Carmen Johnson
Fac/Perm/Co ID # 97-03 | Date 5/10/12 | Doc ID# DIN

Landfill Expansion/Permit Modification

Louisiana-Pacific Corporation
Roaring, River, North Carolina
Permit No. 97-03

Prepared for:

LOUISIANA PACIFIC CORPORATION

February 13, 2008

June 12, 2008

MEMORANDUM

To: Allen Gaither

From: Brian Wootton

Subject: Application for Permit to Construct
Louisiana-Pacific Corporation
Roaring River, NC
Industrial Landfill expansion
Wilkes County, NC
Hydrogeology Review
Permit No. 97-03
Document No. 4772

I have reviewed the Landfill Expansion /Permit Modification (dated July 7, 2007, the revised application dated February 13, 2008, and most recent supporting documentation submitted May 5, 2008), pertaining to hydrogeology for the proposed expansion of the landfill from 5 acres to 7 acres. The Water Quality Plan has been amended to abandon groundwater monitoring well, FA-1 and the continued sampling of existing groundwater monitoring wells FA-2, FA-3, FA-4, and existing surface water sampling point, "Site 4" (located 130 feet southwest of groundwater monitoring well, FA-3) on a semi-annual basis. Since these wells and sampling point have historically been sampled, no background sampling is necessary. The following constituents, Zinc and Boron have been added to the sampling program. The total constituents in the sampling program now include: Zinc, Boron, RCRA Metals, Chloride, Total Dissolved Solids, Specific Conductivity, pH, Turbidity, and Temperature. **The Study and supporting information meets the hydrogeological criteria required in the Rules [15A NCAC 13B .0500]; therefore, I have no objection to issuance of this portion to Permit to Construct based on these rules.**

***Prior to construction activities commencing, the Solid Waste Section requests the following information to be addressed from the permittee.**

Prior to construction of cell(s), all piezometers, ground-water monitoring wells, and borings, located in the proposed cell(s), shall be properly abandoned in accordance with 15A NCAC 2C.0113(b)(1), titled "Abandonment of Wells".

a. In areas where soil is to be undercut, abandoned wells should not be grouted to pre-grade land surface, but to the proposed base grade

b. surface to prevent having to cut excess grout and possibly damaging the wells.

c. Well abandonment records for each piezometer, ground-water monitoring well and boring shall be certified by the permit holder's geologist and submitted to the Solid Waste Section in accordance with 15A NCAC 02C.0114(b).

*Note: These well abandonment conditions noted above have also been stated in the letter from me written May 16, 2008 (Document No. 4115) to Louisiana Pacific Corporation.

Construction Conditions: (Include these conditions stated below, in the Permit to Construct)

The owner's geologist shall examine the cell excavation and note any pertinent geologic features exposed during the construction process and shall notify the Solid Waste Section Hydrogeologist of these findings prior to placement of any liner materials.

The owner's geologist shall be in the field to supervise any additional ground-water monitoring well installations. Any modifications to the approved water quality monitoring plan require approval by the Section Hydrogeologist. Documentation of all changes to the approved plan shall be submitted with the well construction records.

For each well constructed, a well construction record, well schematic, boring log, and a description of well development activities shall be submitted to the Section within 30 days of well completion.

After well completion, provide a scaled map depicting the location of the new ground-water monitoring wells; existing ground-water monitoring wells, and abandoned ground-water monitoring wells.

Please contact me with any questions or comments. I can be reached at (919) 508-8524 or by e-mail.

Sincerely,

Brian Wootton

Brian Wootton

cc: Ed Mussler, Solid Waste Section
Hugh Jernigan, Solid Waste Section

NCDENR
North Carolina Department of Environment and Natural Resources
Dexter R. Matthews, Director
Division of Waste Management
Michael F. Easley, Governor
William G. Ross Jr., Secretary

May 16, 2008

Mr. Kent Nilsson, P.E.
RMT North Carolina, Inc.
30 Patewood Drive, Suite 100
Greenville, SC 29615-3535

RE: Landfill Expansion/ Permit Modification
Louisiana-Pacific Corporation
Roaring River, NC
Industrial Landfill expansion
Wilkes County, NC
Hydrogeology Review
Permit No. 97-03
Tracking # 4542

Dear Mr. Nilsson:

I have reviewed the Landfill Expansion /Permit Modification (dated July 7, 2007, the revised application dated February 13, 2008, and most recent supporting documentation submitted May 5, 2008), pertaining to hydrogeology for the proposed expansion from 5 acres to 7 acres. **The Study and supporting information meets the hydrogeologic criteria required in the Rules [15A NCAC 13B .0500]; therefore, I have no objection to issuance of this portion to Permit to Construct based on these rules.**

Any piezometers, ground-water monitoring wells, and borings, located in proposed cell to be constructed, may be abandoned now or after a Permit to Construct permit is issued by the Solid Waste Section. Please adhere to the following conditions:

Prior to construction of cell(s), all piezometers, ground-water monitoring wells, and borings, located in the proposed cell(s), shall be properly abandoned in accordance with 15A NCAC 2C.0113(b)(1), titled "Abandonment of Wells".

a. In areas where soil is to be undercut, abandoned wells should not be grouted to pre-grade land surface, but to the proposed base grade surface to prevent having to cut excess grout and possibly damaging the wells.

b. Well abandonment records for each piezometer, ground-water monitoring well and boring shall be certified by the permit holder's geologist and submitted to the Solid Waste Section in accordance with 15A NCAC 02C.0114(b).

==========

If you have any questions please call me at 919-508-8524.

Sincerely,

Brian Wootton

Brian Wootton
Hydrogeologist
Solid Waste Section

cc:	Phil Sparks	Louisiana Pacific Corp
	Ed Mussler	Solid Waste Section
	Alan Gaither	Solid Waste Section
	Central File	Solid Waste Section

NCDENR
North Carolina Department of Environment and Natural Resources
Dexter R. Matthews, Director
Division of Waste Management
Michael F. Easley, Governor
William G. Ross Jr., Secretary

October 10, 2007

Mr. Kent Nilsson, P.E.
RMT North Carolina, Inc.
30 Patewood Drive, Suite 100
Greenville, SC 29615-3535

RE: Landfill Expansion/ Permit Modification
Louisiana-Pacific Corporation
Roaring River, NC
Industrial Landfill expansion
Wilkes County, NC
Additional Information Request
Permit No. 97-03

Dear Mr. Nilsson,

The above referenced Landfill Expansion /Permit Modification (from an existing 5 acre footprint to a landfill that covers approximately 7 acres) is being reviewed by the Solid Waste Section (SWS) for hydrogeologic concerns. There are several items in the application that require clarification and/or revision before the hydrogeologic review can be completed. Please respond to the following questions and comments.

RMT Report
Section 1.3 Site Location
Section 1.4 Expanded Landfill Footprint
Sheet 1 of 5 Overall Site Plan
Sheet 2 of 5 Grading Plan
Sheet 5 of 5 Phase Progression Plan

Section 1.3 states in-part: "*The proposed landfill expansion is to be constructed entirely on property owned by LP*".
Has the proposed two (2) acre expansion area been previously approved for Site Suitability by the Solid Waste Section (SWS) according to .0503(1)?

Page 2, Section 1.4 (Expanded Landfill Footprint) states in-part: "*The expanded footprint will still be within the area covered by the existing groundwater monitoring system*".

1646 Mail Service Center, Raleigh, North Carolina 27699-1646
Phone 919-508-8400 \ FAX 919-733-4810 \ Internet http://wastenotnc.org
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Please provide modified updated maps that depict clearly the five (5) acre existing landfill and the expansion of the two (2) additional acres. The maps also need to show location of all ground-water monitoring wells, springs, buffers, location of present and historical boring, piezometers, (from previous hydrogeological studies). **Reference: .0504(2)(a)(b)**.

Also, the maps (Sheets) submitted in the application do not show the location of the property boundaries. Modify the maps by depicting the property boundaries. If the property boundaries are located beyond the edges of the drawings, then state how far the boundaries are located from the proposed foot print.

