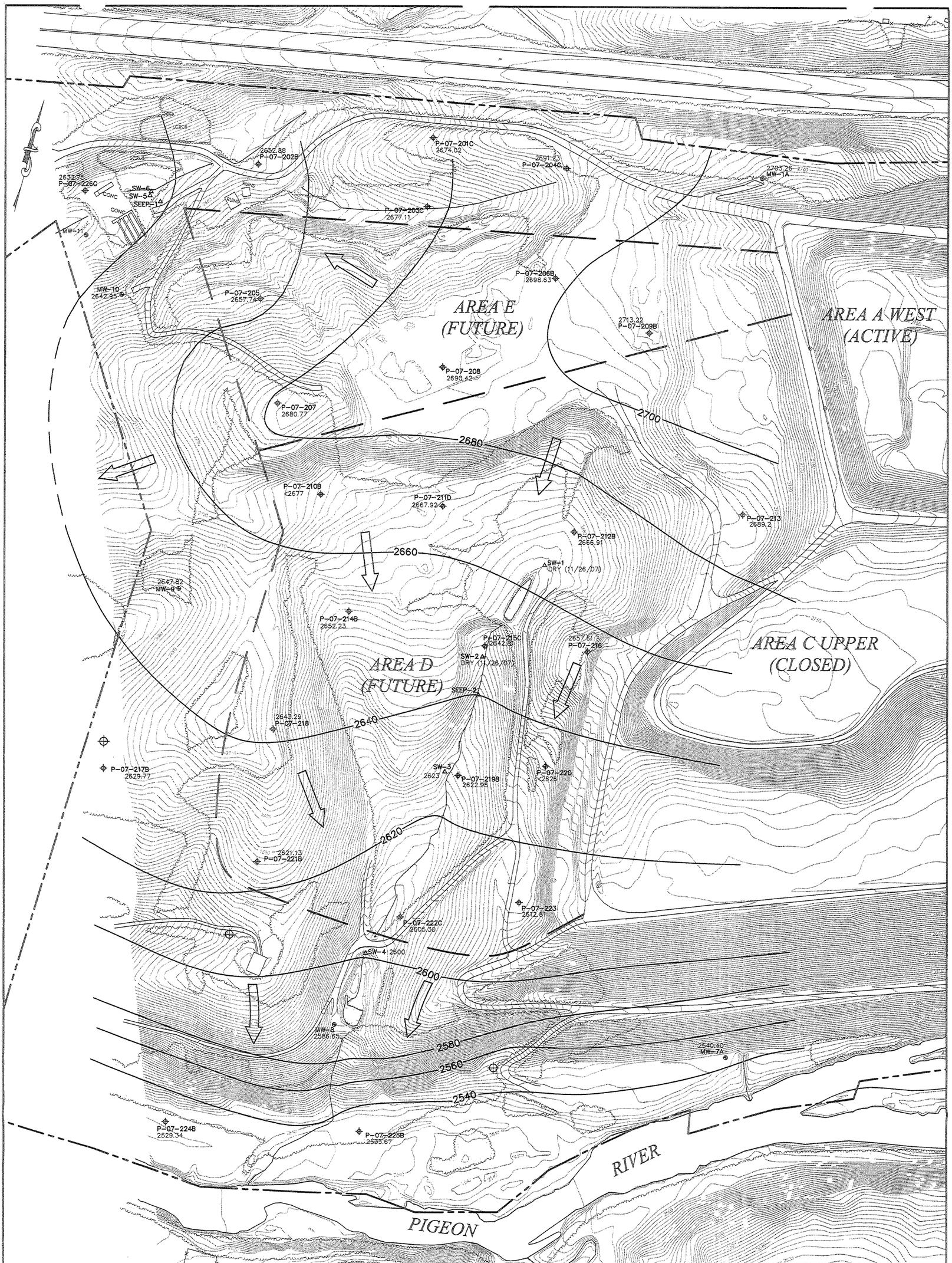
Areas D and E are bordered to the north by U.S. Interstate Highway 40, to the east by Landfill No. 6 Area A (active) and the upper portion of Area C (closed), to the west by private residential property and to the south by the westerly flowing Pigeon River. The ground surface elevation reaches it maximum within the along the northeastern edge of Areas D and E. The elevation decreases by about 250 feet as the topography slopes downward to the Pigeon River about 2000 feet to the south. A ravine containing an unnamed creek traverses the southern half of Area D, and flows into the Pigeon River about 650 feet south of the proposed southern landfill boundary. The current surface topography across Area E slopes downward toward the west-northwest to another ravine located just beyond the northern margin of Areas D and E. Precipitation recharge infiltrating the higher topography would be expected to flow towards the topographic low areas

associated with these two ravines. Deeper groundwater passing beneath Areas D and E flows southward and discharges into the Pigeon River.

5.2 Horizontal Groundwater Flow

Groundwater levels in the P-07-200-series piezometers and older existing monitoring wells at Landfill No. 6 near the proposed landfill expansion Areas D and E were measured monthly since October 2007. Groundwater elevations calculated from measurements obtained on May 31, 2007 were utilized to prepare interpreted groundwater surface contour maps. The May 2007 data represented the seasonal groundwater high in a majority of the piezometers based on nearly a year of monthly water level monitoring. Lines of equal hydraulic potential (potentiometric) were plotted as contour lines on the maps and used to estimate the directions of groundwater flow, which, in the unconsolidated formation, is interpreted to flow approximately perpendicular to the potentiometric contours from areas of higher to lower potential. Two groundwater potentiometric maps were prepared to depict horizontal groundwater flow directions: the shallow groundwater to illustrate the configuration of the wet-season or high groundwater-table (Figure 5-1), and groundwater in the competent bedrock (Figure 5-2), which can be influenced by regional groundwater behavior.

5.2.1 Shallow Groundwater. Groundwater levels measured in the P-07-200-series piezometers and older existing monitoring wells reveal that the water table predominantly lies within the saprolite within the footprint of the proposed landfill expansion areas. Shallow groundwater also occurred in colluvium near the bottom of the ravine in Area D (e.g., P-07-215C and -219B); although, the colluvium largely consists of saprolite that had been transported and deposited downslope by mass movement. A spring, identified as Seep-2 in Figure 5-1, discharges to the unnamed creek in the ravine about 125 feet south of P-07-215C. No surface water was in the creek upstream of Seep-2 during the drought period when the field program was conducted. Another spring (Seep-1) discharges shallow groundwater to the ground surface downslope from the northwest corner of Area E. Surface water flow from these two seeps is discussed in Section 5.5. The groundwater table exists in the alluvium in the floodplain of the Pigeon River beyond the southern limit of Area D (e.g., P-07-224B and -225B). Along the eastern and



LEGEND

- EXISTING MONITORING WELL/PIEZOMETER LOCATION
- SEEP OR SURFACE WATER SAMPLING LOCATION
- 2660 — INTERPRETED GROUNDWATER TABLE SURFACE CONTOUR ELEVATION IN FEET – NGVD
- 2586.65 — ELEVATION OF MEASURED GROUNDWATER LEVEL MAY 30, 2008
- GENERALIZED GROUNDWATER FLOW DIRECTION
- PROPOSED MONITORING WELL

50 0 100 200 FEET

FIGURE 5–1
INTERPRETIVE
GROUNDWATER TABLE SURFACE
BLUE RIDGE PAPER PRODUCTS INC. –
CANTON MILL
CANTON, NC
LANDFILL NO. 6
AREA D AND E

SME
Sevee & Maher Engineers, Inc.
Consulting Engineers
Cumberland Center, Maine

DWG: CantonFinalTopo LMN: GW-MAY2008 CTB: GW-APR2008 REV: 8/27/08

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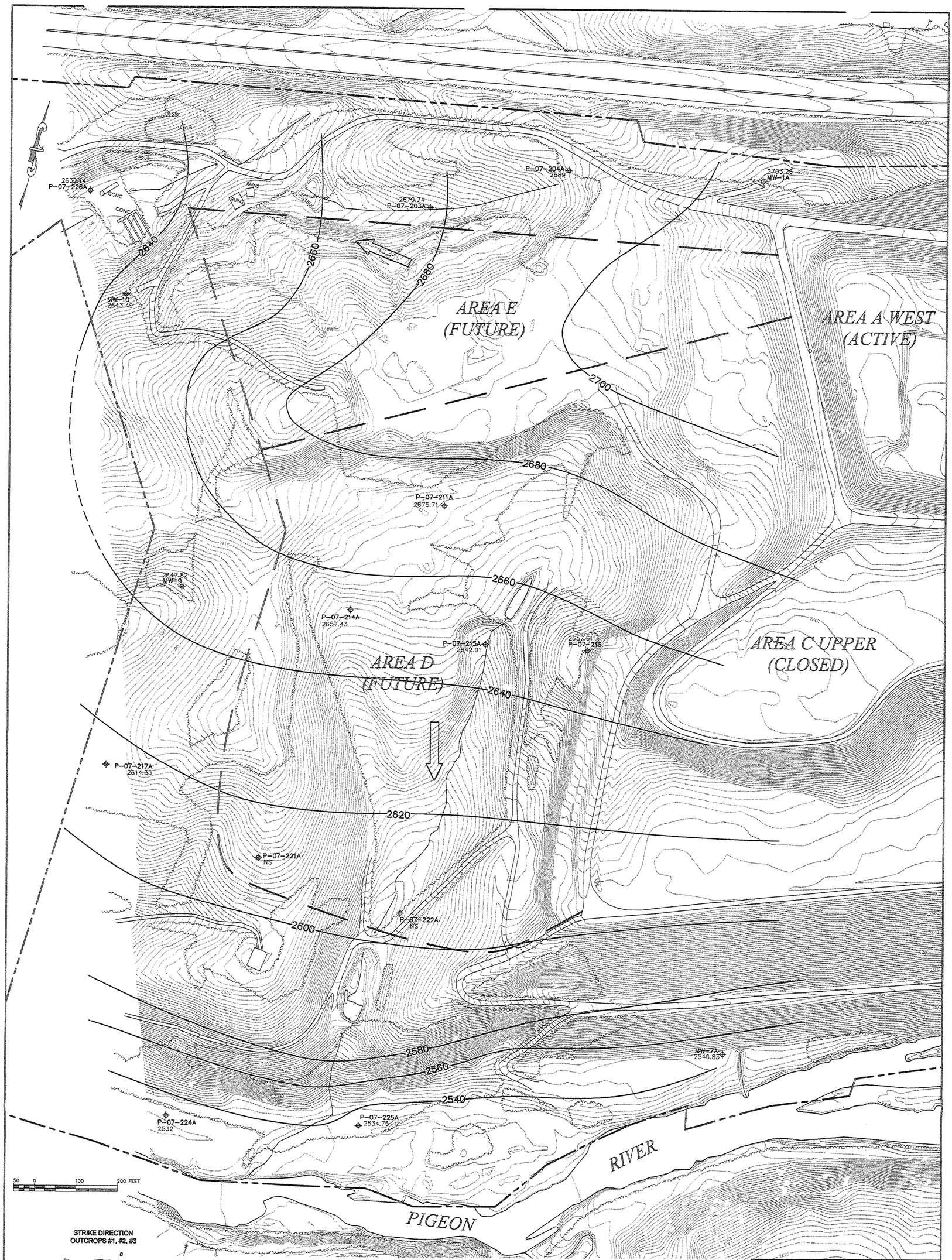

FIGURE 5-2
INTERPRETIVE BEDROCK GROUNDWATER POTENTIOMETRIC SURFACE
BLUE RIDGE PAPER PRODUCTS INC. – CANTON MILL
CANTON, NC
AMENDMENT TO PERMIT
LANDFILL NO. 6
AREA D AND E

SME
Sevee & Maher Engineers, Inc.
Consulting Engineers
Cumberland Center, Maine

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western flanks within and beyond the limit of the proposed landfill areas, the bedrock surface elevation rises to intercept the shallow groundwater surface (e.g., P-07-207, P-07-209B, P-07-213, P-07-216, P-07-217B, P-07-223, and MW-9).

The saprolite retrieved in split-spoon SPT samples often varied from friable, loose to medium dense to very dense with prominent relic bedrock structure evident with increasing depth. Weathering of the saprolite increases its matrix porosity, and on a regional scale, it is interpreted to act isotropically. The structure of the deeper, less decomposed saprolite (PWR) exhibits relict fractures often along planes of micaceous accumulations of the weathered parent bedrock. Therefore, secondary porosity likely also causes local preferential groundwater flow, but on a regional scale the behavior of the PWR is believed to be more isotropic than anisotropic.

An interpretation of the seasonal-high groundwater-table surface is illustrated in Figure 5-1. The groundwater table depth varied from less than 10 feet to more than 70 feet below the existing ground surface. Groundwater was shallower in the piezometers installed along the ravines in the southern portion of Area D (e.g., P-07-212B, -251C, -219B, and -222C) and north of Area E (e.g., P-07-202B and -203C), and in the flood plain adjacent to the Pigeon River (e.g., P-07-224B and -225B). Depth to groundwater increased in the higher topography that borders the eastern and western limits of the landfill expansion areas. The groundwater high occurred during May 2008 in a majority of the P-07-200-series piezometers, while the low was recorded in July 2008. The groundwater table fluctuated from less than 1 foot to about 6 feet during the period water levels were monitored, with the largest change measured in P-07-212B in Area D.

Landfill No. 6 is within an area of North Carolina that has experienced drought conditions since the P-07-200-series piezometers were installed in late summer/early fall of 2007, which has continued into 2008. Therefore, the seasonal variation in the groundwater levels may have been moderated as a result of the drought over the last year. A review of groundwater elevations measured semi-annually between November 1999 and May 2008 in 21 existing monitoring wells around Landfill No. 6 revealed an average difference of about 7 feet between their historic groundwater high and low. Four out of a group of six older monitoring wells that surround the proposed Areas D and E had groundwater elevations in May 2008 within two feet of their

historic maximums. Wells MW-1A (northeast of Area E) and MW-9 (west of Area D) had reported groundwater highs of 9 feet and 6 feet greater than the elevations shown in Figure 5-1, respectively. Therefore, under wetter climatic conditions groundwater elevations in the P-07-200-series piezometers may attain higher levels than currently observed over their limited record, especially those piezometers located in topographically higher recharge areas. In order to adjust the 2008 seasonal-high water table to historical seasonal high during non-drought periods, six feet was added to the 2008 wet-season water table shown in Figure 5-1. This provided a basis for establishing the required four foot vertical separation as required by the Rules from the statistical seasonal high water table.

The highest groundwater elevation was measured in the northeastern portion of the proposed landfill expansion area. The elevation of the water table decreased about 100 feet and 50 feet moving across Areas D and E, respectively. The configuration of the groundwater table generally mimics the surface topography in unconfined aquifer in humid climates (Fetter, 1988). Locally, this is expressed in the interpreted groundwater flow lines that move toward the ravine in the southern half of Area D. Groundwater discharged from a spring at the base of the ravine about 125 feet south of the P-07-222 piezometer cluster. Beneath Area D groundwater flow is primarily to the south under a horizontal hydraulic gradient of about 0.07. The horizontal hydraulic gradient increases to about 0.2 under the steep slopes as groundwater moves beyond Area D and then decreases upon reaching the floodplain of the Pigeon River. The river exists at an elevation of about 2530 feet NGVD downgradient of Area D.

A groundwater divide exists in Area E near its border with Area D (see Figure 5-1). In contrast to Area D, most of the shallow groundwater beneath Area E is interpreted move in a west or northwesterly direction under a horizontal gradient of about 0.07. Groundwater flow beyond Area E is interpreted to subsequently flow in a more southerly direction towards the Pigeon River based on the regional topography of the river valley.

5.2.2 Deep Groundwater. Groundwater movement through the crystalline bedrock flows through secondary openings of discrete fractures. Physical characteristics, including aperture size and frequency, orientation, and the amount of interconnectivity between individual fractures

control the direction and rate of in the bedrock flow system. To evaluate hydraulic characteristics of the deeper groundwater in the competent bedrock, we have utilized water levels from the P-07-200-series piezometers screened at depths in boreholes where the RQD of the rock core exceeded 75 percent. RQDs associated with the older existing monitoring wells were not available.

Groundwater elevations in the competent bedrock fluctuated from less than 1 foot to about 4 feet since October 2007, with the most change occurring within the Areas D and E landfill expansion in P-07-211A and P-07-211B. The bedrock groundwater elevation relief ranged over a 170 feet between its high (MW-1A) and the Pigeon River floodplain (P-07-224A). The general configuration of the bedrock groundwater surface was similar to the shape of the shallow groundwater contour map. Deeper bedrock groundwater predominantly flows in a southerly direction across Area D toward the Pigeon River. The observed degree of bedrock fracturing will likely allow the bedrock to behave isotopically on a site-wide scale. Localized flow in the bedrock may be controlled by specific fracture patterns. The measured horizontal hydraulic seepage gradients in the bedrock were also similar to those determined for the shallow groundwater, and ranged from about 0.06 to 0.08 across Areas D and E. The horizontal seepage gradient increases between the southern limit of Area D and the floodplain of the Pigeon River as the groundwater reaches its regional discharge zone.

5.3 Vertical Groundwater Flow

Nested piezometers consisting of 2 to 3 instruments screened in the different geologic units (saprolite, PWR, and/or bedrock) were installed in many of the drilling locations across the proposed landfill expansion area and beyond its perimeter. Differences between groundwater elevations in these nested piezometers and wells were used to calculate vertical seepage gradients beneath the proposed landfill expansion area, which are summarized in Table 5-1. Groundwater elevations from May 2008 were used to construct the interpreted vertical equipotential lines that are included on the geologic profiles in Figures 4-1 and 4-2. Groundwater flow lines were interpreted to cross approximately perpendicular to the

TABLE 5-1

VERTICAL HYDRAULIC GRADIENTS
LANDFILL NO. 6 EXPANSION
AREAS D & E

Piezometer Designation	Groundwater Zone Screened	Well Pair Comparison	Groundwater Elevation 5/30/2008 (ft-NGVD)	Vertical Gradient (ft/ft)	Direction of Potential Flow
P-07-201A	PWR	A/B	2673.14	0.015	up
P-07-201B	PWR	B/C	2672.65	-0.039	down
P-07-201C	Saprolite	A/C	2674.02	-0.014	down
P-07-202A	PWR	A/B	2651.12	-0.032	down
P-07-202B	Saprolite		2652.88		
P-07-203A	Comp Bedrock	A/B	2679.74	0.108	up
P-07-203B	Frac Bedrock	B/C	2675.81	-0.041	down
P-07-203C	Saprolite	A/C	2677.11	0.040	up
P-07-204A	Frac Bedrock	A/B	2690.65	-0.006	down
P-07-204B	PWR	B/C	2690.90	-0.010	down
P-07-204C	Saprolite	A/C	2691.23	-0.008	down
P-07-206A	Frac Bedrock	A/B	2696.13	-0.090	down
P-07-206B	PWR		2698.63		
P-07-209A	Frac Bedrock	A/B	2710.65	-0.112	down
P-07-209B	PWR		2713.22		
P-07-211A	Comp Bedrock		2675.71		
P-07-211B	Comp Bedrock	B/C	2675.10	0.240	up
P-07-211C	Frac Bedrock	C/A	2667.93	0.058	up
P-07-211D	Saprolite	D/A	2667.92	0.049	up
P-07-212A	Frac Bedrock	A/B	2666.72	-0.012	down
P-07-212B	Colluvium		2666.91		
P-07-214A	Comp Bedrock	A/B	2652.43	0.008	up
P-07-214B	Saprolite		2652.23		
P-07-215A	Comp Bedrock	A/B	2642.91	-0.027	down
P-07-215B	Colluvium	B/C	2643.89	0.067	up
P-07-215C	Colluvium	A/C	2642.81	0.002	up
P-07-217A	Comp Bedrock	A/B	2614.35	-0.131	down
P-07-217B	Frac Bedrock		2629.77		
P-07-219A	Saprolite	A/B	2622.79	-0.004	down
P-07-219B	Colluvium		2622.95		
P-07-222B	PWR	B/C	2605.69	0.008	up
P-07-222C	Reworked Soil		2605.30		
P-07-224A	Comp Bedrock	A/B	2532.00	0.040	up
P-07-224B	Alluvium		2529.34		
P-07-225A	Comp Bedrock	A/B	2534.74	0.029	up
P-07-225B	Alluv/Frac Bedrock		2533.67		
P-07-226A	Comp Bedrock	A/B	2632.14	0.004	up
P-07-226B	Frac Bedrock	B/C	2631.97	-0.020	down
P-07-226C	Saprolite	A/C	2632.75	-0.008	down

equipotential lines in Figures 4-1 and 4-2. However, the interpreted flow lines displayed on the geologic profiles are for schematic purpose, as local flow may vary slightly from that depicted.

The interpretive vertical equipotential contour lines illustrate groundwater flow is laterally directed from the opposing flanks within Area D toward the unnamed creek and continues regionally southward toward the Pigeon River. North of a groundwater divide approximately aligned with the boundary between Areas D and E, groundwater is interpreted to flow towards the west within Area E. The magnitude of the measured upward and downward vertical hydraulic gradients was relatively small across most of the Site, averaging less than 0.06 foot per foot (ft/ft). Overall, the range of values summarized in Table 5-1 was indicative of a prevalent horizontal groundwater flow pattern beneath the landfill expansion area as illustrated by the near vertical equipotential lines in most areas of the geologic profiles.

The largest upward vertical gradient measured (0.24 fee per feet [ft/ft]) existed between the competent bedrock and overlying fractured rock in the vicinity of the Areas D and E common boundary (see P-07-211cluster in Profiles A-A' and D-D'). Continuing downgradient toward the ravine and the unnamed creek in Area D, slight upward gradients were measured in the P-07-215 cluster and P-07-222 cluster piezometers screened above bedrock. The upward gradient at P-07-215 is consistent with the presence of a spring that was observed about 125 feet south of piezometer's location. Beyond the southern limit of Area D, groundwater upflow toward the regional discharge zone is illustrated by the upward vertical gradients calculated in the nested piezometers installed adjacent to the Pigeon River (e.g., P-07-224A and B, and P-07-225A and B).

Slight upward hydraulic gradients also developed between the deeper competent bedrock and the overlying fractured bedrock in the nested piezometers located along the swale north of Area E (e.g., P-07-203 cluster and P-07-226 pair in Profile B-B'). In contrast, downward seepage gradients prevail in the groundwater above the elevation of bedrock in this area.

5.4 Groundwater Seepage Rates

The rate of groundwater movement is a function of the hydraulic conductivity, effective porosity of the geologic formation, and the hydraulic seepage gradient in the direction of flow. Measurements of the hydraulic conductivity derived from in situ slug testing of the lithologic units are summarized in Table 3-3. Porosities based on saturated water contents of unconsolidated formations were calculated from split-spoon soil samples obtained during the drilling program. Horizontal groundwater flow conditions exist beneath most of Areas D and E, and the horizontal seepage gradient was calculated from the May 2008 groundwater elevations measured in piezometers installed within and around the perimeter of the proposed expansion area.

Saprolite will underlie the engineered liner system across the vast majority of the proposed Areas D and E landfill expansion when it is constructed. Calculated hydraulic conductivities from the in situ slug testing of piezometers screened in the shallow friable and the deep, firmer saprolite (referred to as PWR having blow N-value counts over 50 per foot) ranged between 4.8×10^{-6} to 6.0×10^{-3} centimeters per second (cm/sec) and had a geometric mean of 1.3×10^{-4} cm/sec. Their hydraulic conductivities were very similar as was their grain size distribution (see Section 4.1 above). Effective porosity of the saprolite was estimated by utilizing 90 percent of its calculated total porosity, which resulted in an average value of 0.3. The horizontal seepage gradient across Areas D and E based on the configuration of the potentiometric surface in the shallow groundwater (Figure 5-1) was 0.06 and 0.07 ft/ft, respectively. These hydraulic parameters yielded a rate of groundwater movement in the order of 30 feet per year (ft/yr) through the saprolite. This value could increase on a local scale where the secondary porosity of the deeper, dense saprolite (or PWR) was controlling groundwater flow through relict fractures.

The top of bedrock was weathered and very fractured (low RQDs) in areas. In situ hydraulic conductivities in the fractured, weathered rock zone ranged from 1.7×10^{-5} to 4.2×10^{-3} cm/sec, and a corresponding geometric mean of 3.1×10^{-4} cm/sec. In contrast, a wider variation in the in situ hydraulic conductivities was associated with the competent bedrock (RQD greater than 75 percent), which ranged between 8.2×10^{-10} to 1.5×10^{-3} cm/sec. The calculated geometric mean

for the hydraulic conductivity of the competent bedrock was 1.3 x 10^{-5} cm/sec. The porosity of the competent bedrock was calculated using in situ hydraulic conductivities measured in bedrock piezometers and the fracture densities of the corresponding rock core over the screened interval, and the method described by Snow (1968). Calculated bedrock porosities are summarized in Table 5-2. Porosity was found to vary between 3.6 x 10^{-6} and 9.1 x 10^{-4} with a geometric mean of 1.3 x 10^{-4}. The horizontal hydraulic seepage gradient in Areas D and E of 0.08 and 0.06 ft/ft, respectively, was calculated from the May 2008 groundwater levels measured in piezometers screened in the competent bedrock. The average seepage velocity through the competent bedrock was calculated to equal in the order of 9,000 ft/yr beneath Area D. The calculated rate of groundwater movement in Area E is about 25 percent lower (6,800 ft/yr) due to the lower measured hydraulic seepage gradient. The seepage velocity though the upper portion of weathered bedrock is anticipated to fall within the range calculated for the saprolite and the competent bedrock.

The southern margin of Area D is about 600 feet from the Pigeon River. Shallow groundwater moving beyond the downstream boundary of the proposed landfill expansion area is calculated to reach the river in the order of about six years. This travel time estimate accounts for an increased horizontal hydraulic seepage gradient as the topography slopes down to the flood plain and a higher hydraulic conductivity in the alluvial sediments along the floodplain. The western property boundary of Landfill No. 6 is about 300 feet from the proposed landfill limit of Area E. The calculated travel time for shallow groundwater to reach the western property boundary is about 10 years. Although closer to a property boundary than Area D, the hydraulic gradient downgradient of the Area E is not as steep nor is the hydraulic conductivity as high as measured in the alluvium.

5.5 Surface Water Flow Measurements

Surface water flow rates were obtained on October 24, 2007 (SW-1 through SW-4) and November 26, 2007 (SW-1 through SW-6). These results are summarized in Table 5-3. No

TABLE 5-2

SUMMARY OF CALCULATED BEDROCK POROSITY

Piezometer Designation	Hydraulic Conductivity (cm/s)	Screen Interval (ft - bgs)	Screen Length (ft)	Number of Fractures	Spacing (ft)	Spacing (cm)	Intrinsic Permeability (cm^2)	Porosity
P-07-203A	3.04E-04	72.0 - 84.5	12.5	8	1.6	47.6	3.64E-09	6.38E-04
P-07-211B	8.89E-05	77.0 - 85.8	8.8	11	0.8	24.4	1.07E-09	6.62E-04
P-07-214A	2.62E-05	54.5 - 60.5	6.0	6	1.0	30.5	3.14E-10	3.80E-04
P-07-215A	1.12E-04	53.5 - 65.0	11.5	1	11.5	350.5	1.34E-09	1.21E-04
P-07-216	1.46E-03	45.0 - 69.0	24.0	12	2.0	61.0	1.75E-08	9.14E-04
P-07-217A	1.12E-05	169.7 - 191.0	21.3	5	4.3	129.8	1.34E-10	1.09E-04
P-07-221A	8.24E-10	69.0 - 75.0	6.0	1	6.0	182.9	9.88E-15	3.63E-06
P-07-222A	1.63E-09	94.0 - 111.0	17.0	2	8.5	259.1	1.95E-14	3.61E-06
P-07-225A	5.22E-06	43.5 - 49.8	6.3	3	2.1	64.0	6.26E-11	1.35E-04
P-07-226A	1.31E-04	83.0 - 95.1	12.1	5	2.4	73.8	1.57E-09	3.60E-04
						Porosity Geometric Mean:		1.29E-04

surface water was evident in SW-1 and SW-2 along the unnamed creek in the Area D during either monitoring round. Surface water in the unnamed creek originated from Seep-2, which is located between SW-2 and SW-3. Flow in the creek increased from 2 gallons per minute (gpm) to 10 gpm between SW-3 and SW-4 during the October 2007 measurement. The same flow rate was measured at SW-3 the following month, but the amount decreased to 4 gpm at SW-4. Surface water flow rates along the unnamed creek were utilized as part of the design consideration the underdrain system for Area D.

TABLE 5-3

SURFACE WATER FLOW MEASUREMENTS

Location	Elevation (ft - NGVD)	Flow Rate (gallons per minute) 10/24/2007	Flow Rate (gallons per minute) 11/26/2007
SW-1	2667.27	Dry	Dry
SW-2	2645.79	Dry	Dry
SW-3	2623.62	2	2
SW-4	2600.21	10	4
SW-5	2641.91	--	0.8
SW-6	2642.15	--	4.3

Surface water at SW-5 results from discharge received from Seep-1, located 27 feet away on a sideslope off the northwest corner of Area E. Less than 1 gpm of flow was measured at SW-5 in November 2007. SW-6 is located along a ditch that receives runoff from the northwestern portion of the Site and from off-site areas across from U.S. Interstate Highway 40. Drainage at SW-5 flows into this ditch downstream from SW-6. A flow rate of 4.3 gpm was measured at SW-6, and the higher volume related to a larger drainage area that it receives runoff from compared to SW-5.

6.0 CONCLUSION

Based on the extensive hydrogeologic investigation of Areas D and E, we conclude the following:

1. The groundwater flow direction in the unconsolidated formation and competent bedrock has been sufficiently defined to establish downgradient groundwater monitoring points for the proposed landfill expansion (see Figure 5-1).

2. Prior to or during landfill instruction, any piezometer or well (including the drilled well) should be removed and grouted.

3. The statistical seasonal high groundwater table and depth to bedrock have been defined for establishing the minimum vertical separation for the proposed landfill liner.

4. The borings indicated that portions of the deeper saprolite and PWR can be very dense and may be difficult to excavate.

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APPENDIX A

BORING LOGS AND PIEZOMETER INSTALLATION DETAILS

PROJECT: BRPP SITE INVESTIGATION		JOB NO.: 07089.0	BORING NO.: B-07-201
DATE STARTED: 8/25/07	DATE FINISHED: 8/26/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE	
GROUND SURFACE ELEVATION (FT): 2707.7	DRILLING CONTRACTOR: AE DRILLING		LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): N/A		SHEET 1 OF 2

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	water content, %		% > #200	Field Hydraulic Conductivity, k (cm/s)	WELL LOG	DEPTH (FT)
		TOPSOIL							
		RESIDUAL SOIL							
		Stiff red-brown sandy silt, trace roots, trace clay							
5	D1	5.0	14						5
		SAPROLITE							
10	D2		14						10
		Medium dense variable-colored silty sand with relict structure							
15	D3		20						15
							18.0		
20	D4		14	17.3		41.6			20
							23.0		
25	D5		12						25
							9.4E-06		
30	D6	Becoming more dense with more rock fragments	15	18.3					30
35	D7		19	13.9					35
							38.0		
							38.5		
40	D8		17	14.7					40
45	D9		25	14.2		29.9			45
50	D10		36	12.2					50

NOTES:

Installed (3) 3/4" PVC piezometers - screened in overburden

PROJECT: BRPP SITE INVESTIGATION		JOB NO.: 07089.0	BORING NO.: B-07-201
DATE STARTED: 8/25/07	DATE FINISHED: 8/26/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE	
GROUND SURFACE ELEVATION (FT): 2707.7	DRILLING CONTRACTOR: AE DRILLING		LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): N/A		SHEET 2 OF 2

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	water content, %		% > #200	Field Hydraulic Conductivity, k (cm/s)	WELL LOG	DEPTH (FT)
	D10		36						
		SAPROLITE							
55	D11		50+	10.9					55
		PARTIALLY WEATHERED BEDROCK							
60	D12		50+	6.0			59.5		60
							62.0		
65	D13		50	10.8					65
							67.0		
							67.5		
70	D14		50+	9.5					70
75	D15		50+	10.5					75
80	D16		50+	5.4		31.8			80
85	D17		50+	7.0					85
90									90
							93.0		
95	D18		50+	8.0			95.0		95
							3.7E-05		
100		Bottom of Exploration at 100 feet					100.0		100

NOTES:

Installed (3) 3/4" PVC piezometers - screened in overburden

PROJECT: BRPP SITE INVESTIGATION		JOB NO.: 07089.0	BORING NO.: B-07-202
DATE STARTED: 10/17/07	DATE FINISHED: 10/18/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE	
GROUND SURFACE ELEVATION (FT): 2656.4	DRILLING CONTRACTOR: AE DRILLING		LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3		SHEET 1 OF 2

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	water content (field), %	RQD, %		Field Hydraulic Conductivity, k (cm/s)	WELL LOG	DEPTH (FT)
	D1	**TOPSOIL**	4						
		RESIDUAL SOIL					3.0		
5		Loose orange-brown silty sand, trace gravel					5.0		5
	D2		5	35.9					
10		**SAPROLITE**					2.3E-05		10
	D3	Loose gray, brown and white silty fine sand with relict structure	7						
15							15.0		15
	D4		4	36.7			16.0		
20									20
	D5	Medium dense orange-brown silty fine sand with relict structure	13						
25									25
	D6		15	17.8					
30									30
	D7		20						
35									35
	D8		18	16.4					
40									40
	D9	Becoming dense with rock fragments	38						
45									45
	D10	**PARTIALLY WEATHERED BEDROCK** 45.8	50+	11.3					
50									50

NOTES:

Installed (2) 3/4" PVC piezometers - screened in overburden

PROJECT: BRPP SITE INVESTIGATION	JOB NO.: 07089.0	BORING NO.: B-07-202
DATE STARTED: 10/17/07	DATE FINISHED: 10/18/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE
GROUND SURFACE ELEVATION (FT): 2656.4	DRILLING CONTRACTOR: AE DRILLING	LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3	SHEET 2 OF 2

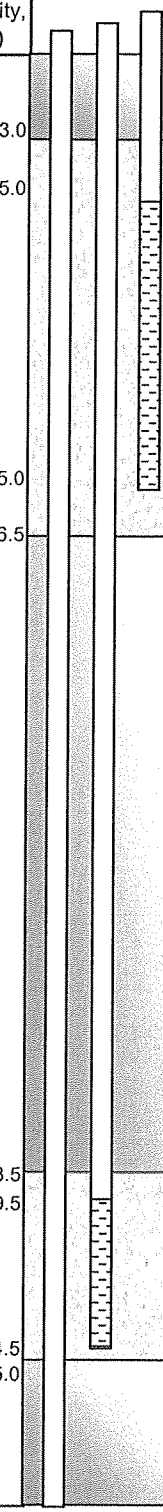
DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	water content (field), %	RQD, %		Field Hydraulic Conductivity, k (cm/s)	WELL LOG	DEPTH (FT)
	D11	50.8	50+						
		PARTIALLY WEATHERED BEDROCK							
55									55
	D12	55.3	50+	14.9					
							58.0		
60									60
	D13	60.9	50+				60.0		
							4.8E-06		
65									65
	D14	65.6	50+						
70									70
	D15	70.6	50+	15.7			70.0		
							71.0		
		Auger Refusal at 71.7 feet							
75		**BEDROCK**							75
	R1				77				
80		Bottom of Exploration at 79.7 feet					79.7		80
85									85
90									90
95									95
100									100

NOTES:

Installed (2) 3/4" PVC piezometers - screened in overburden

PROJECT: BRPP SITE INVESTIGATION		JOB NO.: 07089.0	BORING NO.: B-07-203
DATE STARTED: 8/23/07	DATE FINISHED: 8/24/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE	
GROUND SURFACE ELEVATION (FT): 2684.7	DRILLING CONTRACTOR: AE DRILLING		LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3		SHEET 1 OF 2

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	water content, %	RQD, %	% > #200	Field Hydraulic Conductivity, k (cm/s)
	D1	TOPSOIL **REWORKED SOIL** Brown sandy clayey silt, trace organic, trace gravel	7	29.8		70.6	
5	D2		8	23.5			
		7.0 **SAPROLITE**					
10	D3	Medium dense red-brown silty sand with relict structure, some rock fragments	11	17.3			
15	D4		16	19.4 15.9			
20	D5		18	17.9			
25	D6	Becoming dense	33	14.8			
30	D7	**PARTIALLY WEATHERED BEDROCK** Auger Refusal at 33 feet	54	13.0			
	R1	**FRACTURED ROCK**			27		
35	R2				46		
40	R3				0		
45	R4				54		
50							



NOTES:

Installed (2) 3/4" PVC piezometers - screened in bedrock

Installed (1) 3/4" PVC piezometers - screened in overburden

PROJECT: BRPP SITE INVESTIGATION	JOB NO.: 07089.0	BORING NO.: B-07-203
DATE STARTED: 8/23/07	DATE FINISHED: 8/24/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE
GROUND SURFACE ELEVATION (FT): 2684.7	DRILLING CONTRACTOR: AE DRILLING	LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3	SHEET 2 OF 2

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	water content, %	RQD, %		Field Hydraulic Conductivity, k (cm/s)	WELL LOG	DEPTH (FT)
	R5	53.0			15				
55	R6	**BEDROCK**			76				55
60	R7				42				60
65	R8				76				65
70	R9				79		72.0		70
75	R10				100		74.5 3.0E-04		75
80	R11				100		84.5		80
85		Bottom of Exploration at 84.5 feet							85
90									90
95									95
100									100

NOTES:

Installed (2) 3/4" PVC piezometers - screened in bedrock

Installed (1) 3/4" PVC piezometers - screened in overburden

PROJECT: BRPP SITE INVESTIGATION	JOB NO.: 07089.0(	BORING NO.: B-07-204
DATE STARTED: 10/15/07	DATE FINISHED: 10/17/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE
GROUND SURFACE ELEVATION (FT): 2724.1	DRILLING CONTRACTOR: AE DRILLING	LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3	SHEET 1 OF 3

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	water content (SME lab), %	water content (field), %	% > #200	Field Hydraulic Conductivity, k (cm/s)	WELL LOG	DEPTH (FT)
	D1	TOPSOIL	10						
		RESIDUAL SOIL							
5									5
	D2	Medium dense sandy silt to silty sand, trace clay	12	24.3		51.1			
10									10
	D3		10						
15		15.0							15
	D4	**SAPROLITE**	7						
20		Loose gray-brown silty sand with relict structure, some rock fragments							20
	D5		9						
25									25
	D6		7						
30							30.0		30
	D7		7		28.5				
35							35.0		35
	D8		6						
40							3.0E-04		40
	D9		8		23.9				
45							45.0		45
	D10	Becoming medium dense	20						
50									50

NOTES:

Installed 3/4" PVC piezometer - screened in bedrock

Installed (2) 3/4" PVC piezometers - screened in overburden

PROJECT: BRPP SITE INVESTIGATION	JOB NO.: 07089.0(	BORING NO.: B-07-204
DATE STARTED: 10/15/07	DATE FINISHED: 10/17/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE
GROUND SURFACE ELEVATION (FT): 2724.1	DRILLING CONTRACTOR: AE DRILLING	LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3	SHEET 2 OF 3

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	water content (field), %	RQD (%)		Field Hydraulic Conductivity, k (cm/s)	WELL LOG	DEPTH (FT)
	D11	**SAPROLITE**	46	11.8					
							53.0		
55							55.0		55
	D12		40						
60							60.0		60
	D13	60.9	50+	12.6			60.5		
		PARTIALLY WEATHERED BEDROCK							
65									65
	D14	65.5	50+				65.9		
							67.0		
							3.6E-04		
70									70
	D15	70.5	50+	7.8					
		Auger Refusal at 72.5 feet					72.0		
							72.5		
	R1	**FRACTURED ROCK**			25				
75									75
	R2				8				
80									80
	R3				24				
85									85
	R4				8				
90									90
	R5				0				
95									95
	R6				10				
100									100

NOTES:

Installed 3/4" PVC piezometer - screened in bedrock

Installed (2) 3/4" PVC piezometers - screened in overburden

PROJECT: BRPP SITE INVESTIGATION	JOB NO.: 07089.0(	BORING NO.: B-07-204
DATE STARTED: 10/15/07	DATE FINISHED: 10/17/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE
GROUND SURFACE ELEVATION (FT): 2724.1	DRILLING CONTRACTOR: AE DRILLING	LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3	SHEET 3 OF 3

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	water content, %	RQD (%)		Field Hydraulic Conductivity, k (cm/s)	WELL LOG	DEPTH (FT)
	R6 cont.,								
		FRACTURED ROCK							
	R7				70				
105									105
	R8				18		108.0		
110							110.0		110
	R9				70		1.3E-03		
115									115
	R10				70				
120							120.0		120
		120.7					120.5		
		BEDROCK							
	R11				86				
125									125
		Bottom of boring @ 125.7 feet							
130									130
135									135
140									140
145									145
150									150

NOTES:

Installed 3/4" PVC piezometer - screened in bedrock

Installed (2) 3/4" PVC piezometers - screened in overburden

PROJECT: BRPP SITE INVESTIGATION	JOB NO.: 07089.00	BORING NO.: B-07-205
DATE STARTED: 10/7/07	DATE FINISHED: 10/8/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE
GROUND SURFACE ELEVATION (FT): 2709.4	DRILLING CONTRACTOR: AE DRILLING	LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3	SHEET 1 OF 2

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	water content, %	RQD, %			WELL LOG	DEPTH (FT)
	D1	**SAPROLITE**	11						
5		Medium to very dense brown silty sand, trace gravel with relict structure and rock fragments							5
	D2		46						
10									10
	D3		30						
15									15
	D4		30						
20									20
	D5		50+						
25									25
	D6		25						
30									30
	D7		25						
35									35
	D8		31						
40									40
	D9		35						
45									45
	D10		18				44.0		
50									50

NOTES:

Installed (1) 3/4" PVC piezometer - screened in overburden

PROJECT: BRPP SITE INVESTIGATION		JOB NO.: 07089.00	BORING NO.: B-07-205
DATE STARTED: 10/7/07	DATE FINISHED: 10/8/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE	
GROUND SURFACE ELEVATION (FT): 2709.4	DRILLING CONTRACTOR: AE DRILLING		LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3		SHEET 2 OF 2

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	water content, %	RQD, %		Field Hydraulic Conductivity, k (cm/s)	WELL LOG	DEPTH (FT)
	D11		19						
55									55
	D12	56.8	50+						
60							1.7E-05		60
	D13	60.8	50+						
65									65
	D14		17						
		Auger Refusal at 69.5 feet					68.0 69.0		
70									70
	R1	**BEDROCK**			98				
75									75
	R2				76				
80		Bottom of Exploration at 80.5 feet							80
85									85
90									90
95									95
100									100

NOTES:

Installed (1) 3/4" PVC piezometer - screened in overburden

PROJECT: BRPP SITE INVESTIGATION	JOB NO.: 07089.0	BORING NO.: B-07-206
DATE STARTED: 10/5/07	DATE FINISHED: 10/6/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE
GROUND SURFACE ELEVATION (FT): 2736.0	DRILLING CONTRACTOR: AE DRILLING	LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3	SHEET 1 OF 2

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	water content, %	RQD, %		Field Hydraulic Conductivity, k (cm/s)	WELL LOG	DEPTH (FT)
	D1	**SAPROLITE**	11						
5	D2	Medium dense to dense red, brown and black, silty sand, trace gravel with relict structure	14						5
10	D3		21						10
15	D4		26						15
20	D5		30						20
25	D6		24						25
30	D7		32				30.0		30
		PARTIALLY WEATHERED BEDROCK							
35	D8	35.4	50+				35.0		35
							1.3E-03		
40	D9		50+						40
45	D10		50+				45.0		45
							45.5		
50	D11	49.3	50+						50

NOTES:

Installed (1) 3/4" PVC piezometer - screened in bedrock

Installed (1) 3/4" PVC piezometer - screened in overburden

PROJECT: BRPP SITE INVESTIGATION	JOB NO.: 07089.C	BORING NO.: B-07-206
DATE STARTED: 10/5/07	DATE FINISHED: 10/6/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE
GROUND SURFACE ELEVATION (FT): 2736.0	DRILLING CONTRACTOR: AE DRILLING	LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3	SHEET 2 OF 2

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	water content, %	RQD, %		Field Hydraulic Conductivity, k (cm/s)	WELL LOG	DEPTH (FT)
55	D12	Auger Refusal at 55 feet	50+						55
60	R1	**FRACTURED ROCK**			0				60
65	R2				24		63.0		65
	R3				24		65.0		
70	R4				16		3.6E-04		70
75	R5				52		75.0		75
80	R6	**BEDROCK**			79				80
85	R7				78				85
		Bottom of Exploration at 85 feet							
90									90
95									95
100									100

NOTES:

Installed (1) 3/4" PVC piezometer - screened in bedrock

Installed (1) 3/4" PVC piezometer - screened in overburden

PROJECT: BRPP SITE INVESTIGATION	JOB NO.: 07089.00	BORING NO.: B-07-207
DATE STARTED: 10/8/07	DATE FINISHED: 10/10/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE
GROUND SURFACE ELEVATION (FT): 2756.0	DRILLING CONTRACTOR: AE DRILLING	LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3	SHEET 1 OF 2

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	water content, %	RQD, %	% > #200		WELL LOG	DEPTH (FT)
	D1	**TOPSOIL**	10						
		RESIDUAL SOIL							
5		Medium dense red, brown silty clay, some brown fine sand							5
	D2	**SAPROLITE**	16						
10									10
	D3	Medium to very dense red-brown sandy silt, some gravel with relict structure	29						
15									15
	D4		30	7.9		29.9			
20		Becoming coarser with more rock fragments							20
	D5		28						
25									25
	D6		32						
30									30
	D7		30	6.8		26.9			
35									35
	D8	36.3	50+						
40									40
	D9		46						
45									45
	D10		41						
50		**PARTIALLY WEATHERED BEDROCK**							50

NOTES:

Installed (1) 3/4" PVC piezometer - screened in overburden

PROJECT: BRPP SITE INVESTIGATION		JOB NO.: 07089.00	BORING NO.: B-07-207
DATE STARTED: 10/8/07	DATE FINISHED: 10/10/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE	
GROUND SURFACE ELEVATION (FT): 2756.0	DRILLING CONTRACTOR: AE DRILLING		LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3		SHEET 2 OF 2

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	water content, %	RQD, %		Field Hydraulic Conductivity, k (cm/s)	WELL LOG	DEPTH (FT)
	D11	**PARTIALLY WEATHERED BEDROCK**	50+						
55									55
	D12	Auger Refusal at 56.5 feet	50+						
	R1	**FRACTURED ROCK**			20				
60									60
	R2				0				
65									65
	R3				0		66.0		
70							69.0		70
	R4				0				
75							1.3E-03		75
80									80
	R5				0				
85									85
	R6				68				
90		**BEDROCK**					89.0 89.3		90
	R7				76				
95									95
	R8				96				
100		Bottom of Exploration at 99 feet							100

NOTES:

Installed (1) 3/4" PVC piezometer - screened in overburden

PROJECT: BRPP SITE INVESTIGATION	JOB NO.: 07089.00	BORING NO.: B-07-208
DATE STARTED: 9/6/07	DATE FINISHED: 9/6/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE
GROUND SURFACE ELEVATION (FT): 2731.1	DRILLING CONTRACTOR: AE DRILLING	LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3	SHEET 1 OF 2

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	water content, %	RQD, %	% > #200	Field Hydraulic Conductivity, k (cm/s)	WELL LOG	DEPTH (FT)
		SAPROLITE							
5	D1	Medium dense brown-red silty fine sand with relict structure	16						5
10	D2		24	14.9		33.7			10
15	D3		21						15
							grout		
20	D4		27						20
25	D5	25.4 Very dense brown and black silty gravelly sand with many rock fragments and relict structure	50+						25
30	D6	Becoming medium dense	20	20.8		37.1			30
							32.0		
35	D7		24				35.0		35
40	D8		26	20.6			40.0		40
							4.4E-05		
45	D9	Becoming very dense	47						45
50	D10	50.3	50+	13.8					50

NOTES:

Installed (1) 3/4" PVC piezometer - screened in overburden

PROJECT: BRPP SITE INVESTIGATION		JOB NO.: 07089.00	BORING NO.: B-07-208
DATE STARTED: 9/6/07	DATE FINISHED: 9/6/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE	
GROUND SURFACE ELEVATION (FT): 2731.1	DRILLING CONTRACTOR: AE DRILLING		LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3		SHEET 2 OF 2

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	water content, %	RQD, %			WELL LOG	DEPTH (FT)
55	D11		50+						55
60	D12		50+	17.8			60.0		60
		Auger Refusal at 61 feet					61.0		
	R1	**FRACTURED ROCK**			38				
65		65.5							65
	R2	**BEDROCK**			78				
70									70
	R3				86				
75		75.5							75
		Bottom of Exploration at 75.5 feet							
80									80
85									85
90									90
95									95
100									100

NOTES:

Installed (1) 3/4" PVC piezometer - screened in overburden

PROJECT: BRPP SITE INVESTIGATION	JOB NO.: 07089.(	BORING NO.: B-07-209
DATE STARTED: 10/4/07	DATE FINISHED: 10/5/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE
GROUND SURFACE ELEVATION (FT): 2741.2	DRILLING CONTRACTOR: AE DRILLING	LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3	SHEET 1 OF 2

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	water content, %	RQD, %	% > #200	Field Hydraulic Conductivity, k (cm/s)	WELL LOG	DEPTH (FT)
	D1	**SAPROLITE**	15						
5	D2	Medium to very dense brown, black and yellow silty gravelly sand with relict structure. Very coarse with rock fragments	12						5
10	D3		26	5.5		10.8			10
15	D4		50+						15
20	D5		30						20
25	D6		33					22.0 / 25.0	25
30	D7		50+				6.0E-03		30
		PARTIALLY WEATHERED BEDROCK							
35	D8	Auger Refusal at 35 feet	50+					35.0 / 35.4	35
	R1	**FRACTURED ROCK**			66				
40									40
	R2				22				
45									45
	R3				72				
50								48.5	50

NOTES:

Installed (1) 3/4" PVC piezometer - screened in bedrock

Installed (1) 3/4" PVC piezometer - screened in overburden

PROJECT: BRPP SITE INVESTIGATION	JOB NO.: 07089.(	BORING NO.: B-07-209
DATE STARTED: 10/4/07	DATE FINISHED: 10/5/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE
GROUND SURFACE ELEVATION (FT): 2741.2	DRILLING CONTRACTOR: AE DRILLING	LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3	SHEET 2 OF 2

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	water content, %	RQD, %		Field Hydraulic Conductivity, k (cm/s)	WELL LOG	DEPTH (FT)
	R4	**FRACTURED ROCK**			44		50.3		
55									55
	R5				44		4.5E-05		
60									60
	R6	**BEDROCK**			100		60.3		
65									65
		Bottom of Exploration at 65 feet							
70									70
75									75
80									80
85									85
90									90
95									95
100									100

NOTES:

Installed (1) 3/4" PVC piezometer - screened in bedrock

Installed (1) 3/4" PVC piezometer - screened in overburden

PROJECT: BRPP SITE INVESTIGATION	JOB NO.: 07089.00	BORING NO.: B-07-210
DATE STARTED: 9/17/07	DATE FINISHED: 9/18/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE
GROUND SURFACE ELEVATION (FT): 2706.9	DRILLING CONTRACTOR: AE DRILLING	LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3	SHEET 1 OF 2

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	water content (SME lab), %	water content (field), %			WELL LOG	DEPTH (FT)
	D1	TOPSOIL **RESIDUAL SOIL**	8		18.5				
5	D2	Medium dense mottled silty sand, trace to some gravel	14						5
10	D3		15		14.7				10
		SAPROLITE							
15	D4	Dense brown silty sand, some gravel and rock fragments with relict structure	36				15.0		15
20	D5		38		11.0		20.0		20
25	D6		30		17.0				25
30	D7	Becoming medium dense	28	11.3	17.6		30.0		30
35	D8		20		17.7				35
40	D9		21	22.8	16.9				40
45	D10		14		18.4				45
50	D11		50+	9.9					50

NOTES:

Installed (1) 3/4" PVC piezometer - screened in bedrock

Installed (1) 3/4" PVC piezometer - screened in overburden

PROJECT: BRPP SITE INVESTIGATION	JOB NO.: 07089.00	BORING NO.: B-07-210
DATE STARTED: 9/17/07	DATE FINISHED: 9/18/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE
GROUND SURFACE ELEVATION (FT): 2706.9	DRILLING CONTRACTOR: AE DRILLING	LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3	SHEET 2 OF 2

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	water content (SME lab), %	water content (field), %	RQD, %	Field Hydraulic Conductivity, k (cm/s)	WELL LOG	DEPTH (FT)
55	12D		50+	8.8	14.2				55
		58.5 Auger Refusal at 58.5 feet							
60	R1	**FRACTURED ROCK**				73	59.2		60
	R2					58	60.0 3.4E-05		
65		65.0					65.0		65
	R3	**BEDROCK**				94	65.8		
70		Bottom of Exploration at 70.0 feet							70
75									75
80									80
85									85
90									90
95									95
100									100

NOTES:

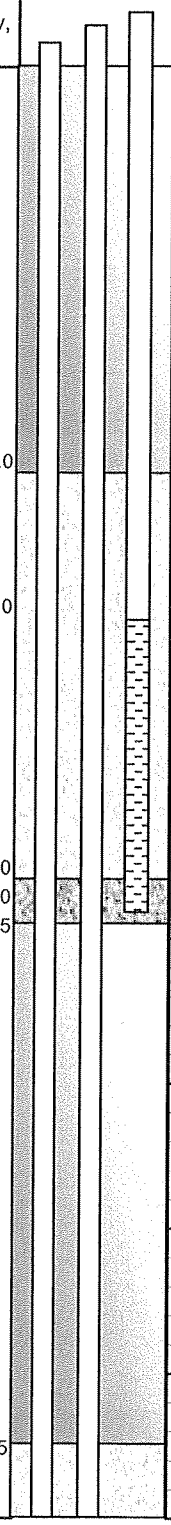
Installed (1) 3/4" PVC piezometer - screened in wx bedrock

Installed (1) 3/4" PVC piezometer - screened in overburden

PROJECT: BRPP SITE INVESTIGATION	JOB NO.: 07089.00	BORING NO.: B-07-211
DATE STARTED: 9/4/07	DATE FINISHED: 9/5/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE
GROUND SURFACE ELEVATION (FT): 2689.9	DRILLING CONTRACTOR: AE DRILLING	LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3	SHEET 1 OF 2

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	water content, %	RQD, %		Field Hydraulic Conductivity, k (cm/s)
		TOPSOIL					
		SAPROLITE					
5	D1	Medium to very dense silty fine to coarse sand with relict structure	22				
10	D2		50+				
		Zones of very dense gravel and rock fragments					14.0
15	D3		36				
							19.0
20	D4		50+				
		Becoming mostly rock fragments					
25	D5		43	11.8			2.2E-03
		Auger refusal at 29.5 feet					28.0
							29.0
30	R1	**FRACTURED ROCK**			0		29.5
35	R2				32		
40	R3				68		
45	R4				72		
50	R5				8		47.5

WELL LOG



NOTES:

Installed (2) 3/4" PVC piezometers - screened in bedrock

Installed (1) 3/4" PVC piezometers - screened in overburden

PROJECT: BRPP SITE INVESTIGATION	JOB NO.: 07089.00	BORING NO.: B-07-211
DATE STARTED: 9/4/07	DATE FINISHED: 9/5/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE
GROUND SURFACE ELEVATION (FT): 2689.9	DRILLING CONTRACTOR: AE DRILLING	LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3	SHEET 2 OF 2

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	water content, %	RQD, %		Field Hydraulic Conductivity, k (cm/s)	WELL LOG	DEPTH (FT)
	R5				8				
	R6				0				
55							55.0		55
							55.5		
	R7				36				
60									60
	R8				70				
65									65
	R9	**BEDROCK**			92				
70									70
	R10				92				
75									75
							77.0		
	R12	**FRACTURED ROCK**			71				
80									80
							80.8		
	R13				68		3.9E-05		
85									85
							85.8		
		Bottom of Exploration at 85.8 feet							
90									90
95									95
100									100

NOTES:

Installed (2) 3/4" PVC piezometers - screened in bedrock

Installed (1) 3/4" PVC piezometers - screened in overburden

PROJECT: BRPP SITE INVESTIGATION	JOB NO.: 07089.00	BORING NO.: B-07-211A
DATE STARTED: 9/7/07	DATE FINISHED: 9/12/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE
GROUND SURFACE ELEVATION (FT): 2689.0	DRILLING CONTRACTOR: AE DRILLING	LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3	SHEET 1 OF 4

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	water content, %	RQD, %			WELL LOG	DEPTH (FT)
		See B-07-211 for Stratigraphy down to 85 feet							
5									5
10									10
15									15
20									20
25									25
		Auger refusal at 29.5 feet							
30		**FRACTURED ROCK**							30
35									35
40									40
45									45
50									50

NOTES:

Installed (1) 3/4" PVC piezometer - screened in bedrock

PROJECT: BRPP SITE INVESTIGATION		JOB NO.: 07089.00	BORING NO.: B-07-211A
DATE STARTED: 9/7/07	DATE FINISHED: 9/12/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE	
GROUND SURFACE ELEVATION (FT): 2689.9	DRILLING CONTRACTOR: AE DRILLING		LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3		SHEET 2 OF 4

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	water content, %	RQD, %			WELL LOG	DEPTH (FT)
55									55
60									60
65									65
		BEDROCK							
70									70
75									75
		FRACTURED ROCK							
80									80
85									85
	R13				64				
90									90
		BEDROCK							
95	R14				86				95
100									100

NOTES:

Installed (1) 3/4" PVC piezometer - screened in bedrock

PROJECT: BRPP SITE INVESTIGATION		JOB NO.: 07089.00	BORING NO.: B-07-211A
DATE STARTED: 9/7/07	DATE FINISHED: 9/12/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE	
GROUND SURFACE ELEVATION (FT): 2689.0	DRILLING CONTRACTOR: AE DRILLING		LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3		SHEET 3 OF 4

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	water content, %	RQD, %			WELL LOG	DEPTH (FT)
		BEDROCK							
105	R15				82				105
110									110
115	R16				48				115
120									120
125	R17				97				125
130									130
135	R18				77				135
140									140
145	R19				24				145
150									150

NOTES:

Installed (1) 3/4" PVC piezometer - screened in bedrock

PROJECT: BRPP SITE INVESTIGATION		JOB NO.: 07089.00	BORING NO.: B-07-211A
DATE STARTED: 9/7/07	DATE FINISHED: 9/12/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE	
GROUND SURFACE ELEVATION (FT): 2689.0	DRILLING CONTRACTOR: AE DRILLING		LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3		SHEET 4 OF 4

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	water content, %	RQD, %		Field Hydraulic Conductivity, k (cm/s)	WELL LOG	DEPTH (FT)
155	R20				32				155
160	R21				94				160
165	R22				84				165
170	R23				96				170
175	R24				54	grout 173 to surface chips 173 to 178			175
180	R25				92			178.0 180.0	180
185	R26				94		4.5E-05		185
190	R27							190.0	190
195		Bottom of Exploration at 190.0 feet							195
200									200

NOTES:

Installed (1) 3/4" PVC piezometer - screened in bedrock

PROJECT: BRPP SITE INVESTIGATION	JOB NO.: 07089.00	BORING NO.: B-07-212
DATE STARTED: 9/12/07	DATE FINISHED: 9/12/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE
GROUND SURFACE ELEVATION (FT): 2677.0	DRILLING CONTRACTOR: AE DRILLING	LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3	SHEET 1 OF 1

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	water content, %	RQD, %		Field Hydraulic Conductivity, k (cm/s)	WELL LOG	DEPTH (FT)
		TOPSOIL							
		COLLUVIUM							
		Loose red-brown silty fine to coarse sand, some gravel, trace clay							
5	D1		6						5
							6.0		
							8.0		
10	D2		7						10
15	D3		7	14.4					15
		17.0					16.0		
							16.5		
	R1	Auger Refusal at 11 feet							
		FRACTURED ROCK			47				
20									20
	R2				20				
25									25
	R3				70		3.3E-03		
							27.0		
							28.0		
30							30.0		30
		BEDROCK							
	R4				96		33.0		
35							cave		35
40									40
45									45
50									50

NOTES:

Installed (1) 3/4" PVC piezometer - screened in wx bedrock

Installed (1) 3/4" PVC piezometer - screened in overburden

PROJECT: BRPP SITE INVESTIGATION	JOB NO.: 07089.00	BORING NO.: B-07-213
DATE STARTED: 10/3/07	DATE FINISHED: 10/4/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE
GROUND SURFACE ELEVATION (FT): 2741.2	DRILLING CONTRACTOR: AE DRILLING	LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3	SHEET 1 OF 2

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	water content, %	RQD, %	% > #200		WELL LOG	DEPTH (FT)
	D1	TOPSOIL **REWORKED SOIL**	10						
5	D2	Medium dense to dense red, brown sandy silt, some rock fragments	18						5
10	D3		37						10
15	D4	**PARTIALLY WEATHERED BEDROCK**	50						15
20	D5		50+	12.2		48.1			20
25	D6		50+						25
30	D7	30.5 Auger Refusal at 32 feet	50+						30
35	R1	**FRACTURED ROCK** 34.7			15				35
40	R2	39.7			0				40
45	R3	44.7			0				45
50	R4	49.7			70				50

NOTES:

Installed (1) 3/4" PVC piezometer - screened in bedrock

PROJECT: BRPP SITE INVESTIGATION	JOB NO.: 07089.00	BORING NO.: B-07-213
DATE STARTED: 10/3/07	DATE FINISHED: 10/4/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE
GROUND SURFACE ELEVATION (FT): 2741.2	DRILLING CONTRACTOR: AE DRILLING	LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3	SHEET 2 OF 2

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)		RQD, %		Field Hydraulic Conductivity, k (cm/s)	WELL LOG	DEPTH (FT)
	R4 cont..	**FRACTURED ROCK**			70		51.0		
55		54.7					55.0		55
60	R5				43		4.2E-03		60
65		64.7							65
70	R6	**BEDROCK**			91				70
75		Bottom of Exploration at 75 feet					74.0 cave		75
							75.0		
80									80
85									85
90									90
95									95
100									100

NOTES:

Installed (1) 3/4" PVC piezometer - screened in bedrock

PROJECT: BRPP SITE INVESTIGATION	JOB NO.: 07089.0C	BORING NO.: B-07-214
DATE STARTED: 9/19/07	DATE FINISHED: 9/19/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE
GROUND SURFACE ELEVATION (FT): 2675.4	DRILLING CONTRACTOR: AE DRILLING	LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3	SHEET 1 OF 2

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	water content (SME lab), %	water content (field), %	RQD, %	Field Hydraulic Conductivity, k (cm/s)	WELL LOG	DEPTH (FT)
	D1	**REWORKED SOIL** Loose red-brown sandy gravelly silt, trace cobble	9						
5	D2		17		11.5				5
		RESIDUAL SOIL Medium dense brown and black silty fine to coarse sand, some gravel							
10	D3		16						10
15	D4	**SAPROLITE** Medium to very dense red, brown and black silty gravelly sand, some rock fragments	15		15.1				15
20	D5		24		11.0		20.0		20
25	D6		27	18.0	16.2		25.0		25
30	D7		40	16.4	15.7		7.5E-06		30
35	D8	**PARTIALLY WEATHERED BEDROCK**	50+	13.7	13.3				35
40	D9		50+	14.1	12.1		40.0		40
45	D10		50+	8.6					45
50	D11		50+		4.9				50

NOTES:

Installed (1) 3/4" PVC piezometer - screened in bedrock

Installed (1) 3/4" PVC piezometer - screened in overburden

PROJECT: BRPP SITE INVESTIGATION	JOB NO.: 07089.00	BORING NO.: B-07-214
DATE STARTED: 9/19/07	DATE FINISHED: 9/19/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE
GROUND SURFACE ELEVATION (FT): 2675.4	DRILLING CONTRACTOR: AE DRILLING	LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3	SHEET 2 OF 2

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	water content, %	RQD, %		Field Hydraulic Conductivity, k (cm/s)	WELL LOG	DEPTH (FT)
		Auger Refusal at 51 feet							
	R-1	**BEDROCK**			89				
55							54.5 55.5		55
	R-2				84		2.6E-05		
60							60.5		60
		Bottom of Exploration at 60.5 feet							
65									65
70									70
75									75
80									80
85									85
90									90
95									95
100									100

NOTES:

Installed (1) 3/4" PVC piezometer - screened in bedrock

Installed (1) 3/4" PVC piezometer - screened in overburden

PROJECT: BRPP SITE INVESTIGATION		JOB NO.: 07089.0(	BORING NO.: B-07-215
DATE STARTED: 8/26/07	DATE FINISHED: 8/27/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE	
GROUND SURFACE ELEVATION (FT): 2650.8	DRILLING CONTRACTOR: AE DRILLING		LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3		SHEET 1 OF 2

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	water content, %	RQD, %	% > #200	Field Hydraulic Conductivity, k (cm/s)	WELL LOG	DEPTH (FT)
		TOPSOIL							
		REWORKED SOIL Silty gravelly sand		15.1		36.4			
5	D1	5.0	17						5
		COLLUVIUM							
10	D2	Medium dense brown sandy silt to silty sand, some gravel, trace clay, trace cobble	12	17.0					10
							13.0		
15	D3		24				cave		15
							19.0		
20	D4		11	40.0		42			20
							22.4		
							23.0		
		Auger Refusal at 24 feet					3.1E-02 24.0		
25	D5 & R1		50+	15.6	80		24.3		25
		BEDROCK							
30	R2				100				30
35	R3				71				35
40	R4				100				40
45	R5				46				45
50	R6				100				50

NOTES:

Installed (1) 3/4" PVC piezometer - screened in bedrock

Installed (1) 3/4" PVC piezometer - screened in overburden

PROJECT: BRPP SITE INVESTIGATION		JOB NO.: 07089.0(	BORING NO.: B-07-215
DATE STARTED: 8/26/07	DATE FINISHED: 8/27/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE	
GROUND SURFACE ELEVATION (FT): 2650.8	DRILLING CONTRACTOR: AE DRILLING		LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3		SHEET 2 OF 2

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	water content, %	RQD, %		Field Hydraulic Conductivity, k (cm/s)	WELL LOG	DEPTH (FT)
		BEDROCK							
							53.5		
55	R7				100		55.0		55
							1.1E-04		
60									60
	R8				100				
65		Bottom of Exploration at 65.0 feet					65.0		65
70									70
75									75
80									80
85									85
90									90
95									95
100									100

NOTES:

Installed (1) 3/4" PVC piezometer - screened in bedrock

Installed (1) 3/4" PVC piezometer - screened in overburden

PROJECT: BRPP SITE INVESTIGATION	JOB NO.: 07089.00	BORING NO.: B-07-215A
DATE STARTED: 8/27/07	DATE FINISHED: 8/27/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE
GROUND SURFACE ELEVATION (FT): 2651.0	DRILLING CONTRACTOR: AE DRILLING	LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3	SHEET 1 OF 1

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	water content, %	RQD, %		Field Hydraulic Conductivity, k (cm/s)	WELL LOG	DEPTH (FT)
		See B-07-215 for Stratigraphy					2.0 4.0		
5	D1		16						5
	D2		17	11.5			2.0E-04		
	D3		50+	7.1					
10	D4		50+	4.6					10
							13.0		
		Bottom of Exploration at 13.0 feet							
15									15
20									20
25									25
30									30
35									35
40									40
45									45
50									50

NOTES:

Installed (1) 3/4" PVC piezometer - screened in overburden

PROJECT: BRPP SITE INVESTIGATION	JOB NO.: 07089.00	BORING NO.: B-07-216
DATE STARTED: 10/2/07	DATE FINISHED: 10/3/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE
GROUND SURFACE ELEVATION (FT): 2706.9	DRILLING CONTRACTOR: AE DRILLING	LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3	SHEET 1 OF 2

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	RQD, %	Field Hydraulic Conductivity, k (cm/s)	WELL LOG	DEPTH (FT)
	D1	TOPSOIL	50+				
		REWORKED SOIL					
5							5
	D2	6.1 Very dense brown gravelly sand, some silt, trace boulders	50+				
10							10
	D3	10.7	50+				
15							15
	D4	15.7	50+				
		Auger Refusal at 17 feet					
	R1	**BEDROCK**		97			
20							20
		FRACTURED ROCK					
25	R2			51			25
30							30
	R3			0			
35							35
		BEDROCK					
40	R4			83			40
45					45.0		45
	R5			76	1.5E-03		
					48.3		
50	R6						50

NOTES:

Installed (1) 3/4" PVC piezometer - screened in bedrock

PROJECT: BRPP SITE INVESTIGATION		JOB NO.: 07089.00	BORING NO.: B-07-216
DATE STARTED: 10/2/07	DATE FINISHED: 10/3/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE	
GROUND SURFACE ELEVATION (FT): 2706.9	DRILLING CONTRACTOR: AE DRILLING		LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3		SHEET 2 OF 2

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)		RQD, %			WELL LOG	DEPTH (FT)
		BEDROCK							
55	R6				90				55
60									60
65	R7				90				65
		Bottom of Exploration at 69.0 feet					68.3		
70							69.0		70
75									75
80									80
85									85
90									90
95									95
100									100

NOTES:

Installed (1) 3/4" PVC piezometer - screened in bedrock

PROJECT: BRPP SITE INVESTIGATION	JOB NO.: 07089.00	BORING NO.: B-07-217
DATE STARTED: 9/20/07	DATE FINISHED: 9/24/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE
GROUND SURFACE ELEVATION (FT): 2685.1	DRILLING CONTRACTOR: AE DRILLING	LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3	SHEET 1 OF 4

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	water content (field), %	WELL LOG	DEPTH (FT)
	D1	**RESIDUAL SOIL**	6	5.9		
		Loose red-brown fine sandy silt, some gravel				
5	D2	**SAPROLITE**	18			5
		Medium to very dense brown and black, silty fine to coarse sand with rock fragment. Relict structure evident.				
10	D3		18	10.5		10
15	D4		30			15
20	D5		34	7.6		20
25	D6	Becoming very dense, mostly rock fragments	50+			25
30	D7		47	6.8		30
35	D8	Dense brown and black silty fine sand with rock fragments and relict structure	34			35
40	D9		32	7.5		40
45	D10		45	11.7		45
50	D11		50+			50

NOTES:

Installed (1) 3/4" PVC piezometer - screened in bedrock

Installed (1) 3/4" PVC piezometer - screened in bedrock/overburden

PROJECT: BRPP SITE INVESTIGATION	JOB NO.: 07089.00	BORING NO.: B-07-217
DATE STARTED: 9/20/07	DATE FINISHED: 9/24/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE
GROUND SURFACE ELEVATION (FT): 2685.1	DRILLING CONTRACTOR: AE DRILLING	LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3	SHEET 2 OF 4

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	water content, %	RQD, %		Field Hydraulic Conductivity, k (cm/s)	WELL LOG	DEPTH (FT)
		Auger Refusal at 51 feet							
	R1	**FRACTURED ROCK**			48				
55							55.0		55
	R2	**BEDROCK**			96				
60									60
							4.0E-04		
65	R3				94				65
70							70.0		70
75	R4				95				75
80									80
	R5				96				
85									85
	R6				92				
90									90
	R7				96				
95									95
	R8				100				
100									100

NOTES:

Installed (1) 3/4" PVC piezometer - screened in bedrock

Installed (1) 3/4" PVC piezometer - screened in bedrock/overburden

PROJECT: BRPP SITE INVESTIGATION	JOB NO.: 07089.00	BORING NO.: B-07-217
DATE STARTED: 9/20/07	DATE FINISHED: 9/24/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE
GROUND SURFACE ELEVATION (FT): 2685.1	DRILLING CONTRACTOR: AE DRILLING	LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3	SHEET 3 OF 4

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	water content, %	RQD, %			WELL LOG	DEPTH (FT)
	R9	**BEDROCK**			94				
105									105
	R10				94				
110									110
115	R11				96				115
120									120
125	R12				99				125
130									130
	R13				94				
135									135
	R14				98				
140									140
	R15				100				
145									145
	R16				98				
150									150

NOTES:

Installed (1) 3/4" PVC piezometer - screened in bedrock

Installed (1) 3/4" PVC piezometer - screened in bedrock/overburden

PROJECT: BRPP SITE INVESTIGATION		JOB NO.: 07089.00	BORING NO.: B-07-217
DATE STARTED: 9/20/07	DATE FINISHED: 9/24/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE	
GROUND SURFACE ELEVATION (FT): 2685.1	DRILLING CONTRACTOR: AE DRILLING		LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3		SHEET 4 OF 4

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	water content, %	RQD, %		Field Hydraulic Conductivity, k (cm/s)	WELL LOG	DEPTH (FT)
	R17	**BEDROCK**			100				
155									155
	R18				100				
160									160
	R19				100				
165									165
	R20				100				
170							169.7		170
							171.0		
175	R21				100				175
180							1.1E-05		180
	R22				100				
185									185
	R23				94				
190									190
	R24				100		191.0		
		Bottom of Exploration at 191.0 feet							
195									195
200									200

NOTES:

Installed (1) 3/4" PVC piezometer - screened in bedrock

Installed (1) 3/4" PVC piezometer - screened in bedrock/overburden

PROJECT: BRPP SITE INVESTIGATION	JOB NO.: 07089.0(	BORING NO.: B-07-218
DATE STARTED: 9/20/07	DATE FINISHED: 9/20/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE
GROUND SURFACE ELEVATION (FT): 2701.1	DRILLING CONTRACTOR: AE DRILLING	LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3	SHEET 1 OF 2

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	water content (SME lab), %	water content (field), %	% > #200		WELL LOG	DEPTH (FT)
	D1	**RESIDUAL SOIL**	8						
		Loose red-brown fine to very fine silt, trace gravel							
5	D2		11		24.3	63.0			5
		SAPROLITE							
10	D3		6						10
		Loose to medium dense red, brown and black silty sand to sandy silt with relict structure, some rock fragments							
15	D4		8		25.5				15
20	D5		17						20
25	D6		14		28.3				25
30	D7	Becoming coarser with more rock fragments	15						30
35	D8		18		26.5				35
40	D9		17						40
45	D10		20		39.1				45
		PARTIALLY WEATHERED BEDROCK							
50	D11		50+						50

NOTES:

Installed (1) 3/4" PVC piezometers - screened in overburden/bedrock

PROJECT: BRPP SITE INVESTIGATION	JOB NO.: 07089.0(	BORING NO.: B-07-218
DATE STARTED: 9/20/07	DATE FINISHED: 9/20/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE
GROUND SURFACE ELEVATION (FT): 2701.1	DRILLING CONTRACTOR: AE DRILLING	LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3	SHEET 1 OF 2

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	water content (SME lab), %	water content (field), %	RQD, %	Field Hydraulic Conductivity, k (cm/s)	WELL LOG	DEPTH (FT)
		PARTIALLY WEATHERED BEDROCK							
55	D12		17	22.4	21.5		55.0		55
60	D13		24	20.0	20.3				60
							1.3E-04		
65	D14	Auger Refusal at 65 feet	50+						65
	R1	**BEDROCK**				88			
70							70.0		70
	R2					100	chips		
75		Bottom of Exploration at 75.3 feet							75
80									80
85									85
90									90
95									95
100									100

NOTES:

Installed (1) 3/4" PVC piezometers - screened in overburden/bedrock

PROJECT: BRPP SITE INVESTIGATION		JOB NO.: 07089.0	BORING NO.: B-07-219
DATE STARTED: 8/28/07	DATE FINISHED: 8/29/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE	
GROUND SURFACE ELEVATION (FT): 2627.6	DRILLING CONTRACTOR: AE DRILLING		LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3		SHEET 1 OF 2

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	water content, %	RQD, %	% > #200	Field Hydraulic Conductivity, k (cm/s)	WELL LOG	DEPTH (FT)
		TOPSOIL							
		COLLUVIUM							
5	D1	Very loose gray and brown silty sand to sandy silt, trace clay	3	18.7			3.0E-05		5
10	D2		3	50.7		32.1			10
15	D3		6	23.4					15
20	D4		5						20
25	D5	**SAPROLITE** 25.3	50+	10.9					25
30	D6	Dense to very dense brown, black and white gravelly silty fine to coarse sand with rock fragments and relict structure	30						30
35	D7		40	13.3		25.2			35
40	D8		42	10.6					40
45	D9		33	7.7					45
50	D10		19				1.1E-03		50

WELL LOG: 3.5, 5.0, 15.0, 15.5, 48.0, 49.0

NOTES:

Installed (2) 3/4" PVC piezometers - screened in overburden

PROJECT: BRPP SITE INVESTIGATION	JOB NO.: 07089.0	BORING NO.: B-07-219
DATE STARTED: 8/28/07	DATE FINISHED: 8/29/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE
GROUND SURFACE ELEVATION (FT): 2627.6	DRILLING CONTRACTOR: AE DRILLING	LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3	SHEET 2 OF 2

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	water content, %	RQD, %			WELL LOG	DEPTH (FT)
		Auger Refusal at 54 feet							
55	R1				30		54.0		55
		FRACTURED ROCK							
	R2				16				
60									60
							chips		
	R3				30				
65									65
	R4	**BEDROCK**			94				
70		Bottom of Exploration at 70.0 feet							70
75									75
80									80
85									85
90									90
95									95
100									100

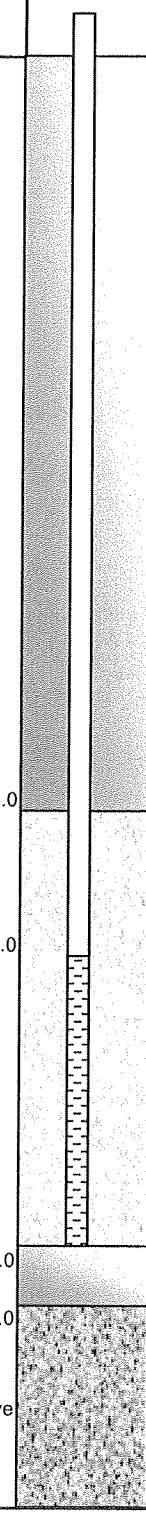
NOTES:

Installed (2) 3/4" PVC piezometers - screened in overburden

PROJECT: BRPP SITE INVESTIGATION	JOB NO.: 07089.00	BORING NO.: B-07-220
DATE STARTED: 9/25/07	DATE FINISHED: 9/25/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE
GROUND SURFACE ELEVATION (FT): 2666.9	DRILLING CONTRACTOR: AE DRILLING	LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3	SHEET 1 OF 1

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	water content, %	RQD, %	% > #200
	D1		50+			
		1.3 **REWORKED SOIL**				
5						
	D2	Medium to very dense brown, black and white gravelly silty sand with boulders	18			
10						
	D3		50+			
		11.4 Boulders				
15						
	D4		50+			
		PARTIALLY WEATHERED BEDROCK				
20						
	D5		50+	11.9		17.7
25						
	D6	25.9	50+			
		Auger Refusal at 28 feet				
30	R1	**FRACTURED ROCK**			65	
	R2				64	
35		35.3				
	R3				54	
40		40.3				
	R4	**BEDROCK**			80	
45		45.3				
	R5				100	
50		50.3 BOE at 50.3 feet				

WELL LOG



DEPTH (FT): 10, 15, 20, 25, 30, 35, 40, 45, 50

NOTES:

Installed (1) 3/4" PVC piezometer - screened in overburden/wx bedrock

PROJECT: BRPP SITE INVESTIGATION	JOB NO.: 07089.00	BORING NO.: B-07-221
DATE STARTED: 9/24/07	DATE FINISHED: 9/24/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE
GROUND SURFACE ELEVATION (FT): 2677.2	DRILLING CONTRACTOR: AE DRILLING	LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3	SHEET 1 OF 2

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	water content, %	% > #200			WELL LOG	DEPTH (FT)
	D1	**RESIDUAL SOIL**	8						
	D2	**SAPROLITE**	9						
5									5
	D3	Loose to dense red, brown and black silty fine sand with relict structure	19	14.2	42.9				
10									10
	D4		23						
15									15
	D5		24						
20									20
	D6		27						
25									25
	D7		27						
30									30
	D8		28						
35									35
	D9	Medium dense brown and black, silty gravelly sand with relict stucture, some rock fragments	32						
40									40
	D10		24						
45									45
	D11		28						
50									50

NOTES:

Installed (1) 3/4" PVC piezometers - screened in overburden/bedrock

Installed (1) 3/4" PVC piezometers - screened in competent bedrock

PROJECT: BRPP SITE INVESTIGATION	JOB NO.: 07089.00	BORING NO.: B-07-221
DATE STARTED: 9/24/07	DATE FINISHED: 9/24/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE
GROUND SURFACE ELEVATION (FT): 2677.2	DRILLING CONTRACTOR: AE DRILLING	LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3	SHEET 2 OF 2

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	water content, %	RQD, %		Field Hydraulic Conductivity, k (cm/s)	WELL LOG	DEPTH (FT)
	D12	**SAPROLITE**	50						
55							54.0		55
	D13	**PARTIALLY WEATHERED BEDROCK**	50+	15.6			56.3		
60									60
	D14	Auger Refusal at 62 feet	50+				61.0		
		BEDROCK			83		1.6E-04		
65									65
							66.0		
					100				
							69.0		
70									70
							70.0		
									chips
					100		8.2E-10		
75		Bottom of Exploration at 75.0 feet							75
80									80
85									85
90									90
95									95
100									100

NOTES:

Installed (1) 3/4" PVC piezometers - screened in overburden/bedrock

Installed (1) 3/4" PVC piezometers - screened in competent bedrock

PROJECT: BRPP SITE INVESTIGATION		JOB NO.: 07089.0(	BORING NO.: B-07-222
DATE STARTED: 8/21/07	DATE FINISHED: 8/23/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE	
GROUND SURFACE ELEVATION (FT): 2610.6	DRILLING CONTRACTOR: AE DRILLING		LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3		SHEET 1 OF 3

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	water content, %	RQD, %	% > #200	Field Hydraulic Conductivity, k (cm/s)	WELL LOG	DEPTH (FT)
		TOPSOIL							
		REWORKED SOIL					3.0		
5							5.0		5
	D1	Stiff brown sandy silt, trace organics	8	15.5					
10							1.8E-04		10
	D2	11.2	14	13.7 21.8					
		SAPROLITE							
15							15.0 15.5		15
	D3	Loose brown silty sand. Friable with relict structure	3	24.3					
20									20
	D4		9	19.1					
25									25
	D5	Becoming medium dense with more rock fragments	22	12.5					
30									30
	D6		13	17.4					
35									35
	D7		18	16.5					
40									40
	D8		48	13.4					
45		45							45
	D9	**PARTIALLY WEATHERED BEDROCK**	50+	15.2		21.7			
50									50

NOTES:

Installed 3/4" PVC piezometer - screened in bedrock

Installed (2) 3/4" PVC piezometers - screened in overburden

PROJECT: BRPP SITE INVESTIGATION	JOB NO.: 07089.0(	BORING NO.: B-07-222
DATE STARTED: 8/21/07	DATE FINISHED: 8/23/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE
GROUND SURFACE ELEVATION (FT): 2610.6	DRILLING CONTRACTOR: AE DRILLING	LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3	SHEET 2 OF 3

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	water content, %	RQD, %		Field Hydraulic Conductivity, k (cm/s)	WELL LOG	DEPTH (FT)
	D10	**PARTIALLY WEATHERED BEDROCK**	50+	11.5					
55							53.0 55.0		55
	D11		65	10.1			1.7E-04		
60							60.0		60
	D12	Auger Refusal at 61 feet	15	14.7			60.5		
65	R1	**BEDROCK**			94				65
70	R2				100				70
75	R3				100				75
80	R4				100				80
85	R5				100				85
90	R6				100				90
95	R7				100		94.0		95
100									100

NOTES:

PROJECT: BRPP SITE INVESTIGATION	JOB NO.: 07089.0(	BORING NO.: B-07-222
DATE STARTED: 8/21/07	DATE FINISHED: 8/23/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE
GROUND SURFACE ELEVATION (FT): 2610.6	DRILLING CONTRACTOR: AE DRILLING	LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3	SHEET 3 OF 3

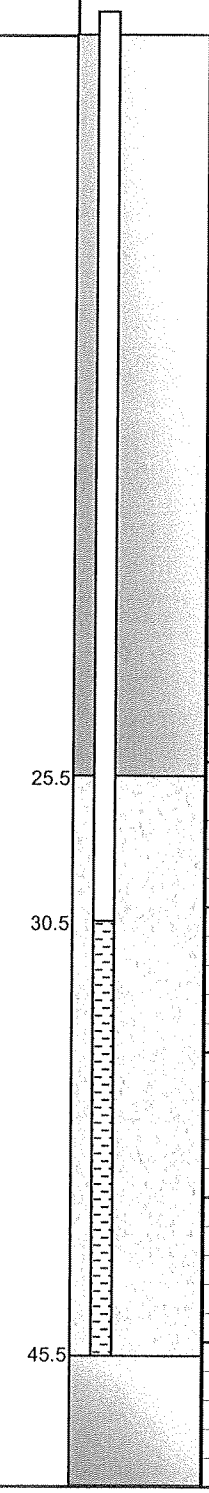
DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	water content, %	RQD, %		Field Hydraulic Conductivity, k (cm/s)	WELL LOG	DEPTH (FT)
	R7						100.6		
		BEDROCK							
105							1.6E-09		105
	R8				98				
110							110.6		110
		Bottom of boring @ 111 feet					111.0		
115									115
120									120
125									125
130									130
135									135
140									140
145									145
150									150

NOTES:

PROJECT: BRPP SITE INVESTIGATION	JOB NO.: 07089.00	BORING NO.: B-07-223
DATE STARTED: 9/18/07	DATE FINISHED: 9/19/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE
GROUND SURFACE ELEVATION (FT): 2648.0	DRILLING CONTRACTOR: AE DRILLING	LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3	SHEET 1 OF 1

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	water content (SME lab), %	water content (field), %	RQD, %	
	D1	TOPSOIL	9				
		SAPROLITE					
5	D2	Medium dense, red, brown, white and black fine sandy silt with relict structure	13		18.3		
10	D3	Becoming more coarse with rock fragments	10				
15	D4		18		22		
20	D5	Mostly rock fragments	48		12.1		
25	D6		28				
30	D7		50		10.5		
35	D8	Trace clay	21	23.7	24.9		
40	D9		50+	15.9	11		
		Auger Refusal at 42 feet					
45	R1	**FRACTURED ROCK**				70	
	R2	**BEDROCK**				84	
50		Bottom of exploration at 50.0 feet					

WELL LOG



DEPTH (FT): 5, 10, 15, 20, 25, 30, 35, 40, 45, 50

NOTES:

Installed (1) 3/4" PVC piezometer - screened in bedrock

PROJECT: BRPP SITE INVESTIGATION	JOB NO.: 07089.0C	BORING NO.: B-07-224
DATE STARTED: 9/25/07	DATE FINISHED: 10/2/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE
GROUND SURFACE ELEVATION (FT): 2537.9	DRILLING CONTRACTOR: AE DRILLING	LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3	SHEET 1 OF 2

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	water content, %	RQD, %	% > #200	Field Hydraulic Conductivity, k (cm/s)	WELL LOG	DEPTH (FT)
	D1	**ALLUVIUM**	4						
		Loose to medium dense brown silty fine sand to sandy silt, some gravel					3.0		
5							5.0		5
	D2		12						
							1.2E-03		
10									10
	D3		20	11.2		4.8			
15							15.0		15
	D4		25	10.4			15.5		
20		**PARTIALLY WEATHERED BEDROCK**							20
	D5		45						
		Auger Refusal at 24.5 feet							
25	R1				100.0				25
		BEDROCK							
	R2				90.0				
30									30
	R3				100				
35									35
	R4				100				
40									40
	R5				100				
45									45
	R6				100				
50									50

NOTES:

Installed (1) 3/4" PVC piezometer - screened in bedrock

Installed (1) 3/4" PVC piezometer - screened in overburden

PROJECT: BRPP SITE INVESTIGATION	JOB NO.: 07089.0C	BORING NO.: B-07-224
DATE STARTED: 9/25/07	DATE FINISHED: 10/2/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE
GROUND SURFACE ELEVATION (FT): 2537.9	DRILLING CONTRACTOR: AE DRILLING	LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3	SHEET 2 OF 2

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	water content, %	RQD, %		Field Hydraulic Conductivity, k (cm/s)	WELL LOG	DEPTH (FT)
	R7	**BEDROCK**			100				
55									55
	R8				100				
60									60
	R9				100				
65									65
	R10				100		68.0		
70							70.0		70
	R11				100				
75									75
	R12				100		7.8E-04		
80									80
	R13				100				
85									85
	R14				100				
90									90
		Bottom of Exploration at 90 feet							
95									95
100									100

NOTES:

Installed (1) 3/4" PVC piezometer - screened in bedrock

Installed (1) 3/4" PVC piezometer - screened in overburden

PROJECT: BRPP SITE INVESTIGATION		JOB NO.: 07089.0	BORING NO.: B-07-225
DATE STARTED: 8/27/07	DATE FINISHED: 8/28/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE	
GROUND SURFACE ELEVATION (FT): 2538.5	DRILLING CONTRACTOR: AE DRILLING		LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3		SHEET 1 OF 1

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	water content, %	RQD, %	% > #200	Field Hydraulic Conductivity, k (cm/s)	WELL LOG	DEPTH (FT)
		TOPSOIL							
		ALLUVIUM							
		Loose brown silty fine to very fine sand					3.0		
5	D1		5	45.9		29.9	5.0		5
		Becoming gravelly					5.7E-04		
10	D2		16	45.1					10
		Auger Refusal at 11 feet very coarse		12.4		8.2			
	R1	**FRACTURED ROCK**			29				
15		15.2					15.0		15
	R2	**BEDROCK**			90				
20		20.2							20
	R3				100				
25		25.2							25
	R4				76				
30		30.2							30
	R5				78				
35		35.2							35
	R6				66				
40		40.2							40
	R7				88				
45		45.2					43.5 44.5		45
	R8				83		5.2E-06		
50		49.8					48.8 cave 49.5		50

NOTES:

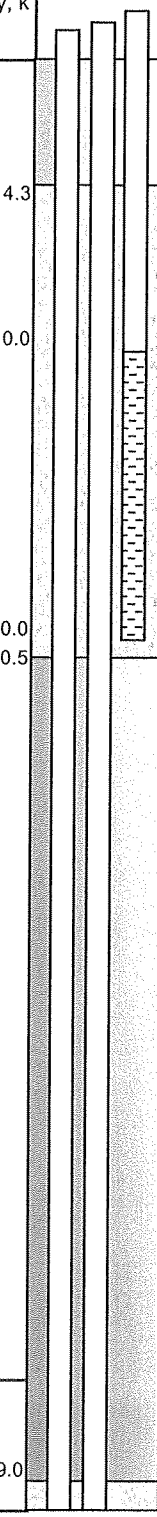
Installed (1) 3/4" PVC piezometer - screened in bedrock

Installed (1) 3/4" PVC piezometer - screened in overburden/wx bedrock

PROJECT: BRPP SITE INVESTIGATION	JOB NO.: 07089.(	BORING NO.: B-07-226
DATE STARTED: 10/18/07	DATE FINISHED: 10/20/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE
GROUND SURFACE ELEVATION (FT): 2645.6	DRILLING CONTRACTOR: AE DRILLING	LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3	SHEET 1 OF 2

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	water content (field), %	RQD, %	% > #200	Field Hydraulic Conductivity, k (cm/s)
	D1	**RESIDUAL SOIL**	6				
5		Loose to medium dense red-brown sandy silt to silty sand, trace gravel, trace clay					4.3
	D2		13	21.7		56.9	
10		**SAPROLITE**					10.0
	D3		10				
15		Loose to medium dense brown silty sand with relict structure					8.7E-05
	D4		9	20.6			
20							20.0
	D5		16	16.3		30.5	20.5
25							
	D6		16	11.7			
30		**PARTIALLY WEATHERED BEDROCK**					
	D7	30.9	50+				
35							
	D8	35.4	50+	5.6			
40							
	D9	41.5	50+	10.5			
45			50+				
	D10	Auger Refusal at 45.5 feet					
	R1	**FRACTURED ROCK**			0		49.0
50							

WELL LOG



NOTES:

Installed (1) 3/4" PVC piezometer - screened in overburden

Installed (1) 3/4" PVC piezometer - screened in wx bedrock

Installed (1) 3/4" PVC piezometer - screened in competent bedrock

PROJECT: BRPP SITE INVESTIGATION	JOB NO.: 07089.(	BORING NO.: B-07-226
DATE STARTED: 10/18/07	DATE FINISHED: 10/20/07	DRILLING METHOD: HSA, WIRE-LINE ROCK CORE
GROUND SURFACE ELEVATION (FT): 2645.6	DRILLING CONTRACTOR: AE DRILLING	LOGGED BY: MSR
BOREHOLE DIA. (IN): 8	ROCK CORE DIA. (IN): 3	SHEET 2 OF 2

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SPT N-VALUE (bpf)	water content (field), %	RQD, %		Field Hydraulic Conductivity, k (cm/s)	WELL LOG	DEPTH (FT)
		FRACTURED ROCK					1.1E-04		
							53.5		
55	R2				65				55
60									60
	R3				34				
65		65.0							65
	R4	**BEDROCK**			90				
70									70
75	R5				75				75
80									80
	R6				84		83.0		
85							85.0		85
	R7				90				
90							2.1E-04		90
	R8				100				
95							95.0		95
		Bottom of Exploration at 95.1 feet					95.1		
100									100

NOTES:

Installed (1) 3/4" PVC piezometer - screened in overburden

Installed (1) 3/4" PVC piezometer - screened in wx bedrock

Installed (1) 3/4" PVC piezometer - screened in competent bedrock

APPENDIX B

ROCK CORE LOGS

BEDROCK CORE LOG

PROJECT BLUE RIDGE PAPER PRODUCTS BORING NO. B-07-203 PAGE 1 OF 4

JOB NO. 07089 DRILLER AE DRILLING

CORE DIAMETER (IN.) 2.5 (HQ) ELEVATION (FT) — DEPTH (FT) 33-47
INTERVAL INTERVAL

AZIMUTH — INCLINATION — LOGGED BY MSR (NAME) 10/21/07 (DATE)

BREAKS IN CORE:
- MEASURED BREAKS OR PARTINGS ACROSS CORE
- CHIPS, CAVITY, LOST CORE
- MEASURED HIGH-ANGLE JOINT (JT = JOINT)
- D CORE BROKEN BY DRILLER
- M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
33	R-1 mod wx; Fe, Fe, Fe	70	1.3/1.5	4/1.5; 27		Brown, gray, chlorite and black quartz, biotite, schistose gneiss medium grained
35	D; R-2 mod wx	NV	3.4/5	2.3/5; 46		wavy variable bedding/foliation
37	Fe, Fe, Fe	50				
39						biotite concentration; quartz large grained
41	R-3 sev wx; chips	NV	0.9/5.0	0/5; 0		
43						
45	R-4 sev wx	45		2.7/5; 54		wavy NV foliation
47	D; Fe, Fe, Fe					

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-203 PAGE 2 OF 4

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 47-61

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

MEASURED BREAKS OR PARTINGS ACROSS CORE
CHIPS, CAVITY, LOST CORE
MEASURED HIGH-ANGLE JOINT (JT = JOINT)
D CORE BROKEN BY DRILLER
M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
47		R-4 cont..	45				Br. quartz-biotite schistose gneiss. Very wx much Fe.
49		49.5					Fractures along bedding planes
	Fe	R-5					
	Fe	mod wx					
51	Fe Fe		45	2.8/4.6	7/4.6		
					15		
		chips					weathered mica schist?
53							
		sev wx					
		53.9					
	M	R-6					
55	D	sl wx					Black, white gray schistose gneiss very foliation Dip NV - 25
					4.3/5.6		
	Mg?		25				
		mod wx			76		
57	Fe Fe Fe						
59			NV				
	D	sl wx					
		R-7					
	Mg Mg	sl wx	30°				
61							

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-203 PAGE 3 OF 4

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 61-75

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

BREAKS IN CORE

- MEASURED BREAKS OR PARTINGS ACROSS CORE
- CHIPS, CAVITY, LOST CORE
- MEASURED HIGH-ANGLE JOINT (JT = JOINT)
- D CORE BROKEN BY DRILLER
- M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
61	mg R-7 cont.. sl wx	30°		2.1/5		many fractures along bedding planes Mg staining in fractures clear banding quartz-biotite, graywacke? feldspar?
63	mg			42		
	Fe mg	50°				
	64.5					
65	Fe R-8 mg sl wx			3.8/5		
	mg B			76		
67						
69		60				
	69.5					
	D R-9 sm wx	40		3.7/4.7		quartz-biotite garnet schistose gneiss feldspar?
71	D					
	mg stain			79		
73	mg					
	74.5					
75	R-10					

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-203 PAGE 4 OF 4

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 75-84.5

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

MEASURED BREAKS OR PARTINGS ACROSS CORE
CHIPS, CAVITY, LOST CORE
MEASURED HIGH-ANGLE JOINT (JT = JOINT)
D CORE BROKEN BY DRILLER
M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
75		R-10 cont..	70				gray-white quartz biotite-garnet gneiss near vertical bands med grained
	D	un wx					
77	D				5.3/5.3		
	D				100		
79							
	D	R-11					
		un wx					quartz concentration (quartzite?) intrusion
81					5/5		
					100		
	D		NV				
83	D						
	D						
85		BOE AT 84.5					

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-204 PAGE 1 OF 4

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 72.5-86

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

BREAKS IN CORE:
- MEASURED BREAKS OR PARTINGS ACROSS CORE
- CHIPS, CAVITY, LOST CORE
- MEASURED HIGH-ANGLE JOINT (JT = JOINT)
- D CORE BROKEN BY DRILLER
- M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE / CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
72	72.5					
	R-1 Sev wx	60-70				Severely weathered schist - biotite quartz stained Rusty Brown could be gneiss? coarse grained dip appear to be 60-75° though diff. to determine Some folds in bedding
74	Fe, Mg stained chips and pieces			25		
76	R-2					
78	Mg Fe stained chips and small pieces			8		
80						
	R-3					
82	mod wx					gray white schistose gneiss
	Fe			24		
84	Fe Sev wx missing and Fe chips					
86						

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-204 PAGE 2 OF 4

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 86-100

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

MEASURED BREAKS OR PARTINGS ACROSS CORE
CHIPS, CAVITY, LOST CORE
MEASURED HIGH-ANGLE JOINT (JT = JOINT)
D CORE BROKEN BY DRILLER
M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE / CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
86	R-4 Sev wx	variable				variable Dip wavy patterns folded bedding schistose gneiss highly weathered brown gray white biotite quartz
88	Fe pieces & chips			8		
90						
	R-5 Sev wx					
92						
				0		
94	Fe pieces and chips					
96	R-6 Sev wx					
98				10		
	Fe pieces and chips					
100						

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-204 PAGE 3 OF 4

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 100 - 114

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

MEASURED BREAKS OR PARTINGS ACROSS CORE
CHIPS, CAVITY, LOST CORE
MEASURED HIGH-ANGLE JOINT (JT = JOINT)
D CORE BROKEN BY DRILLER
M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
100		Fe	variable				
		R-7 mod wx					variable Dip folding of bedding within core
102	Fe	Fe					
		Fe			70		
	Fe	mod wx					becoming competent
104							
	Fe						
106	Fe	R-8 sev wx					weathered schistose gneis
108		mod wx			18		competent
	Fe						
110	Fe	sev wx					weathered
		R-9 mod wx					
112					90		comp. black/gray/white schistose gneiss
114							

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-204 PAGE 4 OF 4

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 114-125.7

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

MEASURED BREAKS OR PARTINGS ACROSS CORE
CHIPS, CAVITY, LOST CORE
MEASURED HIGH-ANGLE JOINT (JT = JOINT)
D CORE BROKEN BY DRILLER
M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
114	Fe, Fe, Fe	R-9 cont. Mod wx	Variable		70		gray/white quartz-biotite gneiss
116	Fe	R-10					
	Fe, Fe	Sev wx					Rusty Brown
118	Fe				70		
	D	Sl wx					variable Dip due to folded bedding
120	D						
		R-11					
122	D, D, Fe, Fe		NW		86		Nv Schistocity
124	D, D						
126		BOE AT 125.7					

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-206 PAGE 1 OF 3

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 55-69

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

BREAKS IN CORE:
- MEASURED BREAKS OR PARTINGS ACROSS CORE
- CHIPS, CAVITY, LOST CORE
- MEASURED HIGH-ANGLE JOINT (JT = JOINT)
- D CORE BROKEN BY DRILLER
- M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
55	R-1 Sev. wx	245°		0		Soil mixed with severely wx mica schist gray and Fe staining rusty brown
57						
59	Soil					
61	R-2 Sev. wx	60-75		24		gray quartz, biotite schist near vertical schistosity some feldspar? coarse grained
63	Fe stain chips					
65	Fe stain R-3 Sev. wx			24		
67						
69	Fe R-4 Sev. wx Fe			16		

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-206 PAGE 2 OF 3

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 69-83

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

MEASURED BREAKS OR PARTINGS ACROSS CORE
CHIPS, CAVITY, LOST CORE
MEASURED HIGH-ANGLE JOINT (JT = JOINT)
D CORE BROKEN BY DRILLER
M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
69		Fe R-4 cont chips					
		R-5					Same as above
71		Fe mod wx					
		D					
		D	45-60°		52		
73		D					
		D					
		Fe pieces					
75		R-6					
		D sl wx	45				
		76.5			79		
77		Fe					almost massive fine grained w. light gray quartzite? intrusion? healed fractures present
		D	not apparent massive				
79		D					pieces of "unmelted" feldspar floating in quartzite matrix?
		D					
		Fe R-7					
81		D D D sl wx			78		
		D					
83							Photo

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-206 PAGE 3 OF 3

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 83-85

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

MEASURED BREAKS OR PARTINGS ACROSS CORE
CHIPS, CAVITY, LOST CORE
MEASURED HIGH-ANGLE JOINT (JT = JOINT)
D CORE BROKEN BY DRILLER
M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
83		Fe R-7 cont..					
		Fe					
85		BOE at 85 feet					

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-207 PAGE 1 OF 2

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 56.5-90

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

MEASURED BREAKS OR PARTINGS ACROSS CORE
CHIPS, CAVITY, LOST CORE
MEASURED HIGH-ANGLE JOINT (JT= JOINT)
D CORE BROKEN BY DRILLER
M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
56		56.5					
		R-1 Sev. wx			.5/2.5 20		Fine grained granitic intrusion, spotted.
58							becoming - quartz, biotite, ~~garnet~~ Felds schist, large crystals
59	59	R-2 Sev. wx			0		
64	64	R-3 Sev wx			0		NOTE CHANGE IN SCALE
69	69	Rusty chips					RETURNED ONLY SEVERLY WX CHIPS from 59' To 84' Schist
74		R-4 Sev wx			0		
79	79	R-5 Sev wx			0		
84	84	R-6 mod wx					becoming more competant gray/white mica schist
86			45-60		2.8/5.0 56		variable dip 45°-60° wavy foliation looks like gneiss except too much mica
88							
	D 89						
90	D	R-7					

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-207 PAGE 2 OF 2

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 90 - 99

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

MEASURED BREAKS OR PARTINGS ACROSS CORE
CHIPS, CAVITY, LOST CORE
MEASURED HIGH-ANGLE JOINT (JT = JOINT)
D CORE BROKEN BY DRILLER
M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
90		R-7 cont...			3.8/5.0		mixed dark and light gray mica schist - quartz biotite (concentrated in places) swirling foliation generally dipping 45-60° but near vertical in places
		Sl wx			76		
92							
	D						
		Fe stains					
94	D	R-8					looks like gneiss but too much biotite
		mg stain					
	D	vn wx			4.8/5.0		
96	D		60°	NV			quartz, felds, biotite banding
	D				96		
		Fe stain					
98							
		BOE @ 99 feet					
100							

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-208 PAGE 1 OF 1

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 61-75.5

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

MEASURED BREAKS OR PARTINGS ACROSS CORE
CHIPS, CAVITY, LOST CORE
MEASURED HIGH-ANGLE JOINT (JT = JOINT)
D CORE BROKEN BY DRILLER
M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
61		Fe R-1 sev wx	Not apparent				fine grained quartz granitic melt
		Fe	45°		38		
63		Fe					Coarse grained dark gray and white mica quartz garnet schist. large biotite concentrations
			70°				
65							
		Fe R-2 sl wx	70°				
67					78		becoming less weathered
69			45°				
71		M R-3 sl wx			86		
73		Fe, Mg	45				
		D mg or calcite?	30°				
75							

5/90

BOE AT 75.5

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-209 PAGE 1 OF 3

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 35 - 49

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

BREAKS IN CORE:
- MEASURED BREAKS OR PARTINGS ACROSS CORE
- CHIPS, CAVITY, LOST CORE
- MEASURED HIGH-ANGLE JOINT (JT = JOINT)
- D CORE BROKEN BY DRILLER
- M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
35	D R-1 mod wx Fe Fe					gray coarse grained garnet biotite/quartz schist
37	Fe Fe Fe Fe sar wx	NV		66		dip is difficult to determine - generally near vertical
39	Fe					
41	R-2 mod wx	70°		22		foliation more prominent
43	Fe quartz in fracture chips					
45	D R-3 sl. wx					migmatite? appears to be remelted
47	slight Fe	40		72		
	slight Fe					~ 4" band of fine grained quartzite?
49						

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-209 PAGE 2 OF 3

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 49 - 63

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

MEASURED BREAKS OR PARTINGS ACROSS CORE
CHIPS, CAVITY, LOST CORE
MEASURED HIGH-ANGLE JOINT (JT = JOINT)
D CORE BROKEN BY DRILLER
M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
49		chips R-3 cont					
							gray slate
		? missing R-4					
51		mod wx					
	Fe		40		44		
53	Fe						Brown biotite quartz schist.
55		R-5					
	D						
		mod wx					
57		slight Fe	40		44		gray
		some healed fractures					
59	Fe Fe Fe						
		R-6					
61							competent rock
	D	mn wx	40		100		
	D						
63							

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-269 PAGE 3 OF 3

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 63-65

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

MEASURED BREAKS OR PARTINGS ACROSS CORE
CHIPS, CAVITY, LOST CORE
MEASURED HIGH-ANGLE JOINT (JT = JOINT)
D CORE BROKEN BY DRILLER
M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
63	D	R-6 continued					
	D						
	D						
65	D						

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-210 PAGE 1 OF 1

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 58.5-70

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

MEASURED BREAKS OR PARTINGS ACROSS CORE
CHIPS, CAVITY, LOST CORE
MEASURED HIGH-ANGLE JOINT (JT = JOINT)
D CORE BROKEN BY DRILLER
M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
57							
59	Fe	R-1 Sl. wx	46		1.1/1.5 73		gray to brown coarse to med. grained schistose gneiss? biotite quartz, muscovite?
	Fe						
	Fe Fe	R-2 Sl. wx					Dip becoming less steep with depth
61	D				2.9/5		intruded band of fine-grained granitic rock
	Fe		40		58		
63	Fe						
	Fe slight Fe		30				
65	D						
	D	R-3 vn wx			4.7/5		prominent banding quartz, biotite, garnet.
67	D		30		94		
69	Fe						
	D						
	D						
71							

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-211 PAGE 1 OF 12

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 29 - 43

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

BREAKS IN CORE

- MEASURED BREAKS OR PARTINGS ACROSS CORE
- CHIPS, CAVITY, LOST CORE
- MEASURED HIGH-ANGLE JOINT (JT = JOINT)
- D CORE BROKEN BY DRILLER
- M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
29	missing R-1 Sev wx			0		missing core
31	R-2 sev wx					becoming quartz - feldspar coarse grained
33	Fe, Fe			32		
	Fe, Fe					
35	Fe, Fe	NV				Brown (stained) highly weathered quartz biotite schist? NV schistocity
	R-3 sev wx					
37	Fe			68		
	Fe, Fe					
39	D					
	Fe, D					
41	R-4 sev wx					
	Fe			72		
43	Fe					

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-211 PAGE 2 OF 11

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 43-57

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

BREAKS IN CORE:
- MEASURED BREAKS OR PARTINGS ACROSS CORE
- CHIPS, CAVITY, LOST CORE
- MEASURED HIGH-ANGLE JOINT (JT = JOINT)
- D CORE BROKEN BY DRILLER
- M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
43	D	R-4 cont. med wx	NV		72		Porown (Fe stained) quartz mica schist? NV Foliation med-coarse grained
45							
47	Fe	R-5 Sev wx			8		Severly weathered only recovered Fe stained quartz and feldspar chips
49							
51		R-6 Sev wx			0		
53							
55							
57		R-7 Sev wx	60°				gray weathered schist? med-c grained

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-211 PAGE 3 OF 12

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 57-71

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

BREAKS IN CORE

- MEASURED BREAKS OR PARTINGS ACROSS CORE
- CHIPS, CAVITY, LOST CORE
- MEASURED HIGH-ANGLE JOINT (JT = JOINT)
- D CORE BROKEN BY DRILLER
- M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
57	Fe, Fe, Fe, Fe, D, Fe, Fe; R-7 cont.; Sev wx	60		36		gray quartz-mica schist very weathered some fractures along bedding planes
61	missing? R-8; Fe; mw wx	70°		70		becoming competent quartz-biotite schistose gneiss - with some layers of coarser grained biotite schist along with almost massive graywacke?
67	R-9; mw wx	NW		92		
71						

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-211 PAGE 4 OF 11

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 71-85

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

BREAKS IN CORE:
- MEASURED BREAKS OR PARTINGS ACROSS CORE
- CHIPS, CAVITY, LOST CORE
- MEASURED HIGH-ANGLE JOINT (JT = JOINT)
- D CORE BROKEN BY DRILLER
- M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
71		R-10 cont. un wx	NV				dark gray/white quartz mica schistose gneiss garnet NV schistocity fine to med grained
	D						
73					92		
75	D						
	D						
	Fe	R-11 un wx	60°				
77					71		
79	not Broken D						fractures along bedding becoming coarser grained
	Fe, Mg		70				
81		R-12 SL wx					remelt - difficult to det. Dip
83		slight Fe Stain			68		mostly quartz gneiss
	D						
85							

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-211 PAGE 5 OF 12

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 85-99

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

BREAKS IN CORE

- MEASURED BREAKS OR PARTINGS ACROSS CORE
- CHIPS, CAVITY, LOST CORE
- MEASURED HIGH-ANGLE JOINT (JT = JOINT)
- D CORE BROKEN BY DRILLER
- M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
85		R-12 cont.					
		R-13 sl wx	48				START B-07-211A dark gray/white biotite quartz schistose gneiss
87	M M				64		
89							
	D	R-14 vwx	NV				wavy variable Dip mostly NV
91	D						large quartz bands (½") (quartzites) with fine grained granitic matrix
	D						
93					86		becoming very thin bands biotite quartz
95	D		50				
97	D						Schist-like med-grained
99							

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-211 PAGE 6 OF 12

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 99-113

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

MEASURED BREAKS OR PARTINGS ACROSS CORE
CHIPS, CAVITY, LOST CORE
MEASURED HIGH-ANGLE JOINT (JT = JOINT)
D CORE BROKEN BY DRILLER
M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
99		R-14 cont..	NV				
	D						gneiss gray
		R-15					
101		unwx	NV				
103							quartz-biotite schistose gneiss to schist
	D		NV		82		
105							Some shiny faces on fractures
	D		70				
107	D						
							schist
109							
		R-16	45				
111		sl wx					very quartz gneiss
		several healed fractures			48		
		remelt					
113							

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-211 PAGE 7 OF 12

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 113-127

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

MEASURED BREAKS OR PARTINGS ACROSS CORE
CHIPS, CAVITY, LOST CORE
MEASURED HIGH-ANGLE JOINT (JT = JOINT)
D CORE BROKEN BY DRILLER
M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
113		R-16 cont.. mod wx	NV				dark gray/white fine grained
115	D		80°		48		NV subvitreously schistose gneiss
	D	slight Fe Mg?					mod-coarse biotite schist
117							
119	D						finer grained biotite quartz schist
	D						
	D?	R-17 slight Mg? unwx					
121							
	D						
123					97		
	D						
125							
	D						
127							

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-211 PAGE 8 OF 12

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL R7-141

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

BREAKS IN CORE

MEASURED BREAKS OR PARTINGS ACROSS CORE
CHIPS, CAVITY, LOST CORE
MEASURED HIGH-ANGLE JOINT (JT = JOINT)
D CORE BROKEN BY DRILLER
M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
127	slight Mg R-17 cont.. in wx	NV		97		light gray and white schistose gneiss (quartz-biotite NV schistocity
129						
	R-18					
131						coarser grained biotite schist. difficult to determine Dip
						mostly quartz
133	Mg					
		45°		77		
135	Mg, Fe?					
						dark gray/white quartz-mica schistose gneiss remelting - rehealed fractures
137						
139						predominantly quartz
	R-19					
141						

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-211 PAGE 9 OF 11

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 141-155

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

BREAKS IN CORE

- MEASURED BREAKS OR PARTINGS ACROSS CORE
- CHIPS, CAVITY, LOST CORE
- MEASURED HIGH-ANGLE JOINT (JT = JOINT)
- D CORE BROKEN BY DRILLER
- M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
141	R-19 cont.. mod wx	45°				predominantly quartz gneiss
143						
145						revelling almost a migmatite
147	pieces with slight Fe, Mg staining			24		
149	chips w/ Mg, Ca?	60°				dark gray / white quartz-biotite schistose gneiss
151	R-20 mod wx					staining greenish Fe? or mg? or Ca?
153	D D	60°		32		
155	D					

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-211 PAGE 10 OF 12

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 155-169

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

MEASURED BREAKS OR PARTINGS ACROSS CORE
CHIPS, CAVITY, LOST CORE
MEASURED HIGH-ANGLE JOINT (JT = JOINT)
D CORE BROKEN BY DRILLER
M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
155		R-21 iron Pyrite vn wx	50°				fracture along bedding
157					94		dark gray quartz mica schistose gneiss wavy quartz stringers
159		mg, Fe pyrite	50°				
161		R-22 vn wx	65		84		
163							schist? - shiny facies
165		R-23 mg, Fe Pyrite vn wx					
167					96		
169			NV				

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-211 PAGE 11 OF 17

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 169-183

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

MEASURED BREAKS OR PARTINGS ACROSS CORE
CHIPS, CAVITY, LOST CORE
MEASURED HIGH-ANGLE JOINT (JT = JOINT)
D CORE BROKEN BY DRILLER
M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE / CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
169	R-23 cont					transition bench to schistose gneiss
						wavy quartz stringer
	R-24					light bluish gray schistose gneiss quartz + biotite
171		45		54		
	mg					
173						
	mg					
	D					
175						
	R-25					
	D					
	D					
177				92		
	D					
	Mg					
	mg					
179	D					
	D					
	D					
	R-26					concentrated biotite black
181				94		
183						

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-211 PAGE 12 OF 12

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 183-190

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

MEASURED BREAKS OR PARTINGS ACROSS CORE
CHIPS, CAVITY, LOST CORE
MEASURED HIGH-ANGLE JOINT (JT = JOINT)
D CORE BROKEN BY DRILLER
M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
183		R-26 cont.. un wx			94		Schistose gneiss, wavy quartz bands w/ biotite
185		R-27 sl wx					mostly quartz with thick 1/4 - 1/2 bands of biotite
	M M			4.5/5	2.4/5.0		
187	M				48		
189	D D						predominantly quartz
191							

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-212 PAGE 1 OF 2

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 17-31

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

BREAKS IN CORE

MEASURED BREAKS OR PARTINGS ACROSS CORE
CHIPS, CAVITY, LOST CORE
MEASURED HIGH-ANGLE JOINT (JT = JOINT)
D CORE BROKEN BY DRILLER
M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
17	R-1 Sev wx; Fe, Fe, Fe	NV		47		Brown from Fe staining to gray and white bands of quartz-biotite schist appears a lower grade of metamorphism than some of the schistose gneiss on site. Near vertical schistosity
19	D, D					
21	Fe; R-2 Sev wx			20		
23	Fe					
25	R-3					
27	mod wx			70		
29	Fe, mg					
31	R-4 vn wx					competent mostly biotite

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-212 PAGE 2 OF 2

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 31-35

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

BREAKS IN CORE

- MEASURED BREAKS OR PARTINGS ACROSS CORE
- CHIPS, CAVITY, LOST CORE
- MEASURED HIGH-ANGLE JOINT (JT = JOINT)
- D — CORE BROKEN BY DRILLER
- M — CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
31	R-4 cont...	Nv				near vertical schistocity predominantly biotite some quartz
	D UNWX					
33	D			96		predominat quartz w/ biotite stringers
	D					
35	D					

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-213 PAGE 1 OF 4

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 32-46

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

BREAKS IN CORE:
- MEASURED BREAKS OR PARTINGS ACROSS CORE
- CHIPS, CAVITY, LOST CORE
- MEASURED HIGH-ANGLE JOINT (JT = JOINT)
- D CORE BROKEN BY DRILLER
- M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
32		missing R-1 Sev wx			.4/217		highly weathered fine grained schistose gneiss? near vertical foliation
		Fe			15		
34		Fe					
		Fe					
		R-2 Sev. wx					black (biotite) and white (quartz) banding
36					0/5		
					0		
38							Fe stained chips
40		R-3 Sev wx					
					0/5		
42					0		
44							
		Fe Fe R-4 Sl. wx					
46							

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-213 PAGE 2 OF 4

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 46-60

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

MEASURED BREAKS OR PARTINGS ACROSS CORE
CHIPS, CAVITY, LOST CORE
MEASURED HIGH-ANGLE JOINT (JT = JOINT)
D CORE BROKEN BY DRILLER
M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE / CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
46	Fe					
	Fe					
	R-4 cont...					near vertical banding black and white schistose gneiss?
	Sl. wx					
48				7/10		
	Fe			70		
50						
52	Fe					
	Fe					
54	Fe					
	3 chips					
	R-5					
56	mod wx					
	missing			43/10		
				43		
58						
	D					
60	Fe					

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-213 PAGE 3 OF 4

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 60-74

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

MEASURED BREAKS OR PARTINGS ACROSS CORE
CHIPS, CAVITY, LOST CORE
MEASURED HIGH-ANGLE JOINT (JT = JOINT)
D CORE BROKEN BY DRILLER
M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
60		R-5 cont... mod wx					
62	D, D						near black biotite schistose quartz gneiss near vertical foliation
64							mostly spotted white quartz (quartzite?)
	D, Fe, Fe	R-6 sl wx					some healed fractures
66	D				9.4/10.3		becoming biotite garnet-quartz schist - appears transitional between schist and gneiss?
68	D, Fe				91		- mostly black biotite - near vertical schistocity although swirling foliation present
70		slight Fe					some feldspar
72	D, Fe						
74	D						fine-grained granitic intrusion?