Additional Requirements:

Provide a copy of the most recent permit (reissued 2002) and a copy of the current water quality monitoring plan.

Provide recent and historical groundwater monitoring data – in graph (trend) format tables. Please highlight any exceedances of groundwater 2L standards. Also include surface water sampling if previously required.

Provide information pertaining to seasonal high groundwater in the existing footprint area and the expansion area according to **.0503(2)(d)(i)**. This information must be confirmed by several years of historical on-site groundwater levels (via piezometers and wells in order to obtain an accurate seasonal high groundwater elevation and base grades. Also modify Sheet 3 of 5 (Cross Sections) by depicting the seasonal high groundwater elevation and proposed base grades on the cross sections.

==========

Please note the comments and questions mentioned above and provide additional information and revisions as needed. If you have any questions, or wish to schedule a meeting to discuss the items referenced in this letter, please call me at (919) -508-8524.

Sincerely,

Brian Wootton

Brian Wootton
Hydrogeologist
Solid Waste Section

cc:

	Ed Mussler	Solid Waste Section
	Larry Frost	Solid Waste Section
	Ellen Lorscheider	Solid Waste Section
	Central Files	

RMT

• ENVIRONMENT • ENERGY • ENGINEERING

February 13, 2008

Mr. Brian Wootton
Hydrogeologist, Solid Waste Section
North Carolina Department of Environment and Natural Resources
1646 Mail Service Center
Raleigh, North Carolina 27699-1646

Subject: Landfill Expansion/Permit Modification
Louisiana-Pacific Corporation
Roaring River, NC
Permit No. 97-03

Reference: Additional Information Request, October 10, 2007

Dear Mr. Wootton:

The purpose of this letter is to respond to questions and comments that were made in your above referenced letter. Your comments, shown in **bold**, are followed by our response or clarification:

Section 1.3 states in-part: *"The proposed landfill expansion is to be constructed entirely on property owned by LP."* Has the proposed two (2) acre expansion area been previously approved for Site Suitability by the Solid Waste Section (SWS) according to .0503(1)?

The landfill permit was originally issued on January 7, 1981 prior to the promulgation of Title 15A, Subchapter 13B of the North Carolina Administrative Code. (A copy of the permit application, dated November 19, 1980 is attached). The area identified for siting of the landfill was permitted without detailed footprint limits other than the waste would placed south of an existing service road and to a maximum elevation of "190 feet". It is unknown how the datum was assumed for that elevation relates to Mean Sea Level elevations.

Page 2, Section 1.4 (Expanded Landfill Footprint) States in-part: "The expanded footprint will still be within the area covered by the existing groundwater monitoring system". Please provide modified updated maps that depict clearly the five (5) acre existing landfill and the expansion of the two (2) additional acres. The maps also need to show location of all groundwater monitoring wells, springs, buffers, location of present and historical boring, piezometers, (from previous hydrogeological studies).

I:\WPGVL\PJT\00-71345\35\L007134535-004.DOC

Sheet 2 of 5, Grading Plan, has been revised to include the footprint of the existing landfill as well as the footprint of the 2-acre expansion.

...the maps (Sheets) submitted in the application do not show the location of the property boundaries. Modify the maps by depicting the property boundaries. If the property boundaries are located beyond the edges of the drawings, then state how far the boundaries are located from the proposed footprint.

As shown on the attached map, the landfill footprint is at least 360 feet from the property boundary. The property boundary shown is based on Wilkes County, North Carolina tax records as of September, 2007.

Provide a copy of the most recent permit (reissued 2002) and a copy of the current water quality monitoring plan.

A copy of the most recent permit, dated November 5, 2002 has been attached to this document. The groundwater monitoring plan was provided Section 3.6 of the *Landfill Design Plan* dated November 24, 1997. That entire document is also attached. The groundwater monitoring requirement was later amended in a letter from Cheryl Marks dated October 27, 1999. A copy of the letter is provided.

Provide recent and historical monitoring data – in graph (trend) format tables. Please highlight any exceedances of groundwater 2L standards. Also include surface water sampling if previously required.

Charts that summarize water level elevation and water quality data are attached to this report.

Provide information pertaining to seasonal high groundwater in the existing footprint area and the expansion area...Also modify Sheet 3 of 5 (Cross Sections) by depicting the seasonal high groundwater elevation and proposed be grades on the cross sections.

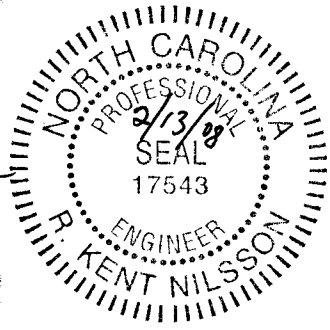
Based on recent monitoring of the existing wells and implied groundwater contours developed by Joyce Engineering Inc, (*Monitoring Well Installation and Analysis*; August 31, 1999), RMT has modified Sheet 3 to show the estimated high groundwater elevation. The data indicate that the base grade of the landfill will maintain the minimum 4 foot separation between waste and the water table in accordance with .0505(7)(a). The modified drawings are attached.

During a meeting held on-site on October 18, 2007 with Jason Watkins and Larry Frost, additional information was requested of RMT's Travis Tarbet related to landfill operations. Therefore revised Operation and Maintenance Procedures are also attached to this document.

We trust this provides the information needed at this time. Please feel free to contact me if you should need any further clarification.

Sincerely,

RMT North Carolina, Inc.



R. Kent Nilsson, P.E.
Project Manager

Attachments:

Landfill and Property Boundaries
Solid Waste Permit No. 97-03, November 5, 2002
Landfill Design Plan, Joyce Engineering, Inc., November 24, 1997
Groundwater Monitoring Data
Monitoring Well Installation and Analysis, Joyce Engineering, Inc., August 31, 1999
Engineering Drawings (Sheets 1 – 5)
Operation and Maintenance Procedures
Letter from NC DENR, October 27, 1999 (Water Quality Monitoring at the Industrial Landfill

cc: Phil Sparks (LP), Leo Tramm (RMT)
Central Files

ABITIBI

Abitibi Corporation, Building Products Division
P.O. Box 98, Highway 268, Roaring River, N.C. 28669
Phone 919—696-2751

November 19, 1980

Mr. J. Gordon Layton
N. C. Department of Human Resources
Division of Health Services
P. O. Box 2091
Raleigh, North Carolina 27602

Dear Mr. Layton:

Regarding your letter of September 22, 1980 outlining the final requirements for approval of our flyash disposal site, enclosed is the information required. This information includes:

1. An erosion control plan.
2. Final contour map.
3. Two cross sections.
4. A copy of the deed for the Abitibi-Price property.
5. The information in Section .0112 of the Solid Waste Management Rules.

The three conditions listed in your letter as being conditions of site approval have been met.

It is my understanding that we now have submitted all required information. We would appreciate anything that could be done to expedite approval of the final permit.

Respectfully,

C. B. Sherman

bp

Enclosures

cc: W. C. Heirtzler
C. F. Shealy
S. J. Myers
R. W. Murdock

ABITIBI-PRICE CORPORATION

Roaring River, North Carolina

FLYASH DISPOSAL SITE PERMIT APPROVAL

Erosion Contour Plan

All areas outside of the actual disposal site that have been cleared during construction of the site will be planted in fescue grass to prevent erosion. The service road bordering the north side of the site will be constructed of crushed rock.

The flyash that will be disposed of in the site sometimes contains hot embers that could conceivably start a fire in dead or dormant grass. Because of this, we do not intend to plant grass within the actual site. Therefore, erosion control of the cleared site will be accomplished by the dike along the side of the site acting as a sediment basin and trapping any soil that might be eroded within the site.

When the flyash in the site reaches the final grade shown on the cross-section drawings, it will be covered with soil. Fescue grass will then be planted. It is our intent to do this in stages, as sufficiently large areas of the site are filled, rather than waiting until the entire site has been filled.

Final Contour Map and Cross-Section Drawings

A contour map of the site and surrounding area is enclosed. The area shaded in yellow is the actual disposal site. The locations of the two cross-sections are indicated on this map.