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT _____

BORING NO. B-07-213 PAGE 4 OF 4

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 74-75

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

BREAKS IN CORE

MEASURED BREAKS OR PARTINGS ACROSS CORE

CHIPS, CAVITY, LOST CORE

MEASURED HIGH-ANGLE JOINT (JT = JOINT)

D CORE BROKEN BY DRILLER

M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
74	R-6 cont...					
76						

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-214 PAGE 1 OF 1

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 51-60.5

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

BREAKS IN CORE

- MEASURED BREAKS OR PARTINGS ACROSS CORE
- CHIPS, CAVITY, LOST CORE
- MEASURED HIGH-ANGLE JOINT (JT = JOINT)
- D CORE BROKEN BY DRILLER
- M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
51	R-1					
	Fe					
	Sl. wx			4/4.5		dark gray coarse grained quartz-biotite garnet schist
	Fe			89		
53						variable foliation
	D quartz concentration					
						prominent dip not apparent
	Fe					
55	D					
	Fe D					
	R-2			4.2/5		
	Sl wx					
57		25°		84		
	Fe					quartz cont.
	slight Fe					
	Fe					
59						
61						

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-215 PAGE 1 OF 3

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 24 - 38

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

MEASURED BREAKS OR PARTINGS ACROSS CORE
CHIPS, CAVITY, LOST CORE
MEASURED HIGH-ANGLE JOINT (JT = JOINT)
D CORE BROKEN BY DRILLER
M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
24		R-1 sl wx			.8/1.0 80		gray mica garnet schist coarse grained near vertical schistocity though diff. to determine in some places concentrations of biotite and garnet.
25							
26		R-2 sl wx	near vert		4.7/5 98		
28							
30		Fe stain					large concentration of quartz, felds coarse grained
30	D	Fe R-3 missing mod wx	45°-60°		3.2/4.5 71		bedding ≈ 45-60° from Horz.
32		Fe stain					
34	D						
35							
36		R-4 un wx	60°		5.2/5.5 95		bedding 60° from Horz.
38	D						

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-215 PAGE 2 OF 3

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 38 - 52

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

BREAKS IN CORE

- MEASURED BREAKS OR PARTINGS ACROSS CORE
- CHIPS, CAVITY, LOST CORE
- MEASURED HIGH-ANGLE JOINT (JT = JOINT)
- D — CORE BROKEN BY DRILLER
- M — CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
38	R-4 cont...					
	m					
40	40					
	R-5					
	m					
	m Sev wx			2.3/5.0		
42	m	45°		46		predominantly biotite
	m					
44						
	45					
	R-6					
46						gray/white/black quartz, biotite, feldspar
	Mg stain on wx			4.6/5		
		45°		92		
48						
	Mg stain					
50	50					
	R-7					
	on wx	60°				some healed fractures
	mg stain					
52						

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-21S PAGE 3 OF 3

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 52-65

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

BREAKS IN CORE:
- MEASURED BREAKS OR PARTINGS ACROSS CORE
- CHIPS, CAVITY, LOST CORE
- MEASURED HIGH-ANGLE JOINT (JT = JOINT)
- D CORE BROKEN BY DRILLER
- M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
52		R-7 cont...					gray biotite garnet? schist
	D						
		vn wx			9.9/10		
54	D		45°-60°				
					95		competent
		Fe stain					
56	D						
58							
60	60 D	R-8					Some biotite concentrations
					5/5		
62							
64							
	65 D						
66							

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-216 PAGE 1 OF 4

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 17 - 31

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

BREAKS IN CORE

- MEASURED BREAKS OR PARTINGS ACROSS CORE
- CHIPS, CAVITY, LOST CORE
- MEASURED HIGH-ANGLE JOINT (JT = JOINT)
- D CORE BROKEN BY DRILLER
- M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
17	R-1 sl. wx	NW		97		Black and white quartz/mica schist - med to coarse grained. Near vertical schistocity
19	D, D	75°				
	R-2					
21						
	Fe mod to Sev wx					
23	Fe, D	60		51		gray/white stained Br. w/ Fe
	Fe					very wx
25	Fe					
	Fe					
27	Fe					
	missing					
29						
	chips R-3 Sev wx					
31						

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-216 PAGE 2 OF 4

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 31-45

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

MEASURED BREAKS OR PARTINGS ACROSS CORE
CHIPS, CAVITY, LOST CORE
MEASURED HIGH-ANGLE JOINT (JT = JOINT)
D CORE BROKEN BY DRILLER
M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
31		R-3 cont. Sev wx			0		severe weathering
33							
		R-4					
35		Fe	50°				
		Fe					
		Sl. wx					Competent
		D					
37					83		gray/white biotite, muscovite quartz schist shiny facies
39							
		D? Pyrite Ca					
41		D					
		D					
43		D Fe					
		R-5 sl wx					
45							

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-216 PAGE 3 OF 4

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 45-59

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

BREAKS IN CORE:
- MEASURED BREAKS OR PARTINGS ACROSS CORE
- CHIPS, CAVITY, LOST CORE
- MEASURED HIGH-ANGLE JOINT (JT = JOINT)
- D — CORE BROKEN BY DRILLER
- M — CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
45	D	R-5 cont.. Sl wx	70				Near vertical schistocity
47	D, D, Fe, D				76		gray/white quartz mica schist
49		R-6 unwx					
51	D						
53	D, D				90		
55	D, Fe						
		mod wx					Fine grained granitic intrusion Fe stained light gray
57	Fe, Fe, Fe, Fe						
59							Schist comp.

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-216 PAGE 4 OF 4

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 59-69

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

MEASURED BREAKS OR PARTINGS ACROSS CORE
CHIPS, CAVITY, LOST CORE
MEASURED HIGH-ANGLE JOINT (JT = JOINT)
D CORE BROKEN BY DRILLER
M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
59		R-7 mod wx					granitic intrusion
							gray/white quartz-mica schist
61		sm wx	70				Dip ≅ 76°
	D						
63					90		
	M						
65							fine grained lt. gray intrusion granitic
							gray quartz-mica (muscovite) schist
67							
	M		45°				
69		BOE AT 69'					

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-217 PAGE 1 OF 10

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) _____ DEPTH (FT) 51-65
INTERVAL INTERVAL

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

BREAKS IN CORE:
- MEASURED BREAKS OR PARTINGS ACROSS CORE
- CHIPS, CAVITY, LOST CORE
- MEASURED HIGH-ANGLE JOINT (JT = JOINT)
- D CORE BROKEN BY DRILLER
- M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
51		missing R-1	70				Brown Rusty Highly weathered
		chips Fe Sev wx					
53	F				48		gray/white quartz biotite garnet schistose gneiss? higher grade of metamorph than schist? NV schistosity ≈ 70° becoming competent
	Fe	Sl wx					
55	Fe						
	Fe	R-2					
	Fe	Un wx					
57	D				96		
	D						
59	D						Zones of less metamorph biotite schist - med grained
	mg mg	R-3					
61		Sl wx					
					94		
63							
65	D						

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-217 PAGE 2 OF 10

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 65-79

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

MEASURED BREAKS OR PARTINGS ACROSS CORE
CHIPS, CAVITY, LOST CORE
MEASURED HIGH-ANGLE JOINT (JT = JOINT)
D CORE BROKEN BY DRILLER
M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
65		R-3 cont	40				finer grained biotite-quartz garnet gneiss dark gray
	M						biotite, muscovite schist
67					94		seems to be transitionally between schist and schistose gneiss
	D						
69		Fe water bearing					
		R-4					gneiss
71			45°				
	D						
73	D						
					95		
75	D						
	D						
77		mg, Pyrite #207	60°				
79	D						

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-217 PAGE 3 OF 10

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 79-93

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

MEASURED BREAKS OR PARTINGS ACROSS CORE
CHIPS, CAVITY, LOST CORE
MEASURED HIGH-ANGLE JOINT (JT = JOINT)
D CORE BROKEN BY DRILLER
M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
79	D	R-4 cont.					
81		R-5 on wx	60°		96		gray/white quartz biotite schistose gneiss - mostly fine grained, but some layers of medium grained biotite schist?
83	D						
	D						prominant Dip (mostly not wavy) ≈ 60°
85	D						
		slight Mg, Ca > R-6 on wx					
87	D				92		
	D						
89	D	? slight Mg, Fe pyrite					schist biotite
							quartz
	D	R-7 on wx					
91	D						
	D				96		quartz
	D						
93	D						

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-217 PAGE 4 OF 10

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 93-107

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

BREAKS IN CORE:
- MEASURED BREAKS OR PARTINGS ACROSS CORE
- CHIPS, CAVITY, LOST CORE
- MEASURED HIGH-ANGLE JOINT (JT = JOINT)
- D CORE BROKEN BY DRILLER
- M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
93		R-7 cont. unwx					gray/white quartz biotite schistose gneiss competant
	D						
95	D		50°				
		R-8					
	D				100		
97	D						
	D						
	D						
99	D						
	D		60°				
	P						
		R-9					fracture along bedding plane
101							
	D				94		
	D						
103	D						
			50°				gneiss mostly fine grain highly metamorphed - some bands of med grained schist
105							
		R-10					
					94		
107							

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-217 PAGE 5 OF 10

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 107-121

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

MEASURED BREAKS OR PARTINGS ACROSS CORE
CHIPS, CAVITY, LOST CORE
MEASURED HIGH-ANGLE JOINT (JT = JOINT)
D CORE BROKEN BY DRILLER
M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
107	mg D	R-10 cont. wn wx			94		garnet quartz-biotite fine grained gneiss gray/white - some bands of med grained biotite muscovite schist - foliation apparent
109	D D		NV				
	D	R-11 wn wx					variable Dip predominantly steep (NV)
111	D D				96		
113	D D	schist?					schist? (biotite, musc conc)
115	D D D D D	quartz					
	D D	wn wx					Transition from schistose gneiss to schist med. grained quartz-biotite layered and intruded by fine grained quartz garnet granitic Rock
117	D D		60°				
	Mg water bearing?						
119	D D D						
		R-12					
121							

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-217 PAGE 6 OF 10

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 121-135

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

BREAKS IN CORE:
- MEASURED BREAKS OR PARTINGS ACROSS CORE
- CHIPS, CAVITY, LOST CORE
- MEASURED HIGH-ANGLE JOINT (JT = JOINT)
- D CORE BROKEN BY DRILLER
- M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
121	R-12 cont.					quartz biotite garnet
	on wx	60°				schist or schistose
123						gneiss
				99		medium to coarse
						grained -
125						more likely schist than
						gneiss less morphed
						shiny mica in breaks
127		NV				
129						
	mg? R-13					
131	on wx					
	slight Mg			91		
133	mg, Fe Pyrite					
135		60°				

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-217 PAGE 7 OF 10

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 135-149

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

BREAKS IN CORE

- MEASURED BREAKS OR PARTINGS ACROSS CORE
- CHIPS, CAVITY, LOST CORE
- MEASURED HIGH-ANGLE JOINT (JT = JOINT)
- D CORE BROKEN BY DRILLER
- M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
135	R-14 vn wx					Gray/white quartz-biotite garnet schist flakey biotite on some Driller breaks medium grained
137				98		
139	D D D D D D D					quartz
141	D D D	50°				
	D D			100		
143	D D					
145	D D D D					mostly quartz
	R-16 wn wx					
147	D D D D	50°		98		
	D Mg Fracture no Fe					
149						

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-217 PAGE 8 OF 10

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 149-163

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

BREAKS IN CORE

- MEASURED BREAKS OR PARTINGS ACROSS CORE
- CHIPS, CAVITY, LOST CORE
- MEASURED HIGH-ANGLE JOINT (JT = JOINT)
- D CORE BROKEN BY DRILLER
- M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
149	R-16 cont..					dark gray/white quartz, mica garnet schist? to schistose gneiss variable Dip
151	R-17 unwx	85°				
153				100		
155						
157	R-18 unwx	60°		100		
159		70				
161	R-19 unwx	60°		100		
163						

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-217 PAGE 9 OF 10

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 163-177

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

BREAKS IN CORE

MEASURED BREAKS OR PARTINGS ACROSS CORE
CHIPS, CAVITY, LOST CORE
MEASURED HIGH-ANGLE JOINT (JT = JOINT)
D CORE BROKEN BY DRILLER
M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
163	R-19 cont..	60°				gray/white quartz biotite schistose gneiss slightly lower grade metamorphism than other site gneiss med. grained unweathered competant
165						
167	R-20 unwx			100		
169		50°				predominantly biotite med grained with more quartz schist than gneiss
171	R-21 unwx					
173				100		
175						
177						

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-217 PAGE 10 OF 10

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 177-191

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

BREAKS IN CORE

MEASURED BREAKS OR PARTINGS ACROSS CORE
CHIPS, CAVITY, LOST CORE
MEASURED HIGH-ANGLE JOINT (JT = JOINT)
D CORE BROKEN BY DRILLER
M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
177	D	R-21 cont... on wx					gray/white quartz-mica schist - med grained fine layers unweathered competent rock
	D						
	D						
179					100		
	D						
	D						
		R-22 on wx	50°				
181	D						
183					100		
	D						
	D						
	D						
185	D						
	D	R-23					
		Mg, Fe Pyrite - H_2O? on wx	30°				
	D						
187							
	D				94		
	D						
189		Mg, Pyrite H_2O?					
			50°				
		R-24					
191					100		

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-218 PAGE 1 OF 1

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 64-75.3

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

BREAKS IN CORE

- MEASURED BREAKS OR PARTINGS ACROSS CORE
- CHIPS, CAVITY, LOST CORE
- MEASURED HIGH-ANGLE JOINT (JT = JOINT)
- D — CORE BROKEN BY DRILLER
- M — CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
64	R-1 chips sev wx Fe stained			0		quartz-biotite-muscovite garnet schist? medium grained
65.3						
66	Fe Fe R-2 Sl. wx	60°				soil
	D			88		
68	D					NV schistocity
	Fe					
70	Fe 70.3	70°				
	R-3 un wx					
72	D			100		
74		60°				
75.3						
76	BOE AT 75.3'					

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-219 PAGE 1 OF 2

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 54-68

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) 10/21/07 (DATE)

MEASURED BREAKS OR PARTINGS ACROSS CORE
CHIPS, CAVITY, LOST CORE
MEASURED HIGH-ANGLE JOINT (JT = JOINT)
D CORE BROKEN BY DRILLER
M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
54		R-1 sev wx Pieces Fe stained			0		white pegmatite coarse & black graphed quartz, bortite feldspar
		R-2 sev wx			16		white gneiss predominantly quartz and feldspar
56			not apparent				
58		missing?					Some rehealed fractures suggest near vertical dip.
		pieces slight Fe staining					
60		R-3 mod/sev wx			30		gray gneiss
62		D Fe staining					
		Fe stains					
64		Pieces					
		R-4 un wx			94		highly metamorphosed (remolded?) bedding and foliation difficult to determine white and gray quartz feldspar, some mica
66		D D D D D					
68							

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-219 PAGE 2 OF 2

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 68-70

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

BREAKS IN CORE

- MEASURED BREAKS OR PARTINGS ACROSS CORE
- CHIPS, CAVITY, LOST CORE
- MEASURED HIGH-ANGLE JOINT (JT = JOINT)
- D — CORE BROKEN BY DRILLER
- M — CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
68						
	Fe slight					
70						

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-220 PAGE 1 OF 2

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 28-42

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

BREAKS IN CORE

- MEASURED BREAKS OR PARTINGS ACROSS CORE
- CHIPS, CAVITY, LOST CORE
- MEASURED HIGH-ANGLE JOINT (JT = JOINT)
- D CORE BROKEN BY DRILLER
- M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
28	R-1 mod wx; Fe; D	NV		63		moderately weathered gray/white, stained Fe, coarse grained quartz biotite schist? NV schistocity
30						
32	R-2 mod wx; D			64		
34	Fe; Sev wx; Fe; Fe; chips Fe					severely weathered schist
36	R-3 Sev wx; Fe; D; D	70		54		
38	Fe; Fe; chips all Fe; Fe	30				
40						
42	Fe; Fe; R-4 Sev wx; Fe			80		

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-220 PAGE 2 OF 2

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 42-50.3

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

BREAKS IN CORE

- MEASURED BREAKS OR PARTINGS ACROSS CORE
- CHIPS, CAVITY, LOST CORE
- MEASURED HIGH-ANGLE JOINT (JT = JOINT)
- D CORE BROKEN BY DRILLER
- M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
42	R-4 cont. vn wx	30		80		vn weathered gray and white medium grained quartz biotite schist to schistose gneiss
44						
46	R-5 vnwx	45		100		
48						
50						
52						
54						

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-221 PAGE 1 OF 1

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 62-75

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

BREAKS IN CORE

MEASURED BREAKS OR PARTINGS ACROSS CORE
CHIPS, CAVITY, LOST CORE
MEASURED HIGH-ANGLE JOINT (JT = JOINT)
D CORE BROKEN BY DRILLER
M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
62	slight Fe R-1 mod wx	NV				Dark gray biotite quartz schistose gneis? could be schist?
	Fe	70+		83		
	Fe					
64	Mg					intrusion - fine grained granitic rock migmatite?
	Fe					
	R-2 unwx	70				
66				100		
68	D					
		45				
70						
	D Fe Pyrite R-3 unwx	70				
				100		
72	D Fe Pyrite					
	D					
74						
	D					
	BOG @ 75					
76						

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-222 PAGE 1 OF 4

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 61-75

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

MEASURED BREAKS OR PARTINGS ACROSS CORE
CHIPS, CAVITY, LOST CORE
MEASURED HIGH-ANGLE JOINT (JT = JOINT)
D CORE BROKEN BY DRILLER
M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
61		R-1	NV	4.2/5.0	4.7/5		gray, white and black medium grained quartz garnet-biotite schistose gneiss
			60		94		foliation and dipping variable 30 - NV
63							
65			30				
67		R-2		5/5	5/5		
				100	100		
69							
71			NV				
		R-3					
73			45	4.2/4.2	4.2/4.2		
				100	100		
75							

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-222 PAGE 2 OF 4

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 75-89

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

MEASURED BREAKS OR PARTINGS ACROSS CORE
CHIPS, CAVITY, LOST CORE
MEASURED HIGH-ANGLE JOINT (JT = JOINT)
D CORE BROKEN BY DRILLER
M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
75		R-3 cont..					
77	D, D	R-4	variable	5.8/5.8 100	5.8/5.8 100		Some wavy quartz bands folded
79	D						
81		R-5 vawx	60-75°	5/5	5/5 100		Black, white, gray fine to med. grained quartz-biotite garnet schistos gneiss unweathered no apparent water bearing fractures
83	D						
85	D, D						
87		R-6 vn wx	60-75°	5/5	5/5 100		
89	D						

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-222 PAGE 3 OF 4

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 89-103

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

MEASURED BREAKS OR PARTINGS ACROSS CORE
CHIPS, CAVITY, LOST CORE
MEASURED HIGH-ANGLE JOINT (JT = JOINT)
D CORE BROKEN BY DRILLER
M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
89	D	R-6 cont...					
91	D						gray, white, black medium grained quartz-biotite schistose gneiss
		R-7 unwx	NV ↓				
93			25° ↓				Dip of bedding and foliation is variable from 25° - near vertical
95			45		10/10 100		Some zones interlayered w/ fine grained granitic rock
97	D						
	D D D						
99							
101	D	R-8					
103							

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-222 PAGE 4 OF 4

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 103-111

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

BREAKS IN CORE:
- MEASURED BREAKS OR PARTINGS ACROSS CORE
- CHIPS, CAVITY, LOST CORE
- MEASURED HIGH-ANGLE JOINT (JT = JOINT)
- D CORE BROKEN BY DRILLER
- M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
103		R-8 cont. on wx	45				white gray black med-fine grained schistose gneiss quartz-biotite. garnet. variable Dip - foliation
105	D		70				
107		slight MS stain	60		9.8/10 98		large bands of fined grained granitic intrusion some healed fractures
109	D						
111							

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-223 PAGE 1 OF 1

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 42 - 50

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

MEASURED BREAKS OR PARTINGS ACROSS CORE
CHIPS, CAVITY, LOST CORE
MEASURED HIGH-ANGLE JOINT (JT = JOINT)
D CORE BROKEN BY DRILLER
M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
42	Fe	R-1 mod wx	NV		2.1/3 70		Dark gray to Brown Quartz-biotite schist near vertical schistocity garnet.
44	Fe, Fe					Rusty Brown	Coarse grained primary mineral component is biotite
46		R-2 vn wx	NV		4.2/5 84	Dark gray	
48							
50							

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-224 PAGE 1 OF 5

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 24-38

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

BREAKS IN CORE

MEASURED BREAKS OR PARTINGS ACROSS CORE
CHIPS, CAVITY, LOST CORE
MEASURED HIGH-ANGLE JOINT (JT = JOINT)
D CORE BROKEN BY DRILLER
M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
24	R-1 sl wx			100		Dark gray banded quartz-biotite-garnet gneiss - medium grained
26	R-2 sl wx	45°		90		
28						
30	R-3 mw wx	60		100		
32						
34						
36	R-4 mw wx			100		
38						

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-224 PAGE 2 OF 5

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 38-52

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

MEASURED BREAKS OR PARTINGS ACROSS CORE
CHIPS, CAVITY, LOST CORE
MEASURED HIGH-ANGLE JOINT (JT = JOINT)
D CORE BROKEN BY DRILLER
M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE / CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
38	R-4 cont. vn wx					
40	R-5 vn wx			100		
42						
44						light and dark gray quartz + biotite schistose gneiss
46	R-6 vn wx	NW ?		100		Some banding w/ finer grained quartzite or granitic rock
48						wavy dip NW ?
50						quartzite intrusion
52	R-7 vn wx	45		100		

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-224 PAGE 3 OF 5

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 52-66

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

MEASURED BREAKS OR PARTINGS ACROSS CORE
CHIPS, CAVITY, LOST CORE
MEASURED HIGH-ANGLE JOINT (JT = JOINT)
D CORE BROKEN BY DRILLER
M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
52		R-7 cont.. un wx	45				
54	D				100		dark gray banded white biotite quartz schistose gneiss
	D	R-8 un wx	N				N.V foliation = 75+°
56	D						
	D						
	D				100		
58							
	D						
60		R-9 un wx					
	D						
	D				100		
62							
	D						
64	D						
	D						
		R-10 un wx					
66							

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-224 PAGE 4 OF 5

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 66-80

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

BREAKS IN CORE:
- MEASURED BREAKS OR PARTINGS ACROSS CORE
- CHIPS, CAVITY, LOST CORE
- MEASURED HIGH-ANGLE JOINT (JT = JOINT)
- D CORE BROKEN BY DRILLER
- M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
66	D, D	R-10 cont.. vn wx	NV		100		dark gray quartz-biotite schistose gneiss med-coarse grained
68	D, D						
70	D	R-11 vn wx			100		variable dip wavy foliation
72	D						
74	D		45				
76	D, D	R-12 vn wx			100		
78	D, D						
80							

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-224 PAGE 5 OF 5

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 80-90

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

BREAKS IN CORE

MEASURED BREAKS OR PARTINGS ACROSS CORE

CHIPS, CAVITY, LOST CORE

MEASURED HIGH-ANGLE JOINT (JT = JOINT)

D CORE BROKEN BY DRILLER

M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
80	D	R-13 un wx					
82	D		NV		100		very dark predominantly biotite gneiss med. grained NV foliation quartz, garnett present
	D D						
84	D						
86	D	R-14 un wx					finer grained graywacke? banding w/ the biotite.
			60		100		
88	D D						was losing water during drilling from 85-87 - no apparent fractures, but very concentrated biotite almost seems porous here.
90							

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT BRPP BORING NO. B-07-225 PAGE 1 OF 3

JOB NO. 07089 DRILLER AE

CORE DIAMETER (IN.) 2.5 ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 11 - 25

AZIMUTH _____ INCLINATION _____ LOGGED BY M. Robinson (NAME) 10/21/07 (DATE)

BREAKS IN CORE:
- MEASURED BREAKS OR PARTINGS ACROSS CORE
- CHIPS, CAVITY, LOST CORE
- MEASURED HIGH-ANGLE JOINT (JT = JOINT)
- D CORE BROKEN BY DRILLER
- M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
11	some soil					
	R-1		2.5/4.2	1.2/4.2		
	D Fe					
	Wx	≈45° bedding		29		wx gneiss migmatic? no mica clasts present quartz and feldspar banding fine-grained gray and white Bedding is fairly consistent @ 45° from horizontal
13	Pieces					
	becoming competent					
15	15.2					
	R-2		5/5	4.5/5		Becoming more competent
	Fe un wx			90		
17		45 bedding				quartz seams at same angle as fractures in R-1 and R-2
	D					
19	D					
	20.2					
	R-3		5/5	5/5		highly metamorphosed (remelt) banding not as apparent white stringers
21	D un wx					
	D			100		almost quartzite
23						
	D					
25	D					

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-225 PAGE 2 OF 3

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 25-39

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

BREAKS IN CORE: MEASURED BREAKS OR PARTINGS ACROSS CORE; CHIPS, CAVITY, LOST CORE; MEASURED HIGH-ANGLE JOINT (JT = JOINT); D CORE BROKEN BY DRILLER; M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING; SL - SLIGHT; MOD - MODERATE; SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
25	25.2 Fe R-4 sl wx	45° bedding and fract.	5/5	3.8/5 76		Fine grained gneissic intrusion of mica, garnet? schist. Bedding fairly constant at 45° from Horizontal
27	dark stain					
29	dark stain					Becoming mica schist coarser grained gray to dark gray
	pieces 30.2					
31	Fe R-5 Fe sl wx	50° bedding and fract.	5/5	3.9/5 78		Some fractures along bedding planes both ≈ 50° from Horz.
33	slight Fe					
	Dark stain D					
35	35.2 R-6	60° bedding and fract.	5/5	3.3/5 66		quartz, mica biotite feldspar? Coarse grained bedding
37						
39						

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-225 PAGE 3 OF 3

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 39-49.8

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

MEASURED BREAKS OR PARTINGS ACROSS CORE
CHIPS, CAVITY, LOST CORE
MEASURED HIGH-ANGLE JOINT (JT = JOINT)
D CORE BROKEN BY DRILLER
M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
39	D D	R-6 cont..					
		40.2					
		R-7					Coarse grained schist gray quartz, mica, biotite
41		Black staining		5/5	4.4/5		
		un wx			88		near vertical (60° +) foliation
43							
45	D	45.2					
	D	R-8		4.6/4.6	3.8/4.6		
		un wx					fractures along foliation
47	D				83		Coarse grained
		iron pyrite in fractures					
49		49.8					
		BOE @ 49.8					

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-226 PAGE 1 OF 4

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 45.5-59

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

BREAKS IN CORE

MEASURED BREAKS OR PARTINGS ACROSS CORE
CHIPS, CAVITY, LOST CORE
MEASURED HIGH-ANGLE JOINT (JT = JOINT)
D CORE BROKEN BY DRILLER
M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
45						
	R-1 sev wx	45				gray/white schistose gneiss quartz, biotite med grained
47	chips			0		
49						
	R-2 mod wx	45				
51	Fe					
	Mg or Ca?					
	D					
	Slight Fe					
53	D					
	Mg					
	D					
55		70		65		
	D					
	Fe					
57		45				
	Fe					
59	Fe, Mg					
	Mg					

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-226 PAGE 2 OF 4

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 59 - 73

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

BREAKS IN CORE

- MEASURED BREAKS OR PARTINGS ACROSS CORE
- CHIPS, CAVITY, LOST CORE
- MEASURED HIGH-ANGLE JOINT (JT = JOINT)
- D CORE BROKEN BY DRILLER
- M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
59	R-2 cont.- Mg, Fe pyrite					
61	? R-3 mod wx; missing core only returned 3.5; B	20° variable	3.5/5			predominantly biotite with quartz schistose gneiss; highly metamorphosed with intrusions and multiple folds within the bedding
63	Mg, D; D, Mg, Mg; slight Fe, D			34		intrusion migmatite?
65	R-4 unwx					variable Dip
67	D			90		migmatite?
69	Mg, Mg					
71	R-5 unwx; D			75		
73	D					

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-226 PAGE 3 OF 4

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 73 - 87

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

BREAKS IN CORE

- MEASURED BREAKS OR PARTINGS ACROSS CORE
- CHIPS, CAVITY, LOST CORE
- MEASURED HIGH-ANGLE JOINT (JT = JOINT)
- D CORE BROKEN BY DRILLER
- M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
73	R-5 cont.. sl. wx	60°				quartz? felds? almost looks like marble
	Mg	NV				very thin banding (texture?)
75	Mg			75		highly metamorphosed quartz biotite schistose gneiss
	Mg					
77						
79		75				
	R-6 mwx					
81		45				
				84		
83	Mg					
85						quartz
	R-7 mwx			90		
87	Mg					

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT _____ BORING NO. B-07-226 PAGE 4 OF 4

JOB NO. _____ DRILLER _____

CORE DIAMETER (IN.) _____ ELEVATION (FT) INTERVAL _____ DEPTH (FT) INTERVAL 87-95

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

MEASURED BREAKS OR PARTINGS ACROSS CORE
CHIPS, CAVITY, LOST CORE
MEASURED HIGH-ANGLE JOINT (JT = JOINT)
D CORE BROKEN BY DRILLER
M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

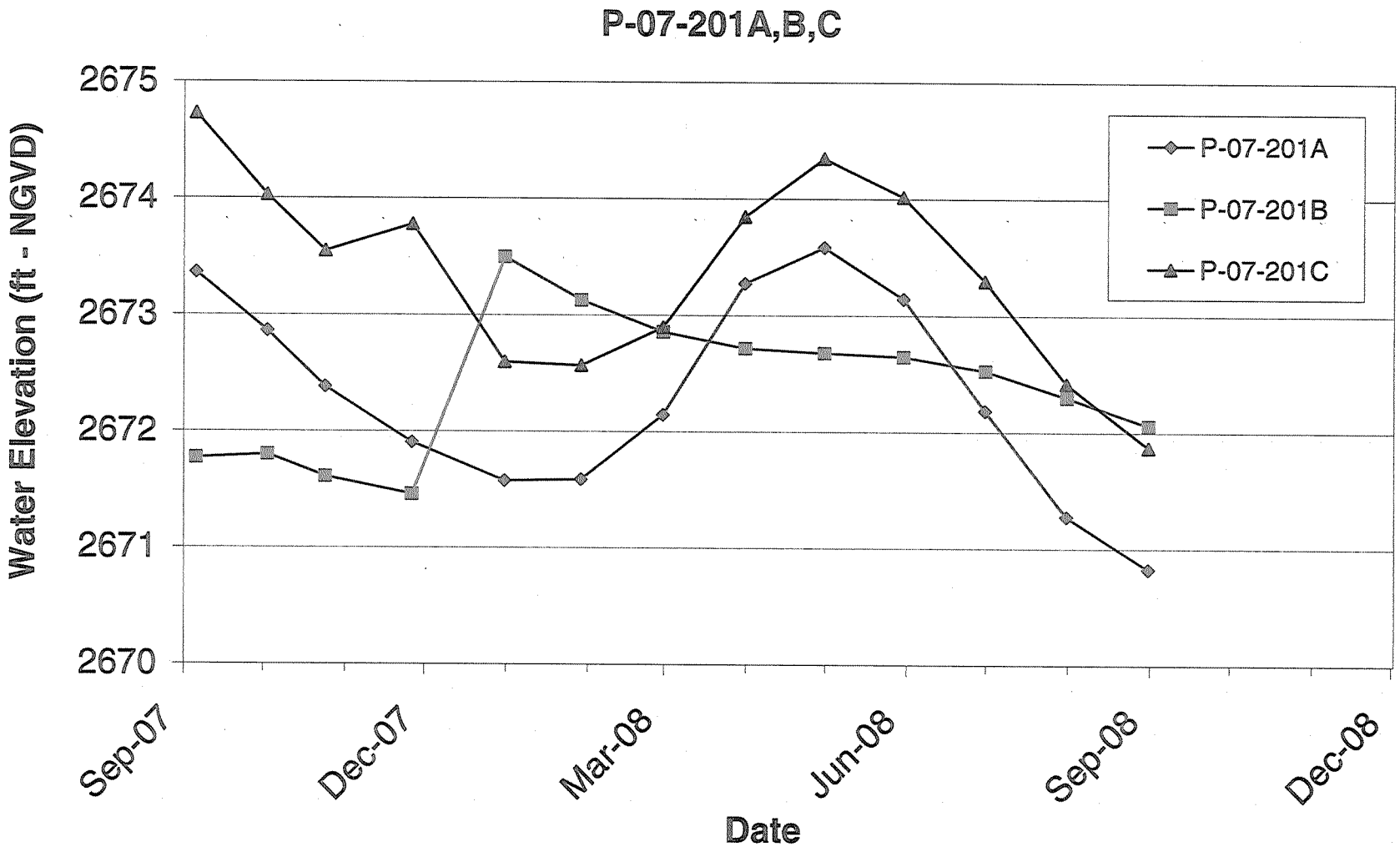
DEPTH	BREAKS IN CORE	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
87		R-7 cont... slight Fe unwx	50°		90		gray/white quartz-mica schistose gneiss med grained
89	D D D						
91		R-8 unwx			100		
	D ? Fe pyrite D ?						
93	D D						
95	D D						
		BOE AT 95'					

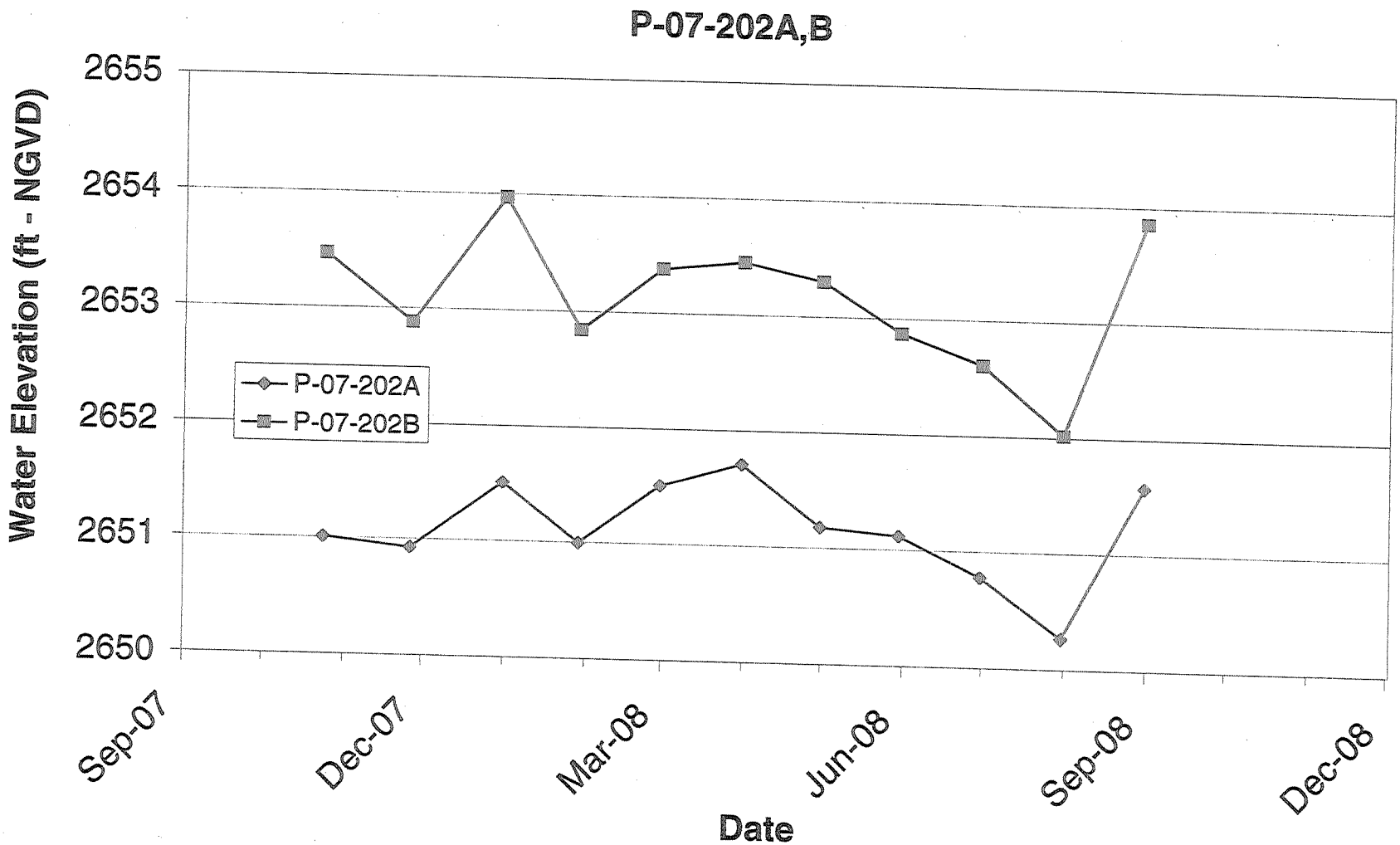
5/90

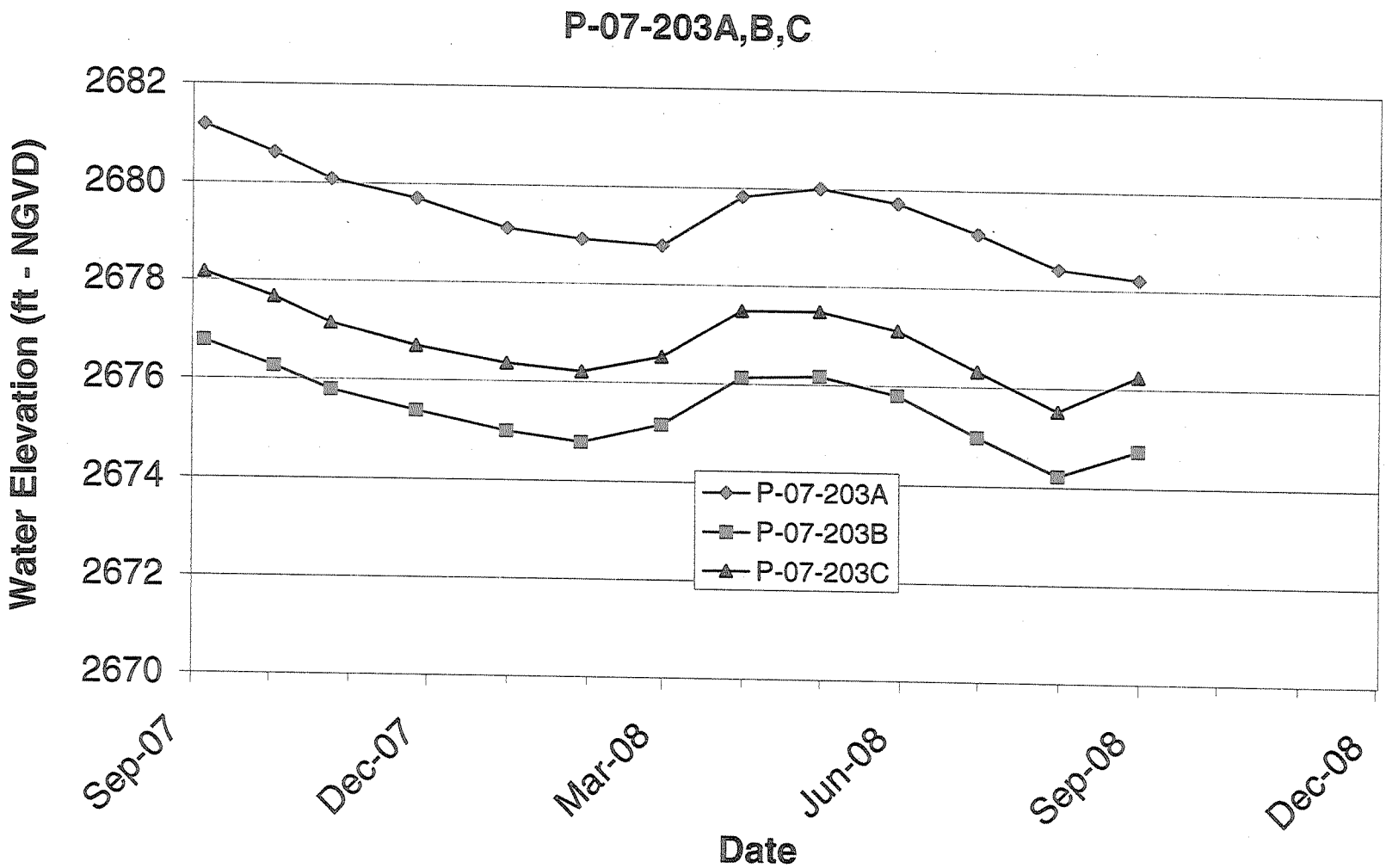
SEVEE & MAHER ENGINEERS

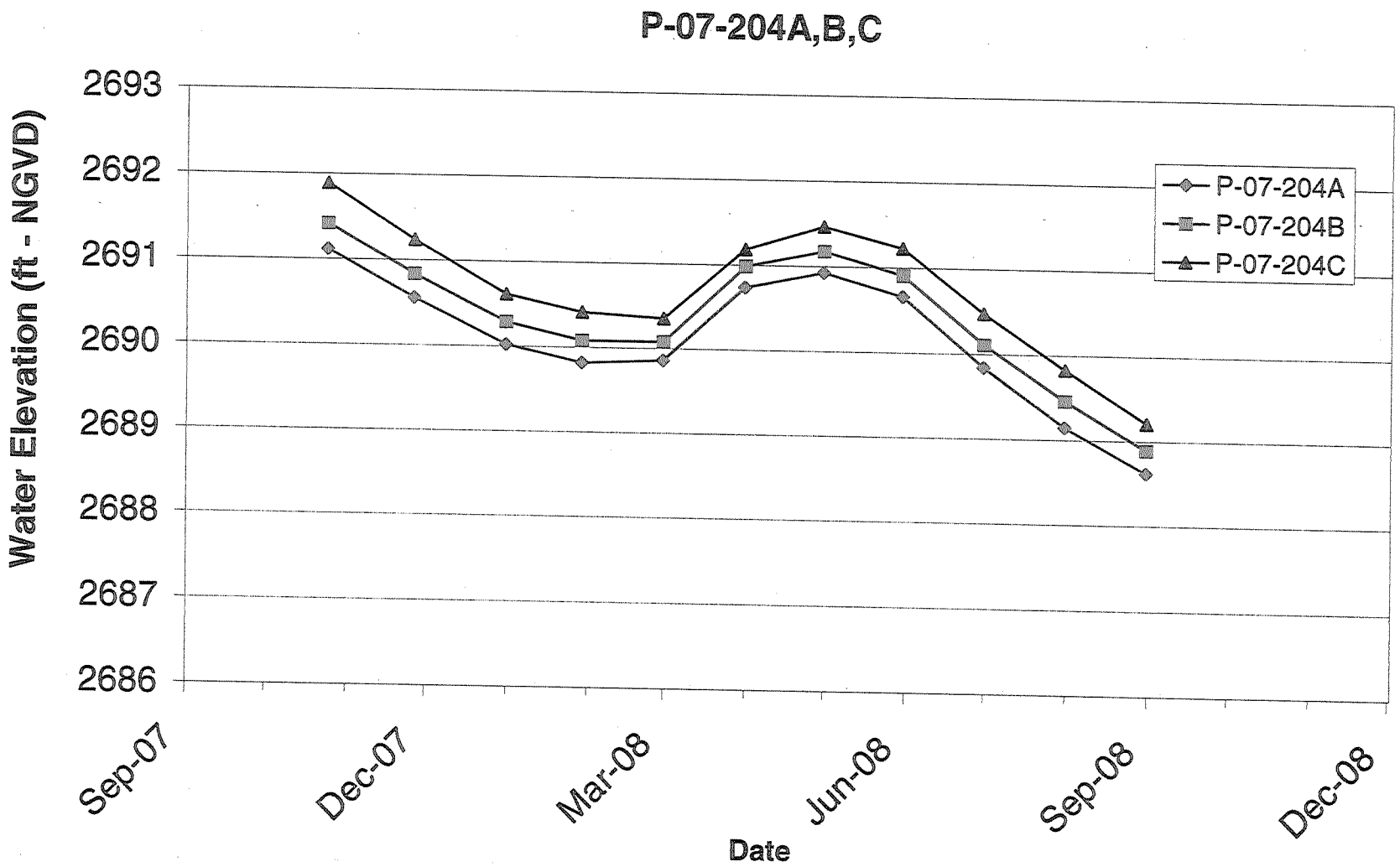
APPENDIX C

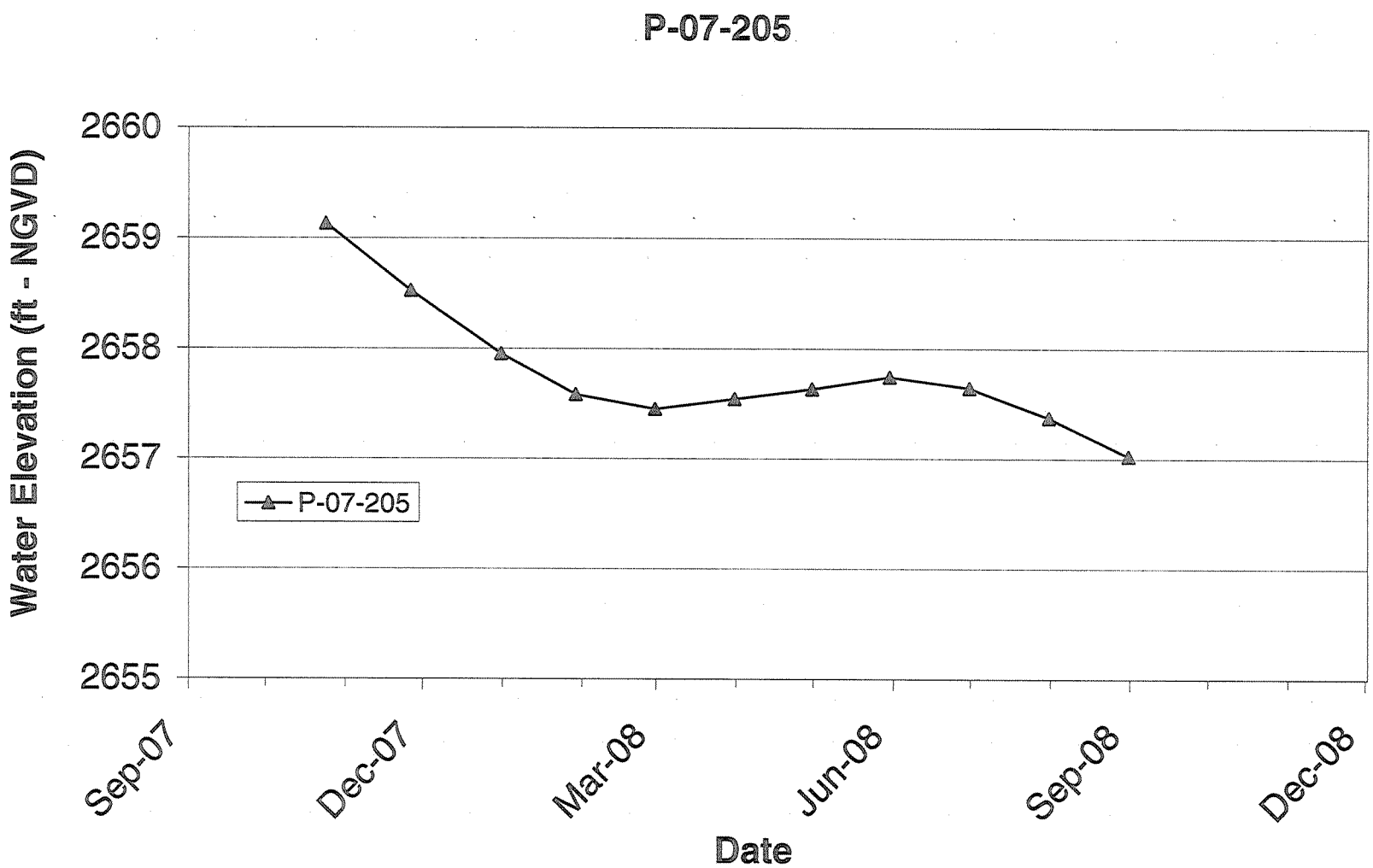
WATER LEVEL PLOTS

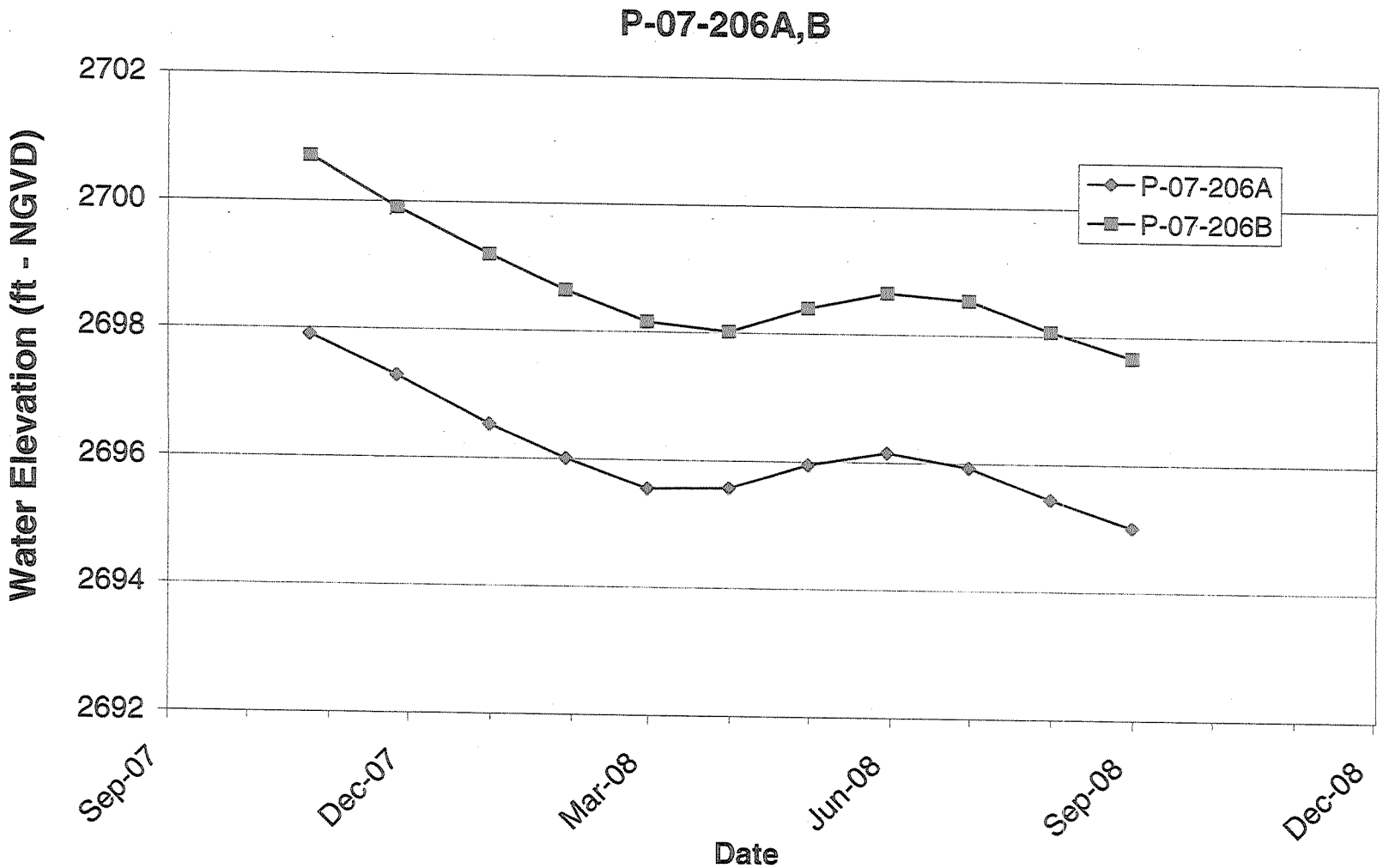

P-07-201A,B,C
Water Elevation (ft - NGVD)
2675
2674
2673
2672
2671
2670
Sep-07
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Date
P-07-201A
P-07-201B
P-07-201C

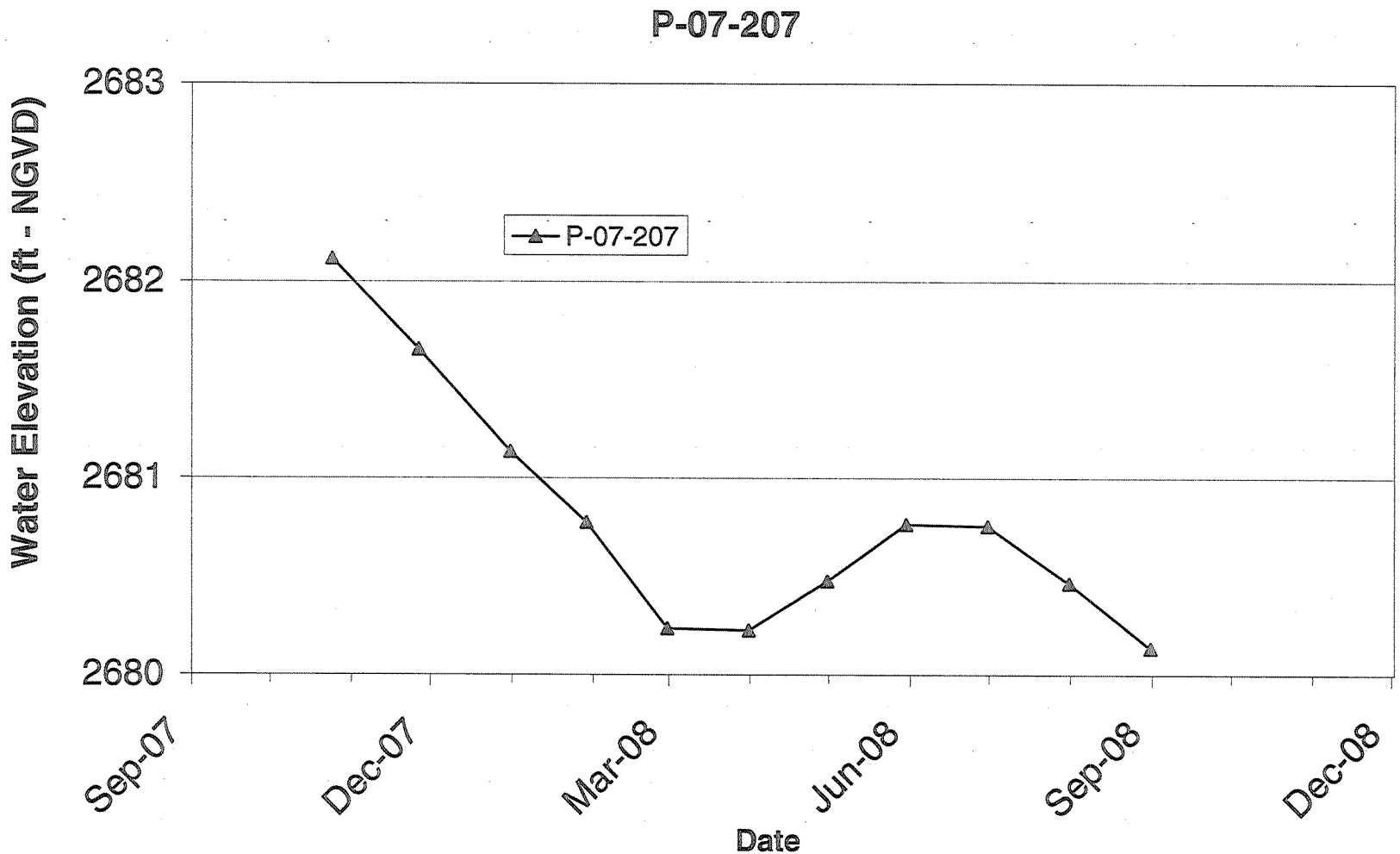

P-07-202A,B
Water Elevation (ft - NGVD)
2655
2654
2653
2652
2651
2650
P-07-202A
P-07-202B
Sep-07
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Date

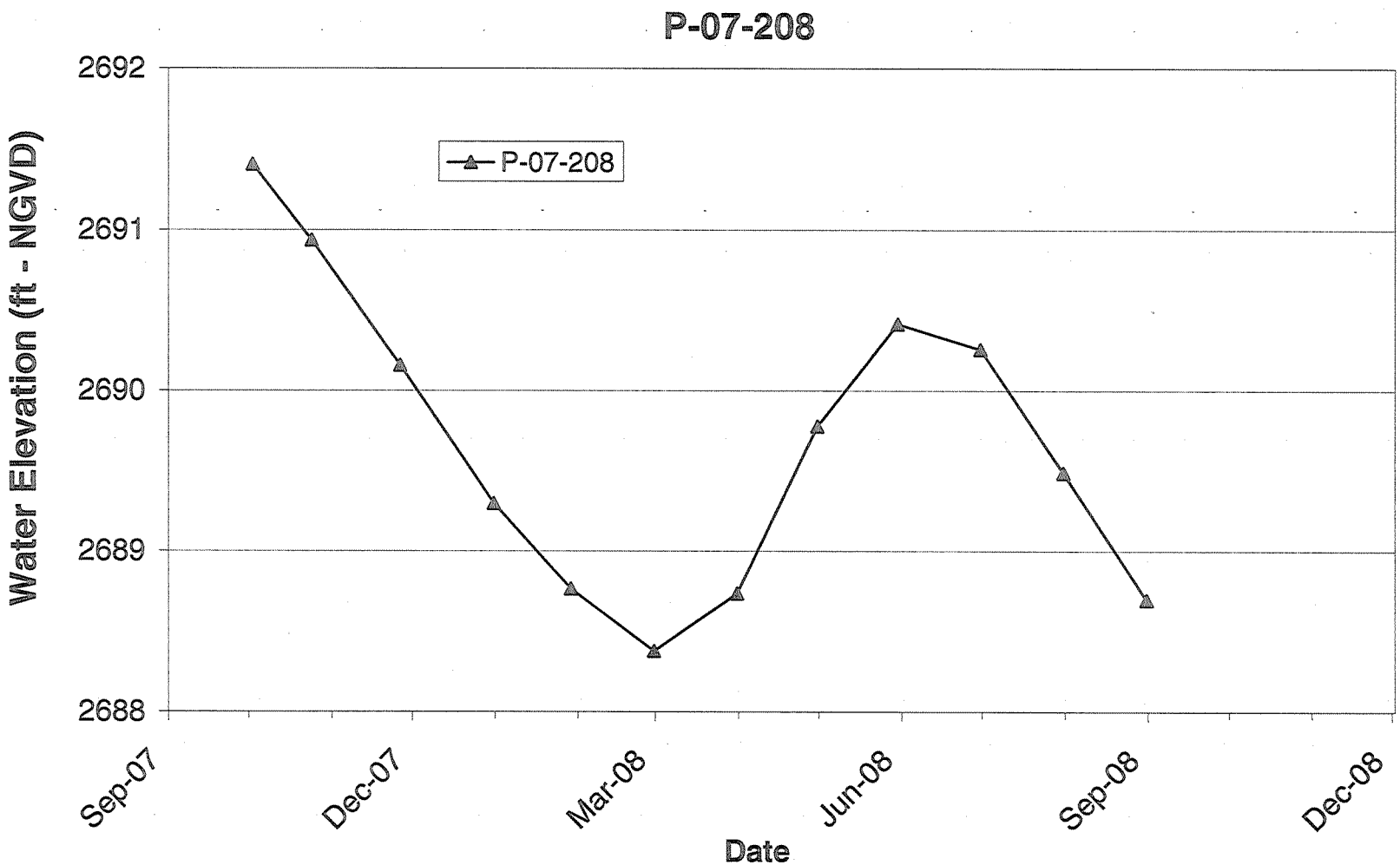

P-07-203A,B,C
Water Elevation (ft - NGVD)
2682
2680
2678
2676
2674
2672
2670
Sep-07
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Date
P-07-203A
P-07-203B
P-07-203C

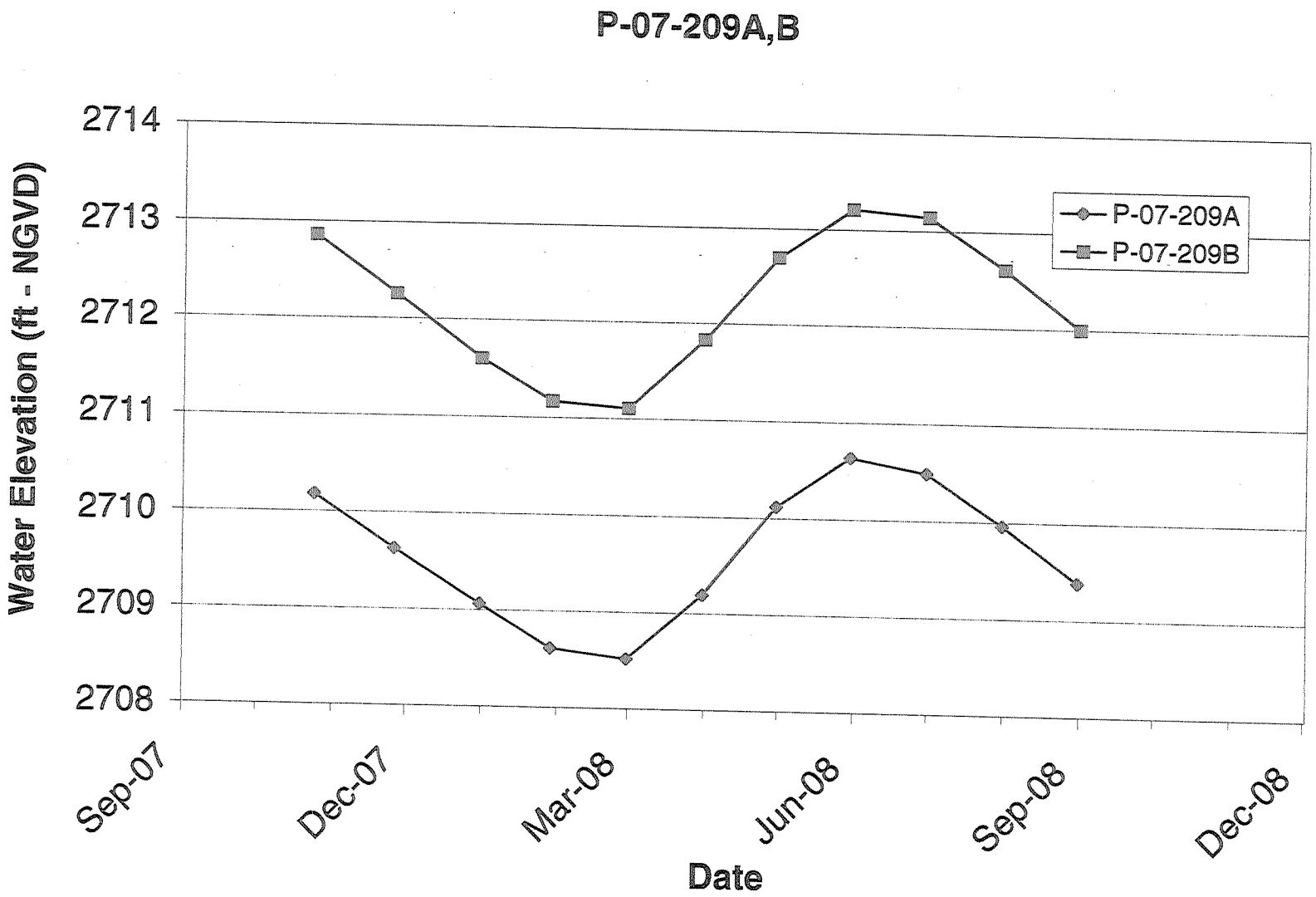

P-07-204A,B,C
Water Elevation (ft - NGVD)
2693
2692
2691
2690
2689
2688
2687
2686
Sep-07
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Date
P-07-204A
P-07-204B
P-07-204C

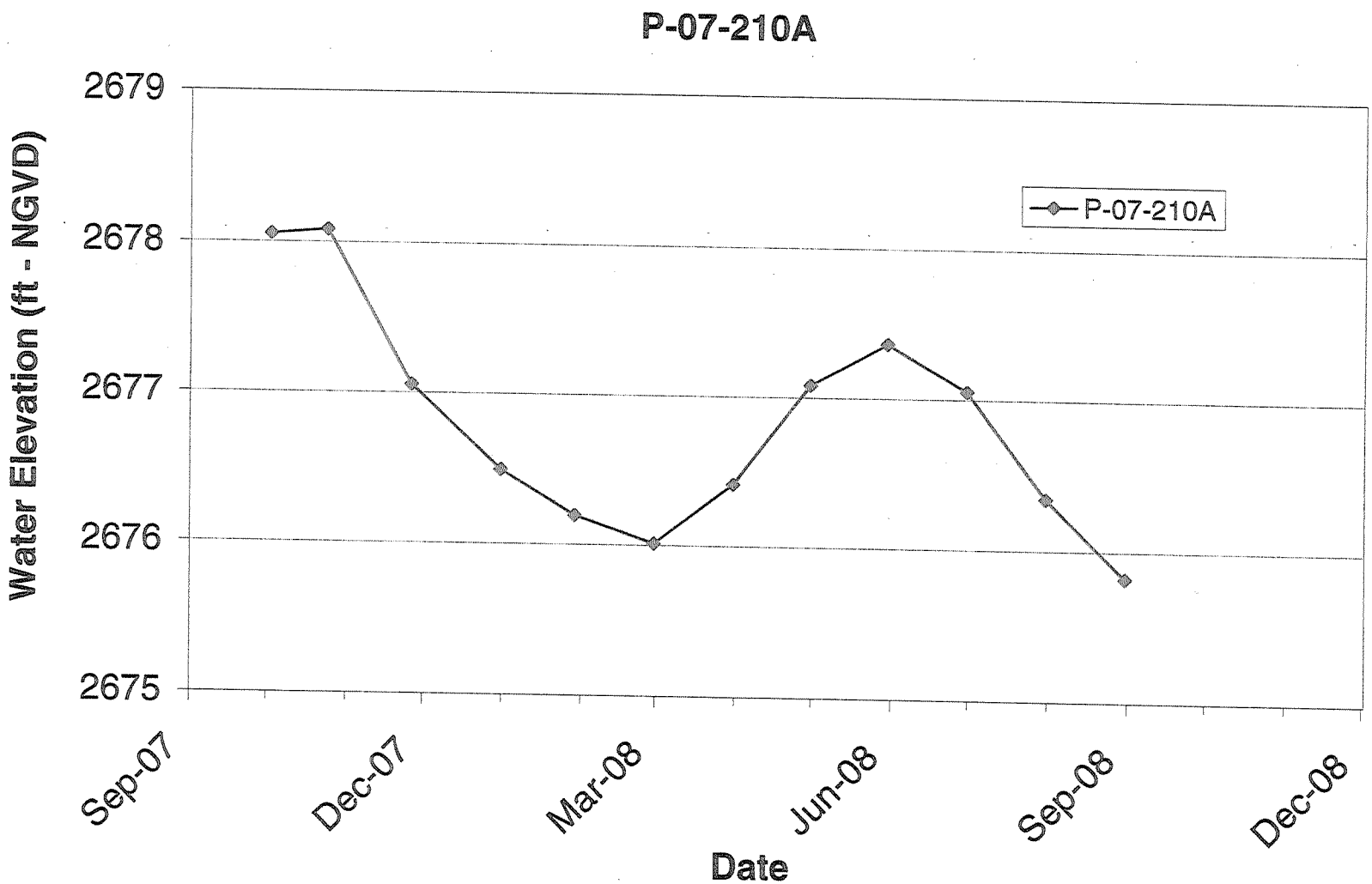

P-07-205
Water Elevation (ft - NGVD)
2660
2659
2658
2657
2656
2655
P-07-205
Sep-07
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Date

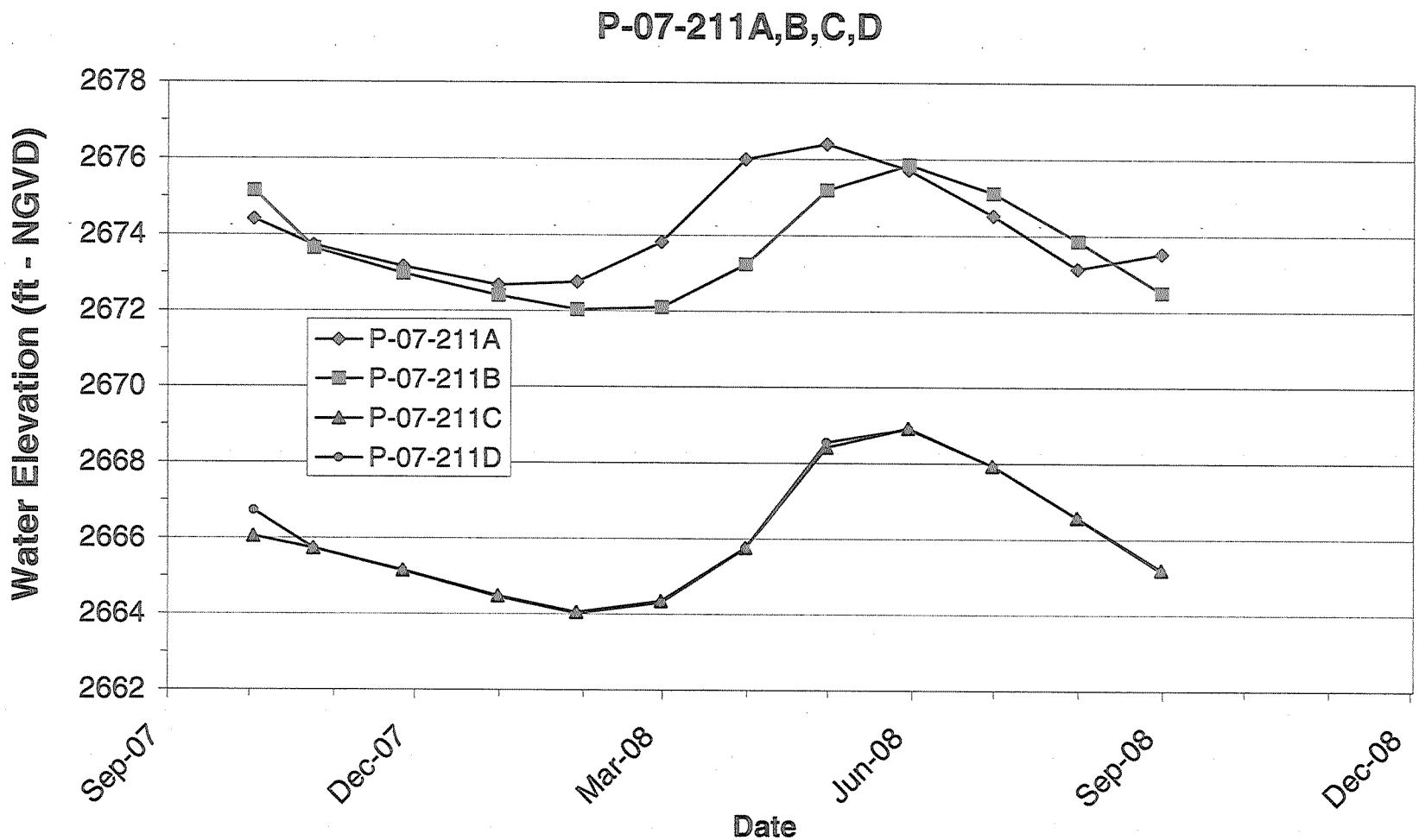

P-07-206A,B
Water Elevation (ft - NGVD)
2702
2700
2698
2696
2694
2692
Sep-07
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Date
P-07-206A
P-07-206B


P-07-207
Water Elevation (ft - NGVD)
2683
2682
2681
2680
P-07-207
Sep-07
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Date


P-07-208
P-07-208
Water Elevation (ft - NGVD)
2692
2691
2690
2689
2688
Sep-07
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Date


P-07-209A,B
Water Elevation (ft - NGVD)
2714
2713
2712
2711
2710
2709
2708
Sep-07
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Date
P-07-209A
P-07-209B


P-07-210A
Water Elevation (ft - NGVD)
2679
2678
2677
2676
2675
P-07-210A
Sep-07
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Date


P-07-211A,B,C,D
Water Elevation (ft - NGVD)
2678
2676
2674
2672
2670
2668
2666
2664
2662
P-07-211A
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P-07-211C
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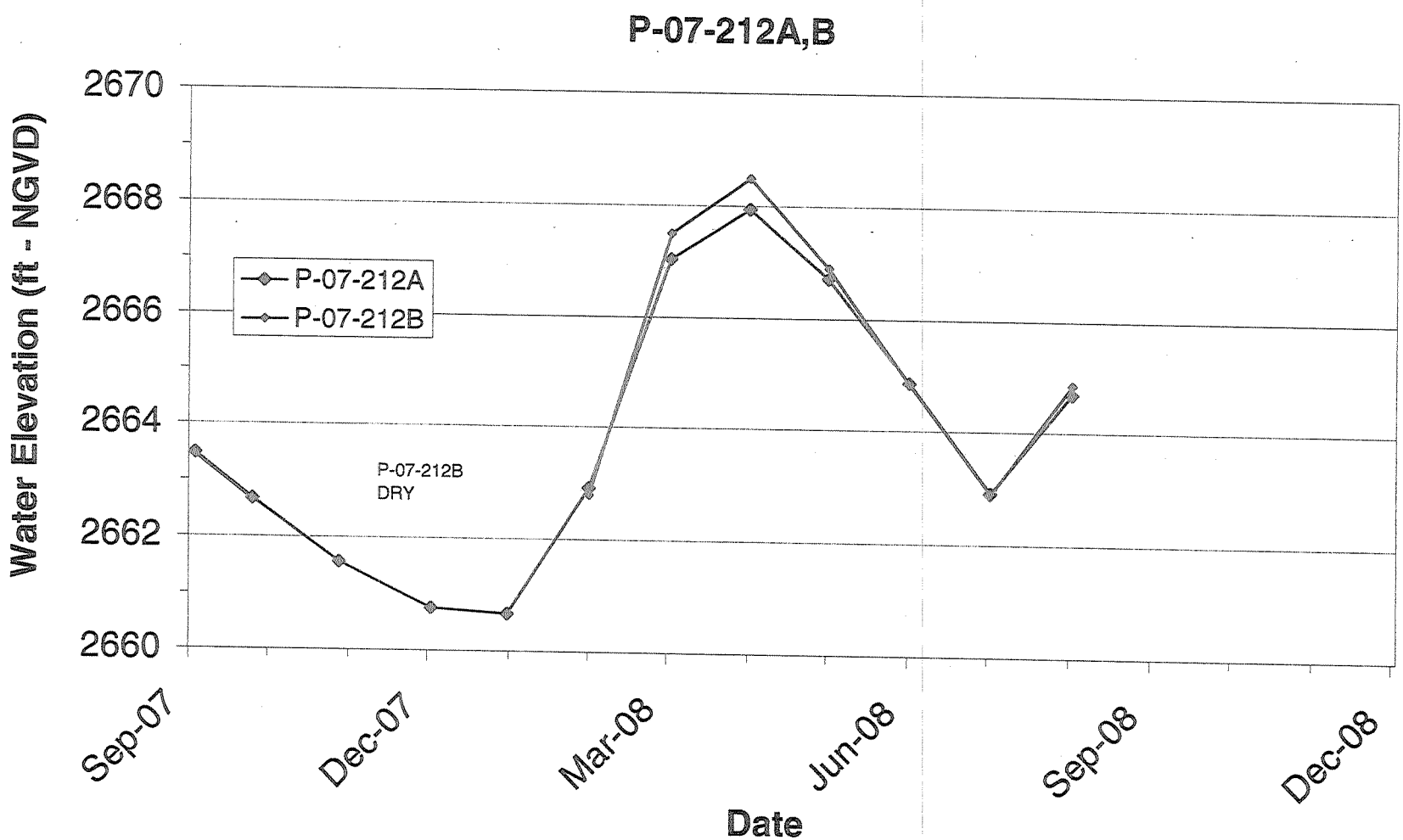
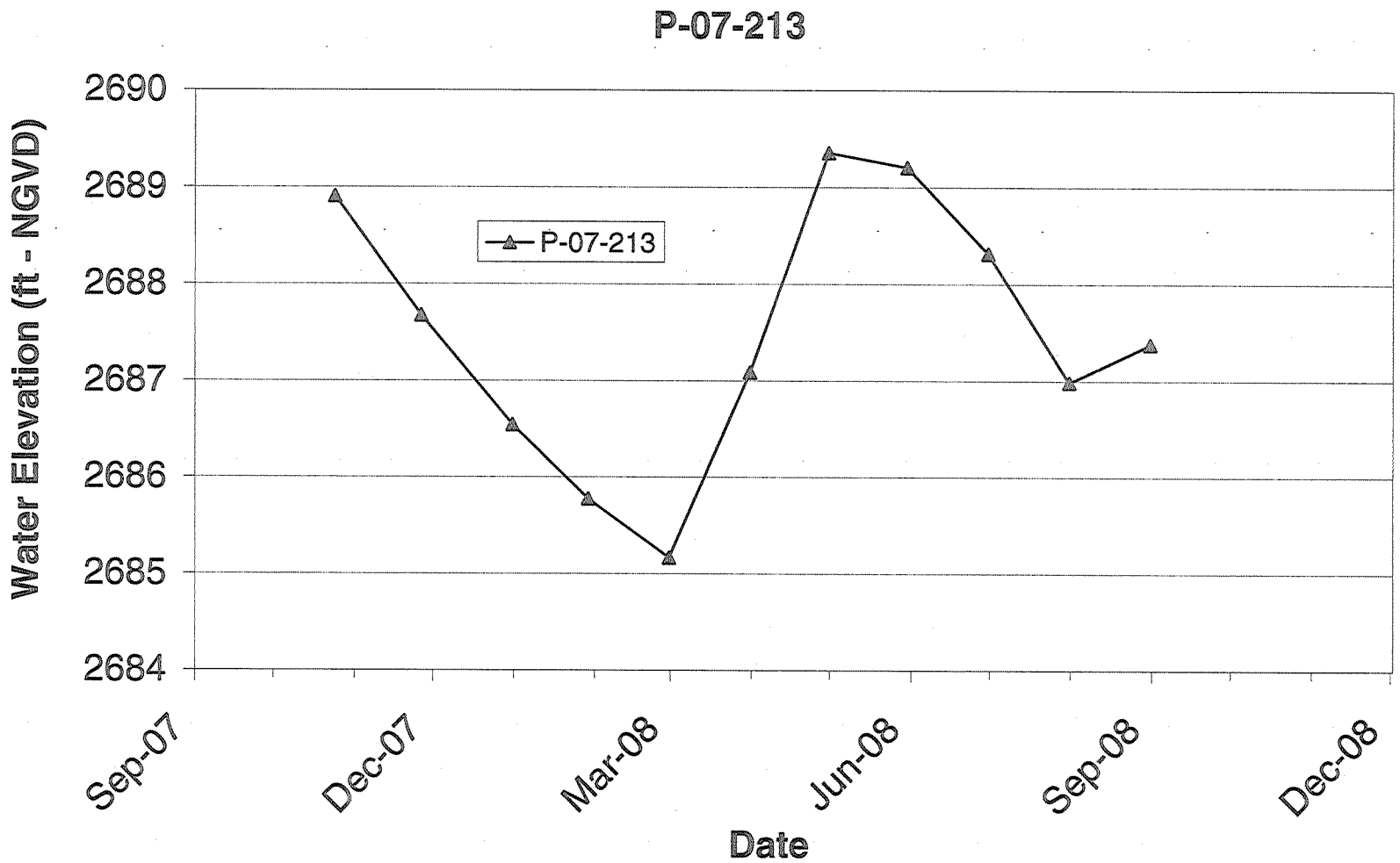
Mar-08
Jun-08
Sep-08
Dec-08
Date


P-07-212A,B
Water Elevation (ft - NGVD)
2670
2668
2666
2664
2662
2660
P-07-212A
P-07-212B
P-07-212B
DRY
Sep-07
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Date


P-07-213
Water Elevation (ft - NGVD)
2690
2689
2688
2687
2686
2685
2684
P-07-213
Sep-07
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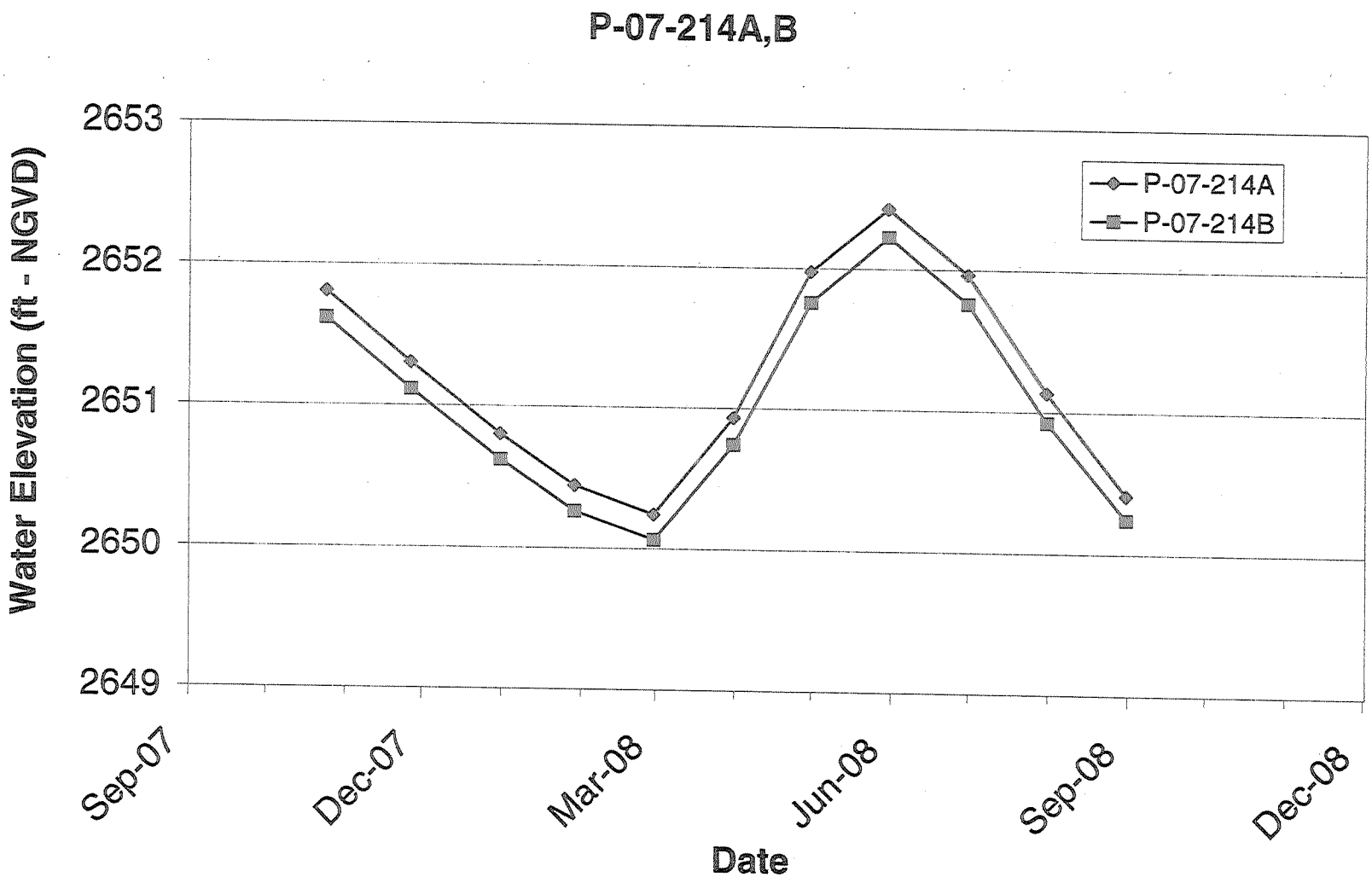
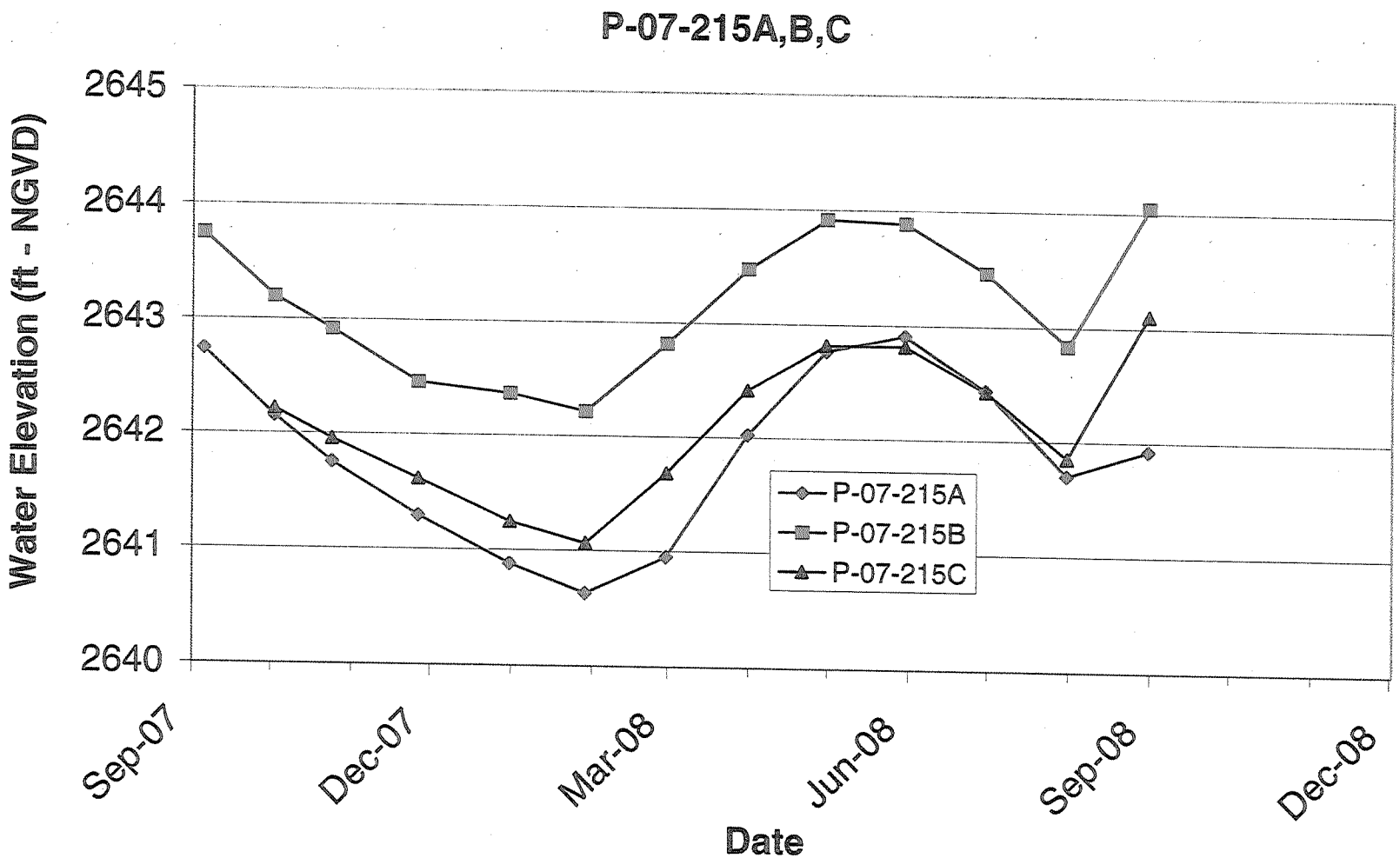
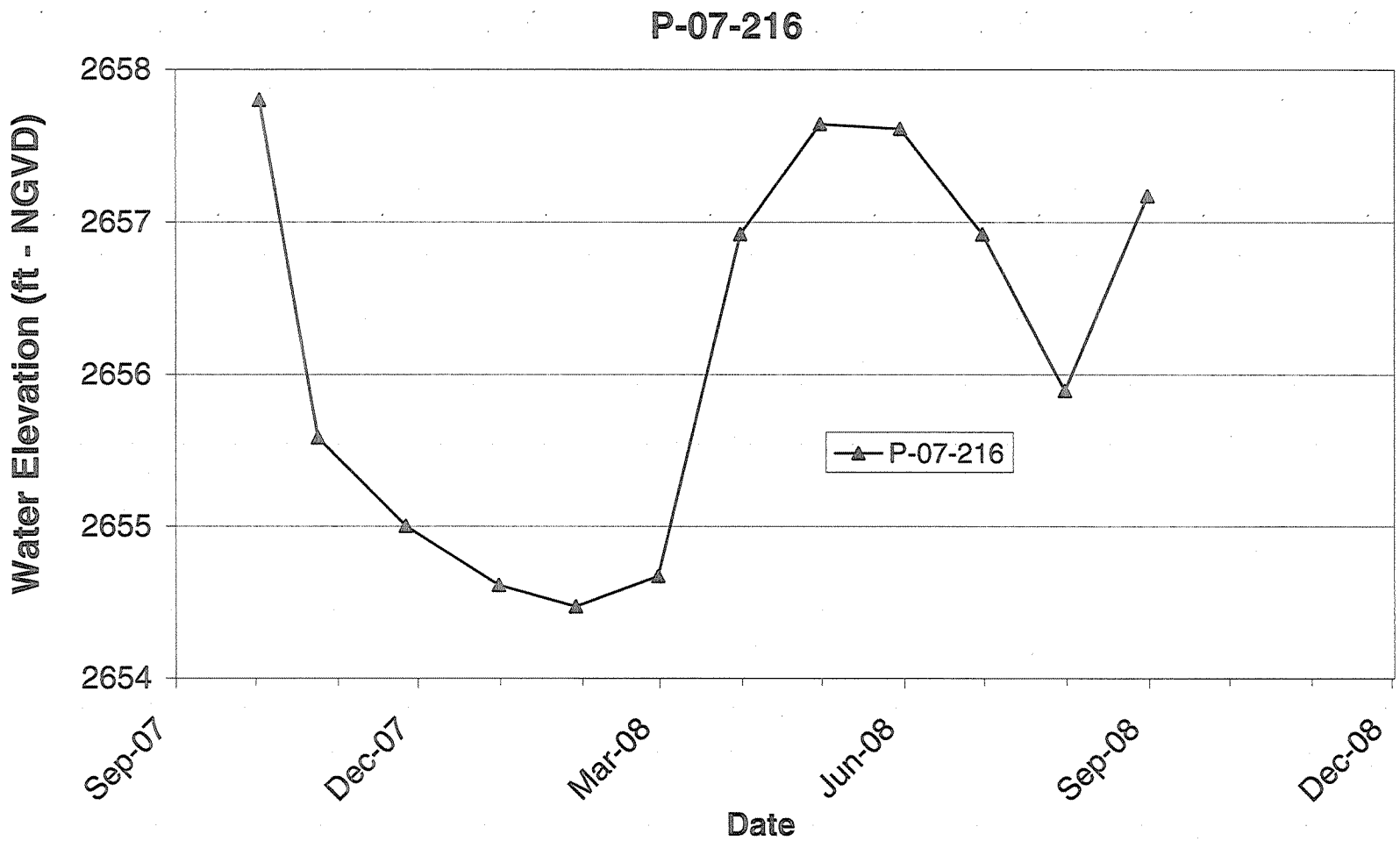
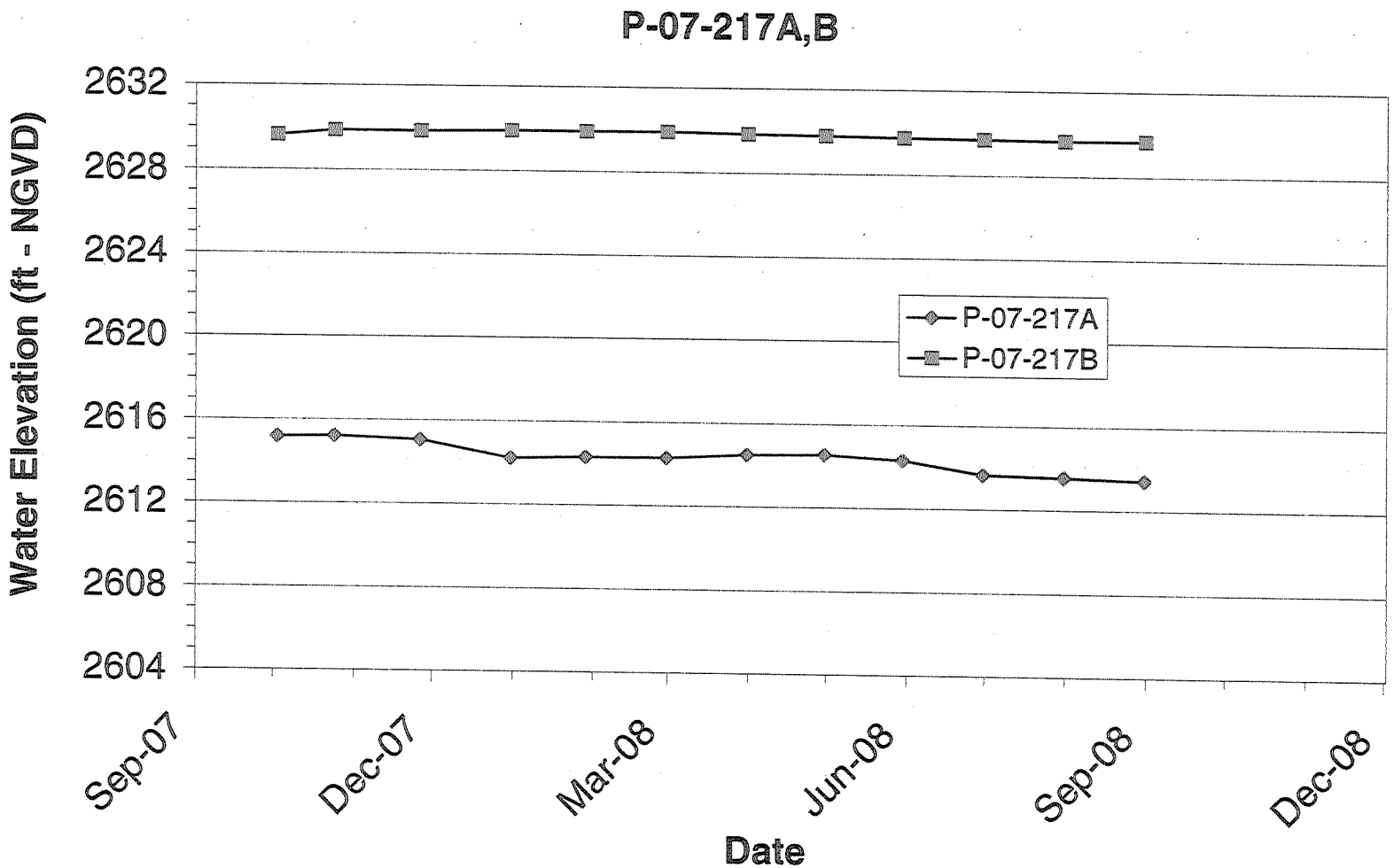
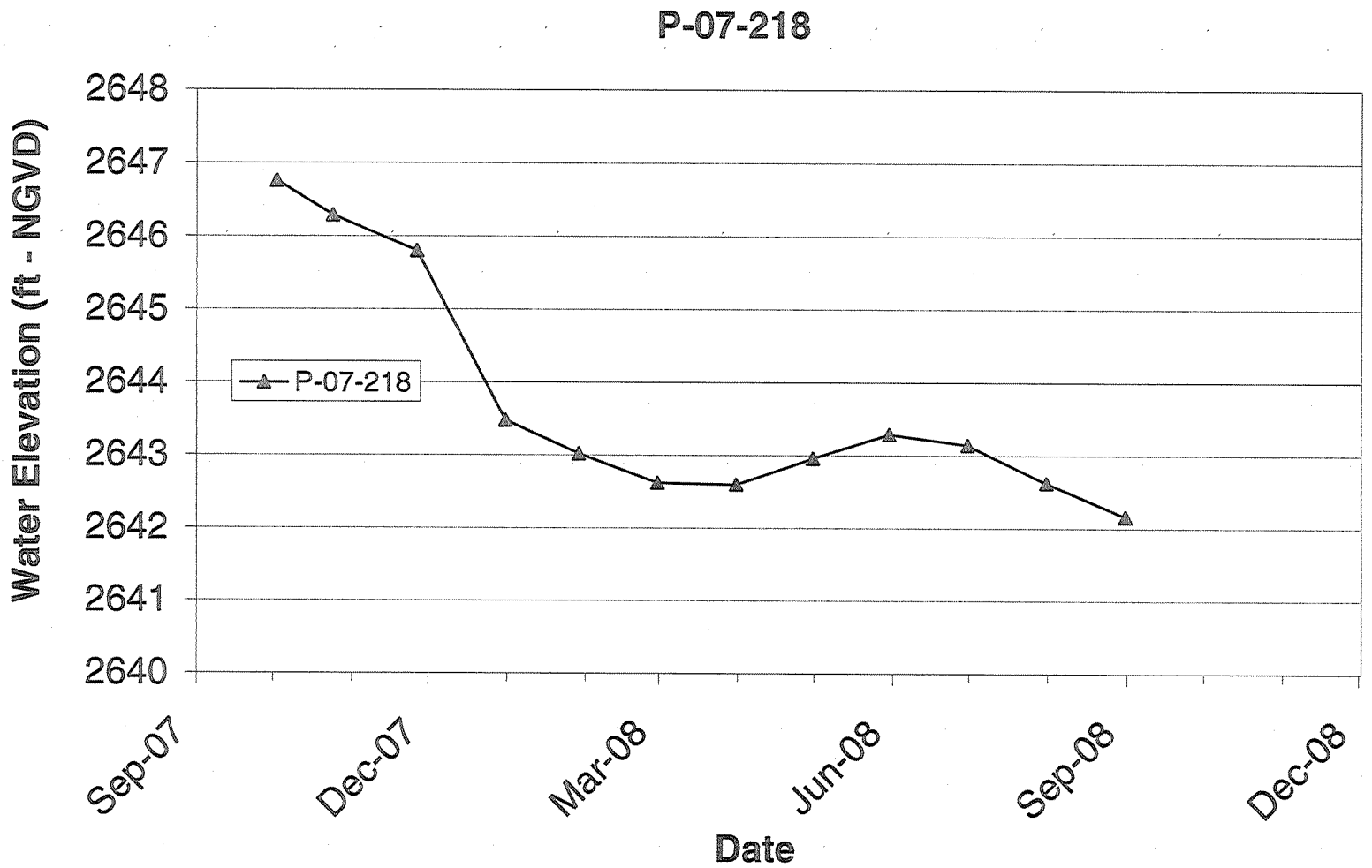
Mar-08
Jun-08
Sep-08
Dec-08
Date