As the map shows, a dike has been constructed at the northeast corner of the site. This was done following your recommendation. The top of the dike is at 190' elevation. A 36" culvert has been installed to prevent the accumulation of any water behind this dike.

The dike along the south side of the site is now at approximately 175' elevation. The purpose of this dike is to prevent the flyash from getting into the intermittent stream. The dike has been located to keep all fly-ash a minimum of fifty feet from this stream.

It is our intent to eventually bring the top of this dike to 190' elevation.

In a recent telephone conversation, you expressed some concern over this dike and whether or not the state dam safety laws would apply. As you suggested, I contacted Mr. Doug Miller, the dam safety engineer out of the Winston-Salem office. He visited the site and viewed the dike. He stated that the dike would not by any stretch of the imagination be considered a dam.

Two cross-section drawings showing existing grade and final elevations are enclosed.

Property Deed

A copy of Abitibi-Price's deed for the property on which the plant and the flyash site are located is enclosed.

Information Required by Section .0112

1. Not applicable.

2. The material that will be disposed of is flyash from a steam-generating boiler fueled by various wood residues, including bark and sawdust. The flyash has been tested and found not to be toxic, reactive, corrosive, or ignitable. The results of this testing were sent to you earlier. The anticipated quantity, when the new boiler becomes fully operational and is fueled entirely by wood residue, is 89 cubic yards per day.

3. The flyash will be transported from its collection site at the boiler to the disposal site in a Dempster Dinosaur truck. This vehicle has a large enclosed box in which the flyash is carried. Upon reaching the disposal site the flyash will be dumped by tilting the box. Any one of several pieces of plant mobile equipment will be used for spreading the flyash. This equipment includes a bulldozer and front-end loaders. Covering of the flyash with soil and planting grass in this soil will be done by outside contractors.

4. Mr. Roger Meade, Steam Plant Supervisor at Abitibi-Price in Roaring River, will be responsible for operation and maintenance of this site.

5. There is no projected use of the disposal site after it has been filled. As mentioned earlier, the flyash will be covered with soil. Grass will then be planted. Once this is done, the area will be allowed to revert to its "natural condition" i.e. whatever weeds, brush, trees, etc. voluntarily grow on the site will not be disturbed.

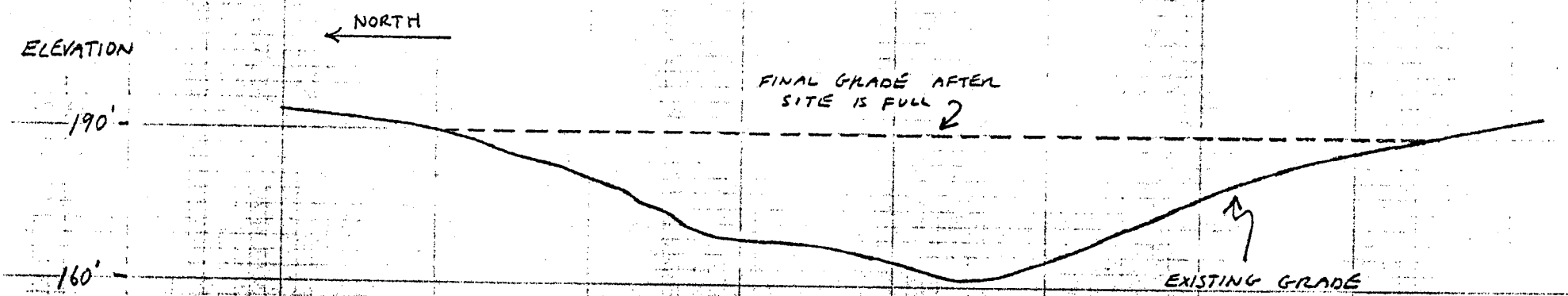
6. The calculated volume of this disposal site is 66,778 cubic yards. The flyash will be generated at the rate of 89 cubic yards per day. Thus, the site will have a capacity of 750 days.

7. The disposal site will be operated in the following manner: The flyash will be hauled from the boiler to the disposal site as the Dempster truck is filled. This would occur several times per day. The flyash will be dumped into the site. The dumped flyash will be levelled and spread as required to stay at or below the 190' elevation. Dumping will be started at the east end of the site, and will continue in a westerly direction as the site is filled. As areas of the site are filled, the flyash will be covered with soil and the area will be planted in grass.

ABITIBI-PRICE CORPORATION

ROARING RIVER, NORTH CAROLINA

FLYASH DISPOSAL SITE - CROSS-SECTION # B

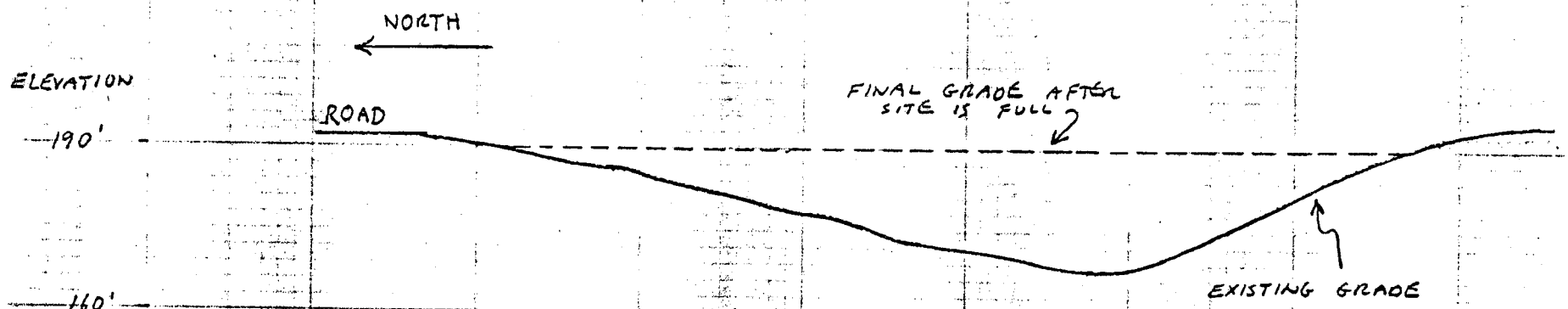


SCALE 1" = 30'

ABITIBI - PRICE CORPORATION

ROARING RIVER, NORTH CAROLINA

FLYASH DISPOSAL SITE - CROSS-SECTION #A



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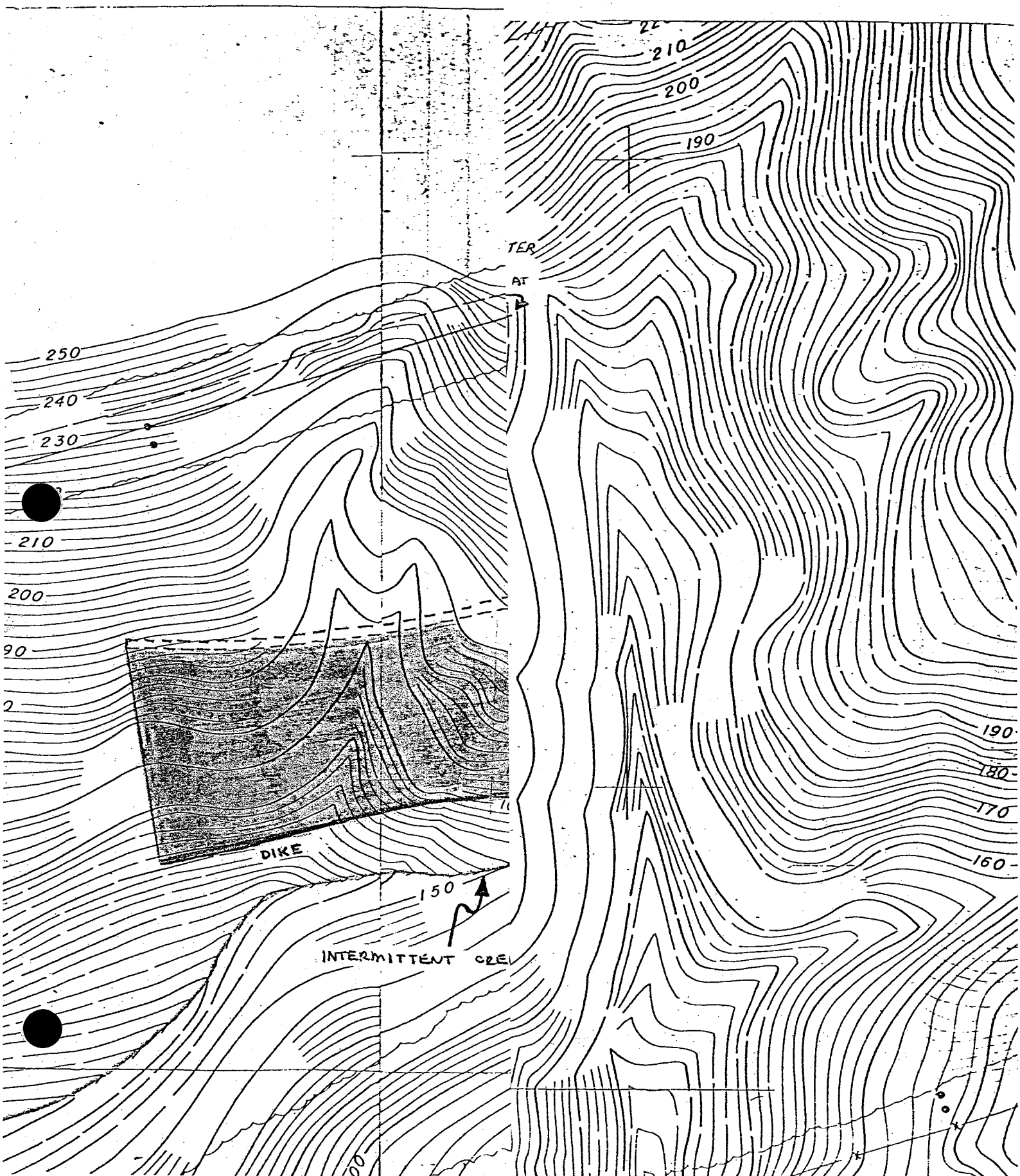
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LEGEND

LOUISIANA-PACIFIC PROPERTY BOUNDARY - APPROXIMATE

ASH LANDFILL BOUNDARY

NOTES

PROPERTY BOUNDARY BASED ON WILKES COUNTY, NC TAX RECORDS AS OF SEPTEMBER 2007

0 1000 2000

Feet

Map Document: (P:\Hydro\71345\ArcGIS9\LandfillLocOnProperty.mxd)
12/12/2007 -- 9:14:10 AM

RMT®

LOUISIANA-PACIFIC CORPORATION
ROARING RIVER, NORTH CAROLINA
LANDFILL PERMIT RENEWAL

LANDFILL AND PROPERTY BOUNDARIES

Drawn By:	TLH
Approved By:	TAT
Project No.:	00-71345.35
File No.	
Date:	DECEMBER 2007

North Carolina
Department of Environment and Natural Resources

Division of Waste Management

Michael F. Easley, Governor
William G. Ross Jr., Secretary
Dexter R. Matthews, Director

November 5, 2002

Melanie Byrd
ABTco, a LP Company
PO Box 98
Roaring River, NC 28669

Re: ABTco Industrial Landfill
Permit No. 97-03
Wilkes County

Dear Ms. Byrd:

The Solid Waste Section has completed review of the design plan for the referenced landfill. Enclosed is Solid Waste Permit No. 97-03 allowing vertical expansion of the existing landfill in accordance with the approved plan.

If you have any questions or comments regarding the permit or conditions, please contact me at (919) 733-0692, ext. 259.

Sincerely,

Sherri Coghill
Permitting Engineer
Solid Waste Section

cc: Joyce Engineering
Brent Rockett, DWM
Wendy Simmons, DWM

North Carolina
Department of Environment and Natural Resources

Division of Waste Management

Michael F. Easley, Governor
William G. Ross Jr., Secretary
Dexter R. Matthews, Director

INDUSTRIAL SOLID WASTE LANDFILL PERMIT

ABTco, a LP Company

is hereby issued a PERMIT to CONSTRUCT and OPERATE an INDUSTRIAL SOLID WASTE LANDFILL FACILITY

located off Hwy 268, Roaring River, Wilkes County, North Carolina, in accordance with Article 9, Chapter 130A, 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 and described by the legal description of the site or the property map contained within the approved application.

James C Coffey

James C. Coffey, Chief
Solid Waste Section

1646 Mail Service Center, Raleigh, North Carolina 27699-1646
Phone: 919-733-0692 \ FAX: 919-733-4810 \ Internet: www.enr.state.nc.us/

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ATTACHMENT 1

Approved Documents

PART I: INDUSTRIAL LANDFILL FACILITY
PART II: INDUSTRIAL LANDFILL UNIT

1. ABTco LANDFILL DESIGN PLAN PREPARED BY JOYCE ENGINEERING, INC., SUBMITTED NOVEMBER 24, 1997.

ATTACHMENT 3
Conditions of Permit

PART I: INDUSTRIAL LANDFILL FACILITY
GENERAL CONDITIONS

1. This permit shall not be effective unless the certified copy is filed in the Register of Deeds office and indexed in the grantor index under the name of the owner of the land in the county or counties in which the land is located. The certified copy of the permit, affixed with the Register's seal and the date, book, and page number of recording shall be returned to the Division of Waste Management (the Division).

2. When this property is sold, leased, transferred or conveyed, 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.

3. The permit to operate is valid for a five-year period and shall expire on November 1, 2007. Modifications to the facility may be required in accordance with the rules in effect at the time of review. This facility may receive solid waste that is generated by ABTco, a LP Company, as described in the permit application.

4. The approved plan for this facility is described in Attachment 1, "Approved Documents". Where discrepancies exist, the most recent submittal and these Conditions shall govern. Some components of the approved plan are reiterated in these Conditions.

5. This permit is not transferable.

6. A copy of this permit, the approved plans, and all pertinent records shall be maintained on-site at the facility and made available to the Solid Waste Section (SWS) upon request.

7. The owner/operator is responsible for obtaining any and all permits and approvals necessary for the development of this project including approval from appropriate agencies for a General or Individual NPDES Stormwater Discharge Permit and Sedimentation and Erosion Control.

PART II: INDUSTRIAL LANDFILL UNIT
OPERATIONAL CONDITIONS

8. This permit approves the operation of ABTco Landfill Vertical Expansion as well as the on-site environmental management and protection facilities as described in the approved plans.

9. All sedimentation and erosion control measures will be conducted in accordance with the Sedimentation Control Act codified at 15 NCAC 4. Native vegetation shall be established on the completed landfill.

10. The solid waste management units within this facility shall conform to all operating requirements described in the approved plans and 15A NCAC 13B .0505, except that daily soil cover is not required.

11. Areas which will not have additional waste placed on them for 12 months or more, but where final termination of operations has not occurred, shall be covered with a minimum of one foot of soil cover.

12. After final termination of disposal operations at the site, or major part thereof, or upon revocation of a permit, the final cover system shall be installed. Final Closure Plans shall be submitted to the Division at least 90 days prior to implementation.

13. Ground water quality at this facility is subject to the "Classifications and Water Quality Standards Applicable To The Groundwater of North Carolina", 15A NCAC 2L. This includes, but is not limited to provisions for detection monitoring, assessment, and corrective action. Compliance will be determined with ground water monitoring at the landfill.

MONITORING AND REPORTING

14. Ground water monitoring at this unit shall be as described in the approved monitoring plan. A readily accessible unobstructed path shall be cleared and maintained so that four-wheel drive vehicles may access monitoring well locations at all times.

15. A field log book which details all development, sampling, repair, and all other pertinent activities associated with each monitoring well shall be kept as part of the permanent facility record.

16. Records of all ground water analytical data shall be kept as part of the permanent facility record.

17. Ground water monitoring wells shall be sampled at least semi-annually according to the specifications outlined in the approved water quality monitoring plan and the current policies and guidelines of the Section in effect at the time of sampling.