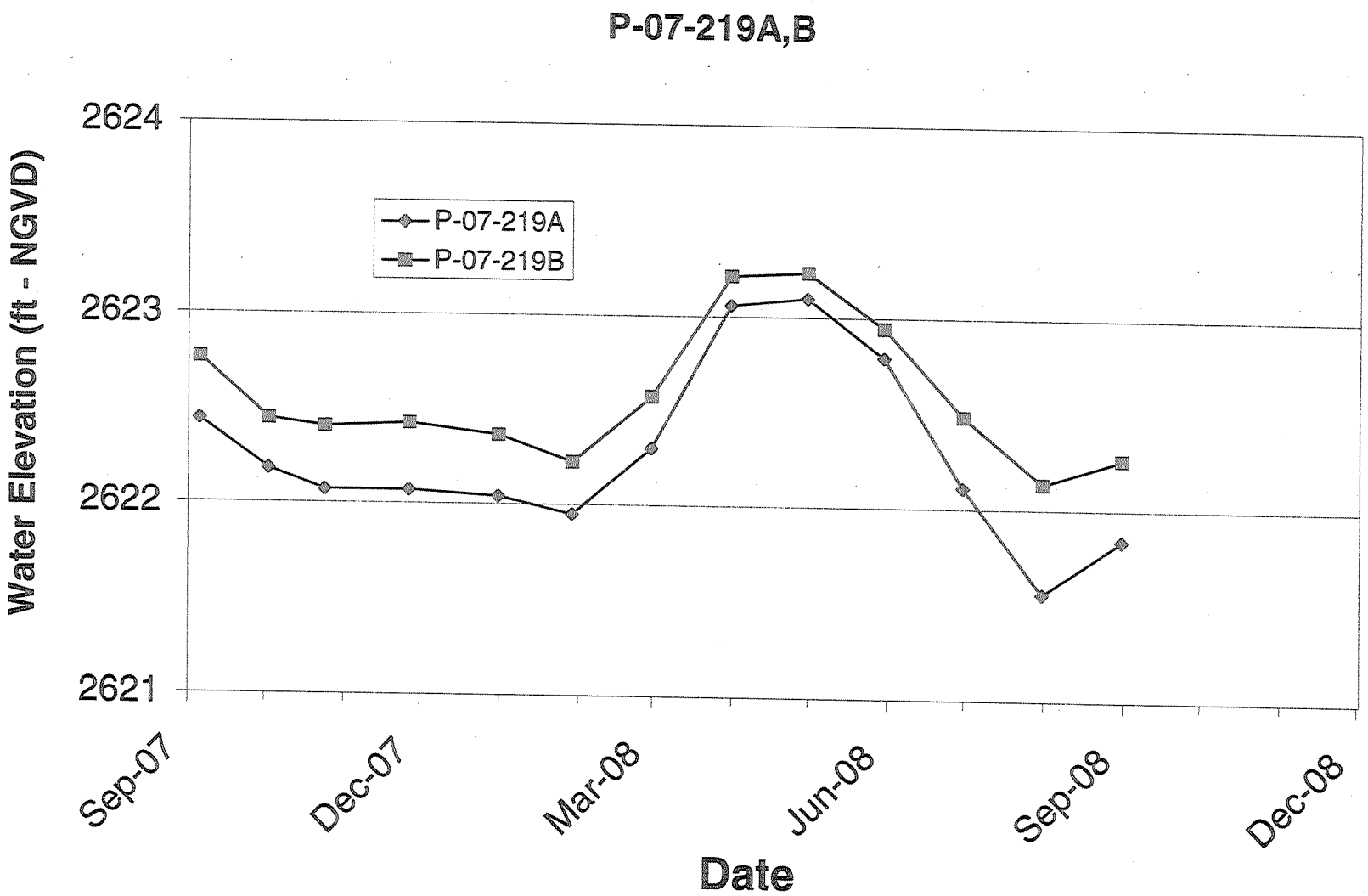

P-07-214A,B
Water Elevation (ft - NGVD)
2653
2652
2651
2650
2649
Sep-07
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Date
P-07-214A
P-07-214B

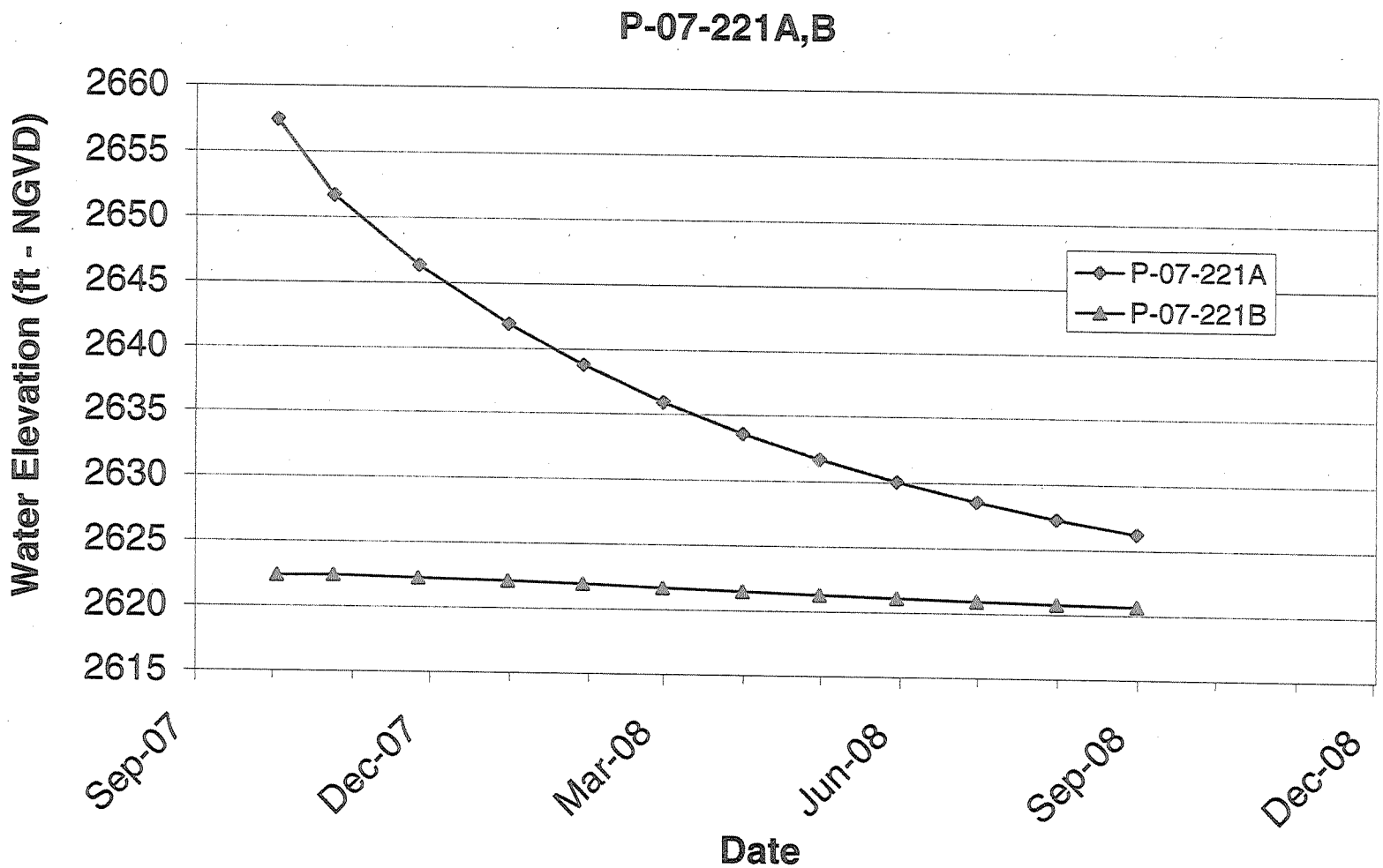

P-07-215A,B,C
Water Elevation (ft - NGVD)
2645
2644
2643
2642
2641
2640
Sep-07
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Date
P-07-215A
P-07-215B
P-07-215C

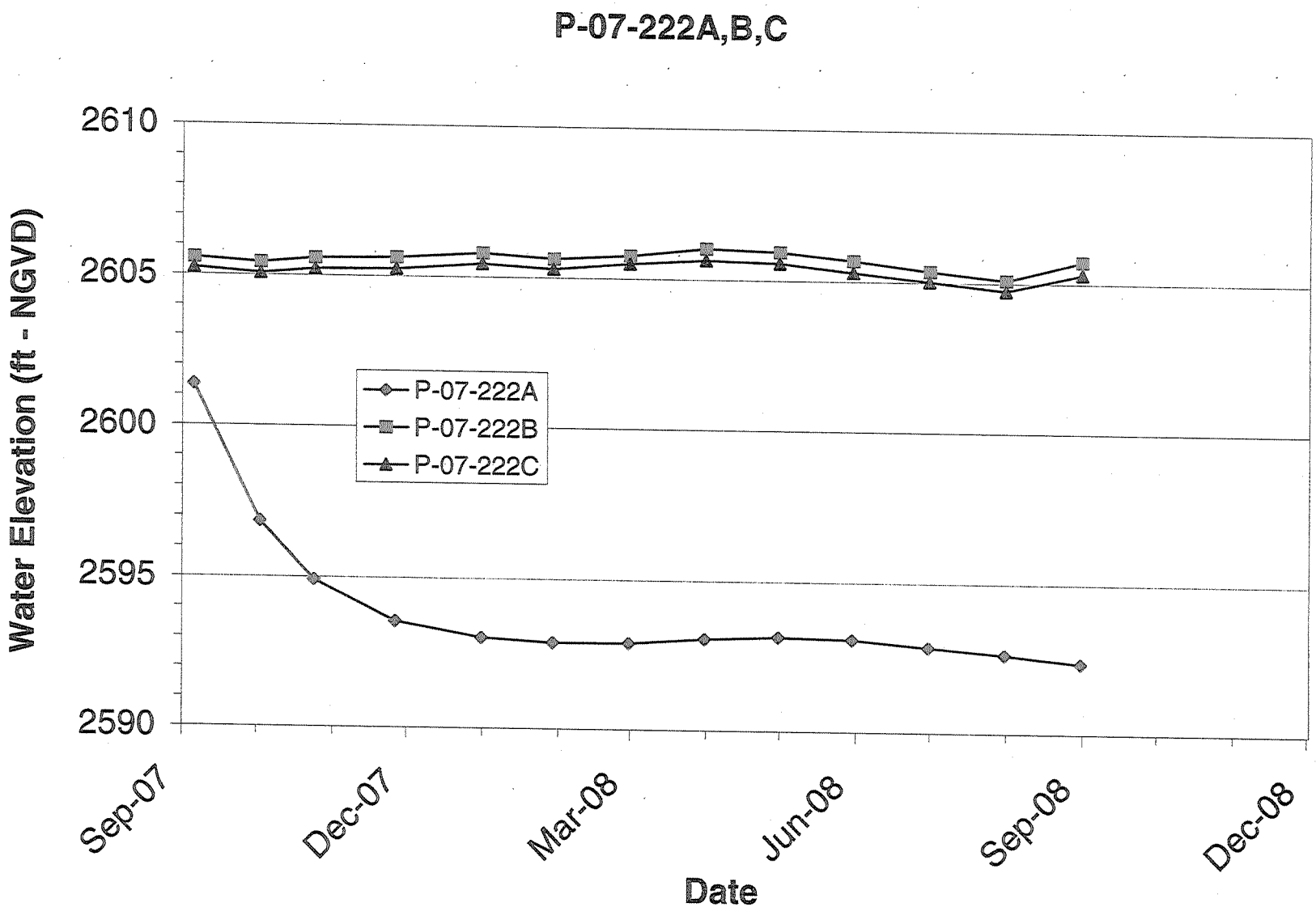

P-07-216
Water Elevation (ft - NGVD)
2658
2657
2656
2655
2654
P-07-216
Sep-07
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Date

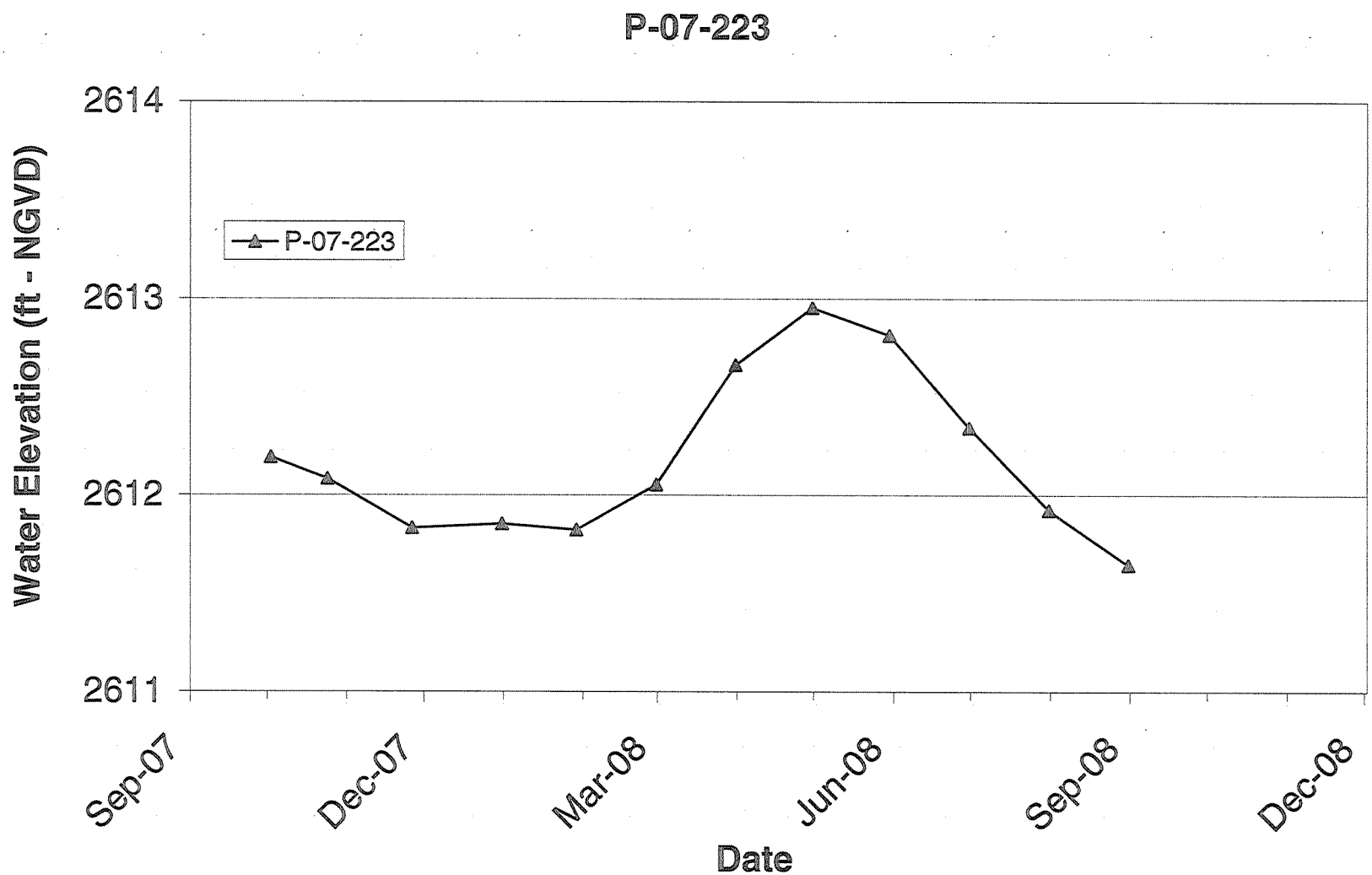

P-07-217A,B
Water Elevation (ft - NGVD)
2632
2628
2624
2620
2616
2612
2608
2604
P-07-217A
P-07-217B
Sep-07
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Date

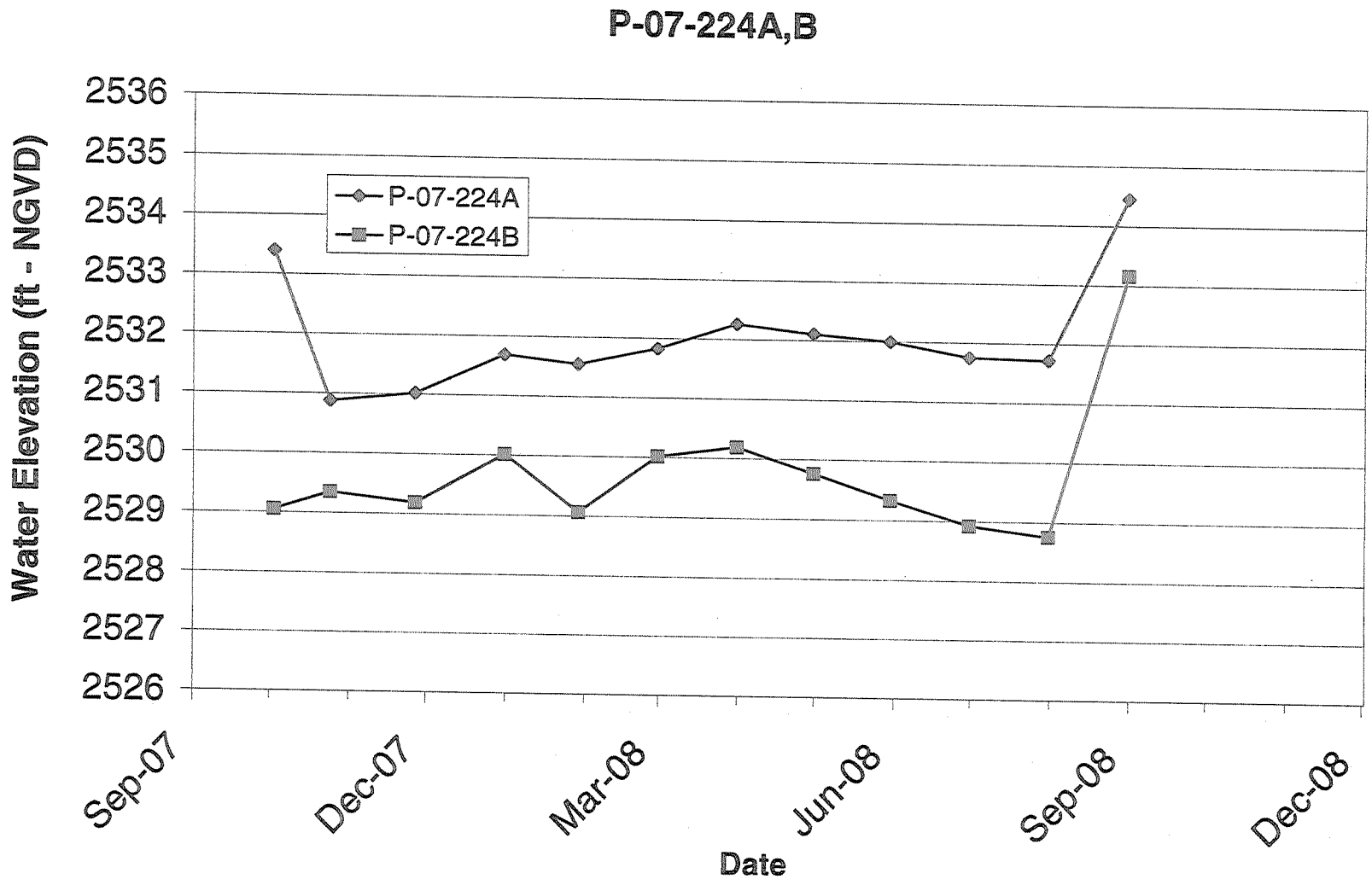

P-07-218
Water Elevation (ft - NGVD)
2648
2647
2646
2645
2644
2643
2642
2641
2640
P-07-218
Sep-07
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Date

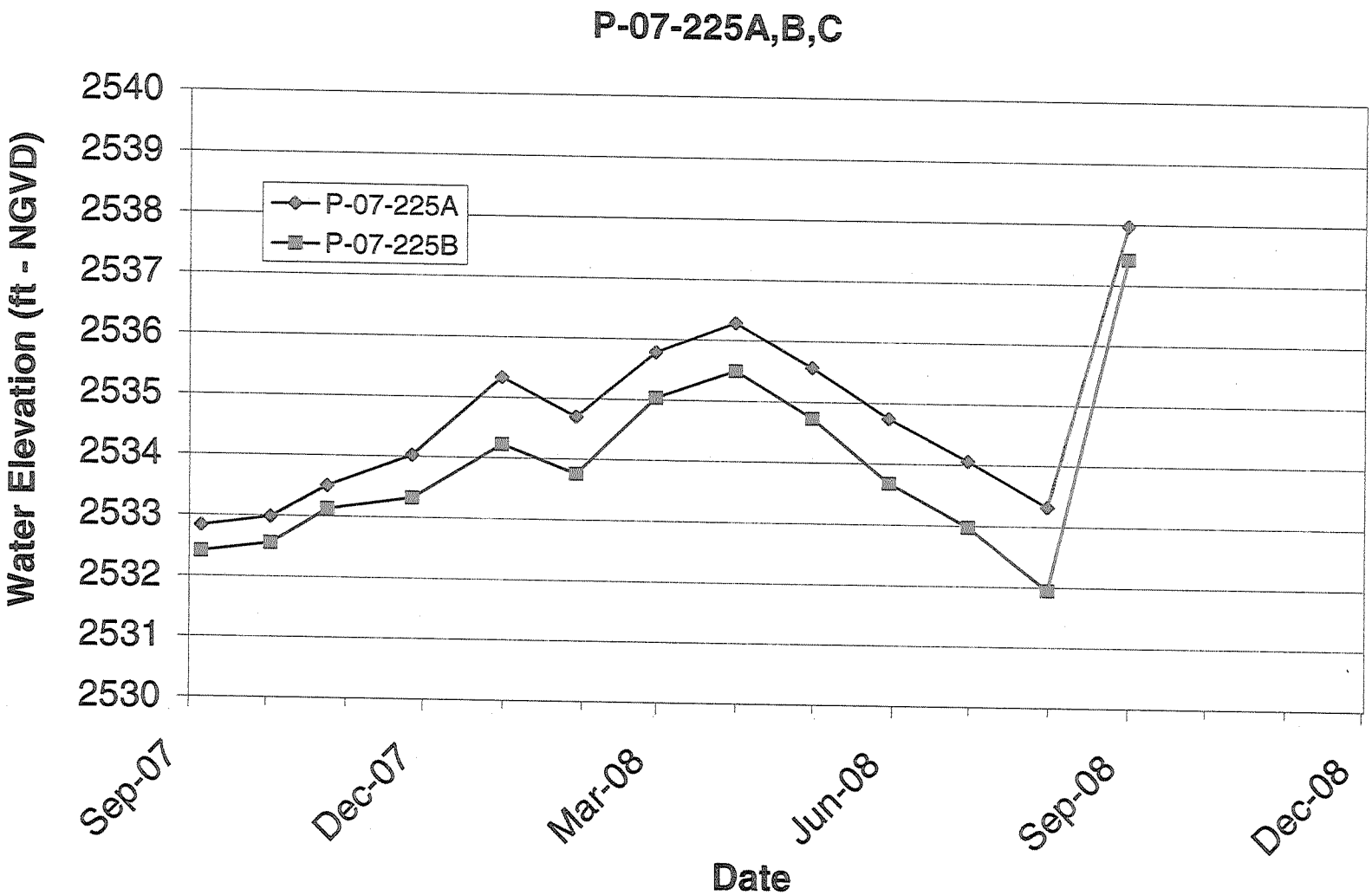

P-07-219A,B
Water Elevation (ft - NGVD)
2624
2623
2622
2621
P-07-219A
P-07-219B
Sep-07
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Date

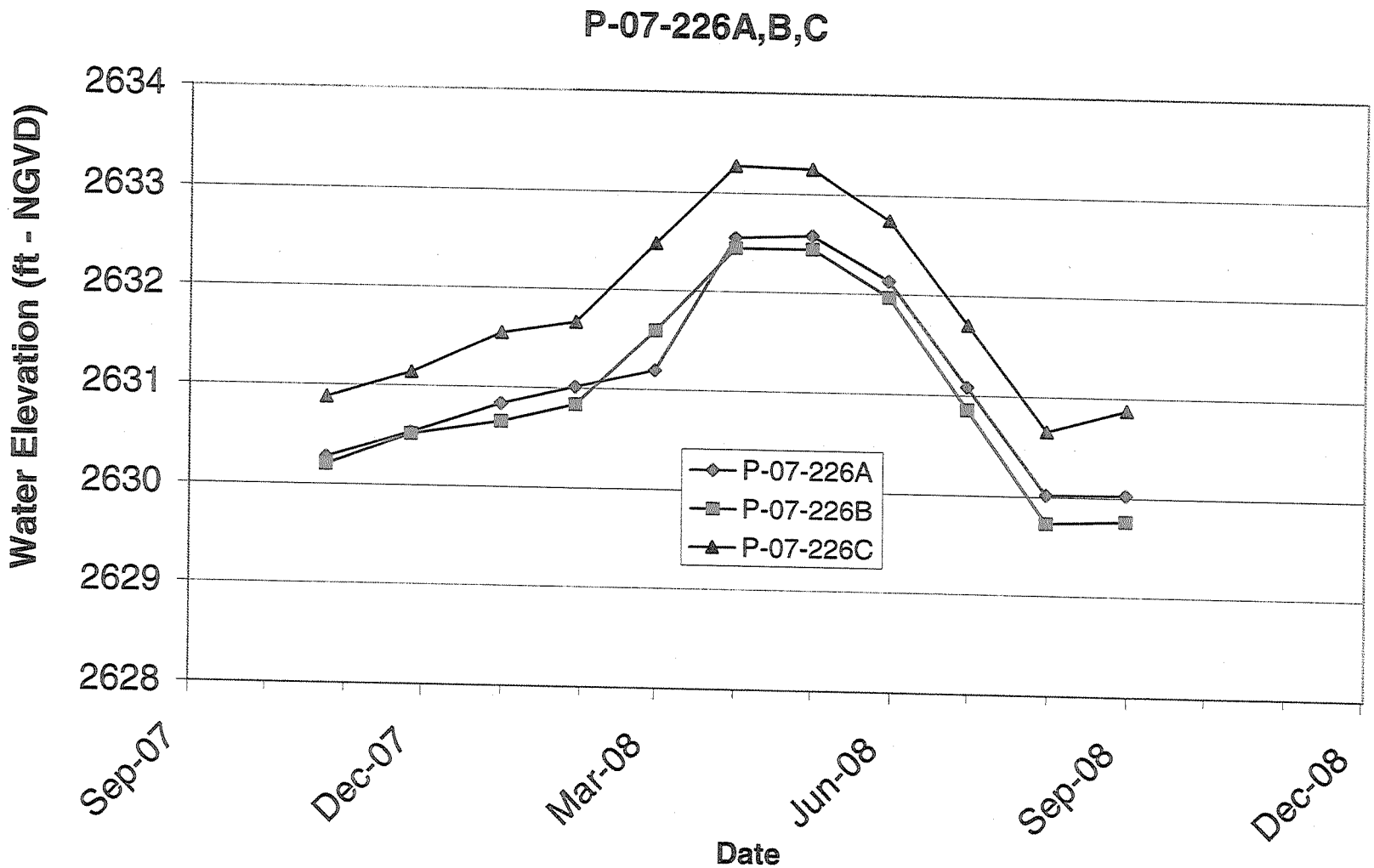

P-07-221A,B
Water Elevation (ft - NGVD)
2660
2655
2650
2645
2640
2635
2630
2625
2620
2615
Sep-07
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Date
P-07-221A
P-07-221B

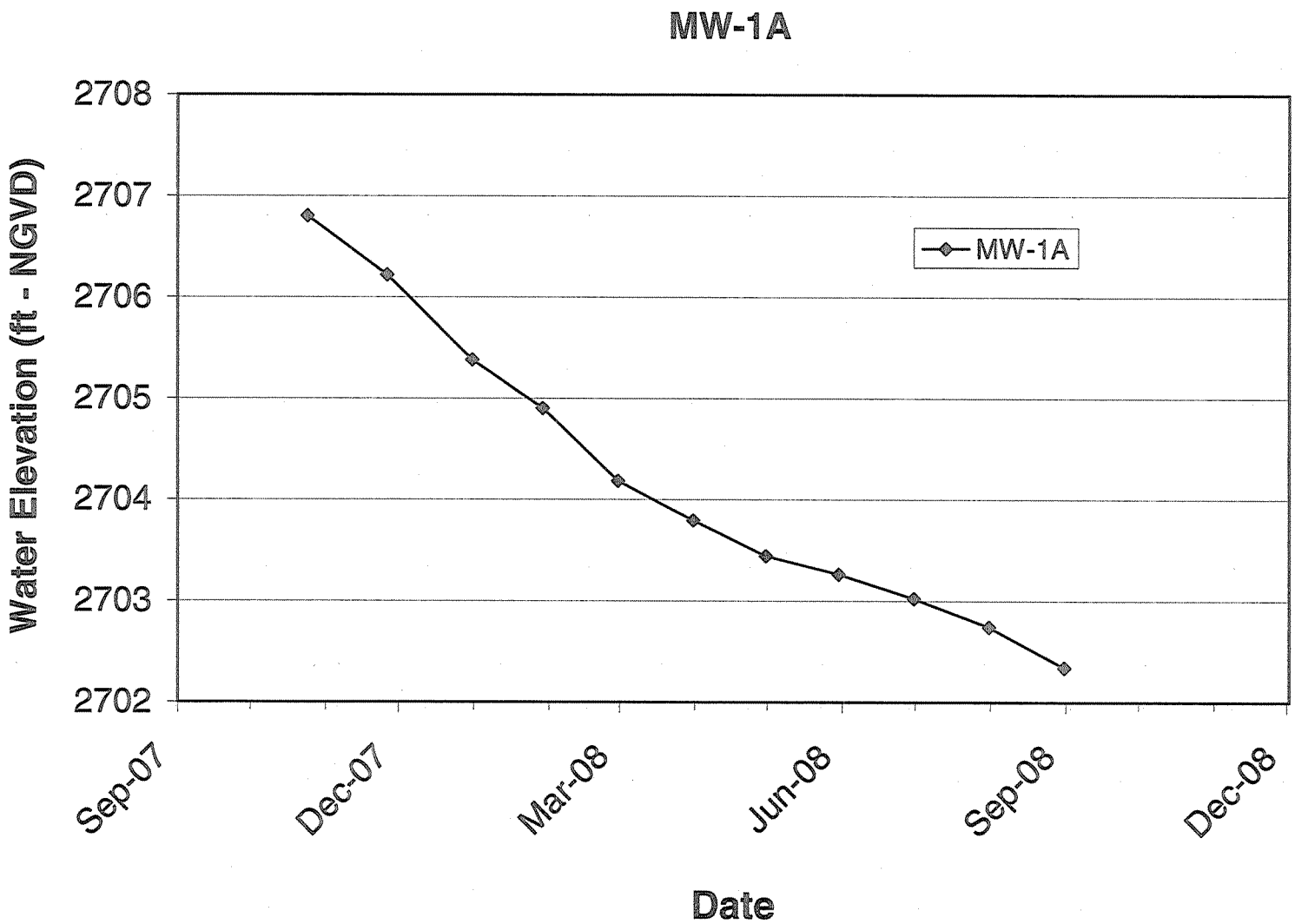

P-07-222A,B,C
Water Elevation (ft - NGVD)
2610
2605
2600
2595
2590
P-07-222A
P-07-222B
P-07-222C
Sep-07
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Date

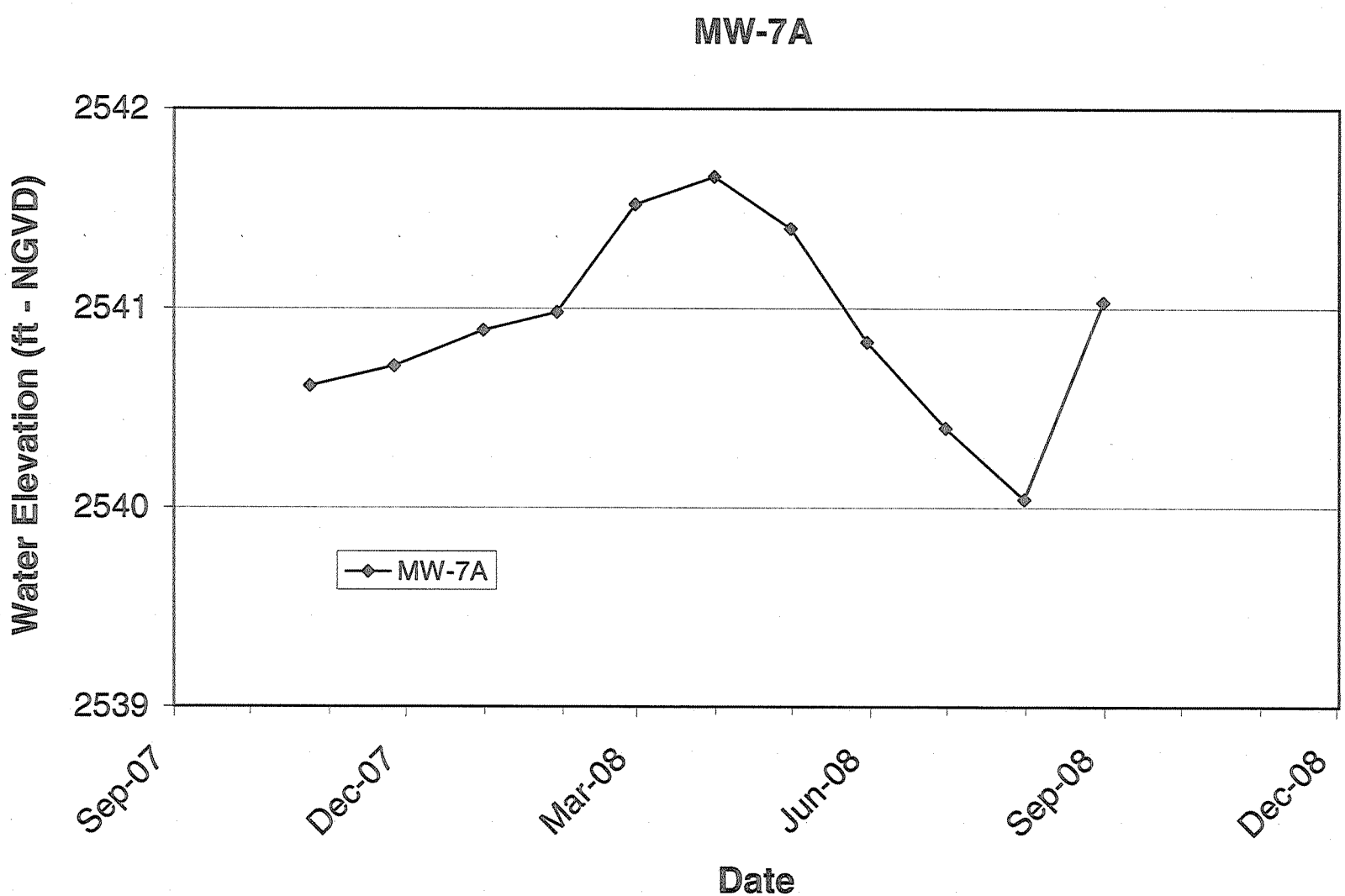

P-07-223
2614
2613
2612
2611
Water Elevation (ft - NGVD)
P-07-223
Sep-07
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Date

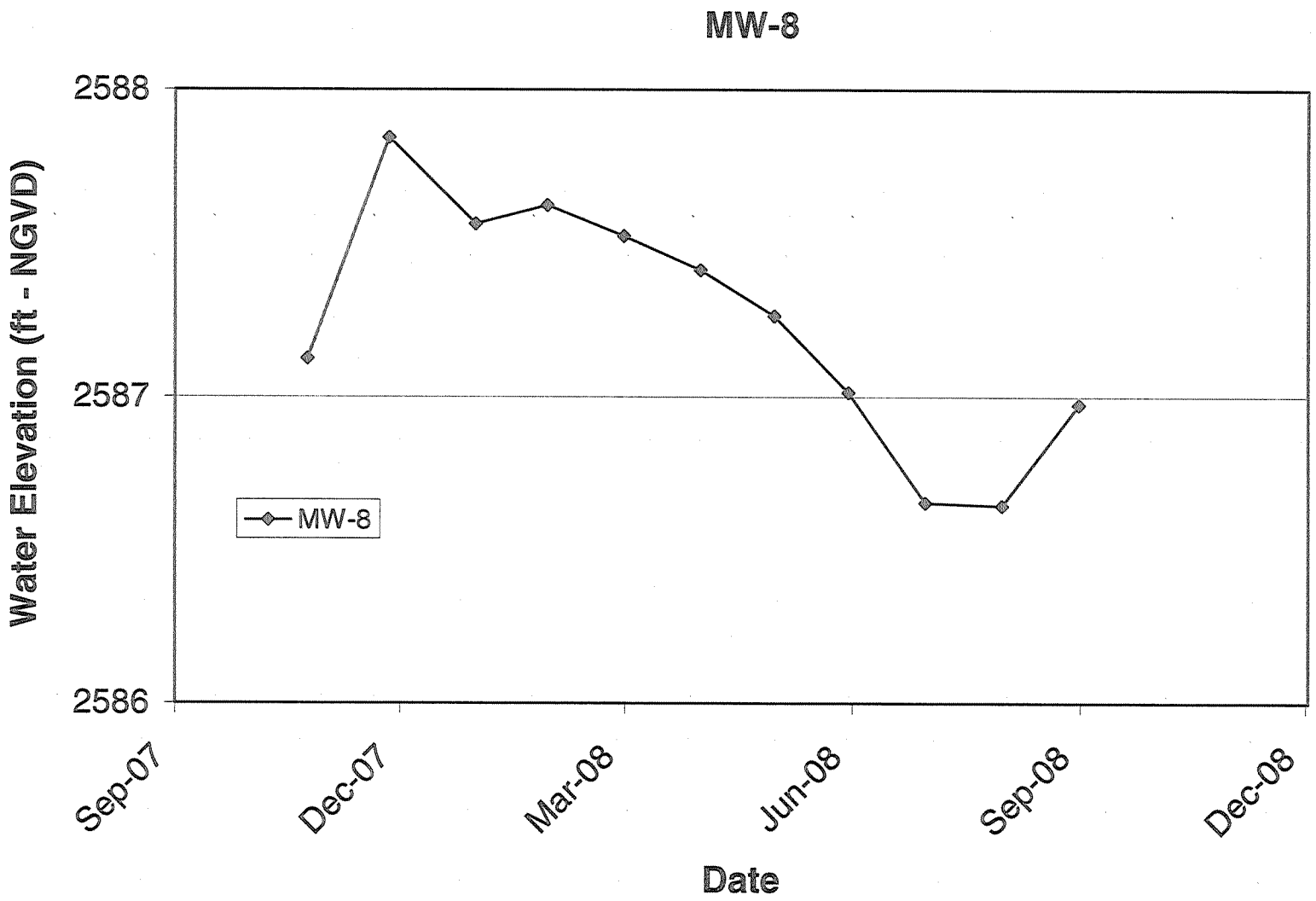

P-07-224A,B
Water Elevation (ft - NGVD)
2536
2535
2534
2533
2532
2531
2530
2529
2528
2527
2526
P-07-224A
P-07-224B
Sep-07
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Date

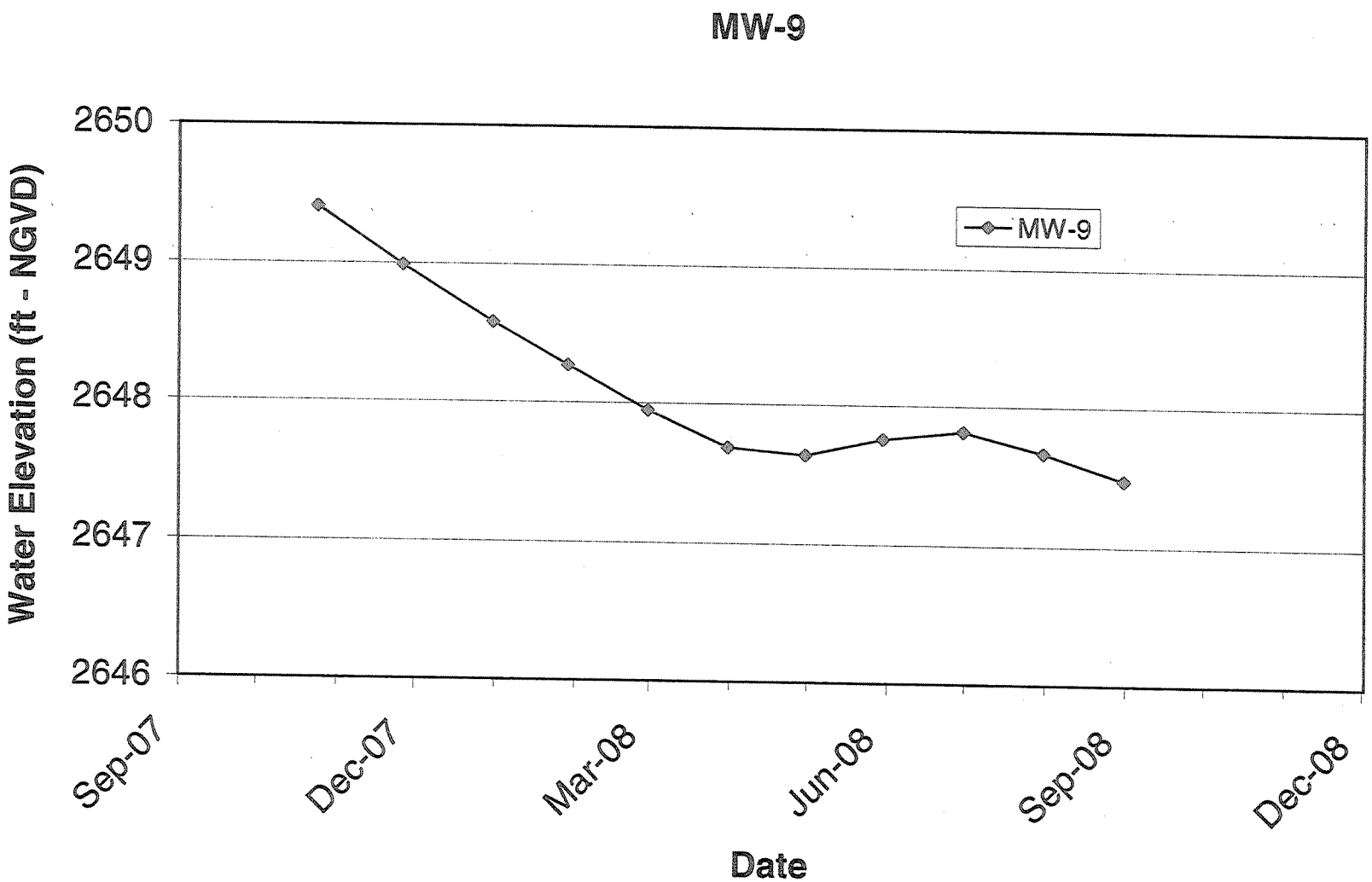

P-07-225A,B,C
Water Elevation (ft - NGVD)
2540
2539
2538
2537
2536
2535
2534
2533
2532
2531
2530
P-07-225A
P-07-225B
Sep-07
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Date

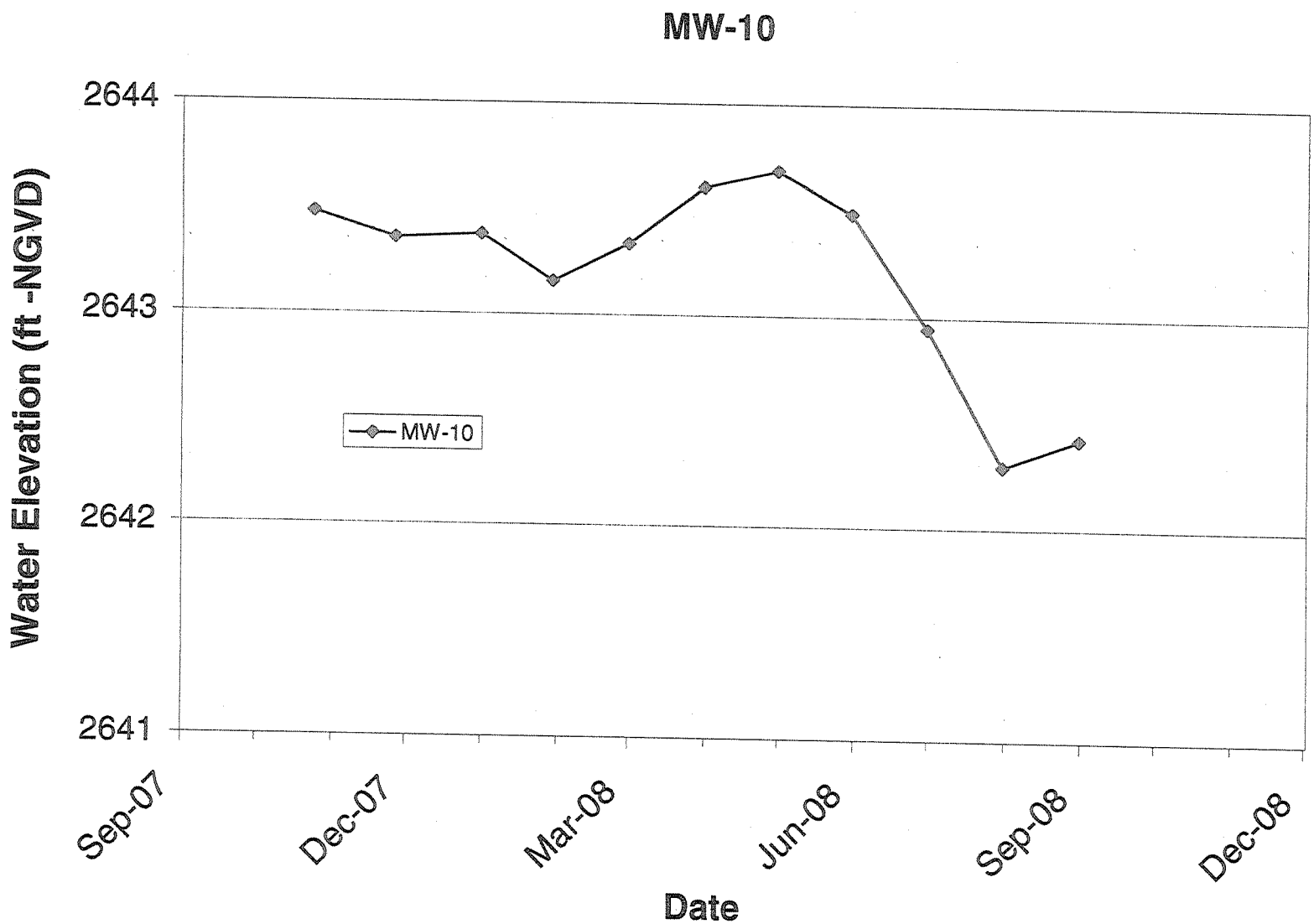

P-07-226A,B,C
Water Elevation (ft - NGVD)
2634
2633
2632
2631
2630
2629
2628
Sep-07
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Date
P-07-226A
P-07-226B
P-07-226C

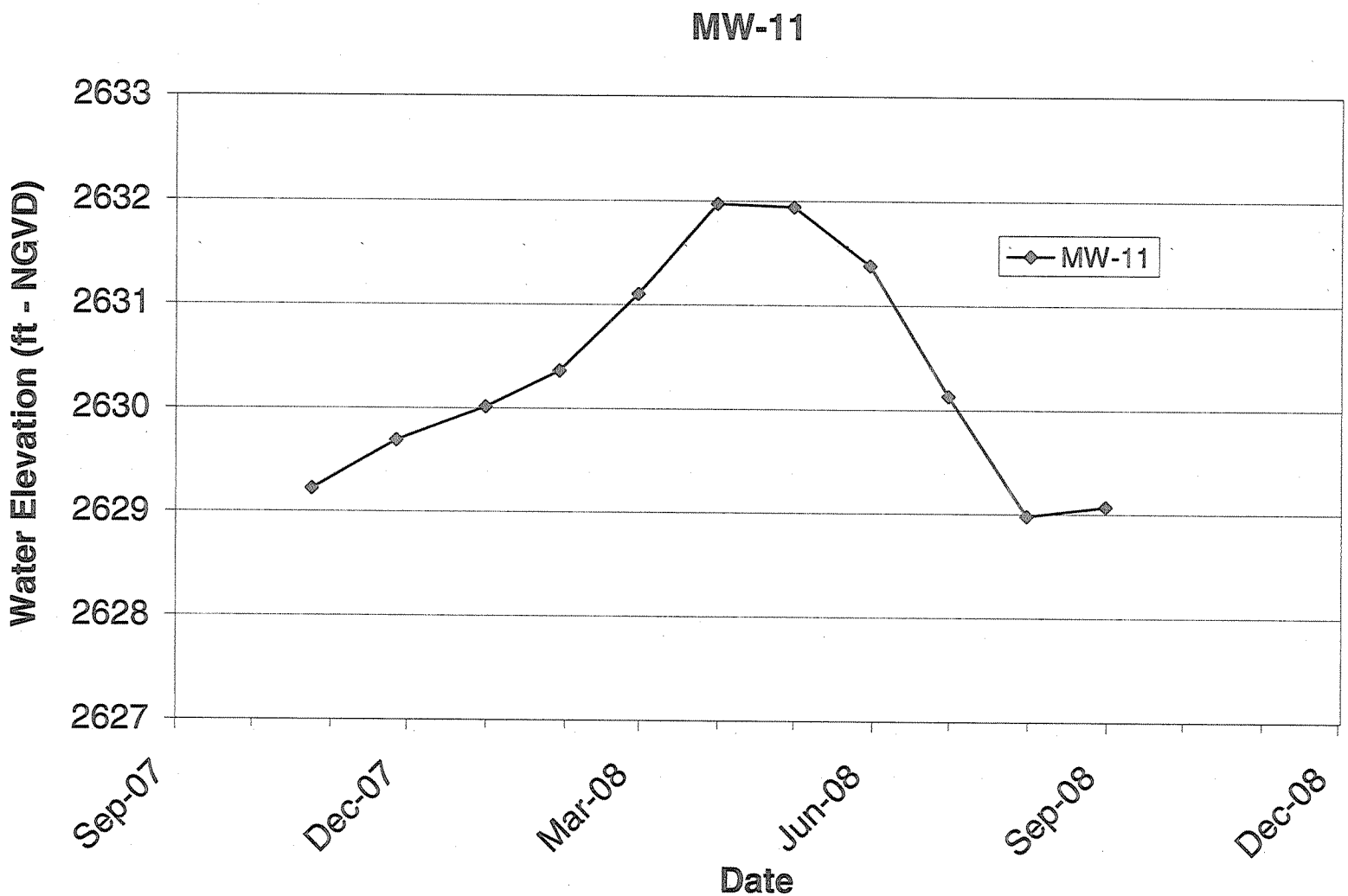

MW-1A
Water Elevation (ft - NGVD)
2708
2707
2706
2705
2704
2703
2702
MW-1A
Sep-07
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Date


MW-7A
2542
2541
2540
2539
Water Elevation (ft - NGVD)
MW-7A
Sep-07
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Date


MW-8
2588
2587
2586
Water Elevation (ft - NGVD)
MW-8
Sep-07
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Date


MW-9
Water Elevation (ft - NGVD)
2650
2649
2648
2647
2646
MW-9
Sep-07
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Date


MW-10
2644
2643
2642
2641
Water Elevation (ft -NGVD)
MW-10
Sep-07
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Date


MW-11
2633
2632
2631
2630
2629
2628
2627
Water Elevation (ft - NGVD)
MW-11
Sep-07
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Date

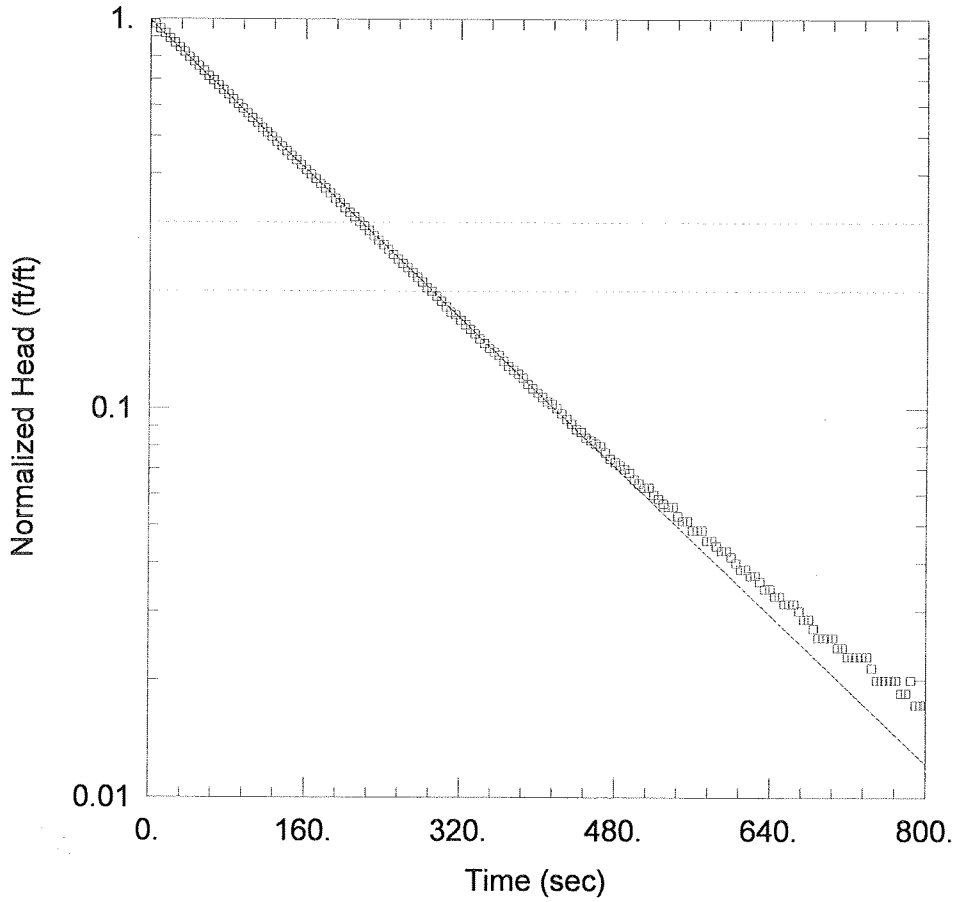
GROUNDWATER ELEVATIONS
LANDFILL NO. 6 EXPANSION
AERAS D & E

Location	MP (ft-TPVC)	Groundwater Elevation (ft NGVD)															Water Level Fluctuation
		Sep-07	2-Oct-07	24-Oct-07	26-Nov-07	31-Dec-07	29-Jan-08	29-Feb-08	31-Mar-08	30-Apr-08	30-May-08	30-Jun-08	31-Jul-08	31-Aug-08	Max	Min	
P-07-201A	2710.88	2673.36	2672.86	2672.38	2671.90	2671.57	2671.58	2672.14	2673.27	2673.58	2673.14	2672.18	2671.27	2670.82	2673.58	2670.82	2.76
P-07-201B	2710.87	2671.77	2671.80	2671.61	2671.46	2673.50	2673.13	2672.86	2672.72	2672.68	2672.65	2672.53	2672.30	2672.06	2673.50	2671.46	2.04
P-07-201C	2710.88	2674.73	2674.03	2673.55	2673.78	2672.60	2672.57	2672.90	2673.85	2674.35	2674.02	2673.30	2672.42	2671.87	2674.73	2671.87	2.86
P-07-202A	2659.40			2651.01	2650.93	2651.51	2651.00	2651.51	2651.71	2651.18	2651.12	2650.78	2650.27	2651.58	2651.71	2650.27	1.44
P-07-202B	2659.44			2653.47	2652.89	2653.98	2652.85	2653.39	2653.46	2653.31	2652.88	2652.62	2652.03	2653.87	2653.98	2652.03	1.95
P-07-203A	2687.82	2681.19	2680.63	2680.10	2679.72	2679.13	2678.93	2678.82	2679.84	2680.02	2679.74	2679.13	2678.43	2678.23	2681.19	2678.23	2.96
P-07-203B	2687.83	2676.78	2676.27	2675.80	2675.39	2675.00	2674.79	2675.16	2676.14	2676.18	2675.81	2674.99	2674.23	2674.75	2676.78	2674.23	2.55
P-07-203C	2687.84	2678.16	2677.66	2677.14	2676.69	2676.35	2676.20	2676.52	2677.48	2677.48	2677.11	2676.31	2675.52	2676.24	2678.16	2675.52	2.64
P-07-204A	2726.76			2691.11	2690.55	2690.01	2689.81	2689.85	2690.73	2690.92	2690.65	2689.83	2689.14	2688.61	2691.11	2688.61	2.50
P-07-204B	2726.83			2691.41	2690.83	2690.28	2690.07	2690.07	2690.98	2691.17	2690.90	2690.10	2689.45	2688.88	2691.41	2688.88	2.53
P-07-204C	2726.84			2691.89	2691.24	2690.62	2690.42	2690.36	2691.19	2691.47	2691.23	2690.48	2689.83	2689.21	2691.89	2689.21	2.68
P-07-205	2712.46			2659.13	2658.52	2657.95	2657.58	2657.45	2657.54	2657.63	2657.74	2657.64	2657.37	2657.02	2659.13	2657.02	2.11
P-07-206A	2739.13			2697.88	2697.26	2696.51	2695.99	2695.53	2695.55	2695.93	2696.13	2695.91	2695.42	2694.99	2697.88	2694.99	2.89
P-07-206B	2739.15			2700.69	2699.89	2699.17	2698.62	2698.14	2698.00	2698.38	2698.63	2698.52	2698.05	2697.65	2700.69	2697.65	3.04
P-07-207	2759.17			2682.12	2681.66	2681.14	2680.78	2680.24	2680.23	2680.48	2680.77	2680.76	2680.47	2680.14	2682.12	2680.14	1.98
P-07-208	2734.46		2691.41	2690.94	2690.16	2689.30	2688.77	2688.38	2688.74	2689.78	2690.42	2690.26	2689.49	2688.70	2691.41	2688.38	3.03
P-07-209A	2743.84			2710.19	2709.63	2709.07	2708.62	2708.52	2709.20	2710.13	2710.65	2710.50	2709.97	2709.39	2710.65	2708.52	2.13
P-07-209B	2743.87			2712.87	2712.27	2711.61	2711.18	2711.12	2711.84	2712.71	2713.22	2713.15	2712.62	2712.01	2713.22	2711.12	2.10
P-07-210A	2710.28		2678.05	2678.08	2677.05	2676.49	2676.19	2676.01	2676.41	2677.08	2677.36	2677.05	2676.34	2675.82	2678.08	2675.82	2.26
P-07-210B	2710.28	DRY (< 2677)															
P-07-211A	2692.15		2674.40	2673.72	2673.16	2672.67	2672.76	2673.81	2675.99	2676.39	2675.71	2674.51	2673.12	2673.52	2676.39	2672.67	3.72
P-07-211B	2693.24	2675.14	2673.64	2672.97	2672.39	2672.03	2672.09	2673.23	2675.18	2675.84	2675.10	2673.85	2672.49	2672.88	2675.84	2672.03	3.81
P-07-211C	2693.25	2666.05	2665.73	2665.15	2664.48	2664.05	2664.35	2665.76	2668.42	2668.92	2667.93	2666.57	2665.19	2665.18	2668.92	2664.05	4.87
P-07-211D	2693.22	2666.72	2665.72	2665.13	2664.45	2664.01	2664.30	2665.74	2668.54	2668.89	2667.92	2666.55	2665.15	2665.14	2668.89	2664.01	4.88
P-07-212A	2680.15		2663.49	2662.69	2661.58	2660.77	2660.68	2662.93	2667.05	2667.95	2666.72	2664.87	2662.93	2664.69	2667.95	2660.68	7.27
P-07-212B	2680.14		2663.45	2662.66	DRY			2662.81	2667.51	2668.50	2666.91	2664.84	2662.91	2664.86	2668.50	2662.66	5.84
P-07-213	2743.70			2688.90	2687.67	2686.54	2685.77	2685.16	2687.08	2689.35	2689.20	2688.31	2686.98	2687.37	2689.35	2685.16	4.19
P-07-214A	2678.42		2652.20	2651.81	2651.31	2650.81	2650.45	2650.25	2650.94	2651.98	2652.43	2651.97	2651.14	2650.42	2652.43	2650.25	2.18
P-07-214B	2678.43		2651.98	2651.62	2651.12	2650.63	2650.27	2650.07	2650.75	2651.76	2652.23	2651.76	2650.93	2650.25	2652.23	2650.07	2.16
P-07-215A	2654.09	2642.74	2642.16	2641.76	2641.30	2640.89	2640.64	2640.96	2642.03	2642.77	2642.91	2642.44	2641.71	2641.93	2642.91	2640.64	2.27
P-07-215B	2654.05	2643.75	2643.20	2642.92	2642.46	2642.37	2642.22	2642.82	2643.48	2643.92	2643.89	2643.47	2642.84	2644.05	2644.05	2642.22	1.83
P-07-215C	2653.73		2642.21	2641.95	2641.61	2641.24	2641.06	2641.68	2642.41	2642.81	2642.81	2642.42	2641.85	2643.10	2643.10	2641.06	2.04
P-07-216	2709.20		2657.80	2655.58	2655.00	2654.61	2654.47	2654.67	2656.92	2657.64	2657.61	2656.92	2655.89	2657.17	2657.80	2654.47	3.33
P-07-217A	2687.66		2615.23	2615.27	2615.10	2614.26	2614.35	2614.34	2614.54	2614.58	2614.35	2613.70	2613.60	2613.48	2615.27	2613.48	1.79
P-07-217B	2687.65		2629.67	2629.90	2629.88	2629.94	2629.92	2629.94	2629.87	2629.83	2629.77	2629.73	2629.69	2629.70	2629.94	2629.67	0.27
P-07-218	2704.00		2646.76	2646.29	2645.80	2643.48	2643.02	2642.62	2642.60	2642.96	2643.29	2643.14	2642.62	2642.16	2646.76	2642.16	4.60
P-07-219A	2630.96	2622.44	2622.18	2622.07	2622.07	2622.04	2621.95	2622.30	2623.06	2623.10	2622.79	2622.11	2621.56	2621.84	2623.10	2621.56	1.54
P-07-219B	2630.97	2622.77	2622.45	2622.41	2622.43	2622.37	2622.23	2622.58	2623.22	2623.24	2622.95	2622.49	2622.14	2622.27	2623.24	2622.14	1.10
P-07-220	2670.34	DRY (< 2626)															
P-07-221A	2680.33		2657.48	2651.74	2646.38	2641.93	2638.81	2635.99	2633.65	2631.75	2630.10	2628.61	2627.33	2626.28	2657.48	2626.28	31.20
P-07-221B	2680.31		2622.39	2622.43	2622.26	2622.11	2621.94	2621.70	2621.51	2621.31	2621.13	2620.96	2620.81	2620.69	2622.43	2620.69	1.74
P-07-222A	2612.75	2601.36	2596.84	2594.92	2593.56	2593.04	2592.89	2592.90	2593.07	2593.16	2593.10	2592.87	2592.64	2592.37	2601.36	2592.37	8.99
P-07-222B	2612.77	2605.57	2605.42	2605.58	2605.62	2605.79	2605.63	2605.77	2606.03	2605.95	2605.69	2605.37	2605.09	2605.73	2606.03	2605.09	0.94
P-07-222C	2612.75	2605.23	2605.06	2605.21	2605.24	2605.44	2605.29	2605.50	2605.64	2605.57	2605.30	2605.02	2604.74	2605.31	2605.64	2604.74	0.90
P-07-223	2651.29		2612.19	2612.08	2611.83	2611.85	2611.82	2612.05	2612.66	2612.95	2612.81	2612.34	2611.92	2611.64	2612.95	2611.64	1.31
P-07-224A	2541.00		2533.40	2530.88	2531.02	2531.69	2531.55	2531.83	2532.26	2532.11	2532.00	2531.75	2531.72	2534.46	2534.46	2530.88	3.58
P-07-224B	2541.04		2529.06	2529.35	2529.19	2530.02	2529.07	2530.02	2530.19	2529.77	2529.34	2528.93	2528.76	2533.16	2533.16	2528.76	4.40
P-07-225A	2541.56	2532.83	2532.98	2533.50	2534.02	2535.33	2534.69	2535.78	2536.28	2535.56	2534.74	2534.05	2533.31	2537.97	2537.97	2532.83	5.14
P-07-225B	2541.58	2532.41	2532.55	2533.12	2533.32	2534.22	2533.75	2535.03	2535.49	2534.72	2533.67	2532.97	2531.94	2537.42	2537.42	2531.94	5.48
P-07-226A	2648.80			2630.28	2630.54	2630.84	2631.02	2631.20	2632.55	2632.58	2632.14	2631.09	2630.02	2630.03	2632.58	2630.02	2.56
P-07-226B	2648.80			2630.20	2630.52	2630.66	2630.84	2631.60	2632.44	2632.44	2631.97	2630.86	2629.73	2629.76	2632.44	2629.73	2.71
P-07-226C	2648.82			2630.88	2631.14	2631.55	2631.67	2632.48	2633.27	2633.25	2632.75	2631.71	2630.66	2630.88	2633.27	2630.66	2.61
MW-1A	2763.68			2706.80	2706.22	2705.38	2704.90	2704.18	2703.79	2703.44	2703.26	2703.02	2702.74	2702.34	2706.80	2702.34	4.46
MW-7A	2551.70			2540.61	2540.71	2540.89	2540.98	2541.52	2541.66	2541.40	2540.83	2540.40	2540.04	2541.03	2541.66	2540.04	1.62
MW-8	2598.64			2587.12	2587.84	2587.56	2587.62	2587.52	2587.41	2587.26	2587.01	2586.65	2586.64	2586.97	2587.84	2586.64	1.20
MW-9	2688.92			2649.41	2648.99	2648.58	2648.27	2647.95	2647.69	2647.64	2647.76	2647.82	2647.67	2647.48	2649.41	2647.48	1.93
MW-10	2682.17			2643.48	2643.36	2643.38	2643.16	2643.34	2643.61	2643.69	2643.49	2642.95	2642.30	2642.43	2643.69	2642.30	1.39
MW-11	2643.65			2629.22	2629.69	2630.01	2630.36	2631.10	2631.97	2631.94	2631.38	2630.13	2628.98	2629.07	2631.97	2628.98	2.99

Notes:
P-07-221A and P-07-222A have not yet attained a static water level condition.

APPENDIX D

IN SITU SLUG TEST RESULTS



WELL TEST ANALYSIS

Data Set: \\Aserver\cfs\Brpp\NC\6e\K-tests\201a1.aqt
Date: 10/27/08 Time: 17:37:31

PROJECT INFORMATION

Company: Sevee & Maher
Client: BRPP
Project: 07089
Location: Canton, NC
Test Well: P-07-201A
Test Date: 11-28-07

AQUIFER DATA

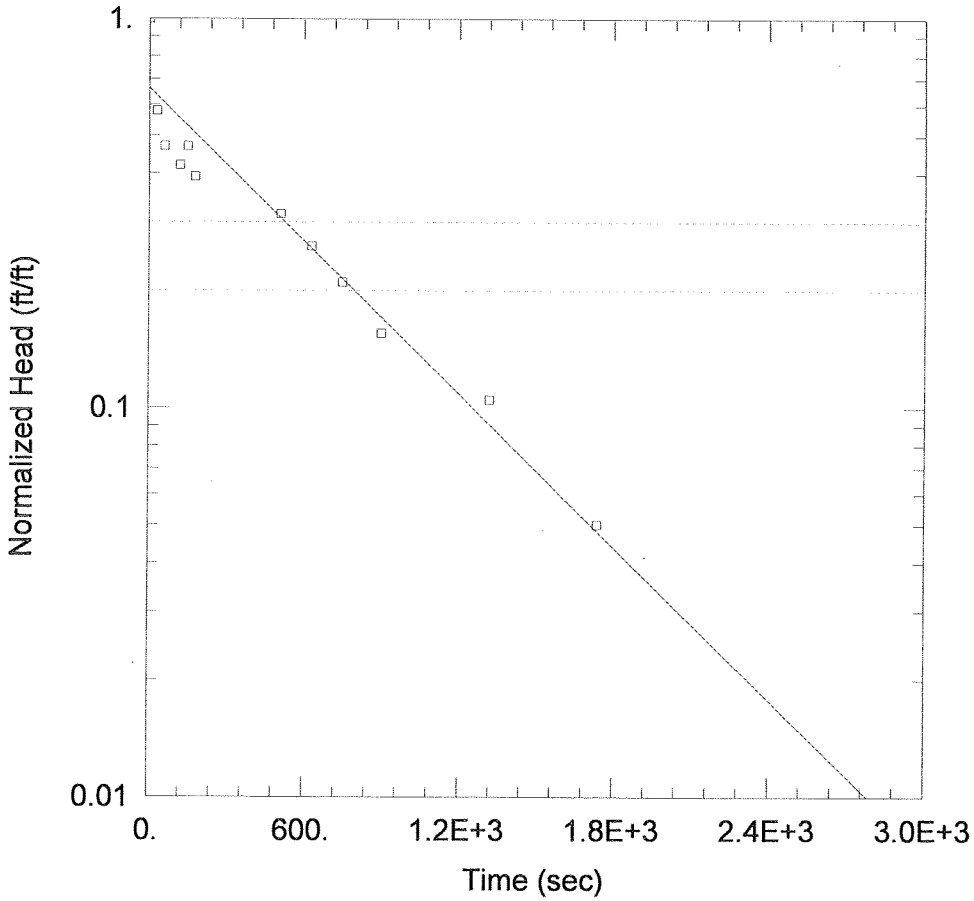
Saturated Thickness: 64.08 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-07-201A)

Initial Displacement: 4.049 ft
Total Well Penetration Depth: 64.08 ft
Casing Radius: 0.03 ft
Static Water Column Height: 64.08 ft
Screen Length: 7. ft
Wellbore Radius: 0.33 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 3.729E-5 cm/sec
y0 = 4.019 ft



WELL TEST ANALYSIS

Data Set: \\Aserver\cfs\Brpp\NC\6e\K-tests\201c.aqt
Date: 10/28/08 Time: 09:38:49

PROJECT INFORMATION

Company: SME
Client: BRPP
Project: 07089
Location: Canton, NC
Test Well: P-07-201C
Test Date: 11-28-07

AQUIFER DATA

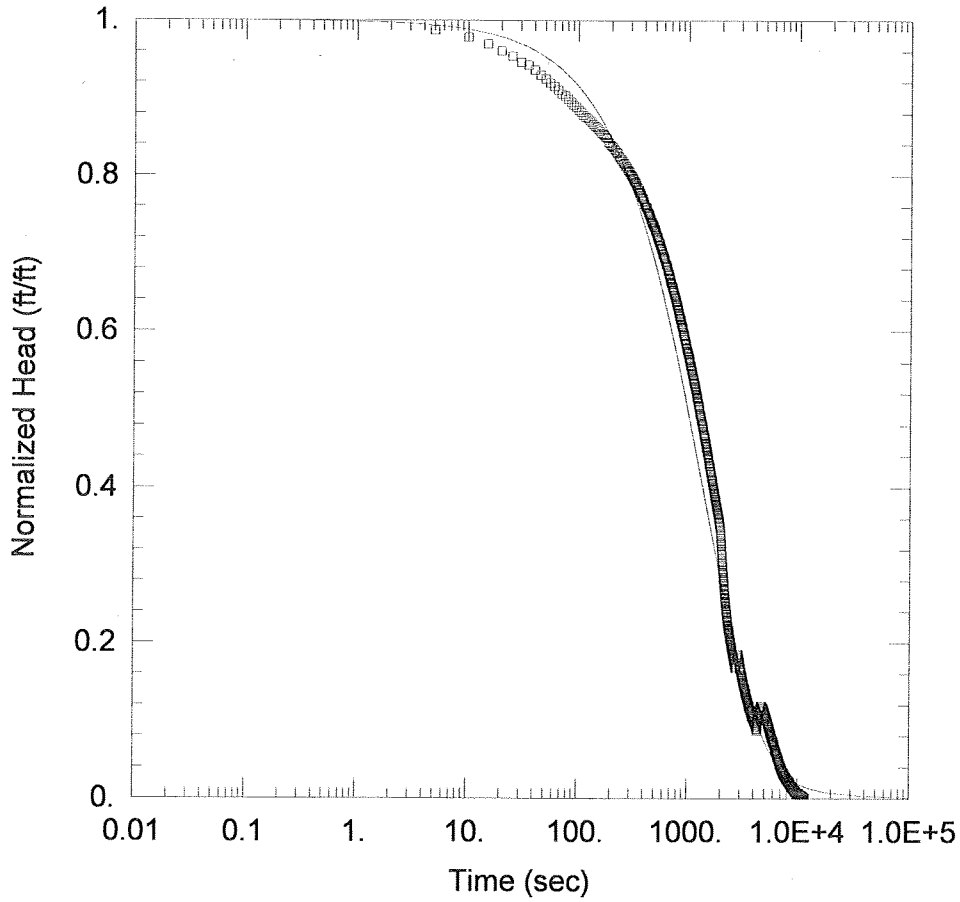
Saturated Thickness: 4.47 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-07-201C)

Initial Displacement: 0.219 ft
Total Well Penetration Depth: 4.47 ft
Casing Radius: 0.03125 ft
Static Water Column Height: 4.47 ft
Screen Length: 4.47 ft
Wellbore Radius: 0.333 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 9.448E-6 cm/sec
y0 = 0.1455 ft



WELL TEST ANALYSIS

Data Set: \\Aserver\cfs\Brpp\NC\6e\K-tests\202a.aqt
Date: 10/28/08 Time: 08:44:43

PROJECT INFORMATION

Company: SME
Client: BRPP
Project: 07089
Location: Canton, NC
Test Well: P-07-202A
Test Date: 11-28-07

AQUIFER DATA

Saturated Thickness: 65.31 ft Anisotropy Ratio (Kz/Kr): 1.

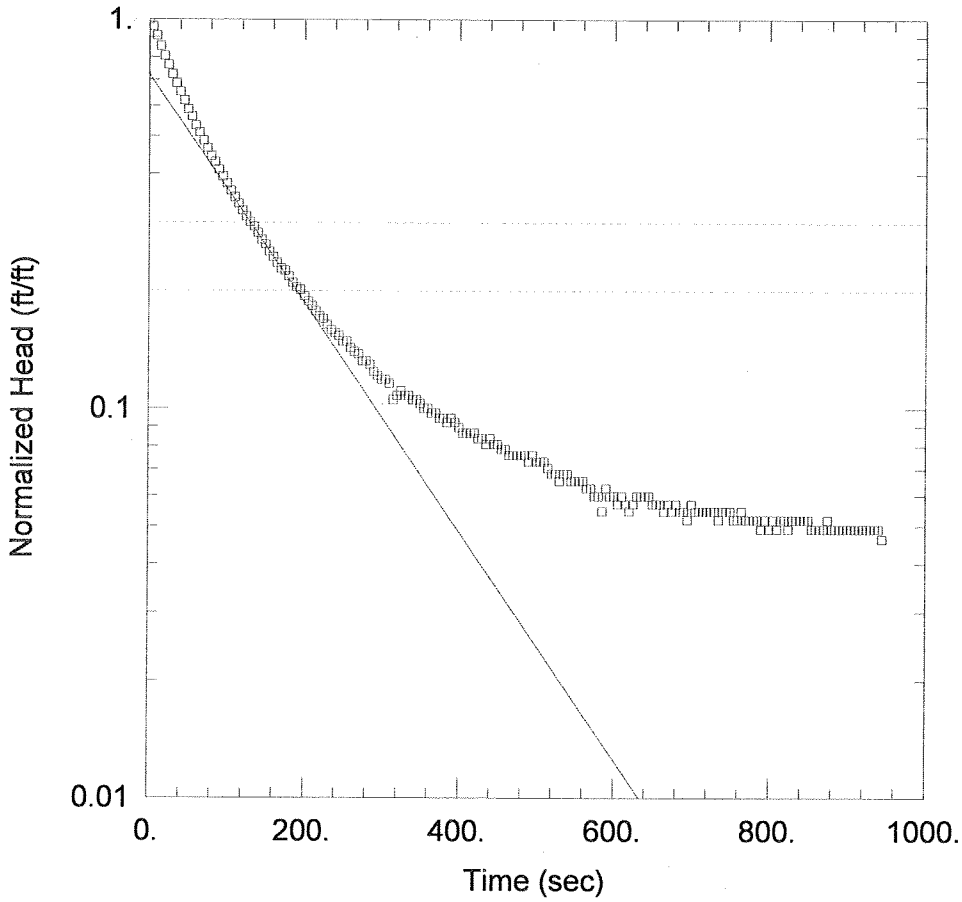
WELL DATA (P-07-202A)

Initial Displacement: 4.505 ft
Total Well Penetration Depth: 65.31 ft
Casing Radius: 0.03125 ft
Static Water Column Height: 65.31 ft
Screen Length: 13. ft
Wellbore Radius: 0.125 ft

SOLUTION

Aquifer Model: Confined Solution Method: Cooper et al.

T = 0.00189 cm^2/sec, K= 4.8×10^{-6} cm/sec S = 1.0E-6



WELL TEST ANALYSIS

Data Set: \\Aserver\cfs\Brpp\NC\6e\K-tests\202b.aqt
Date: 10/28/08 Time: 08:58:24

PROJECT INFORMATION

Company: SME
Client: BRPP
Project: 07089
Location: Canton, NC
Test Well: P-07-202B
Test Date: 11-28-07

AQUIFER DATA

Saturated Thickness: 12.23 ft Anisotropy Ratio (Kz/Kr): 1.

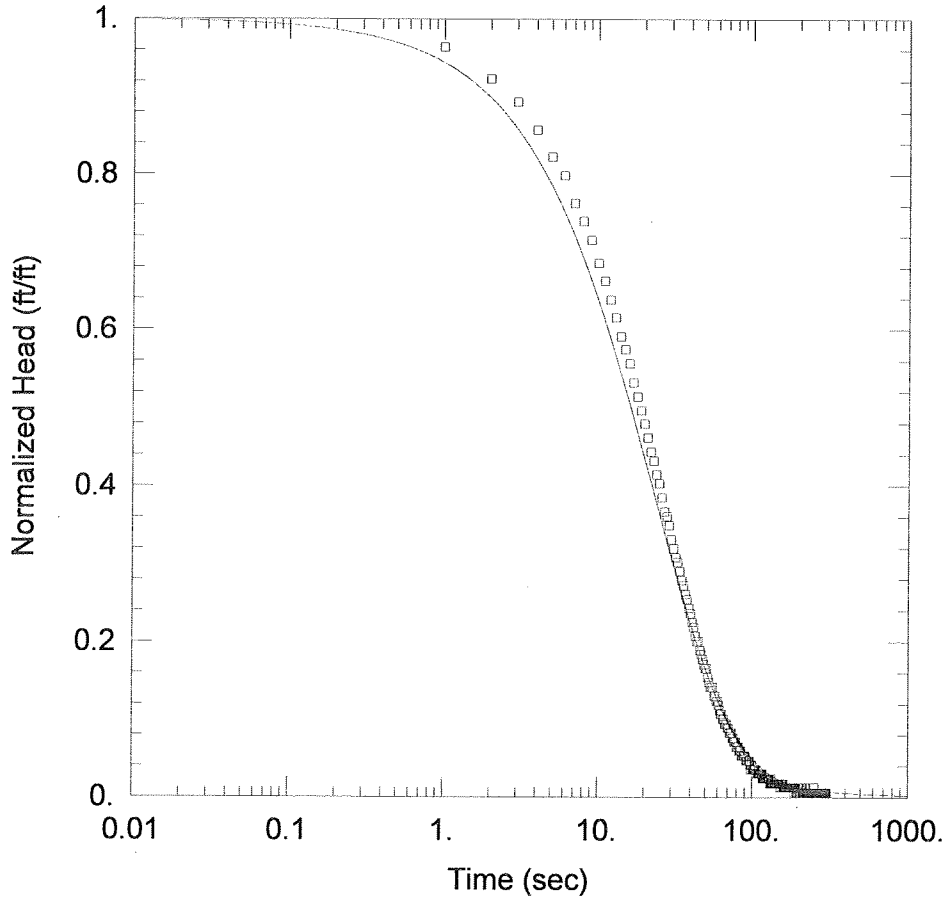
WELL DATA (P-07-202B)

Initial Displacement: 2.156 ft
Total Well Penetration Depth: 12.23 ft
Casing Radius: 0.0313 ft
Static Water Column Height: 12.23 ft
Screen Length: 12.23 ft
Wellbore Radius: 0.33 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 2.267E-5 cm/sec y0 = 1.563 ft



WELL TEST ANALYSIS

Data Set: \\Aserver\cfs\Brpp\NC\6e\K-tests\203a.aqt
Date: 10/28/08 Time: 09:05:42

PROJECT INFORMATION

Company: SME
Client: BRPP
Project: 07089
Location: Canton, NC
Test Well: P-07-203A
Test Date: 11-28-07

AQUIFER DATA

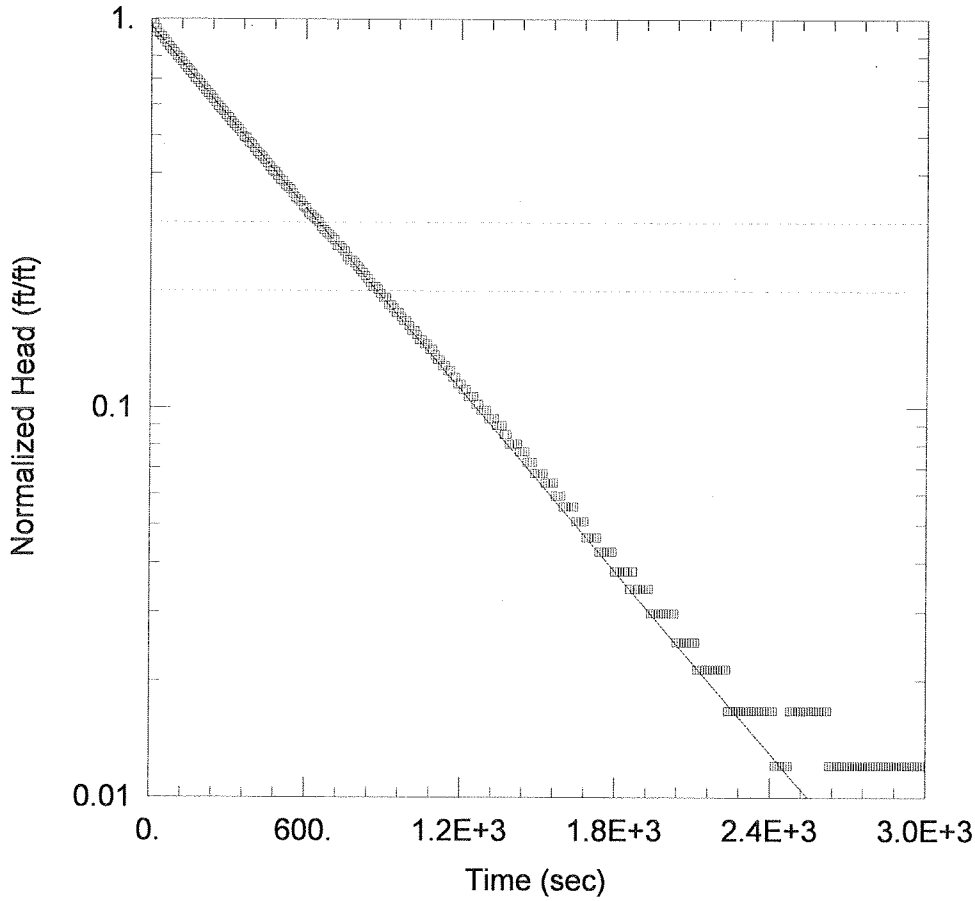
Saturated Thickness: 79.42 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-07-203A)

Initial Displacement: 7.81 ft
Total Well Penetration Depth: 79.42 ft
Casing Radius: 0.0313 ft
Static Water Column Height: 79.42 ft
Screen Length: 12.5 ft
Wellbore Radius: 0.125 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper et al.
T = 0.116 cm^2/sec , K= 3×10^{-4} cm/sec
S = 1.0E-6



WELL TEST ANALYSIS

Data Set: \\Aserver\cfs\Brpp\NC\6e\K-tests\203b.aqt
Date: 10/27/08 Time: 20:22:49

PROJECT INFORMATION

Company: SME
Client: BRPP
Project: 07089
Location: Canton, NC
Test Well: P-07-203B
Test Date: 11-28-07

AQUIFER DATA

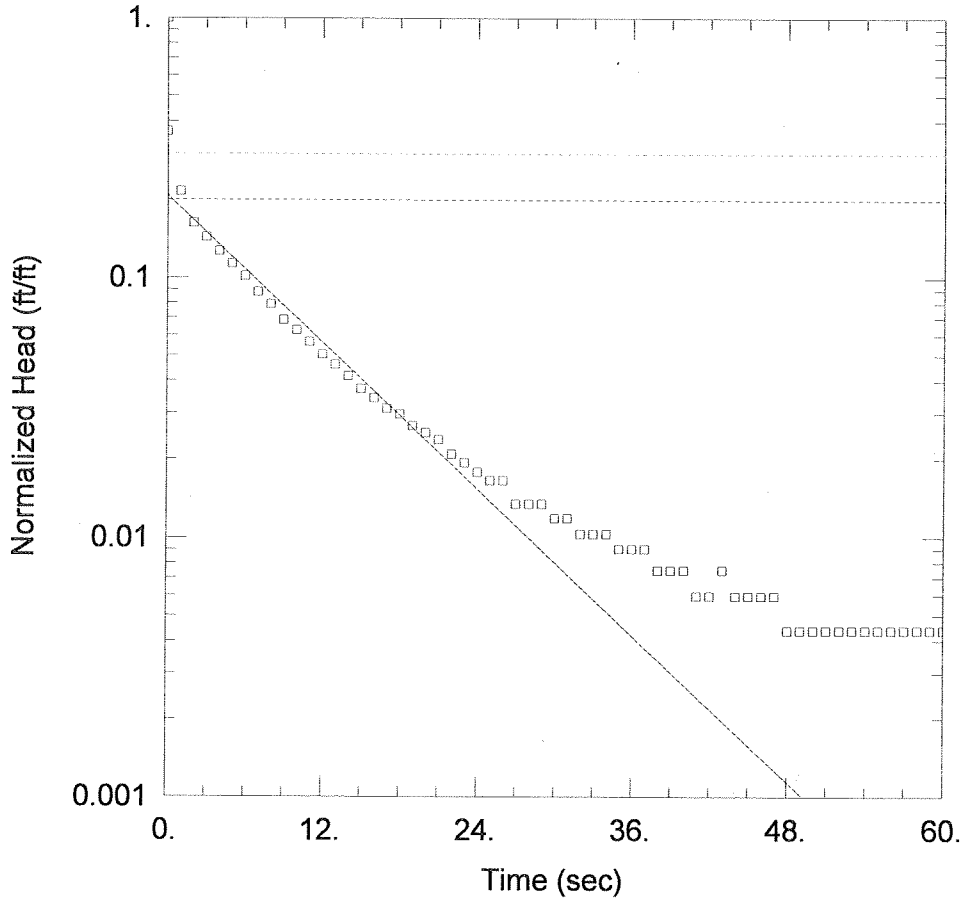
Saturated Thickness: 35.76 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-07-203B)

Initial Displacement: 10.76 ft
Total Well Penetration Depth: 35.76 ft
Casing Radius: 0.0313 ft
Static Water Column Height: 35.7 ft
Screen Length: 6.5 ft
Wellbore Radius: 0.125 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 1.67E-5 cm/sec
y0 = 10.35 ft



WELL TEST ANALYSIS

Data Set: \\Aserver\cfs\Brpp\NC\6e\K-tests\203c.aqt
Date: 10/27/08 Time: 21:38:27

PROJECT INFORMATION

Company: SME
Client: BRPP
Project: 07089
Location: Canton, NC
Test Well: P-07-203C
Test Date: 11-28-07

AQUIFER DATA

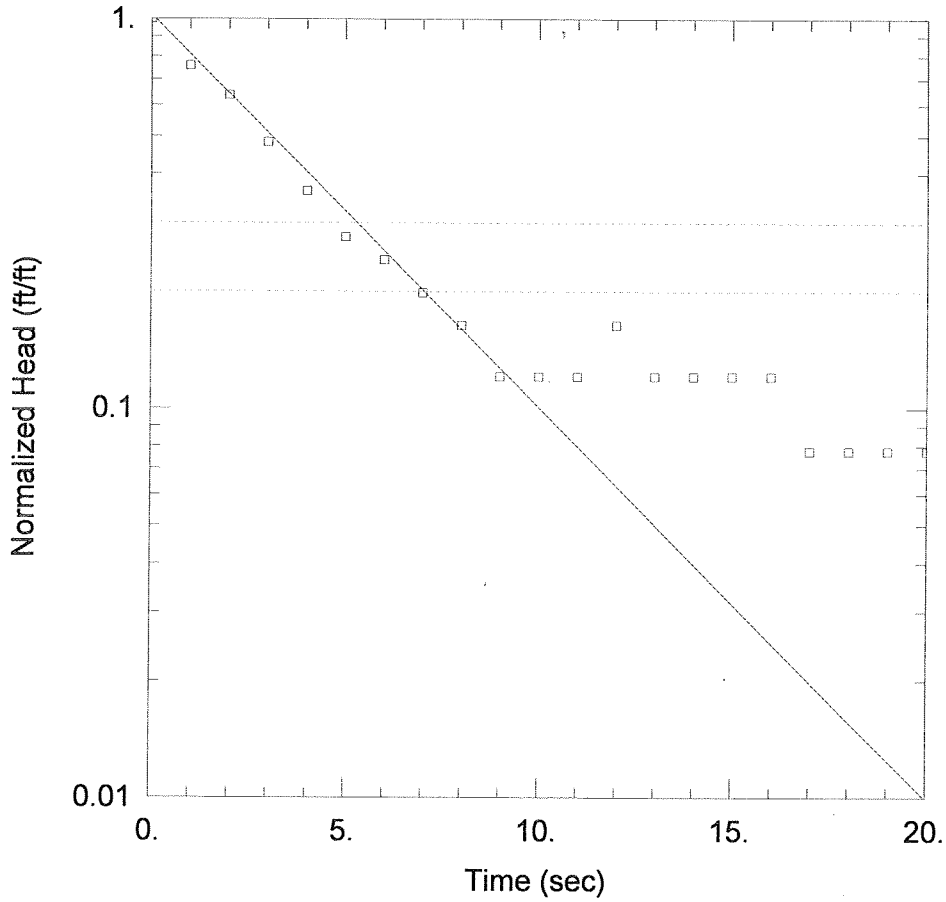
Saturated Thickness: 8.5 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-07-203C)

Initial Displacement: 3.869 ft
Total Well Penetration Depth: 8.5 ft
Casing Radius: 0.0313 ft
Static Water Column Height: 8.5 ft
Screen Length: 8.5 ft
Wellbore Radius: 0.33 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.000464 cm/sec
y0 = 0.8028 ft



WELL TEST ANALYSIS

Data Set: \\Aserver\cfs\Brpp\NC\6e\K-tests\204a.aqt
Date: 10/27/08 Time: 20:26:01

PROJECT INFORMATION

Company: SME
Client: BRPP
Project: 07089
Location: Canton, NC
Test Well: P-07-204A
Test Date: 11-28-07

AQUIFER DATA

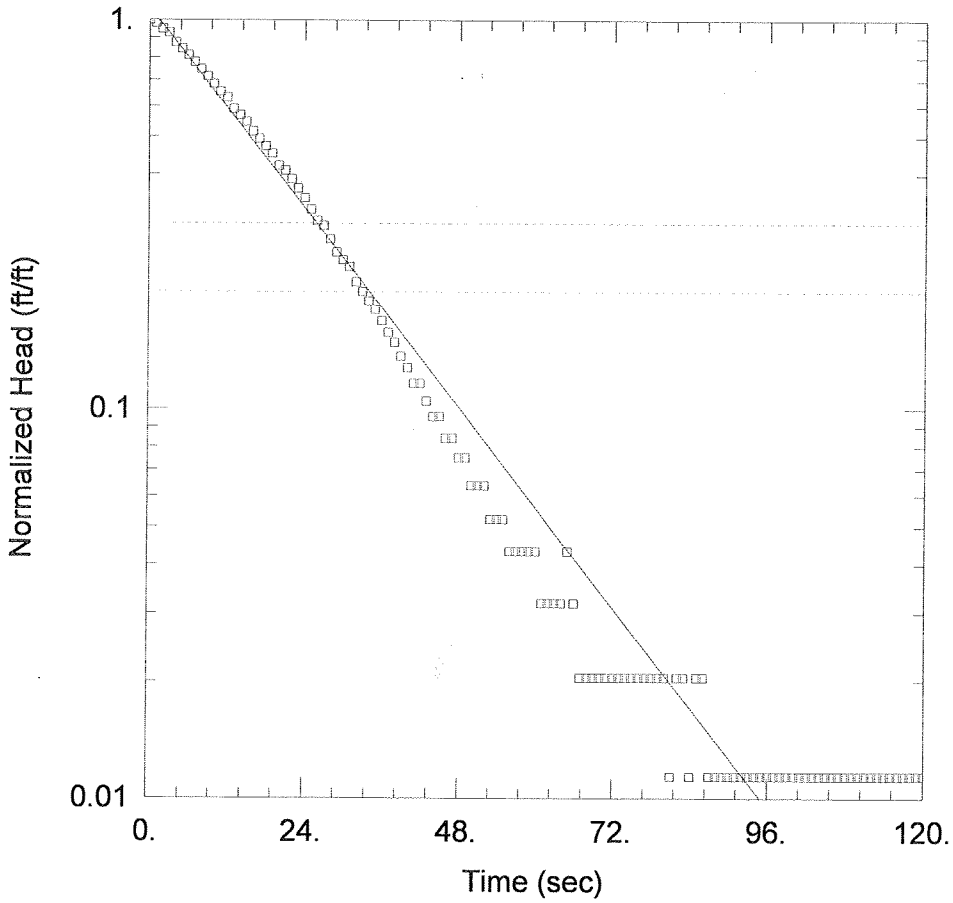
Saturated Thickness: 87.11 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-07-204A)

Initial Displacement: 1.16 ft
Total Well Penetration Depth: 87.11 ft
Casing Radius: 0.0313 ft
Static Water Column Height: 87.11 ft
Screen Length: 12.5 ft
Wellbore Radius: 0.125 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.00131 cm/sec
y0 = 1.189 ft



WELL TEST ANALYSIS

Data Set: \\Aserver\cfs\Brpp\NC\6e\K-tests\204b.aqt
Date: 10/27/08 Time: 18:06:48

PROJECT INFORMATION

Company: SME
Client: BRPP
Project: 07089
Location: Cantom, NC
Test Well: P-07-204B
Test Date: 11-28-07

AQUIFER DATA

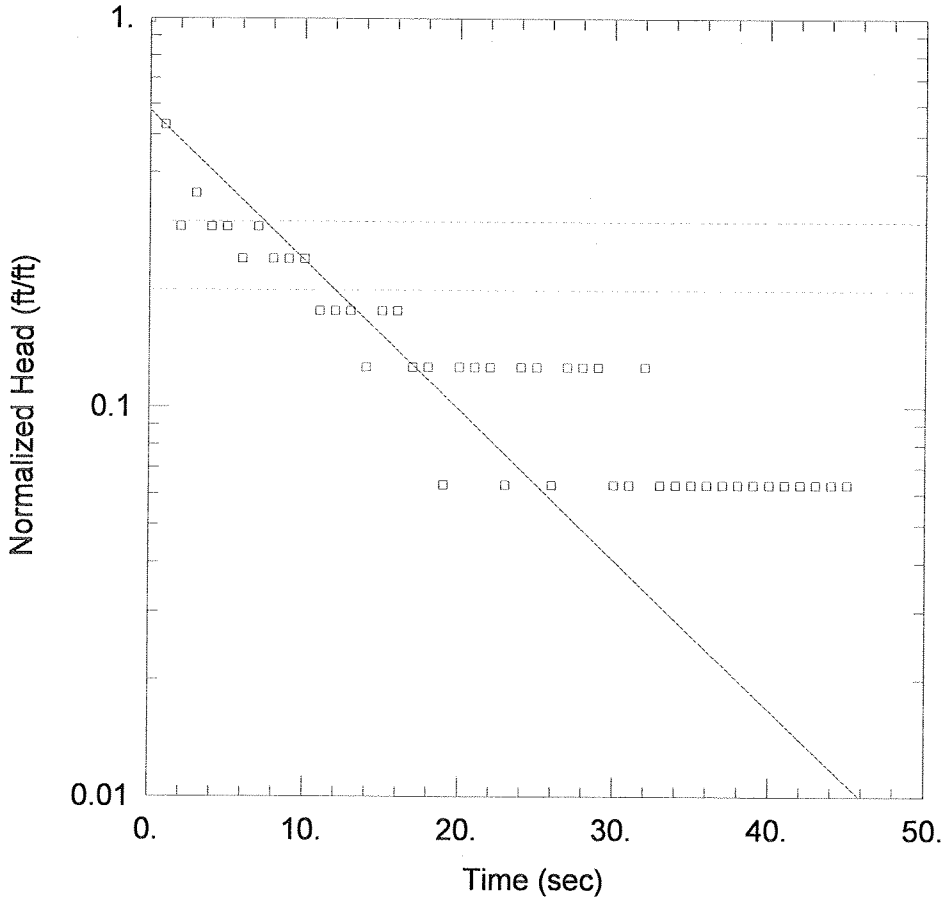
Saturated Thickness: 39.33 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-07-204B)

Initial Displacement: 4.39 ft
Total Well Penetration Depth: 39.33 ft
Casing Radius: 0.0313 ft
Static Water Column Height: 39.33 ft
Screen Length: 6.6 ft
Wellbore Radius: 0.33 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.0003561 cm/sec
y0 = 4.733 ft



WELL TEST ANALYSIS

Data Set: \\Aserver\cfs\Brpp\NC\6e\K-tests\204c.aqt
Date: 10/27/08 Time: 18:08:29

PROJECT INFORMATION

Company: SME
Client: BRPP
Project: 07089
Location: Canton, NC
Test Well: P-07-204C
Test Date: 11-28-07

AQUIFER DATA

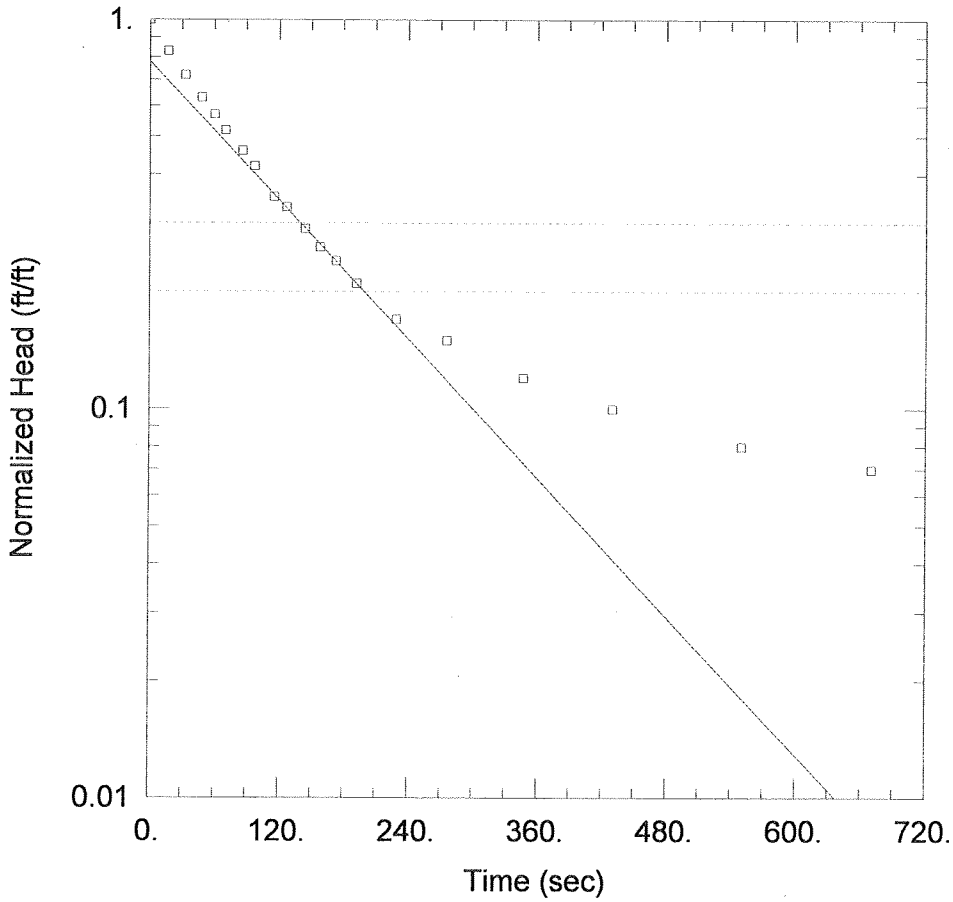
Saturated Thickness: 12.23 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-07-204C)

Initial Displacement: 0.79 ft
Total Well Penetration Depth: 12.23 ft
Casing Radius: 0.0313 ft
Static Water Column Height: 12.23 ft
Screen Length: 12.23 ft
Wellbore Radius: 0.33 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.000297 cm/sec
y0 = 0.4579 ft



WELL TEST ANALYSIS

Data Set: \\Aserver\cfs\Brpp\NC\6e\K-tests\205.aqt
Date: 10/28/08 Time: 07:52:20

PROJECT INFORMATION

Company: SME
Client: BRPP
Project: 07089
Location: Canton, NC
Test Well: P-07-205
Test Date: 11-27-07

AQUIFER DATA

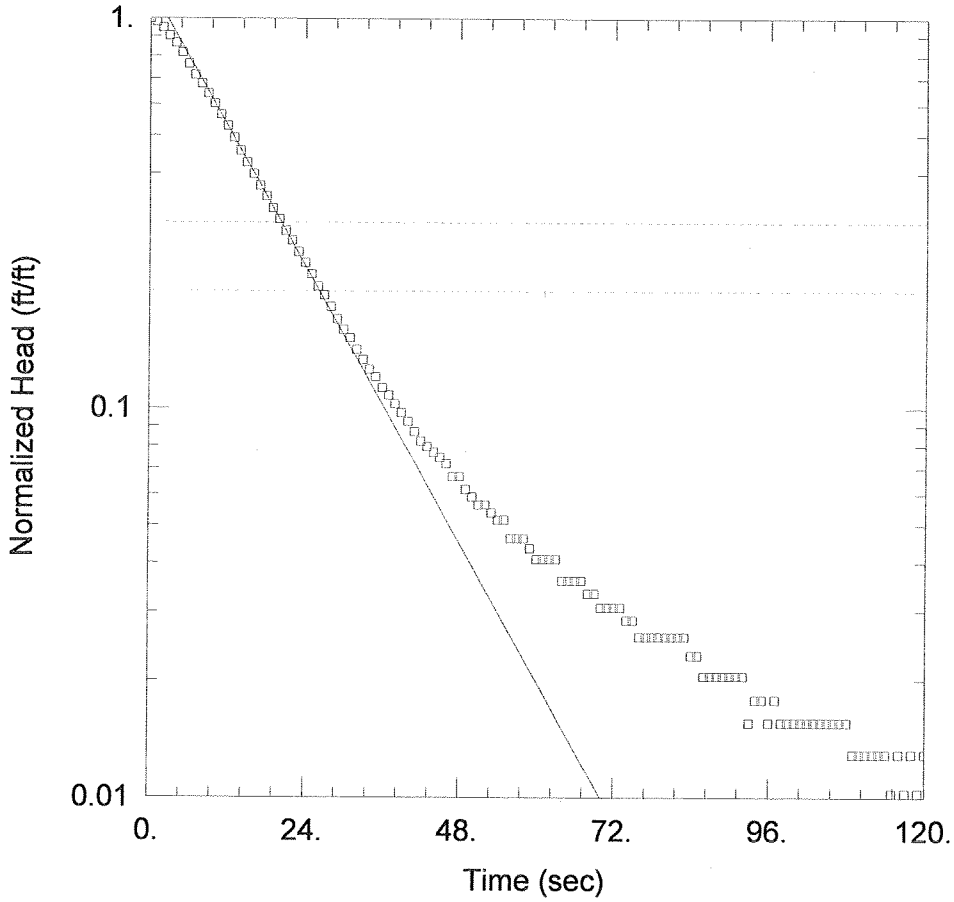
Saturated Thickness: 18.3 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-07-205)

Initial Displacement: 1. ft
Total Well Penetration Depth: 18.3 ft
Casing Radius: 0.0313 ft
Static Water Column Height: 18.3 ft
Screen Length: 18.3 ft
Wellbore Radius: 0.33 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 1.716E-5 cm/sec
y0 = 0.7814 ft



WELL TEST ANALYSIS

Data Set: \\Aserver\cfs\Brpp\NC\6e\K-tests\206a.aqt
Date: 10/27/08 Time: 20:31:42

PROJECT INFORMATION

Company: SME
Client: BRPP
Project: 07089
Location: Canton, NC
Test Well: P-07-206A
Test Date: 11-27-07

AQUIFER DATA

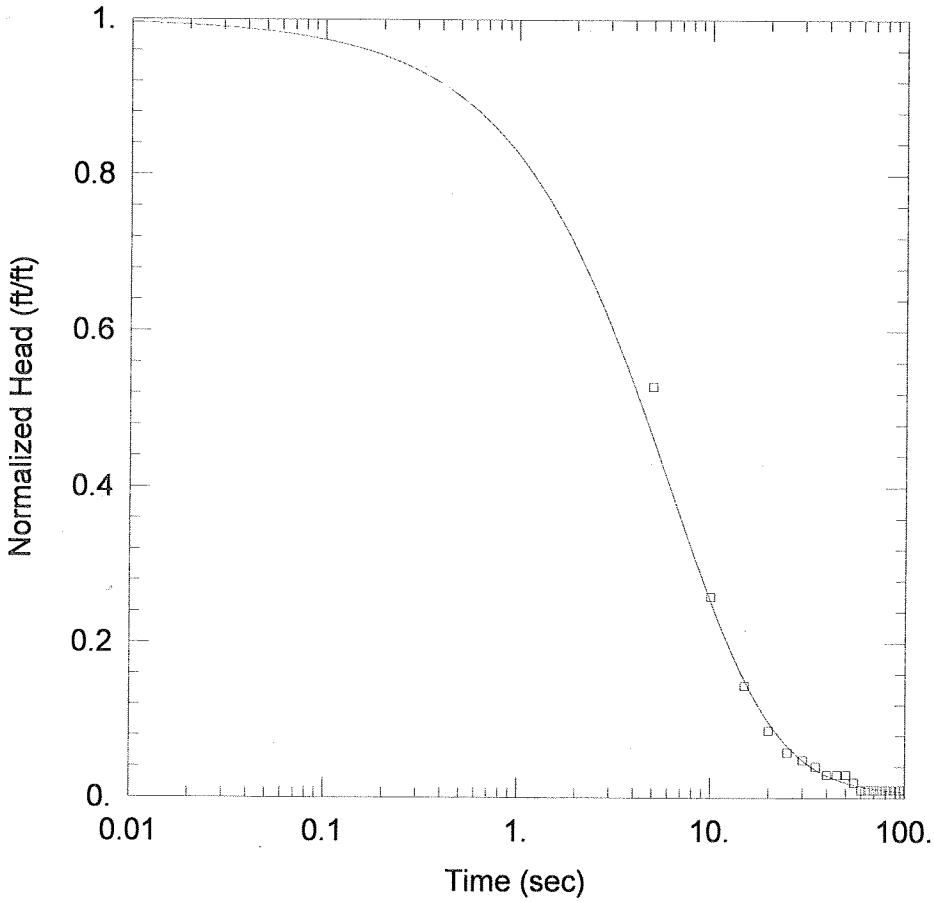
Saturated Thickness: 36.02 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-07-206A)

Initial Displacement: 2.247 ft
Total Well Penetration Depth: 36.02 ft
Casing Radius: 0.0313 ft
Static Water Column Height: 36.02 ft
Screen Length: 12. ft
Wellbore Radius: 0.125 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.0003574 cm/sec
y0 = 2.712 ft



WELL TEST ANALYSIS

Data Set: \\Aserver\cfs\Brpp\NC\6e\K-tests\206b.aqt
Date: 10/28/08 Time: 07:59:26

PROJECT INFORMATION

Company: SME
Client: BRPP
Project: 07089
Location: Canton, NC
Test Well: P-07-206B
Test Date: 11-27-07

AQUIFER DATA

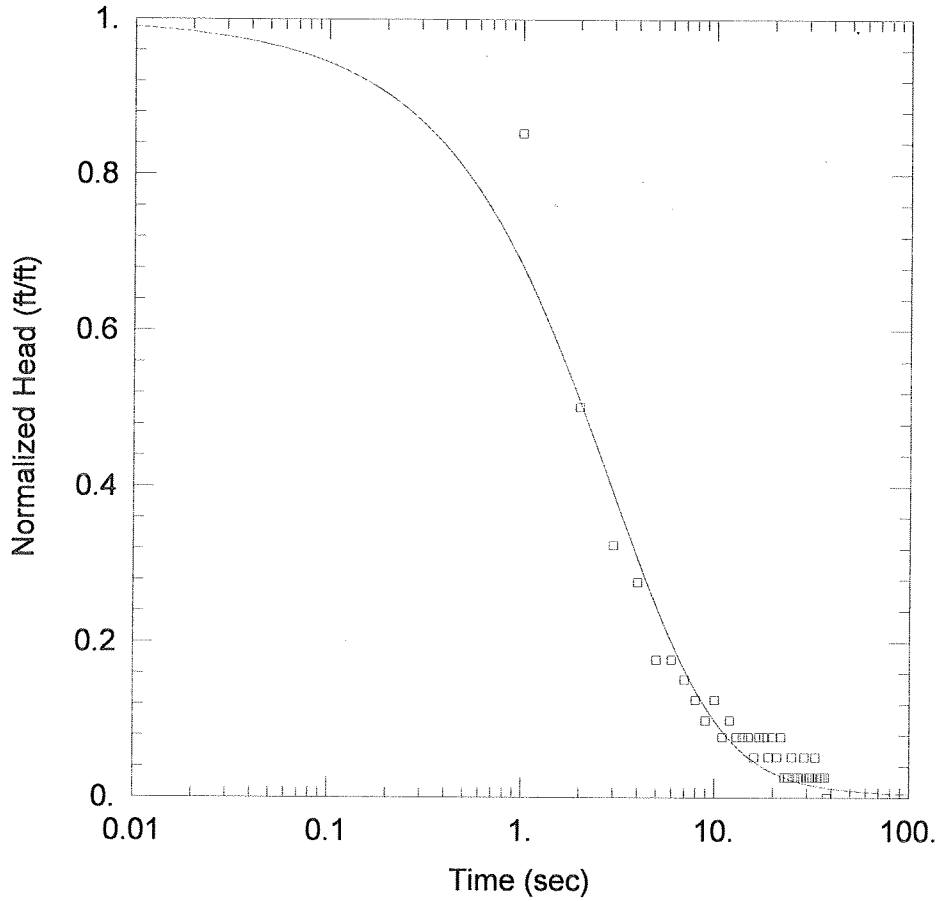
Saturated Thickness: 8.68 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-07-206B)

Initial Displacement: 0.601 ft
Total Well Penetration Depth: 8.68 ft
Casing Radius: 0.0313 ft
Static Water Column Height: 8.68 ft
Screen Length: 8.68 ft
Wellbore Radius: 0.33 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper et al.
T = 0.3531 cm^2/sec, K= 1.3×10^{-3} cm/sec
S = 1.0E-6



WELL TEST ANALYSIS

Data Set: \\Aserver\cfs\Brpp\NC\6e\K-tests\207.aqt
Date: 10/27/08 Time: 20:34:45

PROJECT INFORMATION

Company: SME
Client: BRPP
Project: 07089
Location: Canton, NC
Test Well: P-07-207
Test Date: 11-27-07

AQUIFER DATA

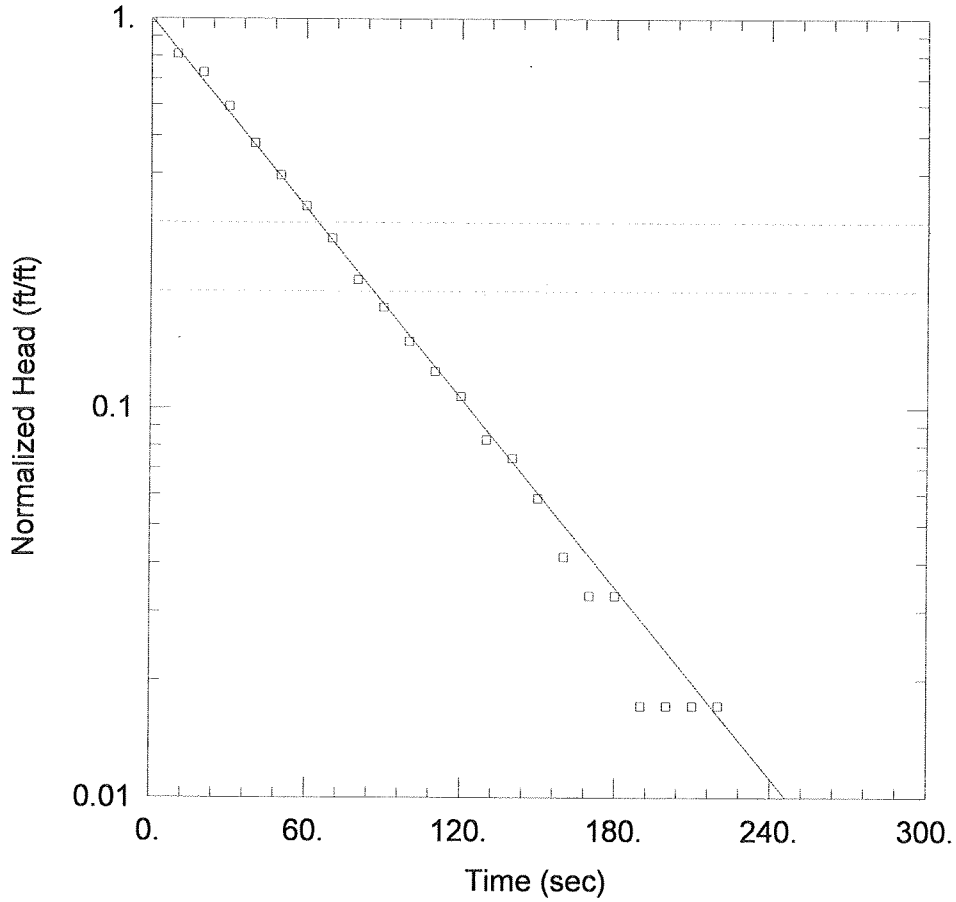
Saturated Thickness: 14.92 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-07-207)

Initial Displacement: 0.231 ft
Total Well Penetration Depth: 14.92 ft
Casing Radius: 0.0313 ft
Static Water Column Height: 14.92 ft
Screen Length: 14.92 ft
Wellbore Radius: 0.125 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper et al.
T = 0.5945 cm^2/sec, K = 1.3×10^{-3} cm/sec
S = 4.752E-5



WELL TEST ANALYSIS

Data Set: \\Aserver\cfs\Brpp\NC\6e\K-tests\208.aqt
Date: 10/27/08 Time: 18:46:42

PROJECT INFORMATION

Company: SME
Client: BRPP
Project: 07089
Location: Canton, NC
Test Well: P-07-208
Test Date: 11-27-07

AQUIFER DATA

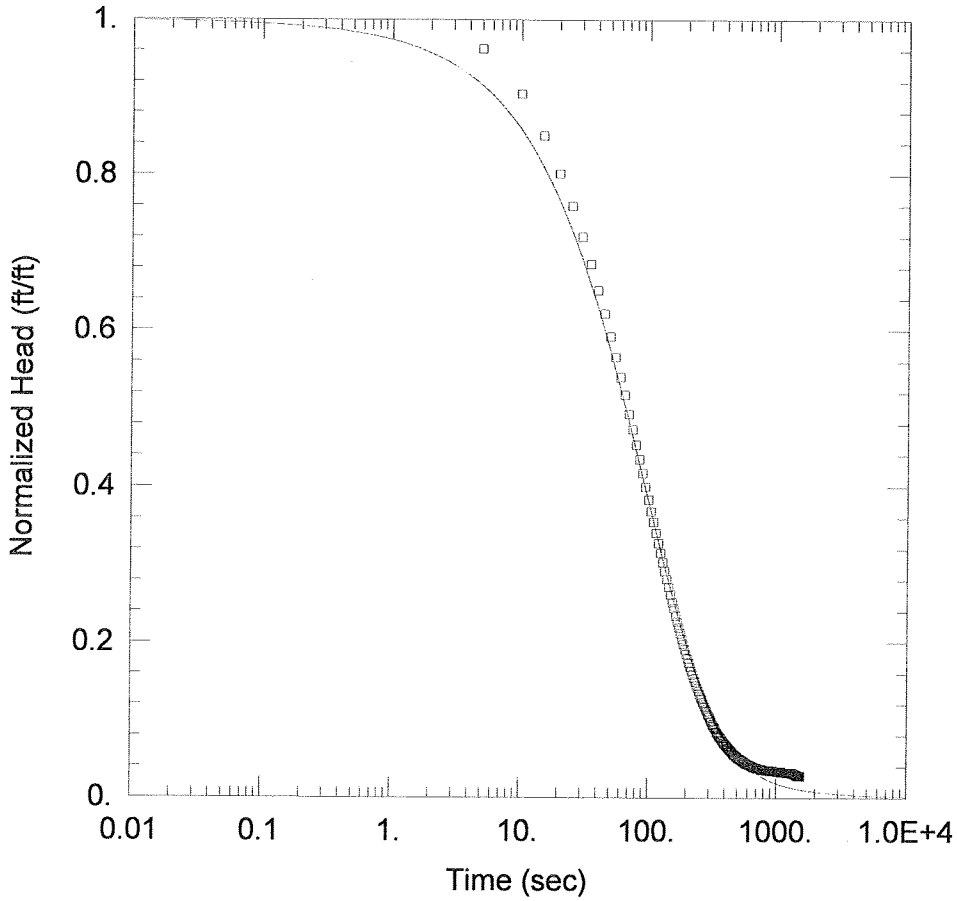
Saturated Thickness: 20.02 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (OW 1)

Initial Displacement: 0.699 ft
Total Well Penetration Depth: 20.02 ft
Casing Radius: 0.0313 ft
Static Water Column Height: 20.02 ft
Screen Length: 20.02 ft
Wellbore Radius: 0.33 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 4.402E-5 cm/sec
y0 = 0.7052 ft



WELL TEST ANALYSIS

Data Set: \\Aserver\cfs\Brpp\NC\6e\K-tests\209a.aqt
Date: 10/27/08 Time: 20:38:22

PROJECT INFORMATION

Company: SME
Client: BRPP
Project: 07089
Location: Canton, NC
Test Well: P-07-209A
Test Date: 11-29-07

AQUIFER DATA

Saturated Thickness: 28.72 ft Anisotropy Ratio (Kz/Kr): 1.