18. Reports of the analytical data for each water quality sampling event shall be submitted to the Section within 60 days of the respective sampling event. Analytical data shall be submitted in a manner prescribed by the Section.

19. The permittee shall maintain a record of the amount of solid waste received at the facility, compiled on a monthly basis. Scales shall be used to weigh the amount of waste received.

20. On or before August 1 of each year, the permittee shall report the amount of waste received (in tons) at this facility and disposed of in the landfill units to the Solid Waste Section, on forms prescribed by the Section. This report shall include the following information:
    a. The reporting period shall be for the previous year, beginning July 1 and ending on June 30.
    b. The amount of waste received and landfilled in tons, compiled on a monthly basis by county or transfer station of origin and by specific waste type if diverted to a specific unit within the permitted facility; and
    c. The completed report shall be forwarded to the Regional Waste Management Specialist for the facility. A copy of the completed report shall be forwarded to the County Manager of each county from which waste was received.

21. If, during the operational life of the facility, it becomes apparent that the operations are impacting ground water adversely, the Solid Waste Section will require landfilling activities to cease and closure of the operating unit(s).

SOLID WASTE ENGINEERING
AND MANAGEMENT

Joyce Engineering, Inc.
436 Spring Garden Street
Greensboro, North Carolina 27401
Tel. (910) 230-1992
Fax (910) 230-1998

November 24, 1997

Mr. Mike Blosser
ABTco, Inc.
Highway 268, P.O. Box 98
Roaring River, North Carolina 28669

Re: Landfill Design Plan-Final Draft Report
JEI Project 364.00, Task 01

Dear Mr. Blosser:

I am enclosing one copy of the final draft of the report and drawings for your review. We have incorporated Erich Burke's comments into this final draft following his review of the second draft last Friday, and are prepared to mail three copies to DENR on Wednesday unless we receive additional comments from you or Mr. Burke.

I have marked this copy as draft; however, if you have no comments, remove the sticker on the cover page for the final report copy. If you have changes, please let us know as soon as possible so that we can complete our submittal to the state. If appropriate, we will send you a copy of the changed pages to insert into this ring binder. Also, we can send additional copies of the final report at your request.

Please feel free to fax or call with any comments or suggestions.

Sincerely,
JOYCE ENGINEERING, INC.

Nancy E. Marshall, P.E.
Senior Project Engineer

Enclosure

C: Janis D. McHargue, P.E.

Prepared for:

ABTco, Inc.
Highway 268, P. O. Box 98
Roaring River, North Carolina 28669
JEI Project No. 364.00, Task 01

ABTco, Inc.
Landfill Design Plan

November 24, 1997

Prepared by:

Joyce Engineering, Inc.
436 Spring Garden Street
Greensboro, North Carolina 27401
(910) 230-1992

Table of Contents

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1.0 INTRODUCTION

ABTco, Inc., Siding Division is located south of State Route 268, west of Roaring River, North Carolina. The site location is indicated on an excerpt of the USGS topographic quadrangle for Roaring River (see Figure 1). The ABTco facility produces building products from hardwood and softwood. These raw materials are ground into wood chips, and then formed into hardboard and fiber cement siding products. Waste wood chips are used as fuel to fire a boiler, and the resulting ash is landfilled on site in an unlined land disposal unit.

ABTco's wood ash monofill began operation in 1981. This landfill unit is regulated and permitted by the North Carolina Department of Environment and Natural Resources (DENR), Solid Waste Section, as an industrial landfill. It was originally permitted on January 7, 1981, and is identified as Permit No. 97-03. The Solid Waste Section has notified ABTco that a landfill design plan must be submitted to satisfy the requirements of the North Carolina Solid Waste Management Rules, specifically Rule .0503(2)(d)(ii), if the industrial landfill is to continue operations after January 1, 1998. The required components of this landfill design plan are given in a letter dated June 2, 1997 from James C. Coffey to Erich Burke of ABTco (attached in Appendix I, Miscellaneous Correspondence), and are as follows:

- A Construction and Operational Plan, illustrating the vertical expansion of the waste footprint established as of January 1, 1998, shown in one-year phases;
- A Water Quality Monitoring Plan, demonstrating compliance with groundwater standards established under 15A NCAC 2L; and
- A Closure Plan, designed to ensure closure in compliance with the above referenced groundwater standards.

The intent of this report and the accompanying drawings is to illustrate the proposed vertical expansion of ABTco's industrial landfill in a manner that satisfies the above requirements. The existing site conditions, including the waste footprint as of January 1, 1998, are shown on Drawing No. 1. The construction and operational plan is illustrated by Drawing Nos. 2 and 3, and by narrative discussion in Section 2.0 following this introduction. The water quality monitoring plan is described in Section 3.0 of this report and Drawing No. 4, while the closure plan consists of Section 4.0 and Drawing Nos. 5 and 6.

2.0 CONSTRUCTION AND OPERATIONAL PLAN

2.1 Introduction

The existing landfill is located northwest of the production facility at the ABTco site. There is no development immediately adjacent to the disposal area. The landfill was constructed within a northeast-to-southwest trending valley after extensive grading activities occurred. Earth berms constructed on the south and west sides of the facility serve to contain the ash and to provide access around the perimeter of the disposal area. The berms reach a maximum height of about sixty feet at the southwest end of the facility. Ash has been placed to the top of the berms throughout most of the disposal area. The one exception is at the west end, where there remains a large concave unfilled area. About 3 ½ acres of undeveloped land drain toward the landfill from the upper part of the hill. Other areas adjacent to the landfill drain to natural drainageways leading away from the landfill.

The approximate limits of ash are indicated on Drawing No. 1, Existing Site Conditions, and encompass approximately 6.0 acres. This is the footprint that is proposed for vertical expansion. In support of this request for an expansion, five one-year phases are shown on the accompanying drawings, as are the final closure contours and associated construction details.

2.2 Waste Characteristics

Approximately 604 cubic yards of wood ash are generated each month. The ash is fairly lightweight, weighing approximately 1,100 pounds per cubic yard. No direct strength testing of the ash was performed during this analysis. However, values of up to 45 degrees for the angle of internal friction have been documented in literature. In addition, cohesion in the ash increases over time with cementation within the ash fill. This process is evident in the field from observation of the older ash fill areas. Laboratory tests conducted to determine the chemical constituents of the ash are discussed in the Water Quality Monitoring Plan, Section 3.0 of this report.

ABTco is producing another byproduct or excess material from a new production facility at the Roaring River plant. The material is a fiber and cement based product typically consisting of the following ranges of materials:

Sand (Silica)	40% to 65%
Portland Cement	30% to 50%
Cellulose	1% to 10%
Clay	1% to 10%.

Laboratory analyses (TCLP) were performed previously on a single composite sample of the material. The data showed no organics, no herbicides or pesticides, and very low metals concentrations. In correspondence from DENR/Division of Waste Management dated March 31, 1997, the Division determined that this waste material can be classified as recovered material if it

is used by ABTco for roadbed stabilization, structural fill or similar applications. If the production operations generate more of this fiber-cement byproduct than can be reused on site, ABTco may opt to dispose of the material in the landfill. Refer to Appendix II for information regarding the fiber and cement based waste product.

2.3 Waste Placement and Operations

The ash is transported from the manufacturing facility in trucks to the on-site landfill. The material is spread and compacted with conventional earth moving equipment. A sprinkler system is provided to control air-borne particles, and can be used for fire-fighting purposes in the event that the ash contains particles that are still smoldering.

2.4 Vertical Expansion Area

The proposed grades for expansion of the landfill in five one-year phases are shown on Drawing Nos. 2 and 3. In 1998 and 1999, landfilling will continue at the western end of the disposal area, in the concave area that is created by the existing earthen berm around the perimeter of the fill. After that time, exterior fill slopes will be constructed at 3 feet horizontal to 1 foot vertical (3H:1V) to allow landfilling to continue above the grade of the existing berm until the final contours are reached (see the Closure Plan and Drawing No. 5). The proposed final contours will enable the maximum storage potential of the site to be attained. It is understood that this permit request is for a five year period, and that the facility is to be constructed so that it can be closed at any point during its active life. If constructed to the proposed maximum contours shown on Drawing No. 5, the landfill's available capacity is 91,500 cubic yards, which could serve ABTco's needs for approximately 12.5 years.

2.5 Erosion and Sediment Control Plan

The erosion and sediment control plan has been prepared to serve anticipated development during the first five years of the vertical expansion. At the end of five years, the erosion and sediment control plan will need to be revised as needed to serve disturbed areas of the subsequent expansion. The following erosion control devices are proposed:

Grass-lined Channels: Grass-lined channels will be provided at the perimeter of the landfill to convey runoff away from the active areas. Temporary liners will be provided as needed to stabilize channels subject to erosion prior to the establishment of channel vegetation. Runoff from disturbed areas will be diverted to one of the sediment control features discussed below. Runoff from off-site areas will be diverted so that it does not flow across the landfill surface. Concentrated runoff will be conveyed to the toe of the landfill via permanent slope drains strategically located on the landfill sides. From the toe, runoff will be directed to natural drainageways at the site.

Silt Fences: Temporary silt fences will be used as needed at the perimeter of disturbed areas not served by a sediment trap. Silt fences are proposed to be used when the disposed ash has reached

the top of the existing berms, but has not been placed to a height above the berms such that a sediment trap is required. For example, silt fences will be erected during the latter part of phase two (the second year), but will be replaced by a sediment trap at the appropriate point in time during phase three (the third year).

Sediment Trap: A temporary sediment trap is proposed to be constructed at the southwest corner of the disposal area as shown on the drawings. The location provides a convenient point for the collection of sediment-laden runoff before it is conveyed to the toe of the landfill. Runoff from disturbed areas as well as runoff from off-site areas will flow to the trap, which will provide in excess of 1800 cubic feet of storage for each disturbed acre draining to it. Accumulated sediment is to be removed from the trap when the sediment has reached a depth of one foot. The sediment trap spillway is sized to accommodate the peak flow resulting from a 25-year storm.

Outlet Stabilization Structure: Riprap aprons will be located at the outlets of the three slope drains to minimize potential scour.

Surface stabilization: Surface stabilization will be accomplished with vegetation and mulch as specified in the vegetation plan.

The complete erosion and sediment control plan has been included as Appendix III to this report.

2.6 Slope Stability Analysis

The landfill side slopes consist of soil fill embankments on the south and west sides, cut slopes and natural slopes on the north and east, and proposed ash fill slopes above the top of the embankment. The grading and soil embankment constructed was completed in about 1981. As discussed above, soil fill depths range up to approximately 60 feet. Soil fill slopes range between 1.2H:1V in the south central portion of the fill embankment, to approximately 2H:1V at the southwest corner. The existing slopes are mostly well vegetated. Slope drains are in place, and more are planned, for stormwater management.

The current height of the ash fill and stockpiled soils in the eastern end of the site is approximately 6 feet above the embankment, at a slope of approximately 5 percent. At the western end of the landfill, the depth of the ash fill is approximately 26 feet below the top of the soil embankment. As discussed above, proposed fill slopes for the ash are 3H:1V. The proposed maximum fill height is approximately 28 feet above the top of the embankment. The final slope on the top of the landfill is approximately 5 percent.

Slope stability analyses were performed for the static condition for a representative "worst case" section through the existing and proposed final slopes of the landfill. The modeling was performed using the computer program, "PC Stabl 5M." The representative slope section, indicated on Drawing No. 5, and the assumptions, calculations and computer output are provided in Appendix IV.

Prior to performing the analysis, one soil test boring was drilled through the embankment to verify the depth of fill at that location, and soil conditions within the embankment. No water was encountered in the borehole to the termination depth of 50 feet. The fill soils primarily consist of silty sand and sandy silt, with Standard Penetration Resistances (N-values) ranging between 8 and 23 blows per foot (bpf). One zone of loose silty sand was identified at a depth of approximately 23.5 to 25 feet with a N-value of 5 bpf. A soft zone of clayey silt (N-value of 6 bpf) was identified at the interface of the fill and residual soils. A copy of the boring log is included in Appendix IV.

An undisturbed sample was collected in the clayey silt between the depths of 37 and 39 feet. A consolidated undrained triaxial shear test was performed on the undisturbed sample by Trigon Engineering Consultants, Inc. of Greensboro, North Carolina. The results of the triaxial shear test indicated a cohesion (c) of 800 pounds per square foot (psf), and an angle of internal friction (ϕ) of 16 degrees (see Appendix V). Soil parameters were assumed for the other fill soils, the residual soil, and the ash, using literature values and empirical knowledge. The assumed strength parameters used in the stability analysis are as follows:

Soil Type	**ϕ (degrees)**	**c (psf)**
Fill: Ash	36	100
Fill: Silty Sand	34	100
Residual?: Clayey Silt	16	800
Residual: Sandy Silt	28	300

References for typical soil strength parameters are provided in Section 5.0 of this report. A total strength analysis was performed since groundwater appears to be at a depth of at least 10 feet below the original ground surface at the toe of the embankment.

Based on the results of the stability analyses, the embankment appears stable under static loading for the existing conditions and proposed landfill development. Using the available information, the mode of failure for the existing and proposed slopes is a face failure through the silty sands in the steep slope. The increased height of the ash fill behind the embankment does not have a significant adverse affect on the stability of the slope, given the light weight of the ash and the strength characteristics for the ash and the existing soils assumed in this analysis. The existing vegetation on the slope will help to stabilize the face against failure.

The factor of safety determined for the slope was less than desirable. The calculated factor of safety for the critical failure surface is 1.22, versus a preferable safety factor of 1.3 or higher. This is an indication that the slope appears stable but that the "margin of error" is smaller than the commonly accepted value. Changing conditions within the slope such as saturation (e.g., due to a leak in the water line installed at the top of the embankment), alteration of the toe of the slope, or denuding of the vegetation could create instability in the surface of the slope.

3.0 WATER QUALITY MONITORING PLAN

3.1 Site and Geologic Description

The general topography of the area is indicated on an enlarged USGS topographic quadrangle (see Figure 1). The landfill was constructed along the side slope of a major northeast to southwest trending valley. Elevations the topographic highs surrounding the site are approximately 1100 feet (MSL) to the north, and 1140 feet (MSL) to the northwest. Elevations in the lower end of the valley below the landfill range to approximately 970 feet (MSL).

Geologically, the site is located on the northwestern edge of the Inner Piedmont belt, between a series of ancient thrust faults known as the Brevard Fault zone. This long linear zone is often referred to as the Brevard belt. The lithologies present, as mapped by Rankin, et al (1972), are of the Precambrian age Crossnore plutonic-volcanic group, and the Ashe Formation, both largely composed of schists and gneisses.

Regarding landfill operations, there do not appear to be any unusual geologic conditions that would complicate the environmental monitoring or other day-to-day management of the facility. There are no known active surficial fault systems in the region (Howard, et al, 1978) that would affect the stability of filling. The Brevard Fault zone, a major tectonic feature of the southern Appalachians, has not been active since the Paleozoic era.

Regarding hydrogeology, there do not appear to be any geologic features such as diabase dikes which could potentially complicate the flow of groundwater in the area. Rankin, et al (1972) have not mapped any such units in the area, nor has any diabase float been observed on site.

3.2 Groundwater Flow Directions

Groundwater flow patterns most likely mimic the pre-development topography. An approximation of that topography is indicated on Drawing No. 4. Based on the original site contours and knowledge of groundwater flow patterns in the Piedmont physiographic province, groundwater from beneath the majority of the landfill flows south towards the bottom of the valley, then flows west towards an unnamed tributary to the Yadkin River. Based on groundwater elevations obtained from two monitoring wells on site, inferred groundwater contours were developed for the landfill area and added to Drawing No. 4.