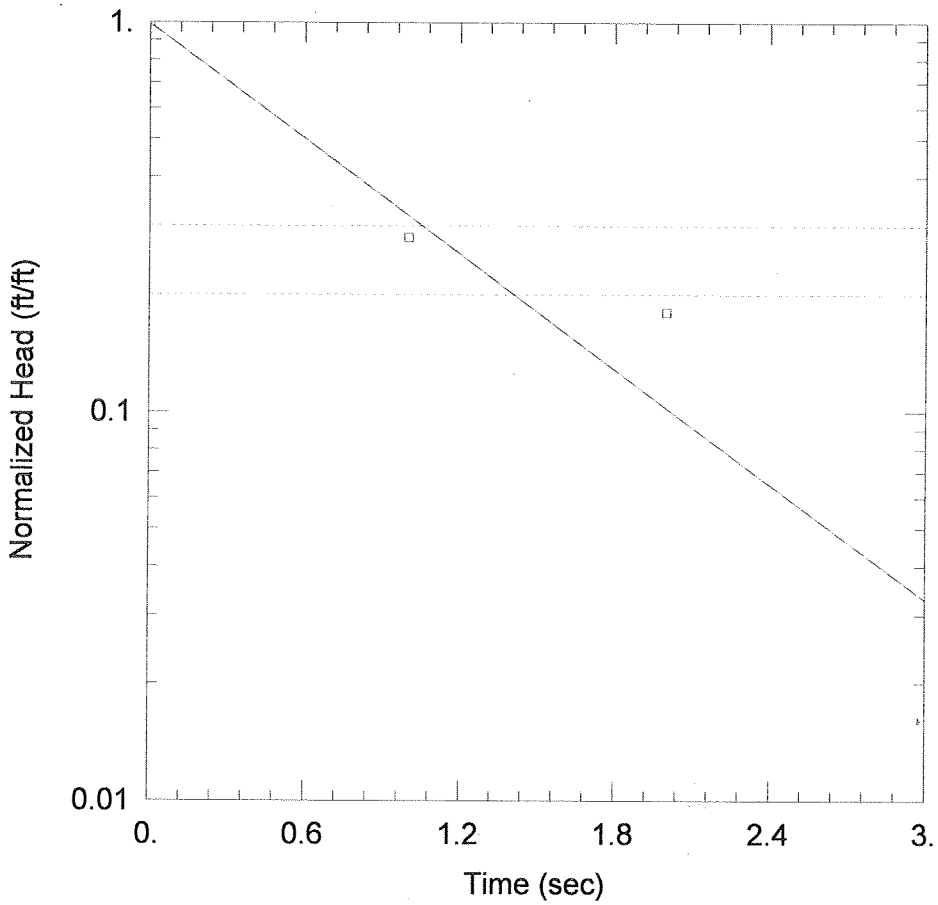
WELL DATA (P-07-209A)

Initial Displacement: 7.067 ft
Total Well Penetration Depth: 28.72 ft
Casing Radius: 0.0313 ft
Static Water Column Height: 28.72 ft
Screen Length: 11.8 ft
Wellbore Radius: 0.125 ft

SOLUTION

Aquifer Model: Confined Solution Method: Cooper et al.

T = 0.01616 cm^2/sec, K = 4.5×10^{-5} CM/SEC S = 0.0001172



WELL TEST ANALYSIS

Data Set: \\Aserver\cfs\Brpp\NC\6e\K-tests\209b.aqt
Date: 10/27/08 Time: 18:49:11

PROJECT INFORMATION

Company: SME
Client: BRPP
Project: 07089
Location: Canton, NC
Test Well: P-07-209B
Test Date: 11-29-07

AQUIFER DATA

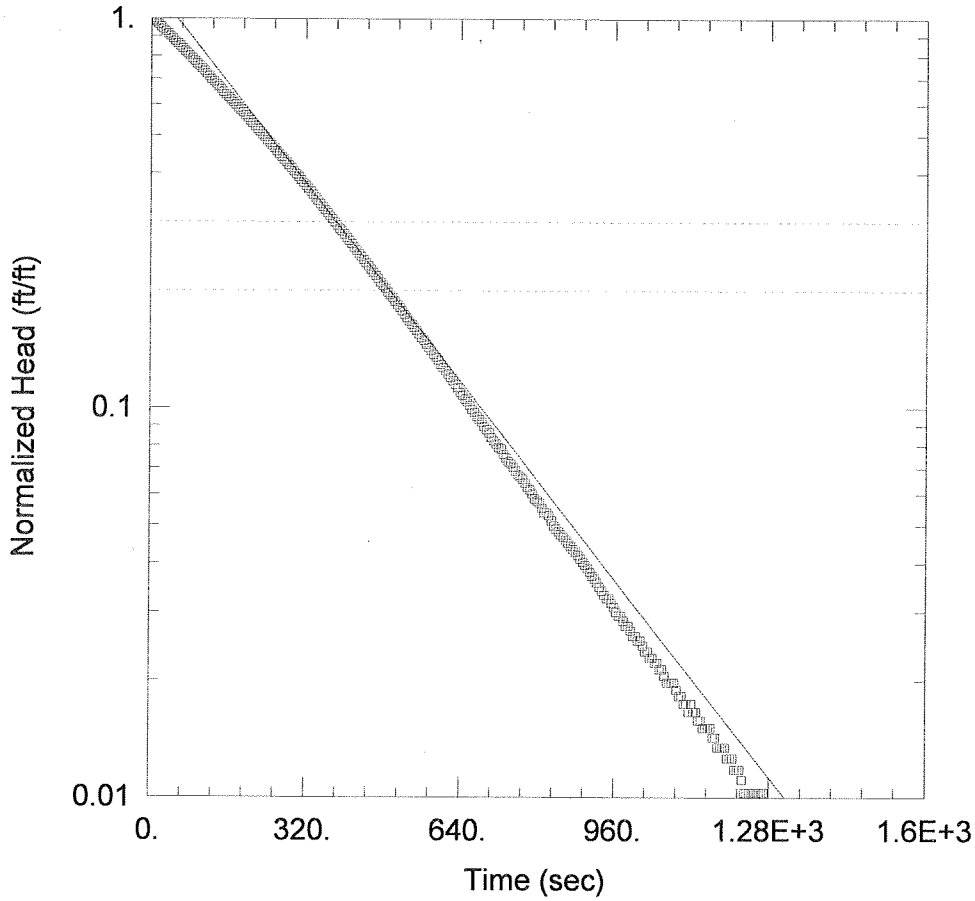
Saturated Thickness: 6. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-07-209B)

Initial Displacement: 0.5 ft
Total Well Penetration Depth: 6. ft
Casing Radius: 0.0313 ft
Static Water Column Height: 6. ft
Screen Length: 6. ft
Wellbore Radius: 0.33 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.006044 cm/sec
y0 = 0.4971 ft



WELL TEST ANALYSIS

Data Set: \\Aserver\cfs\Brpp\NC\6e\K-tests\210a.aqt
Date: 10/27/08 Time: 20:44:04

PROJECT INFORMATION

Company: SME
Client: BRPP
Project: 07089
Location: Canton, NC
Test Well: P-07-210A
Test Date: 11-29-07

AQUIFER DATA

Saturated Thickness: 35.62 ft
Anisotropy Ratio (Kz/Kr): 1.

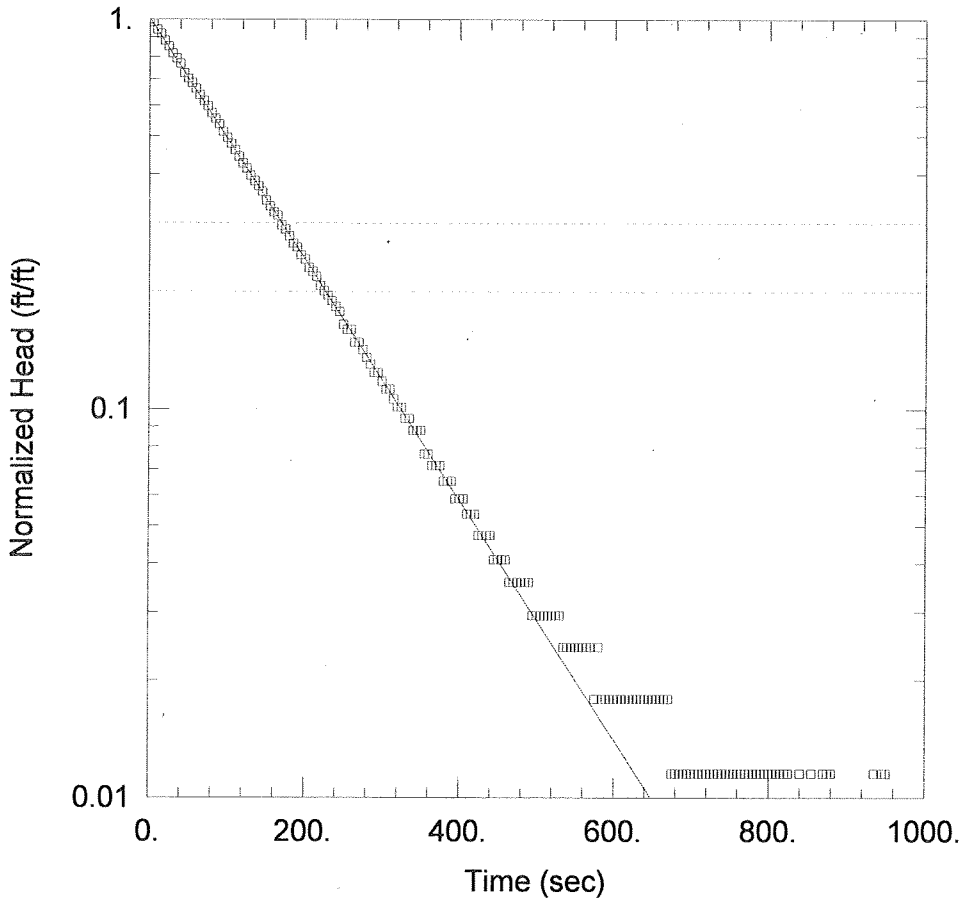
WELL DATA (P-07-210A)

Initial Displacement: 7.288 ft
Total Well Penetration Depth: 35.62 ft
Casing Radius: 0.0313 ft
Static Water Column Height: 35.62 ft
Screen Length: 6.6 ft
Wellbore Radius: 0.125 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 3.358E-5 cm/sec
y0 = 8.913 ft



WELL TEST ANALYSIS

Data Set: \\Aserver\cfs\Brpp\NC\6e\K-tests\211a.aqt
Date: 10/28/08 Time: 08:36:24

PROJECT INFORMATION

Company: SME
Client: BRPP
Project: 07089
Location: Canton, NC
Test Well: P-07-211A
Test Date: 11-29-07

AQUIFER DATA

Saturated Thickness: 174. ft Anisotropy Ratio (Kz/Kr): 1.

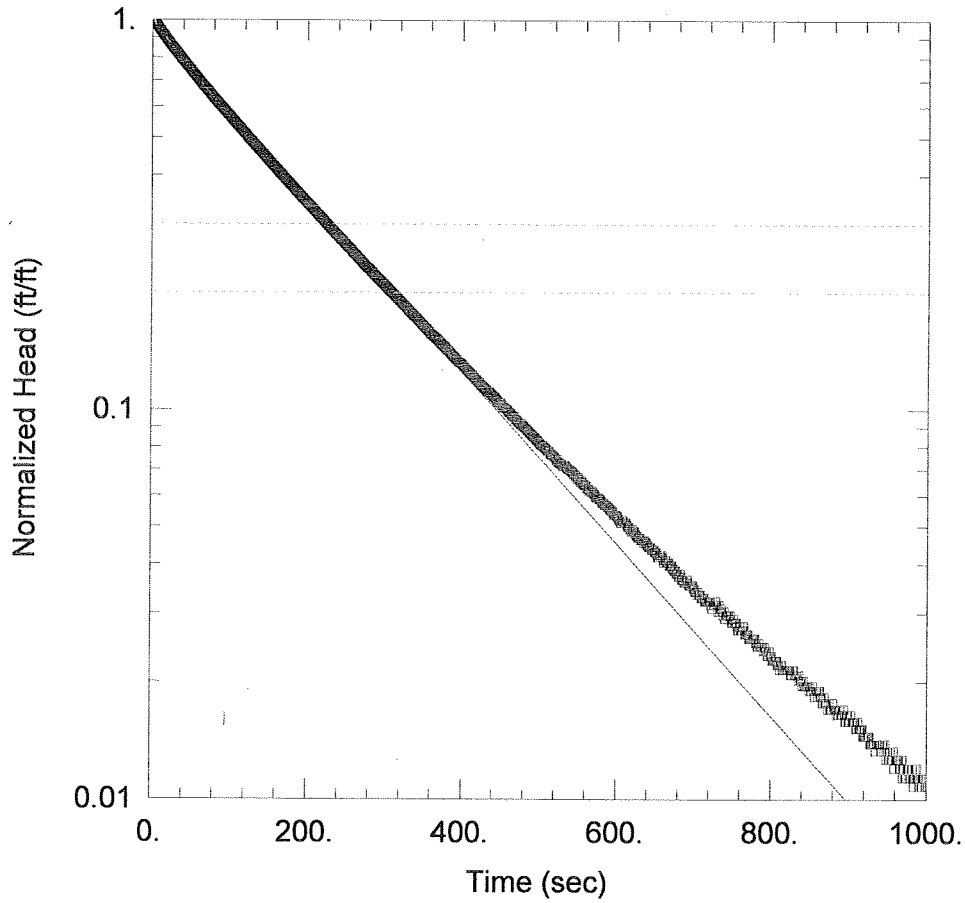
WELL DATA (P-07-211A)

Initial Displacement: 7.81 ft Static Water Column Height: 174. ft
Total Well Penetration Depth: 174. ft Screen Length: 12. ft
Casing Radius: 0.0313 ft Wellbore Radius: 0.125 ft

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice

K = 4.527E-5 cm/sec y0 = 7.904 ft



WELL TEST ANALYSIS

Data Set: \\Aserver\cfs\Brpp\NC\6e\K-tests\211b.aqt
Date: 10/28/08 Time: 08:36:35

PROJECT INFORMATION

Company: SME
Client: BRPP
Project: 07089
Location: Canton, NC
Test Well: P-07-211B
Test Date: 11-29-07

AQUIFER DATA

Saturated Thickness: 68.02 ft
Anisotropy Ratio (Kz/Kr): 1.

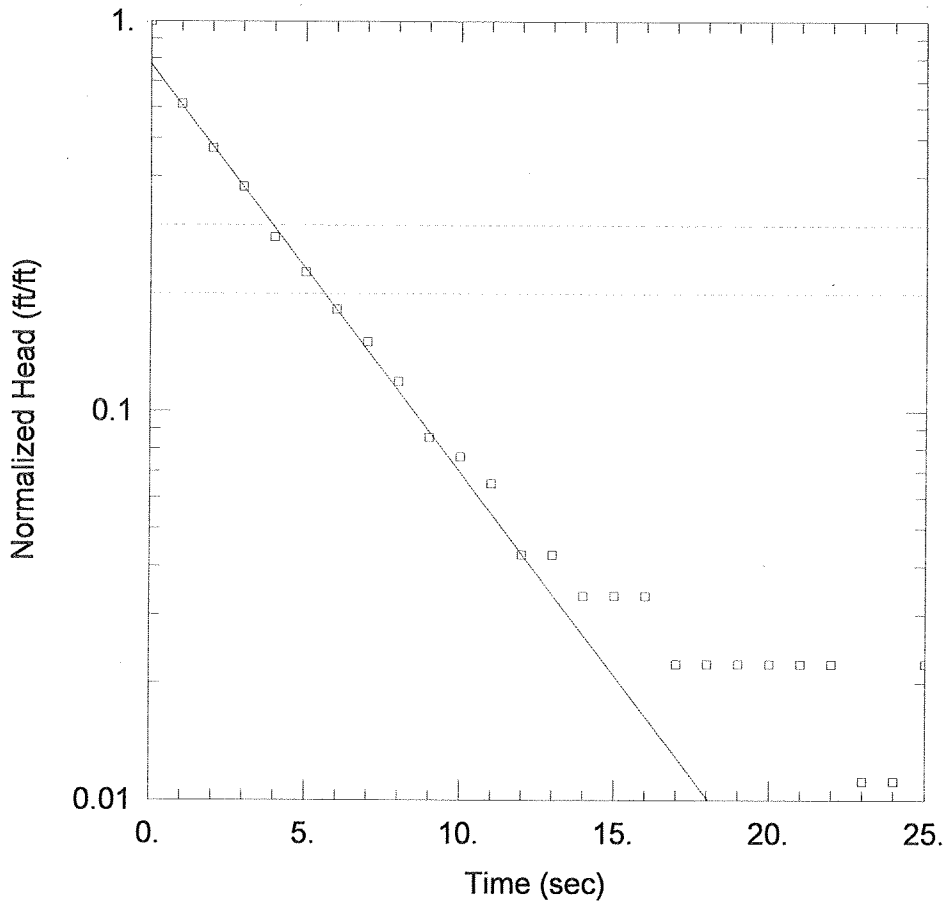
WELL DATA (P-07-211B)

Initial Displacement: 9.148 ft
Total Well Penetration Depth: 68.02 ft
Casing Radius: 0.0313 ft
Static Water Column Height: 68.03 ft
Screen Length: 8.8 ft
Wellbore Radius: 0.125 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

K = 3.887E-5 cm/sec
y0 = 8.808 ft



WELL TEST ANALYSIS

Data Set: \\Aserver\cfs\Brpp\NC\6e\K-tests\211d.aqt
Date: 10/27/08 Time: 18:51:21

PROJECT INFORMATION

Company: SME
Client: BRPP
Project: 07089
Location: Canton, NC
Test Well: P-07-211D
Test Date: 11-29-07

AQUIFER DATA

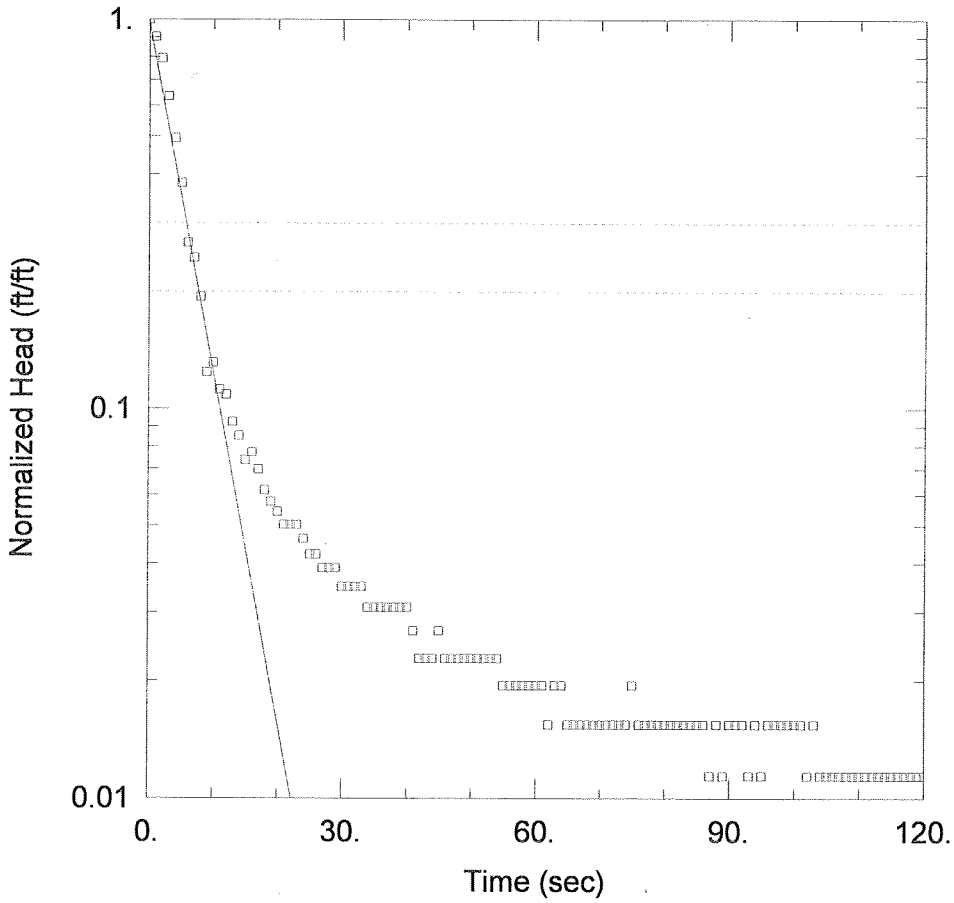
Saturated Thickness: 2.3 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-07-211D)

Initial Displacement: 0.537 ft
Total Well Penetration Depth: 2.3 ft
Casing Radius: 0.0313 ft
Static Water Column Height: 2.3 ft
Screen Length: 2.3 ft
Wellbore Radius: 0.33 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.002171 cm/sec
y0 = 0.417 ft



WELL TEST ANALYSIS

Data Set: \\Aserver\cfs\Brpp\NC\6e\K-tests\212aBR.aqt
Date: 10/28/08 Time: 10:02:26

PROJECT INFORMATION

Company: SME
Client: BRPP
Project: 07089
Location: Canton, NC
Test Well: P-07-212A
Test Date: 11-29-07

AQUIFER DATA

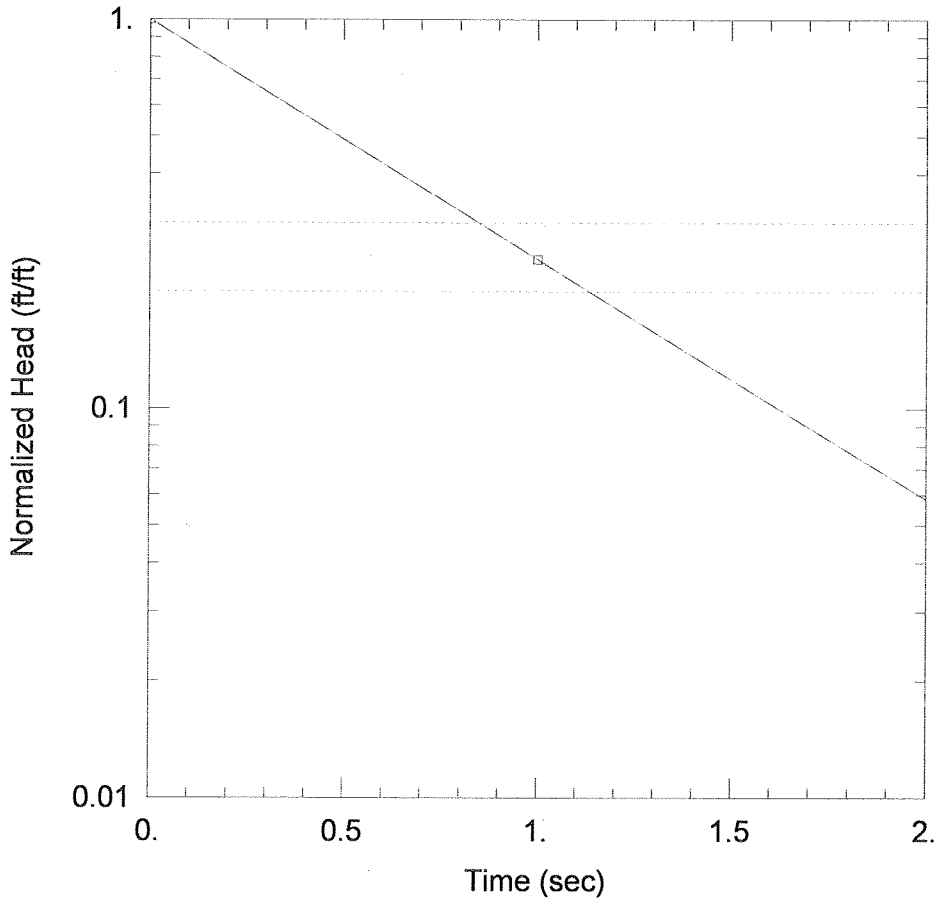
Saturated Thickness: 14.23 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-07-212A)

Initial Displacement: 1.49 ft
Total Well Penetration Depth: 14.23 ft
Casing Radius: 0.0313 ft
Static Water Column Height: 14.23 ft
Screen Length: 3. ft
Wellbore Radius: 0.125 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.003349 cm/sec
y0 = 1.478 ft



WELL TEST ANALYSIS

Data Set: \\Aserver\cfs\Brpp\NC\6e\K-tests\213.aqt
Date: 10/27/08 Time: 20:50:15

PROJECT INFORMATION

Company: SME
Client: BRPP
Project: 07089
Location: Canton, NC
Test Well: P-07-213
Test Date: 11-29-07

AQUIFER DATA

Saturated Thickness: 21.42 ft
Anisotropy Ratio (Kz/Kr): 1.

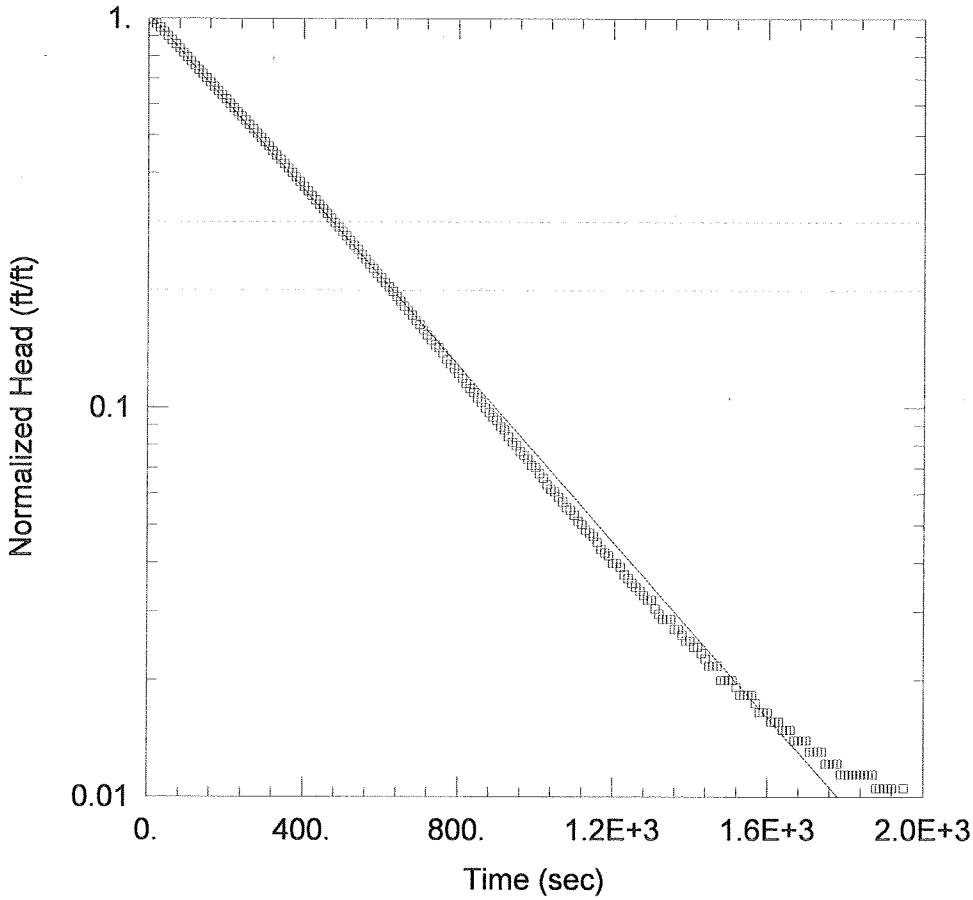
WELL DATA (P-07-213)

Initial Displacement: 1.622 ft
Total Well Penetration Depth: 21.4 ft
Casing Radius: 0.0313 ft
Static Water Column Height: 21.42 ft
Screen Length: 21.4 ft
Wellbore Radius: 0.125 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.00419 cm/sec
y0 = 1.622 ft



WELL TEST ANALYSIS

Data Set: \\Aserver\cfs\Brpp\NC\6e\K-tests\214a.aqt
Date: 10/28/08 Time: 08:36:49

PROJECT INFORMATION

Company: SME
Client: BRPP
Project: 07089
Location: Canton, NC
Test Well: P-07-214A
Test Date: 11-29-07

AQUIFER DATA

Saturated Thickness: 36.45 ft Anisotropy Ratio (Kz/Kr): 1.

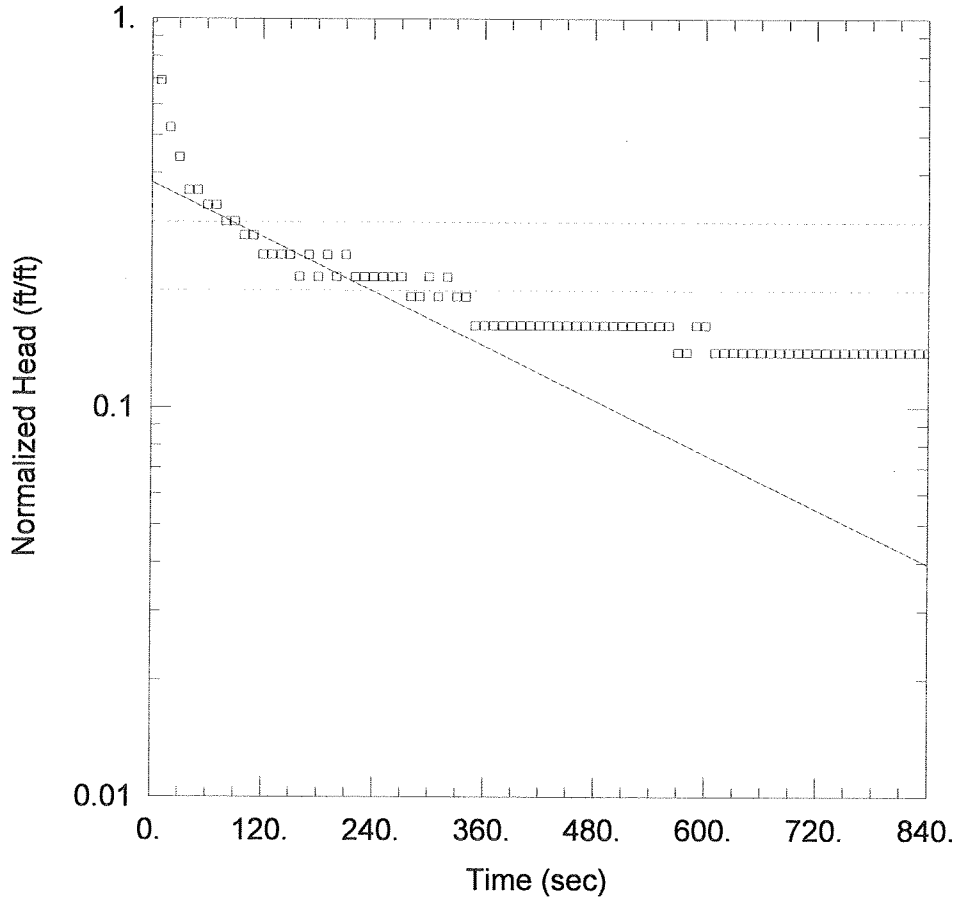
WELL DATA (P-07-214A)

Initial Displacement: 6.659 ft
Total Well Penetration Depth: 36.45 ft
Casing Radius: 0.0313 ft
Static Water Column Height: 36.45 ft
Screen Length: 6. ft
Wellbore Radius: 0.125 ft

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice

K = 2.617E-5 cm/sec y0 = 6.868 ft



WELL TEST ANALYSIS

Data Set: \\Aserver\cfs\Brpp\NC\6e\K-tests\214bBR.aqt
Date: 10/28/08 Time: 09:46:12

PROJECT INFORMATION

Company: SME
Client: BRPP
Project: 07089
Location: Canton, NC
Test Well: P-07-214B
Test Date: 11-29-07

AQUIFER DATA

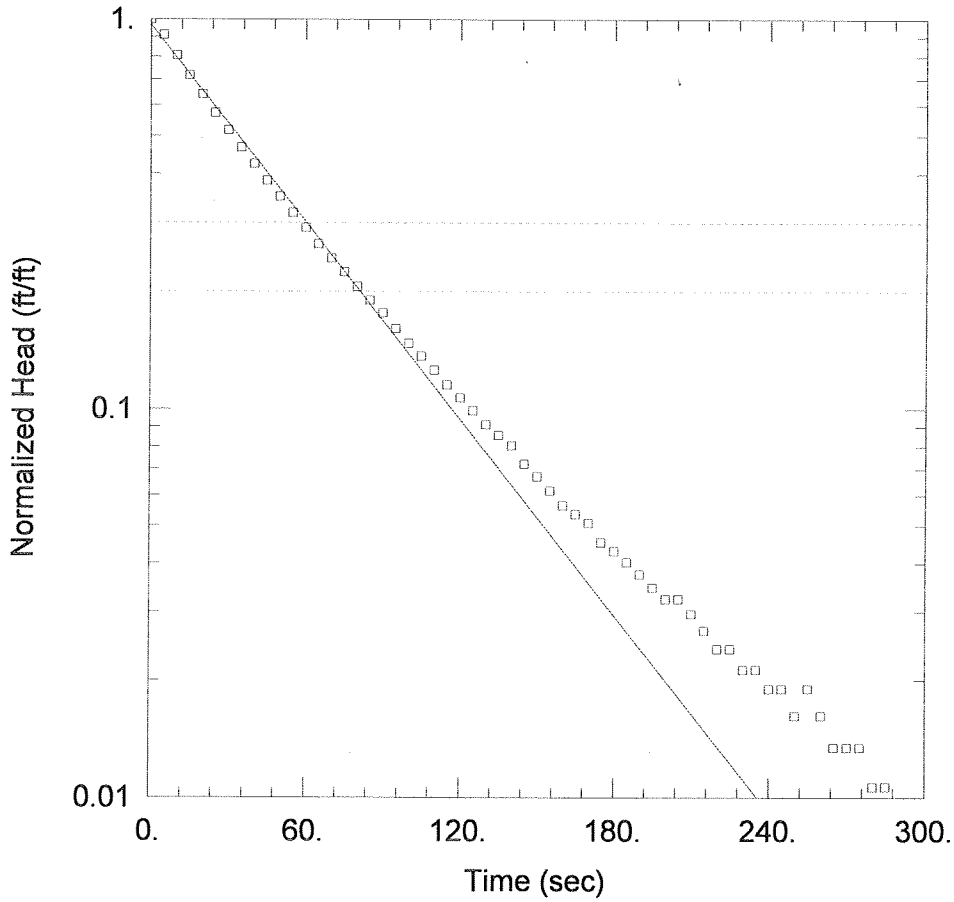
Saturated Thickness: 15.75 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-07-214B)

Initial Displacement: 1.66 ft
Total Well Penetration Depth: 15.75 ft
Casing Radius: 0.0313 ft
Static Water Column Height: 15.75 ft
Screen Length: 15.75 ft
Wellbore Radius: 0.33 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 7.539E-6 cm/sec
y0 = 0.6301 ft



WELL TEST ANALYSIS

Data Set: \\Aserver\cfs\Brpp\NC\6e\K-tests\215a.aqt
Date: 10/28/08 Time: 08:37:02

PROJECT INFORMATION

Company: SME
Client: BRPP
Project: 07089
Location: Canton, NC
Test Well: P-07-215A
Test Date: 11-30-07

AQUIFER DATA

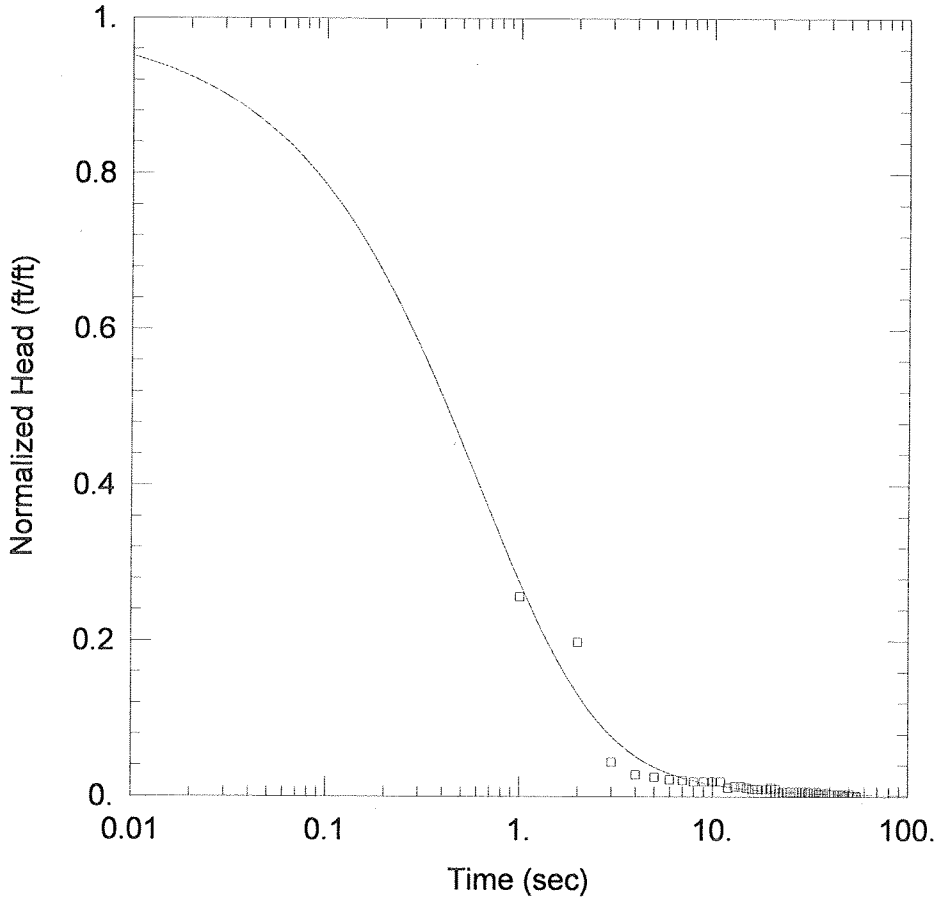
Saturated Thickness: 55.28 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-07-215A)

Initial Displacement: 2.16 ft
Total Well Penetration Depth: 55.28 ft
Casing Radius: 0.0313 ft
Static Water Column Height: 55.28 ft
Screen Length: 11.5 ft
Wellbore Radius: 0.125 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.000112 cm/sec
y0 = 2.092 ft



WELL TEST ANALYSIS

Data Set: \\Aserver\cfs\Brpp\NC\6e\K-tests\215b.aqt
Date: 10/27/08 Time: 21:01:50

PROJECT INFORMATION

Company: SME
Client: BRPP
Project: 07089
Location: Canton, NC
Test Well: P-07-215B
Test Date: 11-30-07

AQUIFER DATA

Saturated Thickness: 1.9 ft
Anisotropy Ratio (Kz/Kr): 1.

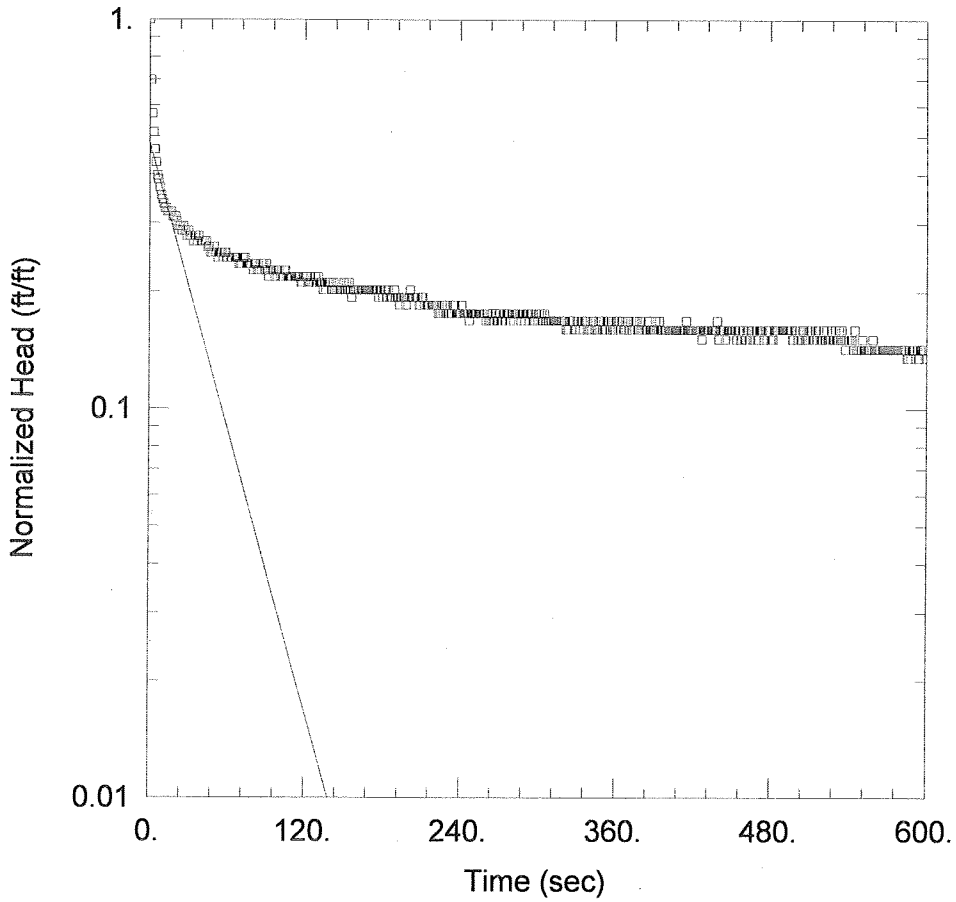
WELL DATA (P-07-215B)

Initial Displacement: 3.667 ft
Total Well Penetration Depth: 1.9 ft
Casing Radius: 0.0313 ft
Static Water Column Height: 1.9 ft
Screen Length: 1.9 ft
Wellbore Radius: 0.33 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper et al.

T = 1.797 cm^2/sec , K= 3.1×10^{-2} cm/sec
S = 9.962E-5



WELL TEST ANALYSIS

Data Set: \\Aserver\cfs\Brpp\NC\6e\K-tests\215c.aqt
Date: 10/27/08 Time: 21:35:00

PROJECT INFORMATION

Company: SME
Client: BRPP
Project: 07089
Location: Canton, NC
Test Well: P-07-215C
Test Date: 11-30-07

AQUIFER DATA

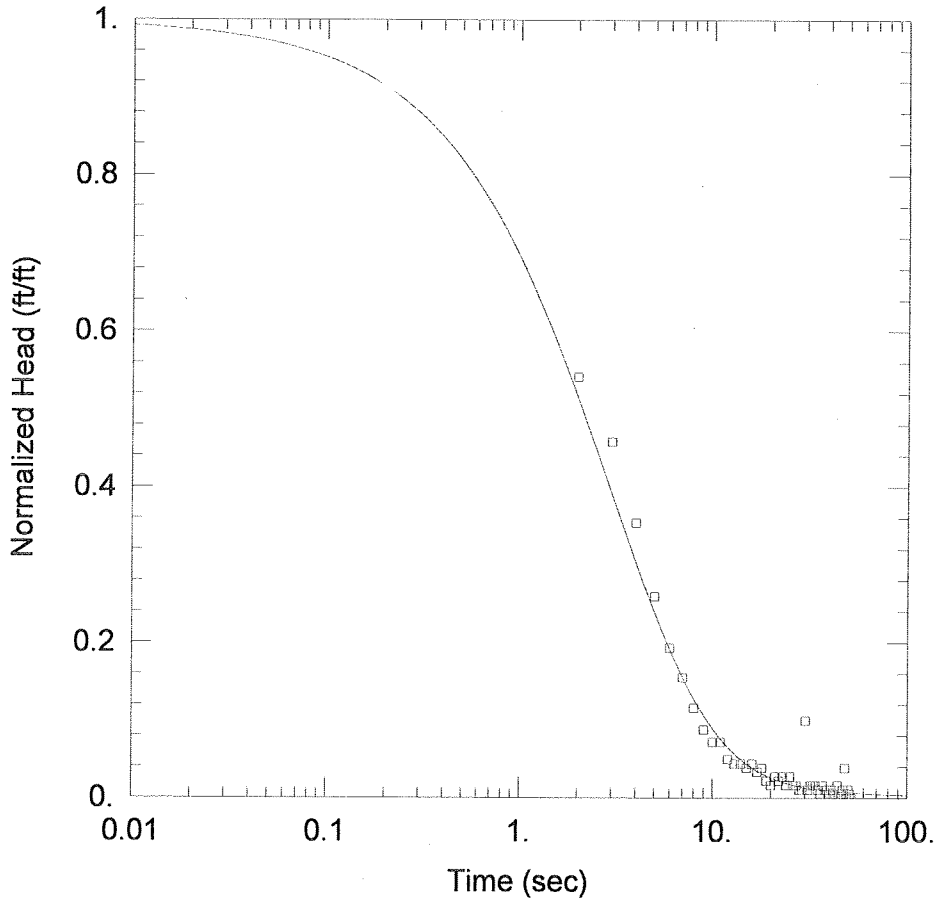
Saturated Thickness: 3.5 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-07-215C)

Initial Displacement: 0.687 ft
Total Well Penetration Depth: 3.5 ft
Casing Radius: 0.0313 ft
Static Water Column Height: 3.5 ft
Screen Length: 3.5 ft
Wellbore Radius: 0.33 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.0002019 cm/sec
y0 = 0.3337 ft



WELL TEST ANALYSIS

Data Set: \\Aserver\cfs\Brpp\NC\6e\K-tests\216.aqt
Date: 10/27/08 Time: 19:52:11

PROJECT INFORMATION

Company: SME
Client: BRPP
Project: 07089
Location: Canton, NC
Test Well: P-07-216
Test Date: 11-29-07

AQUIFER DATA

Saturated Thickness: 16.7 ft
Anisotropy Ratio (Kz/Kr): 1.

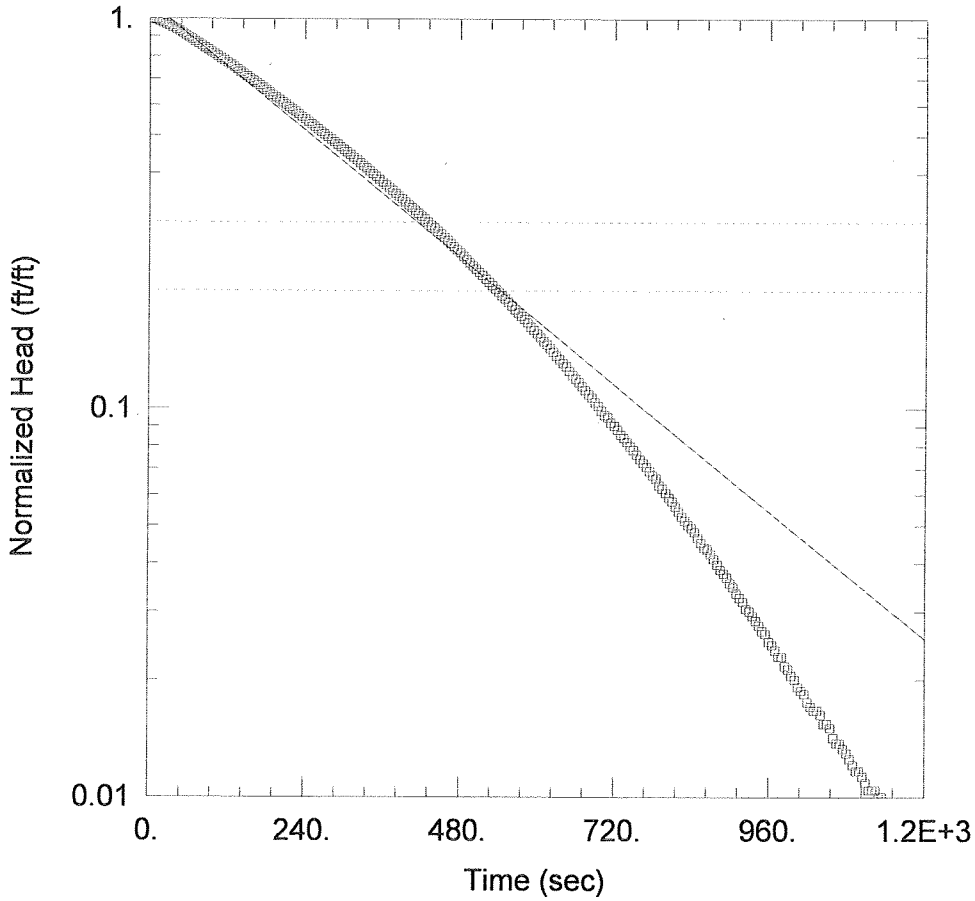
WELL DATA (P-07-216)

Initial Displacement: 1.045 ft
Total Well Penetration Depth: 16.7 ft
Casing Radius: 0.0313 ft
Static Water Column Height: 16.7 ft
Screen Length: 16.7 ft
Wellbore Radius: 0.33 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper et al.

T = 0.7446 cm^2/sec , K= 1.5×10^{-3} cm/sec
S = 1.0E-6



WELL TEST ANALYSIS

Data Set: \\Aserver\cfs\Brpp\NC\6e\K-tests\217a.aqt
Date: 10/28/08 Time: 08:37:36

PROJECT INFORMATION

Company: SME
Client: BRPP
Project: 07089
Location: Canton, NC
Test Well: P-07-217A
Test Date: 12-1-07

AQUIFER DATA

Saturated Thickness: 120.9 ft
Anisotropy Ratio (Kz/Kr): 1.

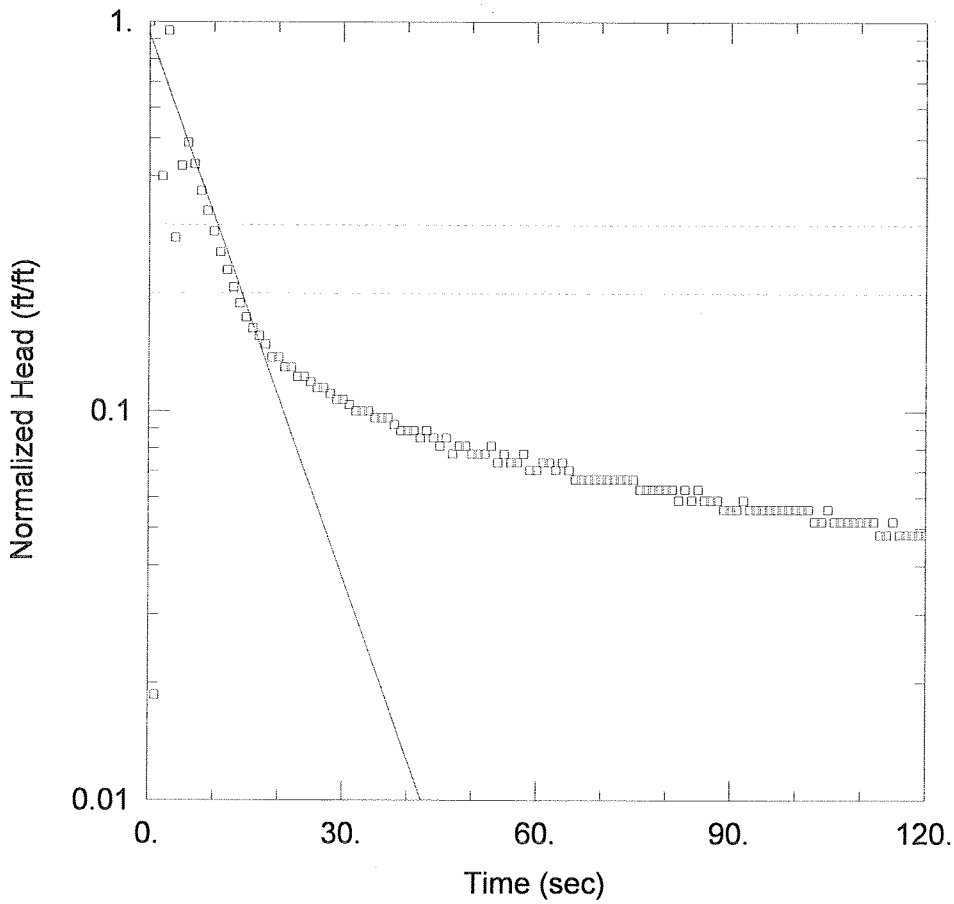
WELL DATA (P-07-217A)

Initial Displacement: 13.8 ft
Total Well Penetration Depth: 120.9 ft
Casing Radius: 0.0313 ft
Static Water Column Height: 120.9 ft
Screen Length: 21.3 ft
Wellbore Radius: 0.125 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

K = 1.117E-5 cm/sec
y0 = 15.17 ft



WELL TEST ANALYSIS

Data Set: \\Aserver\cfs\Brpp\NC\6e\K-tests\217b.aqt
Date: 10/27/08 Time: 20:54:22

PROJECT INFORMATION

Company: SME
Client: BRPP
Project: 07089
Location: Canton, NC
Test Well: P-07-217B
Test Date: 12-1-07

AQUIFER DATA

Saturated Thickness: 14.9 ft
Anisotropy Ratio (Kz/Kr): 1.

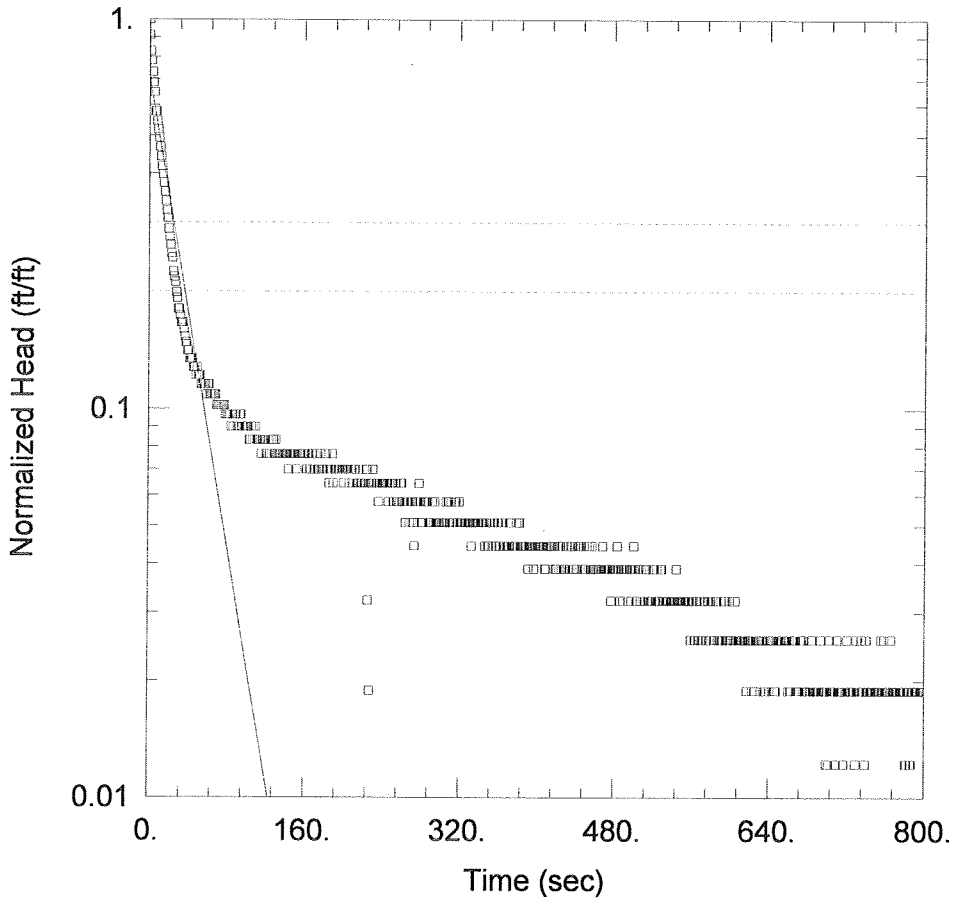
WELL DATA (P-07-217B)

Initial Displacement: 1.559 ft
Total Well Penetration Depth: 14.9 ft
Casing Radius: 0.0313 ft
Static Water Column Height: 14.9 ft
Screen Length: 14.9 ft
Wellbore Radius: 0.125 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.000396 cm/sec
y0 = 1.458 ft



WELL TEST ANALYSIS

Data Set: \\Aserver\cfs\Brpp\NC\6e\K-tests\218.aqt
Date: 10/27/08 Time: 19:01:23

PROJECT INFORMATION

Company: SME
Client: BRPP
Project: 07089
Location: Canton, NC
Test Well: P-07-218
Test Date: 12-1-07

AQUIFER DATA

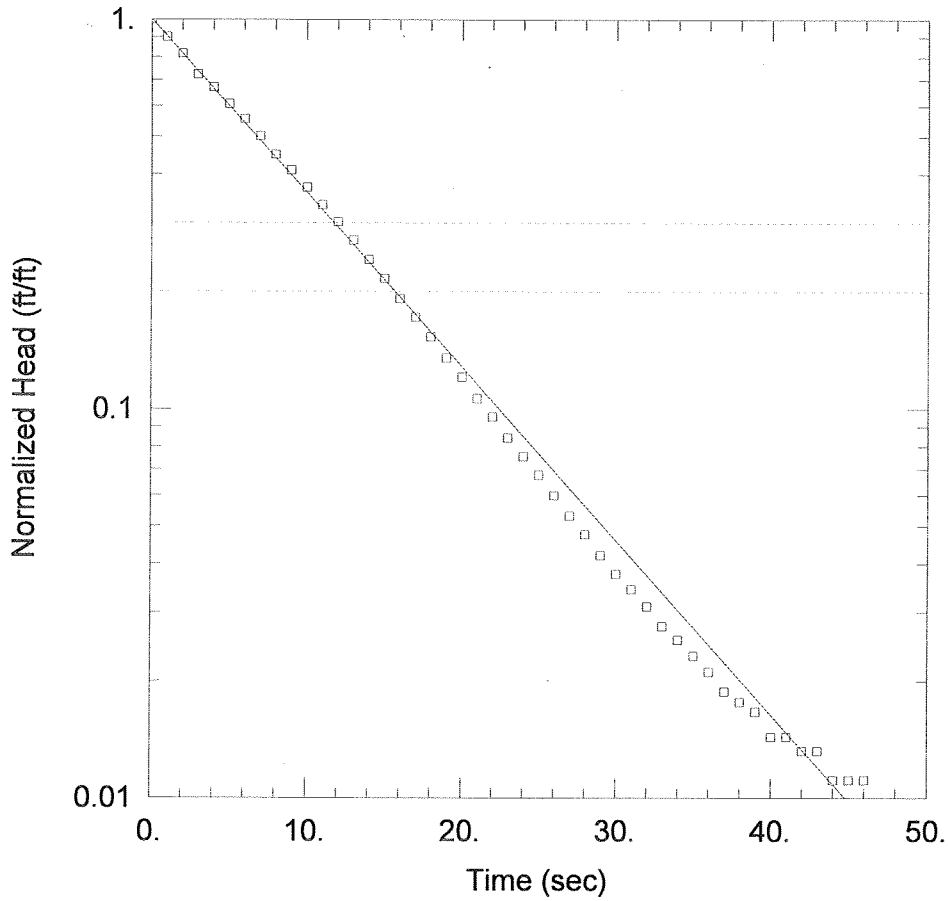
Saturated Thickness: 14.7 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-07-218)

Initial Displacement: 0.9 ft
Total Well Penetration Depth: 14.7 ft
Casing Radius: 0.0313 ft
Static Water Column Height: 14.7 ft
Screen Length: 14.7 ft
Wellbore Radius: 0.125 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.000128 cm/sec
y0 = 0.6448 ft



WELL TEST ANALYSIS

Data Set: \\Aserver\cfs\Brpp\NC\6e\K-tests\219a.aqt
Date: 10/27/08 Time: 19:04:39

PROJECT INFORMATION

Company: SME
Client: BRPP
Project: 07089
Location: Canton, NC
Test Well: P-07-219A
Test Date: 11-30-07

AQUIFER DATA

Saturated Thickness: 48.3 ft Anisotropy Ratio (Kz/Kr): 1.

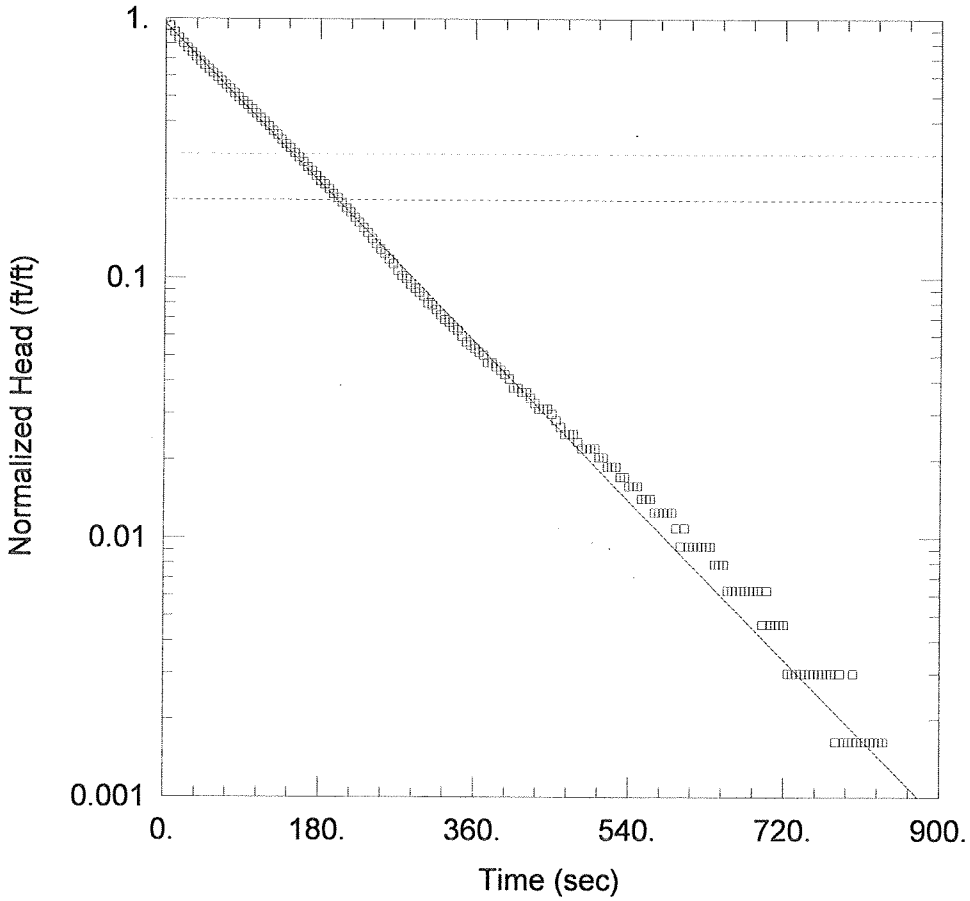
WELL DATA (P-07-219A)

Initial Displacement: 5.209 ft Static Water Column Height: 48.3 ft
Total Well Penetration Depth: 48.3 ft Screen Length: 6. ft
Casing Radius: 0.0313 ft Wellbore Radius: 0.125 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.001075 cm/sec y0 = 5.249 ft



WELL TEST ANALYSIS

Data Set: \\Aserver\cfs\Brpp\NC\6e\K-tests\219b.aqt
Date: 10/27/08 Time: 21:04:26

PROJECT INFORMATION

Company: SME
Client: BRPP
Project: 07089
Location: Canton, NC
Test Well: P-07-219B
Test Date: 11-30-07

AQUIFER DATA

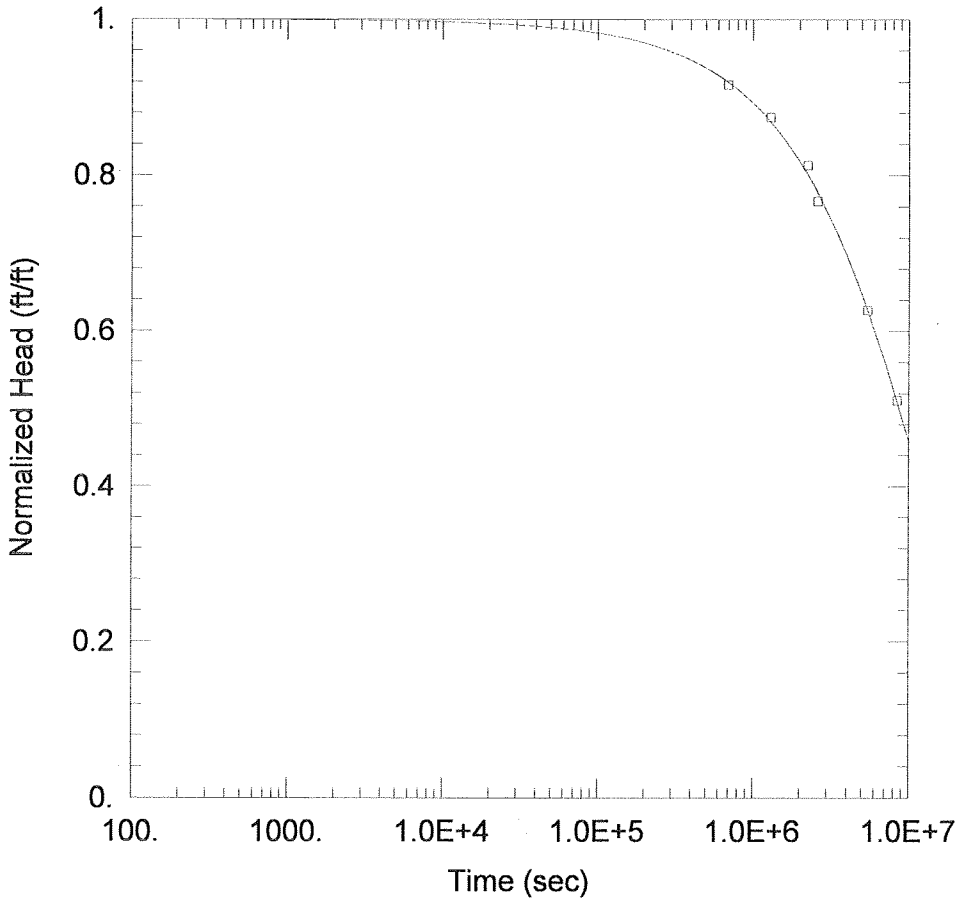
Saturated Thickness: 10.2 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-07-219B)

Initial Displacement: 3.667 ft
Total Well Penetration Depth: 10.2 ft
Casing Radius: 0.0313 ft
Static Water Column Height: 10.2 ft
Screen Length: 10.2 ft
Wellbore Radius: 0.33 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 2.98E-5 cm/sec
y0 = 3.518 ft



WELL TEST ANALYSIS

Data Set: \\Aserver\cfs\Brpp\NC\6e\K-tests\221a.aqt
Date: 10/28/08 Time: 15:14:51

PROJECT INFORMATION

Company: SME
Client: BRPP
Project: 07089
Location: Canton, NC
Test Well: P-07-221A
Test Date: 9-24-07

AQUIFER DATA

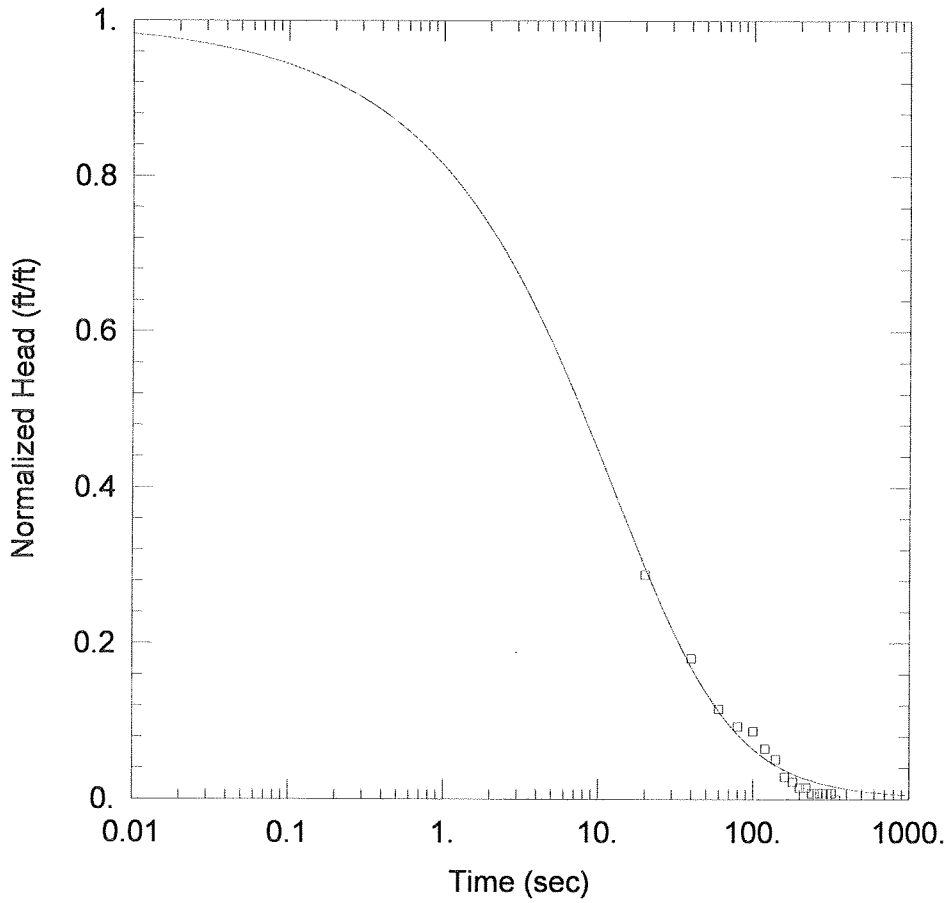
Saturated Thickness: 19.8 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-07-221A)

Initial Displacement: 38.35 ft
Total Well Penetration Depth: 19.8 ft
Casing Radius: 0.0313 ft
Static Water Column Height: 19.8 ft
Screen Length: 6. ft
Wellbore Radius: 0.125 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper et al.
T = 1.507E-7 cm^2/sec, K = 8.2×10^{-10} cm/sec
S = 2.956E-5



WELL TEST ANALYSIS

Data Set: \\Aserver\cfs\Brpp\NC\6e\K-tests\221b.aqt
Date: 10/27/08 Time: 19:12:17

PROJECT INFORMATION

Company: SME
Client: BRPP
Project: 07089
Location: Canton, NC
Test Well: P-07-221B
Test Date: 12-1-07

AQUIFER DATA

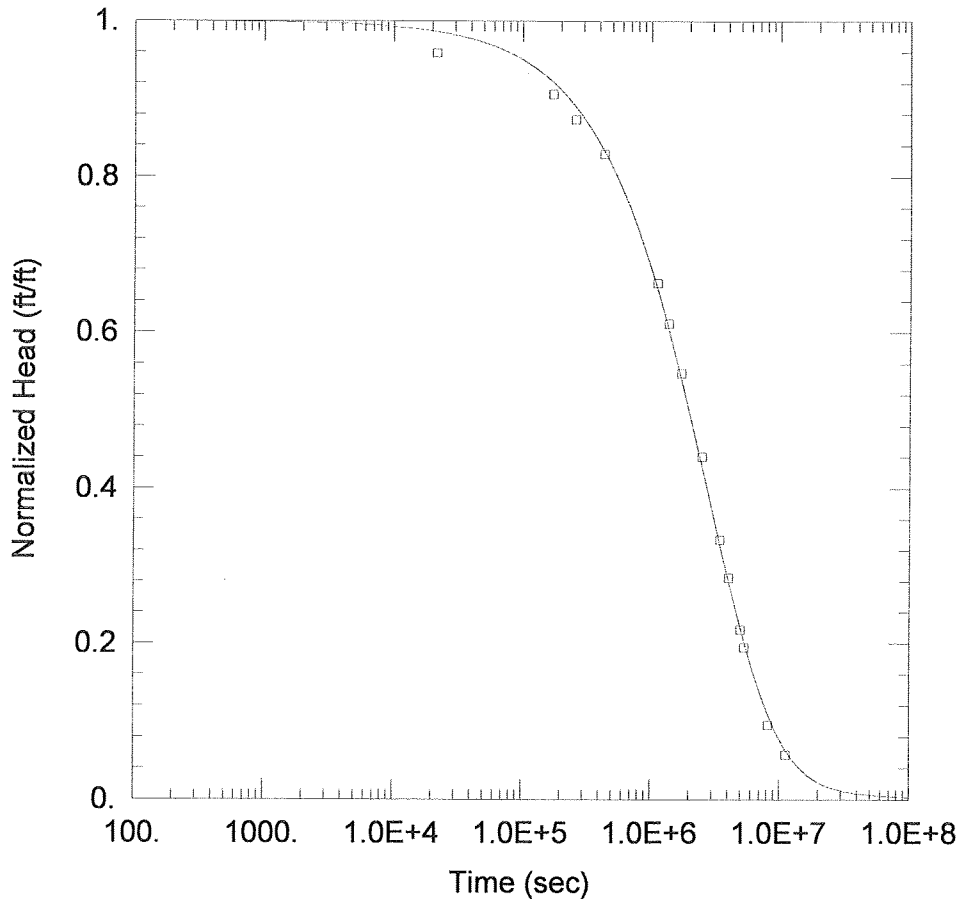
Saturated Thickness: 10.68 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-07-221B)

Initial Displacement: 0.803 ft Static Water Column Height: 10.68 ft
Total Well Penetration Depth: 10.68 ft Screen Length: 9.7 ft
Casing Radius: 0.0313 ft Wellbore Radius: 0.125 ft

SOLUTION

Aquifer Model: Confined Solution Method: Cooper et al.
T = 0.04722 cm^2/sec, K = 1.6×10^{-4} cm/sec S = 0.006753



WELL TEST ANALYSIS

Data Set: \\Aserver\cfs\Brpp\NC\6e\K-tests\222a.aqt
Date: 10/28/08 Time: 15:15:40

PROJECT INFORMATION

Company: SME
Client: BRPP
Project: 07089
Location: Canton, NC
Test Well: P-07-222A
Test Date: 8-23-07

AQUIFER DATA

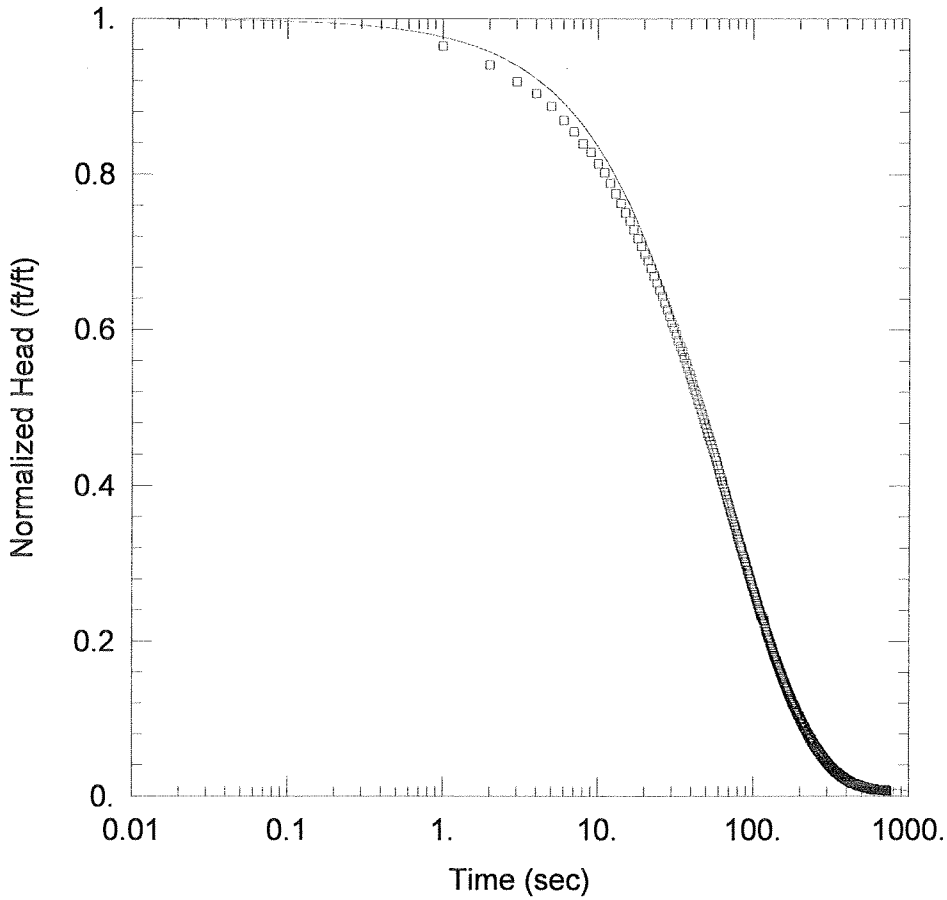
Saturated Thickness: 93.4 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-07-222A)

Initial Displacement: 13.74 ft
Total Well Penetration Depth: 93.4 ft
Casing Radius: 0.0313 ft
Static Water Column Height: 93.4 ft
Screen Length: 17. ft
Wellbore Radius: 0.125 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper et al.
T = 8.423E-7 cm^2/sec, $K = 1.6 \times 10^{-9}$ cm/sec
S = 3.665E-6



WELL TEST ANALYSIS

Data Set: \\Aserver\cfs\Brpp\NC\6e\K-tests\222b.aqt
Date: 10/27/08 Time: 19:18:51

PROJECT INFORMATION

Company: SME
Client: BRPP
Project: 07089
Location: Canton, NC
Test Well: P-07-222B
Test Date: 11-30-07

AQUIFER DATA

Saturated Thickness: 56.2 ft Anisotropy Ratio (Kz/Kr): 1.

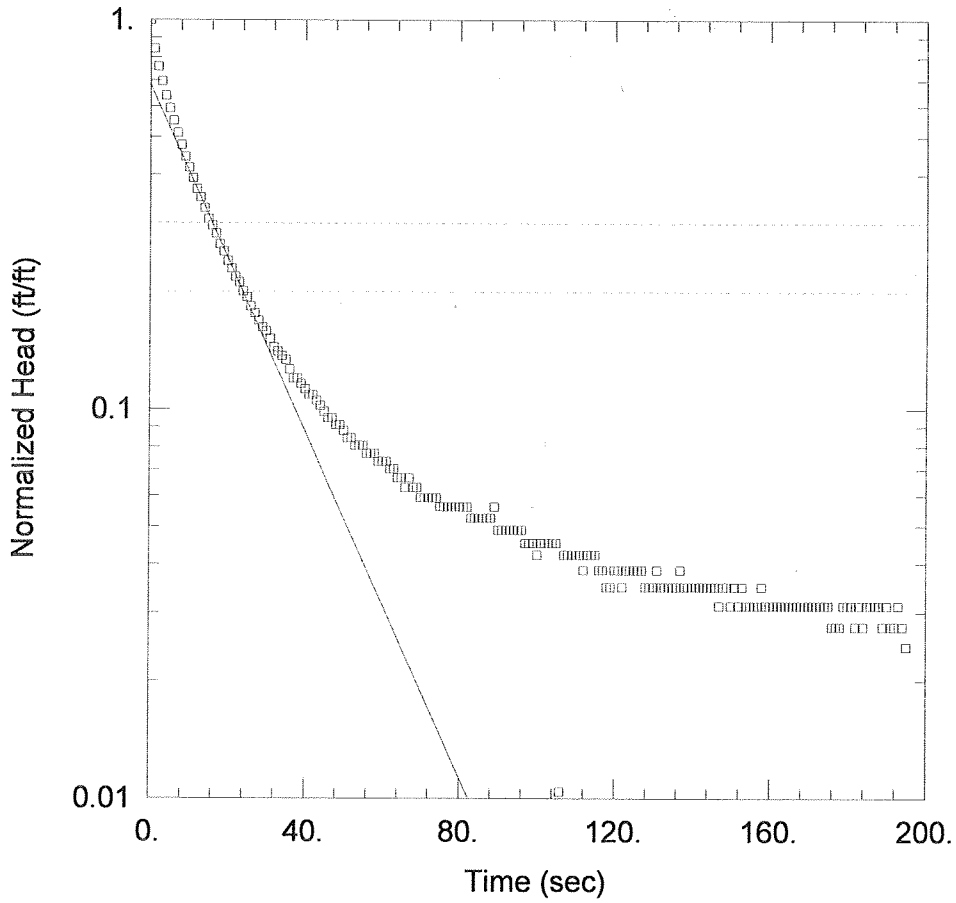
WELL DATA (P-07-222B)

Initial Displacement: 6.363 ft
Total Well Penetration Depth: 56.2 ft
Casing Radius: 0.0313 ft
Static Water Column Height: 56.2 ft
Screen Length: 7.5 ft
Wellbore Radius: 0.33 ft

SOLUTION

Aquifer Model: Confined Solution Method: Cooper et al.

T = 0.03873 cm^2/sec , K = 1.7×10^{-4} cm/sec S = 2.78E-7



WELL TEST ANALYSIS

Data Set: \\Aserver\cfs\Brpp\NC\6e\K-tests\222cBR.aqt
Date: 10/28/08 Time: 09:18:09

PROJECT INFORMATION

Company: SME
Client: BRPP
Project: 07089
Location: Canton, NC
Test Well: P-07-222C
Test Date: 11-30-07

AQUIFER DATA

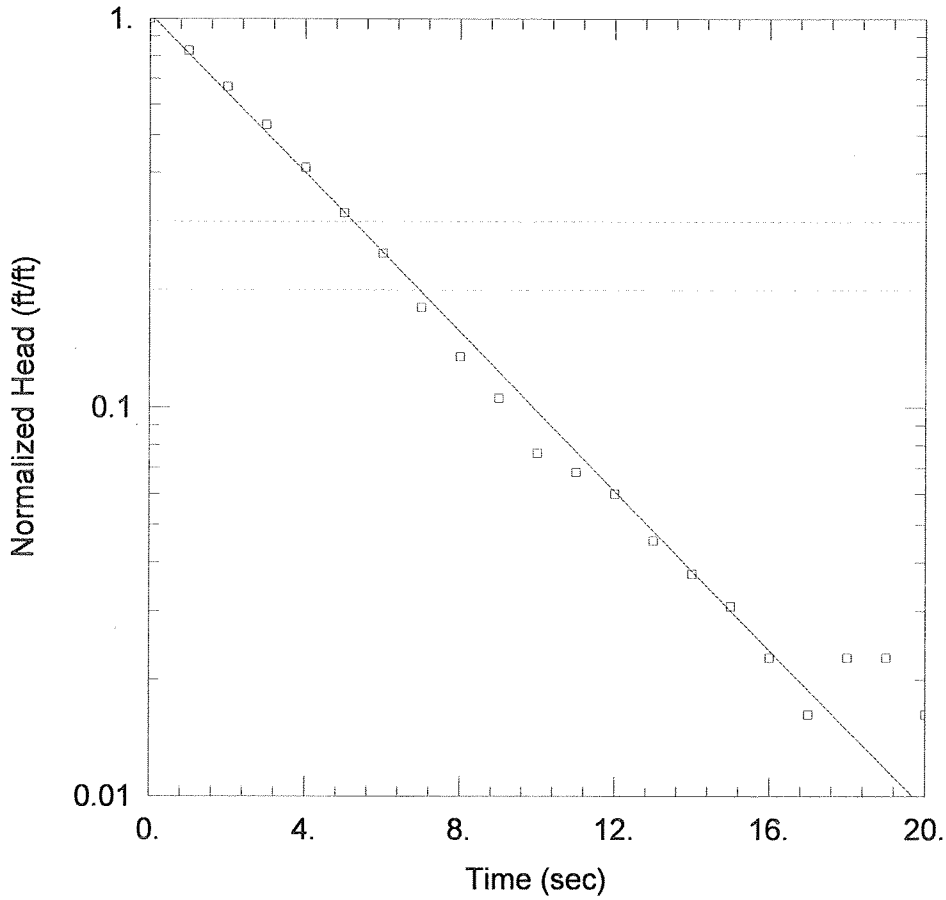
Saturated Thickness: 11.9 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-07-222C)

Initial Displacement: 1.634 ft
Total Well Penetration Depth: 11.9 ft
Casing Radius: 0.0313 ft
Static Water Column Height: 11.9 ft
Screen Length: 11.9 ft
Wellbore Radius: 0.33 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.000175 cm/sec
y0 = 1.117 ft



WELL TEST ANALYSIS

Data Set: \\Aserver\cfs\Brpp\NC\6e\K-tests\224a.aqt
Date: 10/28/08 Time: 08:36:07

PROJECT INFORMATION

Company: SME
Client: BRPP
Project: 07089
Location: Canton, NC
Test Well: P-07-224A
Test Date: 11-30-07

AQUIFER DATA

Saturated Thickness: 82.78 ft Anisotropy Ratio (Kz/Kr): 1.