3.3 Groundwater Monitoring Network

Two groundwater monitoring wells were installed for the ABTco landfill in November 1989. The locations were specified by the Solid Waste Section prior to installation. One upgradient well (FA-1) is located at the upper end of the main northeast-southwest hollow (see Drawing No. 4). The second well (FA-2) is located in the same hollow near the toe of the soil embankment, approximately 450 feet downgradient from FA-1. Wells FA-1 and FA-2 are 28 and 29 feet in depth, respectively. Both

wells have 10-foot screens installed in residual soils. Well Completion Records and correspondence related to the well network are included in Appendix VI. Recorded depths to water have been on the order of 20 to 24 feet in well FA-1, and 12 to 13 feet in FA-2.

On November 14, 1996, Mr. Bobby Lutfy of the Solid Waste Section visited the site to inspect the groundwater monitoring wells. Following Mr. Lutfy's site visit, he stated in a letter dated November 18, 1996, "Pending the evaluation of the boring logs and the next set of sampling results, the existing monitoring system appears generally adequate." Mr. Lutfy commented on the possible influence of surface water on the upgradient well, the proximity of the well to waste, and the shallow depth of the well screen, but has not found the upgradient well to be inadequate. Regarding the downgradient well, Mr. Lutfy stated that, "The downgradient well appears to be located in an excellent location. It appears this well may be screened slightly deeper than is ideal, however otherwise it appears to be a properly designed monitoring well." Mr. Lutfy's visit resulted in a request for additional information, which was supplied by Mr. Erich Burke, P.E. of ABTco on December 30, 1996. As of this date, ABTco has not received further written comment on the monitoring network from the Solid Waste Section.

Given the original and existing site contours and the homogeneous nature of the ash placed in the landfill, the current downgradient well is in an adequate location to detect potential impacts to groundwater. The well is positioned in the hollow downgradient from the earliest portion of the fill area, and is approximately 60 feet from the waste boundary. If future monitoring results indicate that an adverse impact to groundwater has occurred, ABTco may discuss the possibility of adding to or replacing the current upgradient well with the Solid Waste Section. The purpose of a new upgradient well would be to confirm background concentrations for the facility. If an adverse groundwater impact downgradient from the facility is confirmed, ABTco. will discuss with the Section the need for an additional downgradient well, located further down the valley and west-southwest of well FA-2.

3.4 Historic Monitoring Data

In a letter dated October 12, 1987, ABTco was instructed to use the Section's standard list of 23 groundwater monitoring parameters when they began monitoring at their facility. The groundwater monitoring wells have been sampled 16 times beginning with the first event in April 1990. The wells primarily have been sampled for metals, non-metallic inorganic parameters, and organic indicator parameters, but the specific target analyte list has varied over the course of the monitoring program. Summaries of the inorganic analytical data are provided in Appendix VII. Organic parameters have been included on the target analyte lists for special sampling events, but have not been detected during previous sampling events. The analytical results have been submitted to the Solid Waste Section after each sampling event by ABTco.

The concentrations of six metals (arsenic, cadmium, chromium, iron, lead, and manganese) have been reported sporadically above the groundwater quality standards established under 15A NCAC 2L (the "2L standards") in the upgradient and/or downgradient monitoring wells. Concentrations

in the downgradient well are generally comparable with or below those in the upgradient well. Also, trends towards increasing concentrations with time are not evident in the data for either of the wells. Review of the data does not indicate an impact to groundwater from the facility.

3.5 Waste Characterization Relative to 2L Standards

Monitoring of the landfill is required to demonstrate compliance with the groundwater quality standards established under 15A NCAC 2L. Therefore, the intent of the waste characterization included herein is to determine the relationship between the chemical characteristics of leachate generated from the waste (i.e., the ash) and 2L groundwater standards. Previous Toxicity Characteristic Leachate Procedure (TCLP) analyses on the ash included testing for metals, non-metallic inorganic compounds, and organic compounds. The results indicated that organic compounds were not present in leachate generated during the procedure. Thus, the focus of the laboratory testing performed as part of this investigation was to identify the inorganic parameters present in ash leachate that could result in exceedences of 2L standards.

A TCLP was performed on a sample of ash by Enviro-Tech Mid-Atlantic in November 1997. The TCLP analysis list included the inorganic parameters that have current or proposed 2L standards. Those parameters are: antimony, arsenic, barium, beryllium, cadmium, chloride, chromium, cobalt, copper, cyanide, fluoride, iron, lead, manganese, mercury, nickel, nitrate, selenium, silver, sulfate, thallium, vanadium, and zinc. The laboratory achieved levels of detection below existing 2L standards for all parameters. Laboratory detection limits were at or below proposed 2L standards for all parameters except antimony, cobalt and thallium. A summary of the TCLP analyses and the recent analytical results are provided in Appendix VIII.

Of the 24 parameters on the target analyte list, twenty have been reported present in leachate generated from the ash during TCLP analyses. Of these, eight parameters (antimony, barium, chloride, cobalt, fluoride, silver, and vanadium) have been reported present above existing or proposed 2L standards. Twelve parameters were either not detected or were at low concentrations that do not appear to have the potential for producing concentrations in groundwater that would exceed 2L standards. The remaining parameters are present in concentrations that are close enough to 2L standards that we recommend including them in the monitoring program.

3.6 Proposed Monitoring Program

Based on the analyses discussed above in Section 3.5, we recommend the following routine monitoring program for the ABTco ash monofill. Parameters with existing or proposed 2L standards that were not present or were present in low concentrations during TCLP analyses should be excluded from the list of target analytes. In addition, organic compounds should be omitted from the target analyte list since they have not been detected during previous analyses of the ash.

The recommended monitoring list is: antimony, barium, beryllium, cadmium, chloride, cobalt, fluoride, manganese, nickel, nitrite, silver, and vanadium. Since total concentrations of inorganic

parameters can be substantially increased when suspended particles are included in the sample, we recommend that turbidity measurements be made in the field at the time of sampling. In addition, we recommend that the sampling procedure be modified if turbidity measurements are substantially and consistently higher than a target turbidity value of 5 NTU or less. The recommended monitoring frequency is semiannual.

4.0 CLOSURE PLAN

4.1 Background

Because the industrial landfill is projected to operate as a vertical expansion after January 1, 1998, the landfill will require final cover that is acceptable to the Solid Waste Section. ABTco proposes to close the landfill in accordance with the procedures described in this Closure Plan. The proposed maximum final fill contours and associated drainage features are provided on Drawing No. 5, and a typical cross-section of the cap is shown on Drawing No. 6.

4.2 Soil Testing

Laboratory analyses were performed for two on-site soils and two soil composites to determine the suitability of the materials for use during construction of the closure cap. Two potential borrow soils were identified on site. One borrow source, designated as the "stockpile," is located on the eastern end of the ash fill. The stockpile soil consists of brown micaceous silty coarse to fine sand with cobbles. The second potential borrow source, identified in the laboratory report as "borrow," is located on the hill to the north of the landfill. This potential borrow soil consists of red-brown coarse to fine sandy slightly clayey silt. In addition to these soils, one composite mixture was prepared of the stockpile soil and wood ash, and and one composite was prepared of the stockpile soil with wood ash and sludge from the on-site treatment plant.

The laboratory tests consisted of Standard Proctor compaction tests and flexible walled permeability tests. The compaction tests were performed first to establish the moisture-density relationships of the soils and soil composites. Using those test results, test specimens were prepared at densities ranging between 96 and 99 percent of the Standard Proctor maximum dry densities for the materials, with moisture contents of 1.7 to 5.2 over the optimums established for those samples.

The laboratory results for the borrow and stockpile soils indicated remolded hydraulic conductivity values of 1.5×10^{-7} cm/sec and 5.6×10^{-6} cm/sec, respectively. The two composite samples were prepared as follows: (1) 50 percent stockpile soil and 50 percent ash, by volume; and (2) 50 percent stockpile soil, 30 percent ash, and 20 percent sludge, by volume. The laboratory results for the composite samples indicated remolded hydraulic conductivity values on the order of 10^{-6} cm/sec. Based on these results, the on-site soils or composites similar to those tested will be suitable for construction of the barrier layer in the cap. Laboratory results are included in Appendix V.