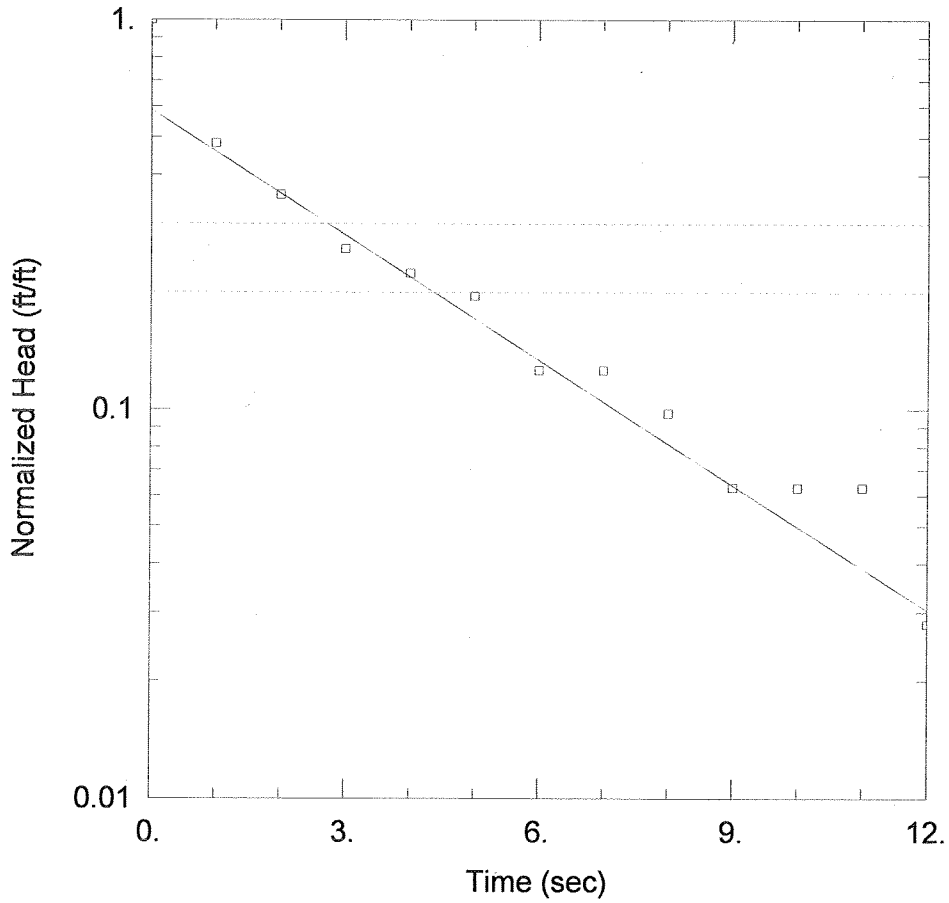
WELL DATA (P-07-224A)

Initial Displacement: 6.15 ft Static Water Column Height: 82.78 ft
Total Well Penetration Depth: 82.78 ft Screen Length: 22. ft
Casing Radius: 0.0313 ft Wellbore Radius: 0.125 ft

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice

K = 0.000777 cm/sec y0 = 6.336 ft



WELL TEST ANALYSIS

Data Set: \\Aserver\cfs\Brpp\NC\6e\K-tests\224b.aqt
Date: 10/27/08 Time: 21:08:33

PROJECT INFORMATION

Company: SME
Client: BRPP
Project: 07089
Location: Canton, NC
Test Well: P-07-224B
Test Date: 11-30-07

AQUIFER DATA

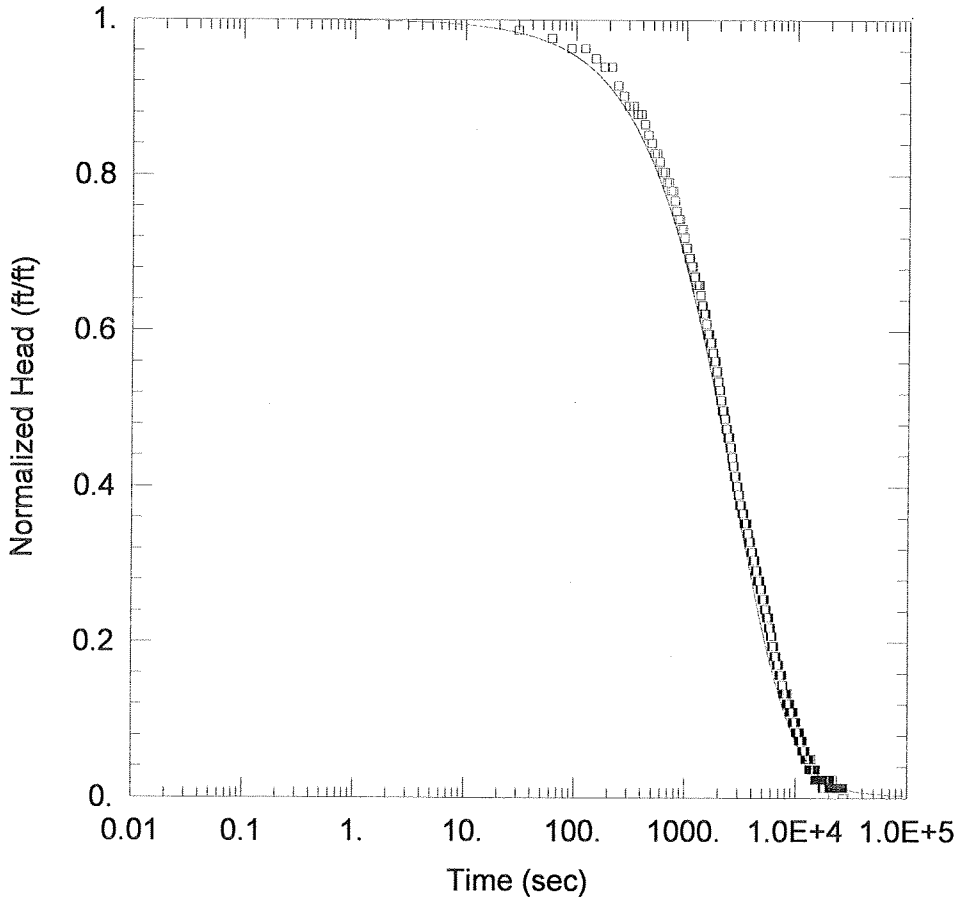
Saturated Thickness: 6.6 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-07-224B)

Initial Displacement: 1.43 ft
Total Well Penetration Depth: 6.6 ft
Casing Radius: 0.0313 ft
Static Water Column Height: 6.6 ft
Screen Length: 6.6 ft
Wellbore Radius: 0.33 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.00124 cm/sec
y0 = 0.8417 ft



WELL TEST ANALYSIS

Data Set: \\Aserver\cfs\Brpp\NC\6e\K-tests\225a.aqt
Date: 10/27/08 Time: 20:11:41

PROJECT INFORMATION

Company: SME
Client: BRPP
Project: 07089
Location: Canton, NC
Test Well: P-07-225A
Test Date: 11-30-07

AQUIFER DATA

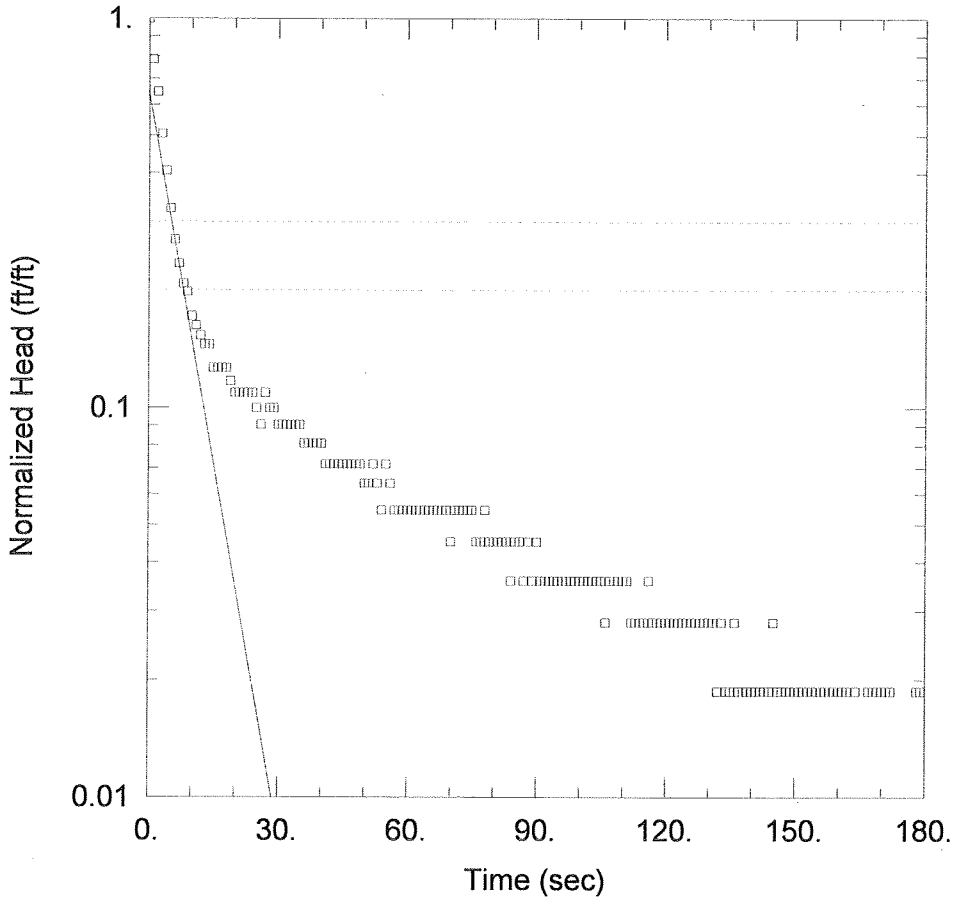
Saturated Thickness: 44.1 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-07-225A)

Initial Displacement: 3.79 ft
Total Well Penetration Depth: 44.1 ft
Casing Radius: 0.0313 ft
Static Water Column Height: 44.1 ft
Screen Length: 6. ft
Wellbore Radius: 0.125 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper et al.
T = 0.0009554 cm^2/sec
S = 1.0E-6



WELL TEST ANALYSIS

Data Set: \\Aserver\cfs\Brpp\NC\6e\K-tests\225b.aqt
Date: 10/27/08 Time: 21:19:37

PROJECT INFORMATION

Company: SME
Client: BRPP
Project: 07089
Location: Canton, NC
Test Well: P-07-225B
Test Date: 11-30-07

AQUIFER DATA

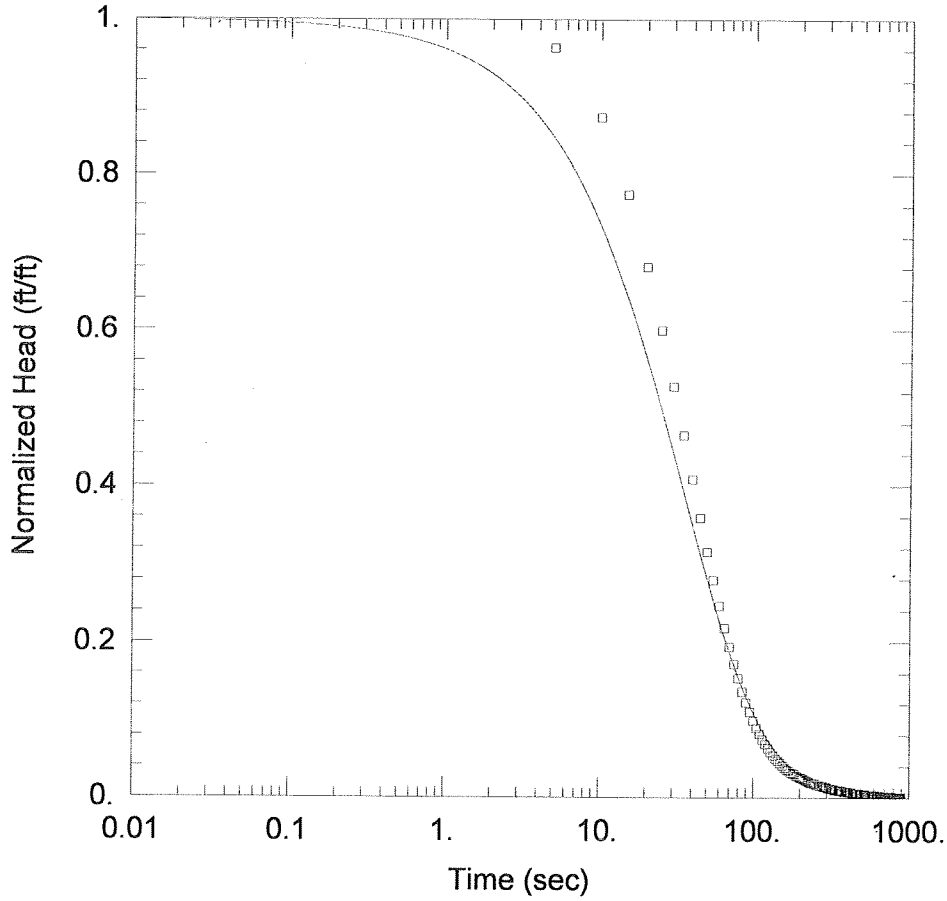
Saturated Thickness: 9.8 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-07-225B)

Initial Displacement: 0.641 ft
Total Well Penetration Depth: 9.8 ft
Casing Radius: 0.0313 ft
Static Water Column Height: 9.8 ft
Screen Length: 9.8 ft
Wellbore Radius: 0.33 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.0005659 cm/sec
y0 = 0.4155 ft



WELL TEST ANALYSIS

Data Set: \\Aserver\cfs\Brpp\NC\6e\K-tests\226a.aqt
Date: 10/27/08 Time: 20:14:28

PROJECT INFORMATION

Company: SME
Client: BRPP
Project: 07089
Location: Canton, NC
Test Well: P-07-226A
Test Date: 11-27-07

AQUIFER DATA

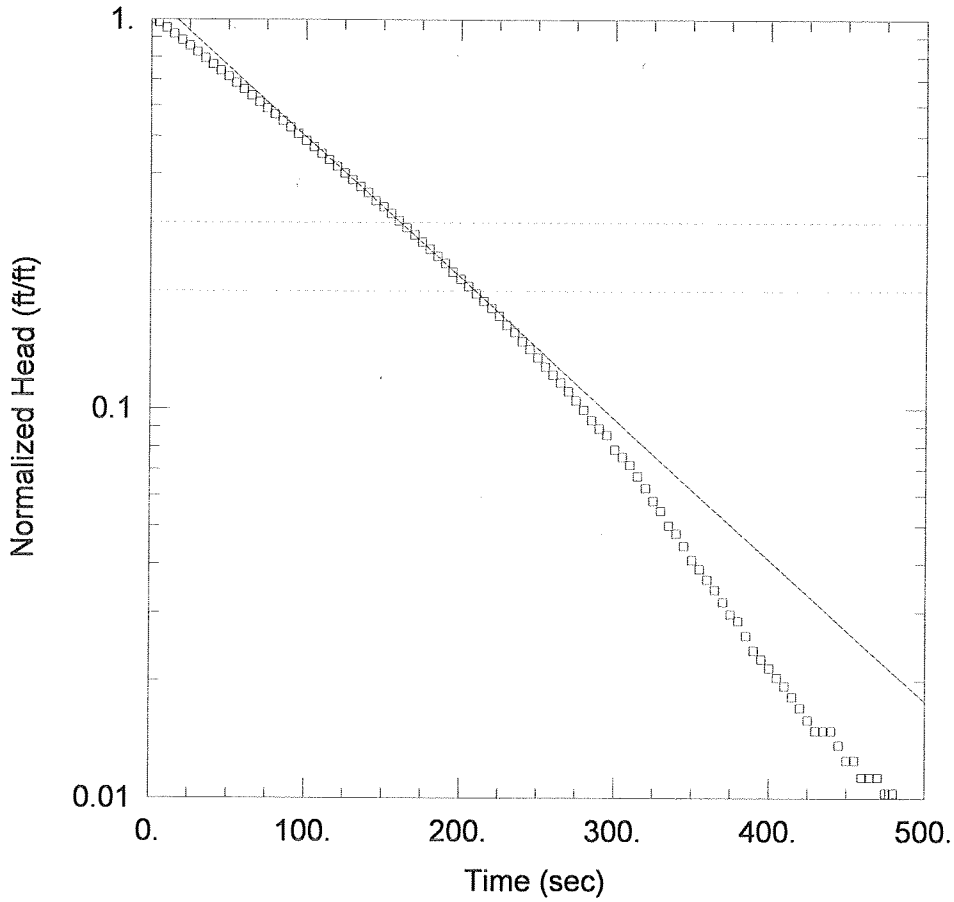
Saturated Thickness: 79.84 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-07-226A)

Initial Displacement: 5.712 ft
Total Well Penetration Depth: 79.84 ft
Casing Radius: 0.0313 ft
Static Water Column Height: 79.84 ft
Screen Length: 12.1 ft
Wellbore Radius: 0.125 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper et al.
T = 0.0759 cm^2/sec, K = 2.1×10^{-4} CM/SEC
S = 1.0E-6



WELL TEST ANALYSIS

Data Set: \\Aserver\cfs\Brpp\NC\6e\K-tests\226b.aqt
Date: 10/27/08 Time: 20:58:09

PROJECT INFORMATION

Company: SME
Client: BRPP
Project: 07089
Location: Canton. NC
Test Well: P-07-226B
Test Date: 11-27-07

AQUIFER DATA

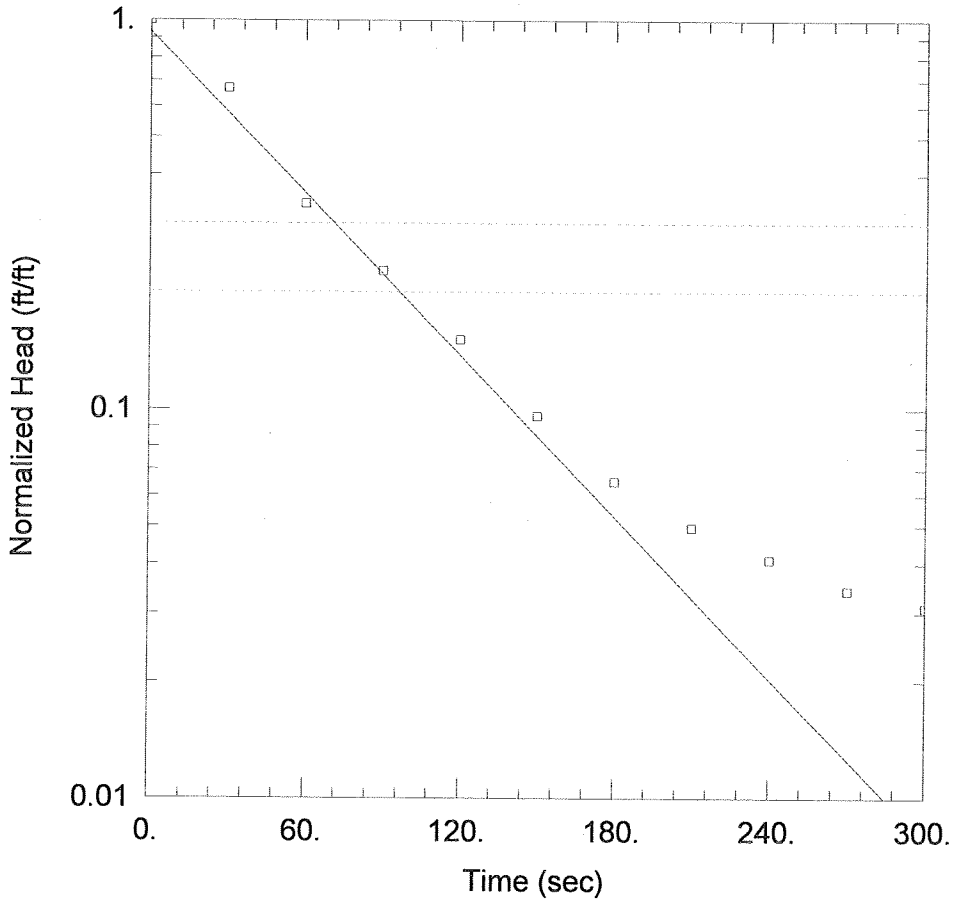
Saturated Thickness: 38.24 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-07-226B)

Initial Displacement: 5.047 ft
Total Well Penetration Depth: 38.24 ft
Casing Radius: 0.0313 ft
Static Water Column Height: 38.24 ft
Screen Length: 4.5 ft
Wellbore Radius: 0.125 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.0001098 cm/sec
y0 = 5.82 ft



WELL TEST ANALYSIS

Data Set: \\Aserver\cfs\Brpp\NC\6e\K-tests\226c.aqt
Date: 10/27/08 Time: 21:16:33

PROJECT INFORMATION

Company: SME
Client: BRPP
Project: 07089
Location: Canton, NC
Test Well: P-07-226C
Test Date: 11-27-07

AQUIFER DATA

Saturated Thickness: 5.8 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-07-226C)

Initial Displacement: 3.361 ft
Total Well Penetration Depth: 5.8 ft
Casing Radius: 0.0313 ft
Static Water Column Height: 5.8 ft
Screen Length: 5.8 ft
Wellbore Radius: 0.33 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 8.65E-5 cm/sec
y0 = 3.136 ft

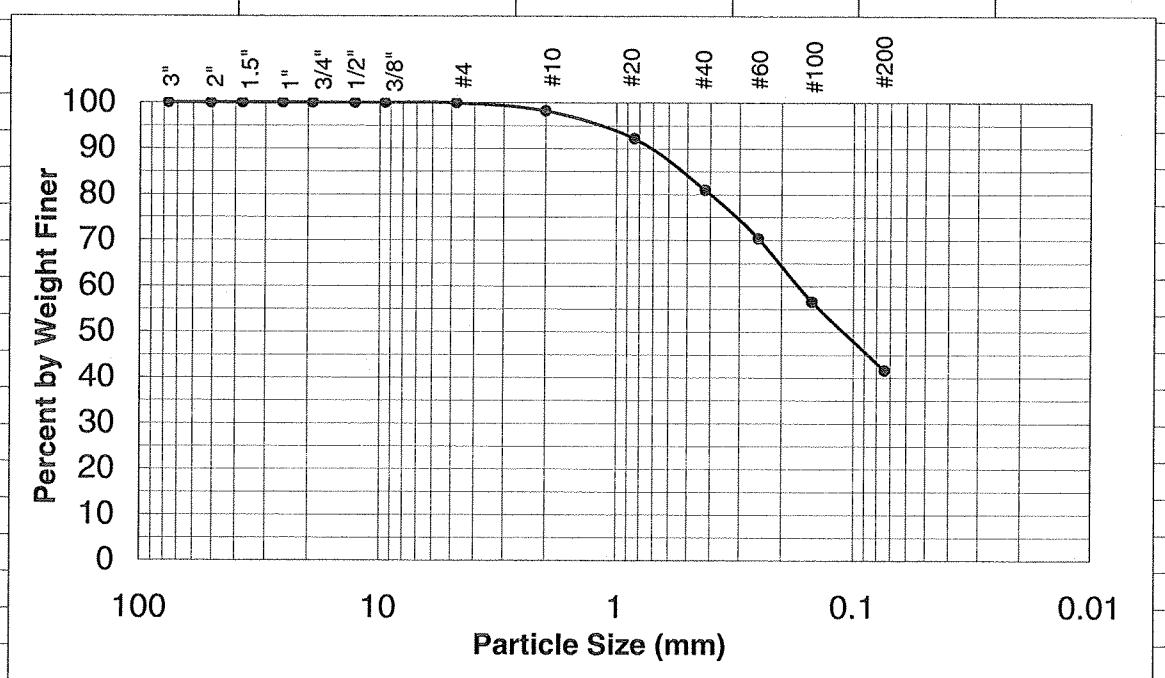
APPENDIX E

GRAIN SIZE ANALYSIS

SEVEE & MAHER ENGINEERS
4 BLANCHARD ROAD
CUMBERLAND CTR., MAINE 04021
(207) 829-5016

GRAIN SIZE ANALYSIS - ASTM D422

PROJECT NAME:	Blue Ridge Paper			PROJECT No:	07089
	Canton, N. Carolina			DATE:	13-Sep-07
SAMPLE SOURCE:	Landfill #6 Expansion			BORING No:	B07-201
SAMPLE DESCRIP:	Reddish brown silty m-f SAND			SAMPLE No:	4D
				DEPTH (ft):	19-21
		DATA			
			SPECIFICATION		
U.S Std SIEVE (in.)	PARTICLE SIZE (mm)	% by WT. FINER	Min	Max	P / F
3	76.2	**100.0**			
2	50.8	**100.0**			
1.5	37.5	**100.0**			
1	25.4	**100.0**			
3/4	19.1	**100.0**			
1/2	12.7	**100.0**			
3/8	9.5	**100.0**			
#4	4.76	**99.9**			
#10	2.0	**98.2**			
#20	0.84	**92.2**			
#40	0.42	**81.0**			
#60	0.25	**70.3**			
#100	0.149	**56.6**			
#200	0.074	**41.6**			

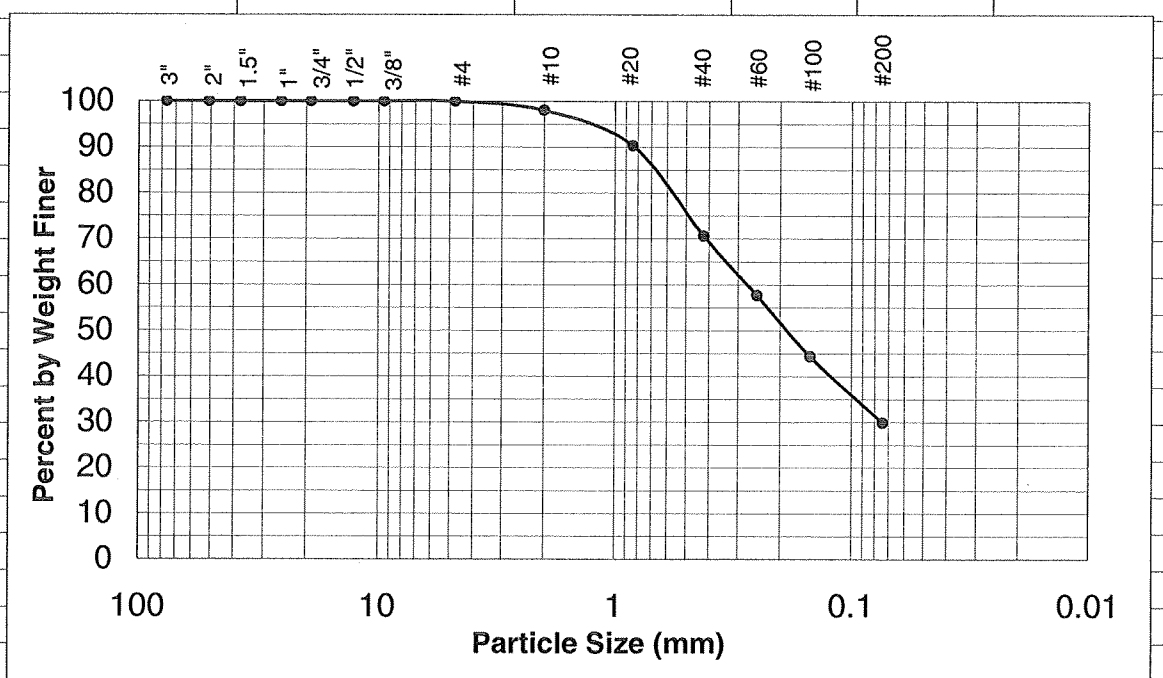


Water Content (%) = 17.3

SEVEE & MAHER ENGINEERS
4 BLANCHARD ROAD
CUMBERLAND CTR., MAINE 04021
(207) 829-5016

GRAIN SIZE ANALYSIS - ASTM D422

PROJECT NAME:	Blue Ridge Paper			PROJECT No:	07089
	Canton, N. Carolina			DATE:	13-Sep-07
SAMPLE SOURCE:	Landfill #6 Expansion			BORING No:	B07-201
SAMPLE DESCRIP:	Brown/white silty m-f SAND			SAMPLE No:	9D
				DEPTH (ft):	44-46
		DATA			
			SPECIFICATION		
U.S Std SIEVE (in.)	PARTICLE SIZE (mm)	% by WT. FINER	Min	Max	P / F
3	76.2	**100.0**			
2	50.8	**100.0**			
1.5	37.5	**100.0**			
1	25.4	**100.0**			
3/4	19.1	**100.0**			
1/2	12.7	**100.0**			
3/8	9.5	**100.0**			
#4	4.76	**100.0**			
#10	2.0	**98.0**			
#20	0.84	**90.3**			
#40	0.42	**70.6**			
#60	0.25	**57.6**			
#100	0.149	**44.4**			
#200	0.074	**29.9**			

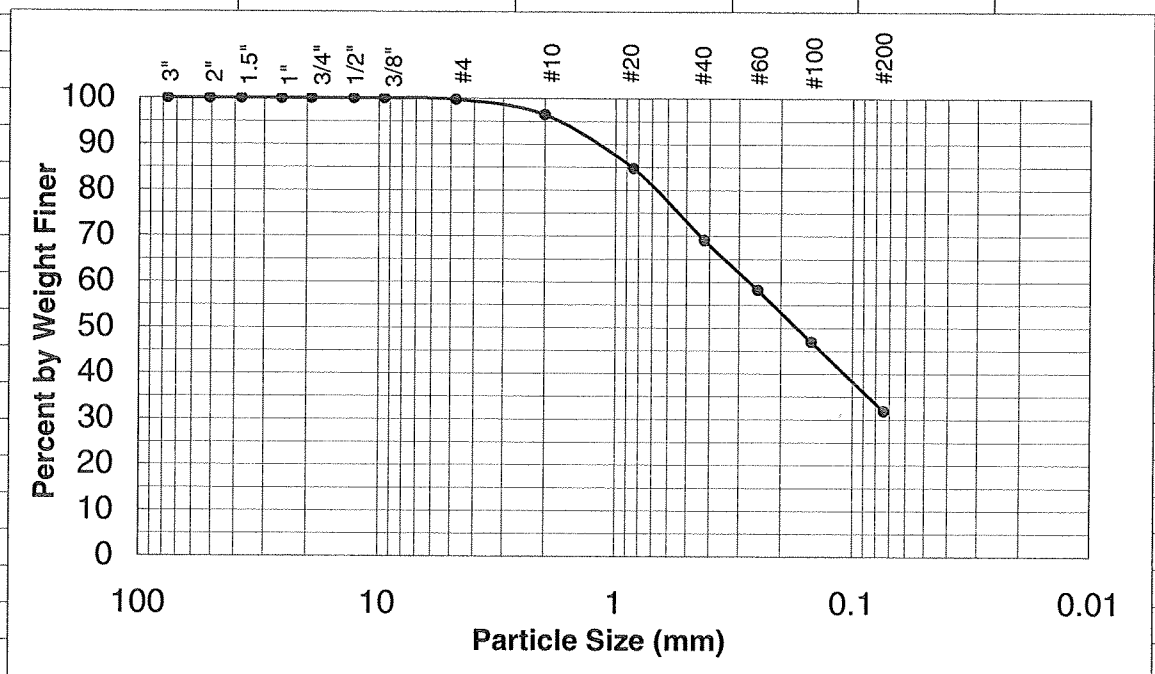


Water Content (%) = 14.2

SEVEE & MAHER ENGINEERS
4 BLANCHARD ROAD
CUMBERLAND CTR., MAINE 04021
(207) 829-5016

GRAIN SIZE ANALYSIS - ASTM D422

PROJECT NAME:	Blue Ridge Paper		PROJECT No:		07089
	Canton, N. Carolina			DATE:	13-Sep-07
SAMPLE SOURCE:	Landfill #6 Expansion		BORING No:		B07-201
SAMPLE DESCRIP:	Lt brown silty m-f SAND		SAMPLE No:		16D
				DEPTH (ft):	79-79.6
		DATA			
			SPECIFICATION		
U.S Std SIEVE (in.)	PARTICLE SIZE (mm)	% by WT. FINER	Min	Max	P / F
3	76.2	**100.0**			
2	50.8	**100.0**			
1.5	37.5	**100.0**			
1	25.4	**100.0**			
3/4	19.1	**100.0**			
1/2	12.7	**100.0**			
3/8	9.5	**100.0**			
#4	4.76	**99.7**			
#10	2.0	**96.5**			
#20	0.84	**84.7**			
#40	0.42	**69.1**			
#60	0.25	**58.2**			
#100	0.149	**46.9**			
#200	0.074	**31.8**			

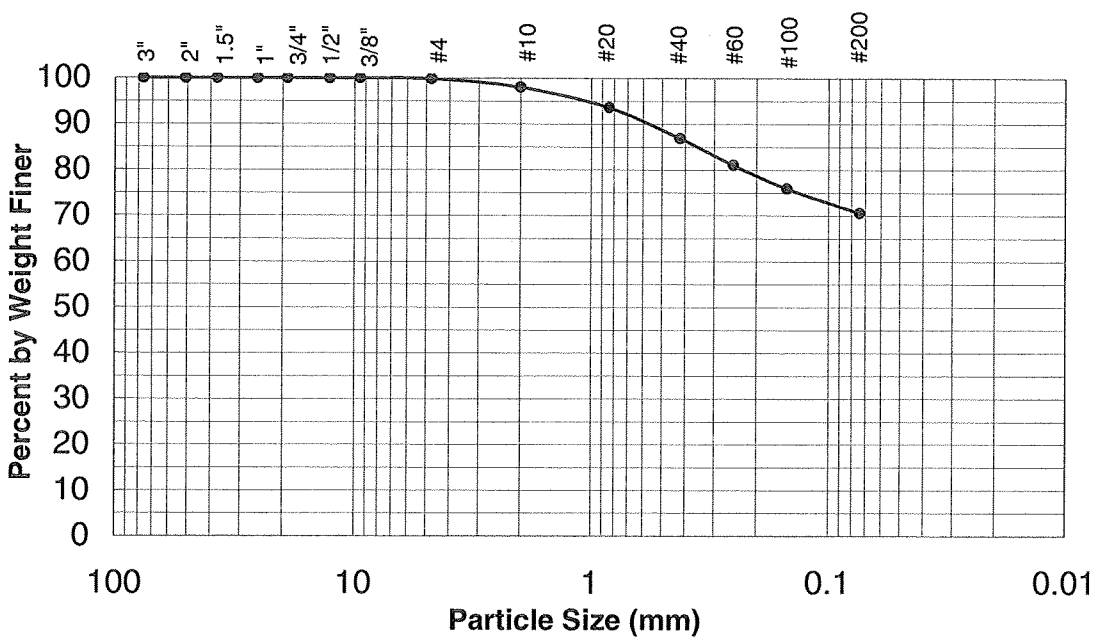


Water Content (%) = 5.4

SEVEE & MAHER ENGINEERS
4 BLANCHARD ROAD
CUMBERLAND CTR., MAINE 04021
(207) 829-5016

GRAIN SIZE ANALYSIS - ASTM D422

PROJECT NAME:	Blue Ridge Paper		PROJECT No:		07089
	Canton, N. Carolina			DATE:	13-Sep-07
SAMPLE SOURCE:	Landfill #6 Expansion		BORING No:		B07-203
SAMPLE DESCRIP:	Brown sandy SILT		SAMPLE No:		1D
				DEPTH (ft):	0-1
		DATA			
			SPECIFICATION		
U.S Std SIEVE (in.)	PARTICLE SIZE (mm)	% by WT. FINER	Min	Max	P / F
3	76.2	**100.0**			
2	50.8	**100.0**			
1.5	37.5	**100.0**			
1	25.4	**100.0**			
3/4	19.1	**100.0**			
1/2	12.7	**100.0**			
3/8	9.5	**100.0**			
#4	4.76	**99.8**			
#10	2.0	**98.1**			
#20	0.84	**93.6**			
#40	0.42	**86.9**			
#60	0.25	**81.0**			
#100	0.149	**76.0**			
#200	0.074	**70.6**			

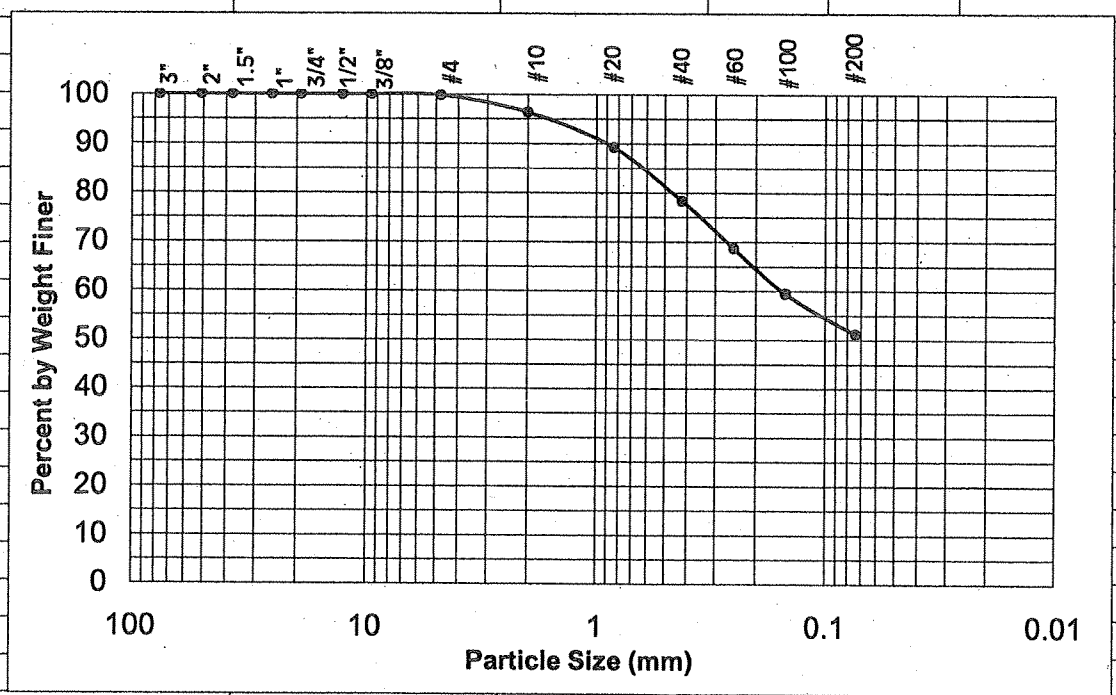


Water Content (%) = 29.8

SEVEE & MAHER ENGINEERS
4 BLANCHARD ROAD
CUMBERLAND CTR., MAINE 04021
(207) 829-5016

GRAIN SIZE ANALYSIS - ASTM D422

PROJECT NAME:	Blue Ridge Paper			PROJECT No:	07089
	Canton, N. Carolina			DATE:	15-Jan-08
SAMPLE SOURCE:	Landfill #6 Expansion			BORING No:	B07-204
SAMPLE DESCRIP:	Red sandy SILT			SAMPLE No:	2D
				DEPTH (ft):	5-7
		DATA			
			SPECIFICATION		
U.S Std SIEVE (in.)	PARTICLE SIZE (mm)	% by WT. FINER	Min	Max	P / F
3	76.2	100.0			
2	50.8	100.0			
1.5	37.5	100.0			
1	25.4	100.0			
3/4	19.1	100.0			
1/2	12.7	100.0			
3/8	9.5	100.0			
#4	4.76	99.8			
#10	2.0	96.4			
#20	0.84	89.2			
#40	0.42	78.3			
#60	0.25	68.6			
#100	0.149	59.4			
#200	0.074	51.1			

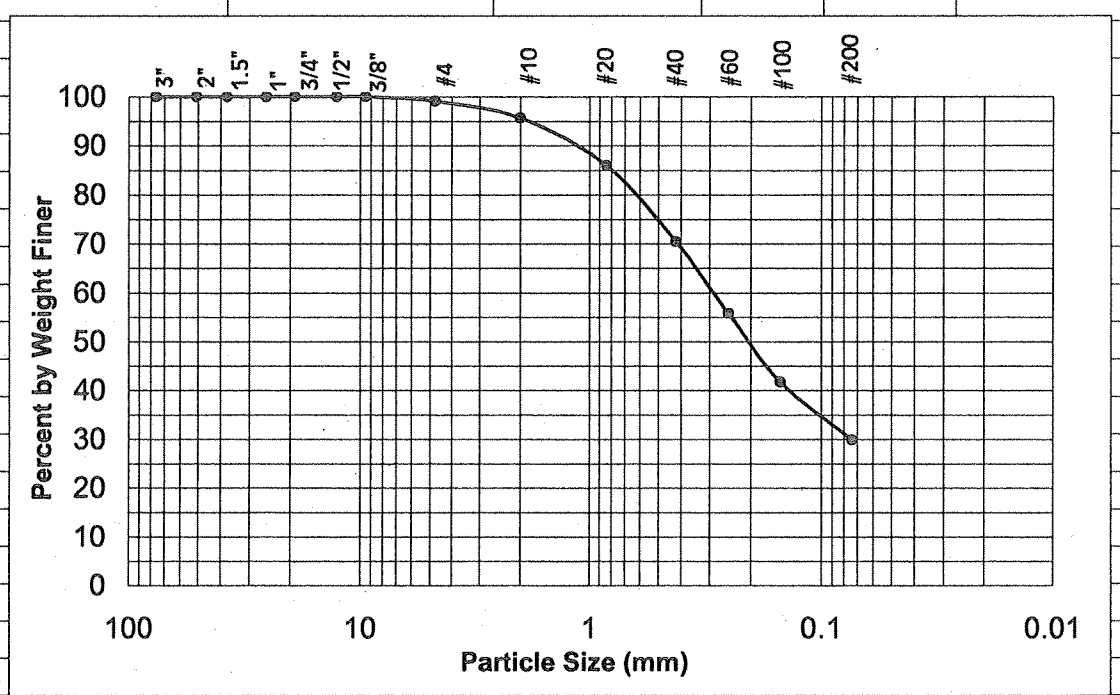


Water Content (%) = 24.3

SEVEE & MAHER ENGINEERS
4 BLANCHARD ROAD
CUMBERLAND CTR., MAINE 04021
(207) 829-5016

GRAIN SIZE ANALYSIS - ASTM D422

PROJECT NAME:	Blue Ridge Paper			PROJECT No:	07089
	Canton, N. Carolina			DATE:	15-Jan-08
SAMPLE SOURCE:	Landfill #6 Expansion			BORING No:	B07-207
SAMPLE DESCRIP:	Reddish-brown silty m-f SAND			SAMPLE No:	4D
				DEPTH (ft):	15-17
		DATA			
			SPECIFICATION		
U.S Std SIEVE (in.)	PARTICLE SIZE (mm)	% by WT. FINER	Min	Max	P / F
3	76.2	100.0			
2	50.8	100.0			
1.5	37.5	100.0			
1	25.4	100.0			
3/4	19.1	100.0			
1/2	12.7	100.0			
3/8	9.5	100.0			
#4	4.76	99.1			
#10	2.0	95.7			
#20	0.84	86.0			
#40	0.42	70.4			
#60	0.25	55.8			
#100	0.149	41.8			
#200	0.074	29.9			

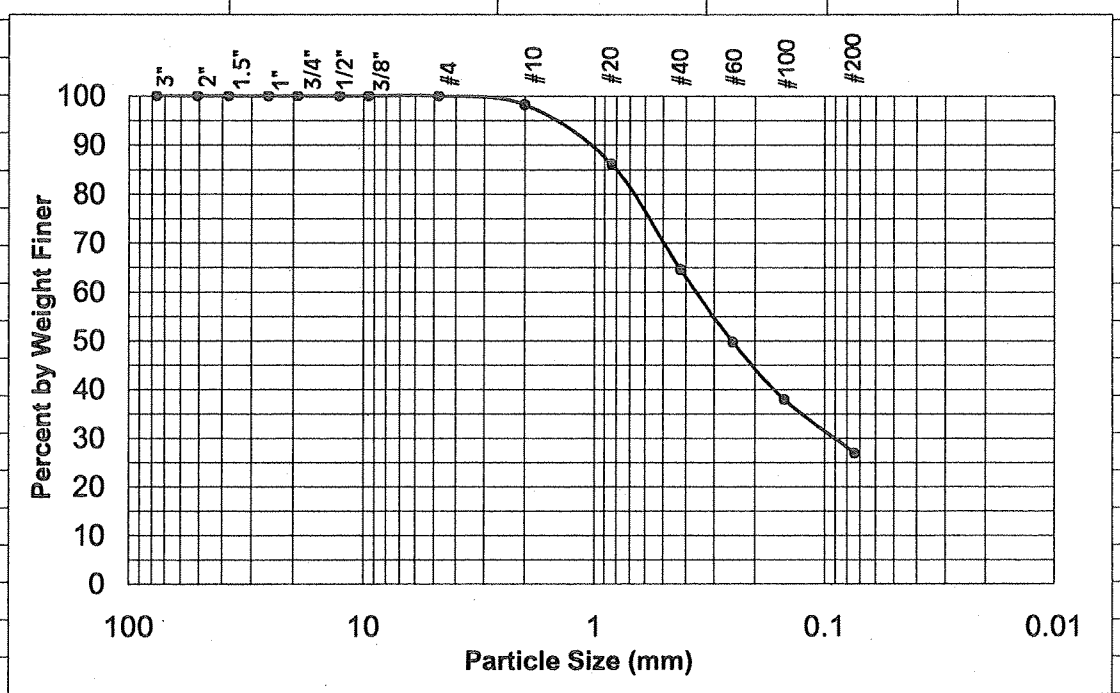


Water Content (%) = 7.9

SEVEE & MAHER ENGINEERS
4 BLANCHARD ROAD
CUMBERLAND CTR., MAINE 04021
(207) 829-5016

GRAIN SIZE ANALYSIS - ASTM D422

PROJECT NAME:	Blue Ridge Paper			PROJECT No:	07089
	Canton, N. Carolina			DATE:	15-Jan-08
SAMPLE SOURCE:	Landfill #6 Expansion			BORING No:	B07-207
SAMPLE DESCRIP:	Reddish-brown silty m-f SAND			SAMPLE No:	7D
				DEPTH (ft):	30-32
		DATA			
			SPECIFICATION		
U.S Std SIEVE (in.)	PARTICLE SIZE (mm)	% by WT. FINER	Min	Max	P / F
3	76.2	100.0			
2	50.8	100.0			
1.5	37.5	100.0			
1	25.4	100.0			
3/4	19.1	100.0			
1/2	12.7	100.0			
3/8	9.5	100.0			
#4	4.76	100.0			
#10	2.0	98.2			
#20	0.84	86.1			
#40	0.42	64.6			
#60	0.25	49.8			
#100	0.149	38.0			
#200	0.074	26.9			

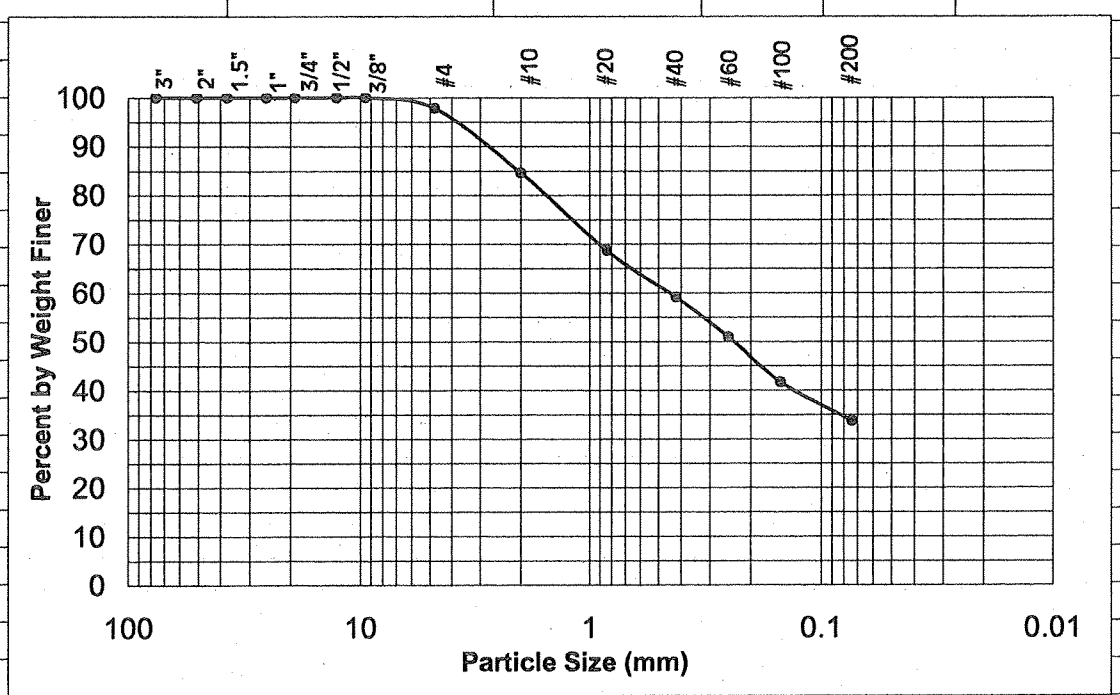


Water Content (%) = 6.8

SEVEE & MAHER ENGINEERS
4 BLANCHARD ROAD
CUMBERLAND CTR., MAINE 04021
(207) 829-5016

GRAIN SIZE ANALYSIS - ASTM D422

PROJECT NAME:	Blue Ridge Paper			PROJECT No:	07089
	Canton, N. Carolina			DATE:	15-Jan-08
SAMPLE SOURCE:	Landfill #6 Expansion			BORING No:	B07-208
SAMPLE DESCRIP:	Reddish-brown silty m-f SAND			SAMPLE No:	2D
				DEPTH (ft):	9-11
		DATA			
			SPECIFICATION		
U.S Std SIEVE (in.)	PARTICLE SIZE (mm)	% by WT. FINER	Min	Max	P / F
3	76.2	100.0			
2	50.8	100.0			
1.5	37.5	100.0			
1	25.4	100.0			
3/4	19.1	100.0			
1/2	12.7	100.0			
3/8	9.5	100.0			
#4	4.76	97.8			
#10	2.0	84.6			
#20	0.84	68.6			
#40	0.42	59.0			
#60	0.25	50.9			
#100	0.149	41.7			
#200	0.074	33.7			

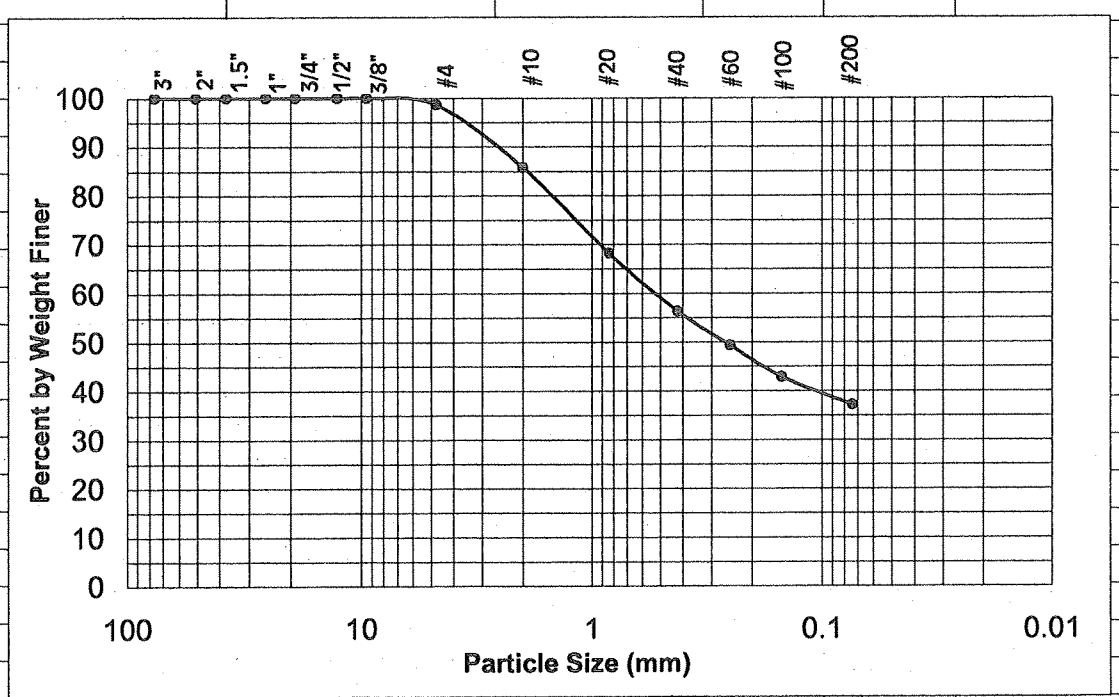


Water Content (%) = 14.9

SEVEE & MAHER ENGINEERS
4 BLANCHARD ROAD
CUMBERLAND CTR., MAINE 04021
(207) 829-5016

GRAIN SIZE ANALYSIS - ASTM D422

PROJECT NAME:	Blue Ridge Paper			PROJECT No:	07089
	Canton, N. Carolina			DATE:	15-Jan-08
SAMPLE SOURCE:	Landfill #6 Expansion			BORING No:	B07-208
SAMPLE DESCRIP:	White-red silty c-f SAND			SAMPLE No:	6D
				DEPTH (ft):	29-31
		DATA			
			SPECIFICATION		
U.S Std SIEVE (in.)	PARTICLE SIZE (mm)	% by WT. FINER	Min	Max	P / F
3	76.2	100.0			
2	50.8	100.0			
1.5	37.5	100.0			
1	25.4	100.0			
3/4	19.1	100.0			
1/2	12.7	100.0			
3/8	9.5	100.0			
#4	4.76	98.6			
#10	2.0	85.8			
#20	0.84	68.2			
#40	0.42	56.3			
#60	0.25	49.4			
#100	0.149	42.8			
#200	0.074	37.1			

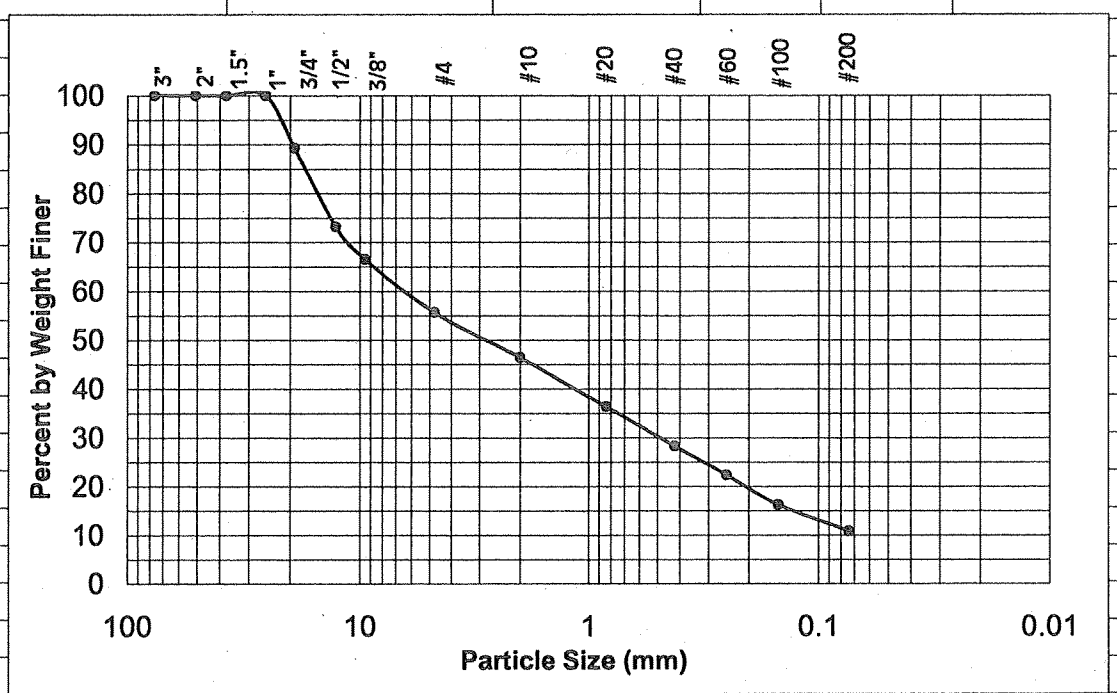


Water Content (%) = 20.8

SEVEE & MAHER ENGINEERS
4 BLANCHARD ROAD
CUMBERLAND CTR., MAINE 04021
(207) 829-5016

GRAIN SIZE ANALYSIS - ASTM D422

PROJECT NAME:	Blue Ridge Paper			PROJECT No:	07089
	Canton, N. Carolina			DATE:	15-Jan-08
SAMPLE SOURCE:	Landfill #6 Expansion			BORING No:	B07-209
SAMPLE DESCRIP:	Brown gravelly c-f SAND, little silt			SAMPLE No:	3D
				DEPTH (ft):	9-11
		DATA			
			SPECIFICATION		
U.S Std SIEVE (in.)	PARTICLE SIZE (mm)	% by WT. FINER	Min	Max	P / F
3	76.2	100.0			
2	50.8	100.0			
1.5	37.5	100.0			
1	25.4	100.0			
3/4	19.1	89.2			
1/2	12.7	73.1			
3/8	9.5	66.5			
#4	4.76	55.6			
#10	2.0	46.4			
#20	0.84	36.3			
#40	0.42	28.3			
#60	0.25	22.3			
#100	0.149	16.3			
#200	0.074	10.8			

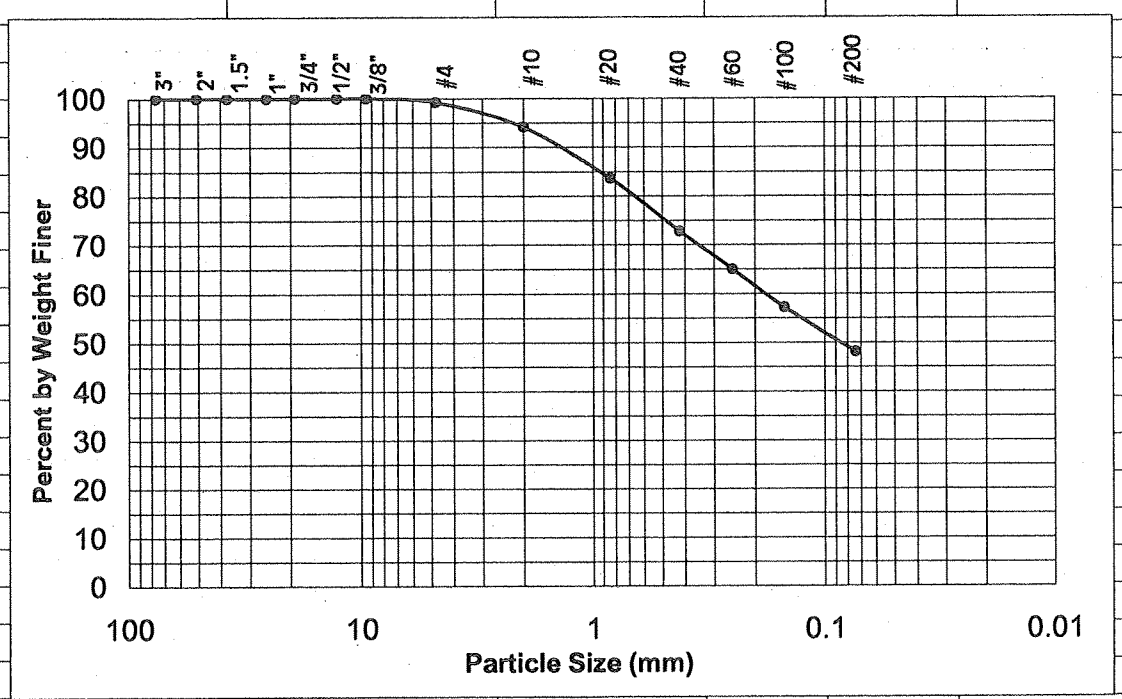


Water Content (%) = 5.5

SEVEE & MAHER ENGINEERS
4 BLANCHARD ROAD
CUMBERLAND CTR., MAINE 04021
(207) 829-5016

GRAIN SIZE ANALYSIS - ASTM D422

PROJECT NAME:	Blue Ridge Paper			PROJECT No:	07089
	Canton, N. Carolina			DATE:	15-Jan-08
SAMPLE SOURCE:	Landfill #6 Expansion			BORING No:	B07-213
SAMPLE DESCRIP:	Brown silty c-f SAND			SAMPLE No:	5D
				DEPTH (ft):	19-21
		DATA			
			SPECIFICATION		
U.S Std SIEVE (in.)	PARTICLE SIZE (mm)	% by WT. FINER	Min	Max	P / F
3	76.2	100.0			
2	50.8	100.0			
1.5	37.5	100.0			
1	25.4	100.0			
3/4	19.1	100.0			
1/2	12.7	100.0			
3/8	9.5	100.0			
#4	4.76	99.2			
#10	2.0	94.1			
#20	0.84	83.6			
#40	0.42	72.7			
#60	0.25	65.0			
#100	0.149	57.2			
#200	0.074	48.1			

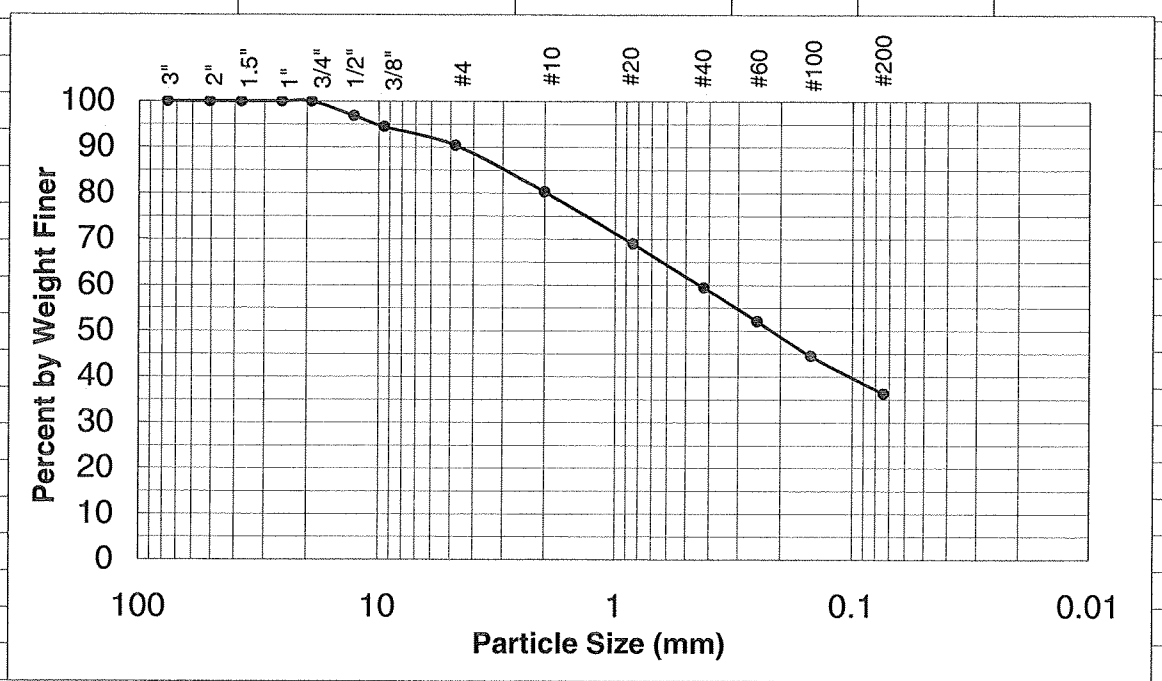


Water Content (%) = 12.2

SEVEE & MAHER ENGINEERS
4 BLANCHARD ROAD
CUMBERLAND CTR., MAINE 04021
(207) 829-5016

GRAIN SIZE ANALYSIS - ASTM D422

PROJECT NAME:	Blue Ridge Paper		PROJECT No:		07089
	Canton, N. Carolina			DATE:	13-Sep-07
SAMPLE SOURCE:	Landfill #6 Expansion		BORING No:		B07-215
SAMPLE DESCRIP:	Red/brown silty SAND, trace gravel		SAMPLE No:		0
				DEPTH (ft):	0-4
		DATA			
			SPECIFICATION		
U.S Std SIEVE (in.)	PARTICLE SIZE (mm)	% by WT. FINER	Min	Max	P / F
3	76.2	**100.0**			
2	50.8	**100.0**			
1.5	37.5	**100.0**			
1	25.4	**100.0**			
3/4	19.1	**100.0**			
1/2	12.7	**96.8**			
3/8	9.5	**94.4**			
#4	4.76	**90.4**			
#10	2.0	**80.3**			
#20	0.84	**69.0**			
#40	0.42	**59.4**			
#60	0.25	**52.1**			
#100	0.149	**44.5**			
#200	0.074	**36.4**			

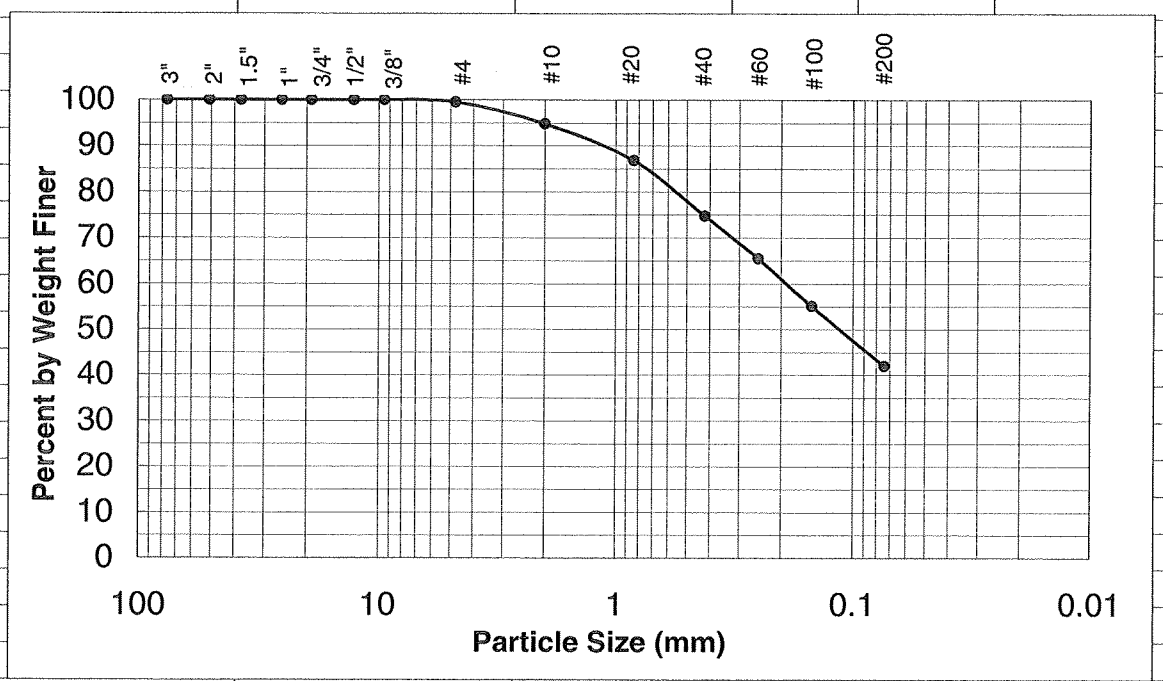


Water Content (%) = 15.1

SEVEE & MAHER ENGINEERS
4 BLANCHARD ROAD
CUMBERLAND CTR., MAINE 04021
(207) 829-5016

GRAIN SIZE ANALYSIS - ASTM D422

PROJECT NAME:	Blue Ridge Paper			PROJECT No:	07089
	Canton, N. Carolina			DATE:	13-Sep-07
SAMPLE SOURCE:	Landfill #6 Expansion			BORING No:	B07-215
SAMPLE DESCRIP:	Red/brown silty SAND			SAMPLE No:	4D
				DEPTH (ft):	19-21
		DATA			
			SPECIFICATION		
U.S Std SIEVE (in.)	PARTICLE SIZE (mm)	% by WT. FINER	Min	Max	P / F
3	76.2	**100.0**			
2	50.8	**100.0**			
1.5	37.5	**100.0**			
1	25.4	**100.0**			
3/4	19.1	**100.0**			
1/2	12.7	**100.0**			
3/8	9.5	**100.0**			
#4	4.76	**99.5**			
#10	2.0	**94.8**			
#20	0.84	**86.9**			
#40	0.42	**74.8**			
#60	0.25	**65.5**			
#100	0.149	**55.1**			
#200	0.074	**42.0**			

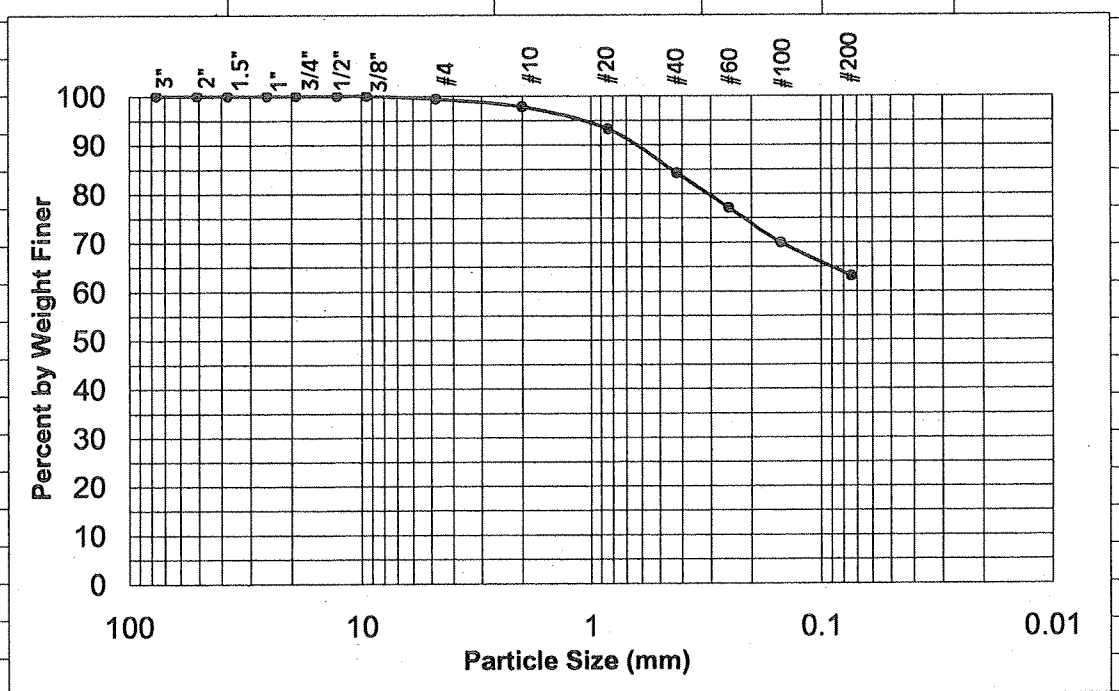


Water Content (%) = 40.0

SEVEE & MAHER ENGINEERS
4 BLANCHARD ROAD
CUMBERLAND CTR., MAINE 04021
(207) 829-5016

GRAIN SIZE ANALYSIS - ASTM D422

PROJECT NAME:	Blue Ridge Paper			PROJECT No:	07089
	Canton, N. Carolina			DATE:	15-Jan-08
SAMPLE SOURCE:	Landfill #6 Expansion			BORING No:	B07-218
SAMPLE DESCRIP:	Red sandy SILT			SAMPLE No:	2D
				DEPTH (ft):	4-6
		DATA			
			SPECIFICATION		
U.S Std SIEVE (in.)	PARTICLE SIZE (mm)	% by WT. FINER	Min	Max	P / F
3	76.2	100.0			
2	50.8	100.0			
1.5	37.5	100.0			
1	25.4	100.0			
3/4	19.1	100.0			
1/2	12.7	100.0			
3/8	9.5	100.0			
#4	4.76	99.4			
#10	2.0	97.8			
#20	0.84	93.2			
#40	0.42	84.2			
#60	0.25	77.0			
#100	0.149	70.0			
#200	0.074	63.0			

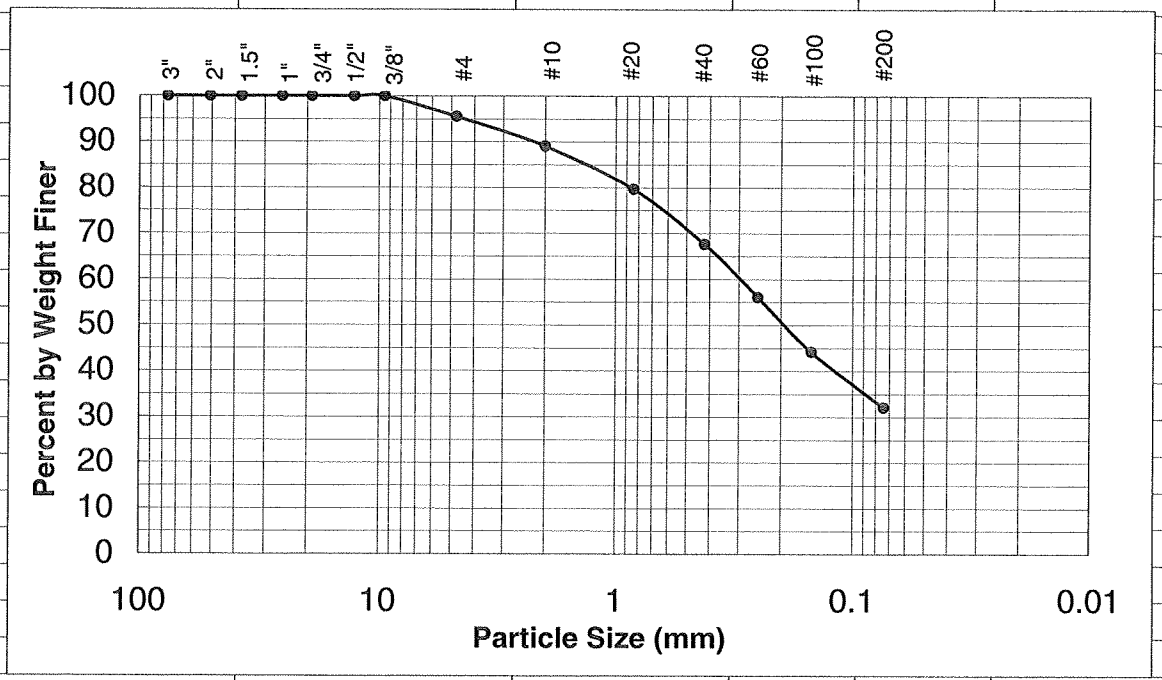


Water Content (%) = 24.3

SEVEE & MAHER ENGINEERS
4 BLANCHARD ROAD
CUMBERLAND CTR., MAINE 04021
(207) 829-5016

GRAIN SIZE ANALYSIS - ASTM D422

PROJECT NAME:	Blue Ridge Paper		PROJECT No:		07089
	Canton, N. Carolina			DATE:	13-Sep-07
SAMPLE SOURCE:	Landfill #6 Expansion		BORING No:		B07-219
SAMPLE DESCRIP:	Orange/red silty SAND		SAMPLE No:		2D
				DEPTH (ft):	9-11
		DATA			
			SPECIFICATION		
U.S Std SIEVE (in.)	PARTICLE SIZE (mm)	% by WT. FINER	Min	Max	P / F
3	76.2	**100.0**			
2	50.8	**100.0**			
1.5	37.5	**100.0**			
1	25.4	**100.0**			
3/4	19.1	**100.0**			
1/2	12.7	**100.0**			
3/8	9.5	**100.0**			
#4	4.76	**95.6**			
#10	2.0	**89.0**			
#20	0.84	**79.6**			
#40	0.42	**67.6**			
#60	0.25	**56.0**			
#100	0.149	**44.1**			
#200	0.074	**32.1**			

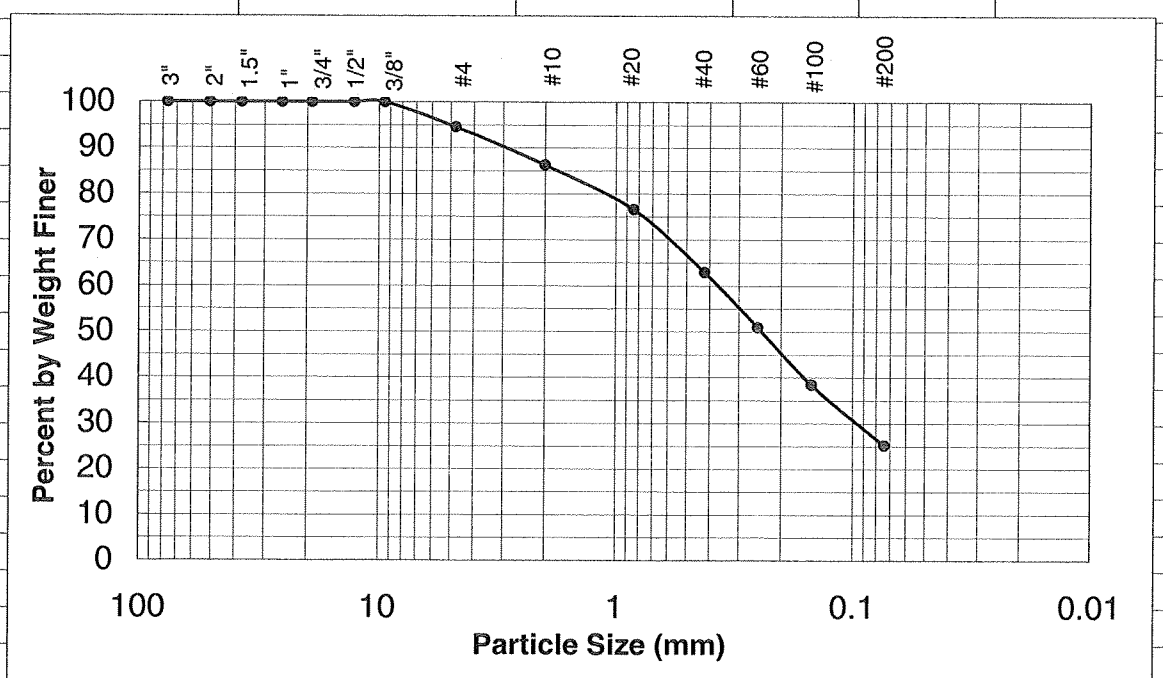


Water Content (%) = 50.7

SEVEE & MAHER ENGINEERS
4 BLANCHARD ROAD
CUMBERLAND CTR., MAINE 04021
(207) 829-5016

GRAIN SIZE ANALYSIS - ASTM D422

PROJECT NAME:	Blue Ridge Paper		PROJECT No:		07089
	Canton, N. Carolina			DATE:	13-Sep-07
SAMPLE SOURCE:	Landfill #6 Expansion		BORING No:		B07-219
SAMPLE DESCRIP:	Red/brown silty SAND, trace gravel		SAMPLE No:		7D
				DEPTH (ft):	34-36
		DATA			
			SPECIFICATION		
U.S Std SIEVE (in.)	PARTICLE SIZE (mm)	% by WT. FINER	Min	Max	P / F
3	76.2	**100.0**			
2	50.8	**100.0**			
1.5	37.5	**100.0**			
1	25.4	**100.0**			
3/4	19.1	**100.0**			
1/2	12.7	**100.0**			
3/8	9.5	**100.0**			
#4	4.76	**94.6**			
#10	2.0	**86.2**			
#20	0.84	**76.6**			
#40	0.42	**62.9**			
#60	0.25	**50.9**			
#100	0.149	**38.4**			
#200	0.074	**25.2**			

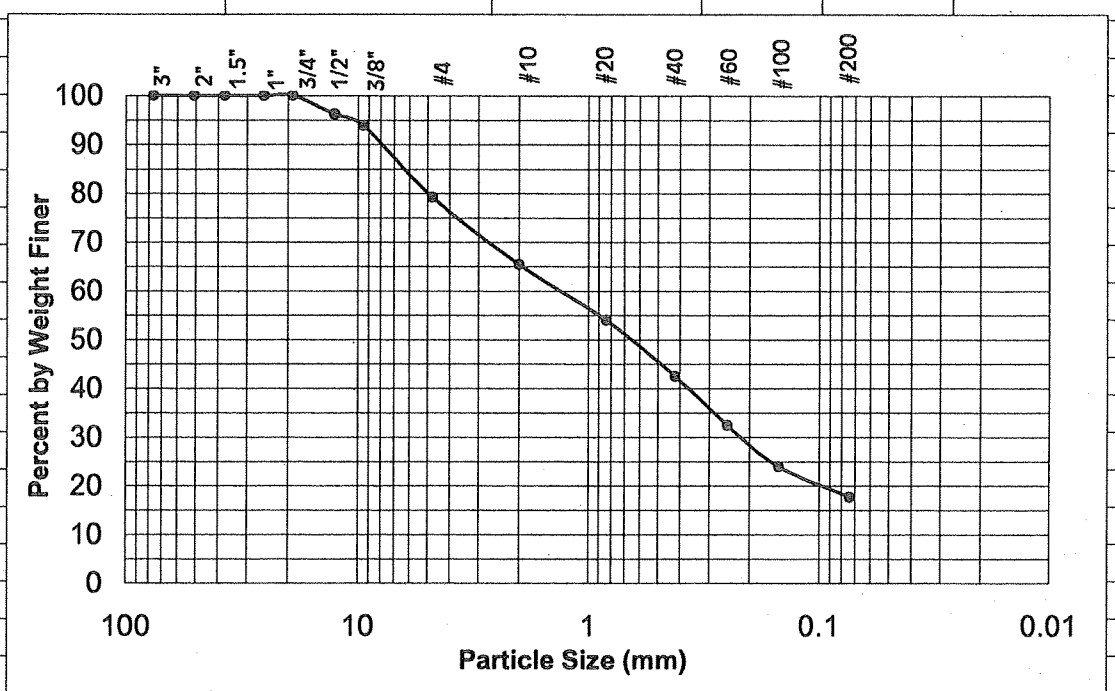


Water Content (%) = 13.3

SEVEE & MAHER ENGINEERS
4 BLANCHARD ROAD
CUMBERLAND CTR., MAINE 04021
(207) 829-5016

GRAIN SIZE ANALYSIS - ASTM D422

PROJECT NAME:	Blue Ridge Paper			PROJECT No:	07089
	Canton, N. Carolina			DATE:	15-Jan-08
SAMPLE SOURCE:	Landfill #6 Expansion			BORING No:	B07-220
SAMPLE DESCRIP:	Red c-f SAND, littke gravel and silt			SAMPLE No:	5D
				DEPTH (ft):	20-22
		DATA			
			SPECIFICATION		
U.S Std SIEVE (in.)	PARTICLE SIZE (mm)	% by WT. FINER	Min	Max	P / F
3	76.2	100.0			
2	50.8	100.0			
1.5	37.5	100.0			
1	25.4	100.0			
3/4	19.1	100.0			
1/2	12.7	96.2			
3/8	9.5	93.9			
#4	4.76	79.2			
#10	2.0	65.4			
#20	0.84	54.0			
#40	0.42	42.5			
#60	0.25	32.4			
#100	0.149	24.0			
#200	0.074	17.7			

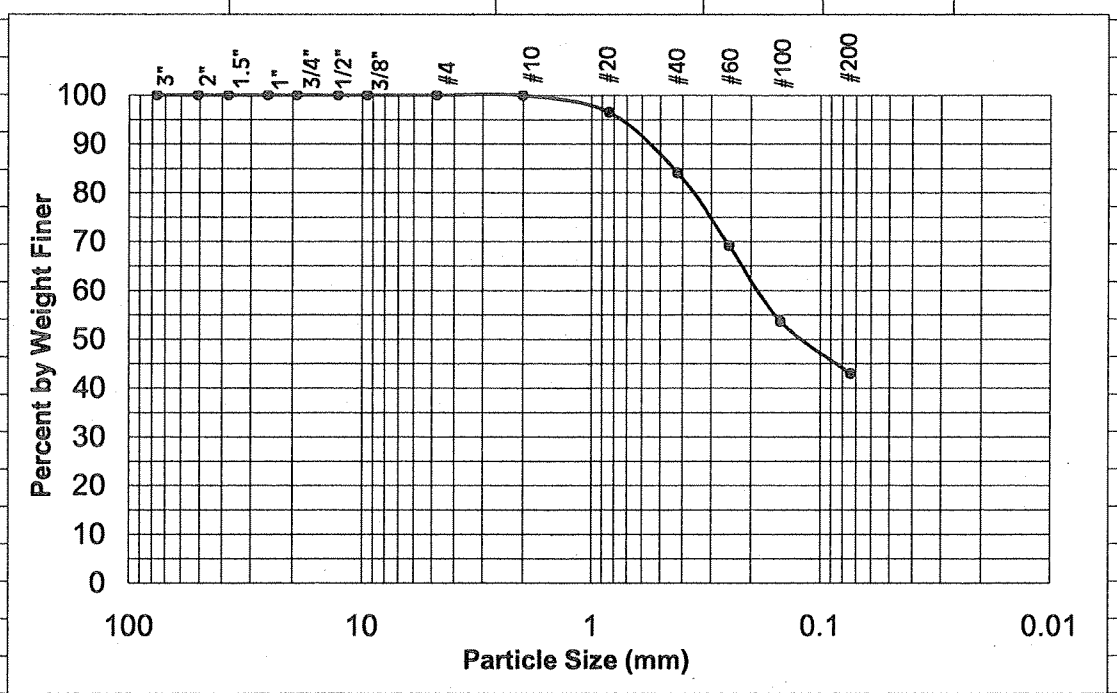


Water Content (%) = 11.9

SEVEE & MAHER ENGINEERS
4 BLANCHARD ROAD
CUMBERLAND CTR., MAINE 04021
(207) 829-5016

GRAIN SIZE ANALYSIS - ASTM D422

PROJECT NAME:	Blue Ridge Paper			PROJECT No:	07089
	Canton, N. Carolina			DATE:	15-Jan-08
SAMPLE SOURCE:	Landfill #6 Expansion			BORING No:	B07-221
SAMPLE DESCRIP:	Red-brown silty m-f SAND			SAMPLE No:	3D
				DEPTH (ft):	5-7
		DATA			
			SPECIFICATION		
U.S Std SIEVE (in.)	PARTICLE SIZE (mm)	% by WT. FINER	Min	Max	P / F
3	76.2	100.0			
2	50.8	100.0			
1.5	37.5	100.0			
1	25.4	100.0			
3/4	19.1	100.0			
1/2	12.7	100.0			
3/8	9.5	100.0			
#4	4.76	100.0			
#10	2.0	99.9			
#20	0.84	96.5			
#40	0.42	84.1			
#60	0.25	69.1			
#100	0.149	53.6			
#200	0.074	42.9			

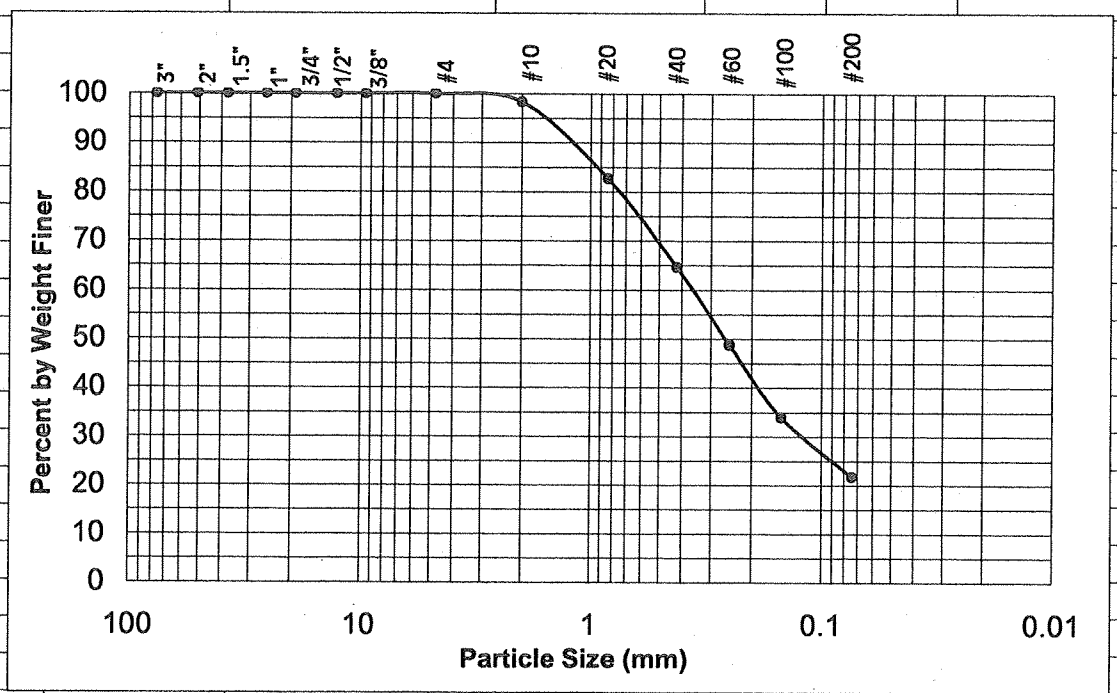


Water Content (%) = 14.2

SEVEE & MAHER ENGINEERS
4 BLANCHARD ROAD
CUMBERLAND CTR., MAINE 04021
(207) 829-5016

GRAIN SIZE ANALYSIS - ASTM D422

PROJECT NAME:	Blue Ridge Paper			PROJECT No:	07089
	Canton, N. Carolina			DATE:	15-Jan-08
SAMPLE SOURCE:	Landfill #6 Expansion			BORING No:	B07-222
SAMPLE DESCRIP:	Brown silty m-f SAND			SAMPLE No:	9D
				DEPTH (ft):	45-46
		DATA			
			SPECIFICATION		
U.S Std SIEVE (in.)	PARTICLE SIZE (mm)	% by WT. FINER	Min	Max	P / F
3	76.2	100.0			
2	50.8	100.0			
1.5	37.5	100.0			
1	25.4	100.0			
3/4	19.1	100.0			
1/2	12.7	100.0			
3/8	9.5	100.0			
#4	4.76	100.0			
#10	2.0	98.3			
#20	0.84	82.7			
#40	0.42	64.6			
#60	0.25	48.8			
#100	0.149	33.9			
#200	0.074	21.7			

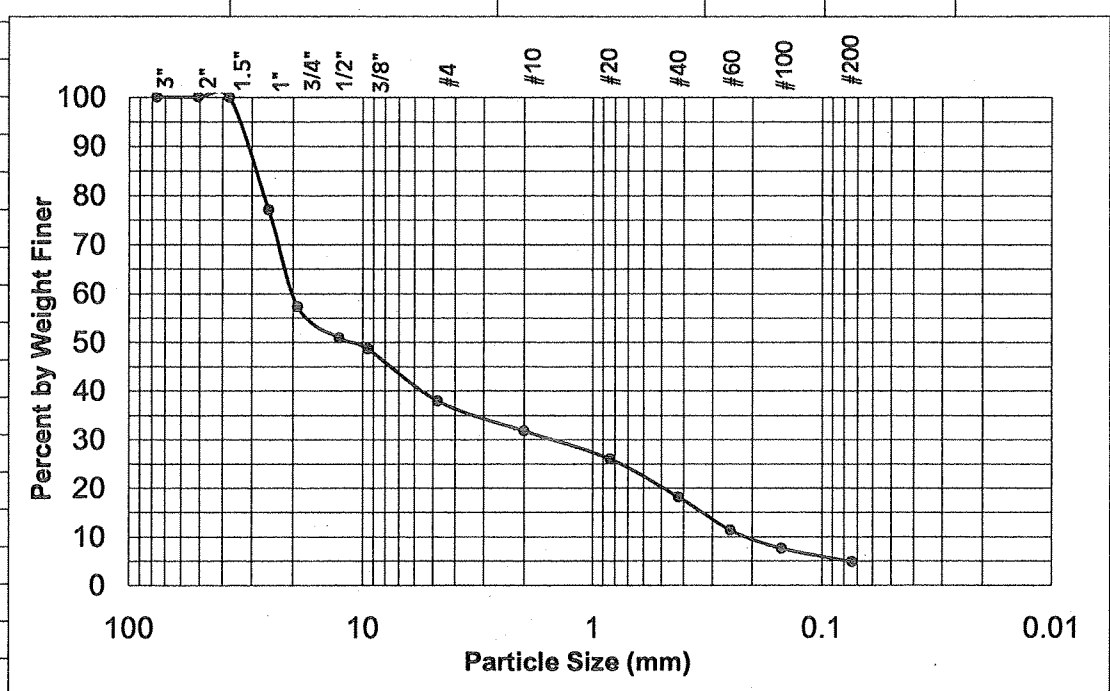


Water Content (%) = 13.4

SEVEE & MAHER ENGINEERS
4 BLANCHARD ROAD
CUMBERLAND CTR., MAINE 04021
(207) 829-5016

GRAIN SIZE ANALYSIS - ASTM D422

PROJECT NAME:	Blue Ridge Paper			PROJECT No:	07089
	Canton, N. Carolina			DATE:	15-Jan-08
SAMPLE SOURCE:	Landfill #6 Expansion			BORING No:	B07-224
SAMPLE DESCRIP:	Brown sandy GRAVEL			SAMPLE No:	3D
				DEPTH (ft):	10-12
		DATA			
			SPECIFICATION		
U.S Std SIEVE (in.)	PARTICLE SIZE (mm)	% by WT. FINER	Min	Max	P / F
3	76.2	100.0			
2	50.8	100.0			
1.5	37.5	100.0			
1	25.4	77.0			
3/4	19.1	57.3			
1/2	12.7	50.8			
3/8	9.5	48.6			
#4	4.76	37.9			
#10	2.0	31.8			
#20	0.84	26.0			
#40	0.42	18.1			
#60	0.25	11.3			
#100	0.149	7.6			
#200	0.074	4.8			

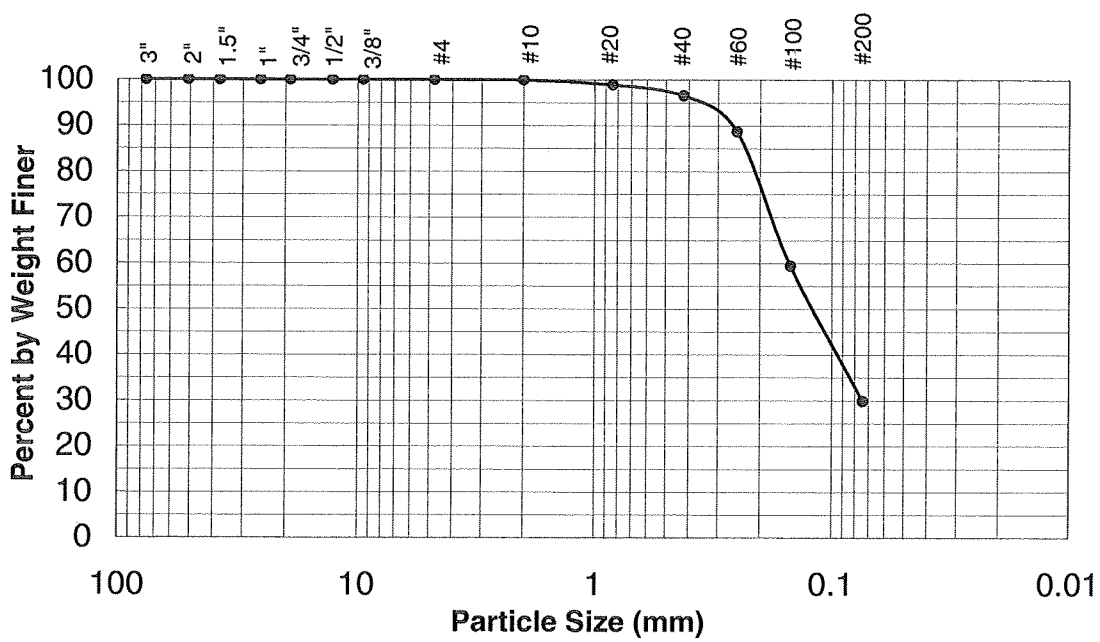


Water Content (%) = 11.2

SEVEE & MAHER ENGINEERS
4 BLANCHARD ROAD
CUMBERLAND CTR., MAINE 04021
(207) 829-5016

GRAIN SIZE ANALYSIS - ASTM D422

PROJECT NAME:	Blue Ridge Paper		PROJECT No:		07089
	Canton, N. Carolina			DATE:	13-Sep-07
SAMPLE SOURCE:	Landfill #6 Expansion		BORING No:		B07-225
SAMPLE DESCRIP:	Dark brown silty SAND		SAMPLE No:		1D
				DEPTH (ft):	4-6
		DATA			
			SPECIFICATION		
U.S Std SIEVE (in.)	PARTICLE SIZE (mm)	% by WT. FINER	Min	Max	P / F
3	76.2	**100.0**			
2	50.8	**100.0**			
1.5	37.5	**100.0**			
1	25.4	**100.0**			
3/4	19.1	**100.0**			
1/2	12.7	**100.0**			
3/8	9.5	**100.0**			
#4	4.76	**100.0**			
#10	2.0	**100.0**			
#20	0.84	**98.9**			
#40	0.42	**96.5**			
#60	0.25	**88.7**			
#100	0.149	**59.4**			
#200	0.074	**29.9**			

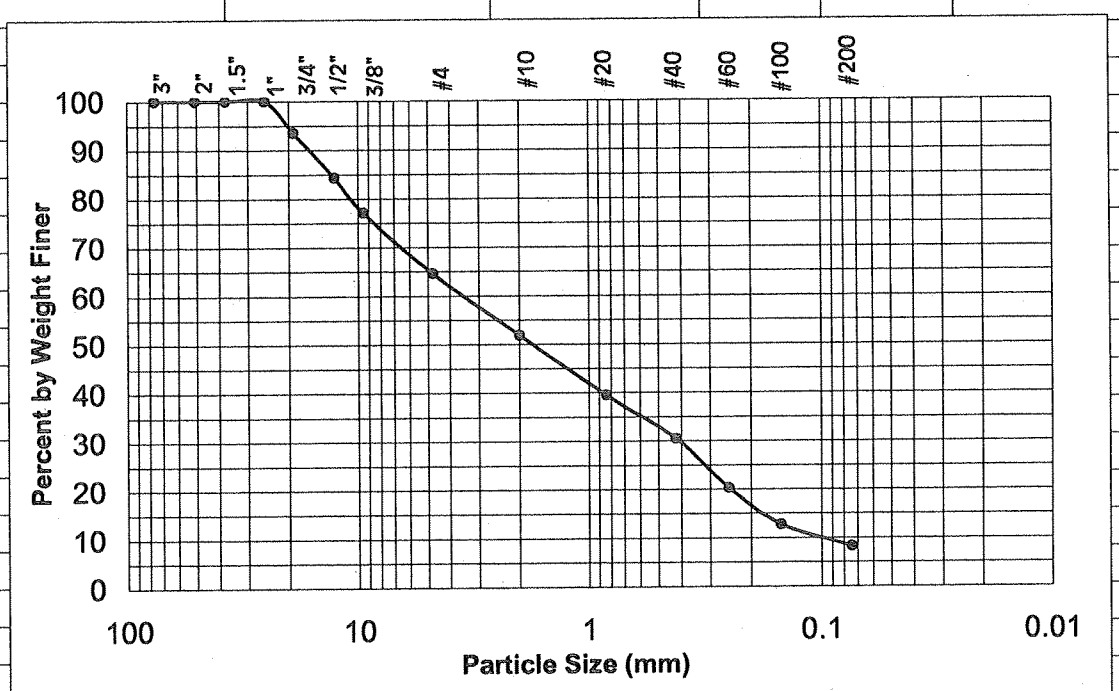


Water Content (%) = 45.9

SEVEE & MAHER ENGINEERS
4 BLANCHARD ROAD
CUMBERLAND CTR., MAINE 04021
(207) 829-5016

GRAIN SIZE ANALYSIS - ASTM D422

PROJECT NAME:	Blue Ridge Paper			PROJECT No:	07089
	Canton, N. Carolina			DATE:	15-Jan-08
SAMPLE SOURCE:	Landfill #6 Expansion			BORING No:	B07-225
SAMPLE DESCRIP:	Brown gravelly c-f SAND, trace silt			SAMPLE No:	2D
				DEPTH (ft):	9.5-11
		DATA			
			SPECIFICATION		
U.S Std SIEVE (in.)	PARTICLE SIZE (mm)	% by WT. FINER	Min	Max	P / F
3	76.2	100.0			
2	50.8	100.0			
1.5	37.5	100.0			
1	25.4	100.0			
3/4	19.1	93.6			
1/2	12.7	84.3			
3/8	9.5	77.1			
#4	4.76	64.5			
#10	2.0	51.8			
#20	0.84	39.5			
#40	0.42	30.4			
#60	0.25	20.3			
#100	0.149	12.7			
#200	0.074	8.2			

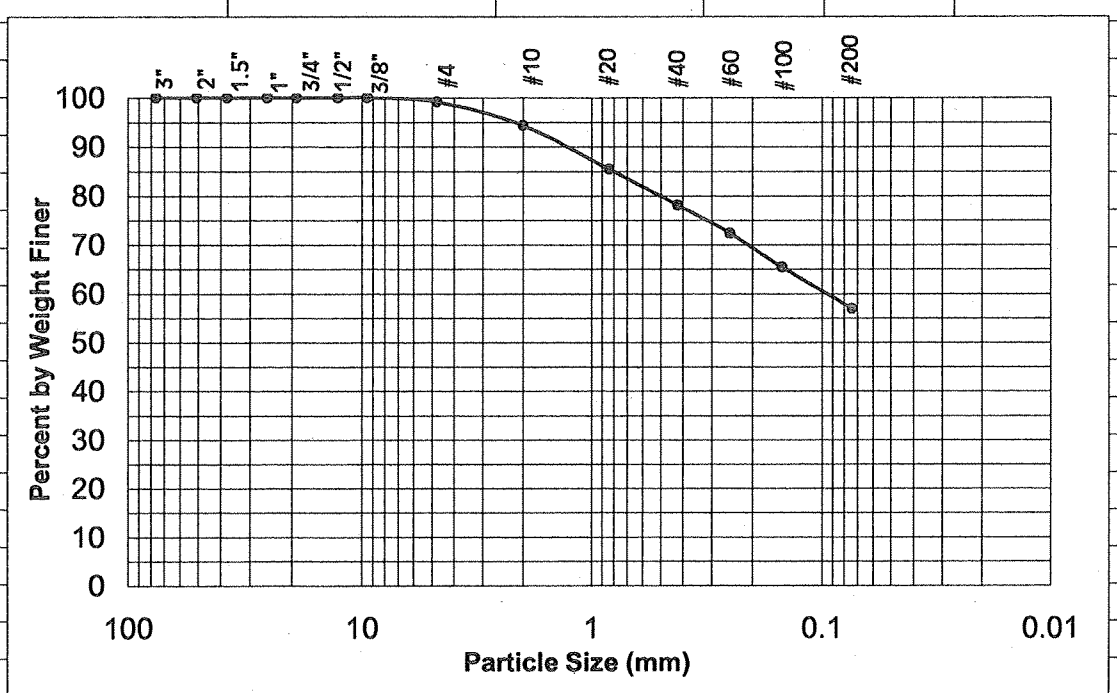


Water Content (%) = 14.1

SEVEE & MAHER ENGINEERS
4 BLANCHARD ROAD
CUMBERLAND CTR., MAINE 04021
(207) 829-5016

GRAIN SIZE ANALYSIS - ASTM D422

PROJECT NAME:	Blue Ridge Paper			PROJECT No:	07089
	Canton, N. Carolina			DATE:	15-Jan-08
SAMPLE SOURCE:	Landfill #6 Expansion			BORING No:	B07-226
SAMPLE DESCRIP:	Red-brown sandy SILT			SAMPLE No:	2D
				DEPTH (ft):	5-7
		DATA			
			SPECIFICATION		
U.S Std SIEVE (in.)	PARTICLE SIZE (mm)	% by WT. FINER	Min	Max	P / F
3	76.2	100.0			
2	50.8	100.0			
1.5	37.5	100.0			
1	25.4	100.0			
3/4	19.1	100.0			
1/2	12.7	100.0			
3/8	9.5	100.0			
#4	4.76	99.2			
#10	2.0	94.3			
#20	0.84	85.4			
#40	0.42	78.1			
#60	0.25	72.3			
#100	0.149	65.4			
#200	0.074	56.9			

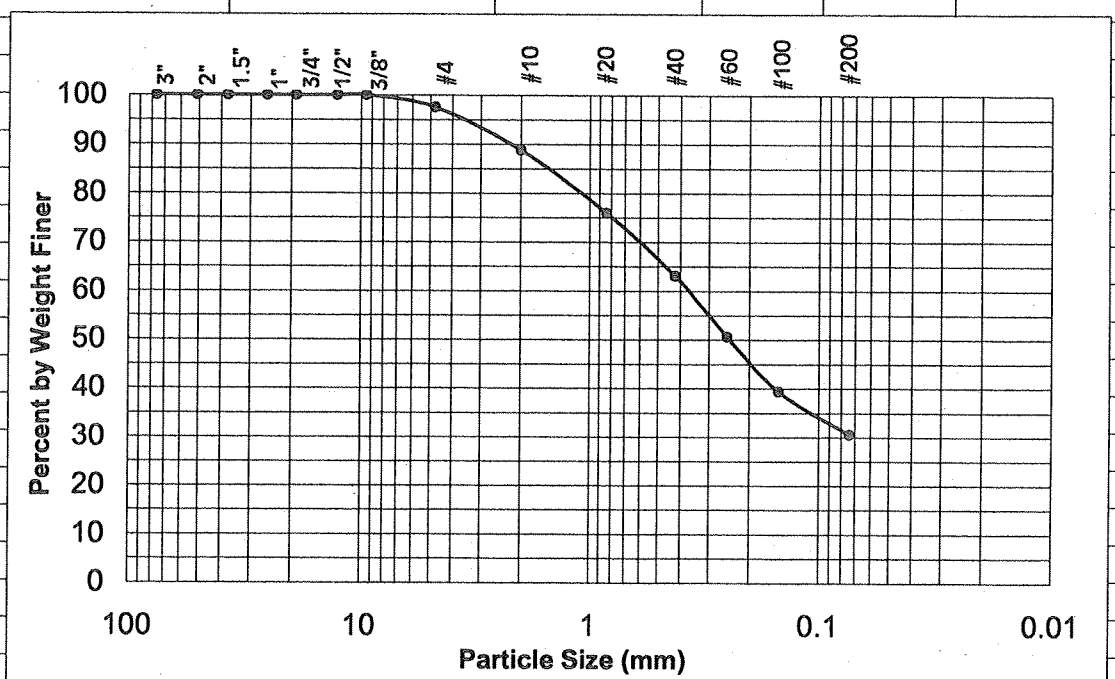


Water Content (%) = 21.7

SEVEE & MAHER ENGINEERS
4 BLANCHARD ROAD
CUMBERLAND CTR., MAINE 04021
(207) 829-5016

GRAIN SIZE ANALYSIS - ASTM D422

PROJECT NAME:	Blue Ridge Paper			PROJECT No:	07089
	Canton, N. Carolina			DATE:	15-Jan-08
SAMPLE SOURCE:	Landfill #6 Expansion			BORING No:	B07-226
SAMPLE DESCRIP:	Brown silty m-f SAND			SAMPLE No:	5D
				DEPTH (ft):	20-22
		DATA			
			SPECIFICATION		
U.S Std SIEVE (in.)	PARTICLE SIZE (mm)	% by WT. FINER	Min	Max	P / F
3	76.2	100.0			
2	50.8	100.0			
1.5	37.5	100.0			
1	25.4	100.0			
3/4	19.1	100.0			
1/2	12.7	100.0			
3/8	9.5	100.0			
#4	4.76	97.5			
#10	2.0	88.8			
#20	0.84	75.9			
#40	0.42	63.1			
#60	0.25	50.6			
#100	0.149	39.4			
#200	0.074	30.5			



Water Content (%) = 16.3

APPENDIX F

MOISTURE CONTENTS, SPECIFIC GRAVITY AND POROSITY CALCULATIONS

BLUE RIDGE PAPER
LANDFILL 6 EXPANSION
WATER CONTENT FROM BORINGS

BORING SAMPLE	DEPTH (ft.)	CAN No.	WT. WET SOIL & CAN (g)	WT. DRY SOIL & CAN (g)	WT. H20 (g)	WT. CAN (g)	DRY SOIL (g)	WATER CONTENT (%)
B07-222	5-6.5	50	146.69	134.12	12.57	53.06	81.06	15.5
	10-11.2	51	170.92	156.71	14.21	53.04	103.67	13.7
	11.2-12	52	167.44	147	20.44	53.04	93.96	21.8
	15-17	53	217.99	185.71	32.28	52.96	132.75	24.3
	20-22	54	229.36	201.16	28.2	53.38	147.78	19.1
	25-27	55	231.65	211.74	19.91	52.99	158.75	12.5
	30-32	56	241.87	213.93	27.94	53.12	160.81	17.4
	35-37	57	230.52	205.43	25.09	53.21	152.22	16.5
	40-42	58	255.84	231.84	24	53.11	178.73	13.4
	45-46	59	226.66	203.68	22.98	52.82	150.86	15.2
	50-50.4	60	190.98	176.75	14.23	53.2	123.55	11.5
	55-56.9	61	248.1	230.21	17.89	52.91	177.3	10.1
	60-61.8	62	248.76	223.69	25.07	53.13	170.56	14.7
B07-203	0-1		from sieve analysis					29.8
	5-7	63	183.94	158.97	24.97	52.93	106.04	23.5
	9-11	64	203.31	181.15	22.16	53.15	128	17.3
	14-15.5	65	231.34	202.44	28.9	53.1	149.34	19.4
	15.5-16	50	216.77	194.29	22.48	53.06	141.23	15.9
	19-21	51	235.32	207.64	27.68	53.04	154.6	17.9
	24-26	52	236.76	213.11	23.65	53.04	160.07	14.8
	29-31	53	224.79	204.98	19.81	52.96	152.02	13.0
B07-201	19-21		from sieve analysis					17.3
	29-31	54	192.45	170.93	21.52	53.38	117.55	18.3
	34-36	55	274.26	247.31	26.95	52.99	194.32	13.9
	39-41	56	263.54	236.6	26.94	53.12	183.48	14.7
	44-46		from sieve analysis					14.2
	49-51	57	262.7	239.98	22.72	53.21	186.77	12.2
	54-54.8	58	241.76	223.24	18.52	53.11	170.13	10.9
	59-59.6	59	201.06	192.7	8.36	52.82	139.88	6.0
	64-66	60	250.08	230.91	19.17	53.2	177.71	10.8
	69-69.5	61	221.61	206.93	14.68	52.91	154.02	9.5
	74-74.5	62	242.53	224.58	17.95	53.13	171.45	10.5
	79-79.6		from sieve analysis					5.4
	84-85	63	158.07	151.21	6.86	52.93	98.28	7.0
	94-95	64	194.33	183.86	10.47	53.15	130.71	8.0

BLUE RIDGE PAPER
LANDFILL 6 EXPANSION
WATER CONTENT FROM BORINGS

BORING SAMPLE	DEPTH (ft.)	CAN No.	WT. WET SOIL & CAN (g)	WT. DRY SOIL & CAN (g)	WT. H20 (g)	WT. CAN (g)	DRY SOIL (g)	WATER CONTENT (%)
B07-215	0-4		from sieve analysis					15.1
	9-11	52	131.35	119.99	11.36	53.04	66.95	17.0
	19-21		from sieve analysis					40.0
	24-24.6	53	148.08	135.25	12.83	52.96	82.29	15.6
B07-215A	6-8	65	272.88	250.13	22.75	53.1	197.03	11.5
	8-9.3	50	232.1	220.2	11.9	53.06	167.14	7.1
	10-10.5	51	187.49	181.59	5.9	53.04	128.55	4.6
B07-225	4-6		from sieve analysis					45.9
	9-9.5	54	146.66	117.65	29.01	53.38	64.27	45.1
	9.5-11	55	213.67	195.94	17.73	52.99	142.95	12.4
B07-219	4-6	56	210.88	186	24.88	53.12	132.88	18.7
	9-11		from sieve analysis					50.7
	14-16	57	212.63	182.45	30.18	53.21	129.24	23.4
	24-26	58	258.19	238.05	20.14	53.11	184.94	10.9
	34-36		from sieve analysis					13.3
	39-41	59	146.23	137.31	8.92	52.82	84.11	10.6
	44-46	60	122.97	114.17	8.8	53.2	114.17	7.7
B07-208	39-41	62	220.69	192.05	28.64	53.13	139.1	20.6
	49-50.3	63	271.37	244.98	26.39	52.95	191.82	13.8
	59-59.5	64	209.73	178.09	31.64	53.16	178.09	17.8
B07-212	14-16	65	208.98	182.68	26.3	53.15	182.68	14.4
B07-205	50-52	1	263.15	222.16	40.99	45.6	176.97	23.2
	55-56.8	2	272.47	235.02	37.45	45.19	189.99	19.7
	65-67	3	268.15	217.51	50.64	45.03	217.51	23.3
B07-209	29-30	4	297.77	278.85	18.92	45.33	233.05	8.1
	?-34.5	5	210.68	197.58	13.1	45.8	197.58	6.6
B07-210	29-30	6	297.78	272.19	25.59	45.45	226.39	11.3
	39-40	7	282.38	238.27	44.11	45.8	193.06	22.8
	49-50	8	285.29	263.68	21.61	45.21	217.91	9.9
	54-54.4	9	141.47	130.08	11.39	45.77	130.08	8.8

BLUE RIDGE PAPER
LANDFILL 6 EXPANSION
WATER CONTENT FROM BORINGS

BORING SAMPLE	DEPTH (ft.)	CAN No.	WT. WET SOIL & CAN (g)	WT. DRY SOIL & CAN (g)	WT. H20 (g)	WT. CAN (g)	DRY SOIL (g)	WATER CONTENT (%)
B07-211	24-26	10	274.73	245.64	29.09	45.12	245.64	11.8
B07-214	24-26	11	258.47	225.99	32.48	45.63	180.49	18.0
	29-31	12	228.36	202.69	25.67	45.5	157	16.4
	34-36	13	277.15	249.25	27.9	45.69	203.84	13.7
	39-40	14	231.31	208.23	23.08	45.41	163.24	14.1
	44-44.6	15	193.42	178.13	15.29	44.99	178.13	8.6
B07-218	54-56	16	222.36	190.05	32.31	45.33	144.1	22.4
	59-61	17	246.73	205.59	41.14	45.95	205.59	20.0
B07-221	55-57	18	231.27	200.06	31.21	45.41	200.06	15.6
B07-223	34-36	19	231.82	196.17	35.65	45.44	150.45	23.7
	39-40	20	277.67	239.49	38.18	45.72	239.49	15.9
B07-224	10-12	21	275.59	253.2	22.39	46.13	207.65	10.8
	15-17	22	291.34	263.93	27.41	45.55	263.93	10.4

FIELD MOISTURE CONTENTS
LANDFILL NO. 6 EXPANSION
BLUE RIDGE PAPER PRODUCTS - CANTON MILL
CANTON, NC

Boring No.	Sample No.	Depth (ft bgs)	Analysis Date	Wet Weight of Soil (grams)	Dry Weight of Soil (grams)	Weight of Water (grams)	Water Content (%)
B-07-202	2D	5-7	10/22/2007	4.65	3.42	1.23	35.9
B-07-202	4D	15-17	10/22/2007	5.67	4.15	1.52	36.7
B-07-202	6D	25-27	10/22/2007	4.63	3.93	0.70	17.8
B-07-202	8D	35-37	10/22/2007	3.67	3.15	0.52	16.4
B-07-202	10D	45-45.8	10/22/2007	6.92	6.21	0.71	11.3
B-07-202	12D	55-55.3	10/22/2007	5.98	5.20	0.77	14.9
B-07-202	15D	70-70.6	10/22/2007	5.53	4.78	0.75	15.7
B-07-204	7D	30-32	10/22/2007	6.16	4.79	1.37	28.5
B-07-204	9D	40-42	10/22/2007	4.29	3.46	0.83	23.9
B-07-204	11D	50-52	10/22/2007	4.36	3.90	0.46	11.8
B-07-204	13D	60-62	10/22/2007	5.12	4.55	0.57	12.6
B-07-204	15D	70-70.5	10/22/2007	5.35	4.96	0.39	7.8
B-07-210	1D	0-2	9/18/2007	3.43	2.89	0.53	18.5
B-07-210	3D	9-11	9/18/2007	3.74	3.26	0.48	14.7
B-07-210	5D	19-21	9/18/2007	4.43	4.90	0.54	11.0
B-07-210	6D	24-26	9/18/2007	6.49	5.55	0.94	17.0
B-07-210	7D	30-31	9/18/2007	6.30	5.36	0.95	17.6
B-07-210	8D	34-35	9/18/2007	6.12	5.20	0.92	17.7
B-07-210	9D	40-41	9/18/2007	7.00	5.99	1.02	16.9
B-07-210	10D	44-46	9/18/2007	7.02	5.93	1.09	18.4
B-07-210	12D	54-54.4	9/18/2007	4.88	4.27	0.61	14.2
B-07-214	2D	4-6	9/25/2007	3.80	3.41	0.39	11.5
B-07-214	4D	14-16	9/25/2007	4.20	3.65	0.55	15.1
B-07-214	5D	20-21	9/25/2007	3.82	3.44	0.38	11.0
B-07-214	6D	24-26	9/24/2007	4.36	3.75	0.61	16.2
B-07-214	7D	29-31	9/24/2007	4.08	3.52	0.56	15.7
B-07-214	8D	34-36	9/24/2007	5.61	4.96	0.66	13.3
B-07-214	9D	40-41	9/24/2007	4.93	4.39	0.53	12.1
B-07-214	11D	49-49.5	9/24/2007	6.06	5.78	0.28	4.9
B-07-217	1D	0-2	9/25/2007	2.87	2.71	0.16	5.9
B-07-217	3D	9-11	9/25/2007	4.97	4.50	0.47	10.5
B-07-217	5D	19-21	9/25/2007	3.30	3.06	0.23	7.6
B-07-217	7D	29-31	9/25/2007	4.26	3.99	0.27	6.8
B-07-217	9D	39-41	9/25/2007	2.78	2.58	0.20	7.5
B-07-217	10D	44-46	9/25/2007	3.54	3.17	0.37	11.7
B-07-218	2D	4-6	9/24/2007	7.11	5.68	1.44	25.3
B-07-218	4D	14-16	9/24/2007	2.80	2.23	0.57	25.5
B-07-218	6D	24-26	9/24/2007	2.91	2.27	0.64	28.3
B-07-218	8D	34-36	9/24/2007	2.89	2.29	0.61	26.5
B-07-218	10D	44-46	9/24/2007	2.46	1.77	0.69	39.1
B-07-218	12D	54-56	9/24/2007	3.11	2.56	0.55	21.5
B-07-218	13D	59-61	9/24/2007	4.93	4.10	0.83	20.3

FIELD MOISTURE CONTENTS
LANDFILL NO. 6 EXPANSION
BLUE RIDGE PAPER PRODUCTS - CANTON MILL
CANTON, NC

Boring No.	Sample No.	Depth (ft bgs)	Analysis Date	Wet Weight of Soil (grams)	Dry Weight of Soil (grams)	Weight of Water (grams)	Water Content (%)
B-07-223	2D	4-6	9/18/2007	3.92	3.32	0.61	18.3
B-07-223	4D	14-15	9/18/2007	5.10	4.18	0.92	22.0
B-07-223	5D	19-21	9/18/2007	5.53	4.93	0.60	12.1
B-07-223	7D	29-31	9/25/2007	4.37	3.95	0.41	10.5
B-07-223	8D	34-36	9/25/2007	5.51	4.41	1.10	24.9
B-07-223	9D	40-40.5	9/25/2007	3.89	3.50	0.38	11.0
B-07-226	4D	15-17	10/22/2007	4.24	3.52	0.72	20.6
B-07-226	5D	20-22	10/22/2007	3.65	3.15	0.50	15.9
B-07-226	6D	25-27	10/22/2007	5.03	4.51	0.53	11.7
B-07-226	8D	35-35.4	10/22/2007	3.70	3.50	0.20	5.6
B-07-226	9D	40-41.5	10/22/2007	3.86	3.49	0.37	10.5

Notes:Testing performed on GEM microwave apparatus.

Abreviations:
ft bgs - feet below ground surface
% - percent

SPECIFIC GRAVITY OF SOIL SOLIDS (G_s)

Project BRPP

Job No. 07089

Location of Project LANDFILL #6 EXPANSION

Boring No. B07-219 Sample No. 8D|9D

Description of Soil Red-brown silty SAND

Depth of Sample 39-46

Tested By EJL

Date of Testing 14 SEPT 07

Test no.	1	2		
Vol. of flask at 20°C				
Method of air removal[a]	VACUUM →			
Wt. flask + water + soil = W_{bws}	497.5	501.1		
Temperature, °C	20.5	19.5		
Wt. flask + water[b] = W_{bw}	419.1	420.0		
Evap. dish no.	A-13	A-14		
Wt. evap. dish + dry soil	345.1	349.1		
Wt. of evap. dish	224.7	224.7		
Wt. of dry soil = W_s	120.4	124.4		
$W_w = W_s + W_{bw} - W_{bws}$	42.0	43.3		
$G_s = \alpha W_s / W_w$	2.866	2.873		

[a]Indicate vacuum or aspirator for air removal.

[b]W_{bw} is the weight of the flask filled with water at same temp. ± 1°C as for W_{bws} or value from calibration curve at T of W_{bws}.

Remarks

Average specific gravity of soil solids (G_s) = 2.87

Typical values of the correction factor, α

T, °C	α	γ_w, g/cm³
16	1.0007	0.99897
18	1.0004	0.99862
20	1.0000	0.99823
22	0.9996	0.99780
24	0.9991	0.99732
26	0.9986	0.99681

Typical values of G_s

Type of soil	G_s
Sand	2.65-2.67
Silty sand	2.67-2.70
Inorganic clay	2.70-2.80
Soils with micas or iron	2.75-3.00
Organic soils	Variable but may be under 2.00

% MOISTURE - POROSITY CALCULATION WORKSHEET
LANDFILL NO. 6 EXPANSION
AREAS D & E

Boring	Sample No.	Depth (ft bgs)	Moisture Content (%) (1)		SPT N-Value>50 (PWR)	Average Moisture Content (%)			Geologic Unit
			BRPP GEM (2)	SME Lab		Saturated Soil	Saturated Soil with SPT>50	Saturated Soil with SPT<50	
B-07-218	2D	4-6	25.3						Residual Soil
	4D	14-16	25.5						
	6D	24-26	28.3						Saprolite
	8D	34-36	26.5						
	10D	44-46	39.1						
	12D	54-56	21.5			20.9	N/A	20.9	
	13D	59-61	20.3						
B07-219	1D	4-6		18.7					Colluvium
	2D	9-11		50.7		50.7	N/A	50.7	
	3D	14-16		23.4		13.2	10.9	13.7	Saprolite
	5D	24-26		10.9	x				
	7D	34-36		13.3					
	8D	39-41		10.6					
	9D	44-46		7.7					
B07-222	1D	5-6.5		15.5		14.6	N/A	14.6	Reworked Soil
	2D-1	10-11.2		13.7					
	2D-2	11.2-12		21.8		16.0	12.3	17.5	Saprolite
	3D	15-17		24.3					
	4D	20-22		19.1					
	5D	25-27		12.5					
	6D	30-32		17.4					
	7D	35-37		16.5					
	8D	40-42		13.4					
	9D	45-46		15.2	x				
	10D	50-50.4		11.5	x				
	11D	55-56.9		10.1	x				
	12D	60-61.8		14.7					
B-07-223	2D	4-6	18.3						Saprolite
	4D	14-15	22.0						
	5D	19-21	12.1						
	7D	29-31	10.5		x				
	8D	34-36	24.9						
	9D	40-40.5	11.0		x	11.0	11.0	N/A	
B-07-226	4D	15-17	20.6			12.8	8.1	16.0	Saprolite
	5D	20-22	15.9						
	6D	25-27	11.7						
	8D	35-35.4	5.6		x				
	9D	40-41.5	10.5		x				

Notes:
1. Blue shading indicates soil sample collected from below the interpreted water table.
2. Testing performed on GEM microwave apparatus at BRPP.

Effective Porosity from Saturated Moisture Content

Variables: S = degree of saturation
G = Specific Gravity = 2.87
w = moisture content
e = void ratio, which = n/(1-n)
n = porosity
n_e = effective porosity, assume 0.9 n

Solution: Gw = Se [S = 1 at saturation]
Gw = n/(1-n)
Gw (1-n) = n
Gw - Gwn = n
Gw = n + Gwn
Gw = n (1 + Gw)
n = Gw/(1 +Gw)
n_e = 0.9 n

	Summary Porosity Calculations			
	Saturated Soil	Saturated Soil with SPT>50	Saturated Soil with SPT<50	Geologic Unit
mean w %:	14.6	10.9	17.6	Saprolite
e:	0.42	0.31	0.50	
n:	0.30	0.24	0.34	
n_e:	0.27	0.21	0.30	
mean w %:	23.7	10.1	30.5	Colluvium
e:	0.68	0.29	0.88	
n:	0.40	0.22	0.47	
n_e:	0.36	0.20	0.42	
mean w %:	15.6	10.9	18.9	All Saturated Soil
e:	0.45	0.31	0.54	
n:	0.31	0.24	0.35	
n_e:	0.28	0.21	0.32	

% MOISTURE - POROSITY CALCULATION WORKSHEET
LANDFILL NO. 6 EXPANSION
AREAS D & E

Boring	Sample No.	Depth (ft bgs)	Moisture Content (%) (1)		SPT N-Value>50 (PWR)	Average Moisture Content (%)			Geologic Unit
			BRPP GEM (2)	SME Lab		Saturated Soil	Saturated Soil with SPT>50	Saturated Soil with SPT<50	
B-07-201	D4	19-21		17.3		10.2	8.5	13.7	Saprolite
	D6	29-31		18.3					
	D7	34-36		13.9					
	D8	39-41		14.7					
	D9	44-46		14.2					
	D10	49-51		12.2					
	D11	54-54.8		10.9	x				
	D12	59-59.6		6.0	x				
	D13	64-66		10.8	x				
	D14	69-69.5		9.5	x				
	D15	74-74.5		10.5	x				
	D16	79-79.6		5.4	x				
	D17	84-85		7.0	x				
	D18	94-95		8.0	x				
B-07-202	2D	5-7	35.9			35.9	N/A	35.9	Residual Soil
	4D	15-17	36.7			18.8	14.0	23.6	Saprolite
	6D	25-27	17.8						
	8D	35-37	16.4						
	10D	45-45.8	11.3		x				
	12D	55-55.3	14.9		x				
	15D	70-70.6	15.7		x				
B07-203	D1	0-1		29.8		16.4	13.0	17.1	Reworked Soil
	D2	5-7		23.5					
	D3	9-11		17.3					Saprolite
	D4-1	14-15.5		19.4					
	D4-2	15.5-16		15.9					
	D5	19-21		17.9					
	D6	24-26		14.8					
	D7	29-31		13.0	x				
B-07-204	7D	30-32	28.5			14.0	10.7	23.9	Saprolite
	9D	40-42	23.9						
	11D	50-52	11.8		x				
	13D	60-62	12.6		x				
	15D	70-70.5	7.8		x				
B07-208	D8	39-41		20.6		17.4	15.8	20.6	Saprolite
	D10	49-50.3		13.8	x				
	D12	59-59.5		17.8	x				
B-07-210	1D	0-2	18.5			17.0	14.2	17.7	Residual Soil
	3D	9-11	14.7						
	5D	19-21	11.0						Saprolite
	6D	24-26	17.0						
	7D	30-31	17.6						
	8D	34-35	17.7						
	9D	40-41	16.9						
	10D	44-46	18.4						
	12D	54-54.4	14.2		x				
B07-212	3D	14-16		14.4		14.4	N/A	14.4	Colluvium
B-07-214	2D	4-6	11.5			12.4	10.1	16.0	Reworked Soil
	4D	14-16	15.1						Saprolite
	5D	20-21	11.0						
	6D	24-26	16.2						
	7D	29-31	15.7						
	8D	34-36	13.3		x				
	9D	40-41	12.1		x				
	11D	49-49.5	4.9		x				
B07-215	D	0-4		15.1		24.2	15.6	28.5	Reworked Soil
	2D	9-11		17.0					Colluvium
	4D	19-21		40.0					
	5D	24-24.6		15.6	x				
B07-215A	2D	6-8		11.5		4.6	4.6	N/A	Colluvium
	3D	8-9.3		7.1					
	4D	10-10.5		4.6	x				
B-07-217	1D	0-2	5.9						Residual Soil
	3D	9-11	10.5						Saprolite
	5D	19-21	7.6						
	7D	29-31	6.8						
	9D	39-41	7.5						
	10D	44-46	11.7						

ATTACHMENT 4

EROSION AND SEDIMENTATION CONTROL PLAN

EROSION AND SEDIMENT CONTROL PLAN FOR EXPANSION OF LANDFILL 6 AREA D SOUTH CANTON, NORTH CAROLINA

Prepared for

BLUE RIDGE PAPER PRODUCTS INC. - CANTON MILL DIVISION OF EVERGREEN PACKAGING CANTON, NORTH CAROLINA

NOVEMBER 2008

SME

Sevee & Maher Engineers, Inc.
Waste Management and Hydrogeologic Consultants
Cumberland Center, Maine

NORTH CAROLINA PROFESSIONAL SEAL 20589 ENGINEER JOHN E. SEVEE

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1.0 INTRODUCTION

This Erosion and Sediment Control Plan is designed for the expansion activities at Landfill No. 6, Area D South, located in Canton, North Carolina (see Figure 1-1). This plan was designed to comply with the Haywood County Erosion and Sediment Control Ordinance.

This law requires installation and maintenance of sufficient erosion control practices to retain sediment within the boundaries of the site. The primary requirements of which are:

1. Retaining or establishing a sufficient buffer zone along any natural watercourses or lakes to contain sediment to the first 25 percent of the buffer strip nearest the disturbance area.
2. Maintaining an undisturbed buffer of 25 feet along trout waters.
3. Minimizing slope cuts and fills to that sufficient for proper stabilization.
4. Vegetating slopes within 15 working days or 90 calendar days following final grading to prevent off-site sedimentation.
5. Minimizing 10-year discharge velocities at discharge points for post construction.

As designed, uncontaminated runoff for post-development conditions at the site will be directed through an existing on site detention basin which then discharges to a second downgradient basin. The basin outlet control structure discharge device will run north to south under the landfill expansion waste liner system. Contaminated runoff from within the expansion will be directed into the leachate collection system through a series of perforated underdrain pipes embedded in stone. Runoff collected in the leachate collection system is discharged to an existing leachate pond located within Landfill No. 6 property limits. A comparison is made between the pre- and post-development conditions and is located in Section 2.3 of this plan.

BASE MAP ADAPTED FROM 7.5 MIN USGS TOPO QUADS
CANTON, NC – 1990
CLYDE – 1978

1000 0 2000 4000 FEET

FIGURE 1-1
SITE LOCATION PLAN
BLUE RIDGE PAPER PRODUCTS INC. – CANTON MILL
CANTON, NORTH CAROLINA
LANDFILL NO. 6 EXPANSION

SME
Sevee & Maher Engineers, Inc.

DWG: 6E-SITELOC LMN: NONE CTB: SME-STD REV:

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All drainage structures in the proposed development were designed to accommodate runoff from the 10-year/24-hour storm event and all detention basins were designed for the 25-year/24-hour storm event. Erosion control measures for the expansion are addressed in this plan and in construction documents for the site. The erosion control measures are intended to stabilize surface water drainage ways during construction and to provide temporary and permanent erosion control systems to minimize sediment transport during construction and operations.

The post-development surface water peak velocities were evaluated in applicable areas which are affected by the landfill expansion. Stormwater flows were calculated using a computer modeling system called HydroCAD (Version 8.5) by Applied Microcomputer Systems of Chocorua, New Hampshire. The methods utilized in HydroCAD are based on the Soil Conservations Services (SCS) Technical Release No. 55 (TR55) Methodology for determining runoff peak flow values and flood hydrographs. A 24-hour Type 2 storm with antecedent moisture condition II was used to model the runoff characteristics of the site. Models were created for post-development site conditions using a 2-, 10- and 25-year frequency storm event. The post-development condition consists of the excavation for the landfill base and liner system.

1.1 Project Description

The purpose of this project is to construct an approximately 16 acre landfill expansion located at Blue Ridge Landfill No. 6. The site is located in Haywood County, Canton, North Carolina, and is situated north of the Pigeon River and west of Bowen Branch, both of which are classified as Class C water bodies (See Figure 1-1). The project will consist of the excavation of site soils, construction of access roadways, expansion of detention basin, placement of landfill liner materials, installation of leachate collection system, and construction of leachate collection pump station with force main.

1.2 Site Description

The topography of the landfill expansion area generally slopes to the south between 2 and 50 percent. Ground cover ranges from wooded areas to the southwest to brush covered meadow and

sand covered areas on the remainder of the site. Surface water drainage flows overland and into a series of rock and vegetated drainage ditches, detention basins, culverts, and natural drainage swales before entering into the Pigeon River. An existing seep is located within the proposed landfill expansion limits. A 12-inch underdrain located beneath the landfill liner is proposed to convey flowage from the seep to an existing basin located directly south of the landfill expansion.

1.3 Adjacent Properties

Land use near Landfill No. 6 is primarily farmland, residential and undeveloped properties.

2.0 WATERSHED STORMWATER FLOWS

2.1 Pre Development Conditions

The study area for the landfill expansion watershed consists of approximately 72.06 acres in pre-development conditions. Ground cover consists of wooded areas on the southwest portion of the watershed with the remaining areas being a mix of brush/meadow and gravel. All site stormwater flows overland southerly and westerly to the property line before it discharges into the Pigeon River. Land use for the watershed area consists of approximately 28.57 acres of woods cover (HSG B), 4.32 acres of gravel access roads (HSG B) 38.37 acres of brush/grass mix (HSG B) and 0.80 acres of impervious area. Based on NRCS soils mapping site soils are Evard-Cowee and Hayesville and are classified as hydraulic soil group (HSG) B for the purposes of this analysis. The soils map is included in Appendix A.

The 72.06 acre watershed is subdivided into four subcatchments for modeling purposes. Maximum pre-development discharge velocities for the 25-year/24-hour storm event were generated for each subcatchment and analyzed at four points of analysis along or within the landfill property line and can be seen on Drawing D-100, Pre-Development Stormwater Management Plan which is included in Appendix B-1. A fifth off property point of analysis is also included to ensure an increase in discharge as measured at the Pigeon River does not occur resultant of the proposed development.

The majority of site impacted by the landfill expansion is located within Subcatchment 1 (SC-1). Subcatchment 1 consists of approximately 36.99 acres and is located west previously constructed landfill areas. A deep vegetated drainage swale is centralized within the subcatchment and runs north to south. A seep is located within the swale and discharges approximately 2-gallons/minute. The drainage swale terminates at a small, previously constructed detention basin (Pond-P1) with 24-inch culvert outlet device. Stormwater is discharged from the basin southerly into a riprap drainage channel (Reach-R1) where it eventually crosses the property boundary and enters the Pigeon River. A weighted curve number (CN) of 64 was used for SC-1, generating a peak flow of 73.72 cfs from a 25-year/24-hour duration storm as routed through Pond-P1.

Subcatchment 2 (SC-2) consists of approximately 24.31 acres and is located to the north of subcatchment 1. This subcatchment is bounded by the westerly property line and contains a portion of Interstate-40 to the north. Stormwater within SC-2 flows westerly in wooded overland flow before it crosses the property line. Once runoff leaves the property it flows through a series of natural drainage ways (Reach-R2) which discharge into the Pigeon River. A weighted curve number (CN) of 64 was used for SC-2, generating a peak flow of 66.27 cfs from a 25-year/24-hour duration storm.

Subcatchment 3 (SC-3) consists of approximately 3.47 acres and is located west of SC-1 and is bounded by the westerly property line. Stormwater within SC-3 flows westerly in wooded overland flow before it crosses the property line. Once runoff leaves the property it flows through a series of natural drainage ways (Reach-R3) which discharge into the Pigeon River. A weighted curve number (CN) of 57 was used for SC-3, generating a peak flow of 7.94 cfs from a 25-year/24-hour duration storm.

Subcatchment 4 (SC-4) consists of approximately 7.29 acres and is located southwest of SC-1 and is bounded by the westerly property line. Stormwater within SC-4 flows westerly in wooded overland flow before it crosses the property line. Once runoff leaves the property it flows through a series of natural drainage ways (Reach-R4) which discharge into the Pigeon River. A weighted curve number (CN) of 62 was used for SC-3, generating a peak flow of 18.28 cfs from a 25-year/24-hour duration storm.

A resultant flow of 109.14 cfs is projected from a 25-year/24-hour duration storm as measured at the Pigeon River analysis point.

2.2 Post Development Conditions

The study area for post-development conditions is the same size as the pre-development condition (approximately 72.06 acres); however, the configuration of the individual subcatchments within the area changes due to site regrading and design of on-site stormwater systems. The analyzed watershed is divided into six subcatchments, SC-1A, 1B, 1C, 2, 3 and 4. The post-development subcatchment areas are shown on Drawing D-101, Post-Development Stormwater Management Plan. Reports of the post-development analysis are located in Appendix B-2.

In post-development conditions, Subcatchment 1 (SC-1) is divided into three separate areas, (1A, 1B and 1C) and, as in pre-development conditions, continues to convey stormwater in a southerly direction. SC-1A is the northerly most area and is located directly north of the proposed landfill expansion and consists of approximately 20.00 acres. The majority of the subcatchment is undeveloped brush/grass mix. The subcatchment consists of the proposed gravel construction/access roads, an existing detention basin, a portion of the temporary stockpile and the northerly boundary of the landfill excavations along the containment berm. In order to prevent runoff leaving the subcatchment from entering the proposed landfill excavation area, an earthen containment berm is proposed and acts to maintain separation of clean runoff from within SC-1A and leachate generated from runoff contaminated with waste in SC-1B. The existing detention basin (Pond-P2) located within the subcatchment will function as a sediment basin during construction and will attenuate peak flows from upgradient areas during and after the landfill expansion construction activities. Utilizing Pond-P2 will also allow stormwater runoff of upgradient areas to be routed separately from runoff from within the proposed landfill expansion area. This acts to separate contaminated runoff and clean runoff. In order to utilize the existing detention basin, Pond-P2 will require clearing, grubbing, and lowering the base of the pond to elevation 2656 and expanding the overall footprint. This will allow Pond-P2 to adequately accommodate the peak flow without overtopping the earthen containment berm during the 25-year/24-hour storm event. Other modifications to Pond-P2 will involve replacing the existing outlet device with a composite outlet control structure and 12-inch HDPE underdrain pipe. The composite outlet control structure consists of a 4-foot diameter drop inlet riser

(manhole barrel). Twelve individual ½-inch orifices embedded in 2 feet of crushed stone are located at the basin base elevation and an 8-inch side mounted orifice is located 2 feet above the basin base. All stormwater entering the structure is routed to a 12-inch HDPE underdrain outlet pipe (Reach-R1A). The pond outlet pipe is located beneath the proposed landfill liner and discharges to a second existing on site detention basin (Pond-P1) located just south of the proposed landfill expansion. A weighted curve number (CN) of 67 was used for SC-1A, generating a peak flow of 9.54 cfs from a 25-year/24-hour duration storm as routed through Pond-P2.

Subcatchment 1B (SC-1B) consists of approximately 16.06 acres in post-development conditions and contains the entire proposed lined landfill area. All stormwater runoff collected within the limits of SC-1B is contained within a separate leachate collection system and therefore does not contribute to the overall watershed analysis model. For this reason, SC-1B is removed from the analysis model.

Subcatchment 1C (SC-1C) consists of approximately 2.73 acres in post-development conditions and contains a portion of the landfill perimeter road and associated fill slopes. All stormwater from within SC-1C drains southerly into an existing detention basin (Pond-P1) which also receives upgradient stormwater from Pond-P2 as previously discussed. Pond-P1 safely conveys runoff from the 25-year/24-hour duration storm via an existing 24-inch culvert. As in pre-development conditions, stormwater is then discharged southerly into a riprap drainage channel (Reach-R1) where it eventually crosses the property boundary and enters the Pigeon River. A weighted curve number (CN) of 65 was used for SC-1C, generating a peak flow of 14.61 cfs from a 25-year/24-hour duration storm as routed through Pond-P1.

Subcatchment 2 (SC-2) consists of approximately 22.88 acres in post-development conditions and includes a portion of the temporary stockpile. As in pre-development conditions, Stormwater within SC-2 flows westerly in wooded overland flow before it crosses the property line. Once runoff leaves the property it flows through a series of natural drainage ways (Reach-R2) which discharge into the Pigeon River. A weighted curve number (CN) of 64 was used for SC-2, generating a peak flow of 62.37 cfs from a 25-year/24-hour duration storm.

Subcatchment 3 (SC-3) consists of approximately 4.14 acres in post-development conditions and includes portion of the fill slopes resultant from construction of the landfill perimeter road. As in pre-development conditions, Stormwater within SC-3 flows westerly in wooded overland flow before it crosses the property line. Once runoff leaves the property it flows through a series of natural drainage ways (Reach-R3) which discharge into the Pigeon River. A weighted curve number (CN) of 57 was used for SC-3, generating a peak flow of 7.90 cfs from a 25-year/24-hour duration storm.

Subcatchment 4 (SC-4) consists of approximately 6.25 acres in post-development conditions and includes a portion of the landfill perimeter road and associated fill slopes. As in pre-development conditions, Stormwater within SC-4 flows westerly in wooded overland flow before it crosses the property line. Once runoff leaves the property it flows through a series of natural drainage ways (Reach-R4) which discharge into the Pigeon River. A weighted curve number (CN) of 63 was used for SC-4, generating a peak flow of 16.41 cfs from a 25-year/24-hour duration storm.

A resultant flow of 63.15 cfs is projected from a 25-year/24-hour duration storm as measured at the Pigeon River analysis point.

2.3 Comparison of Peak Flows

TABLE 2-1

COMPARISON OF PRE- AND POST-DEVELOPMENT RUNOFF
25-YR/24-HOUR STORM EVENT

Analysis Point	Pre-Development Flow (cfs)	Post-Development Flow (cfs)	Difference
1 (SC-1)	73.72	14.61	(-) 59.11
2 (SC-2)	66.27	62.37	(-) 3.90
3 (SC-3)	7.94	7.90	(-) 0.04
4 (SC-4)	18.28	16.41	(-) 1.87
Pigeon River	109.14	63.15	(-) 45.99

As indicated in Table 2-1, peak runoff rates for post-development conditions at Landfill No. 6 will be less than existing flow rates. This is due to the removal of all runoff from the analysis

which is collected within the SC-IB area as it is contained in the Leachate collection system. It is our opinion that the project complies with the Haywood County Erosion and Sediment Control Ordinance and will not negatively impact receiving waters, adjacent properties, downstream properties and/or downstream flow conditions.

3.0 PERFORMANCE STANDARDS

Permanent erosion and sedimentation control measures are designed to provide protection from a rainfall event equivalent in magnitude to the 10-year storm event. Temporary erosion and sedimentation control measures are designed to provide protection from a rainfall event equivalent in magnitude to the 2-year storm event in an unvegetated state. Performance standards and design calculations for erosion and sediment control are included in Appendix C.

3.1 Culvert Inlet/Outlet Protection

Design of the culvert inlet and outlet protections are sized and analyzed based on the 10-year/24-hour storm event. Outlet protection in the form of riprap aprons is required at several locations within the proposed development. These locations are shown on Drawing D-101, Post-Development Stormwater Management Plan in Appendix B-2, associated design calculations for inlet/outlet protection are included in Appendix C.

3.2 Drainage Channels

Design of drainage channel geometries are conservatively sized based on the subcatchment(s) with the maximum drainage area, quickest time of concentration, and capacity to handle the peak flow from a 10-year/24-hour storm. Design of the erosion control matting was analyzed using North American Green's (NAG) Erosion Control Material Design Software Version 4.3. Flow from a 2-year/24-hour storm event was used to design channel linings where temporary turf reinforcement mat is adequate. Flow from a 10-year/24-hour storm event was used to design areas where permanent channel lining is required.

Several small drainage ditches are located along the proposed landfill perimeter/access roads are in cut sections. In most cases a trapezoidal cross-section with maximum 2.5 horizontal to 1 vertical (2.5H:1V) sideslopes, 2-foot-wide bottom, and minimum 2-foot depth was used for all ditches. The ditch capacity in each case is greater than the peak flow generated from stormwater runoff while maintaining a minimum of 1-foot freeboard within the ditch. Temporary matting

during the unvegetated condition will require NAG's temporary lining S75BN or equal, prior to a permanent channel lining of vegetation.

The outlet at the existing 24-inch storm drain from Pond-P1 discharges into an existing riprap lined channel which flows to the south towards the Pigeon River. The riprap lined channel is approximately 200 feet long and is sufficiently lined to convey runoff from the 10-year/24-hour storm event and therefore requires no modifications.

Discharge velocities at each respective discharge point were analyzed to ensure existing channel erosion will not occur. The following table shows 10-year/24-hour runoff velocities as modeled for pre- and post-development conditions as measured at analysis points 1 through 4 at the landfill property line.

TABLE 3-1

COMPARISON OF PRE- AND POST-DEVELOPMENT RUNOFF VELOCITIES 10-YR/24-HOUR STORM EVENT

Analysis Point	Pre-Development Flow (fps)	Post-Development Flow (fps)	Difference
1 (SC-1)	4.55	3.17	(-) 1.38
2 (SC-2)	2.74	2.69	(-) 0.05
3 (SC-3)	1.70	1.76	(+) 0.06
4 (SC-4)	2.95	2.86	(-) 0.09

As indicated in Table 3-1, peak runoff velocities for post-development conditions at Landfill No. 6 will be less than existing velocities with the exception of SC-3. The increase in velocity of 0.06 fps as measured at the SC-3 discharge point is a 3.5% increase and is not expected to be of concern as the existing drainage channel in which runoff flows is currently vegetated, will remain undisturbed, and has a maximum permissible velocity of 3 fps, therefore reducing the likelihood for erosion. It is our opinion that the project complies with the Haywood County Erosion and Sediment Control Ordinance and will not negatively impact receiving waters, adjacent properties, downstream properties and/or downstream flow conditions.

4.0 PLANNED SEDIMENT AND EROSION CONTROL PRACTICES

Proposed erosion and sedimentation control practices include the following:

1. Construction Sequence Schedule (Practice 6.01) – A construction sequence schedule is included in this plan as Section 5.0.

2. Surface Roughening (Practice 6.03) – To aid in the establishment of vegetative cover, all slopes receiving topsoil will be tracked with appropriate equipment to create grooves perpendicular to the slope. See Specification Section 02480.

3. Topsoiling (Practice 6.04) – – Topsoil will be added to a depth of four inches in all areas. Specifications for Topsoiling are located in Specification Section 02480.

4. Permanent Seeding (Practice 6.11.1) – Permanent seeding will be applied to all areas disturbed by construction. Specifications for Seeding are located in Specification Section 02480.

5. Mulching (Practice 6.14.1) – Mulch will be applied to all seeded areas to limit erosion. See Specification Sections 02270 and 02480 for mulching technical specifications.

6. Grass-Lined Channels (Practice 6.30.1) –All grass-lined channels will be lined with Erosion Control Blankets until vegetation is stabilized in the channel. See Specification Section 02270 for erosion control blanket technical specifications. See Appendix C for drainage channel design calculations.

7. Siltation Fence (Practice 6.62.1) - Siltation fence will be installed along the clearing limit lines where siltation is likely to occur. Siltation fence will be

installed in areas noted on the design drawings. See Specification Section 02270 for technical specifications.

8. Dust Control (Practice 6.84.1) – Should excessive dust become a problem with construction it will be controlled by application of water in a fine spray with a water truck. See Specification Section 02270 for technical specifications.

9. Hay Bales – Hay bales will be placed in drainage channels as indicated on the design drawings. See Specification Section 02270 for technical specifications.

5.0 CONSTRUCTION SCHEDULE

The following construction schedule shall be maintained throughout the project:

1. Obtain plan approval and other applicable permits.

2. Clearly mark limits of work and limits of clearing.

3. Hold pre-construction conference at least one week prior to commencement of construction.

4. Install silt fence as indicated for the perimeter/access roads and landfill expansion areas.

5. Perform clearing and grubbing required for the perimeter/access roads and landfill expansion areas.

6. Perform construction activities for the perimeter/access roads and landfill expansion areas.

7. Install turf reinforcement mat and riprap in ditches, where specified.

8. Sequence construction activities so that not more than four acres of area are open at one time. An open area is one that has not reached final grade and/or has not been permanently seeded and mulched.

9. Remove temporary silt fence upon completion of project and remove other erosion control measures when all areas are stabilized. Estimated time before final stabilization – 9 months from final seeding.

6.0 CONSTRUCTION MAINTENANCE PLAN

The following maintenance will occur at the site in order to minimize the chances for erosion and sediment control issues at the site:

1. All erosion and sediment control practices will be checked for stability and operation following every runoff-producing rainfall but in no case less than once per week. Any required repairs shall be made immediately to maintain all structures as designed.

2. An adequate inventory of sediment and erosion control items (i.e., siltation fence, hay bales, check dam stone, etc.) shall be maintained on-site to perform maintenance sediment and erosion control practices without delay.

3. Sediment will be removed from siltation fence when it becomes one-half foot deep at the fence. Sedimentation fence shall be repaired as necessary to maintain an effective sediment barrier.

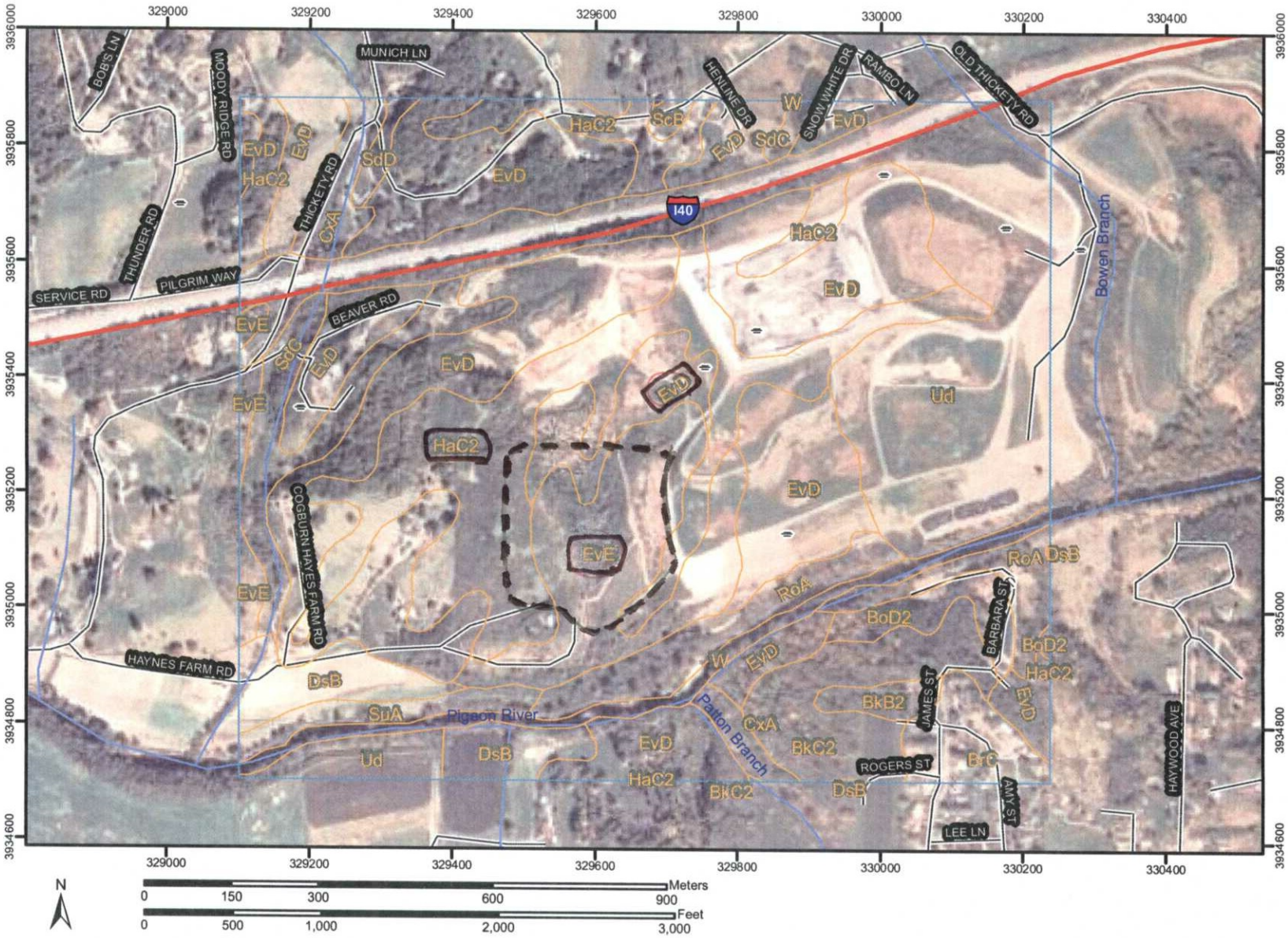
4. Sediments removed from siltation fences and temporary sediment traps will be placed in areas not prone to erosion.

5. All seeded areas will be fertilized, reseeded, and remulched as necessary according to specifications to maintain a vigorous, dense, vegetative growth.

APPENDIX A

SOILS MAP

Soil Map–Haywood County Area, North Carolina
(Landfill No. 6, Canton, North Carolina)



USDA Natural Resources Conservation Service

Web Soil Survey 2.0
National Cooperative Soil Survey

8/6/2008
Page 1 of 3

SOILS MAPPING
1 OF 3

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Units

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features

- Gully
- Short Steep Slope
- Other

Political Features

Municipalities

- Cities
- Urban Areas

Water Features

- Oceans
- Streams and Canals

Transportation

- Rails

Roads

- Interstate Highways
- US Routes
- State Highways
- Local Roads
- Other Roads

MAP INFORMATION

Original soil survey map sheets were prepared at publication scale. Viewing scale and printing scale, however, may vary from the original. Please rely on the bar scale on each map sheet for proper map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 17N

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Haywood County Area, North Carolina
Survey Area Data: Version 8, Feb 20, 2008

Date(s) aerial images were photographed: 4/2/1998

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Soils Mapping
2 of 3

Map Unit Legend

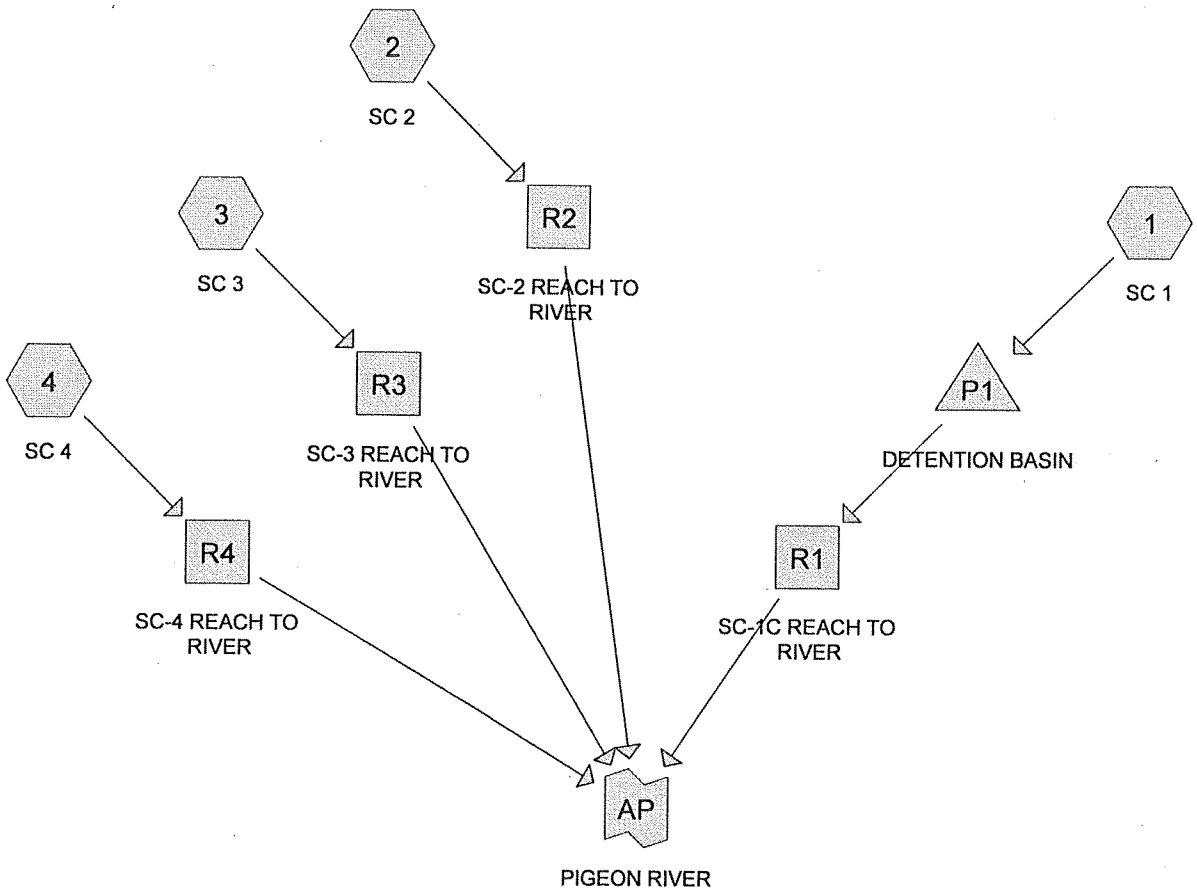
Haywood County Area, North Carolina (NC606)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
BkB2	Braddock clay loam, 2 to 8 percent slopes, eroded	2.8	0.7%
BkC2	Braddock clay loam, 8 to 15 percent slopes, eroded	16.2	4.0%
BoD2	Braddock clay loam, 15 to 30 percent slopes, eroded, stony	5.9	1.4%
BrC	Braddock-Urban land complex, 2 to 15 percent slopes	7.9	1.9%
CxA	Cullowhee-Nikwasi complex, 0 to 2 percent slopes, frequently flooded	7.8	1.9%
DsB	Dillsboro loam, 2 to 8 percent slopes	13.2	3.2%
EvD	Evard-Cowee complex, 15 to 30 percent slopes	B 134.8	33.1%
EvE	Evard-Cowee complex, 30 to 50 percent slopes	B 31.4	7.7%
HaC2	Hayesville clay loam, 8 to 15 percent slopes, eroded	B 61.8	15.1%
RoA	Rosman fine sandy loam, 0 to 2 percent slopes, occasionally flooded	16.9	4.1%
ScB	Saunook loam, 2 to 8 percent slopes	0.9	0.2%
SdC	Saunook loam, 8 to 15 percent slopes, stony	14.5	3.6%
SdD	Saunook loam, 15 to 30 percent slopes, stony	1.7	0.4%
SuA	Statler loam, 0 to 3 percent slopes, rarely flooded	5.3	1.3%
Ud	Udorthents, loamy	78.3	19.2%
W	Water	8.5	2.1%
Totals for Area of Interest (AOI)		407.7	100.0%

SOILS MAPPING
3 of 3

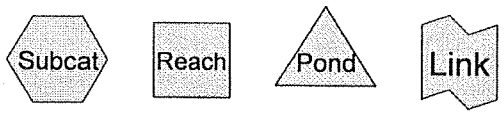
APPENDIX B-1

STORMWATER ANALYSIS - PRE-DEVELOPMENT

10-YR
Velocity Analysis



COMPARISON OF 10-YR STORM
Velocities @ EACH DISCHARGE POINT



Drainage Diagram for PH1-PRE
Prepared by Sevee & Maher Engineers, Inc., Printed 10/3/2008
HydroCAD® 8.50 s/n 001260 © 2007 HydroCAD Software Solutions LLC

10-YR
Velocity Analysis

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: SC 1 Runoff Area=36.990 ac 0.00% Impervious Runoff Depth>1.70"
Flow Length=1,864' Tc=19.4 min CN=64 Runoff=67.96 cfs 5.248 af

Subcatchment 2: SC 2 Runoff Area=24.310 ac 3.17% Impervious Runoff Depth>1.70"
Flow Length=1,320' Tc=16.4 min CN=64 Runoff=49.13 cfs 3.452 af

Subcatchment 3: SC 3 Runoff Area=3.470 ac 0.00% Impervious Runoff Depth>1.21"
Flow Length=457' Tc=11.5 min CN=57 Runoff=5.50 cfs 0.350 af

Subcatchment 4: SC 4 Runoff Area=7.290 ac 0.41% Impervious Runoff Depth>1.56"
Flow Length=622' Tc=16.2 min CN=62 Runoff=13.32 cfs 0.945 af

Reach R1: SC-1C REACH TO RIVER Avg. Depth=1.05' Max Vel=4.55 fps Inflow=32.49 cfs 5.245 af
n=0.100 L=370.0' S=0.1568 '/' Capacity=566.87 cfs Outflow=32.46 cfs 5.235 af

Reach R2: SC-2 REACH TO RIVER Avg. Depth=1.43' Max Vel=2.74 fps Inflow=49.13 cfs 3.452 af
n=0.100 L=2,550.0' S=0.0380 '/' Capacity=279.24 cfs Outflow=31.25 cfs 3.373 af

Reach R3: SC-3 REACH TO RIVER Avg. Depth=0.40' Max Vel=1.70 fps Inflow=5.50 cfs 0.350 af
n=0.100 L=1,700.0' S=0.0765 '/' Capacity=395.93 cfs Outflow=2.88 cfs 0.340 af

Reach R4: SC-4 REACH TO RIVER Avg. Depth=0.76' Max Vel=2.95 fps Inflow=13.32 cfs 0.945 af
n=0.100 L=350.0' S=0.1000 '/' Capacity=452.76 cfs Outflow=12.81 cfs 0.942 af

Pond P1: DETENTION BASIN Peak Elev=2,595.40' Storage=38,767 cf Inflow=67.96 cfs 5.248 af
Primary=32.49 cfs 5.245 af Secondary=0.00 cfs 0.000 af Outflow=32.49 cfs 5.245 af

Link AP: PIGEON RIVER Inflow=70.15 cfs 9.890 af
Primary=70.15 cfs 9.890 af

Total Runoff Area = 72.060 ac Runoff Volume = 9.995 af Average Runoff Depth = 1.66"
98.89% Pervious = 71.260 ac ~~1.11% Impervious = 0.800 ac~~

imp = gravel & imp = 5.12ac
7.1 % imp

IMPERVIOUS
AREA
Analysis

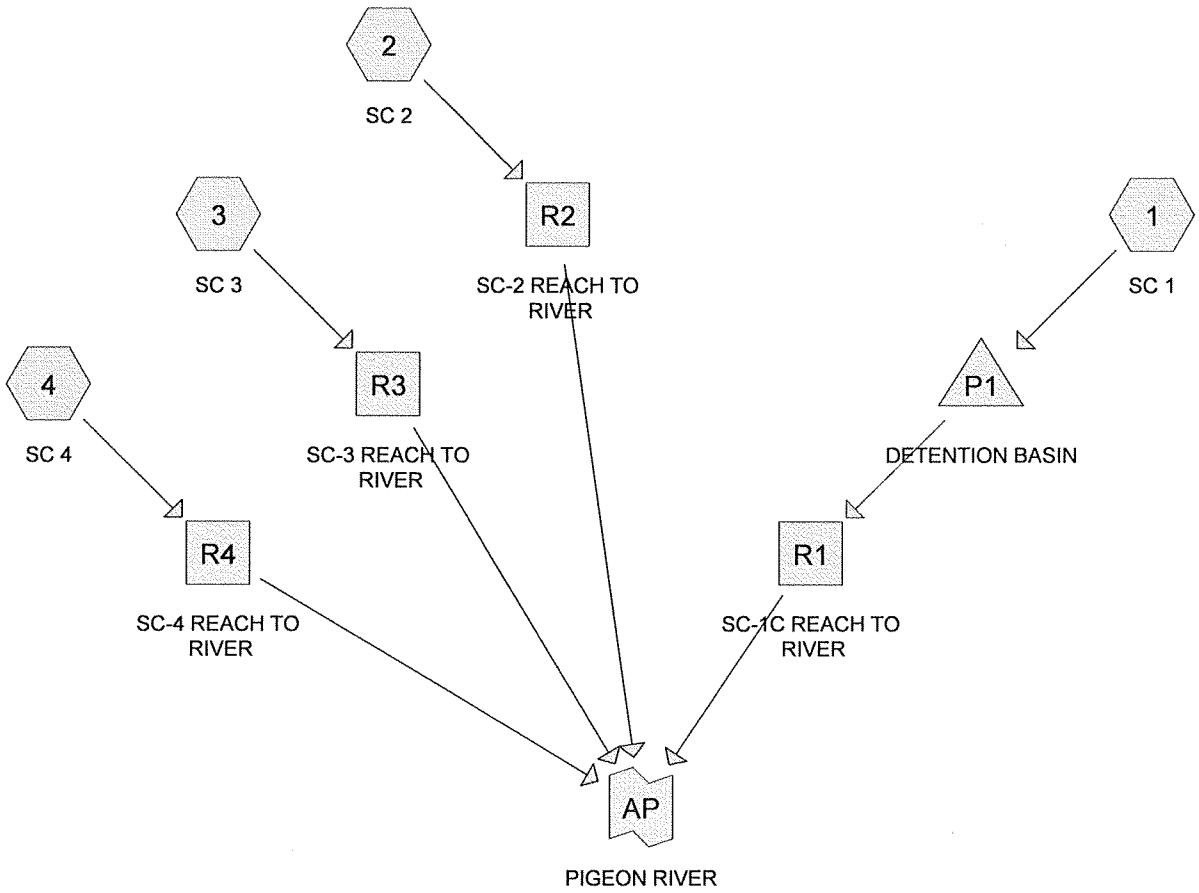
Area Listing (all nodes)

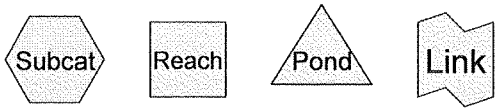
Area (acres)	CN	Description (subcatchment-numbers)
28.570	55	Woods, Good, HSG B (1,2,3,4)
38.370	67	EX-Brush/Grass mix, Poor, HSG B (1,2,3,4)
4.320	85	EX-Gravel roads, HSG B (1,2,4)
0.800	98	EX-Paved parking & roofs (2,4)

IMP = 5.12 AC

COMPARISON OF
PRE & POST AREAS

SEE POST IN
APPENDIX B2





Drainage Diagram for PH1-PRE
Prepared by Sevee & Maher Engineers, Inc., Printed 9/26/2008
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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: SC 1 Runoff Area=36.990 ac 0.00% Impervious Runoff Depth>2.25"
Flow Length=1,864' Tc=19.4 min CN=64 Runoff=91.84 cfs 6.940 af

Subcatchment 2: SC 2 Runoff Area=24.310 ac 3.17% Impervious Runoff Depth>2.25"
Flow Length=1,320' Tc=16.4 min CN=64 Runoff=66.27 cfs 4.566 af

Subcatchment 3: SC 3 Runoff Area=3.470 ac 0.00% Impervious Runoff Depth>1.67"
Flow Length=457' Tc=11.5 min CN=57 Runoff=7.94 cfs 0.483 af

Subcatchment 4: SC 4 Runoff Area=7.290 ac 0.41% Impervious Runoff Depth>2.08"
Flow Length=622' Tc=16.2 min CN=62 Runoff=18.28 cfs 1.264 af

Reach R1: SC-1C REACH TO RIVER Avg. Depth=1.53' Max Vel=5.80 fps Inflow=73.72 cfs 6.937 af
n=0.100 L=370.0' S=0.1568 '/' Capacity=566.87 cfs Outflow=68.44 cfs 6.926 af

Reach R2: SC-2 REACH TO RIVER Avg. Depth=1.70' Max Vel=3.06 fps Inflow=66.27 cfs 4.566 af
n=0.100 L=2,550.0' S=0.0380 '/' Capacity=279.24 cfs Outflow=44.55 cfs 4.475 af

Reach R3: SC-3 REACH TO RIVER Avg. Depth=0.50' Max Vel=1.97 fps Inflow=7.94 cfs 0.483 af
n=0.100 L=1,700.0' S=0.0765 '/' Capacity=395.93 cfs Outflow=4.64 cfs 0.472 af

Reach R4: SC-4 REACH TO RIVER Avg. Depth=0.88' Max Vel=3.25 fps Inflow=18.28 cfs 1.264 af
n=0.100 L=350.0' S=0.1000 '/' Capacity=452.76 cfs Outflow=17.65 cfs 1.261 af

Pond P1: DETENTION BASIN Peak Elev=2,596.51' Storage=50,117 cf Inflow=91.84 cfs 6.940 af
Primary=34.83 cfs 6.499 af Secondary=38.89 cfs 0.438 af Outflow=73.72 cfs 6.937 af

Link AP: PIGEON RIVER Inflow=109.14 cfs 13.134 af
Primary=109.14 cfs 13.134 af

Total Runoff Area = 72.060 ac Runoff Volume = 13.254 af Average Runoff Depth = 2.21"
98.89% Pervious = 71.260 ac 1.11% Impervious = 0.800 ac

Summary for Subcatchment 1: SC 1

Runoff = 91.84 cfs @ 12.11 hrs, Volume= 6.940 af, Depth> 2.25"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Yr Storm Rainfall=6.00"

	Area (ac)	CN	Description
	12.660	55	Woods, Good, HSG B
*	2.560	85	EX-Gravel roads, HSG B
*	21.770	67	EX-Brush/Grass mix, Poor, HSG B
	36.990	64	Weighted Average
	36.990		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	100	0.1000	0.15		**Sheet Flow, Segment ID: A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
7.0	690	0.1070	1.64		**Shallow Concentrated Flow, Segment ID: B-C** Woodland Kv= 5.0 fps
1.2	823	0.0830	11.62	2,324.15	**Trap/Vee/Rect Channel Flow, Segment ID: C-D** Bot.W=0.00' D=10.00' Z= 2.0 '/' Top.W=40.00' n= 0.100 Earth, dense brush, high stage
0.1	63	0.1110	12.48	39.19	**Circular Channel (pipe), Segment ID: D-E** Diam= 24.0" Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.025 Corrugated metal
0.3	188	0.0430	10.19	4,238.01	**Trap/Vee/Rect Channel Flow, Segment ID: E-F** Bot.W=40.00' D=8.00' Z= 2.0 & 1.0 '/' Top.W=64.00' n= 0.100 Earth, dense brush, high stage
19.4	1,864	Total			

Summary for Subcatchment 2: SC 2

Runoff = 66.27 cfs @ 12.07 hrs, Volume= 4.566 af, Depth> 2.25"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Yr Storm Rainfall=6.00"

	Area (ac)	CN	Description
	9.820	55	Woods, Good, HSG B
*	1.620	85	EX-Gravel roads, HSG B
*	12.100	67	EX-Brush/Grass mix, Poor, HSG B
*	0.770	98	EX-Paved parking & roofs
	24.310	64	Weighted Average
	23.540		Pervious Area
	0.770		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	80	0.2125	0.20		**Sheet Flow, Segment ID: A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
4.9	350	0.0570	1.19		**Shallow Concentrated Flow, Segment ID: B-C** Woodland Kv= 5.0 fps
1.6	460	0.0760	4.92	196.97	**Parabolic Channel, Segment ID: C-D** W=30.00' D=2.00' Area=40.0 sf Perim=30.4' n= 0.100 Earth, dense brush, high stage
0.1	40	0.1000	9.77	17.27	**Circular Channel (pipe), Segment ID: D-E** Diam= 18.0" Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.025 Corrugated metal
2.1	210	0.0290	1.68	20.21	**Trap/Vee/Rect Channel Flow, Segment ID: E-F** Bot.W=2.00' D=1.00' Z= 10.0 '/' Top.W=22.00' n= 0.100 Earth, dense brush, high stage
0.4	100	0.0200	4.37	7.72	**Circular Channel (pipe), Segment ID: F-G** Diam= 18.0" Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.025 Corrugated metal
0.6	80	0.0500	2.21	26.54	**Trap/Vee/Rect Channel Flow, Segment ID: G-H** Bot.W=2.00' D=1.00' Z= 10.0 '/' Top.W=22.00' n= 0.100 Earth, dense brush, high stage
16.4	1,320	Total			

Summary for Subcatchment 3: SC 3

Runoff = 7.94 cfs @ 12.02 hrs, Volume= 0.483 af, Depth> 1.67"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Yr Storm Rainfall=6.00"

	Area (ac)	CN	Description
	2.840	55	Woods, Good, HSG B
*	0.000	85	EX-Gravel roads, HSG B
*	0.630	67	EX-Brush/Grass mix, Poor, HSG B
*	0.000	98	EX-Paved parking & roofs
	3.470	57	Weighted Average
	3.470		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.7	100	0.1290	0.17		**Sheet Flow, Segment ID: A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
1.1	116	0.1290	1.80		**Shallow Concentrated Flow, Segment ID: B-C** Woodland Kv= 5.0 fps
0.7	241	0.1040	5.79	463.51	**Parabolic Channel, Segment ID: C-D** W=60.00' D=2.00' Area=80.0 sf Perim=60.2' n= 0.100 Earth, dense brush, high stage
11.5	457	Total			

Summary for Subcatchment 4: SC 4

Runoff = 18.28 cfs @ 12.07 hrs, Volume= 1.264 af, Depth> 2.08"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Yr Storm Rainfall=6.00"

	Area (ac)	CN	Description
	3.250	55	Woods, Good, HSG B
*	0.140	85	EX-Gravel roads, HSG B
*	3.870	67	EX-Brush/Grass mix, Poor, HSG B
*	0.030	98	EX-Paved parking & roofs
	7.290	62	Weighted Average
	7.260		Pervious Area
	0.030		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.8	162	0.1420	0.20		**Sheet Flow, Segment ID: A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
2.0	280	0.1070	2.29		**Shallow Concentrated Flow, Segment ID: B-C** Short Grass Pasture Kv= 7.0 fps
0.4	180	0.1390	6.70	535.86	**Parabolic Channel, Segment ID: C-D** W=60.00' D=2.00' Area=80.0 sf Perim=60.2' n= 0.100 Earth, dense brush, high stage
16.2	622	Total			

Summary for Reach R1: SC-1C REACH TO RIVER

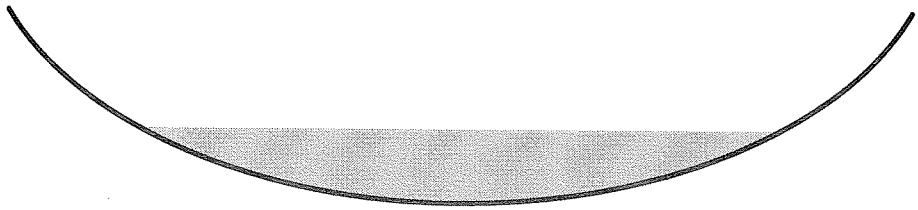
[81] Warning: Exceeded Pond P1 by 3.00' @ 0.00 hrs

Inflow Area = 36.990 ac, 0.00% Impervious, Inflow Depth > 2.25" for 25-Yr Storm event
Inflow = 73.72 cfs @ 12.22 hrs, Volume= 6.937 af
Outflow = 68.44 cfs @ 12.27 hrs, Volume= 6.926 af, Atten= 7%, Lag= 2.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.80 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 2.36 fps, Avg. Travel Time= 2.6 min

Peak Storage= 4,651 cf @ 12.25 hrs, Average Depth at Peak Storage= 1.53'
Bank-Full Depth= 4.00', Capacity at Bank-Full= 566.87 cfs

20.00' x 4.00' deep Parabolic Channel, n= 0.100 Earth, dense brush, high stage
Length= 370.0' Slope= 0.1568 '/'
Inlet Invert= 2,590.00', Outlet Invert= 2,532.00'



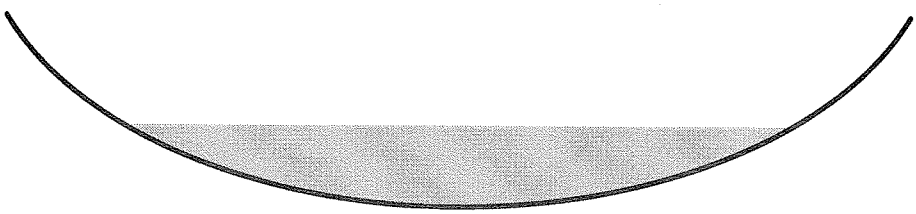
Summary for Reach R2: SC-2 REACH TO RIVER

Inflow Area = 24.310 ac, 3.17% Impervious, Inflow Depth > 2.25" for 25-Yr Storm event
Inflow = 66.27 cfs @ 12.07 hrs, Volume= 4.566 af
Outflow = 44.55 cfs @ 12.43 hrs, Volume= 4.475 af, Atten= 33%, Lag= 21.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.06 fps, Min. Travel Time= 13.9 min
Avg. Velocity = 1.25 fps, Avg. Travel Time= 34.0 min

Peak Storage= 37,541 cf @ 12.20 hrs, Average Depth at Peak Storage= 1.70'
Bank-Full Depth= 4.00', Capacity at Bank-Full= 279.24 cfs

20.00' x 4.00' deep Parabolic Channel, n= 0.100 Earth, dense brush, high stage
Length= 2,550.0' Slope= 0.0380 '/'
Inlet Invert= 2,632.00', Outlet Invert= 2,535.00'



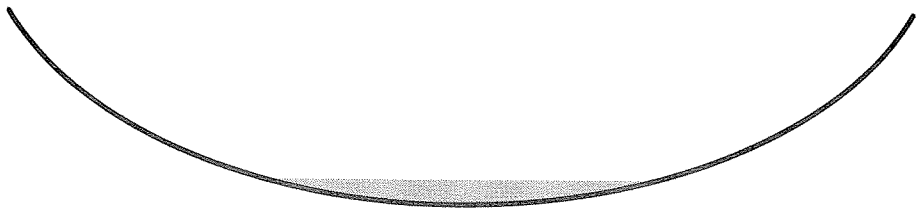
Summary for Reach R3: SC-3 REACH TO RIVER

Inflow Area = 3.470 ac, 0.00% Impervious, Inflow Depth > 1.67" for 25-Yr Storm event
Inflow = 7.94 cfs @ 12.02 hrs, Volume= 0.483 af
Outflow = 4.64 cfs @ 12.38 hrs, Volume= 0.472 af, Atten= 42%, Lag= 21.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.97 fps, Min. Travel Time= 14.4 min
Avg. Velocity = 0.86 fps, Avg. Travel Time= 32.9 min

Peak Storage= 4,043 cf @ 12.14 hrs, Average Depth at Peak Storage= 0.50'
Bank-Full Depth= 4.00', Capacity at Bank-Full= 395.93 cfs

20.00' x 4.00' deep Parabolic Channel, n= 0.100 Earth, dense brush, high stage
Length= 1,700.0' Slope= 0.0765 '/'
Inlet Invert= 2,664.00', Outlet Invert= 2,534.00'



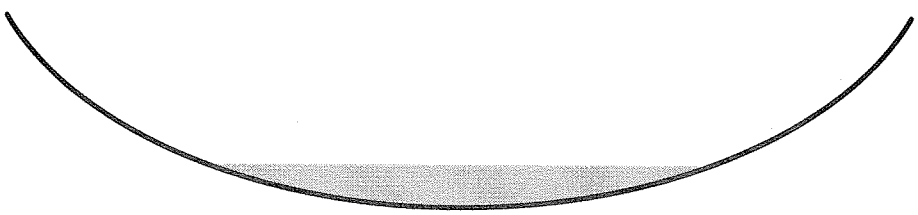
Summary for Reach R4: SC-4 REACH TO RIVER

Inflow Area =	7.290 ac,	0.41% Impervious,	Inflow Depth >	2.08"	for 25-Yr Storm event
Inflow =	18.28 cfs @	12.07 hrs,	Volume=	1.264 af	
Outflow =	17.65 cfs @	12.12 hrs,	Volume=	1.261 af,	Atten= 3%, Lag= 3.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.25 fps, Min. Travel Time= 1.8 min
Avg. Velocity = 1.21 fps, Avg. Travel Time= 4.8 min

Peak Storage= 1,937 cf @ 12.09 hrs, Average Depth at Peak Storage= 0.88'
Bank-Full Depth= 4.00', Capacity at Bank-Full= 452.76 cfs

20.00' x 4.00' deep Parabolic Channel, n= 0.100 Earth, dense brush, high stage
Length= 350.0' Slope= 0.1000 '/'
Inlet Invert= 2,568.00', Outlet Invert= 2,533.00'



Summary for Pond P1: DETENTION BASIN

Inflow Area =	36.990 ac,	0.00% Impervious,	Inflow Depth >	2.25"	for 25-Yr Storm event
Inflow =	91.84 cfs @	12.11 hrs,	Volume=	6.940 af	
Outflow =	73.72 cfs @	12.22 hrs,	Volume=	6.937 af,	Atten= 20%, Lag= 7.0 min
Primary =	34.83 cfs @	12.22 hrs,	Volume=	6.499 af	
Secondary =	38.89 cfs @	12.22 hrs,	Volume=	0.438 af	

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 2,596.51' @ 12.22 hrs Surf.Area= 10,881 sf Storage= 50,117 cf

Plug-Flow detention time= 8.7 min calculated for 6.922 af (100% of inflow)
Center-of-Mass det. time= 8.4 min (865.5 - 857.1)

Volume	Invert	Avail.Storage	Storage Description
#1	2,587.00'	67,560 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,587.00	10	0	0
2,588.00	778	394	394
2,590.00	2,513	3,291	3,685
2,592.00	6,109	8,622	12,307
2,594.00	7,994	14,103	26,410
2,596.00	10,345	18,339	44,749
2,598.00	12,466	22,811	67,560

Device	Routing	Invert	Outlet Devices
#1	Primary	2,587.00'	**24.0" x 30.0' long Culvert** CMP, projecting, no headwall, Ke= 0.900 Outlet Invert= 2,586.00' S= 0.0333 '/' Cc= 0.900 n= 0.025 Corrugated metal
#2	Secondary	2,596.00'	**45.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=34.70 cfs @ 12.22 hrs HW=2,596.44' (Free Discharge)
└─**1=Culvert** (Inlet Controls 34.70 cfs @ 11.04 fps)

Secondary OutFlow Max=34.16 cfs @ 12.22 hrs HW=2,596.44' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 34.16 cfs @ 1.72 fps)

Summary for Link AP: PIGEON RIVER

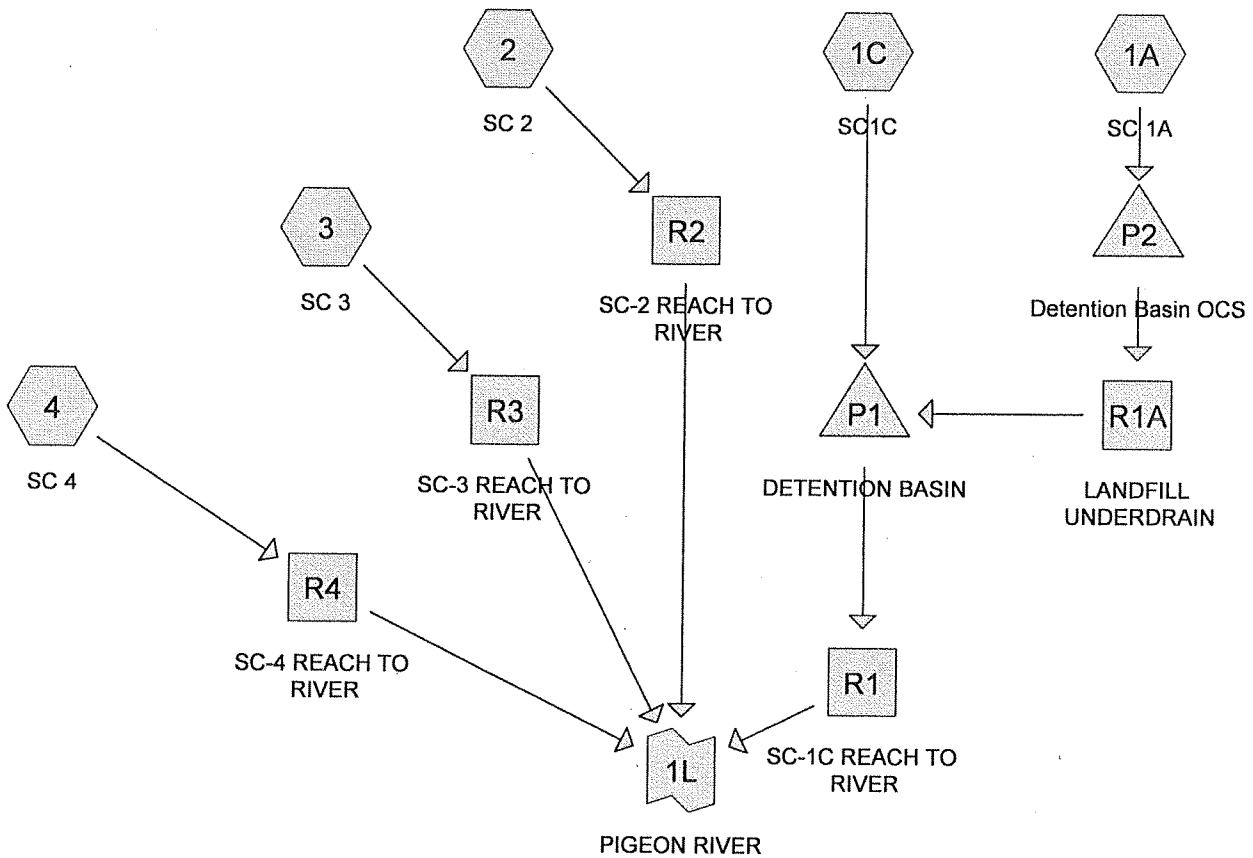
Inflow Area = 72.060 ac, 1.11% Impervious, Inflow Depth > 2.19" for 25-Yr Storm event
Inflow = 109.14 cfs @ 12.30 hrs, Volume= 13.134 af
Primary = 109.14 cfs @ 12.30 hrs, Volume= 13.134 af, Atten= 0%, Lag= 0.0 min

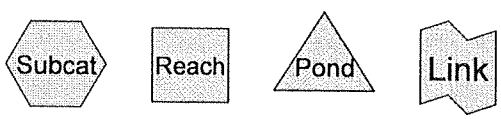
Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

APPENDIX B-2

STORMWATER ANALYSIS - POST-DEVELOPMENT

10-YR
Velocity Analysis





Drainage Diagram for PH1-POST
Prepared by Sevee & Maher Engineers, Inc., Printed 10/3/2008
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10-yr
Velocity Analysis

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1A: SC 1A Runoff Area=20.000 ac 0.30% Impervious Runoff Depth=1.94"
Flow Length=1,222' Tc=5.3 min CN=67 Runoff=70.03 cfs 3.239 af

Subcatchment 1C: SC1C Runoff Area=2.730 ac 0.00% Impervious Runoff Depth=1.79"
Flow Length=302' Tc=8.4 min CN=65 Runoff=7.73 cfs 0.407 af

Subcatchment 2: SC 2 Runoff Area=22.880 ac 3.37% Impervious Runoff Depth=1.71"
Flow Length=1,320' Tc=16.4 min CN=64 Runoff=46.24 cfs 3.264 af

Subcatchment 3: SC 3 Runoff Area=4.140 ac 0.00% Impervious Runoff Depth=1.21"
Flow Length=880' Tc=16.4 min CN=57 Runoff=5.43 cfs 0.418 af

Subcatchment 4: SC 4 Runoff Area=6.250 ac 0.00% Impervious Runoff Depth=1.64"
Flow Length=622' Tc=16.2 min CN=63 Runoff=12.07 cfs 0.853 af

Reach R1: SC-1C REACH TO RIVER Avg. Depth=0.60' Max Vel=3.17 fps Inflow=9.97 cfs 3.635 af
n=0.100 L=370.0' S=0.1568 '/' Capacity=566.87 cfs Outflow=9.63 cfs 3.634 af
-1.38 decrease OK

Reach R1A: LANDFILL UNDERDRAIN Avg. Depth=0.73' Max Vel=13.28 fps Inflow=8.14 cfs 3.229 af
D=12.0" n=0.013 L=1,010.0' S=0.0673 '/' Capacity=9.24 cfs Outflow=8.11 cfs 3.228 af

Reach R2: SC-2 REACH TO RIVER Avg. Depth=1.39' Max Vel=2.69 fps Inflow=46.24 cfs 3.264 af
n=0.100 L=2,550.0' S=0.0380 '/' Capacity=279.24 cfs Outflow=28.97 cfs 3.264 af
-0.05 decrease OK

Reach R3: SC-3 REACH TO RIVER Avg. Depth=0.43' Max Vel=1.76 fps Inflow=5.43 cfs 0.418 af
n=0.100 L=1,700.0' S=0.0765 '/' Capacity=395.93 cfs Outflow=3.25 cfs 0.418 af
+0.06 increase < table 1/2 Div(B)(5)

Reach R4: SC-4 REACH TO RIVER Avg. Depth=0.73' Max Vel=2.86 fps Inflow=12.07 cfs 0.853 af
n=0.100 L=350.0' S=0.1000 '/' Capacity=452.76 cfs Outflow=11.60 cfs 0.853 af
-.09 OK

Pond P1: DETENTION BASIN Peak Elev=2,588.70' Storage=1,066 cf Inflow=10.67 cfs 3.635 af
Primary=9.97 cfs 3.635 af Secondary=0.00 cfs 0.000 af Outflow=9.97 cfs 3.635 af

Pond P2: Detention Basin OCS Peak Elev=2,662.85' Storage=60,396 cf Inflow=70.03 cfs 3.239 af
Primary=8.12 cfs 3.150 af Secondary=0.00 cfs 0.000 af Outflow=8.12 cfs 3.150 af

Link 1L: PIGEON RIVER Inflow=44.77 cfs 8.169 af
Primary=44.77 cfs 8.169 af

Total Runoff Area = 56.000 ac Runoff Volume = 8.181 af Average Runoff Depth = 1.75"
98.52% Pervious = 55.170 ac ~~1.48% Impervious = 0.830 ac~~

original area = 72.06 ac

imp = gravel & imp = 5.37 ac
7.45% imp

SUMMARY OF GRAIN SIZE AND
MOISTURE CONTENT ANALYSIS RESULTS
LANDFILL NO. 6 EXPANSION
BLUE RIDGE PAPER PRODUCTS
CANTON, NC

Silt % = 57
Sand % = 43

Boring	Sample	Depth (ft)	Soil Unit	Natural MC (%)	Percent Grain Size Distribution						USCS Classification	
					Gravel	Sand				Silt (clay)	Symbol	Description
						Coarse	Medium	Fine	Total			
B-07-224	3D	10-12	Alluvium	11.2	62.1	6.1	13.7	13.3	33.1	4.8	GW	Well-graded gravel with sand
B-07-225	1D	4-6		45.9	0	0	3.5	66.6	70.1	29.9	SM	Silty sand
B-07-225	2D	9-11		14.1	35.5	12.7	21.4	22.2	56.3	8.2	SW-SM	Well-graded sand with silt and gravel
B-07-215	4D	19-21	Colluvium	40	0.5	4.7	20	32.8	57.5	42.0	SM	Silty sand
B-07-219	2D	9-11		50.7	4.4	6.6	21.4	35.5	63.5	32.1	SM	Silty sand
B-07-203	1D	0-1	Fill	29.8	0.2	1.7	11.2	16.3	29.2	70.6	ML	Silt with sand
B-07-215	Bag	0-4		15.1	9.6	10.1	20.9	23.0	54.0	36.4	SM	Silty sand
B-07-204	2D	5-7	Residual Soil	24.3	0.2	3.4	18.1	27.2	48.7	51.1	ML	sandy silt
B-07-218	2D	4-6		24.3	0.6	1.6	13.6	21.2	36.4	63.0	ML	sandy silt
B-07-226	2D	5-7		21.7	0.8	4.9	16.2	21.2	42.3	56.9	ML	sandy silt
B-07-201	4D	19-21	Saprolite	17.3	0.1	1.7	17.2	39.4	58.3	41.6	SM	Silty sand
B-07-201	9D	44-46		14.2	0	2	27.4	40.7	70.1	29.9	SM	Silty sand
B-07-207	4D	15-17		7.9	0.9	3.4	25.3	40.5	69.2	29.9	SM	Silty sand
B-07-207	7D	30-32		6.8	0	1.8	33.6	37.7	73.1	26.9	SM	Silty sand
B-07-208	2D	9-11		14.9	2.2	13.2	25.6	25.3	64.1	33.7	SM	Silty sand
B-07-208	6D	29-31		20.8	1.4	12.8	29.5	19.2	61.5	37.1	SM	Silty sand
B-07-209	3D	9-11		5.5	44.4	9.2	18.1	17.5	44.8	10.8	SW-SM	Well-graded sand with silt and gravel
B-07-219	7D	34-36		13.3	5.4	8.4	23.3	37.7	69.4	25.2	SM	Silty sand
B-07-221	3D	5-7		14.2	0	0.1	15.8	41.2	57.1	42.9	SM	Silty sand
B-07-226	5D	20-22		16.3	2.5	8.7	25.7	32.6	67.0	30.5	SM	Silty sand
B-07-201	16D	79-79.6	(PWR)	5.4	0.3	3.2	27.4	37.3	67.9	31.8	SM	Silty sand
B-07-213	5D	19-21		12.2	0.8	5.1	21.4	24.6	51.1	48.1	SM	Silty sand
B-07-220	5D	20-22		11.9	20.8	13.8	22.9	24.8	61.5	17.7	SM	Silty sand with gravel
B-07-222	9D	45-46		13.4	0	1.8	33.6	42.9	78.3	21.7	SM	Silty sand

Mean Percent Moisture Content and Grain Size Distribution for Soil Units

Alluvium-1 (1)	46	0	0	4	67	70	30	SM	silty sand
Alluvium-2 (2)	13	49	9	18	18	45	7	GW-GM	well-graded gravel with silt and sand
Colluvium	45	2	6	21	34	61	37	SM	silty sand
Fill	22	5	6	16	20	42	54	ML	sandy silt
Residuum	23	1	3	16	23	42	57	ML	sandy silt
Saprolite (all)	12	6	6	25	33	64	31	SM	silty sand
Saprolite	13	6	6	24	33	63	31	SM	silty sand
(PWR)	11	5	6	26	32	65	30	SM	silty sand

Abbreviations:

MC - moisture content
PWR - partially-weathered rock
Classification System
USCS - Unified Soil

Notes:
1. Shallow alluvium
2. Deep alluvium

W 0 of 5

10-98 Velocity Analysis

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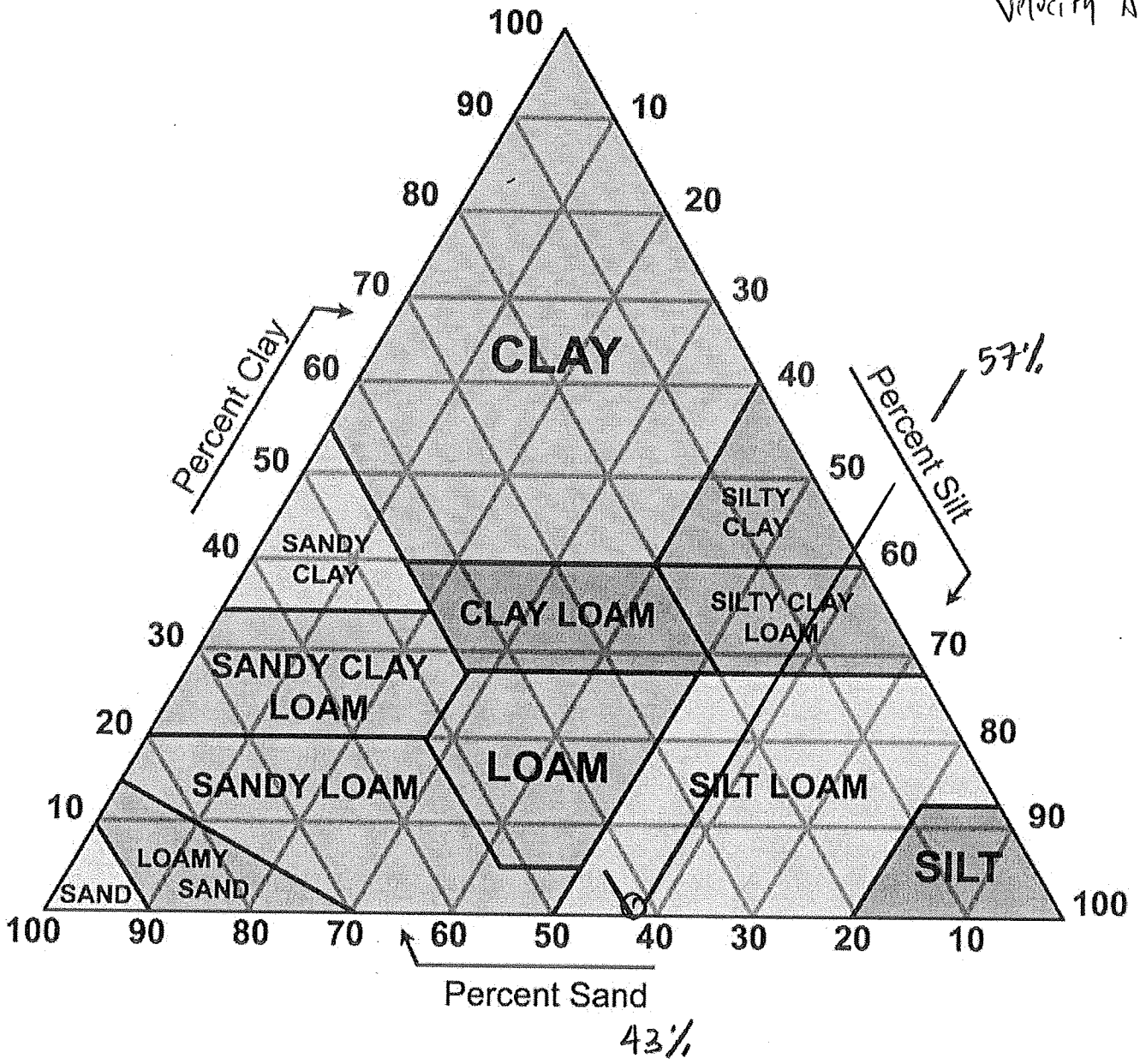
10-Yr
Velocity Analysis



SILT LOAM

10-yr
Velocity Analysis

Material	*Maximum Permissible*	*Velocities*
	F.P.S.	*M.P.S.*
Fine sand	2.5	.8
Sandy loam	2.5	.8
Silt loam	3	.8
Firm loam	3.5	.9
Fine gravel	5	1.1
Still clay	5	1.5
Graded loam to cobble	5	1.5
Graded silt to cobble	5.5	1.5
Alluvial silts (non-colloidal)	3.5	1.1
Alluvial silts (colloidal)	5	1.5
Coarse gravel	6	1.8
Cobbles and shingles	5.5	1.7
Shales and hard pans	6	1.8
Source – adapted from recommendations by Special Committee on Irrigation Research, ASCE, 1926, for channels with straight alignment. For sinuous channels, multiply allowable velocity by .95 for slightly sinuous, by .9 for moderately sinuous channels, and by .8 for highly sinuous channels.		

(6) *Storm water runoff permit.* A storm water runoff permit is required where:

(a) A sediment control plan is required, and;

(b) The parcel is over two acres in area, and;

(c) The impervious surface of the new construction, including buildings, roads, sidewalks, recreational facilities, and the like, is over 50% of the acreage. For the purposes of this section, impervious surfaces include gravel, asphalt, concrete, tennis courts, and the like. (Note: Wooden slated decks and the water area of a swimming pool are considered pervious.)

(7) *Design standards.* The first one inch of rainfall shall be required to percolate on the site. This shall be accomplished through best management practices such as buffer areas, grassed swales, filter strips, porous pavement, infiltration basins and trenches, water quality inlets, retention ponds, extended detention ponds and other measures.

(8) *Storm water drainage plan.* A storm water drainage plan is required for all developments meeting the requirements of division (B)(6) above. It shall be prepared by a registered engineer, landscape architect or, to the extent permitted by law, a registered land surveyor and shall contain the following general elements:

Impervious Area Analysis

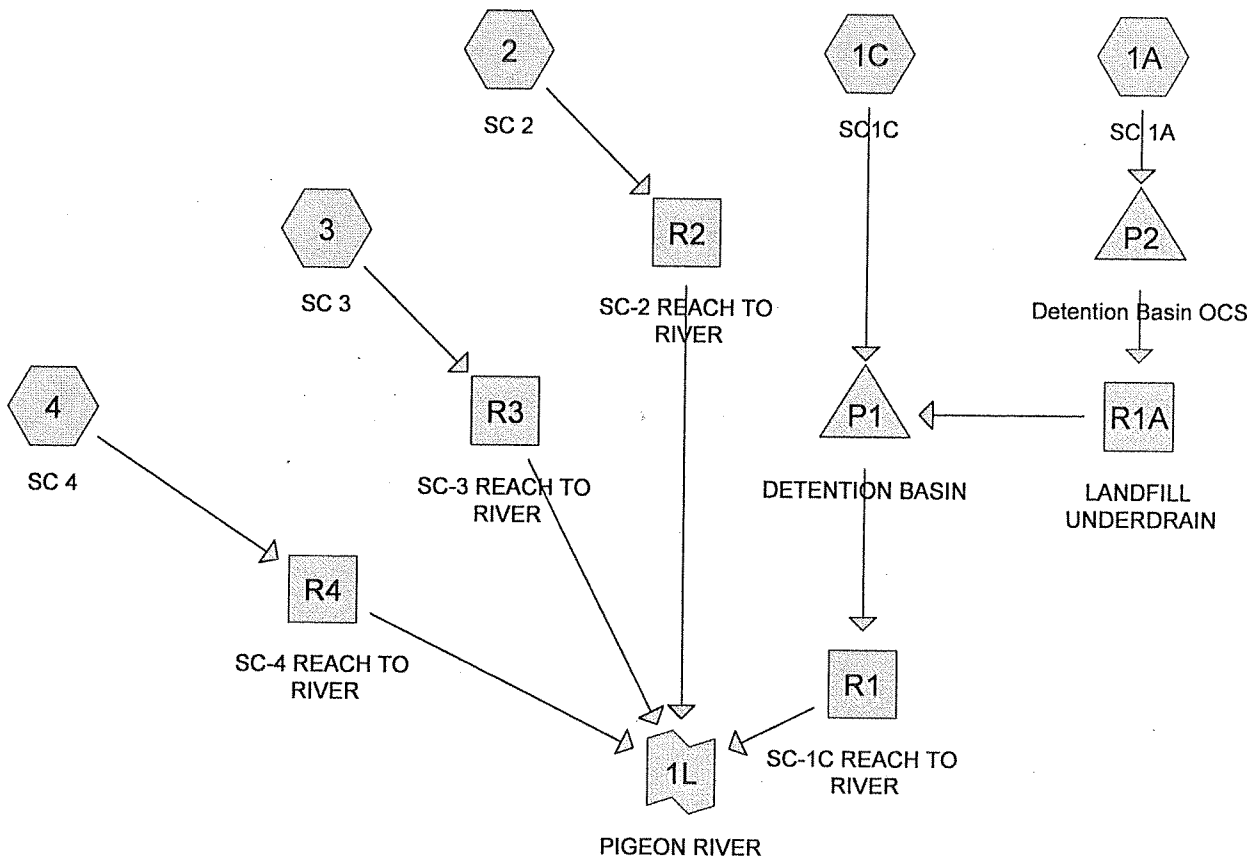
Area Listing (all nodes)

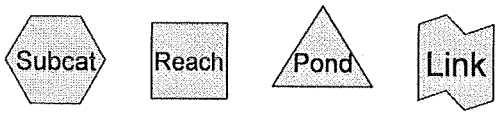
	Area (acres)	CN	Description (subcatchment-numbers)
-11.06	17.510	55	Woods, Good, HSG B (1A,1C,2,3,4)
	6.320	58	Meadow, non-grazed, HSG B (1A,1C,2,3,4)
-16.25	22.120	67	EX-Brush/Grass mix, Poor, HSG B (1A,1C,2,3,4)
	4.680	69	50-75% Grass cover, Fair, HSG B, STOCKPILE (1A,2)
-2.67	1.650	85	EX-Gravel roads, HSG B (1A,1C,2,4)
	2.890	85	Gravel roads, HSG B (1A,1C,4) +2.89
-.03	0.770	98	EX-Paved parking & roofs (2)
	0.060	98	LINER (1A) +.06

IMP= 5.37 ac

gravel +.22

IMP +.03





Drainage Diagram for PH1-POST
Prepared by Sevee & Maher Engineers, Inc., Printed 9/26/2008
HydroCAD® 8.50 s/n 001260 © 2007 HydroCAD Software Solutions LLC

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1A: SC 1A Runoff Area=20.000 ac 0.30% Impervious Runoff Depth>2.53"
Flow Length=1,222' Tc=5.3 min CN=67 Runoff=91.35 cfs 4.214 af

Subcatchment 1C: SC1C Runoff Area=2.730 ac 0.00% Impervious Runoff Depth>2.35"
Flow Length=302' Tc=8.4 min CN=65 Runoff=10.26 cfs 0.534 af

Subcatchment 2: SC 2 Runoff Area=22.880 ac 3.37% Impervious Runoff Depth>2.25"
Flow Length=1,320' Tc=16.4 min CN=64 Runoff=62.37 cfs 4.297 af

Subcatchment 3: SC 3 Runoff Area=4.140 ac 0.00% Impervious Runoff Depth>1.67"
Flow Length=880' Tc=16.4 min CN=57 Runoff=7.90 cfs 0.575 af

Subcatchment 4: SC 4 Runoff Area=6.250 ac 0.00% Impervious Runoff Depth>2.17"
Flow Length=622' Tc=16.2 min CN=63 Runoff=16.41 cfs 1.129 af

Reach R1: SC-1C REACH TO RIVER Avg. Depth=0.72' Max Vel=3.56 fps Inflow=14.61 cfs 4.386 af
n=0.100 L=370.0' S=0.1568 '/' Capacity=566.87 cfs Outflow=14.41 cfs 4.375 af

Reach R1A: LANDFILL UNDERDRAIN Avg. Depth=0.91' Max Vel=13.41 fps Inflow=9.56 cfs 3.861 af
D=12.0" n=0.013 L=1,010.0' S=0.0673 '/' Capacity=9.24 cfs Outflow=9.66 cfs 3.855 af

Reach R2: SC-2 REACH TO RIVER Avg. Depth=1.64' Max Vel=2.99 fps Inflow=62.37 cfs 4.297 af
n=0.100 L=2,550.0' S=0.0380 '/' Capacity=279.24 cfs Outflow=41.66 cfs 4.210 af

Reach R3: SC-3 REACH TO RIVER Avg. Depth=0.53' Max Vel=2.03 fps Inflow=7.90 cfs 0.575 af
n=0.100 L=1,700.0' S=0.0765 '/' Capacity=395.93 cfs Outflow=5.16 cfs 0.563 af

Reach R4: SC-4 REACH TO RIVER Avg. Depth=0.84' Max Vel=3.14 fps Inflow=16.41 cfs 1.129 af
n=0.100 L=350.0' S=0.1000 '/' Capacity=452.76 cfs Outflow=15.84 cfs 1.125 af

Pond P1: DETENTION BASIN Peak Elev=2,589.50' Storage=2,145 cf Inflow=16.11 cfs 4.389 af
Primary=14.61 cfs 4.386 af Secondary=0.00 cfs 0.000 af Outflow=14.61 cfs 4.386 af

Pond P2: Detention Basin OCS Peak Elev=2,664.03' Storage=80,038 cf Inflow=91.35 cfs 4.214 af
Primary=9.54 cfs 3.821 af Secondary=0.00 cfs 0.000 af Outflow=9.54 cfs 3.821 af

Link 1L: PIGEON RIVER Inflow=63.15 cfs 10.273 af
Primary=63.15 cfs 10.273 af

Total Runoff Area = 56.000 ac Runoff Volume = 10.749 af Average Runoff Depth = 2.30"
98.52% Pervious = 55.170 ac 1.48% Impervious = 0.830 ac

Summary for Subcatchment 1A: SC 1A

[49] Hint: Tc<2dt may require smaller dt

Runoff = 91.35 cfs @ 11.94 hrs, Volume= 4.214 af, Depth> 2.53"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Yr Storm Rainfall=6.00"

	Area (ac)	CN	Description
	1.610	55	Woods, Good, HSG B
*	0.670	85	EX-Gravel roads, HSG B
*	9.230	67	EX-Brush/Grass mix, Poor, HSG B
	1.890	85	Gravel roads, HSG B
	3.860	58	Meadow, non-grazed, HSG B
*	0.060	98	LINER
	2.680	69	50-75% Grass cover, Fair, HSG B, STOCKPILE
	20.000	67	Weighted Average
	19.940		Pervious Area
	0.060		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	100	0.1900	0.49		**Sheet Flow, Segment ID: A-B** Range n= 0.130 P2= 3.50"
0.3	43	0.1160	2.38		**Shallow Concentrated Flow, Segment ID: B-C** Short Grass Pasture Kv= 7.0 fps
0.5	435	0.0670	14.55	276.53	**Trap/Vee/Rect Channel Flow, Segment ID: C-D** Bot.W=4.00' D=2.00' Z= 2.5 & 3.0 '/' Top.W=15.00' n= 0.030 Earth, grassed & winding
0.2	162	0.0680	13.73	16.85	**Circular Channel (pipe), Segment ID: D-E** Diam= 15.0" Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
0.7	397	0.1610	9.12	364.84	**Parabolic Channel, Segment ID: E-F** W=20.00' D=3.00' Area=40.0 sf Perim=21.1' n= 0.100 Earth, dense brush, high stage
0.2	85	0.0350	7.12	1,367.27	**Trap/Vee/Rect Channel Flow, Segment ID: F-G** Bot.W=20.00' D=6.00' Z= 2.0 '/' Top.W=44.00' n= 0.100 Earth, dense brush, high stage
5.3	1,222	Total			

Summary for Subcatchment 1C: SC1C

Runoff = 10.26 cfs @ 11.98 hrs, Volume= 0.534 af, Depth> 2.35"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Yr Storm Rainfall=6.00"

	Area (ac)	CN	Description
	0.310	55	Woods, Good, HSG B
*	0.070	85	EX-Gravel roads, HSG B
*	0.850	67	EX-Brush/Grass mix, Poor, HSG B
	0.420	85	Gravel roads, HSG B
	1.080	58	Meadow, non-grazed, HSG B
	2.730	65	Weighted Average
	2.730		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	92	0.1960	0.20		**Sheet Flow, Segment ID: A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
0.6	146	0.3150	3.93		**Shallow Concentrated Flow, Segment ID: B-C** Short Grass Pasture Kv= 7.0 fps
0.1	64	0.0470	10.53	4,718.88	**Trap/Vee/Rect Channel Flow, Segment ID: C-D** Bot.W=40.00' D=8.00' Z= 2.0 '/' Top.W=72.00' n= 0.100 Earth, dense brush, high stage
8.4	302	Total			

Summary for Subcatchment 2: SC 2

Runoff = 62.37 cfs @ 12.07 hrs, Volume= 4.297 af, Depth> 2.25"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Yr Storm Rainfall=6.00"

	Area (ac)	CN	Description
	9.820	55	Woods, Good, HSG B
*	0.770	85	EX-Gravel roads, HSG B
*	9.420	67	EX-Brush/Grass mix, Poor, HSG B
*	0.770	98	EX-Paved parking & roofs
	0.000	85	Gravel roads, HSG B
	0.100	58	Meadow, non-grazed, HSG B
*	2.000	69	50-75% Grass cover, Fair, HSG B, STOCKPILE
	22.880	64	Weighted Average
	22.110		Pervious Area
	0.770		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	80	0.2125	0.20		**Sheet Flow, Segment ID: A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
4.9	350	0.0570	1.19		**Shallow Concentrated Flow, Segment ID: B-C** Woodland Kv= 5.0 fps
1.6	460	0.0760	4.92	196.97	**Parabolic Channel, Segment ID: C-D** W=30.00' D=2.00' Area=40.0 sf Perim=30.4' n= 0.100 Earth, dense brush, high stage
0.1	40	0.1000	9.77	17.27	**Circular Channel (pipe), Segment ID: D-E** Diam= 18.0" Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.025 Corrugated metal
2.1	210	0.0290	1.68	20.21	**Trap/Vee/Rect Channel Flow, Segment ID: E-F** Bot.W=2.00' D=1.00' Z= 10.0 '/' Top.W=22.00' n= 0.100 Earth, dense brush, high stage
0.4	100	0.0200	4.37	7.72	**Circular Channel (pipe), Segment ID: F-G** Diam= 18.0" Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.025 Corrugated metal
0.6	80	0.0500	2.21	26.54	**Trap/Vee/Rect Channel Flow, Segment ID: G-H** Bot.W=2.00' D=1.00' Z= 10.0 '/' Top.W=22.00' n= 0.100 Earth, dense brush, high stage
16.4	1,320	Total			

Summary for Subcatchment 3: SC 3

Runoff = 7.90 cfs @ 12.08 hrs, Volume= 0.575 af, Depth> 1.67"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Yr Storm Rainfall=6.00"

	Area (ac)	CN	Description
	3.160	55	Woods, Good, HSG B
*	0.000	85	EX-Gravel roads, HSG B
*	0.540	67	EX-Brush/Grass mix, Poor, HSG B
*	0.000	98	EX-Paved parking & roofs
	0.000	85	Gravel roads, HSG B
	0.440	58	Meadow, non-grazed, HSG B
	4.140	57	Weighted Average
	4.140		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.4	100	0.0700	0.13		**Sheet Flow, Segment ID: A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
2.4	257	0.1250	1.77		**Shallow Concentrated Flow, Segment ID: B-C** Woodland Kv= 5.0 fps
0.9	280	0.0960	4.96	163.79	**Trap/Vee/Rect Channel Flow, Segment ID: C-D** Bot.W=4.00' D=2.00' Z= 2.5 & 10.0 '/' Top.W=29.00' n= 0.100 Earth, dense brush, high stage
0.7	243	0.1070	5.88	470.15	**Parabolic Channel, Segment ID: D-E** W=60.00' D=2.00' Area=80.0 sf Perim=60.2'

n= 0.100 Earth, dense brush, high stage

16.4	880	Total

Summary for Subcatchment 4: SC 4

Runoff = 16.41 cfs @ 12.07 hrs, Volume= 1.129 af, Depth> 2.17"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Yr Storm Rainfall=6.00"

	Area (ac)	CN	Description
	2.610	55	Woods, Good, HSG B
*	0.140	85	EX-Gravel roads, HSG B
*	2.080	67	EX-Brush/Grass mix, Poor, HSG B
*	0.000	98	EX-Paved parking & roofs
	0.580	85	Gravel roads, HSG B
	0.840	58	Meadow, non-grazed, HSG B
	6.250	63	Weighted Average
	6.250		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.8	162	0.1420	0.20		**Sheet Flow, Segment ID: A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
2.0	280	0.1070	2.29		**Shallow Concentrated Flow, Segment ID: B-C** Short Grass Pasture Kv= 7.0 fps
0.4	180	0.1390	6.70	535.86	**Parabolic Channel, Segment ID: C-D** W=60.00' D=2.00' Area=80.0 sf Perim=60.2' n= 0.100 Earth, dense brush, high stage
16.2	622	Total			

Summary for Reach R1: SC-1C REACH TO RIVER

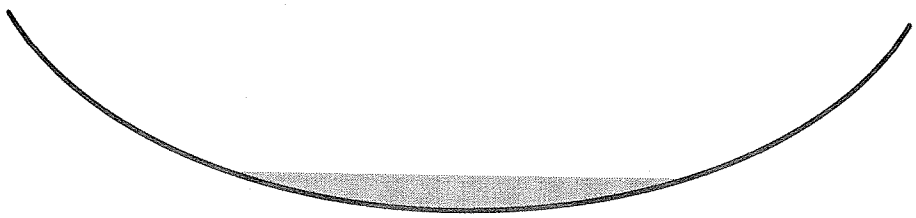
[81] Warning: Exceeded Pond P1 by 3.00' @ 0.00 hrs

Inflow Area = 22.730 ac, 0.26% Impervious, Inflow Depth > 2.32" for 25-Yr Storm event
Inflow = 14.61 cfs @ 12.09 hrs, Volume= 4.386 af
Outflow = 14.41 cfs @ 12.15 hrs, Volume= 4.375 af, Atten= 1%, Lag= 3.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.56 fps, Min. Travel Time= 1.7 min
Avg. Velocity = 1.49 fps, Avg. Travel Time= 4.1 min

Peak Storage= 1,510 cf @ 12.11 hrs, Average Depth at Peak Storage= 0.72'
Bank-Full Depth= 4.00', Capacity at Bank-Full= 566.87 cfs

20.00' x 4.00' deep Parabolic Channel, n= 0.100 Earth, dense brush, high stage
Length= 370.0' Slope= 0.1568 '/'
Inlet Invert= 2,590.00', Outlet Invert= 2,532.00'



Summary for Reach R1A: LANDFILL UNDERDRAIN

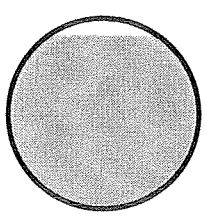
[52] Hint: Inlet/Outlet conditions not evaluated
[55] Hint: Peak inflow is 103% of Manning's capacity
[88] Warning: Qout>Qin may require Finer Routing>1
[79] Warning: Submerged Pond P2 Primary device # 1 INLET by 0.89'

Inflow Area =	20.000 ac,	0.30% Impervious,	Inflow Depth >	2.32"	for 25-Yr Storm event
Inflow =	9.56 cfs @	12.40 hrs, Volume=		3.861 af,	Incl. 0.02 cfs Base Flow
Outflow =	9.66 cfs @	12.10 hrs, Volume=		3.855 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 13.41 fps, Min. Travel Time= 1.3 min
Avg. Velocity = 6.69 fps, Avg. Travel Time= 2.5 min

Peak Storage= 762 cf @ 12.07 hrs, Average Depth at Peak Storage= 0.91'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 9.24 cfs

12.0" Diameter Pipe, n= 0.013 Corrugated PE, smooth interior
Length= 1,010.0' Slope= 0.0673 '/'
Inlet Invert= 2,655.00', Outlet Invert= 2,587.00'



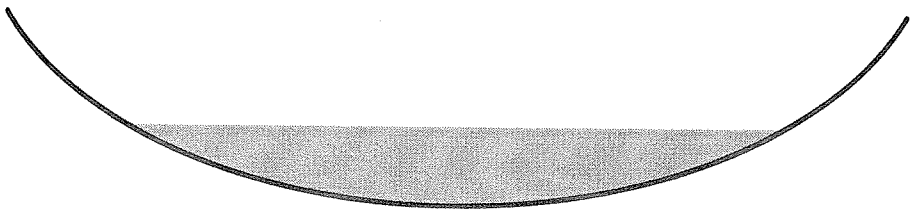
Summary for Reach R2: SC-2 REACH TO RIVER

Inflow Area =	22.880 ac,	3.37% Impervious,	Inflow Depth >	2.25"	for 25-Yr Storm event
Inflow =	62.37 cfs @	12.07 hrs, Volume=		4.297 af	
Outflow =	41.66 cfs @	12.44 hrs, Volume=		4.210 af,	Atten= 33%, Lag= 22.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.99 fps, Min. Travel Time= 14.2 min
Avg. Velocity = 1.23 fps, Avg. Travel Time= 34.6 min

Peak Storage= 35,765 cf @ 12.20 hrs, Average Depth at Peak Storage= 1.64'
Bank-Full Depth= 4.00', Capacity at Bank-Full= 279.24 cfs

20.00' x 4.00' deep Parabolic Channel, n= 0.100 Earth, dense brush, high stage
Length= 2,550.0' Slope= 0.0380 '/'
Inlet Invert= 2,632.00', Outlet Invert= 2,535.00'



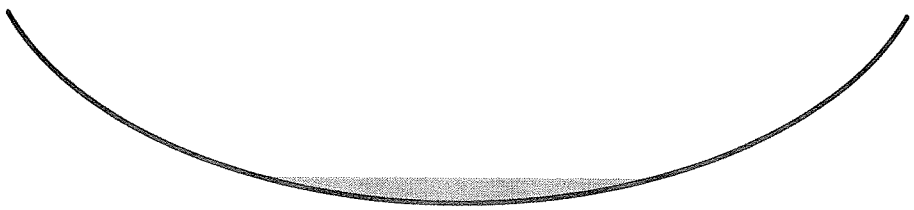
Summary for Reach R3: SC-3 REACH TO RIVER

Inflow Area =	4.140 ac,	0.00% Impervious,	Inflow Depth > 1.67"	for 25-Yr Storm event
Inflow =	7.90 cfs @	12.08 hrs, Volume=	0.575 af	
Outflow =	5.16 cfs @	12.45 hrs, Volume=	0.563 af, Atten= 35%, Lag= 22.1 min	

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.03 fps, Min. Travel Time= 13.9 min
Avg. Velocity = 0.91 fps, Avg. Travel Time= 31.2 min

Peak Storage= 4,358 cf @ 12.21 hrs, Average Depth at Peak Storage= 0.53'
Bank-Full Depth= 4.00', Capacity at Bank-Full= 395.93 cfs

20.00' x 4.00' deep Parabolic Channel, n= 0.100 Earth, dense brush, high stage
Length= 1,700.0' Slope= 0.0765 '/'
Inlet Invert= 2,664.00', Outlet Invert= 2,534.00'



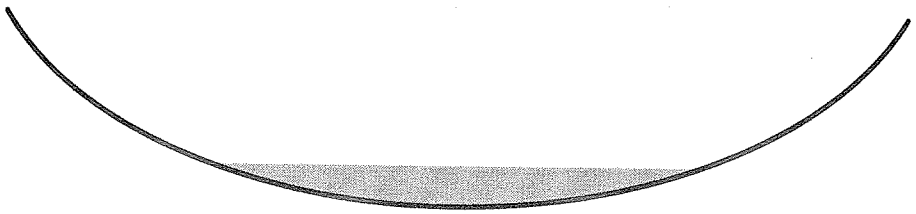
Summary for Reach R4: SC-4 REACH TO RIVER

Inflow Area =	6.250 ac,	0.00% Impervious,	Inflow Depth > 2.17"	for 25-Yr Storm event
Inflow =	16.41 cfs @	12.07 hrs, Volume=	1.129 af	
Outflow =	15.84 cfs @	12.12 hrs, Volume=	1.125 af, Atten= 4%, Lag= 3.3 min	

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.14 fps, Min. Travel Time= 1.9 min
Avg. Velocity = 1.16 fps, Avg. Travel Time= 5.0 min

Peak Storage= 1,795 cf @ 12.09 hrs, Average Depth at Peak Storage= 0.84'
Bank-Full Depth= 4.00', Capacity at Bank-Full= 452.76 cfs

20.00' x 4.00' deep Parabolic Channel, n= 0.100 Earth, dense brush, high stage
Length= 350.0' Slope= 0.1000 '/'
Inlet Invert= 2,568.00', Outlet Invert= 2,533.00'



Summary for Pond P1: DETENTION BASIN

[62] Warning: Exceeded Reach R1A OUTLET depth by 1.64' @ 12.10 hrs

Inflow Area =	22.730 ac,	0.26% Impervious,	Inflow Depth >	2.32"	for 25-Yr Storm event
Inflow =	16.11 cfs @	12.03 hrs,	Volume=	4.389 af	
Outflow =	14.61 cfs @	12.09 hrs,	Volume=	4.386 af,	Atten= 9%, Lag= 3.5 min
Primary =	14.61 cfs @	12.09 hrs,	Volume=	4.386 af	
Secondary =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 2,589.50' @ 12.09 hrs Surf.Area= 1,560 sf Storage= 2,145 cf

Plug-Flow detention time= 1.7 min calculated for 4.386 af (100% of inflow)
Center-of-Mass det. time= 1.3 min (948.2 - 946.9)

Volume	Invert	Avail.Storage	Storage Description
#1	2,587.00'	21,176 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,587.00	10	0	0
2,588.00	778	394	394
2,590.00	1,822	2,600	2,994
2,592.00	2,492	4,314	7,308
2,594.00	3,333	5,825	13,133
2,596.00	4,710	8,043	21,176

Device	Routing	Invert	Outlet Devices
#1	Primary	2,587.00'	**24.0" x 30.0' long Culvert** CMP, projecting, no headwall, Ke= 0.900 Outlet Invert= 2,586.00' S= 0.0333 '/' Cc= 0.900 n= 0.025 Corrugated metal
#2	Secondary	2,596.00'	**45.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=14.56 cfs @ 12.09 hrs HW=2,589.49' (Free Discharge)
└─**1=Culvert** (Inlet Controls 14.56 cfs @ 4.63 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2,587.00' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond P2: Detention Basin OCS

Inflow Area =	20.000 ac,	0.30% Impervious,	Inflow Depth > 2.53"	for 25-Yr Storm event
Inflow =	91.35 cfs @	11.94 hrs, Volume=	4.214 af	
Outflow =	9.54 cfs @	12.40 hrs, Volume=	3.821 af, Atten= 90%, Lag= 27.5 min	
Primary =	9.54 cfs @	12.40 hrs, Volume=	3.821 af	
Secondary =	0.00 cfs @	0.00 hrs, Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 2,664.03' @ 12.40 hrs Surf.Area= 18,121 sf Storage= 80,038 cf

Plug-Flow detention time= 169.6 min calculated for 3.813 af (90% of inflow)
Center-of-Mass det. time= 121.8 min (961.2 - 839.5)

Volume	Invert	Avail.Storage	Storage Description
#1	2,656.00'	122,136 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,656.00	4,005	0	0
2,660.00	9,112	26,234	26,234
2,662.00	13,033	22,145	48,379
2,664.00	18,006	31,039	79,418
2,666.00	24,712	42,718	122,136

Device	Routing	Invert	Outlet Devices
#1	Primary	2,655.00'	**12.0" x 1,010.0' long Culvert** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 2,587.00' S= 0.0673 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior
#2	Device 1	2,656.00'	**0.5" Vert. Pool Drain Holes X 12.00** C= 0.600
#3	Device 1	2,658.00'	**8.0" Vert. Pond Dewatering Orifice** C= 0.600
#4	Device 1	2,662.50'	**24.0" Horiz. Top Overflow** Limited to weir flow C= 0.600
#5	Secondary	2,665.00'	**75.0' long x 8.0' breadth Containment Berm** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Primary OutFlow Max=9.54 cfs @ 12.40 hrs HW=2,664.03' (Free Discharge)
└─1=**Culvert** (Barrel Controls 9.54 cfs @ 12.14 fps)
  ├─2=**Pool Drain Holes** (Passes < 0.22 cfs potential flow)
  ├─3=**Pond Dewatering Orifice** (Passes < 4.01 cfs potential flow)
  └─4=**Top Overflow** (Passes < 18.74 cfs potential flow)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2,656.00' (Free Discharge)
└─5=**Containment Berm** (Controls 0.00 cfs)

Summary for Link 1L: PIGEON RIVER

Inflow Area =	56.000 ac,	1.48% Impervious,	Inflow Depth >	2.20"	for 25-Yr Storm event
Inflow =	63.15 cfs @	12.42 hrs, Volume=	10.273 af		
Primary =	63.15 cfs @	12.42 hrs, Volume=	10.273 af,	Atten= 0%,	Lag= 0.0 min

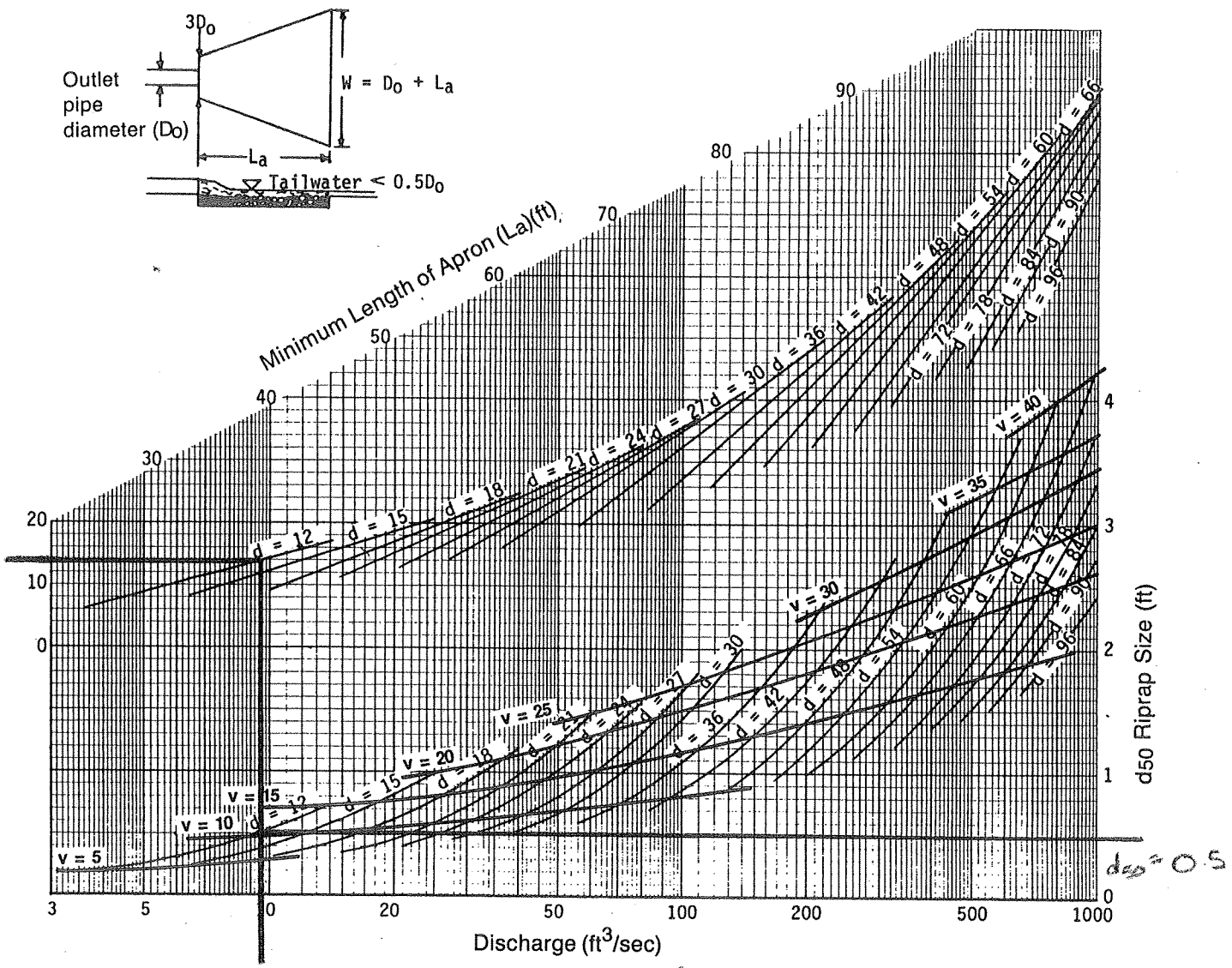
Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

APPENDIX C

EROSION AND SEDIMENT CONTROL DESIGN CALCULATIONS

Outlet protection

12" UNDERDRAIN – OUTLET PROTECTION



a=14'

d50=0.5'

10-YR Q=9.44 cfs

Curves may not be extrapolated.

Figure 8.06a Design of outlet protection protection from a round pipe flowing full, minimum tailwater condition (T_w < 0.5 diameter).

Outlet protection 12" underdrain

Summary for Reach R1A: LANDFILL UNDERDRAIN

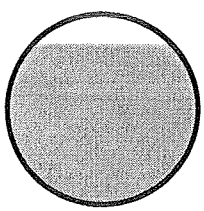
[52] Hint: Inlet/Outlet conditions not evaluated
[55] Hint: Peak inflow is 102% of Manning's capacity
[79] Warning: Submerged Pond P2 Primary device # 1 INLET by 0.84'

Inflow Area =	20.000 ac,	0.30% Impervious,	Inflow Depth > 1.94"	for 10-yr Storm event
Inflow =	9.44 cfs @	12.26 hrs, Volume=	3.227 af,	Incl. 0.02 cfs Base Flow
Outflow =	9.44 cfs @	12.30 hrs, Volume=	3.223 af,	Atten= 0%, Lag= 2.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 13.42 fps, Min. Travel Time= 1.3 min
Avg. Velocity = 6.26 fps, Avg. Travel Time= 2.7 min

Peak Storage= 712 cf @ 12.28 hrs, Average Depth at Peak Storage= 0.84'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 9.24 cfs

12.0" Diameter Pipe, n= 0.013 Corrugated PE, smooth interior
Length= 1,010.0' Slope= 0.0673 '/'
Inlet Invert= 2,655.00', Outlet Invert= 2,587.00'



outlet protection

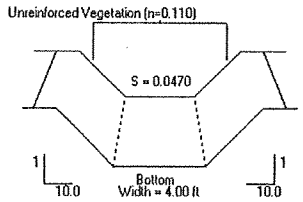
12" underdrain

Permanent Lining Analysis

North American Green - ECMDS Version 4.3		9/24/2008 02:17 PM	COMPUTED BY: HME
PROJECT NAME: Blue Ridge, Canton, NC		PROJECT NO.: 07089.00	
FROM STATION/REACH: 8/24/08	TO STATION/REACH: 12" Underdrain	DRAINAGE AREA: Permanent Lining	DESIGN FREQUENCY:

HYDRAULIC RESULTS

Discharge (cfs)	Peak Flow Period (hrs)	Velocity (fps)	Area (sq.ft)	Hydraulic Radius(ft)	Normal Depth (ft)
9.4	1.0	1.54	6.12	0.38	0.61



Not to Scale

LINER RESULTS

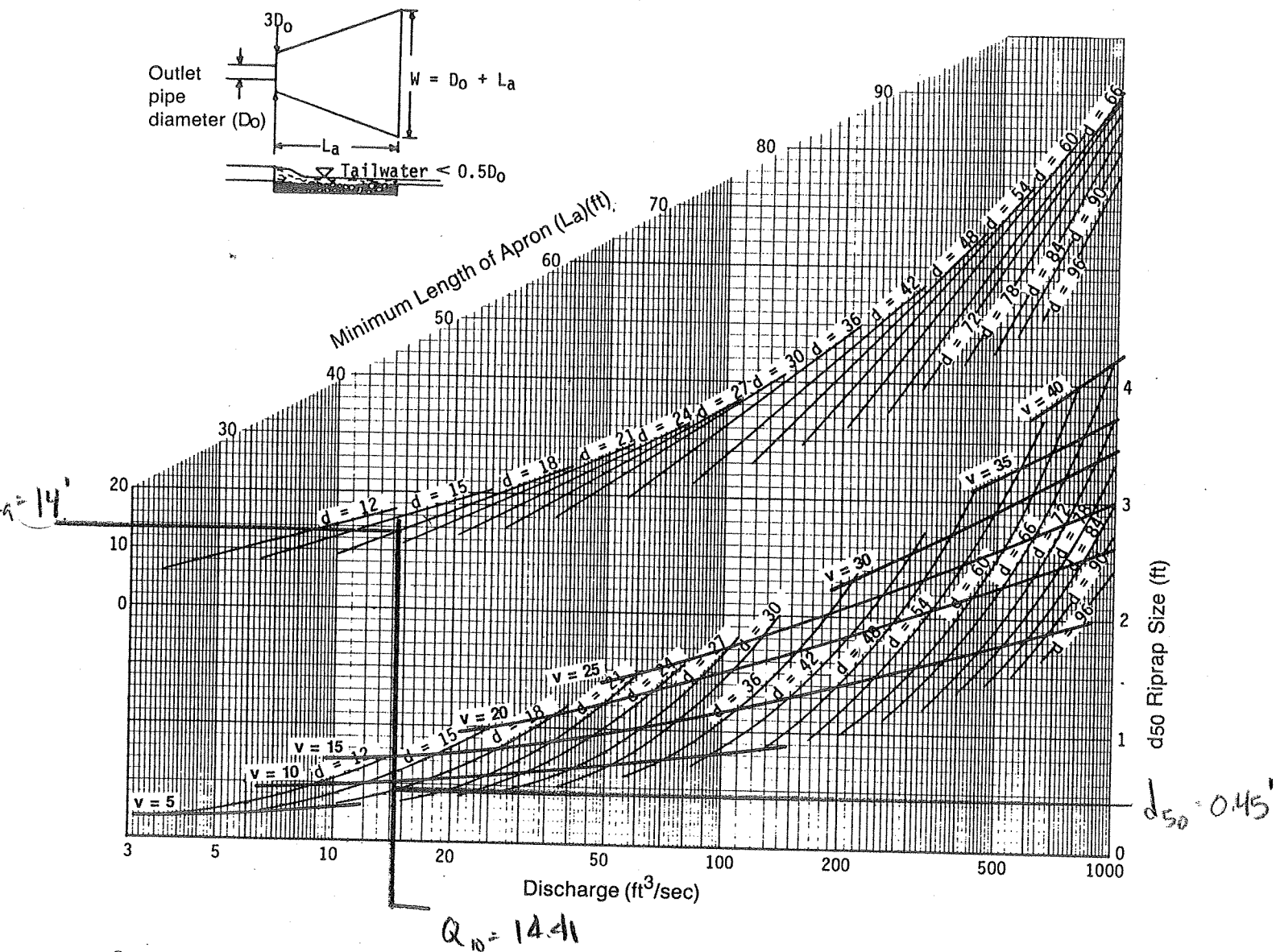
Reach	Matting Type / Staple Pattern	Stability Analysis	Vegetation Characteristics: Phase	Class	Type	Density	Permissible Shear Stress (psf)	Calculated Shear Stress (psf)	Safety Factor	Remarks
Straight	Unreinforced	Vegetation		C	Mix	75-95%	4.20	1.78	2.36	STABLE
		Soil	Sandy Loam				0.035	0.009	3.87	STABLE

None Required

Back to Input Screen

Outlet

18' Culvert under 36" Access Rd
INLET / OUTLET Protection Analysis



Curves may not be extrapolated.

Figure 8.06a Design of outlet protection protection from a round pipe flowing full, minimum tailwater condition (T_w < 0.5 diameter).

Output 18" Culvert under 36 - Access RD

E-S AREAS
Prepared by Sevee & Maher Engineers, Inc.
HydroCAD® 8.50 s/n 001260 © 2007 HydroCAD Software Solutions LLC

Type II 24-hr 10-yr Storm Rainfall=5.20"
Printed 9/24/2008

Summary for Pond 7P: DITCH/CULVERT

[62] Warning: Exceeded Reach 3R OUTLET depth by 0.86' @ 12.15 hrs
[62] Warning: Exceeded Reach 5R OUTLET depth by 3.31' @ 12.10 hrs

Inflow Area =	7.668 ac,	0.00% Impervious,	Inflow Depth >	1.89"	for 10-yr Storm event
Inflow =	21.50 cfs @	12.02 hrs,	Volume=	1.210 af	
Outflow =	14.41 cfs @	12.12 hrs,	Volume=	1.193 af,	Atten= 33%, Lag= 5.6 min
Primary =	14.41 cfs @	12.12 hrs,	Volume=	1.193 af	

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 2,669.43' @ 12.12 hrs Surf.Area= 2,833 sf Storage= 5,665 cf

Plug-Flow detention time= 12.7 min calculated for 1.190 af (98% of inflow)
Center-of-Mass det. time= 4.5 min (858.0 - 853.5)

Volume	Invert	Avail.Storage	Storage Description
#1	2,655.00'	7,420 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

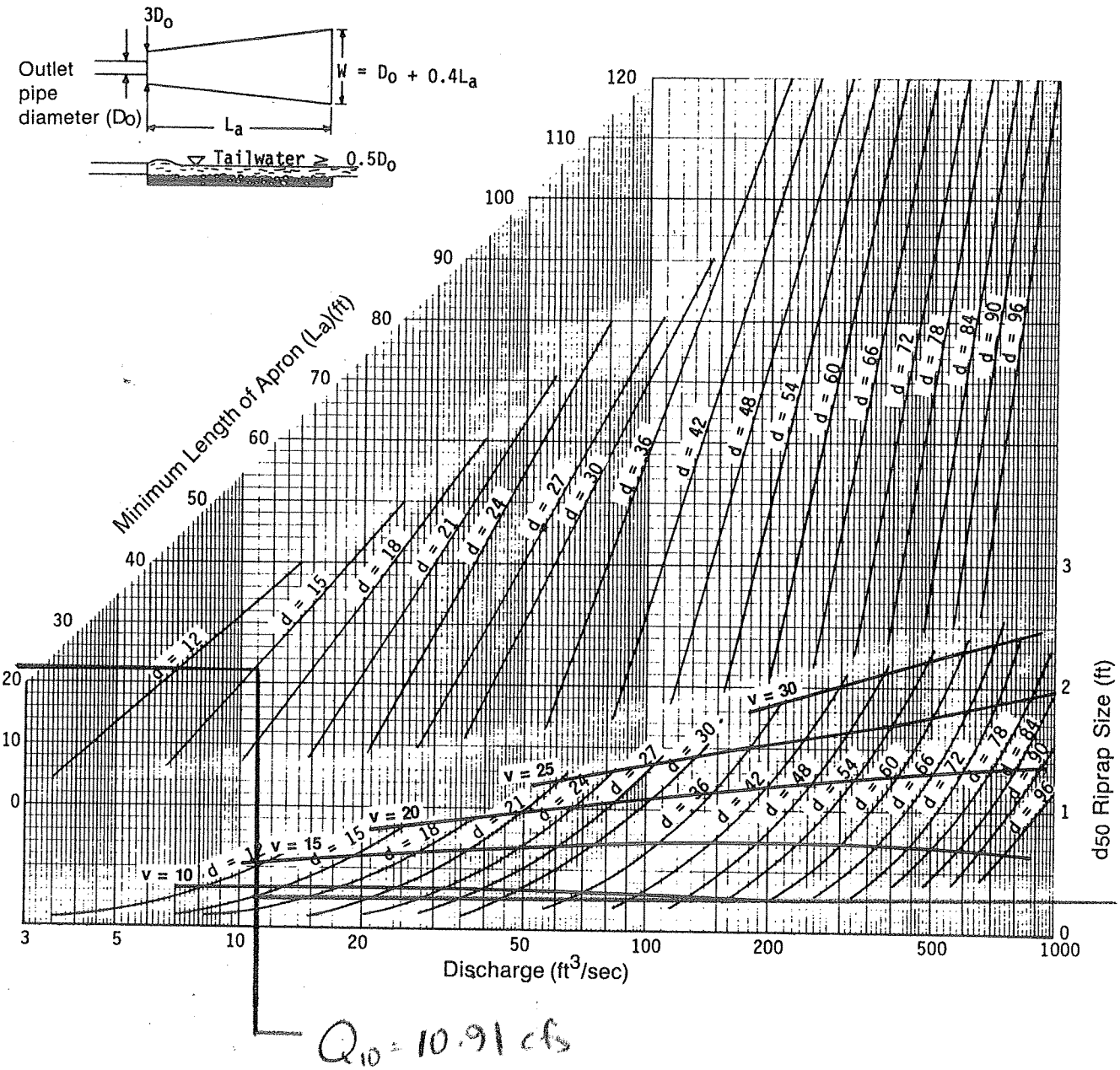
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,655.00	10	0	0
2,666.00	148	869	869
2,668.00	1,526	1,674	2,543
2,670.00	3,351	4,877	7,420

Device	Routing	Invert	Outlet Devices
#1	Primary	2,665.00'	**18.0" x 68.0' long Culvert** CPP, mitered to conform to fill, Ke= 0.700 Outlet Invert= 2,664.00' S= 0.0147 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=14.33 cfs @ 12.12 hrs HW=2,669.39' (Free Discharge)
└─**1=Culvert** (Inlet Controls 14.33 cfs @ 8.11 fps)

Outlet

15" culvert NEAR Stockpile
- thru intersection



Curves may not be extrapolated.

Figure 8.06b Design of outlet protection from a round pipe flowing full, maximum tailwater condition ($T_w \geq 0.5$ diameter).

1 of 2

outlet protection

15" Culvert near stockpile
outlet protection Analysis
- thru intersection

E-S AREAS
Prepared by Sevee & Maher Engineers, Inc.
HydroCAD® 8.50 s/n 001260 © 2007 HydroCAD Software Solutions LLC

Type II 24-hr 10-yr Storm Rainfall=5.20"
Printed 9/24/2008

Summary for Pond 2P: CULVERT

[85] Warning: Oscillations may require Finer Routing>1

Inflow Area =	3.747 ac,	0.00% Impervious,	Inflow Depth >	2.10"	for 10-yr Storm event
Inflow =	13.28 cfs @	11.96 hrs,	Volume=	0.656 af	
Outflow =	10.91 cfs @	12.01 hrs,	Volume=	0.656 af,	Atten= 18%, Lag= 2.9 min
Primary =	10.91 cfs @	12.01 hrs,	Volume=	0.656 af	

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 2,733.00' @ 12.01 hrs Surf.Area= 781 sf Storage= 1,015 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.4 min (843.8 - 843.5)

Volume	Invert	Avail.Storage	Storage Description
#1	2,728.00'	1,995 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

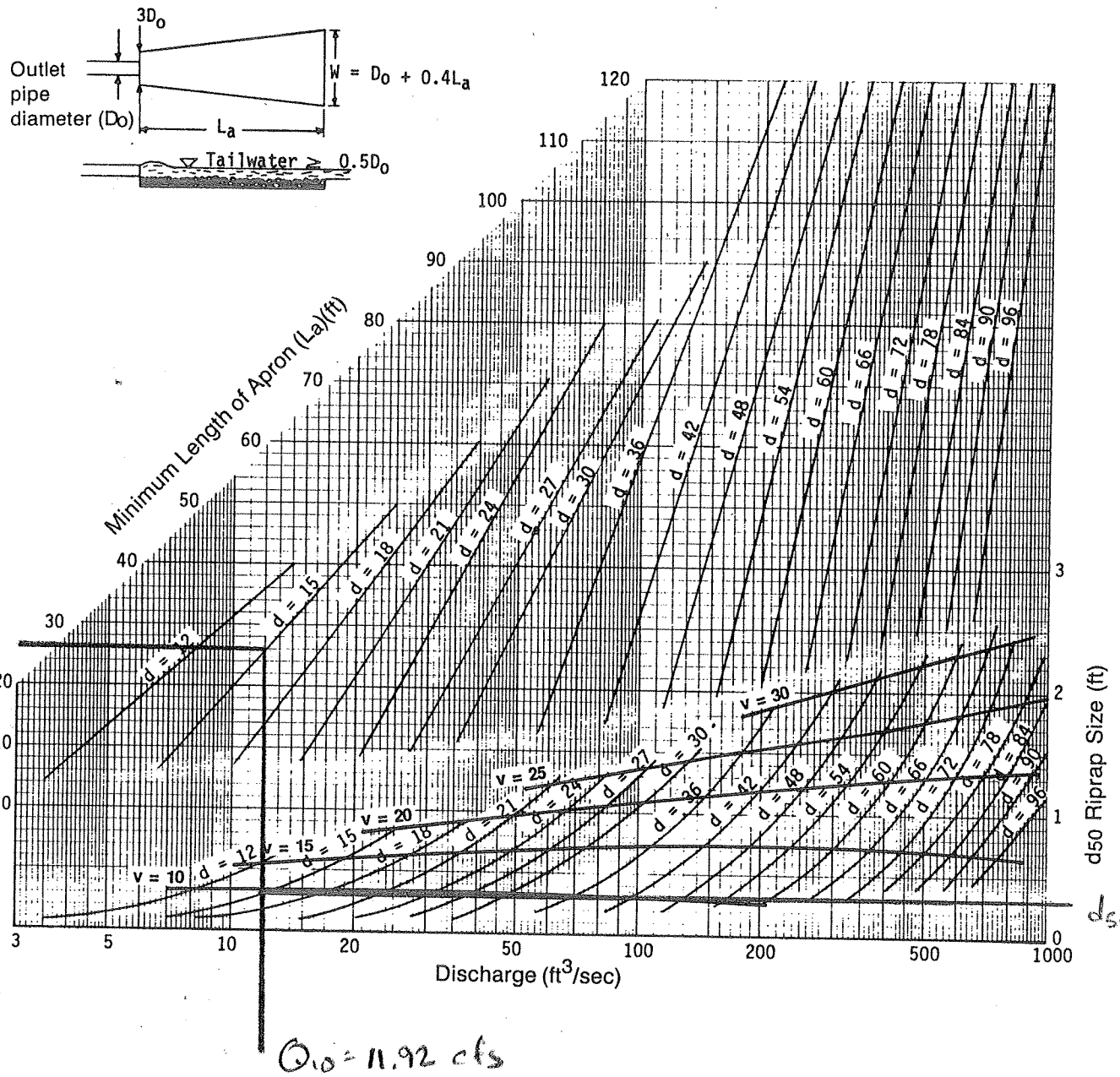
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,728.00	10	0	0
2,730.00	25	35	35
2,732.00	375	400	435
2,734.00	1,185	1,560	1,995

Device	Routing	Invert	Outlet Devices
#1	Primary	2,728.00'	**15.0" x 162.0' long Culvert** CPP, mitered to conform to fill, Ke= 0.700 Outlet Invert= 2,720.00' S= 0.0494 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=10.83 cfs @ 12.01 hrs HW=2,732.94' (Free Discharge)
└─**1=Culvert** (Inlet Controls 10.83 cfs @ 8.83 fps)

Outlet

15" culvert near Stockpile
- Under perimeter rd access



Curves may not be extrapolated.

Figure 8.06b Design of outlet protection from a round pipe flowing full, maximum tailwater condition ($T_w \geq 0.5$ diameter).

1 of 2

15" culvert near stockpile
- under perimeter rd access

Summary for Reach 4R: CULVERT

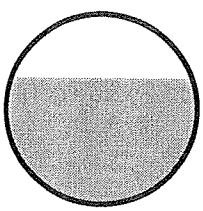
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 3.384 ac, 0.00% Impervious, Inflow Depth > 2.10" for 10-yr Storm event
Inflow = 11.99 cfs @ 11.96 hrs, Volume= 0.593 af
Outflow = 11.92 cfs @ 11.96 hrs, Volume= 0.593 af, Atten= 1%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 13.99 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 4.92 fps, Avg. Travel Time= 0.2 min

Peak Storage= 51 cf @ 11.96 hrs, Average Depth at Peak Storage= 0.82'
Bank-Full Depth= 1.25', Capacity at Bank-Full= 15.60 cfs

15.0" Diameter Pipe, n= 0.013 Corrugated PE, smooth interior
Length= 60.0' Slope= 0.0583 '/'
Inlet Invert= 2,722.50', Outlet Invert= 2,719.00'



Ditch Lining

Existing 24" Culvert
Permanent Lining

Summary for Pond P1: DETENTION BASIN

[62] Warning: Exceeded Reach R1A OUTLET depth by 1.58' @ 12.05 hrs

Inflow Area =	22.730 ac,	0.26% Impervious,	Inflow Depth > 1.92"	for 10-yr Storm event
Inflow =	16.09 cfs @	12.01 hrs, Volume=	3.629 af	
Outflow =	14.31 cfs @	12.07 hrs, Volume=	3.627 af,	Atten= 11%, Lag= 3.5 min
Primary =	14.31 cfs @	12.07 hrs, Volume=	3.627 af	
Secondary =	0.00 cfs @	0.00 hrs, Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 2,589.43' @ 12.07 hrs Surf.Area= 1,527 sf Storage= 2,048 cf

Plug-Flow detention time= 1.7 min calculated for 3.627 af (100% of inflow)
Center-of-Mass det. time= 1.4 min (899.3 - 897.9)

Volume	Invert	Avail.Storage	Storage Description
#1	2,587.00'	21,176 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,587.00	10	0	0
2,588.00	778	394	394
2,590.00	1,822	2,600	2,994
2,592.00	2,492	4,314	7,308
2,594.00	3,333	5,825	13,133
2,596.00	4,710	8,043	21,176

Device	Routing	Invert	Outlet Devices
#1	Primary	2,587.00'	**24.0" x 30.0' long Culvert** CMP, projecting, no headwall, Ke= 0.900 Outlet Invert= 2,586.00' S= 0.0333 '/' Cc= 0.900 n= 0.025 Corrugated metal
#2	Secondary	2,596.00'	**45.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=14.15 cfs @ 12.07 hrs HW=2,589.40' (Free Discharge)
└─**1=Culvert** (Inlet Controls 14.15 cfs @ 4.50 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2,587.00' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

itch Lining

EXISTING 24" Culvert
Perm Lining Analysis

DITCHS~1.LST
****** HYCHL ****** (Version 6.1) ****** Date 09-24-2008

Commands Read From File: C:\PROGRA~1\HYCHL\HYCHL\DITCHS~1.CHL

```
      JOB BLUE RIDGE
      UNI 0
** UNITS PARAMETER = 0 (ENGLISH)
      CHL .1568  14.31
      TRP 4      3      3
** LEFT SIDE SLOPE    3.0 AND RIGHT SIDE SLOPE    3.0
** THE BASE WIDTH OF THE TRAPEZOID (ft)    4.00
      LRR .5     2 42     2.65   0.15
** D50 (ft)     .50
** ANGLE OF REPOSE (DEGREES)   42.00
** SPECIFIC GRAVITY    2.65
** SHIELDS PARAMETER    .150
      END
***************END OF COMMAND FILE************
```

EXISTING RIPRAP LINED DITCH

```
BLUE RIDGE
------------
INPUT REVIEW
------------
  DESIGN PARAMETERS:
      DESIGN DISCHARGE (ft^3/s):          14.31
      CHANNEL SHAPE:                  TRAPEZOIDAL
      CHANNEL SLOPE (ft/ft):               .157
-------------------------------------
HYDRAULIC CALCULATIONS USING BATHURST
-------------------------------------

FLOW (cfs)                  14.31
MAX DEPTH (ft)                .43
AREA (ft^2)                  2.31
WETTED PERIMETER (ft)        6.76
HYDRAULIC RADIUS (ft)         .34
AVG VELOCITY (ft/s)          6.19
MANNINGS EQUIVALENT          .047
Davg / D50                    .70
FROUDE NUMBER                1.65
REYNOLDS NUMBER (10^5)        .81
------------------
STABILITY ANALYSIS
------------------
```

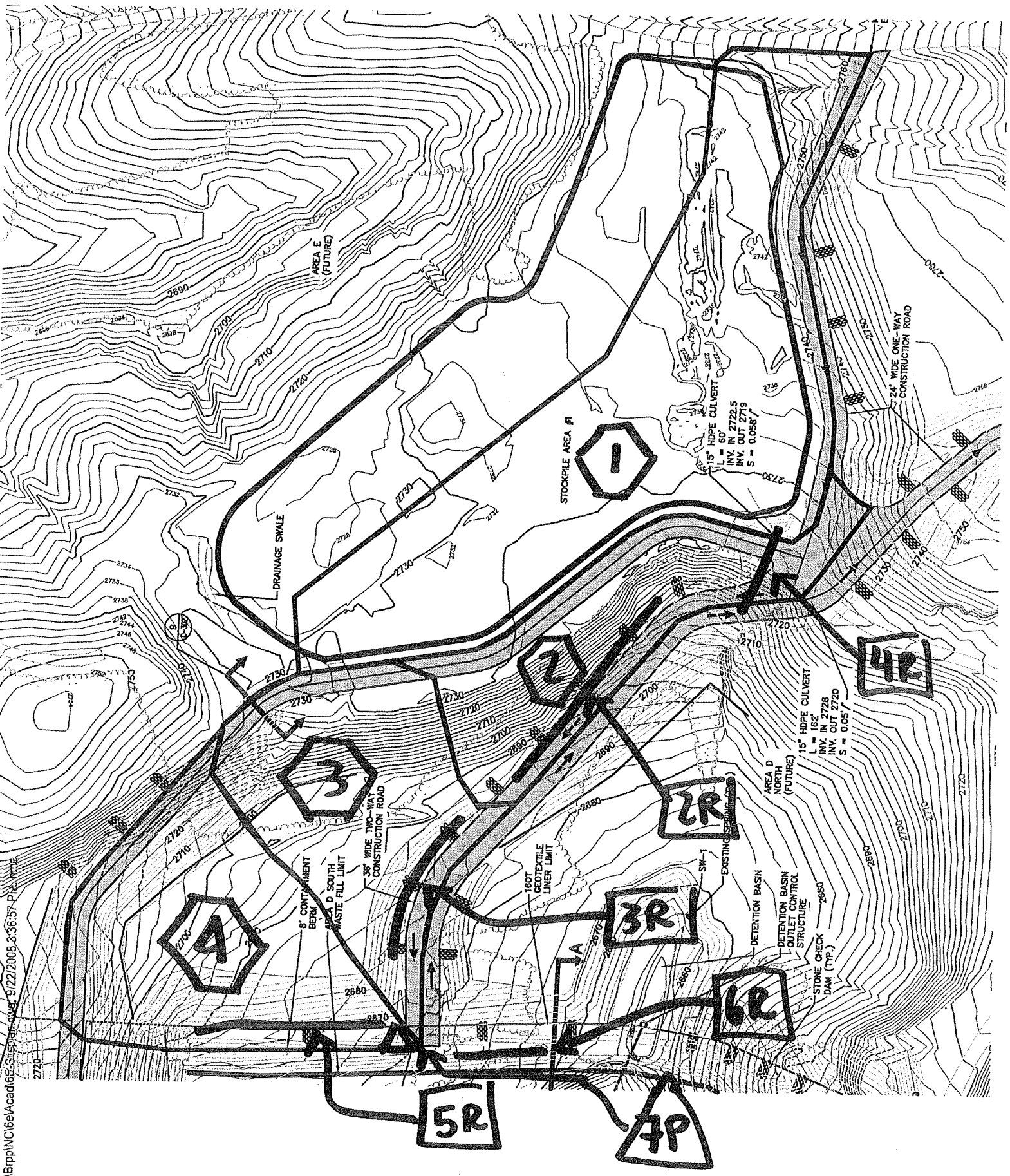
CONDITION	LINING TYPE	PERMIS SHR (LB/FT^2)	CALC. SHR (LB/FT^2)	STAB. FACTOR	REMARKS
BOTTOM; STRAIGHT	RIPRAP	7.72	4.25	1.82	STABLE
SIDE; STRAIGHT	RIPRAP	6.81	3.64	1.87	STABLE

*** NORMAL END OF HYCHL ***

EXISTING LINING IS SUFFICIENT

Lining

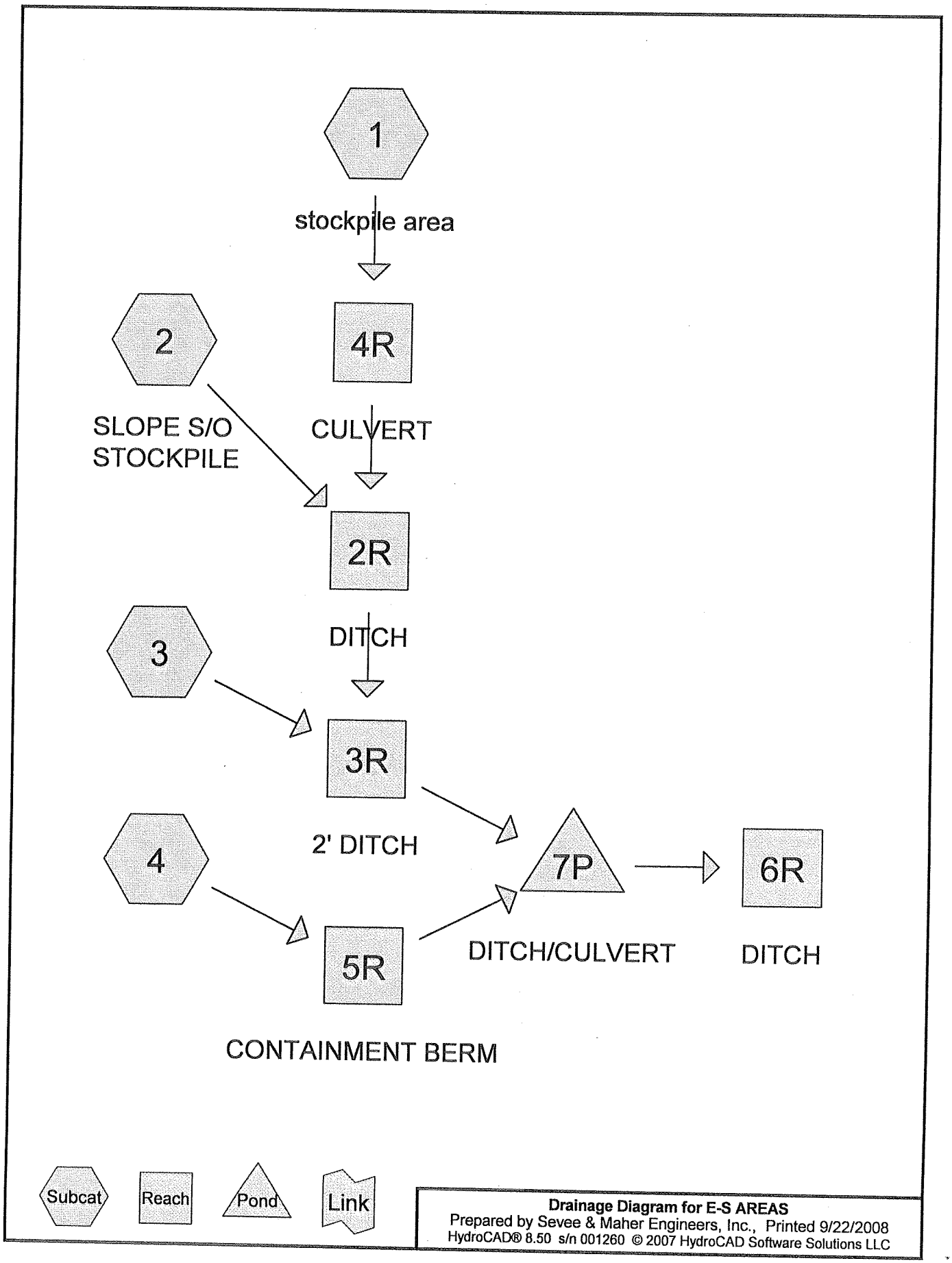
Analysis of Culverts & Ditches Downgradiant of Stockpile Area



P:\Brpp\NC\6e\Acad\6E-Site plan.dwg, 9/22/2008 3:36:57 PM, rtne

Ditch Linings

Analysis of Culverts & Ditches Downgradient of Stockpile Area



Ditch
Lining

STOCKPILE AREA CULVERT
PG 1

Summary for Subcatchment 1A: stockpile area

Runoff = 11.99 cfs @ 11.96 hrs, Volume= 0.593 af, Depth> 2.10"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Storm Rainfall=5.20"

	Area (sf)	CN	Description
	0	55	Woods, Good, HSG B
*	0	85	EX-Gravel roads, HSG B
*	0	67	EX-Brush/Grass mix, Poor, HSG B
	0	85	Gravel roads, HSG B
	0	58	Meadow, non-grazed, HSG B
*	0	98	LINER
	147,422	69	50-75% Grass cover, Fair, HSG B, STOCKPILE
	147,422	69	Weighted Average
	147,422		Pervious Area

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

Ditch Lining

Stockpile area culvert

Pg 2

Summary for Reach 4R: CULVERT

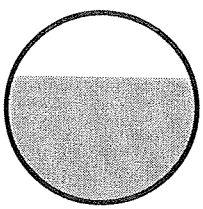
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 3.384 ac, 0.00% Impervious, Inflow Depth > 2.10" for 10-yr Storm event
Inflow = 11.99 cfs @ 11.96 hrs, Volume= 0.593 af
Outflow = 11.92 cfs @ 11.96 hrs, Volume= 0.593 af, Atten= 1%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 13.99 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 4.92 fps, Avg. Travel Time= 0.2 min

Peak Storage= 51 cf @ 11.96 hrs, Average Depth at Peak Storage= 0.82'
Bank-Full Depth= 1.25', Capacity at Bank-Full= 15.60 cfs

15.0" Diameter Pipe, n= 0.013 Corrugated PE, smooth interior
Length= 60.0' Slope= 0.0583 '/'
Inlet Invert= 2,722.50', Outlet Invert= 2,719.00'



Ditch Lining

Stockpile area culvert

pg 3

flows @ outlet only.

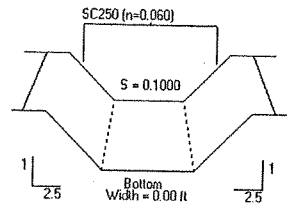
North American Green - ECMDS Version 4.3 | 9/22/2008 | 02:50 PM | COMPUTED BY: HME

PROJECT NAME: BLUE RIDGE | PROJECT NO.: 07089.00

FROM STATION/REACH: STOCKPILE | TO STATION/REACH: | DRAINAGE AREA: | DESIGN FREQUENCY: 10-YEAR

HYDRAULIC RESULTS

Discharge (cfs)	Peak Flow Period (hrs)	Velocity (fps)	Area (sq ft)	Hydraulic Radius(ft)	Normal Depth (ft)
11.9	1.0	4.72	2.52	0.47	1.00



Not to Scale

LINER RESULTS

Reach	Matting Type / Staple Pattern	Stability Analysis	Vegetation Characteristics: Phase	Class	Type	Density	Permissible Shear Stress (psf)	Calculated Shear Stress (psf)	Safety Factor	Remarks
Straight	SC250	Vegetation	3	C	Mix	75-95%	10.00	6.26	1.60	STABLE
	Staple E	Soil	Sandy Loam				0.800	0.401	1.99	STABLE

PERMANENT LINING REQUIRED

SC 250

Back to Input Screen

Ditch Lining

Stockpile Area - Ditch after culvert
Pg 4

Summary for Reach 2R:

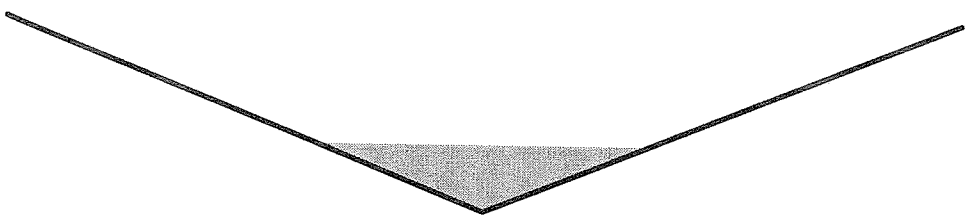
[62] Warning: Exceeded Reach 4R OUTLET depth by 1.67' @ 12.05 hrs

Inflow Area =	4.630 ac,	0.00% Impervious,	Inflow Depth >	2.10"	for 10-yr Storm event
Inflow =	16.34 cfs @	11.96 hrs,	Volume=	0.811 af	
Outflow =	14.99 cfs @	12.02 hrs,	Volume=	0.809 af,	Atten= 8%, Lag= 3.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.29 fps, Min. Travel Time= 1.9 min
Avg. Velocity = 1.30 fps, Avg. Travel Time= 4.9 min

Peak Storage= 1,818 cf @ 11.99 hrs, Average Depth at Peak Storage= 1.38'
Bank-Full Depth= 4.00', Capacity at Bank-Full= 267.91 cfs

0.00' x 4.00' deep channel, n= 0.100 Earth, dense brush, high stage
Side Slope Z-value= 2.5 '/' Top Width= 20.00'
Length= 382.0' Slope= 0.0890 '/'
Inlet Invert= 2,720.00', Outlet Invert= 2,686.00'

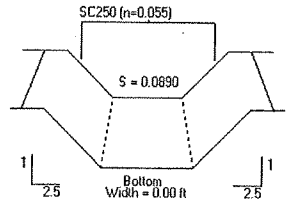


Stockpile area- ~~Culvert South~~
Ditch south of Culvert
Pg 5

North American Green - ECMDS Version 4.3		9/22/2008 03:04 PM	COMPUTED BY: HME
PROJECT NAME: BLUE RIDGE		PROJECT NO.: 07089.00	
FROM STATION/REACH: DITCH	TO STATION/REACH:	DRAINAGE AREA:	DESIGN FREQUENCY: 10-YEAR

HYDRAULIC RESULTS

Discharge (cfs)	Peak Flow Period (hrs)	Velocity (fps)	Area (sq ft)	Hydraulic Radius(ft)	Normal Depth (ft)
16.3	1.0	5.18	3.15	0.52	1.12



LINER RESULTS

Not to Scale

Reach	Matting Type / Staple Pattern	Stability Analysis	Vegetation Characteristics: Phase	Class	Type	Density	Permissible Shear Stress (psf)	Calculated Shear Stress (psf)	Safety Factor	Remarks
Straight	SC250	Vegetation	3	C	Mix	75-95%	10.00	6.23	1.61	STABLE
	Staple E	Soil	Sandy Loam				0.800	0.397	2.02	STABLE

Permanent Lining Required

SC 250

Back to Input Screen

Also: temp lining not sufficient for erosion control therefore perm lining must be installed as temp ess control Measures.

itch Limits

Stockpile Area - 2' Ditch
Pg 6

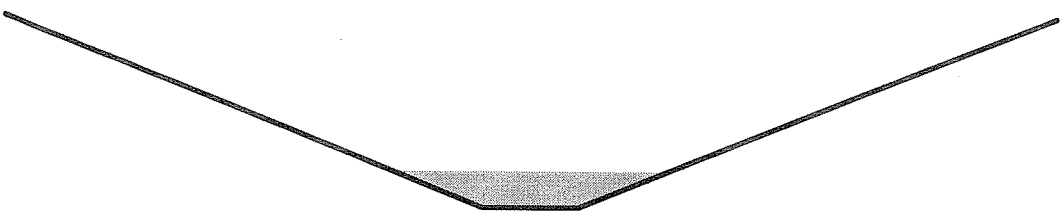
Summary for Reach 3R: 2' DITCH

Inflow Area =	6.077 ac,	0.00% Impervious,	Inflow Depth >	2.02"	for 10-yr Storm event
Inflow =	18.68 cfs @	12.01 hrs,	Volume=	1.024 af	
Outflow =	18.12 cfs @	12.02 hrs,	Volume=	1.023 af,	Atten= 3%, Lag= 1.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.51 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 2.20 fps, Avg. Travel Time= 1.9 min

Peak Storage= 718 cf @ 12.01 hrs, Average Depth at Peak Storage= 0.74'
Bank-Full Depth= 4.00', Capacity at Bank-Full= 825.72 cfs

2.00' x 4.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.5 '/' Top Width= 22.00'
Length= 252.0' Slope= 0.0635 '/'
Inlet Invert= 2,684.00', Outlet Invert= 2,668.00'



Ditch Linings

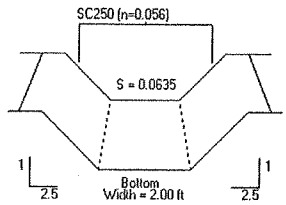
Stockpile Area-d Ditch

Pg 7

North American Green - ECMDS Version 4.3		9/22/2008 03:22 PM	COMPUTED BY: HME
PROJECT NAME: BLUE RIDGE		PROJECT NO.: 07089.00	
FROM STATION/REACH: 2' WIDE	TO STATION/REACH:	DRAINAGE AREA:	DESIGN FREQUENCY: 10-YEAR

HYDRAULIC RESULTS

Discharge (cfs)	Peak Flow Period (hrs)	Velocity (fps)	Area (sq ft)	Hydraulic Radius(ft)	Normal Depth (ft)
18.7	1.0	4.63	4.03	0.57	0.93



Not to Scale

LINER RESULTS

Reach	Matting Type / Staple Pattern	Stability Analysis	Vegetation Characteristics: Phase	Class	Type	Density	Permissible Shear Stress (psf)	Calculated Shear Stress (psf)	Safety Factor	Remarks
Straight	SC250	Vegetation	3	C	Mix	75-95%	10.00	3.69	2.71	STABLE
	Staple E	Soil	Sandy Loam				0.800	0.296	2.70	STABLE

Back to Input Screen

Requires Permanent Lining

SC 250

Ditch Lining

Stockpile Area-
containment Berm
DITCH
Pg 8

Summary for Reach 6R: DITCH

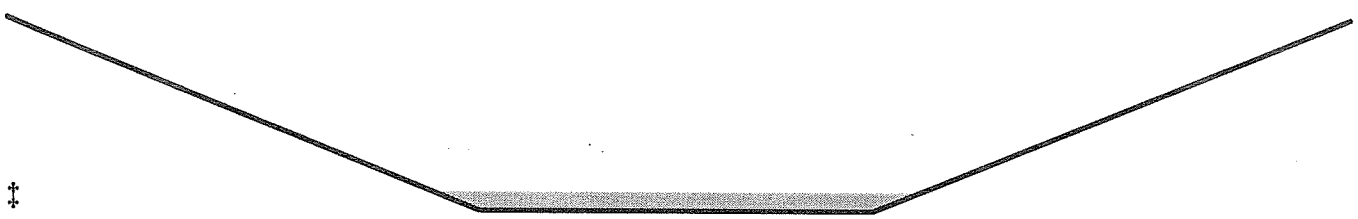
[79] Warning: Submerged Pond 7P Primary device # 1 OUTLET by 0.38'

Inflow Area = 7.668 ac, 0.00% Impervious, Inflow Depth > 1.87" for 10-yr Storm event
Inflow = 14.41 cfs @ 12.12 hrs, Volume= 1.193 af
Outflow = 14.32 cfs @ 12.14 hrs, Volume= 1.191 af, Atten= 1%, Lag= 1.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.35 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 1.12 fps, Avg. Travel Time= 2.3 min

Peak Storage= 665 cf @ 12.12 hrs, Average Depth at Peak Storage= 0.38'
Bank-Full Depth= 4.00', Capacity at Bank-Full= 1,103.53 cfs

10.00' x 4.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 3.0 '/' Top Width= 34.00'
Length= 155.0' Slope= 0.0258 '/'
Inlet Invert= 2,664.00', Outlet Invert= 2,660.00'



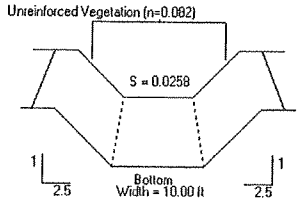
Ditch Lining

Stockpile Area
Containment Berm Ditch
Pg 9

North American Green - ECMDS Version 4.3 | 9/22/2008 | 03:34 PM | COMPUTED BY: HME
PROJECT NAME: BLUE RIDGE | PROJECT NO.: 07089.00
FROM STATION/REACH: | TO STATION/REACH: | DRAINAGE AREA: | DESIGN FREQUENCY: 10-YEAR

HYDRAULIC RESULTS

Discharge (cfs)	Peak Flow Period (hrs)	Velocity (fps)	Area (sq ft)	Hydraulic Radius(ft)	Normal Depth (ft)
14.4	1.0	1.95	7.40	0.55	0.64



Not to Scale

LINER RESULTS

Reach	Matting Type / Staple Pattern	Stability Analysis	Vegetation Characteristics: Phase	Class	Type	Density	Permissible Shear Stress (psf)	Calculated Shear Stress (psf)	Safety Factor	Remarks
Straight	Unreinforced	Vegetation		C	Mix	75-95%	4.20	1.03	4.09	STABLE
		Soil	Sandy Loam				0.035	0.009	3.80	STABLE

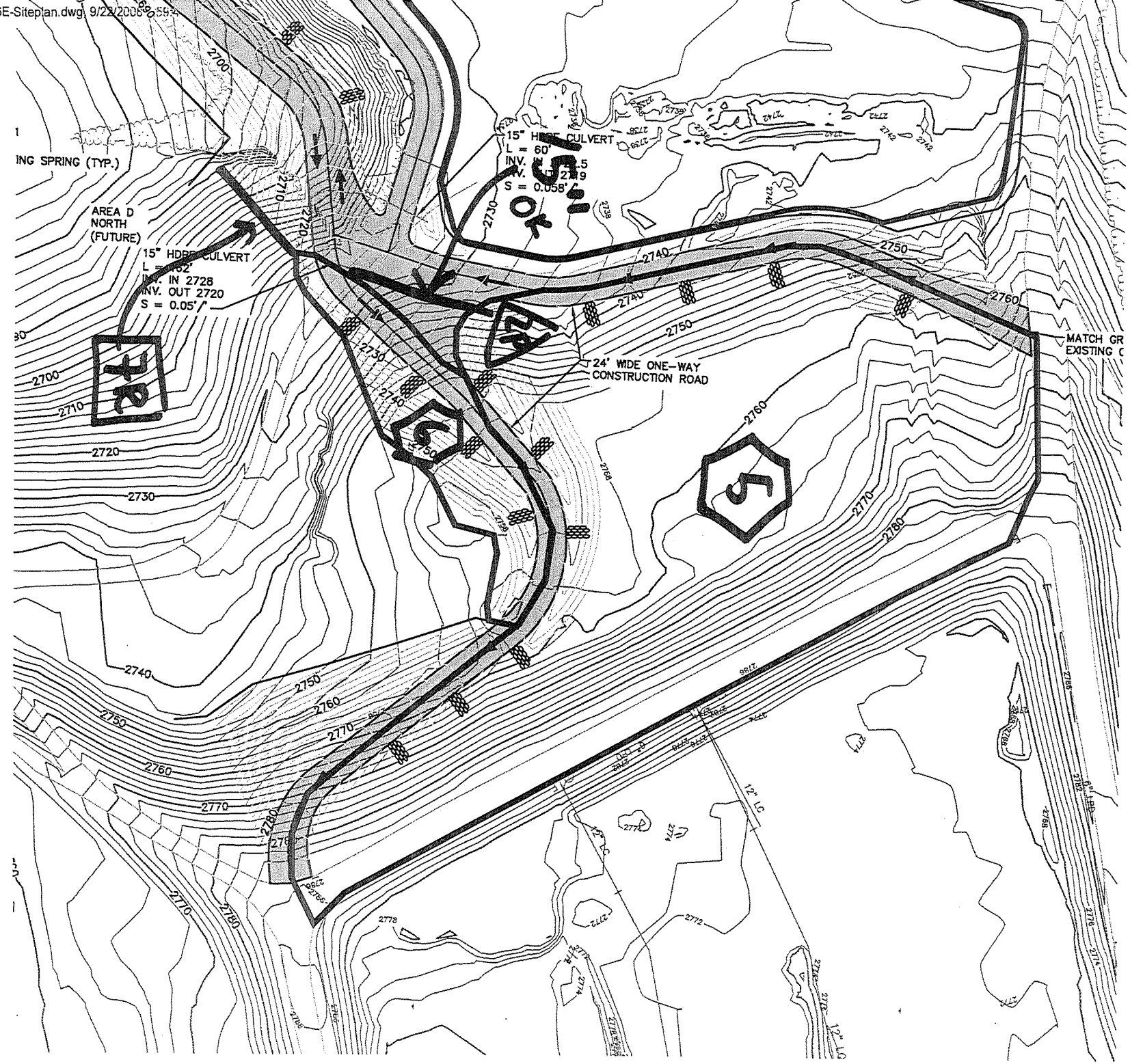
- No temp Lining req'd

- Permanent Lining required:

stable upon vegetation

Back to Input Screen

P:\Brpp\NC\6e\Acad\6E-Siteplan.dwg, 9/22/2005 6:59:

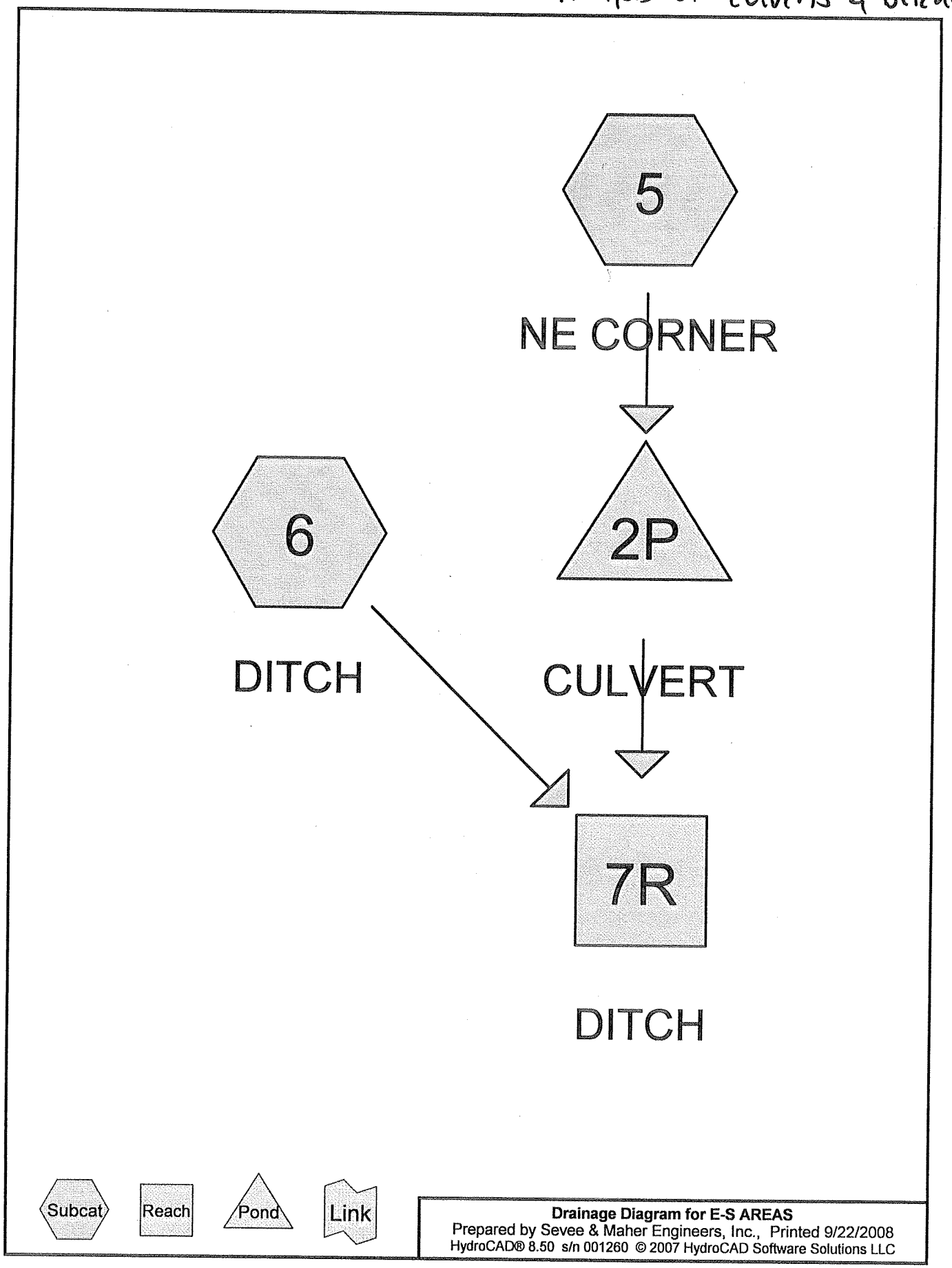


Northern [illegible]
Analysis of Culverts & Ditches

Ditch

Northeast corner of site.

Analysis of Culverts & Ditches



Ditch

N/E corner of site

Pg 1

Summary for Reach 7R: DITCH

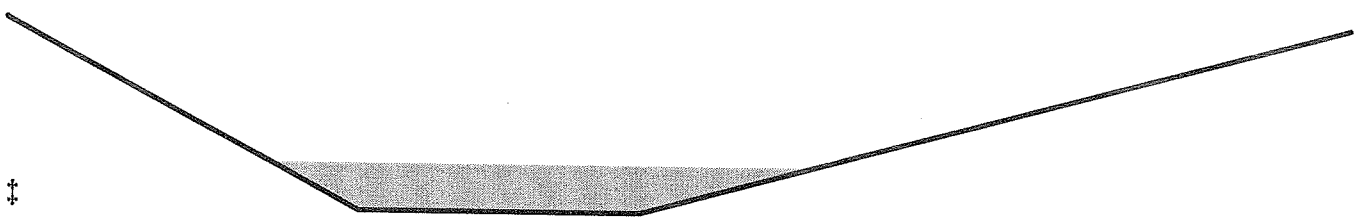
[79] Warning: Submerged Pond 2P Primary device # 1 OUTLET by 0.49'

Inflow Area =	4.211 ac,	0.00% Impervious,	Inflow Depth >	2.08"	for 10-yr Storm event
Inflow =	12.27 cfs @	12.00 hrs, Volume=	0.731 af		
Outflow =	12.20 cfs @	12.01 hrs, Volume=	0.731 af,	Atten= 1%,	Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.31 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 1.33 fps, Avg. Travel Time= 1.4 min

Peak Storage= 320 cf @ 12.00 hrs, Average Depth at Peak Storage= 0.49'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 215.70 cfs

4.00' x 2.00' deep channel, n= 0.100 Earth, dense brush, high stage
Side Slope Z-value= 2.5 5.0 '/' Top Width= 19.00'
Length= 112.0' Slope= 0.3214 '/'
Inlet Invert= 2,720.00', Outlet Invert= 2,684.00'



‡

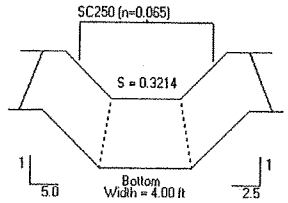
Ditch

N/E Corner of Site
Pg 2

North American Green - ECMDS Version 4.3 | 9/22/2008 | 03:58 PM | COMPUTED BY: HME
PROJECT NAME: BLUE RIDGE | PROJECT NO.: 07069.00
FROM STATION/REACH: DITCH 7A | TO STATION/REACH: | DRAINAGE AREA: | DESIGN FREQUENCY: 10-YEAR

HYDRAULIC RESULTS

Discharge (cfs)	Peak Flow Period (hrs)	Velocity (fps)	Area (sq.ft)	Hydraulic Radius(ft)	Normal Depth (ft)
12.3	1.0	5.84	2.11	0.30	0.39



Not to Scale

LINER RESULTS

Reach	Matting Type / Staple Pattern	Stability Analysis	Vegetation Characteristics: Phase	Class	Type	Density	Permissible Shear Stress (psf)	Calculated Shear Stress (psf)	Safety Factor	Remarks
Straight	SC250	Vegetation	3	C	Mix	75-95%	10.00	7.76	1.29	STABLE
	Staple E	Soil	Sandy Loam				0.800	0.740	1.08	STABLE

Permanent Lining Required

SC 250

Back to Input Screen

****** HYCHL ****** (Version 6.1) ****** Date 09-24-2008

```
Commands Read From File: C:\PROGRA~1\HYCHL\HYCHL\DITCHS~1.CHL

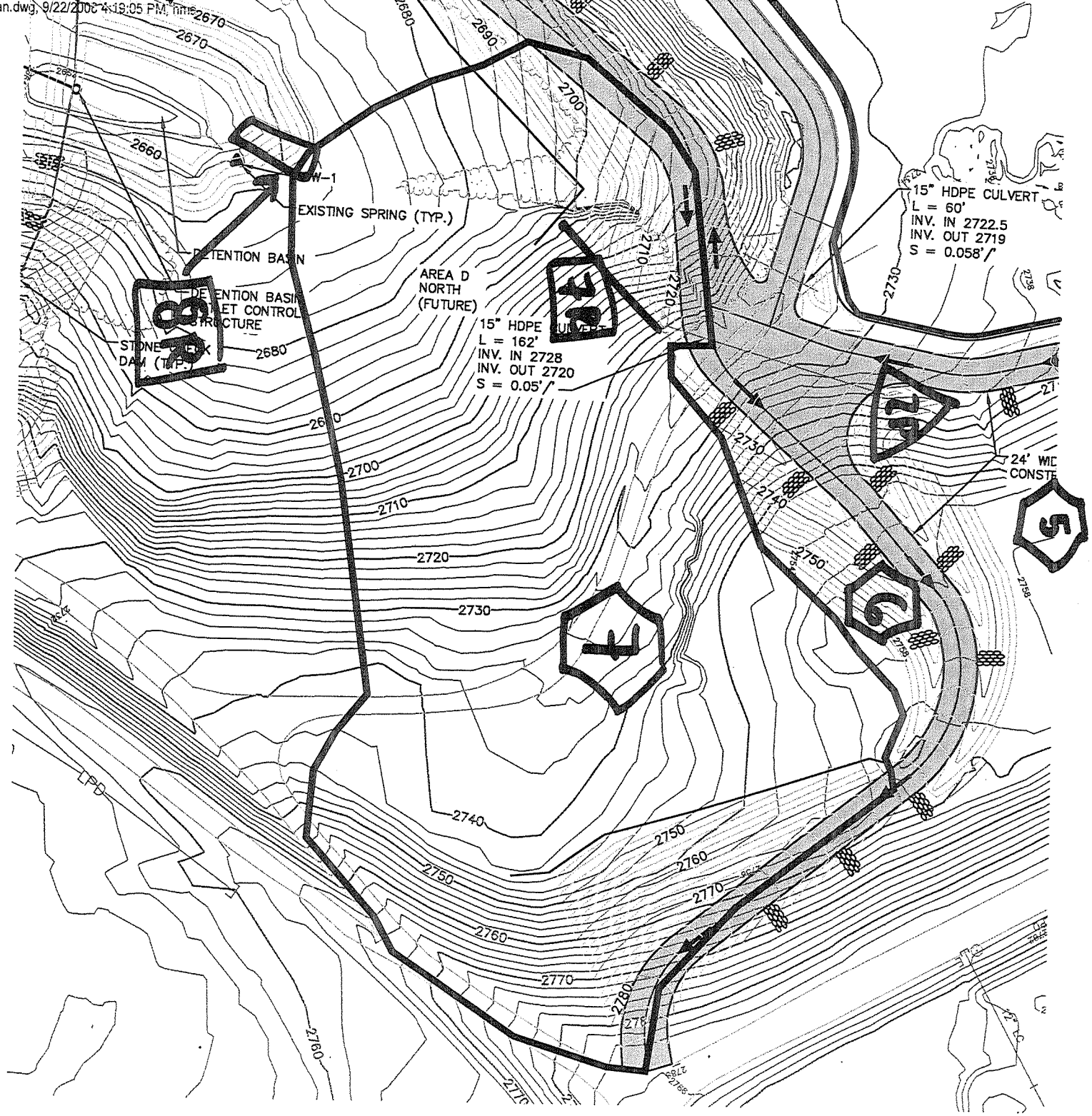
      JOB BRPP
      UNI 0
** UNITS PARAMETER = 0 (ENGLISH)
      CHL .3214  12.27
*** WARNING:  DATA IS OUT OF REASONABLE RANGE
      TRP 4      2.5     2.5
** LEFT SIDE SLOPE    2.5 AND RIGHT SIDE SLOPE    2.5
** THE BASE WIDTH OF THE TRAPEZOID (ft)    4.00
      LRR .33    2 42     2.65   0.150
** D50 (ft)    .33
** ANGLE OF REPOSE (DEGREES)   42.00
** SPECIFIC GRAVITY    2.65
** SHIELDS PARAMETER    .150
      END
***************END OF COMMAND FILE************

BRPP
------------
INPUT REVIEW
------------
  DESIGN PARAMETERS:
      DESIGN DISCHARGE (ft^3/s):          12.27
      CHANNEL SHAPE:                  TRAPEZOIDAL
      CHANNEL SLOPE (ft/ft):               .321
-------------------------------------
HYDRAULIC CALCULATIONS USING BATHURST
-------------------------------------

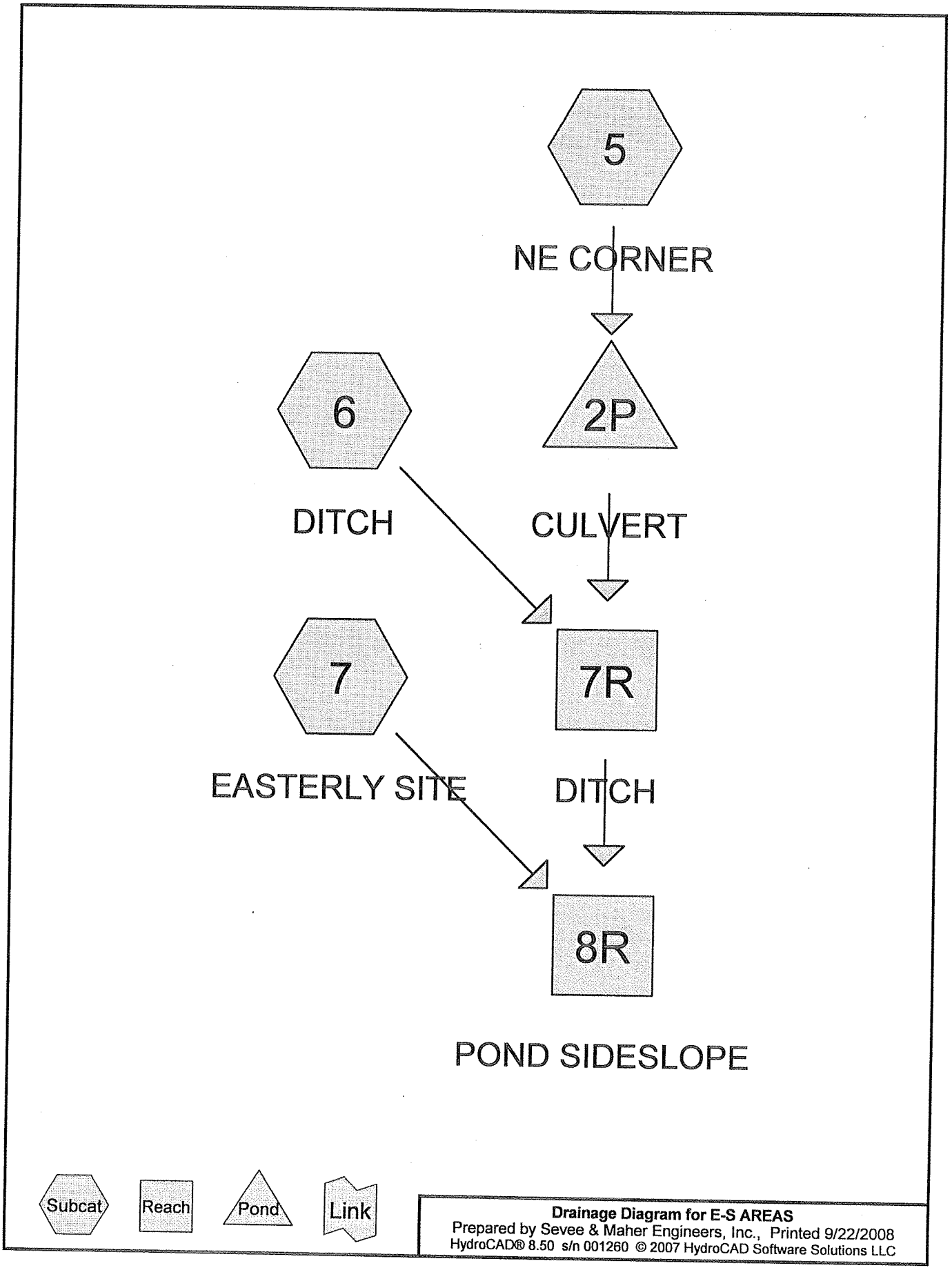
FLOW (cfs)                  12.27
MAX DEPTH (ft)                .25
AREA (ft^2)                  1.18
WETTED PERIMETER (ft)        5.37
HYDRAULIC RADIUS (ft)         .22
AVG VELOCITY (ft/s)         10.44
MANNINGS EQUIVALENT          .030
Davg / D50                    .68
FROUDE NUMBER                3.66
REYNOLDS NUMBER (10^5)        .43
------------------
STABILITY ANALYSIS
------------------
```

CONDITION	LINING TYPE	PERMIS SHR (LB/FT^2)	CALC. SHR (LB/FT^2)	STAB. FACTOR	REMARKS
BOTTOM; STRAIGHT	RIPRAP	5.10	5.07	1.01	STABLE
SIDE; STRAIGHT	RIPRAP	4.24	4.13	1.03	STABLE

```
*** NORMAL END OF HYCHL ***
```


EXISTING SPRING (TYP.)
DETENTION BASIN
DETENTION BASIN OUTLET CONTROL STRUCTURE
STONE CHECK DAM (TYP.)
AREA D NORTH (FUTURE)
15" HDPE CULVERT
L = 162'
INV. IN 2728
INV. OUT 2720
S = 0.05'/'
15" HDPE CULVERT
L = 60'
INV. IN 2722.5
INV. OUT 2719
S = 0.058'/'
24' WIDE CONSTRUCTION
2660
2670
2680
2690
2700
2710
2720
2730
2740
2750
2760
2770
2780

Ditch


5
NE CORNER
2P
6
DITCH
CULVERT
7R
7
EASTERLY SITE
DITCH
8R
POND SIDESLOPE
Subcat
Reach
Pond
Link
Drainage Diagram for E-S AREAS
Prepared by Sevee & Maher Engineers, Inc., Printed 9/22/2008
HydroCAD® 8.50 s/n 001260 © 2007 HydroCAD Software Solutions LLC

Ditch

Summary for Reach 8R: POND SIDESLOPE

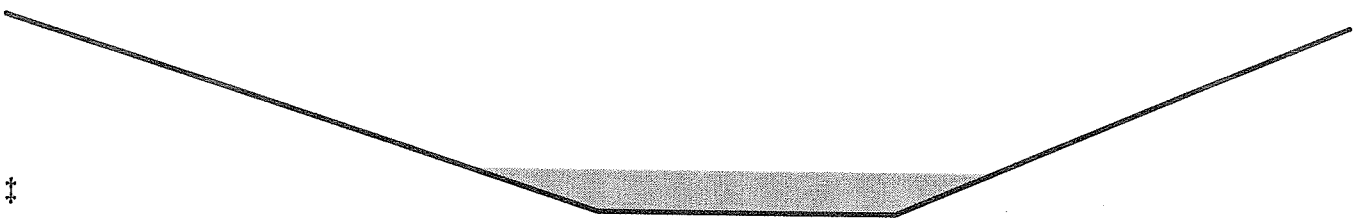
[85] Warning: Oscillations may require Finer Routing>1

Inflow Area =	8.746 ac,	0.00% Impervious,	Inflow Depth >	2.05"	for 10-yr Storm event
Inflow =	27.06 cfs @	11.97 hrs,	Volume=	1.494 af	
Outflow =	26.96 cfs @	11.97 hrs,	Volume=	1.494 af,	Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 11.21 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 3.33 fps, Avg. Travel Time= 0.2 min

Peak Storage= 110 cf @ 11.97 hrs, Average Depth at Peak Storage= 0.43'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 576.93 cfs

4.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 4.0 3.0 '/' Top Width= 18.00'
Length= 46.0' Slope= 0.3043 '/'
Inlet Invert= 2,672.00', Outlet Invert= 2,658.00'



‡

Ditch

POND SIDESLOPE ANALYSIS

DITCHS~1.LST

****** HYCHL ****** (Version 6.1) ****** Date 09-22-2008

Commands Read From File: C:\PROGRA~1\HYCHL\HYCHL\DITCHS~1.CHL

```
      JOB BRPP
      UNI 0
** UNITS PARAMETER = 0 (ENGLISH)
      CHL .3043  27.06
*** WARNING:  DATA IS OUT OF REASONABLE RANGE
      TRP 4 4 3
** LEFT SIDE SLOPE    4.0 AND RIGHT SIDE SLOPE    3.0
** THE BASE WIDTH OF THE TRAPEZOID (ft)    4.00
      LRR .58    2 42     2.65   .15
** D50 (ft)    .58
** ANGLE OF REPOSE (DEGREES)   42.00
** SPECIFIC GRAVITY    2.65
** SHIELDS PARAMETER    .150
      END
***************END OF COMMAND FILE************
```

RIPRAP REQUIRED

D_{50} = 7"

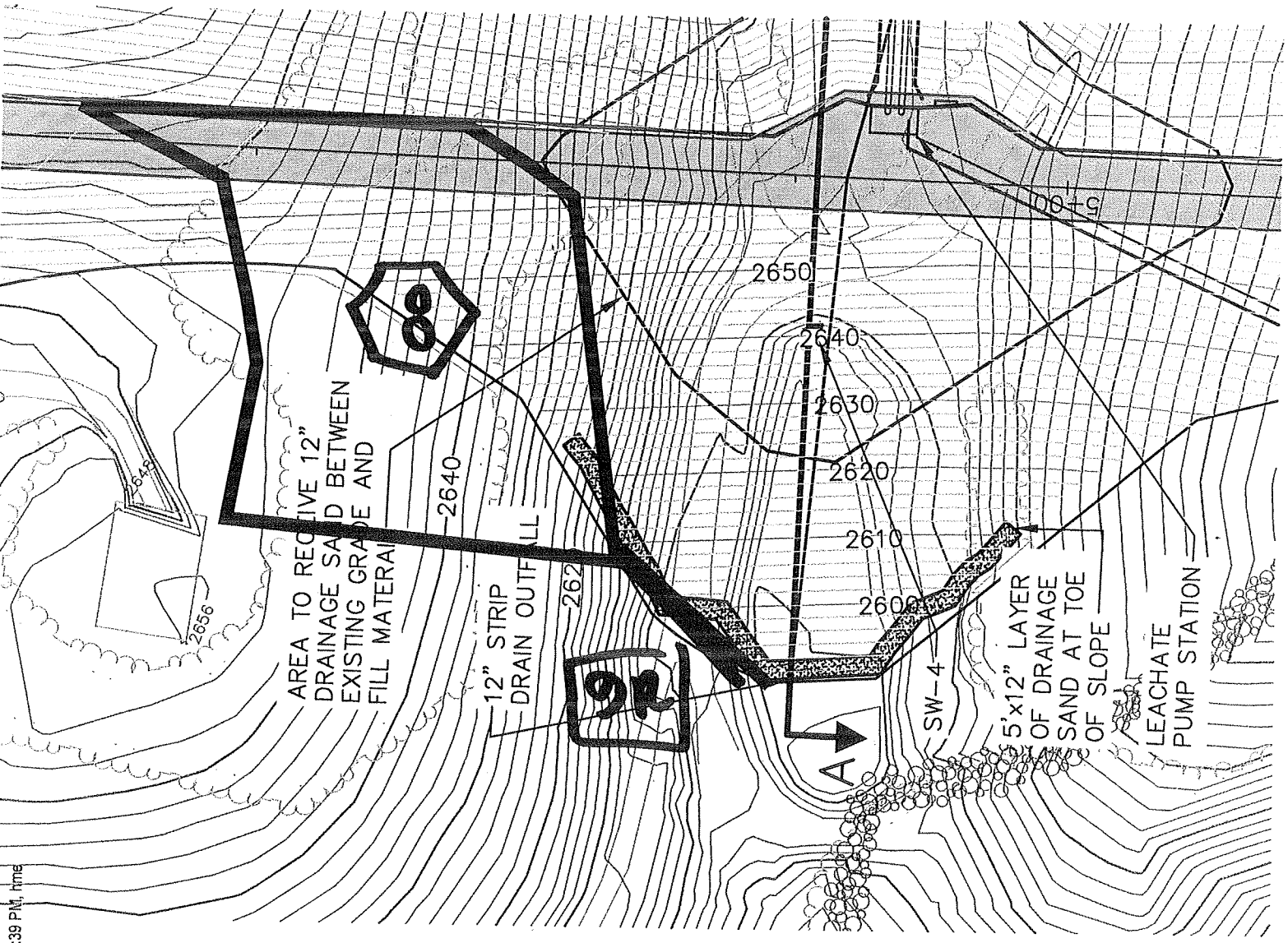
```
BRPP
------------
INPUT REVIEW
------------
  DESIGN PARAMETERS:
      DESIGN DISCHARGE (ft^3/s):          27.06
      CHANNEL SHAPE:                  TRAPEZOIDAL
      CHANNEL SLOPE (ft/ft):               .304
-------------------------------------
HYDRAULIC CALCULATIONS USING BATHURST
-------------------------------------

FLOW (cfs)                 27.06
MAX DEPTH (ft)               .43
AREA (ft^2)                 2.41
WETTED PERIMETER (ft)       7.17
HYDRAULIC RADIUS (ft)        .34
AVG VELOCITY (ft/s)        11.24
MANNINGS EQUIVALENT         .035
Davg / D50                   .59
FROUDE NUMBER               3.01
REYNOLDS NUMBER (10^5)      1.01
------------------
STABILITY ANALYSIS
------------------
```

CONDITION	LINING TYPE	PERMIS SHR (LB/FT^2)	CALC. SHR (LB/FT^2)	STAB. FACTOR	REMARKS
BOTTOM; STRAIGHT	RIPRAP	8.96	8.24	1.09	STABLE
SIDE; STRAIGHT	RIPRAP	7.89	7.80	1.01	STABLE

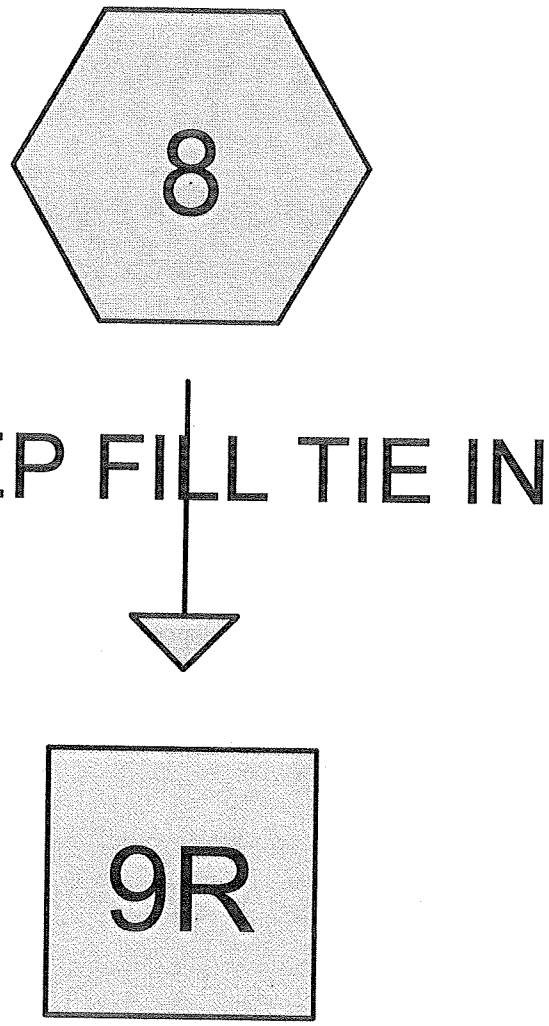
*** NORMAL END OF HYCHL ***

Analysis of Match Point
@ Deep Fill



P:\Brppl\NC\6e\Acad\6E-Siteplan.dwg, 9/22/2008 4:43:39 PM, hma

Analysis of Match Point
@ Deep fill



Subcat Reach Pond Link

Drainage Diagram for E-S AREAS
Prepared by Sevee & Maher Engineers, Inc., Printed 9/22/2008
HydroCAD® 8.50 s/n 001260 © 2007 HydroCAD Software Solutions LLC

Ditch

Analysis of Match Point @ Deep Fill

Pg 1

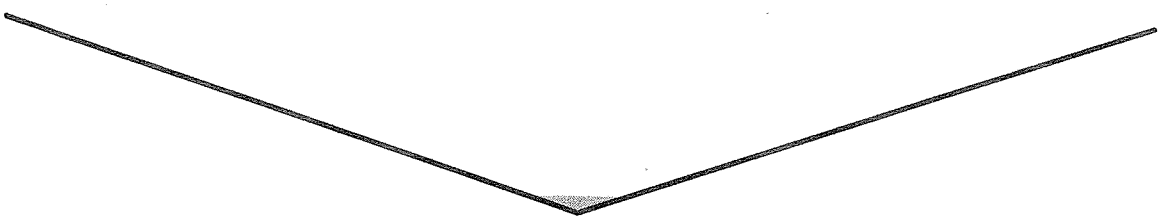
Summary for Reach 9R: TIE IN DITCH

Inflow Area =	0.465 ac,	0.00% Impervious,	Inflow Depth >	1.56"	for 10-yr Storm event
Inflow =	1.20 cfs @	11.97 hrs, Volume=	0.061 af		
Outflow =	1.17 cfs @	11.97 hrs, Volume=	0.061 af,	Atten= 2%,	Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.51 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.34 fps, Avg. Travel Time= 0.5 min

Peak Storage= 16 cf @ 11.97 hrs, Average Depth at Peak Storage= 0.27'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 748.93 cfs

0.00' x 3.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 3.0 '/' Top Width= 18.00'
Length= 75.0' Slope= 0.2667 '/'
Inlet Invert= 2,610.00', Outlet Invert= 2,590.00'



Ditch

Analysis of Match Point @ Deep Fill

Pg 2

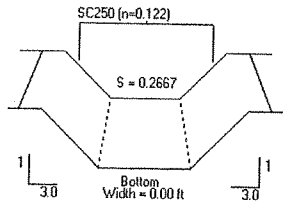
North American Green - ECMDS Version 4.3 | 9/22/2008 | 04:46 PM | COMPUTED BY: HME

PROJECT NAME: BLUE RIDGE | PROJECT NO.: 07089.00

FROM STATION/REACH: DEEP FILL | TO STATION/REACH: | DRAINAGE AREA: | DESIGN FREQUENCY: 10-YEAR

HYDRAULIC RESULTS

Discharge (cfs)	Peak Flow Period (hrs)	Velocity (fps)	Area (sq.ft)	Hydraulic Radius(ft)	Normal Depth (ft)
1.2	1.0	2.17	0.55	0.20	0.43



LINER RESULTS

Not to Scale

Reach	Matting Type / Staple Pattern	Stability Analysis	Vegetation Characteristics: Phase	Class	Type	Density	Permissible Shear Stress (psf)	Calculated Shear Stress (psf)	Safety Factor	Remarks
Straight	SC250	Vegetation	3	C	Mix	75-95%	10.00	7.14	1.40	STABLE
	Staple E	Soil	Sandy Loam				0.800	0.191	4.18	STABLE

permanent lining required

Back to Input Screen

SC 250

24-1.24

H FLOAT

Detention Basin

Structure Flotation Design

Project Name: Blue Ridge
Project Location: Canton, NC
Project No: 7089
Comp By: HME
Date: 9/22/2008
Chk. By:

OBJECTIVE: Design Underdrained Soil Filter Outlet Structures to Resist Floatation.

DESIGN CRITERIA

1. Design Outlet Structures to resist flotation neglecting all soil friction along sides of structure (conservative).

DESIGN ANALYSIS

Step 1: Choose most critical case (i.e. case with largest differential of 25-year storm water elevation and invert out.

Outlet Structure	high water (ft)	bottom (ft)	low water (ft)	Difference (ft)
Pond #2 OCS	2664.03	2655.00	2655.00	9.03

Step 2: Calculate uplift on structure.

Calculate Weight of Water Displaced

Difference = 9.03 ft (Max anticipated water height - Inv. Out Elev)
Sump Depth = 0.0 ft
Bottom Depth = 0.5 ft ASSUME DEPTH OF CONCRETE FOOTING FOR WEIGHT PURPOSES
Total Depth = 9.53 ft
Unit Weight of Water = 62.4 lb/ft^3
Pressure at Total Depth = 594.672 lb/ft^2
Manhole Outer Dia. = 4.83 ft
Pi = 3.1416
$A_{manhole}$ = 18.32 ft^2
Total Uplift Pressure = Pressure at Total Depth x $A_{manhole}$
Total Uplift Pressure = 10,896 lb

Step 3: Determine Weight of Structure without concrete footing:

Frame and Grate Weight = 50 lb
Cover Weight = 1328 lb
Concrete Bottom Weight= 1935 lb (6" overhang)
Barrel Weight = 835 lb/vft
Barrel Top El = 2662 ft (6" beneath top)
Barrel Bottom El = 2655 ft
Difference = 7 ft
Weight of Barrels = 5842 lb/vft
Manhole Inner Dia. = 4.0 ft
Pi = 3.1416
A_{circle} = 12.57 ft^2
Volume Displaced in Sump = 0.00 ft^3
Weight of Water in Sump = - lb
Total Structure Weight = 9,156 lb
Differential = (1,740) lb

Factor of Safety = 0.84 (Desired Factor of Safety is 1.1) if not met proceed to step 4

Step 4: Determine Weight of Structure with concrete footing:

Unit Weight of Water = 62.4 lb/ft^3
Unit Weight of Concrete = 145 lb/ft^3
Difference= 82.6 lb/ft^3

Footing Dimensions if required:

footing thickness=	12	Inches
footing L=	5.83	feet
footing W=	5.83	feet

total structure weight w/o footing= 9,156 lb
total footing weight= 2807 lb

Factor of Safety = 1.10

OCS w/ Seep Holes

Summary for Pond P2: Detention Basin OCS

Inflow Area =	20.000 ac,	0.30% Impervious,	Inflow Depth >	0.85"	for 2-Yr Storm event
Inflow =	29.31 cfs @	11.95 hrs,	Volume=	1.416 af	
Outflow =	2.17 cfs @	12.90 hrs,	Volume=	1.122 af,	Atten= 93%, Lag= 56.9 min
Primary =	2.17 cfs @	12.90 hrs,	Volume=	1.122 af	
Secondary =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 2,659.78' @ 12.90 hrs Surf.Area= 8,827 sf Storage= 24,229 cf

Plug-Flow detention time= 186.6 min calculated for 1.120 af (79% of inflow)
Center-of-Mass det. time= 95.9 min (969.8 - 873.9)

Volume	Invert	Avail.Storage	Storage Description
#1	2,656.00'	122,136 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,656.00	4,005	0	0
2,660.00	9,112	26,234	26,234
2,662.00	13,033	22,145	48,379
2,664.00	18,006	31,039	79,418
2,666.00	24,712	42,718	122,136

Device	Routing	Invert	Outlet Devices
#1	Primary	2,655.00'	**12.0" x 1,010.0' long Culvert** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 2,587.00' S= 0.0673 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior
#2	Device 1	2,656.00'	**0.5" Vert. Pool Drain Holes X 12.00** C= 0.600
#3	Device 1	2,658.00'	**8.0" Vert. Pond Dewatering Orifice** C= 0.600
#4	Device 1	2,662.50'	**24.0" Horiz. Top Overflow** Limited to weir flow C= 0.600
#5	Secondary	2,665.00'	**75.0' long x 8.0' breadth Containment Berm** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Primary OutFlow Max=2.17 cfs @ 12.90 hrs HW=2,659.78' (Free Discharge)
└─**1=Culvert** (Passes 2.17 cfs of 7.82 cfs potential flow)
  ├─**2=Pool Drain Holes** (Orifice Controls 0.15 cfs @ 9.33 fps)
  ├─**3=Pond Dewatering Orifice** (Orifice Controls 2.02 cfs @ 5.78 fps)
  └─**4=Top Overflow** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2,656.00' (Free Discharge)
└─**5=Containment Berm** (Controls 0.00 cfs)

Principal Spillway Capacity

Summary for Pond P2: Detention Basin OCS

Inflow Area =	20.000 ac,	0.30% Impervious,	Inflow Depth = 0.85"	for 2-Yr Storm event
Inflow =	29.31 cfs @	11.95 hrs, Volume=	1.417 af	
Outflow =	9.60 cfs @	0.00 hrs, Volume=	3.627 af, Atten= 67%, Lag= 0.0 min	
Primary =	9.60 cfs @	0.00 hrs, Volume=	3.627 af	
Secondary =	0.00 cfs @	0.00 hrs, Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Starting Elev= 2,665.00' Surf.Area= 21,359 sf Storage= 99,101 cf
Peak Elev= 2,665.00' @ 0.00 hrs Surf.Area= 21,359 sf Storage= 99,101 cf

Plug-Flow detention time= 305.5 min calculated for 1.352 af (95% of inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	2,656.00'	122,136 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,656.00	4,005	0	0
2,660.00	9,112	26,234	26,234
2,662.00	13,033	22,145	48,379
2,664.00	18,006	31,039	79,418
2,666.00	24,712	42,718	122,136

Device	Routing	Invert	Outlet Devices
#1	Primary	2,655.00'	**12.0" x 1,010.0' long Culvert** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 2,587.00' S= 0.0673 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior
#2	Device 1	2,656.00'	**0.5" Vert. Pool Drain Holes X 12.00** C= 0.600
#3	Device 1	2,658.00'	**8.0" Vert. Pond Dewatering Orifice** C= 0.600
#4	Device 1	~~2,662.50'~~	**24.0" Horiz. Top Overflow** Limited to weir flow C= 0.600
#5	Secondary	2,665.00'	**75.0' long x 8.0' breadth Containment Berm** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Primary OutFlow Max=9.60 cfs @ 0.00 hrs HW=2,665.00' (Free Discharge)
└─**1=Culvert** (Barrel Controls 9.60 cfs @ 12.22 fps)
  ├─**2=Pool Drain Holes** (Passes < 0.24 cfs potential flow)
  ├─**3=Pond Dewatering Orifice** (Passes < 4.34 cfs potential flow)
  └─**4=Top Overflow** (Passes < 23.92 cfs potential flow)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2,665.00' (Free Discharge)
└─**5=Containment Berm** (Controls 0.00 cfs)

H_2O start elev = Containment Berm

OCS w/ Soap Holes

Summary for Pond P2: Detention Basin OCS

Inflow Area =	20.000 ac,	0.30% Impervious,	Inflow Depth > 1.94"	for 10-yr Storm event
Inflow =	70.03 cfs @	11.94 hrs, Volume=	3.237 af	
Outflow =	8.12 cfs @	12.36 hrs, Volume=	2.897 af, Atten= 88%, Lag= 25.0 min	
Primary =	8.12 cfs @	12.36 hrs, Volume=	2.897 af	
Secondary =	0.00 cfs @	0.00 hrs, Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 2,662.85' @ 12.36 hrs Surf.Area= 15,153 sf Storage= 60,396 cf

Plug-Flow detention time= 187.4 min calculated for 2.891 af (89% of inflow)
Center-of-Mass det. time= 134.5 min (981.8 - 847.3)

Volume	Invert	Avail.Storage	Storage Description
#1	2,656.00'	122,136 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,656.00	4,005	0	0
2,660.00	9,112	26,234	26,234
2,662.00	13,033	22,145	48,379
2,664.00	18,006	31,039	79,418
2,666.00	24,712	42,718	122,136

Device	Routing	Invert	Outlet Devices
#1	Primary	2,655.00'	**12.0" x 1,010.0' long Culvert** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 2,587.00' S= 0.0673 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior
#2	Device 1	2,656.00'	**0.5" Vert. Pool Drain Holes X 12.00** C= 0.600
#3	Device 1	2,658.00'	**8.0" Vert. Pond Dewatering Orifice** C= 0.600
#4	Device 1	2,662.50'	**24.0" Horiz. Top Overflow** Limited to weir flow C= 0.600
#5	Secondary	2,665.00'	**75.0' long x 8.0' breadth Containment Berm** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Primary OutFlow Max=8.07 cfs @ 12.36 hrs HW=2,662.85' (Free Discharge)
└─**1=Culvert** (Passes 8.07 cfs of 9.46 cfs potential flow)
  ├─**2=Pool Drain Holes** (Orifice Controls 0.21 cfs @ 12.58 fps)
  ├─**3=Pond Dewatering Orifice** (Orifice Controls 3.57 cfs @ 10.24 fps)
  └─**4=Top Overflow** (Weir Controls 4.29 cfs @ 1.94 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2,656.00' (Free Discharge)
└─**5=Containment Berm** (Controls 0.00 cfs)

Hydrograph for Pond P2: Detention Basin OCS

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
0.00	0.00	0	2,656.00	0.00	0.00	**0.00**
1.00	0.00	0	2,656.00	0.00	0.00	0.00
2.00	0.00	0	2,656.00	0.00	0.00	0.00
3.00	0.00	0	2,656.00	0.00	0.00	0.00
4.00	0.00	0	2,656.00	0.00	0.00	0.00
5.00	0.00	0	2,656.00	0.00	0.00	0.00
6.00	0.00	0	2,656.00	0.00	0.00	0.00
7.00	0.00	0	2,656.00	0.00	0.00	0.00
8.00	0.00	0	2,656.00	0.00	0.00	0.00
9.00	0.00	0	2,656.00	0.00	0.00	0.00
10.00	0.00	0	2,656.00	0.00	0.00	0.00
11.00	**0.60**	637	2,656.15	0.03	0.03	0.00
12.00	**51.59**	**48,374**	**2,662.00**	**3.41**	**3.41**	0.00
13.00	4.12	**57,671**	**2,662.67**	**5.18**	**5.18**	0.00
14.00	2.55	54,495	2,662.45	3.61	3.61	0.00
15.00	2.08	50,020	2,662.12	3.47	3.47	0.00
16.00	1.63	44,568	2,661.70	3.27	3.27	0.00
17.00	1.46	38,748	2,661.21	3.03	3.03	0.00
18.00	1.30	33,264	2,660.72	2.77	2.77	0.00
19.00	1.13	28,205	2,660.21	2.46	2.46	0.00
20.00	0.95	23,682	2,659.71	2.13	2.13	0.00
21.00	0.92	20,015	2,659.28	1.78	1.78	0.00
22.00	0.89	17,436	2,658.96	1.46	1.46	0.00
23.00	0.85	15,785	2,658.74	1.20	1.20	0.00
24.00	0.78	14,820	2,658.61	1.02	1.02	0.00
25.00	0.00	12,560	2,658.30	0.40	0.40	0.00
26.00	0.00	11,559	2,658.15	0.20	0.20	0.00
27.00	0.00	10,989	2,658.06	0.14	0.14	0.00
28.00	0.00	10,549	2,658.00	0.11	0.11	0.00
29.00	0.00	10,153	2,657.94	0.11	0.11	0.00
30.00	0.00	9,763	2,657.88	0.11	0.11	0.00
31.00	0.00	9,380	2,657.82	0.11	0.11	0.00
32.00	0.00	9,004	2,657.76	0.10	0.10	0.00
33.00	0.00	8,633	2,657.70	0.10	0.10	0.00
34.00	0.00	8,269	2,657.64	0.10	0.10	0.00
35.00	0.00	7,912	2,657.58	0.10	0.10	0.00
36.00	0.00	7,561	2,657.52	0.10	0.10	0.00
37.00	0.00	7,218	2,657.46	0.09	0.09	0.00
38.00	0.00	6,881	2,657.40	0.09	0.09	0.00
39.00	0.00	6,551	2,657.35	0.09	0.09	0.00
40.00	0.00	6,228	2,657.29	0.09	0.09	0.00
41.00	0.00	5,912	2,657.23	0.09	0.09	0.00
42.00	0.00	5,603	2,657.18	0.08	0.08	0.00
43.00	0.00	5,302	2,657.12	0.08	0.08	0.00
44.00	0.00	5,008	2,657.07	0.08	0.08	0.00
45.00	0.00	4,721	2,657.01	0.08	0.08	0.00
46.00	0.00	4,443	2,656.96	0.08	0.08	0.00
47.00	0.00	4,171	2,656.91	0.07	0.07	0.00
48.00	0.00	3,908	2,656.86	0.07	0.07	0.00

Dewatering time

> 48-11 = 37 HRS

INFLOW = 0 @ 25.0 HRS

OUTFLOW continues past 48.0 HRS

OK

OCS w/ DEEP HOLES

Summary for Pond P2: Detention Basin OCS

Inflow Area =	20.000 ac,	0.30% Impervious,	Inflow Depth > 2.53"	for 25-Yr Storm event
Inflow =	91.35 cfs @	11.94 hrs, Volume=	4.214 af	
Outflow =	9.54 cfs @	12.40 hrs, Volume=	3.821 af, Atten= 90%, Lag= 27.5 min	
Primary =	9.54 cfs @	12.40 hrs, Volume=	3.821 af	
Secondary =	0.00 cfs @	0.00 hrs, Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 2,664.03' @ 12.40 hrs Surf.Area= 18,121 sf Storage= 80,038 cf

Plug-Flow detention time= 169.6 min calculated for 3.813 af (90% of inflow)
Center-of-Mass det. time= 121.8 min (961.2 - 839.5)

Volume	Invert	Avail.Storage	Storage Description
#1	2,656.00'	122,136 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,656.00	4,005	0	0
2,660.00	9,112	26,234	26,234
2,662.00	13,033	22,145	48,379
2,664.00	18,006	31,039	79,418
2,666.00	24,712	42,718	122,136

Device	Routing	Invert	Outlet Devices
#1	Primary	2,655.00'	**12.0" x 1,010.0' long Culvert** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 2,587.00' S= 0.0673 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior
#2	Device 1	2,656.00'	**0.5" Vert. Pool Drain Holes X 12.00** C= 0.600
#3	Device 1	2,658.00'	**8.0" Vert. Pond Dewatering Orifice** C= 0.600
#4	Device 1	2,662.50'	**24.0" Horiz. Top Overflow** Limited to weir flow C= 0.600
#5	Secondary	2,665.00'	**75.0' long x 8.0' breadth Containment Berm** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Primary OutFlow Max=9.54 cfs @ 12.40 hrs HW=2,664.03' (Free Discharge)
└─1=**Culvert** (Barrel Controls 9.54 cfs @ 12.14 fps)
  ├─2=**Pool Drain Holes** (Passes < 0.22 cfs potential flow)
  ├─3=**Pond Dewatering Orifice** (Passes < 4.01 cfs potential flow)
  └─4=**Top Overflow** (Passes < 18.74 cfs potential flow)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2,656.00' (Free Discharge)
└─5=**Containment Berm** (Controls 0.00 cfs)

OCS W/O Seep Holes

Summary for Pond P2: DETENTION BASIN

Inflow Area =	20.000 ac,	0.30% Impervious,	Inflow Depth > 2.53"	for 25-Yr Storm event
Inflow =	91.35 cfs @	11.94 hrs, Volume=	4.214 af	
Outflow =	9.51 cfs @	12.40 hrs, Volume=	4.157 af, Atten= 90%, Lag= 27.6 min	
Primary =	9.51 cfs @	12.40 hrs, Volume=	4.157 af	
Secondary =	0.00 cfs @	0.00 hrs, Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 2,663.65' @ 12.40 hrs Surf.Area= 17,125 sf Storage= 73,193 cf

Plug-Flow detention time= 79.8 min calculated for 4.157 af (99% of inflow)
Center-of-Mass det. time= 71.9 min (911.4 - 839.5)

Volume	Invert	Avail.Storage	Storage Description
#1	2,656.00'	122,136 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

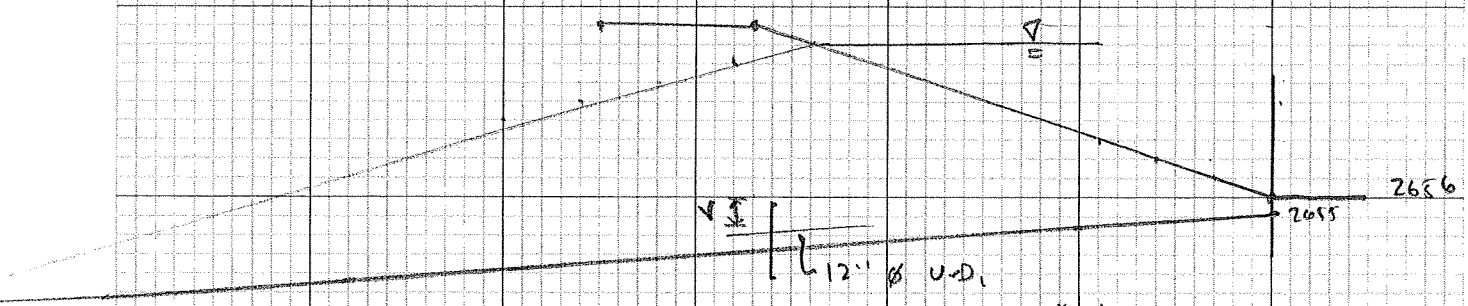
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,656.00	4,005	0	0
2,660.00	9,112	26,234	26,234
2,662.00	13,033	22,145	48,379
2,664.00	18,006	31,039	79,418
2,666.00	24,712	42,718	122,136

Device	Routing	Invert	Outlet Devices
#1	Primary	2,655.00'	**12.0" x 1,010.0' long Culvert** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 2,587.00' S= 0.0673 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior
#2	Device 1	2,656.00'	**10.0" Vert. Orifice** C= 0.600
#3	Device 1	2,660.00'	**24.0" Horiz. Grate** Limited to weir flow C= 0.600
#4	Secondary	2,665.00'	**75.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Primary OutFlow Max=9.51 cfs @ 12.40 hrs HW=2,663.65' (Free Discharge)
└─**1=Culvert** (Barrel Controls 9.51 cfs @ 12.11 fps)
  ├─**2=Orifice** (Passes < 7.06 cfs potential flow)
  └─**3=Grate** (Passes < 28.88 cfs potential flow)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2,656.00' (Free Discharge)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

PROJECT Blue Ridge	COMP. BY HME	JOB NO. 07089.00
Anti Seep Collar Design	CHK. BY	DATE 9-29-08



Assume 48" HT -

$V = \frac{48''}{2} - \frac{12''}{2} = 18'' = 1.5'$

$L_s + Z_n V \geq 1.1\, L_s$ or $n \geq \frac{.5 L_s}{V}$

$L_s = 70'$, $n \geq \frac{.5(70)}{1.5} = 23$

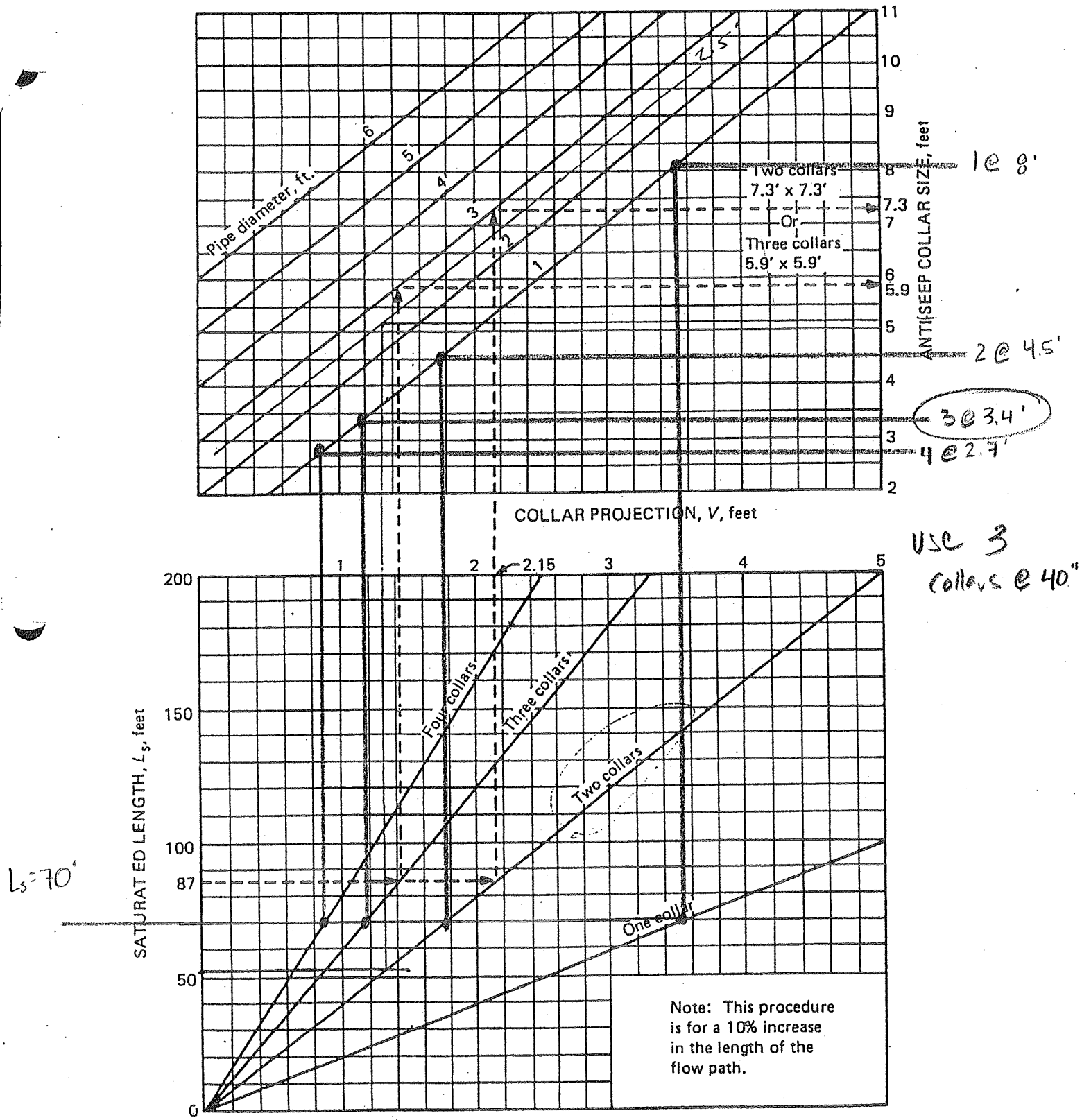


Figure I-27. Anti-seep collars — number and size.[1]

9.09

APPENDIX D

EROSION AND SEDIMENT CONTROL PLAN CHECKLIST

Haywood County Erosion Control Program, 1233 N. Main St., Waynesville, N.C. 28786, phone is 828-452-6706, fax is 828-452-6767

Submittal dates for checklist items for the erosion and sediment control plan for proposed land-disturbing activities for the following project:

PROJECT NAME: Blue Ridge Paper Products Inc, Canton Mill

Dates ↓	
10/6	Project location
10/6	Roads, streets (show names or assign temporary numbers and stations)
10/6	North arrow
10/6	Scale
10/6	Property line
10/6	Adjoining lakes, streams, ponds, dams or major drainage ways,
10/6	Existing contours
10/6	Proposed contours
10/6	Limits of disturbed area clearly delineated
10/6	Acreage or size of disturbed area
10/6	Planned and existing building locations and elevations
10/6	Lot and/or building numbers
10/6	Land use of surrounding areas
N/A	Rock outcrops
10/6	Seeps or springs
N/A	Wetland limits
N/A	Easements
10/6	Boundaries of the total tract
N/A	Borrow areas
N/A	Waste areas
10/6	Stockpiled topsoil or subsoil locations
10/6	Street profiles
10/6	Existing and planned drainage patterns
10/6	Offsite areas that drain through the project
10/6	Size and location of culverts and sewers
10/6	Soils information
10/6	Design calculations for peak discharges of runoff, construction phase
10/6	Design calculations for peak discharges of runoff, final runoff coefficients
10/6	Design calculations for culverts and storm sewers
10/6	Construction details for culverts and storm sewers
10/6	Design calculations for existing and planned channels
10/6	Cross sections for existing and planned channels
10/6	Methods of stabilization of existing & planned channels
10/6	Temporary linings of existing and planned channels
10/6	Design calculations for energy dissipators below culvert and storm sewer outlets

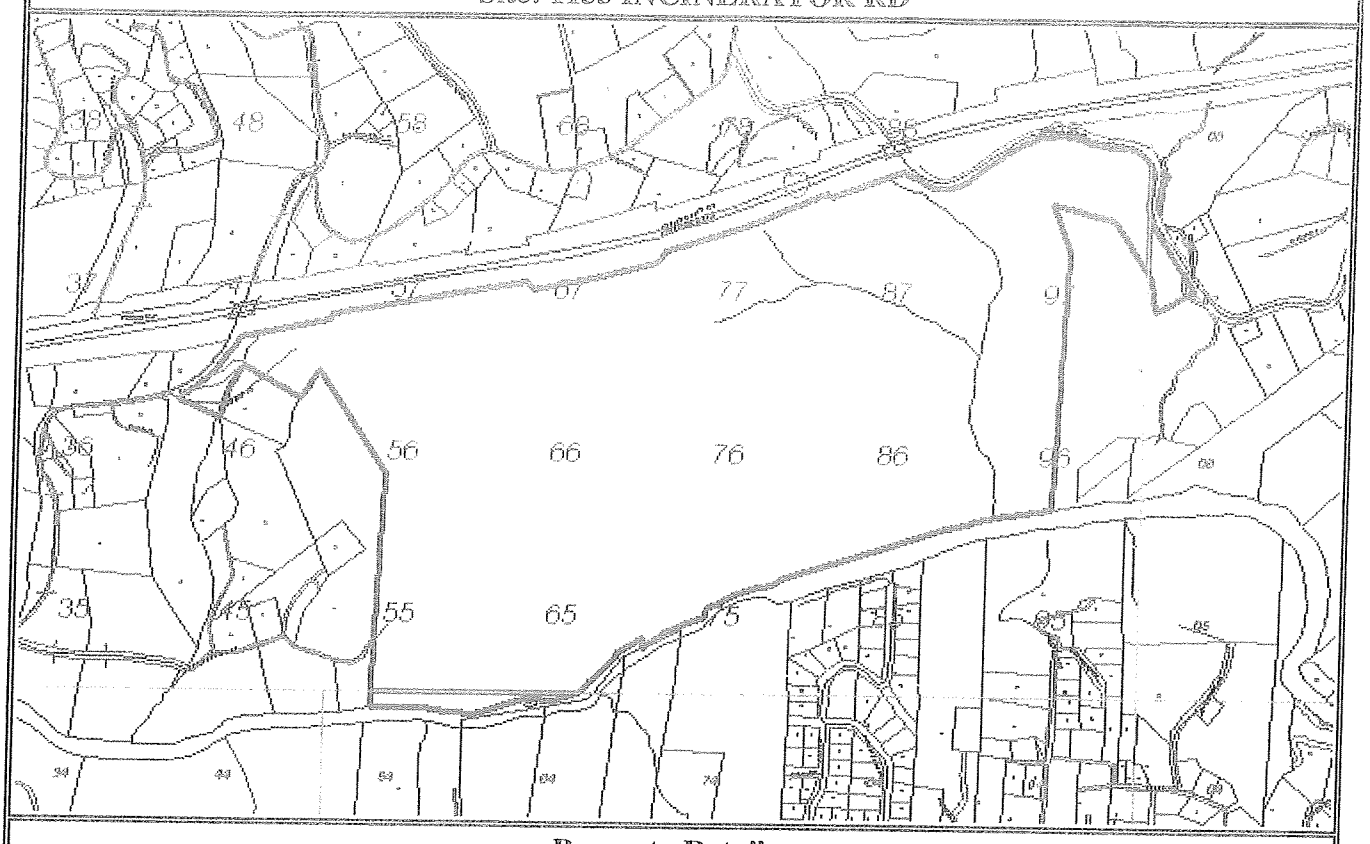
Dates ↓	
10/6	Legend for erosion and sediment control measures
10/6	Location of temporary measures
10/6	Location of permanent measures
10/6	Construction drawings and details for temporary and permanent measures
10/6	Design calculations for sediment basins and traps
10/6	Maintenance requirements during construction
10/6	Maintenance requirements and responsible person(s) of permanent measures
10/6	Areas and acreage to receive temporary vegetative stabilization (types)
10/6	Areas and acreage to receive permanent vegetative stabilization (types)
10/6	Areas and acreage to receive other types of ground cover (gravel, pavement or other)
10/6	Methods of soil preparation for seeding
10/6	Soil amendments and rates
10/6	Mulching rates
10/6	Stated timeframes for ground cover on all disturbed areas
10/6	Narrative describing construction sequence
10/6	Narrative describing the nature and purpose of the construction activity
10/6	Completed form of Financial Responsibility and Ownership
10/6	Completed Affidavit for Land-Disturbing Activities in Haywood County
10/6	Bid specifications regarding erosion control
10/6	Construction sequence related to erosion and sediment control
10/6	Correct plan review fee
10/6	Construction details for energy dissipators below culvert and storm sewer outlets
10/6	Design calculations and construction details to control ground water (seeps, springs, high water table)
10/6	Names of receiving watercourse or municipal operator (where storm water discharges occur)
	Corps of Engineers contacted for regulated work
	Division of Water Quality contacted for regulated work
10/6	Flood Hazard areas located
10/6	Division of Solid Waste contacted for regulated work

Reviewer:

APPENDIX E

FINANCIAL RESPONSIBILITY/OWNERSHIP FORM

Site: 1155 INCINERATOR RD



Property Details:

START	1001	UNIQUEID	14891
PIN_DASH	8647-76-6665	PIN	8647766665
NAME1	BLUE RIDGE PAPER PRODUCTS, INC	NAME2	
ADDRESS1	GARY WILLIAMS	ADDRESS2	P O BOX 4000
CTY_ST_ZIP	CANTON, NC 28716	MAPSHEET	8647
LEGAL_REF1	472/1073	LEGAL_REF2	
ADD_REF1		ADD_REF2	
CALC_ACRES	244.255	STREET_ADD	1155 INCINERATOR RD
SALE_DAT1	5/19/1999	SALE_PRIC1	0
PROP_DESC	1155 INCINERATOR RD TR 15 1151 INCINERATOR RD	SUBDIV_COD	
SUBDIV_NAM		TOT_MKT_VA	739160
TOT_BLD_VA	79070	MAIN_AREA	1208
YR_BUILT	1976	LAND_VALUE	660090
DEFER_VAL	0	TO_ASSD_VA	739160
ACCT_NO	126531	TOWNSHIP	BEAVERDAM
SALE_DAT2		SALE_PRIC2	0
TAX_CODES	G01,F02,F10	BUILD_USE	DWELLING
OCCUPANCY	SINGLE FAMILY	LAND_TYPE	OPENLAND,WOODLAND,WATERFRONT,HOMESITE

DISCLAIMER: These maps and information either in digital or hardcopy format are not surveys. This map data is prepared from the inventory of real property found within this jurisdiction and is compiled from recorded deeds, plats, and other public records and data. Users of any maps generated on this site are hereby notified that the aforementioned public primary information sources should be consulted for verification on the information contained herein. Haywood County assumes no legal responsibility for the information contained on these maps.

TRANSFER MADE ON PROPERTY RECORD
Date 5/19/99
By pm

Excise Tax $120,000.00

HAYWOOD COUNTY NC 05/19/1999
$120000.00
STATE OF NORTH CAROLINA Real Estate Excise Tax

Book 472 Page 1073
REGISTERED
HAYWOOD COUNTY NC
05/19/1999 10:30 AM
AMY R. MURRAY
Register Of Deeds

7169
Recording Time, Book and Page

Tax Lot No. _____ Parcel Identifier No. _____
Verified by _____ County on the ____ day of _____, 19 ___
by _____

Mail after recording to: S. H. Spencer Compton, Paul, Weiss, Rifkind, Wharton & Garrison, 1285 Avenue of the Americas, New York, NY 10019-6064.
This instrument was prepared by: Robert E. Fogarty, One Champion Plaza, Stamford, CT 06921.
Brief description for the Index: **

NORTH CAROLINA SPECIAL WARRANTY DEED

THIS DEED made this 14th day of May, 1999 to be effective as of and from the 14th day of May, 1999, by and between

GRANTOR	GRANTEE
Champion International Corporation, a New York corporation One Champion Plaza Stamford, Connecticut 06921	Blue Ridge Paper Products Inc. a Delaware Corporation c/o KPS Special Situations Fund, L.P. 200 Park Avenue, 58th Floor New York, NY 10166

1073

The designation Grantor and Grantee as used herein shall include said parties, their successors and assigns, and shall include singular, plural, masculine, feminine or neuter as required by context.

WITNESSETH, that the Grantor, for a valuable consideration paid by the Grantee, the receipt of

which is hereby acknowledged, has and by these presents does *GRANT, BARGAIN, SELL* and *CONVEY* unto the Grantee in fee simple, subject to the exceptions described below, those certain parcels of land situated in Haywood County, North Carolina which are more particularly described on Exhibit "A" attached hereto and made a part hereof for all purposes together with any improvements thereon (referred to hereinafter as the "Premises"). In the case of tracts numbered one through eight, the legal descriptions were prepared by using calls contained in deeds to Champion International or its predecessor and calls in deeds to adjoining landowners and that the description should follow streets, the Pigeon River and the lines of properties of adjoining landowners referred to, notwithstanding the fact that an actual survey of the tracts may show the calls to vary from those contained in the deeds referred to.

TO HAVE AND TO HOLD the aforesaid lots and parcels of land and all privileges and appurtenances thereto belonging to the Grantee and its successors and assigns in fee simple.

And the Grantor covenants with the Grantee, that Grantor has done nothing to impair such title in and to the Premises as Grantor received, and Grantor will warrant and defend the title to the Premises against the lawful claims of all persons claiming by, under or through Grantor, except for the exceptions hereinafter stated.

1. This conveyance is made and accepted subject to the following: mortgages, deeds of trust, claims, charges, liens, pledges, leases, covenants, restrictions, reservations, tenancies, encroachments, lack of access, security interests, conditional sales agreements, title retention agreements, conservation zones, easements, encumbrances, third party rights and other restrictions on or imperfections of title, of any kind and nature choate or inchoate, including liens for taxes not yet due and payable, of record in the office where official real estate records are maintained in the county where the Premises are situated, as are revealed by the surveys heretofore furnished to the Grantee by the Grantor, and as are apparent from an inspection of the Premises.

2. That certain memorandum of lease between Americarb, Inc., and Grantor dated April 28, 1992, including the easements described therein, which memorandum of lease was registered in Book 427 at page 384 in the Register of Deeds of Haywood County on June 12, 1992.

3. That certain unrecorded lease between the Town of Canton and Grantor dated March 11, 1997, for Blackwell Field located near 100 Park Street, Canton, North Cariolina.

1074

4. That certain unrecorded lease between the County of Haywood and Grantor dated November 1, 1997, for a parcel of land on Fiberville road west of School Street in the Town of Canton, North Carolina, including an easement described therein.

5. That certain unrecorded agreement between Thurman R. Robinson, Robert E. Robinson and James Reeves Robinson and Grantor dated June 11, 1982.

This conveyance includes all of Grantor's rights, titles, and interests, if any, in and to all of the oil, gas, and other minerals in, on, under or that may be produced or saved from the aforementioned property, including coal, lignite, sulfur, and uranium, as wells as any other minerals customarily extracted from real property through surface mining operations.

GRANTEE, BY ITS ACCEPTANCE HEREOF AND OF THE BENEFITS TO BE DERIVED HEREFROM, ACKNOWLEDGES THAT THE HEREIN-DESCRIBED PREMISES ARE CONVEYED BY GRANTOR TO GRANTEE "IN THEIR PRESENT CONDITION, AS IS AND WITH ALL FAULTS" AND WITHOUT WARRANTY OF ANY KIND EXCEPT THE WARRANTY OF TITLE TO SAID PREMISES HEREIN CONTAINED.

IN WITNESS WHEREOF, the Grantor and the Grantee have caused this instrument to be signed in their respective corporate name by their duly authorized officers and their seals to be hereunto affixed by authority of their Boards of Directors, the day and year first above written.

Champion International Corporation

[corporate seal]

By: _____
Stephen B. Brown, Senior Vice President

ATTEST:

_____
Name: Robert E. Fogarty
Title: Asst. Secretary

1075

STATE OF NEW YORK)
) SS.
COUNTY OF NEW YORK)

I, the undersigned, a Notary Public in and for said state and county do hereby certify that Robert E. Fogarty personally appeared before me this day and acknowledged that (s)he is an Asst. Secretary of Champion International Corporation, a corporation, and that by authority duly given and as the act of the corporation, the foregoing instrument was signed in its name by its Senior Vice President, sealed with its corporate seal, and attested to by himself/herself as its Asst. Secretary.

WITNESS my hand and Notarial Seal this 13th day of May, 1999.

[NOTARY SEAL]

Christina Lynge

Notary Public

CHRISTINA V. LYNGE
Notary Public, State of New York
No. 4902102
Qualified in New York County
Commission Expires July 27, 19[illegible]

My Commission Expires:
July 27, 1999

[corporate seal]

Blue Ridge Paper Products Inc.

By: [illegible]
Name: Gordon Jones
Title: Chief Executive Officer

ATTEST:

Stephen Presser

Name: Stephen Presser
Title: Secretary

1076

STATE OF NEW YORK)
) SS.
COUNTY OF NEW YORK)

I, the undersigned, a Notary Public in and for said state and county do hereby certify that Stephen Presser personally appeared before me this day and acknowledged that (s)he is ~~as~~ the Secretary of Blue Ridge Paper Products Inc, a corporation, and that by authority duly given and as the act of the corporation, the foregoing instrument was signed in its name by its Chief Executive Officer ~~President~~, sealed with its corporate seal, and attested to by himself/~~herself~~ as its _____ Secretary.

WITNESS my hand and Notarial Seal this 14th day of May, 1999.

[NOTARY SEAL]

Dorcas Dawe
Notary Public

My Commission Expires:

DORCAS DAWE
Notary Public, State of New York
No. 31-4877033
Qualified in New York County
Commission Filed in Kings & Queens County
Commission Expires February 2, 2001

The foregoing Certificate(s) of Christina V. Zynga
DORCAS Dawe

is/are certified to be correct. This instrument and this certificate are duly registered at the date and time and in the Book and Page show on the first page hereof.

Amy R Murray REGISTER OF DEEDS FOR Haywood County

By:_____ Deputy/Assistant-Register of Deeds.

1077

Exhibit A
Canton Property

In the case of tracts numbered one through eight, the legal descriptions were prepared by using calls contained in deeds to Champion International or its predecessor and calls in deeds to adjoining landowners and that the description should follow streets, the Pigeon River and the lines of properties of adjoining landowners referred to, notwithstanding the fact that an actual survey of the tracts may show the calls to vary from those contained in the deeds referred to.

FIRST TRACT

Located in the Town of Canton, Haywood County

BEGINNING on a iron rod set in the northwestern right of way line of NC Highway 215, Woodside Drive, as established by a right of way agreement between Catherine S. Trull and others and the North Carolina Department of Transportation dated June 5, 1991 and recorded in Deed Book 418, at Page 977 in the Haywood County Registry, said point being the easternmost corner on the highway right of way of a tract of land owned by Catherine Smathers Trull, Webb Morrow Smathers, Mary Smathers Cook and Ruby Smathers McKinney by virtue of a deed from Ruby Webb Smathers dated September 1, 1977 and recorded in Deed Book 292 at Page 304 in the Haywood County Registry which is known as tax parcel No. 8657-51-3912 on the Haywood County Tax Maps, said beginning point being also located in the eastern boundary of Block "B" as shown on a plat of Sunset Park, which plat is recorded in Plat Cabinet B at Slide 61 in the Haywood County Registry; runs thence with the northern boundary of the Trull and others tract and with the northern boundary of Blocks "B" and "D" of Sunset Park a course of approximately North 51 deg. 30 min. West to a point which is the northeastern corner of Lot 21 of Block "D" of Sunset Park which point is located South 86 deg. East 40 feet from State Road No. 1554 (Terrace Drive) and in the southern boundary of a tract conveyed to Reeves Payne and wife, by Wiley C. Jones and wife by deed dated November 13, 1958 and recorded in Deed Book 176 at Page 411 in the Haywood County Registry, now shown as tax parcel 8657-43-2262; thence with the Southern boundary of said tract South 86 deg. East to the southeastern corner of said tract; thence with the eastern boundary of said tract and the eastern boundary of a tract described in a deed from Thurman Smith and wife to James Boyd Croft and wife, Angel Croft dated August 4, 1987 and recorded in Deed Book 383, at Page 4 in the Haywood County Registry, which is known as tax parcel No. 8657-43-3259 North 2 deg. 15 min.

East to a point which is the southwestern corner of a tract conveyed to Donna M. Ledbetter and N. Paulette Shelton by deed dated August 21, 1993 and recorded in Deed Book 437 at Page 1344 in the Haywood County Registry; thence with the southern boundary of said tract, North 71 deg. 50 min. East to a point in the southern boundary of said tract which is the northwestern corner of a tract of land conveyed to Jack Douglas Waldrop and wife, Mary Jo S. Waldrop by deed dated May 4, 1967 and recorded in Deed Book 219 at Page 31 in the Haywood County Registry; runs thence with the Southwestern boundary of said tract, South 21 deg. 02 min. East 237.8 feet to a point at the southernmost corner of said tract at the westernmost corner of a tract conveyed by Champion Papers, Inc. to Horace B. Sellars and wife, Doris Sellars by deed dated June 4, 1963 and recorded in Deed Book 199 at Page 69 in the Haywood County Registry; runs thence with the southwestern boundary of the Sellars' tract, South 51 deg. 25 min. East 140.5 feet to the southernmost corner of said tract and the westernmost corner of a tract conveyed by Champion Papers, Inc. to Greek F. Waddell and wife, Daphne R. Waddell by deed dated May 16, 1962 and recorded in Deed Book 195, at Page 35 in the Haywood County Registry; runs thence with the boundaries of said tract, South 51 deg. 25 min. East 125.00 feet to the southernmost corner of said tract and North 38 deg. 35 min. East 157.00 feet to the easternmost corner of said tract in the center of Pasadena Street; runs thence with the center of Pasadena Street in a southeasterly direction (approximately South 54 deg. 12 min. East) to a point which is the southernmost corner in Pasadena Street of a tract of land described in a deed from The Champion Paper and Fibre Company to W. K. Stephens and wife, Elaine F. Stevens, dated February 2, 1960 and recorded in Deed Book 185 at Page 258 in the Haywood County Registry; thence with the southeastern line of said tract North 38 deg. 35 min. East 177.7 feet to the Easternmost corner of said tract; thence South 38 deg. 56 min. 06 sec. East to the northernmost corner of a tract conveyed by U. S. Plywood-Champion Papers, Inc. to Ray W. Foster and wife by deed dated December 13, 1968 and recorded in Deed Book 232 at Page 90; thence with the northwestern line of the Foster tract, South 38 deg. 35 min. West 172 feet to the center of Pasadena Street; thence with Pasadena Street, South 51 deg. 25 min. East 319 feet to the intersection of Pasadena Street with a street (unopened) known as Newberry Street which is the Southernmost corner of a lot conveyed by The Champion Paper and Fibre Company to R. W. Foster and wife by deed dated October 27, 1959 and recorded in Deed Book 186 at Page 7; runs thence with the southeastern line of the R. W. Foster lot, North 38 deg. 35 min. East 167.00 feet to the easternmost corner of said lot; thence with the northern boundary of said lot, North 51 deg. 25 min. West 194.00 to the northernmost corner of said lot and the easternmost corner of the tract conveyed to Foster by Deed Book 232 at Page 90, above referred to; thence with the Eastern boundary of that tract, North 51 deg. 25 min. West 65 feet and North 45 deg. 20 min. West 63 feet to the northernmost corner of said lot; thence continuing North 45 deg. 20 min. West to the southernmost corner of a tract of land described in a deed from Pauline Connelly Self and others to Roland E. Osborne, III dated May 29, 1996 and recorded in Deed Book 453, at Page

297 in the Haywood County Registry; runs thence with the southern boundary of said tract North 70 deg. 27 min. 48 sec. East 150.94 feet to the easternmost corner of said tract; thence with the eastern boundary of said tract which is the western margin of a street known as Skyland Terrace in a northwesterly direction to the northeastern corner of said tract at the southeastern corner of a tract of land conveyed by U.S. Plywood-Champion Papers, Inc. to David S. Jaynes and wife, Stuart Jaynes by deed dated February 19, 1969 and recorded in Deed Book 232 at Page 482 in the Haywood County Registry; runs thence with the eastern boundary of the Jaynes' tract and with the western boundary of Skyland Avenue, North 30 deg. West 60 feet to the northeastern corner of said tract; thence continuing with the western margin of Skyland Avenue, North 31 deg. 41 min. West 113.1 feet to a point; North 18 deg. 01 min. West 305.44 feet, more or less, to the point of intersection of the western margin of Skyland Avenue with the southern margin of Terrace Drive; thence in a southeastern direction with the southern margin of Terrace Drive, 30 feet, more or less, to the point of intersection of the southern margin of Terrace Drive with the eastern margin of Skyland Avenue and at the northwest corner of Lot 4 as shown on a plat entitled, "Survey for Champion International Corporation", recorded in Plat Cabinet C, Slide 1121 in the Haywood County Registry; runs thence with the eastern margin of Skyland Avenue and the western boundary of said Lot 4, South 13 deg. 11 min. 07 sec. East 168.51 feet to a point which is the northwestern corner of Lot FTD-5 shown on a plat of Fiberville and Skyland Terrace which is recorded in Map Book E at Page C-6 in the Office of the Register of Deeds for Haywood County, which lot is described in a deed to Naomi C. Bohnsdahl, Trustee which is recorded in Deed Book 438 at Page 2135 in the Haywood County Registry; runs thence with the eastern margin of Skyland Terrace and the Bohnsdahl tract, five (5) calls as follows: South 18 deg. 04 min. East 17.04 feet to a point, South 10 deg. 30 min. East 26.99 feet to a point, South 18 deg. 06 min. East 33.35 feet to a point, South 25 deg. 23 min. East 60.41 feet to a point and South 31 deg. 37 min. East, passing the southwestern corner of Lot FTD-5 at 51.36 feet a total distance of 101.36 feet to a point which is the southwestern corner of the second tract described in the deed recorded in Deed Book 438 at Page 2135 in the Haywood County Registry; runs thence with the southern and eastern boundaries of the second tract, North 65 deg. 35 min. East to the southeastern corner of said second tract and North 19 deg. 01 min. West 50.00 feet to the southeastern corner of Lot FTD-5 as shown on the recorded plat of Fiberville and Skyland Terrace; runs thence with the southern boundary of Lot FTD-4 as shown on the plat, North 65 deg. 35 min. East 96.00 feet to a point, the common corner of Lots FTD-3, 4 and 6; thence with the western boundary of FTD-6, South 26 deg. 51 min. East 93.69 feet to a point; thence with the western boundary of Lot FTD-1 (as described in Deed Book 317 at Page 872), South 30 deg. 02 min. East 268.00 feet to the southwestern corner of Lot FTD-1; thence with the southern boundary of said lot, North 58 deg. 48 min. East 218.28 feet to a point in the southwestern margin of Terrace Drive, a corner of Lot FTD-1; thence continuing North 58 deg. 48 min. East 30.00 feet, more or less, to a point on the

eastern margin of Terrace Drive as shown on the plat; thence with the eastern margin of Terrace Drive as shown on the plat, in a northwesterly direction to the point of intersection of the eastern margin of Terrace Drive and with the eastern margin of Thompson Avenue; runs thence with the eastern margin of Thompson Avenue, on a curve to the right and in a northeasterly direction to a point on the eastern margin of Thompson Avenue, which is the westernmost corner of Lot FT-2 as shown on the plat of Fiberville and Skyland Terrace which lot is described in a deed from Security Mortgage Investors to Burgin W. Scott and Faye F. Scott recorded in Deed Book 298 at Page 324 in the Haywood County Registry; runs thence with the southern boundary of said lot, North 86 deg. 12 min. East 250.84 feet to the southeastern corner of said lot in the western boundary of lot FC-6 as shown on the plat; runs thence with the western boundary of Lot FC-6 and the western boundary of Lot FD-3, North 18 deg. 09 min. West , passing the northeastern corner of Lot FT-2 at 135 feet, 140 feet, more or less, to the northwestern corner of Lot FD-3 as shown on the plat; thence with the northern boundary of said lot, North 71 deg. 51 min. East 50 feet to the northwestern corner of Lot FD-2 as shown on the plat at the northeastern corner of Lot FD-3 as shown on the plat; runs thence with the eastern boundary of Lot FD-3 and FC-6, South 18 deg. 09 min. East 212.5 feet to the southeastern corner of lot FC-6 on the northern margin of "Avenue C" as shown on said plat, which is now known as Rosewood; thence crossing Rosewood, in a southerly direction, to a point which is the northwestern corner of Lot FC-3 as shown on the recorded plat which is a concrete monument control corner; runs thence with the southern margin of Rosewood Avenue, North 71 deg. 51 min. East along the northern boundary of Lot FC-3 and FC-1 (which were reconveyed to Champion International Corporation by deeds recorded in Deed Book 395 at Page 1063 and Deed recorded in Deed Book 293 at Page 391, 104.5 feet to the northeastern corner of Lot FC-1; runs thence with the eastern boundary of Lot FC-1 and Lot FB-2, crossing an unopened alley, South 18 deg. 09 min. East 187.10 feet, more or less, to the southeastern corner of Lot FB-2 as shown on the recorded plat in the northern margin of "Avenue B", now known as Balsam Drive; runs thence with the northern margin of Balsam Drive, and the southern boundary of Lots FB-2, FB-4 and FB-6, South 71 deg. 51 min. West 150.00 feet to the southwestern corner of Lot FB-6 on the northern margin of Balsam Avenue; thence crossing Balsam Avenue, to the northwestern corner of Lot FB-5 as shown on the recorded plat; runs thence with the western boundary of Lot FB-5 and Lot FA-6 and crossing a eight (8) foot alley, South 15 deg. 00 min.. East 196.28 feet to the southwestern corner of Lot FA-6 in the northern margin of a street known as "Avenue A" on the recorded plat, now known as White Pine Avenue; thence running South 15 deg. East approximately 32 feet to the northwestern corner of Lot FA-5 in the southern margin of Avenue A or White Pine Avenue; runs thence North 71 deg. 51 min. East 166.5 feet to a point in the southern margin of Avenue A or White Pine Avenue at the northeastern corner of Lot FA-1 shown on the recorded plat in the western margin of a ten (10) foot alley; runs thence with the eastern boundary of Lot FA-1 and the western boundary of the ten (10) foot alley, South 16

deg. 14 min. East 135.73 feet to a corner of Lot FA-1 in the boundary of Lot FM-3 at the end of the alley; runs thence North 71 deg. 51 min. East along the end of said alley, 10.00 feet to a point in the western boundary of Lot FM-5 in the eastern boundary of the alley; thence with the western boundary of Lot FM-5, North 16 deg. 14 min. West 49.9 feet to the northwestern corner of Lot FM-5; runs thence with the northern boundary of Lot FM-5, North 71 deg. 51 min. East to the point of intersection of the northern boundary of Lot FM-5 and the western boundary of a tract of land conveyed by Champion International Corporation to the North Carolina Department of Transportation by instrument dated May 23, 1991 and record in Deed Book 418 at Page 1170 in the Haywood County Registry; runs thence with the western boundary of the tract so conveyed by Champion to the Department of Transportation which is the western right of way line of NC Highway 215 in a southwesterly direction to the point of BEGINNING.

SECOND TRACT:

Located in the Town of Canton, Haywood County

BEGINNING on a point in the center of Terrace Drive (State Road 1554) which said point is the northwestern corner of a tract of land described in a deed from H. Michael Bull and others to Smith Capehart Nicholls and wife, Marilyn Bull Nicholls dated June 7, 1988 and recorded in Deed Book 391 at Page 429 in the Haywood County Registry, said point also being the northern common corner of lots of FP-1 and FP-O as shown on an unrecorded plat of the property of The Champion & Fibre Company; runs thence with the western margin of Lot FP-0, which is the property described in the deed to Nicholls recorded in Book 391, at Page 429, South 24 deg. 45 min. East 152 feet to the southernmost corner of the Nicholls property in the northern boundary line of a tract of land described in a deed from Hilda S. Hardin, widow to Chris Michael Hardin dated January 23, 1998 and recorded in Deed Book 463 at Page 1415 in the Haywood County Registry; runs thence with the northern boundary of said tract, North 87 deg. 06 min. 22 sec. West 58.67 feet to a point; then South 58 deg. 09 min. 00 sec. West 94.30 feet to a point in the center of Pasadena Street; runs thence with the center of Pasadena Street about North 30 deg. 45 min. West to the point of intersection of the center line of Pasadena Street with the center line of Terrace Drive; runs thence with the center of Terrace Drive in a northeasterly direction to the place of BEGINNING.

The above described tract is the major portion of lot FP-1 as shown on the unrecorded plat of property of The Champion Paper and Fibre Company and includes property adjacent to said lot within the right of way of Pasadena Street and Terrace Drive.

THIRD TRACT:

Located in the Town of Canton, Haywood County

Being Lots 3 and 4 as shown on a plat entitled "Survey for Champion International Corporation" by Hampton, Hintz & Associates which is recorded in Plat Cabinet C at Slide 1121 in the Office of the Register of Deeds for Haywood County, reference to said recorded plat being made for a more particularly description of the lots.

FOURTH TRACT:

Located in the Town of Canton, Haywood County

BEGINNING on a stake which is the southernmost corner of the second tract described in a deed from Michael Pace and wife and others to Kathy W. Garrett dated May 8, 1998 and recorded in Deed Book 465 at Page 1008 in the Office of the Register of Deeds for Haywood County; runs thence with the Eastern boundary of said tract (which is the western boundary of the property of Champion International Corporation, North 2 deg. 35 min. East 320.1 feet to a large white oak corner of the Garrett tract which is also the southernmost corner of the First Tract described in a deed from W. V. Ivester and wife, Pearl Ivester to The Champion Paper and Fibre Company dated May 31, 1955 and recorded in Deed Book 165 at Page 124 in the Office of the Register of Deeds for Haywood County; runs thence with the northern boundary of the Garrett tract and the southern boundary of the First Tract described in the deed to Champion (Deed Book 165 at Page 124) North 53 deg. West passing through a spring 360.7 feet, more or less, to a Spanish oak corner and North 56 deg. 35 min. West 186.9 feet to the westernmost corner of the first tract described in the deed to The Champion Paper and Fibre Company recorded in Deed Book 165 at Page 124 on the southeastern bank of the Pigeon River; thence continuing North 56 deg. 35 min. West to a point in the center of the Pigeon River; runs thence up and with the center of the Pigeon River in a northerly, easterly, southerly and southeasterly direction to a point in the center of the River where Woodside Drive (State Road 215) crosses the Pigeon River; runs thence in a southwesterly direction to a point which represents the eastern right of way line, extended southward, of a street formerly known as Main Street (now known as Fiberville Street) which street is shown as Main Street on a plat entitled Fiberville & Skyland Terrace, which plat is recorded in Plat Book E, at Page C-6 in the office of the Register of Deeds for Haywood County; runs thence with the eastern margin of the street known as Fiberville Street so as to include a strip of land between said street and the Pigeon River in a northwesterly direction (about North 40 deg. West and then North 37 deg. West) to a point on the eastern margin of Fiberville Street at a point which is located North 53 deg. 32 min. East 35.5 feet (across Fiberville Street) from the northernmost corner of lot 48 as shown on the plat of Fiberville and Skyland Terrace referred to above; thence crossing Fiberville Street, South 53 deg. 32 min. West 35.5 feet, more or less, to the northernmost corner of said Lot 48; runs thence with the

Northern boundary of said Lot 48, South 53 deg. 32 min. West 142.18 feet, more or less, to the westernmost corner of said Lot 48; runs thence with the western boundary of Lot 48, 47, 46, 45, 44, 43 and 42, South 40 deg. 03 min. East 402 feet, more or less, to a point which is the southernmost corner of Lot 42 as shown on the recorded plat at the northernmost corner of a tract of land conveyed by Champion International Corporation to George Michael Trostel, II by deed dated November 19, 1991 and recorded in Deed Book 423 at Page 383 in the Haywood County Registry; runs thence with the northwestern boundary of said tract, South 34 deg. 33 min. 10 sec. West 155.32 feet to the westernmost corner of the Trostel tract on the northeastern margin of Thompson Avenue; runs thence with the northeastern or eastern margin of Thompson Avenue in a northwesterly direction to a point where Thompson Avenue makes a curve to the south and becomes Skyland Terrace; runs thence with the northern and western margins of Skyland Terrace to a point on the western margin of Skyland Terrace at the northeastern corner of a tract of land described in a deed from Stephen A. Burrus and wife to John C. Parrish and wife, Audrey Lucille Parrish dated May 29, 1998 and recorded in Deed Book 465, at Page 1651 in the Haywood County Registry; runs thence with the northern boundary of said tract, North 81 deg. 20 min. 00 sec. West 150.33 feet and North 81 deg. 26 min. 00 sec. West 50.00 feet to an iron pin which is the northwestern corner of the Parrish tract; runs thence with the western boundary of the Parrish tract, South 5 deg. 42 min. 11 sec. West 250.60 feet to a concrete monument which is the southwestern corner of the Parrish tract; runs thence with the southern boundary of the Parrish tract, North 78 deg. 59 min. 07 sec. East 88 feet, more or less, to the northwestern corner of the second tract described in a deed from Holly Cochran Messer to Ronald M. Higdon and Kathy L. Jackson dated March 26, 1991 and recorded in Deed Book 416, at Page 442 in the Haywood County Registry; runs thence with the western boundary of the first and second tracts described in the Higdon deed, South 6 deg. 32 min. 00 sec. East 25.07 feet and South 14 deg. 51 min. 00 sec. East 106.75 feet to the southwestern corner of the first tract described in the Higdon deed at the northwestern corner of a tract of land described in a deed from Louise W. Sechrest to James Allen Sechrest and Margaret Ann Abbott dated March 31, 1995 and recorded in Deed Book 446 at Page 1599 in the Haywood County Registry; runs thence with the western boundary of the Sechrest tract, South 1 deg. 21 min. West 137.39 feet to the southwestern corner of the Sechrest tract which is the Northwestern corner of Lot FS-6 as shown on the plat entitled "Fiberville & Skyland Terrace" recorded in Plat Book E at Page C-6 in the Haywood County Registry; runs thence with the western line of lot FS-6, South 19 deg. 54 min. East 99.34 feet, more or less, to a point which is the southwestern corner of FS-6 at the northeastern corner of a tract of land described in a deed from Champion Papers, Inc. to Joseph Samuel Schenck and wife, Elaine C. Schenck recorded in Deed Book 215 at Page 27 in the Haywood County Registry; runs thence with the northern and western boundaries of the Schenck tract, South 73 deg. 59 min. West 171.7 feet and South 19 deg. 45 min. East 126.64 feet to the southwestern corner of the Schenck tract at the northwestern corner of a tract of

land described in a deed from Wilford Phillips and wife to James C. Ward and wife, Betty W. Ward dated December 2, 1966 and recorded in Deed Book 214 at Page 284 in the Haywood County Registry; runs thence with the western boundary of the Ward tract, South 19 deg. 54 min. East 10 feet to a point and South 22 deg. 47 min. East 110 feet to the southwestern corner of the Ward tract at the northwestern corner of the second tract described in a deed from R. D. Coleman, Jr. and wife, Ruth K. Coleman to Frank C. Morrison, Jr. and wife, Joan M. Morrison dated June 1, 1961 and recorded in Deed Book 188 at Page 205 in the Haywood County Registry; runs thence with the western boundary of the Morrison property South 22 deg. 47 min. East 10 feet to a point and South 24 deg. 29 min. East 160.85 feet to the southwestern corner of the Morrison tract in the northern margin of Terrace Drive; thence with the northern margin of Terrace Drive in a southwesterly direction, 155 feet, more or less, to a point on the northern margin of Terrace Drive which is the southeastern corner of a tract described in a deed from Champion Papers, Inc. to W. E. Smith and wife, Cathleen Smith dated December 6, 1963 and recorded in Deed Book 201 at Page 57 in the Haywood County Registry; runs thence with the eastern boundary of said tract, North 02 deg. 45 min. East 293 feet to the northeastern corner of said tract and South 57 deg. 13 min. West 60 feet to the northwestern corner of said tract in the western boundary of the property of Champion International Corporation; runs thence in a northerly direction a straight line to the point of BEGINNING.

FIFTH TRACT:

Located in the Town of Canton, Haywood County

Being a tract of land lying between Thompson Avenue on the east and Skyland Terrace on the west and more particularly described as follows:

BEGINNING on a point on the western margin of Thompson Avenue at the northeastern corner of a tract of land described in a deed from Neal C. Bellamy, Jr. and wife, Mary Jean Bellamy to Sam R. Brown, Jr. and wife, Virginia B. Brown dated May 29, 1959 and recorded in Deed Book 177 at Page 379 in the Haywood County Registry; runs thence with the western margin of Thompson Avenue in a northerly direction to its intersection with Skyland Terrace; thence in a westerly and southerly direction with the southern and eastern margins of Skyland Terrace to a point in the eastern margin of Skyland Terrace which is the northwestern corner of the Sam R. Brown and wife tract above referred to; runs thence with the northern boundary of the Brown tract, North 66 deg. 49 min. East 128.50 feet to the place of BEGINNING.

SIXTH TRACT:

Located in the Town of Canton, Haywood County

Being Lots 36, 37, 39, 44, 46 and 47 as shown on the recorded plat of Fiberville & Skyland Terrace recorded in Plat Book E at Page C-6 in the Office of the Register of Deeds for Haywood County, reference to which plat is hereby made for a more particularly description.

SEVENTH TRACT:

Located in the Town of Canton, Haywood County

Being Lot FB-1, Lots FM-15 and FM-17 and Lot FM-9 as shown on the plat of Fiberville & Skyland Terrace recorded in Plat Book E at Page C-6 in the Haywood County Registry less that portion of said lots which may lie within the boundaries of Balsam Avenue, White Pine Drive or Woodside Drive (State Road No. 215) as the new right of way was conveyed for Woodside Drive by Champion International Corporation to the North Carolina Department of Transportation by instrument dated May 23, 1991 and recorded in Deed Book 418 at page 1170 in the Haywood County Registry.

EIGHTH TRACT:

Located in the Town of Canton, Haywood County

Beginning on a point at the intersection at the northern margin of High Street with the eastern margin of Reservoir Street as they are now located; runs thence with the eastern margin of Reservoir Street and the eastern margin of Mitchell Street in a northerly direction to a point on the eastern margin of Mitchell Street which is the northwestern corner of a tract of land described in a deed from W. W. Mitchell and wife, Sally Mitchell to The Champion Paper and Fibre Company dated July 18, 1958 and recorded in Deed Book 175 at Page 336 in the Haywood County Registry; runs thence with the northern boundary of said tract, North 79 deg. 45 min. East 320 feet, more or less, to the northeastern corner of said tract in the western margin of Cherry Street, as it now exists; thence with the western margin of Cherry Street in a southeasterly direction to a point on the western margin of Cherry Street which is the northernmost corner of a tract of land described in a deed from Champion International Corporation to Donald R. Mitchell and wife, Melinda S. Mitchell dated May 10, 1993 and recorded in Deed Book 430 at Page 5 in the Haywood County Registry; runs thence with the northwestern boundary of said tract, South 35 deg. 29 min. 38 sec. West 145.75 feet to the westernmost corner of said tract and South 45 deg. 45 min. East 28.5 feet to the southernmost corner of said tract in the northernmost corner of a tract described in a deed from James Reeves Robinson to Lois Robinson dated February 26, 1979 and

recorded in Deed Book 305 at Page 40 in the Haywood County Registry; runs thence with the northern boundary of the Lois Robinson tract, South 34 deg. West 72.8 feet to the northwestern corner of said tract in the northeastern corner of a tract described in a deed from Catherine E. Mashburn to Thomas Dewey Parham dated June 24, 1985 and recorded in Deed Book 360 at Page 1013 in the Haywood County Registry; runs thence with the northern boundary of said tract, South 51 deg. West 117 feet to the northwestern corner of said tract; runs thence South 27 deg. 20 min. East 136 feet to a point in the northern margin of High Street at the southwestern corner of the Parham tract; runs thence with the northern margin of High Street in a southwesterly direction, 130 feet, more or less, to a point on the northern margin of High Street which is the southeastern corner of Lot No. 19 of Block D as shown on a plat of the lands of J. N. Mease, Academy Heights, recorded in Map Book A, at Page 99 in the Haywood County Registry, which lot, together with Lot 17 and 18 were conveyed to Mary D. Clemmons by Mary Dudley by deed recorded in Deed Book 260 at Page 22 in the Haywood County Registry; runs thence with the boundaries of Lots 19, 18 and 17, North 22 deg. 45 min. West 100 feet to a point, South 77 deg. 45 min. West 90 feet to a point and South 22 deg. 45 min. East 100 feet to a point on the northern margin of High Street; thence with the northern margin of High Street in a southwesterly direction to the point of BEGINNING.

NINTH TRACT

Located in the Town of Canton, Haywood County

(The Main Mill Site)

BEGINNING at a railroad spike found which is located 3,7760.61 feet South 80 Degrees 32 Minutes 52 Seconds East of the North Carolina Geodetic Survey Monument "Mease" in Haywood County, North Carolina, thence South 8 Degrees, 42 Minutes, 01 Seconds West, 18.55 feet, to a point on a curve, thence 24.98 feet along a curve to the left of radius 547.65 feet, a chord bearing and distance of South 85 Degrees, 17 Minutes, 27 Seconds West, 24.97 feet, to a point, thence South 8 Degrees, 42 Minutes, 01 Seconds West, 10.35 feet, to a point, thence 25.00 feet along a curve to the right of radius 537.65 feet, a chord bearing and distance of North 85 Degrees, 02 Minutes, 11 Seconds East, 25.00 feet, to a point, thence South 8 Degrees, 42 Minutes, 01 Seconds West, 79.03 feet, to a point, thence 120.14 feet along a curve to the left of radius 2291.83 feet, a chord bearing and distance of South 74 Degrees, 46 Minutes, 03 Seconds West, 120.12 feet, to a point, thence South 73 Degrees, 18 Minutes, 26 Seconds West, 423.11 feet, to a point, thence South 23 Degrees, 44 Minutes, 10 Seconds East, 60.41 feet, to a point, thence South 71 Degrees, 50 Minutes, 21 Seconds West, 10.00 feet, to a point, thence South 24 Degrees, 24 Minutes, 48 Seconds East, 109.89 feet to a corner of a wall, thence South 24 Degrees, 24 Minutes,

48 Seconds East, 149.15 feet to the south east corner of a concrete monument found, thence South 24 Degrees, 24 Minutes, 48 Seconds East, 14.96 feet, to a point, thence South 71 Degrees, 50 Minutes, 21 Seconds West, 109.79 feet to a point, thence North 18 Degrees, 09 Minutes, 39 Seconds West, 14.30 feet to the corner of a wall, thence North 18 Degrees, 09 Minutes, 39 Seconds West, 149.13 feet to the corner of a wall, thence South 71 Degrees, 50 Minutes, 21 Seconds West, 150.00 feet to an iron rod set, thence North 18 Degrees, 09 Minutes, 39 Seconds West, 48.61 feet to an iron pipe found, thence South 73 Degrees, 09 Minutes, 21 Seconds West, 152.10 feet to a point, thence South 18 Degrees, 09 Minutes, 39 Seconds East, 215.54 feet to a point, thence South 71 Degrees, 58 Minutes, 39 Seconds West, 232.64 feet to an iron rod found, thence South 71 Degrees, 45 Minutes, 24 Seconds West, 140.51 feet to an iron rod found, thence North 12 Degrees, 11 Minutes, 19 Seconds West, 295.47 feet to an iron rod found, thence North 12 Degrees, 11 Minutes, 19 Seconds West, 56.95 feet, to a point, thence South 73 Degrees, 20 Minutes, 21 Seconds West, 257.23 feet, to a point, thence South 73 Degrees, 15 Minutes, 08 Seconds West, 28.27 feet to a point in the bed of the Pigeon River, thence South 15 Degrees, 33 Minutes, 19 Seconds East, 330.00 feet to a point in the bed of the Pigeon River, thence South 14 Degrees, 48 Minutes, 19 Seconds East, 363.00 feet to a point in the bed of the Pigeon River, thence North 29 Degrees, 18 Minutes, 19 Seconds West, 297.00 feet to a point, thence North 14 Degrees, 48 Minutes, 19 Seconds West, 33.70 feet to a point, thence South 66 Degrees, 01 Minutes, 56 Seconds West, 59.21 feet to a point, thence South 66 Degrees, 01 Minutes, 56 Seconds West, 16.81 feet to a point, thence South 66 Degrees, 01 Minutes, 56 Seconds West, 71.19 feet to a point, thence South 71 Degrees, 59 Minutes, 15 Seconds West, 600.00 feet to a point, thence South 38 Degrees, 45 Minutes, 45 Seconds East, 50.89 feet to a point, thence South 71 Degrees, 37 Minutes, 11 Seconds West, 38.99 feet to a point, thence North 77 Degrees, 10 Minutes, 45 Seconds West, 210.38 feet to a point in the center of Main Street, thence North 75 Degrees, 51 Minutes, 43 Seconds West, 216.70 feet to a point in the center of Main Street, thence North 11 Degrees, 15 Minutes, 44 Seconds East, 32.00 feet to an iron pipe found, thence North 11 Degrees, 15 Minutes, 13 Seconds East, 189.89 feet to an iron pipe found, thence North 11 Degrees, 15 Minutes, 17 Seconds East, 65.34 feet to a point, thence 172.51 feet along a curve to the right of radius 744.61 feet, a chord bearing and distance of South 87 Degrees, 11 Minutes, 33 Seconds West, 172.12 feet, to a point, thence North 86 Degrees, 10 Minutes, 17 Seconds West, 105.76 feet to a point, thence South 4 Degrees, 49 Minutes, 38 Seconds West, 38.50 feet to an iron pipe found, thence North 83 Degrees, 27 Minutes, 22 Seconds West, 124.48 feet to an iron pipe found, thence South 2 Degrees, 22 Minutes, 14 Seconds East, 111.43 feet to an iron rod set, thence South 2 Degrees, 22 Minutes, 14 Seconds East, 37.07 feet to a point in the center of Main Street, thence North 57 Degrees, 42 Minutes, 14 Seconds West, 157.20 feet, to a point, thence North 48 Degrees, 56 Minutes, 17 Seconds West, 130.00 feet, to a point, thence North 7 Degrees, 38 Minutes, 35 Seconds West, 4.78 feet, to an iron pipe found, thence North

7 Degrees, 39 Minutes, 15 Seconds West, 63.42 feet, to an iron pipe found, thence North 73 Degrees, 44 Minutes, 22 Seconds West, 42.49 feet, to a point, thence 180.31 feet along a curve to the right of radius 1389.60 feet, a chord bearing and distance of North 70 Degrees, 01 Minutes, 20 Seconds West, 180.18 feet, to a point, thence North 66 Degrees, 18 Minutes, 18 Seconds West, 206.20 feet, to a point, thence North 8 Degrees, 52 Minutes, 05 Seconds East, 12.27 feet, to an iron rail found, thence North 8 Degrees, 39 Minutes, 26 Seconds East, 75.87 feet, to an iron rail found, thence North 9 Degrees, 14 Minutes, 09 Seconds East, 42.75 feet, to a point, thence 39.29 feet along a curve to the right of radius 823.36 feet, a chord bearing and distance of South 59 Degrees, 16 Minutes, 24 Seconds East, 39.29 feet, to an iron pipe found, thence North 4 Degrees, 53 Minutes, 45 Seconds West, 153.29 feet, to a point, thence North 8 Degrees, 51 Minutes, 52 Seconds East, 15.96 feet, to an iron rail found, thence North 56 Degrees, 10 Minutes, 00 Seconds East, 66.00 feet, to a chiseled square in a concrete drive, thence North 23 Degrees, 46 Minutes, 42 Seconds West, 111.58 feet, to an iron rail found, thence North 23 Degrees, 46 Minutes, 39 Seconds West, 8.52 feet, to an iron pipe found, thence North 23 Degrees, 46 Minutes, 39 Seconds West, 4.11 feet, to a point, thence North 21 Degrees, 37 Minutes, 38 Seconds East, 82.98 feet, to a point, thence 165.07 feet along a curve to the right of radius 420.49 feet, a chord bearing and distance of North 32 Degrees, 52 Minutes, 25 Seconds East, 164.01 feet, to a point, thence North 44 Degrees, 07 Minutes, 11 Seconds East, 42.56 feet, to an iron rod set, thence 20.03 feet along a curve to the right of radius 581.21 feet, a chord bearing and distance of North 45 Degrees, 06 Minutes, 25 Seconds East, 20.03 feet, to a point, thence South 42 Degrees, 43 Minutes, 18 Seconds East, 22.23 feet, to an iron rod set, thence North 50 Degrees, 20 Minutes, 27 Seconds East, 117.69 feet, to an iron rod found, thence North 58 Degrees, 29 Minutes, 18 Seconds East, 115.84 feet, to an iron rod found, thence North 52 Degrees, 15 Minutes, 59 Seconds East, 117.82 feet, to an iron rod found, thence North 40 Degrees, 00 Minutes, 10 Seconds East, 215.07 feet, to an iron rod found, thence North 39 Degrees, 13 Minutes, 20 Seconds East, 347.13 feet, to an iron rod found, thence North 63 Degrees, 55 Minutes, 29 Seconds East, 55.04 feet, to an iron rod set, thence North 35 Degrees, 47 Minutes, 19 Seconds East, 50.09 feet, to an iron rod found, thence North 17 Degrees, 25 Minutes, 15 Seconds East, 53.85 feet, to an iron rod set, thence North 39 Degrees, 50 Minutes, 55 Seconds East, 273.98 feet, to an iron rod set, thence North 32 Degrees, 35 Minutes, 30 Seconds East, 87.17 feet, to an iron rod set, thence North 20 Degrees, 22 Minutes, 34 Seconds East, 98.03 feet, to an iron rod set, thence North 10 Degrees, 11 Minutes, 22 Seconds East, 63.49 feet, to an iron rod, set thence North 11 Degrees, 46 Minutes, 37 Seconds East, 172.96 feet, to an iron rod set, thence North 8 Degrees, 43 Minutes, 02 Seconds East, 137.00 feet, to an iron rod set, thence North 3 Degrees, 51 Minutes, 15 Seconds West, 123.85 feet, to an iron rod found, thence North 13 Degrees, 44 Minutes, 44 Seconds West, 111.02 feet, to an iron rod set, thence North 16 Degrees, 07 Minutes, 46 Seconds West, 359.74 feet, to an iron rod found, thence North 10 Degrees, 40 Minutes, 25 Seconds West, 152.90 feet, to an iron rod found, thence North 25 Degrees,

53 Minutes, 47 Seconds East, 77.84 feet, to an iron rod set, thence North 64 Degrees, 17 Minutes, 19 Seconds East, 181.94 feet, to an iron rod set, thence North 64 Degrees, 17 Minutes, 19 Seconds East, 80.23 feet, to an iron rod set, thence North 30 Degrees, 01 Minutes, 48 Seconds West, 102.77 feet, to a point, thence 50.43 feet along a curve to the left of radius 1472.39 feet, a chord bearing and distance of North 31 Degrees, 00 Minutes, 40 Seconds West, 50.43 feet, to an iron rod set, thence North 63 Degrees, 24 Minutes, 36 Seconds East, 45.73 feet, to an iron rail found, thence North 63 Degrees, 24 Minutes, 36 Seconds East, 157.67 feet, to an iron rail found, thence North 62 Degrees, 42 Minutes, 27 Seconds East, 158.44 feet, to an iron rail found, thence South 16 Degrees, 07 Minutes, 26 Seconds West, 156.89 feet, to an iron pipe found, thence South 8 Degrees, 25 Minutes, 05 Seconds West, 18.26 feet, to an iron rod set, thence South 81 Degrees, 34 Minutes, 55 Seconds East, 293.77 feet, to a Champion monument found, thence South 75 Degrees, 25 Minutes, 04 Seconds East, 19.52 feet, to an iron pipe found, thence South 75 Degrees, 25 Minutes, 04 Seconds East, 131.65 feet, to an iron rod set, thence South 56 Degrees, 35 Minutes, 04 Seconds East, 199.18 feet, to an iron pipe found, thence South 56 Degrees, 35 Minutes, 04 Seconds East, 178.52 feet, to an iron pipe found, thence South 3 Degrees, 45 Minutes, 48 Seconds East, 8.35 feet, to a point, thence 36.06 feet along a curve to the left of radius 50.91 feet, a chord bearing and distance of South 24 Degrees, 03 Minutes, 15 Seconds East, 35.31 feet, to a point, thence 55.17 feet along a curve to the left of radius 241.43 feet, a chord bearing and distance of South 50 Degrees, 53 Minutes, 29 Seconds East, 55.05 feet, to a point, thence South 57 Degrees, 26 Minutes, 18 Seconds East, 141.68 feet, to a point, thence 179.41 feet along a curve to the left of radius 835.27 feet, a chord bearing and distance of South 63 Degrees, 35 Minutes, 30 Seconds East, 179.07 feet, to a point, thence 15.72 feet along a curve to the left of radius 28.60 feet, a chord bearing and distance of South 85 Degrees, 29 Minutes, 44 Seconds East, 15.53 feet, to a point, thence North 78 Degrees, 45 Minutes, 14 Seconds East, 74.62 feet, to a point, thence 56.52 feet along a curve to the right of radius 53.84 feet, a chord bearing and distance of South 70 Degrees, 26 Minutes, 21 Seconds East, 53.84 feet, to a point, thence 6.30 feet along a curve to the right of radius 11.73 feet, a chord bearing and distance of South 24 Degrees, 15 Minutes, 00 Seconds East, 11.73 feet, to a point, thence South 8 Degrees, 52 Minutes, 05 Seconds East, 44.19 feet, to a point, thence 88.55 feet along a curve to the left of radius 166.60 feet, a chord bearing and distance of South 24 Degrees, 05 Minutes, 41 Seconds East, 87.51 feet, to a point, thence South 39 Degrees, 19 Minutes, 16 Seconds East, 63.85 feet, to a point, thence 183.43 feet along a curve to the right of radius 586.83 feet, a chord bearing and distance of South 30 Degrees, 22 Minutes, 00 Seconds East, 182.68 feet, to a point, thence South 21 Degrees, 24 Minutes, 43 Seconds East, 200.20 feet, to an iron rod set, thence South 74 Degrees, 31 Minutes, 50 Seconds West, 120.43 feet, to an iron rod set, thence South 74 Degrees, 31 Minutes, 50 Seconds West, 81.30 feet, to an iron rod set, thence South 80 Degrees, 13 Minutes, 15 Seconds West, 122.19 feet, to a point, thence South 7 Degrees, 04 Minutes, 10 Seconds East, 30.03 feet, to a Champion

Monument found, thence South 11 Degrees, 57 Minutes, 01 Seconds West, 85.36 feet, to a Champion Monument found, thence South 78 Degrees, 21 Minutes, 08 Seconds East, 118.21 feet, to an iron rod found, thence South 78 Degrees, 21 Minutes, 08 Seconds East, 27.63 feet, to a point, thence North 8 Degrees, 38 Minutes, 19 Seconds East, 49.61 feet, to an iron rod found, thence South 81 Degrees, 58 Minutes, 10 Seconds East, 88.88 feet, to an iron rod found, thence North 74 Degrees, 31 Minutes, 50 Seconds East, 15.00 feet, to an iron rod found, thence North 74 Degrees, 31 Minutes, 50 Seconds East, 106.00 feet, to an iron rod found, thence North 74 Degrees, 31 Minutes, 50 Seconds East, 5.41 feet, to a point, thence North 0 Degrees, 21 Minutes, 00 Seconds East, 128.86 feet, to a point, thence North 43 Degrees, 12 Minutes, 56 Seconds East, 7.65 feet, to an iron pipe found, thence North 69 Degrees, 21 Minutes, 58 Seconds East, 117.52 feet, to an iron pipe found, thence South 20 Degrees, 36 Minutes, 07 Seconds East, 99.89 feet, to an axle found, thence North 73 Degrees, 15 Minutes, 02 Seconds East, 60.40 feet, to an axle found, thence North 71 Degrees, 37 Minutes, 20 Seconds East, 92.15 feet, to an iron pipe found, thence North 20 Degrees, 27 Minutes, 50 Seconds West, 102.21 feet, to an iron rod found, thence North 73 Degrees, 10 Minutes, 54 Seconds East, 117.57 feet, to an iron pipe found, thence South 19 Degrees, 56 Minutes, 16 Seconds East, 99.85 feet, to an iron pipe found, thence North 72 Degrees, 03 Minutes, 15 Seconds East, 112.00 feet, to an iron rod found, thence North 19 Degrees, 56 Minutes, 06 Seconds West, 100.00 feet, to an iron rod found, thence North 69 Degrees, 32 Minutes, 36 Seconds East, 369.33 feet, to an iron pipe found, thence South 59 Degrees, 10 Minutes, 52 Seconds West, 107.00 feet, to an iron rod found, thence South 3 Degrees, 40 Minutes, 52 Seconds West, 53.00 feet, to an iron rod found, thence 64.97 feet along a curve to the left of radius 61.54 feet, a chord bearing and distance of South 32 Degrees, 09 Minutes, 27 Seconds West, 61.99 feet, to a point, thence South 1 Degrees, 54 Minutes, 49 Seconds West, 336.40 feet, to a point, thence 9.01 feet along a curve to the right of radius 6.19 feet, a chord bearing and distance of South 43 Degrees, 37 Minutes, 35 Seconds West, 8.23 feet, to a point, thence South 85 Degrees, 20 Minutes, 21 Seconds West, 24.41 feet, to a point, thence 49.26 feet along a curve to the left of radius 73.09 feet, a chord bearing and distance of South 66 Degrees, 02 Minutes, 02 Seconds West, 48.33 feet, to a point, thence South 46 Degrees, 43 Minutes, 43 Seconds West, 94.29 feet, to a point, thence 61.11 feet along a curve to the left of radius 97.48 feet, a chord bearing and distance of South 28 Degrees, 46 Minutes, 09 Seconds West, 60.11 feet, to a point, thence South 10 Degrees, 48 Minutes, 34 Seconds West, 87.06 feet, to a point, thence 63.78 feet along a curve to the right of radius 48.20 feet, a chord bearing and distance of South 48 Degrees, 42 Minutes, 50 Seconds West, 59.23 feet, to a point, thence South 86 Degrees, 37 Minutes, 05 Seconds West, 35.20 feet, to a point, thence South 14 Degrees, 23 Minutes, 00 Seconds East, 35.06 feet, to an iron pipe found, thence South 14 Degrees, 23 Minutes, 00 Seconds East, 121.57 feet, to an iron pipe found, thence South 14 Degrees, 23 Minutes, 00 Seconds East, 6.46 feet, to a point, thence North 67 Degrees, 47 Minutes, 44 Seconds East, 32.35 feet, to a point, thence North 68

Degrees, 06 Minutes, 17 Seconds East, 35.51 feet, to a 36" Locust tree, thence South 14 Degrees, 36 Minutes, 38 Seconds East, 3.38 feet, to a point, thence North 45 Degrees, 36 Minutes, 27 Seconds East, 32.00 feet, to an iron pipe found, thence North 39 Degrees, 00 Minutes, 55 Seconds East, 17.02 feet, to an iron pipe found, thence North 39 Degrees, 01 Minutes, 02 Seconds East, 36.27 feet, to an iron pipe found, thence North 39 Degrees, 00 Minutes, 59 Seconds East, 74.01 feet, to an iron rod set, thence North 52 Degrees, 39 Minutes, 01 Seconds West, 53.12 feet, to an iron rod set, thence North 79 Degrees, 57 Minutes, 44 Seconds East, 55.24 feet, to an iron pipe found, thence North 79 Degrees, 57 Minutes, 44 Seconds East, 79.34 feet, to an iron pipe found, thence South 2 Degrees, 04 Minutes, 15 Seconds East, 24.89 feet, to an iron pipe found, thence South 0 Degrees, 05 Minutes, 45 Seconds West, 99.56 feet, to an "x" chiseled in a concrete sidewalk, thence South 0 Degrees, 18 Minutes, 39 Seconds East, 75.00 feet, to a point, thence South 77 Degrees, 13 Minutes, 24 Seconds West, 65.00 feet, to a point, thence South 59 Degrees, 40 Minutes, 21 Seconds West, 59.24 feet, to a point, thence North 24 Degrees, 21 Minutes, 30 Seconds West, 15.69 feet, to a point, thence 87.47 feet along a curve to the right of radius 222.11 feet, a chord bearing and distance of South 75 Degrees, 55 Minutes, 21 Seconds West, 86.91 feet, to a point, thence South 87 Degrees, 12 Minutes, 15 Seconds West, 597.72 feet, to a point, thence 214.37 feet along a curve to the right of radius 354.97 feet, a chord bearing and distance of North 75 Degrees, 29 Minutes, 42 Seconds West, 211.13 feet, to a point, thence South 31 Degrees, 48 Minutes, 20 Seconds West, 50.00 feet, to a point, thence 244.57 feet along a curve to the left of radius 404.97 feet, a chord bearing and distance of South 75 Degrees, 29 Minutes, 42 Seconds East, 240.87 feet, to a point, thence North 87 Degrees, 12 Minutes, 15 Seconds East, 597.72 feet, to a point, thence 106.51 feet along a curve to the left of radius 237.12 feet, a chord bearing and distance of North 76 Degrees, 00 Minutes, 51 Seconds East, 105.62 feet, to an iron rod set, thence North 63 Degrees, 08 Minutes, 46 Seconds East, 15.93 feet, to a point, thence 52.24 feet along a curve to the right of radius 126.84 feet, a chord bearing and distance of North 73 Degrees, 16 Minutes, 00 Seconds East, 51.87 feet, to a point, thence 47.09 feet along a curve to the right of radius 29.18 feet, a chord bearing and distance of South 48 Degrees, 42 Minutes, 13 Seconds East, 42.14 feet, to a point, thence 61.59 feet along a curve to the right of radius 1159.76 feet, a chord bearing and distance of South 0 Degrees, 57 Minutes, 16 Seconds East, 61.58 feet, to an iron rod set, thence North 75 Degrees, 46 Minutes, 37 Seconds West, 52.40 feet, to a railroad spike set, thence South 59 Degrees, 33 Minutes, 53 Seconds West, 96.40 feet, to a railroad spike set, thence South 4 Degrees, 33 Minutes, 53 Seconds West, 62.04 feet, to a railroad spike set, thence South 4 Degrees, 33 Minutes, 53 Seconds West, 352.96 feet, to a railroad spike set, thence South 61 Degrees, 03 Minutes, 53 Seconds West, 4.60 feet, to a railroad spike set, thence South 14 Degrees, 31 Minutes, 44 Seconds West, 176.57 feet, to a point, thence South 84 Degrees, 53 Minutes, 58 Seconds East, 31.59 feet, to a point, thence North 14 Degrees, 31 Minutes, 44 Seconds East, 138.47 feet, to a point, thence 17.56

feet along a curve to the right of radius 23.01 feet, a chord bearing and distance of North 36 Degrees, 23 Minutes, 33 Seconds East, 17.13 feet, to a point, thence North 58 Degrees, 15 Minutes, 22 Seconds East, 51.89 feet, to a point, thence 19.70 feet along a curve to the right of radius 39.41 feet, a chord bearing and distance of North 72 Degrees, 34 Minutes, 39 Seconds East, 19.49 feet, to a point, thence 13.35 feet along a curve to the right of radius 10.42 feet, a chord bearing and distance of South 56 Degrees, 23 Minutes, 13 Seconds East, 12.46 feet, to a point, thence South 19 Degrees, 40 Minutes, 23 Seconds East, 2.32 feet, to a point, thence South 8 Degrees, 41 Minutes, 25 Seconds West, 5.64 feet, to a point, thence 90.71 feet along a curve to the left of radius 1090.84 feet, a chord bearing and distance of South 6 Degrees, 18 Minutes, 30 Seconds West, 90.68 feet, to a point, thence South 3 Degrees, 55 Minutes, 34 Seconds West, 85.50 feet, to a point, thence South 84 Degrees, 53 Minutes, 58 Seconds East, 12.88 feet, to a point, thence North 11 Degrees, 24 Minutes, 05 Seconds East, 41.00 feet, to a point, thence South 84 Degrees, 03 Minutes, 59 Seconds East, 18.13 feet, to a point on the East side of Bridge Street, thence North 3 Degrees, 55 Minutes, 34 Seconds East, 45.75 feet, to a point, thence 87.69 feet along a curve to the right of radius 1054.51 feet, a chord bearing and distance of North 6 Degrees, 18 Minutes, 30 Seconds East, 87.66 feet, to a point, thence North 8 Degrees, 41 Minutes, 25 Seconds East, 28.76 feet, to a point, thence 46.56 feet along a curve to the right of radius 42.32 feet, a chord bearing and distance of North 40 Degrees, 12 Minutes, 11 Seconds East, 44.24 feet, to a point, thence North 71 Degrees, 42 Minutes, 57 Seconds East, 56.51 feet, to a point, thence 193.93 feet along a curve to the right of radius 525.70 feet, a chord bearing and distance of North 82 Degrees, 17 Minutes, 02 Seconds East, 192.83 feet, to a point, thence South 87 Degrees, 08 Minutes, 54 Seconds East, 6.88 feet, to a point, thence South 17 Degrees, 43 Minutes, 59 Seconds East, 1.85 feet, to a point, thence South 17 Degrees, 43 Minutes, 59 Seconds East, 125.50 feet, to an iron rod found, thence North 71 Degrees, 11 Minutes, 01 Seconds East, 62.70 feet, to an iron rod found, thence South 22 Degrees, 44 Minutes, 00 Seconds East, 83.00 feet, to an iron rod found, thence South 28 Degrees, 03 Minutes, 59 Seconds East, 126.07 feet, to a concrete monument found, thence North 84 Degrees, 03 Minutes, 59 Seconds West, 117.68 feet, concrete monument found, thence South 44 Degrees, 35 Minutes, 59 Seconds West, 70.54 feet, to a concrete monument found, thence South 82 Degrees, 17 Minutes, 13 Seconds West, 221.94 feet, to a concrete monument found, thence North 88 Degrees, 07 Minutes, 22 Seconds West, 113.38 feet, to a railroad spike found, thence 181.44 feet along a curve to the left of radius 2391.46 feet, a chord bearing and distance of South 79 Degrees, 25 Minutes, 40 Seconds West, 181.40 feet, to a railroad spike found and the Point of Beginning containing 197.019 acres, more or less. Being the same tract of land shown in that certain survey titled Champion Plant, Canton, North Carolina, dated May 11, 1999, by C. O. Hampton Company, Land Surveyors, P.O. Drawer 1319, Fletcher, North Carolina and recorded as a plat in the Haywood County Registry on Slide Number _____, on the _____ day of 1999.

Canton Property May 13 , 1999

1093

TENTH TRACT (Oxygen Injection Site at Landfill #3).

BEGINNING on an iron rod set, which iron rod is located South 4 deg. 37 min. 48 sec. West 154.02 feet from a pine on the eastern bank of the Pigeon River, which pine is the beginning corner of a tract of land described in a deed from W. M. Williamson and wife, Oma Jarrett Williamson to The Champion Paper and Fibre Company, dated October 28, 1955 and recorded in Deed Book 165 at Page 600 in the Haywood County Registry and which pine is also the beginning corner of another tract of land conveyed to the Champion Paper and Fibre Company by E. O. Crane and wife, Treacy Crane by deed dated October 28, 1957 and recorded in Deed Book 174 at Page 234 in the Haywood County Registry, the iron rod beginning corner being further located North 50 deg. 20 min. 29 sec. West 4,894.52 feet from NC Geodetic Survey Station MEASE having coordinates of North=672106.184 and East=854833.547, NAD 83; runs thence from the beginning corner thus established and tied down as follows: South 35 deg. 38 min. 01 sec. East 24.95 feet to a point in the center of a 20 foot right of way for an oxygen line hereinafter separately set forth; continuing South 35 deg. 38 min. 01 sec. East 58.05 feet to an iron rod set; South 53 deg. 16 min. 01 sec. East 98.60 feet to an iron rod set; South 36 deg. 18 min. 34 sec. West 25.82 feet to a point in a gravel drive which is the western terminus and beginning point of a thirty (30) foot right of way for ingress and egress hereinafter separately described; continuing South 36 deg. 18 min. 34 sec. West 52.53 feet to an iron rod set northeast of the Pigeon River; thence continuing South 36 deg. 18 min. 34 sec. West 30.06 feet to the northeastern bank of the Pigeon River; runs thence up and with the bank of the Pigeon River, eight calls as follows: North 52 deg. 27 min. 06 sec. West 54.66 feet to a point, North 58 deg. 57 min. 42 sec. West 37.63 feet to a point, North 54 deg. 10 min. 17 sec. West 38.63 feet to a point, North 44 deg. 58 min. 42 sec. West 34.58 feet to the southernmost corner of a concrete deck adjacent to the River, North 36 deg. 31 min. 21 sec. West 10.94 feet to the westernmost corner of the concrete deck, North 31 deg. 16 min. 23 sec. West 54.71 feet to a point, North 4 deg. 34 min. 22 sec. West 43.19 feet to a point and North 33 deg. 39 min. 10 sec. East 31.43 feet to a point on the bank of the river; thence leaving the Pigeon River and running South 83 deg. 06 min. 23 sec. East, 32.19 feet to an iron rod set; thence continuing South 83 deg. 06 min. 23 sec. East 57.56 feet to the place of BEGINNING. Containing 0.62 acres, according to a survey by C. O. Hampton Company, Land Surveyors dated May 11, 1999 and entitled "Survey for Champion International Landfill 3 Oxygen Injection Site".

ELEVENTH TRACT (Road Right of Way at Landfill #3)

There is hereby conveyed a thirty (30) foot right of way for ingress, egress and regress from said Oxygen Injection Site to Wrightsville Road (State Road No. 1551), the center

line of the right of way being described as follows:

BEGINNING on a point in the center of the gravel drive referred to in the above description, which point is the terminus of the fourth call contained in said description; runs thence with the center of the gravel drive, twenty-one (21) calls as follows:

South 71 Deg. 07 Min. 37 Sec. East 114.22 feet, to a point; thence 296.78 feet along a curve to the left of radius 472.80 feet, a chord bearing and distance of South 89 Deg. 06 Min. 35 Sec. East 291.93 feet, to a point; thence 283.51 feet along a curve to the left a radius of 1219.60 feet, a chord bearing and distance of North 66 Deg. 14 Min. 53 Sec. East 282.87 feet, to a point; thence North 59 Deg. 35 Min. 19 Sec. East 112.26 feet, to a point; thence 466.70 feet along a curve to the left of radius 1085.51 feet, a chord bearing and distance of North 47 Deg. 16 Min. 19 Sec. East 463.11 feet, to a point; thence North 34 Deg. 57 Min. 19 Sec. East 202.51 feet to a point; thence 159.79 feet along a curve to the left of radius 1651.68 feet, a chord bearing and distance of North 32 deg. 11 min. 02 sec. East 159.73 feet to a point; thence 143.16 feet along a curve to the right of radius 222.36 feet, a chord bearing and distance of North 47 Deg. 51 Min. 26 Sec. East 140.70 feet, to a point; thence North 66 Deg. 18 Min. 08 Sec. East 51.32 feet, to a point; thence 140.91 feet along a curve to the left of radius 145.95 feet, a chord bearing and distance of North 38 Deg. 38 Min. 34 Sec. East 135.51 feet, to a point; thence North 10 Deg. 59 Min. 00 Sec. East 118.05 feet, to a point; thence 167.49 feet along a curve to the right of radius 399.64 feet, a chord bearing and distance of North 22 Deg. 59 Min. 23 Sec. East 166.27 feet, to a point; thence North 34 Deg. 59 Min. 46 Sec. East 91.32 feet, to a point; thence 26.69 feet along a curve to the left of radius 40.00 feet, a chord bearing and distance of North 15 Deg. 52 Min. 56 Sec. East 26.20 feet, to a point; thence North 3 Deg. 13 Min. 55 Sec. West 22.49 feet, to a point; thence 31.16 feet along a curve to the left of radius 30.00 feet, a chord bearing and distance of North 32 Deg. 59 Min. 15 Sec. West 29.78 feet, to a point; thence North 62 Deg. 44 Min. 35 Sec. West 32.48 feet, to a point; thence 40.95 feet along a curve to the left of radius 81.42 feet, a chord bearing and distance of North 77 Deg. 09 Min. 02 Sec. West 40.52 feet, to a point; thence South 88 Deg. 26 Min. 30 Sec. West 163.77 feet, to a point; thence 185.66 feet along a curve to the right of radius 603.28 feet, a chord bearing and distance of North 82 Deg. 44 Min. 31 Sec. West 184.92 feet, to a point; thence North 73 Deg. 55 Min. 32 Sec. West 91.01 feet, to a point in the center of Wrightsville Road (State Road No. 1551), according to a survey by C. O. Hampton Company, Land Surveyors dated May 11, 1999 and entitled "Survey for Champion International Landfill 3 Oxygen Injection Site".

The right of way shall be 30 feet in width, 15 feet on either side of the center line above described.

Canton Property May 13 , 1999

1095

TWELFTH TRACT (Oxygen Storage Site at Landfill #3).

BEGINNING on an iron rod set in the boundary line between the tract conveyed to the Champion Paper and Fibre Company by W. M. Williamson and wife, by Deed Book 165, at Page 600, and the tract conveyed to The Champion Paper and Fibre Company by E. O. Crane and wife, by Deed Book 174 at Page 234, both in the Haywood County Registry, said beginning point being located North 51 deg. 15 min. 05 sec. East 725.55 feet from a pine on the eastern bank of the Pigeon River which pine is the beginning corner described in both of the tracts referred to, the iron rod set at the beginning corner being further located North 40 deg. 31 min. 33 sec. West 4,908.98 feet from NC Geodetic Survey Station MEASE having coordinates of N= 672106.184 and E = 854883.547, NAD 83; runs thence from the beginning corner thus located and tied down as follows: North 61 deg. 22 min. 00 sec. West 174.84 to an iron rod set; North 38 deg. 32 min. 07 sec. East 65.69 feet to a point which is the northeastern terminus of the center line of a twenty (20) foot right of way for an oxygen line hereinafter separately described; thence continuing North 38 deg. 32 min. 07 sec. East 20.70 feet to an iron rod set; thence South 61 deg. 22 min. 00 sec. East 195.44 feet to a point in the dividing line between the two tracts owned by Champion International Corporation by virtue of the two deeds to the Champion Paper and Fibre Company above referred to; runs thence South 51 deg. 15 min. 05 sec. West 13.54 feet to a point in the center of a gravel drive which is the western terminus of a twenty-five (25) foot right of way leading to Wrightsville Road (State Road No. 1551) which is hereinafter separately described; thence continuing South 51 deg. 15 min. 05 sec. West 78.66 feet to the place of BEGINNING. Containing 0.36 acres according to a survey by C. O. Hampton Company, Land Surveyors dated May 11, , 1999 and entitled "Survey for Champion International Landfill 3 Oxygen Injection Site".

THIRTEENTH TRACT (Road Right of Way at Landfill #3)

There is also hereby conveyed a twenty-five (25) foot right of way for ingress, egress and regress from the above described 0.36 acre Oxygen Storage Site to the a public road known as Wrightsville Road (State Road #1551), the center line of the 25 foot right of way being described as follows: BEGINNING on a point in the center of the gravel drive which is the terminus of the fifth call contained in the description to the 0.36 acre tract above described; runs thence from said point, South 61 deg. 12 min. 38 sec. East 99.88 feet to a point, thence 106.91 feet along a curve to the left of radius of 114.99 feet a chord bearing and distance of South 87 deg. 50 min. 47 sec. East 103.10 feet; thence North 65 deg. 31 min. 05 sec. East 23.04 feet to a point in the gravel drive where it intersects the State maintained portion of Wrightsville Road (State Road No. 1551). According to a survey by C. O. Hampton Company, Land Surveyors dated May11, 1999 and entitled "Survey for Champion International Landfill 3 Oxygen

Injection Site". The right of way shall extend 12½ feet on either side of the center line.

FOURTEENTH TRACT (Oxygen Line Right of Way at Landfill #3)

There is also hereby conveyed an easement for an existing oxygen line, which easement is twenty (20) feet in width, and which easements leads from the Oxygen Storage Site (above described) in a southwesterly direction to the Oxygen Injection Site above described, the center line of the easement being described as follows: BEGINNING on a point which is the terminus of the second call contained in the description for the 0.36 acre Oxygen Storage Site above described, which point is in the center of the existing oxygen line, runs thence with the center of said oxygen line, eleven calls as follows: North 57 deg. 13 min. 37 sec. West 52.57 feet to a point, South 36 deg. 45 min. 22 sec. West 65.66 feet to a point, South 34 deg. 04 min. 05 sec. West 142.36 feet to a point, South 2 deg. 07 min. 54 sec. West 104.14 feet to a point, South 4 deg. 45 min. 15 sec. West 101.20 feet to a point, South 0 deg. 04 min. 13 sec. East 52.23 feet to a point, South 16 deg. 07 min. 29 sec. West 56.58 feet to a point, South 23 deg. 49 min. 08 sec. West 40.57 feet to a point, South 28 deg. 41 min. 18 sec. West 213.13 feet to a point, South 17 deg. 10 min. 34 sec. West 49.82 feet to a point and South 73 deg. 21 min. 57 sec. West 132.20 feet to a point in the northern line of the 0.62 acre Oxygen Injection Site above described. According to a survey by C. O. Hampton Company, Land Surveyors dated May 11, , 1999 and entitled "Survey for Champion International Landfill 3 Oxygen Injection Site". The twenty (20) foot right of way above described shall lie parallel to and ten (10) feet on either side of the center line.

FIFTEENTH TRACT (Landfill 6)

Beginning at a right-of-way monument at the intersection of the southern right-of-way of Interstate 40 with the western right-of-way of Incinerator Road, Secondary Road 1550, said beginning point stands North 75 degrees, 15 minutes, 57 seconds East, 2,493.54 feet from North Carolina Geodetic Survey Monument "Culvert",
thence, from said beginning point and with the right-of-way of Incinerator Road, as follows: South 45 Degrees, 07 Minutes, 15 Seconds East, 44.40 feet,
to an existing iron pipe
thence 234.90 feet along a curve to the left of radius 285.63 feet,
a chord bearing and distance of
South 68 Degrees, 40 Minutes, 53 Seconds East, 228.34 feet,
to a point
thence 158.72 feet along a curve to the left of radius 285.63 feet,
a chord bearing and distance of
South 71 Degrees, 50 Minutes, 20 Seconds East, 156.69 feet,
to a existing iron pipethence North 55 Degrees, 55 Minutes, 07 Seconds East, 102.63

feet,
to a existing iron pipe
thence North 7 Degrees, 59 Minutes, 55 Seconds West, 22.26 feet,
to a existing iron pipe
thence North 55 Degrees, 55 Minutes, 08 Seconds East, 190.10 feet,
to a existing iron pipe
thence 143.90 feet along a curve to the right of radius 642.13 feet,
a chord bearing and distance of
North 62 Degrees, 20 Minutes, 20 Seconds East, 143.60 feet,
to an existing iron pipe
thence, leaving the right-of-way of Incinerator Road, North 24 Degrees, 02 Minutes, 39 Seconds West, 42.40 feet,
to a point
thence North 82 Degrees, 45 Minutes, 46 Seconds East, 151.17 feet,
to a point
thence South 78 Degrees, 14 Minutes, 14 Seconds East, 260.67 feet,
to a point
thence North 86 Degrees, 45 Minutes, 46 Seconds East, 179.21 feet,
to a point
thence South 56 Degrees, 14 Minutes, 14 Seconds East, 346.62 feet,
to an iron rod set
thence South 56 Degrees, 14 Minutes, 14 Seconds East, 20.00 feet,
to a point in Thickety Creek
thence, with Thickety Creek as follows: South 28 Degrees, 23 Minutes, 48 Seconds West, 62.18 feet,
to a point
thence South 14 Degrees, 28 Minutes, 17 Seconds West, 47.12 feet,
to a point
thence South 9 Degrees, 14 Minutes, 54 Seconds East, 46.42 feet,
to a point
thence South 16 Degrees, 45 Minutes, 17 Seconds West, 38.09 feet,
to a point
thence South 0 Degrees, 04 Minutes, 24 Seconds East, 50.66 feet,
to a point
thence leaving Thickety Creek, North 76 Degrees, 21 Minutes, 01 Seconds West, 46.87 feet,
to a point in the center of Incinerator Road, Secondary Road 1550
thence with the center of said Incinerator Road as follows: 146.71 feet along a curve to the left of radius 251.02 feet,
a chord bearing and distance of
South 25 Degrees, 43 Minutes, 18 Seconds East, 144.63 feet,
to a point

thence 208.12 feet along a curve to the right of radius 1158.87 feet,
a chord bearing and distance of
South 37 Degrees, 19 Minutes, 14 Seconds East, 207.84 feet,
to a point
thence 70.62 feet along a curve to the right of radius 2407.61 feet,
a chord bearing and distance of
South 31 Degrees, 20 Minutes, 08 Seconds East, 70.61 feet,
to a point in the center of the Incinerator Road bridge over Thickety Creek
thence leaving said Incinerator Road and with Thickety Creek, as follows: South 28 Degrees, 50 Minutes, 37 Seconds West, 12.35 feet,
to a point
thence South 13 Degrees, 50 Minutes, 35 Seconds West, 53.36 feet,
to a point
thence South 3 Degrees, 11 Minutes, 14 Seconds East, 73.83 feet,
to a point
thence South 37 Degrees, 02 Minutes, 53 Seconds East, 30.19 feet,
to a point
thence South 63 Degrees, 54 Minutes, 11 Seconds East, 4.74 feet,
to a point
thence leaving Thickety Creek South 65 Degrees, 29 Minutes, 48 Seconds West, 27.64 feet,
to an iron rod set
thence South 65 Degrees, 29 Minutes, 48 Seconds West, 183.59 feet,
to an iron rod set at a fence corner
thence North 8 Degrees, 18 Minutes, 11 Seconds West, 189.45 feet,
to an iron rod set at a fence corner
thence North 32 Degrees, 51 Minutes, 27 Seconds West, 434.89 feet,
to an axle found at fence corner
thence North 75 Degrees, 48 Minutes, 25 Seconds West, 409.08 feet,
to a iron rod set
thence South 24 Degrees, 02 Minutes, 39 Seconds East, 311.10 feet,
to an existing iron pipe at fence corner
thence South 3 Degrees, 42 Minutes, 21 Seconds West, 297.40 feet,
to an existing iron pipe
thence South 3 Degrees, 42 Minutes, 21 Seconds West, 1289.64 feet,
to an existing iron pipe
thence South 3 Degrees, 42 Minutes, 20 Seconds West, 22.99 feet,
to a point on the north bank of the Pigeon River
thence with the north bank of the Pigeon River, as follows: South 82 Degrees, 05 Minutes, 50 Seconds West, 337.95 feet,
to a point
thence South 76 Degrees, 32 Minutes, 50 Seconds West, 275.46 feet,

to a point
thence South 71 Degrees, 55 Minutes, 45 Seconds West, 1,057.44 feet,
to a point
thence crossing a side channel of Pigeon River South 59 Degrees, 44 Minutes, 28 Seconds West, 77.77 feet,
to a point on the south bank of a small island
thence with the south bank of said small island South 73 Degrees, 53 Minutes, 25 Seconds West, 221.45 feet,
to a point
thence South 63 Degrees, 28 Minutes, 45 Seconds West, 172.95 feet,
to a point
thence South 60 Degrees, 19 Minutes, 22 Seconds West, 46.31 feet,
to a point
thence leaving the south bank of said small island South 8 Degrees, 32 Minutes, 30 Seconds West, 39.99 feet,
to a point in the Pigeon river
thence with the centerline of Pigeon River as follows South 67 Degrees, 01 Minutes, 40 Seconds West, 255.69 feet,
to a point
thence South 55 Degrees, 45 Minutes, 48 Seconds West, 169.96 feet,
to a point
thence with the centerline of Pigeon River as follows: North 1 Degrees, 42 Minutes, 26 Seconds East, 59.99 feet,
to a point on the north bank of Pigeon River
thence leaving the centerline of Pigeon River and with the north bank of Pigeon River as follows: South 57 Degrees, 32 Minutes, 23 Seconds West, 168.46 feet,
to a point
thence South 43 Degrees, 22 Minutes, 03 Seconds West, 354.58 feet,
to a point
thence South 73 Degrees, 35 Minutes, 48 Seconds West, 196.79 feet,
to a point
thence North 78 Degrees, 57 Minutes, 35 Seconds West, 116.59 feet,
to a point
thence South 85 Degrees, 37 Minutes, 22 Seconds West, 50.32 feet,
to a point
thence South 69 Degrees, 23 Minutes, 42 Seconds West, 213.17 feet,
to a point
thence South 78 Degrees, 46 Minutes, 46 Seconds West, 117.33 feet,
to a point
thence North 88 Degrees, 45 Minutes, 31 Seconds West, 83.05 feet,
to a point
thence North 83 Degrees, 14 Minutes, 25 Seconds West, 90.47 feet,

to a point
thence North 81 Degrees, 52 Minutes, 10 Seconds West, 192.86 feet,
to a point
thence South 89 Degrees, 16 Minutes, 02 Seconds West, 142.69 feet,
to a point
thence South 87 Degrees, 44 Minutes, 38 Seconds West, 113.33 feet,
to a point
thence leaving the north bank of Pigeon River, North 2 Degrees, 21 Minutes, 51 Seconds East, 21.73 feet,
to a existing iron pipe
thence North 2 Degrees, 21 Minutes, 51 Seconds East, 1413.68 feet,
to an existing iron rod in a pine stump at a fence corner
thence North 32 Degrees, 39 Minutes, 17 Seconds West, 765.15 feet,
to an existing iron rod north of a small branch
thence South 35 Degrees, 17 Minutes, 20 Seconds West, 211.82 feet,
to an existing iron pipe in the center of said small branch
thence North 60 Degrees, 31 Minutes, 13 Seconds West, 347.98 feet,
to an existing iron pipe in the center of a 60 foot right-of-way
thence North 60 Degrees, 31 Minutes, 13 Seconds West, 59.06 feet,
to a point in the center of said 60 foot right-of-way
thence leaving the 60 foot right-of-way, South 30 Degrees, 08 Minutes, 08 Seconds West, 29.65 feet,
to an existing iron pipe
thence South 30 Degrees, 08 Minutes, 08 Seconds West, 158.64 feet,
to an existing iron pipe
thence South 14 Degrees, 14 Minutes, 53 Seconds West, 168.20 feet,
to an existing iron pipe
thence North 66 Degrees, 04 Minutes, 22 Seconds West, 288.30 feet,
to an existing iron rod in the east right-of-way of New Thickety Road, Secondary Road 1513
thence with the existing right-of-way of said New Thickety Road as follows: 207.79 feet
along a curve to the left of radius 756.89 feet,
a chord bearing and distance of
North 57 Degrees, 21 Minutes, 43 Seconds East, 207.14 feet,
to a point
thence with the existing right-of-way of said New Thickety Road as follows: 257.65 feet
along a curve to the left of radius 756.89 feet,
a chord bearing and distance of
North 39 Degrees, 44 Minutes, 43 Seconds East, 256.41 feet,
to a point
thence North 29 Degrees, 59 Minutes, 35 Seconds East, 83.70 feet,
to a right-of-way monument at the intersection of the east right-of-way of said New

Thickety Road with the southern right-of-way of Interstate 40
thence leaving the right-of-way of New Thickety Road and with the southern right-of-way of Interstate 40 as follows: North 78 Degrees, 56 Minutes, 05 Seconds East, 359.88 feet,
to a right-of-way monument
thence North 79 Degrees, 39 Minutes, 56 Seconds East, 201.61 feet,
to a right-of-way monument
thence North 25 Degrees, 05 Minutes, 54 Seconds East, 36.87 feet,
to a right-of-way monument
thence North 79 Degrees, 32 Minutes, 15 Seconds East, 936.32 feet,
to a right-of-way monument
thence North 79 Degrees, 36 Minutes, 39 Seconds East, 271.15 feet,
to a right-of-way monument
thence South 38 Degrees, 30 Minutes, 16 Seconds East, 56.32 feet,
to a right-of-way monument
thence North 79 Degrees, 30 Minutes, 14 Seconds East, 268.20 feet,
to a right-of-way monument
thence North 78 Degrees, 39 Minutes, 29 Seconds East, 204.38 feet,
to a right-of-way monument
thence North 76 Degrees, 17 Minutes, 53 Seconds East, 309.86 feet,
to a right-of-way monument
thence North 35 Degrees, 21 Minutes, 25 Seconds East, 94.49 feet,
to a right-of-way monument
thence North 72 Degrees, 11 Minutes, 44 Seconds East, 384.90 feet,
to a right-of-way monument
thence North 69 Degrees, 24 Minutes, 00 Seconds East, 255.53 feet,
to a right-of-way monument
thence North 67 Degrees, 53 Minutes, 32 Seconds East, 249.81 feet,
to a right-of-way monument
thence North 67 Degrees, 41 Minutes, 03 Seconds East, 154.44 feet,
to a right-of-way monument
thence South 39 Degrees, 50 Minutes, 28 Seconds East, 31.93 feet,
to a right-of-way monument
thence 461.67 feet along a curve to the right of radius 5578.25 feet,
a chord bearing and distance of
North 69 Degrees, 04 Minutes, 55 Seconds East, 461.53 feet,
to a right-of-way monument
the Point of Beginning Containing 245.0 acres, more or less, according to a survey by C. O. Hampton Company, Land Surveyors dated May 11, 1999 and entitled "Survey for Champion International Landfill 6".

Canton Property May 13 , 1999

1102

TRANSFER MADE ON PROPERTY RECORD
Date 5/19/99
By pm

Excise Tax $120,000.00

HAYWOOD COUNTY NC 05/19/1999
$120000.00
STATE OF NORTH CAROLINA Real Estate Excise Tax

Book 472 Page 1073
REGISTERED
HAYWOOD COUNTY NC
05/19/1999 10:30 AM
AMY R. MURRAY
Register Of Deeds

7169
Recording Time, Book and Page

Tax Lot No. _____ Parcel Identifier No. _____
Verified by _____ County on the _____ day of _____, 19 ___
by _____

Mail after recording to: S. H. Spencer Compton, Paul, Weiss, Rifkind, Wharton & Garrison, 1285 Avenue of the Americas, New York, NY 10019-6064.
This instrument was prepared by: Robert E. Fogarty, One Champion Plaza, Stamford, CT 06921.
Brief description for the Index: **

NORTH CAROLINA SPECIAL WARRANTY DEED

THIS DEED made this 14th day of May, 1999 to be effective as of and from the 14th day of May, 1999, by and between

GRANTOR	GRANTEE
Champion International Corporation, a New York corporation One Champion Plaza Stamford, Connecticut 06921	Blue Ridge Paper Products Inc. a Delaware Corporation c/o KPS Special Situations Fund, L.P. 200 Park Avenue, 58th Floor New York, NY 10166

1073

The designation Grantor and Grantee as used herein shall include said parties, their successors and assigns, and shall include singular, plural, masculine, feminine or neuter as required by context.

WITNESSETH, that the Grantor, for a valuable consideration paid by the Grantee, the receipt of

APPENDIX F

AFFIDAVIT FOR LAND-DISTURBING ACTIVITIES IN HAYWOOD COUNTY, NC

APPENDIX G

LAND DISTURBING SURETY BOND

ATTACHMENT 5

LANDFILL NO. 6 SOLID WASTE PERMIT AND PROPERTY DESCRIPTION

Ronald H. Levine, M.D., M.P.H.
STATE HEALTH DIRECTOR

DIVISION OF HEALTH SERVICES
P.O. Box 2091
Raleigh, N.C. 27602-2091

CERTIFIED COPY OF SOLID WASTE PERMIT

I do hereby certify that the attached PERMIT is an exact and true copy of Permit No. 45-06.

O. W. Strickland
O. W. Strickland, Head
Solid & Hazardous Waste Management Branch
Environmental Health Section

CERTIFIED TRUE COPY
10 DAVIS
in accts
NC 28706

North Carolina
Wake County

I, Nell L. Sellers, a Notary Public for said County and State, do hereby certify that O.W. Strickland personally appeared before me this day and acknowledged the due execution of the foregoing instrument.

Witness my hand and official seal, this the 28th day of March, 1984.

(official seal)

Nell L. Sellers
Notary Public

NELL T. SELLERS NOTARY PUBLIC WAKE COUNTY, N.C.

My commission expires July 24, 1987.

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PERMIT NO. 43-06

DATE ISSUED 3/28/84

STATE OF NORTH CAROLINA
DEPARTMENT OF HUMAN RESOURCES
Division of Health Services
P.O. Box 2091 Raleigh 27602

SOLID WASTE PERMIT

CHAMPION PAPERS is hereby issued a permit to operate a SANITARY LANDFILL (No. 6 Areas A-C) located ON S.R. 1550 & I-40 IN HAYWOOD COUNTY, in accordance with Article 13B of the General Statutes of North Carolina and all rules promulgated thereunder and subject to the conditions set forth in this permit. The facility is located on the below described property.

BEGINNING on a concrete right of way monument at the point of intersection of the Southern right of way line of Interstate Highway 40, with the Southeastern right of way line of the New Thickety Road, said concrete right of way monument being located South 75 deg. 34 min. 14 sec. West 1683.01 feet from North Carolina Geodetic Survey "Station Culvert" have Y coordinate of 677542.47 and an X coordinate of 845996.22, said beginning point being further the Northwestern corner of the "First Tract" described in a deed to Champion International Corporation from Brantley M. Davis and wife, Gladys S. Davis, dated January 8, 1981, and recorded in Deed Book 321 at Page 158, in the Office of the Register of Deeds for Haywood County; runs thence from the beginning point thus established and with the Southern right of way line of Interstate Highway 40, 14 calls as follows: North 79 deg. 12 min. East 561.62 feet to a concrete right of way monument; North 25 deg. 06 min. East 36.88 feet to a concrete right of way monument; North 79 deg. 34 min. East 1207.83 feet to a concrete right of way monument; South 28 deg. 31 min. East 56.18 feet to a concrete right of way monument; North 79 deg. 30 min. East 268.26 feet to a concrete right of way monument; North 78 deg. 40 min. East 204.63 feet to a concrete right of way monument; North 76 deg. 18 min. East 309.93 feet to a concrete right of way

O. W. Strickland, Head
Solid & Hazardous Waste Management Branch
Environmental Health Section

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DHS Form 2677 (Rev. 1/82)
Solid & Hazardous Waste Management Branch

PERMIT NO. 43-06

DATE ISSUED 3/28/84

SOLID WASTE PERMIT

Property Description (Continued):

monument; North 35 deg. 22 min. East 94.51 feet to a concrete right of way monument; North 72 deg. 12 min. East 384.99 feet to a concrete right of way monument; North 69 deg. 25 min. East 255.85 feet to a concrete right of way monument; North 67 deg. 57 min. East 249.62 feet to a concrete right of way monument; North 67 deg. 41 min. East 154.48 feet to a concrete right of way monument; South 39 deg. 50 min. East 31.94 feet to a concrete right of way monument; and on a curve to the right with a radius of 5579.58 feet, an arc distance of 461.78 feet to a concrete right of way monument delineating the intersection of the Southern right of way line of Interstate Highway 40 and the Southern right of way line of the New Thickety Road; thence with the Southern right of way line of the New Thickety Road, six calls as follows: South 43 deg. 07 min. East 44.41 feet to an iron pipe; on a curve to the left with a radius of 285.69 feet, an arc distance of 393.72 feet to a point; North 55 deg. 55 min. East 102.55 feet to a point; North 8 deg. 0 min. West 22.27 feet to a point; North 55 deg. 55 min. East 190.14 feet to a point; and on a curve to the right with a radius of 642.29 feet, an arc distance of 95.58 feet to a point on said right of way line; thence leaving the Southern right of way line of the New Thickety Road and running with a hedgerow, the line of the property claimed by Carroll Smith, South 34 deg. 57 min. East 255.48 feet to a point; thence South 24 deg. 03 min. East, with a fence line and the line of the Claude Smith property, 459.74 feet to an iron pipe at a fence corner; runs thence South 3 deg. 42 min. West, generally with a fence and with the line of Thurman R. Robinson, and passing an iron pipe at 1587.42 feet, 1610.42 feet to the Northern margin of the Pigeon River; thence down the Pigeon River, ten calls as follows: South 82 deg. 06 min. West 338.03 feet to a point on the North Bank of the river, at the mouth of Sorrells Cove Branch; South 76 deg. 33 min. West 275.53 feet to an eight inch walnut on the North bank of the river; South 71 deg. 56 min. West 1057.69 feet to an eight inch leaning willow on the North bank of the river, where the channel of said river forks; South 59 deg. 45 min. West 77.79 feet to a point on the South margin of an island in the river; South 74 deg. 54 min. West 221.50 feet to a point on the Southern margin of said island in the river; South 63 deg. 29 min. West 172.99 feet to a point on the Southern margin of said island in the river; South 60 deg. 19 min. West 46.32 feet to a point on the South bank of said island in the river; South 08 deg. 33 min. West 40 feet to a point in the center of the main channel of the river; South 67 deg. 02 min. West 255.75 feet to a point in the main channel of the river; and South 55 deg. 46 min. West 170 feet to a point in the center of the main channel of the river; runs thence North 01 deg. 43 min. East 60 feet to a point on the Northern edge of the Pigeon River; thence with the North bank of the Pigeon River, twelve calls as follows: South 57 deg. 32 min. West 168.50 feet to an eighteen inch sycamore; South 43 deg. 22 min. West 354.67 feet to a point; South 73 deg. 36 min. West 196.84 feet to an eighteen inch sycamore; North 78 deg. 57 min. West 116.62 feet to a forked maple; South 85 deg. 37 min., West 50.33

PERMIT NO. 45-06

DATE ISSUED 3/23/84

SOLID WASTE PERMIT

Property Description (Continued):

feet to a six inch forked bean tree; South 69 deg. 24 min. West 213.22 feet to a twelve inch locust; South 78 deg. 47 min. West 117.36 feet to a twelve inch sycamore; North 88 deg. 45 min. West 83.07 feet to an eight inch sycamore; North 83 deg. 14 min. West 90.49 feet to a ten inch sycamore; North 81 deg. 52 min. West 192.91 feet to a twelve inch locust; South 89 deg. 16 min. West 142.72 feet to a twenty inch walnut; and South 87 deg. 45 min. West 113.37 feet to a point on the bank of said river, in the Eastern boundary line of the property of George H. Cogburn, Jr.; runs thence with the Eastern and Northeastern boundary line of the Cogburn property; three calls as follows: North 02 deg. 24 min. East 1434.14 feet to an iron pipe in a fence stump in a fence corner; North 33 deg. 04 min. West 752.69 feet to a point in a maple stump; and, generally with a branch, South 41 deg. 18 min. West 203.57 feet to an iron pipe in the center of said branch at the Easternmost corner of a tract of land conveyed by James L. Henderson and wife, to Casmer A. Bolniak and wife, by deed dated August 12, 1974, and recorded in Deed Book 270 at Page 423, Records of Haywood County; runs thence with the Northern and Northwestern boundary line of the Bolniak tract, four calls as follows: North 60 deg. 29 min. West 337.85 feet to an iron pipe in the center of a sixty foot private road right of way; North 60 deg. 03 min. West 57 feet to an iron pipe in the center of said private road right of way; South 29 deg. 47 min. West 201.58 feet to a hub; and South 14 deg. 11 min. West 155.06 feet to a hub in a fence line; thence leaving the Bolniak line, and running North 66 deg. 04 min. West 288.55 feet to an iron pipe on the Southeastern right of way line of the New Thickety Road: thence with said right of way, three calls as follows: on a curve to the left with a radius of 755.94 feet, an arc distance of 206.87 feet to an iron pipe; on another curve to the left with a radius of 465.63 feet, an arc distance of 258.76 feet to an iron pipe; and North 30 deg. East 83.72 feet to the place of BEGINNING, according to a survey by Webb A. Morgan, R.L.S., containing 235.051 acres.

PERMIT NO. 43-06

DATE ISSUED 3/28/84

SOLID WASTE PERMIT

Conditions of Permit:

1. This permit may be subject to review at an administrative hearing upon petition of anyone whose legal rights, privileges and duties may have been affected by the issuance thereof.

2. This permit shall not be effective unless the certified copy is filed in the register of deeds' office, in the grantor index under the name of the owner of the land in the county or counties in which the land is located. After recordation, the certified copy shall be returned to the Solid & Hazardous Waste Management Branch and shall have indicated on it the page and book number, date of recordation and registrar's seal.

3. The following requirements shall be met prior to receiving solid waste at the site:

   a. Site preparation shall be in accordance with construction plan.

   b. Site inspection shall be made by a representative of the Division of Health Services.

4. This solid waste disposal site is permitted to receive solid waste as defined in 10 NCAC 10C, .0101(31), except that hazardous waste, liquid waste and any other wastes that may pose a threat to the environment or the public health are prohibited from disposal at this site unless prior authorization is obtained from the Division of Health Services.

5. This permit is for construction according to plans prepared by Law Engineering Testing Co. dated January, 1983. Any modification or deviation from the approved plans shall be approved by the N.C. Solid and Hazardous Waste Management Branch.

6. Ground water monitoring wells are installed per the DHS monitoring well standard.

DHS Form 2871 (Rev. 1/82)
Solid & Hazardous Waste Management Branch

PERMIT NO. 43-06

DATE ISSUED 3/28/84

SOLID WASTE PERMIT

Conditions of Permit:

7. The northwest corner of area E shall be limited to 30' south of the existing stream unless the stream, after proper approval is obtained, is relocated so that it is outside landfill construction activity.

8. The groundwater and surface water sampling plan is adequate with the exception of the following items:

   1. Sampling frequency should be no less than annually.

   2. Parameters to be evaluated are:

      A. EPA Interim Primary Drinking Water Standards*

         Arsenic
         Barium
         Cadmium
         Chromium
         Fluoride
         Lead
         Mercury
         Nitrite (as N)
         Selenium
         Silver

         *Maximum allowable concentrations can be found in the May 19, 1980 Federal Register, Appendix III, page 33757.

      B. Groundwater Quality Parameters*

         Chloride
         Iron
         Manganese
         Sulfate
         Phenols

         *Allowable concentrations based on 1962 Drinking Water Standards and background water quality data.

PERMIT NO. 63-06

DATE ISSUED 7/28/86

SOLID WASTE PERMIT

Conditions of Permit:

C. Groundwater Contamination Indicators*

pH
Specific conductance
Elevation of groundwater surface
Total organic carbon
Total organic halogen
Total dissolved solids

*Allowable concentrations determined by background comparison, see Part 265.93(b) Appendix B.

Filed for registration
day of April 19 84
4:20 o'clock P.M and registered
in office of the Register of Deeds for
Haywood County, North Carolina.
This 2 day of April 19 84
in Book No. 349 on page 842
Charles L. Jewell
Register of Deeds
of Haywood County
By Jewell M. Justice
Asst.

EHS Form 2871 (Rev. 1/82)
Solid & Hazardous Waste Management Branch