4.3 Final Cover Design

The North Carolina Solid Waste Management Rules do not provide specific performance requirements for caps over industrial landfills. Given the relatively innocuous waste characteristics of the wood ash being disposed in the landfill, particularly when compared to municipal solid waste (MSW), ABTco is proposing a cap section that is no more stringent than the regulatory minimum cap (RMC) used by the Solid Waste Section for closure of unlined MSW landfills. The proposed cap section consists of a 12-inch low permeability layer of the soil/ash mixture, a 12-inch erosion layer, and vegetative cover.

ABTco will construct a low permeability soil or soil/ash cap over the landfill once the available disposal capacity is reached. Any of the materials discussed in Section 4.2 would be suitable for cap construction. However, at this time, ABTco is proposing to use a 50-50 percent mixture (by volume) of the stockpile soil and wood ash. The hydraulic conductivity of that mixture was 3.4×10^{-6} cm/sec when tested in the laboratory. Use of the soil/ash mixture will enable ABTco to make better use of the site by disposing of additional waste at the facility. An intermediate cover layer is not proposed given the ease with which the ash can be graded to provide a smooth working surface for placement of the cap, and the desire to avoid an unnecessary loss of disposal capacity. A 12-inch erosion layer of unspecified soil or soil amended with sludge is proposed above the low permeability layer.

EPA's Hydrologic Evaluation of Landfill Performance computer program (HELP3 Model) was used to compare the performance of ABTco's proposed cap section with the RMC. The RMC section consists of 18 inches of compacted soil with a permeability of less than or equal to 1×10^{-5} cm/sec, 6 inches of topsoil, and vegetative cover. Average infiltration through the RMC cap section was calculated to be 8.37 inches, or 18.45 percent of an average annual rainfall of 45 inches.

The 12-inch erosion layer in the proposed cap was modeled as a vertical percolation layer consisting of moderately compacted silts and sands (USCS Classification ML, soil texture #22). The low-permeability layer was modeled first as a barrier layer and then as a vertical percolation layer. The hydraulic conductivity used in the model was the value (3.4×10^{-6} cm/sec) obtained from laboratory testing of the proposed soil/ash mixture.

The results from the HELP3 Model analyses indicated an average annual infiltration through the proposed cap to be 8.3 inches or less with an average annual rainfall of 45 inches, which is at least equivalent to infiltration rates through the RMC. Output from the HELP3 program is provided in Appendix IX.

4.4 Cap Construction

All construction and seeding activities will be carried out in accordance with the "North Carolina Erosion and Sediment Control Planning and Design Manual". Appropriate construction quality assurance activities will be conducted to document that the cover is constructed in substantial accordance with the performance standard discussed herein.

5.0 REFERENCES

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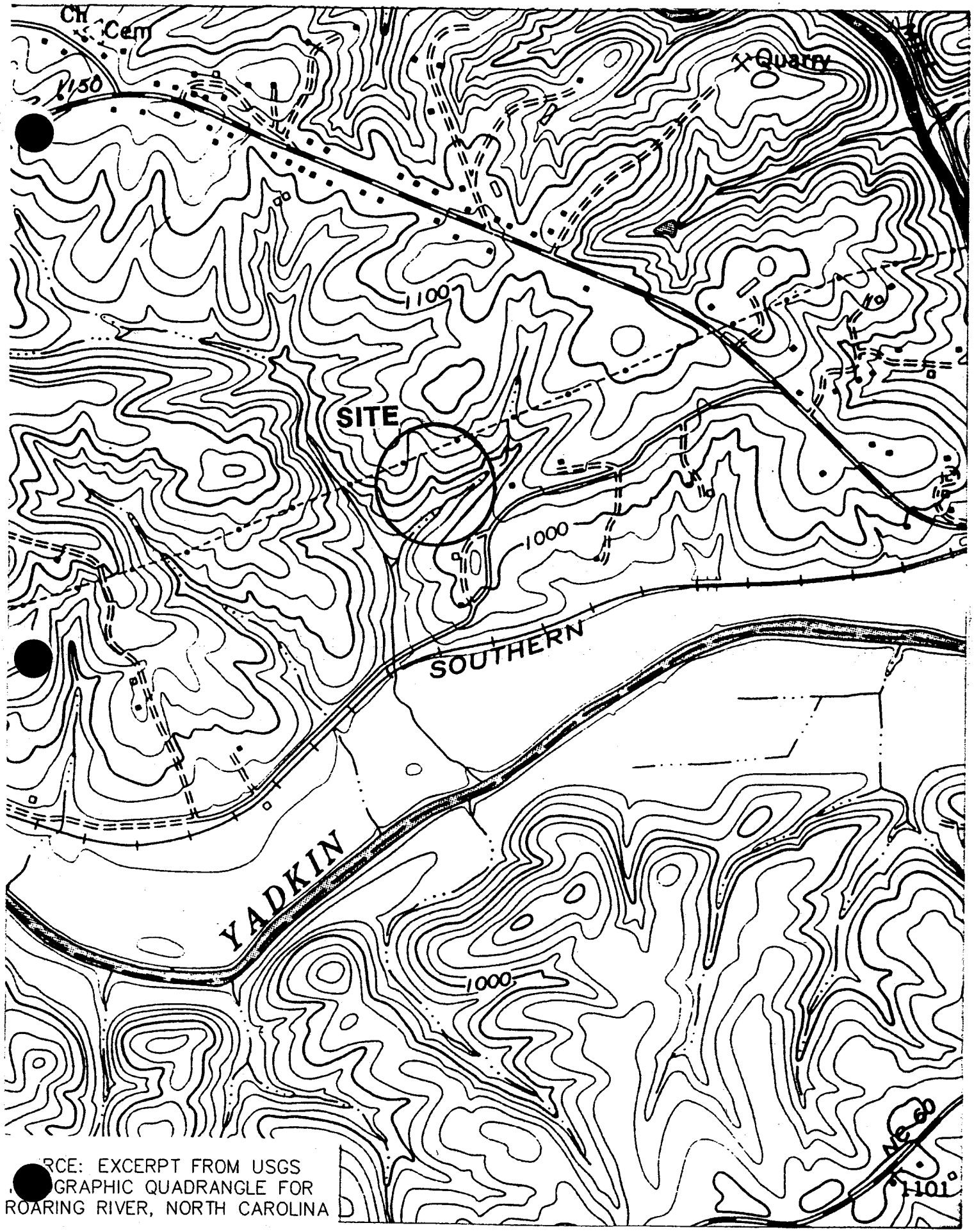

RCE: EXCERPT FROM USGS
GRAPHIC QUADRANGLE FOR
ROARING RIVER, NORTH CAROLINA

FIGURE 1	JOYCE ENGINEERING INC.	SCALE 1"=1000'	PROJECT NO. 364.01	ABTCo INDUSTRIAL LANDFILL SITE LOCATION MAP 11/17/97

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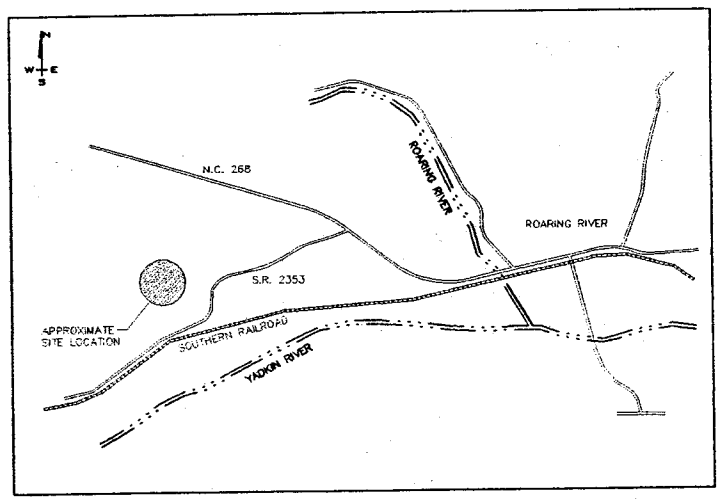
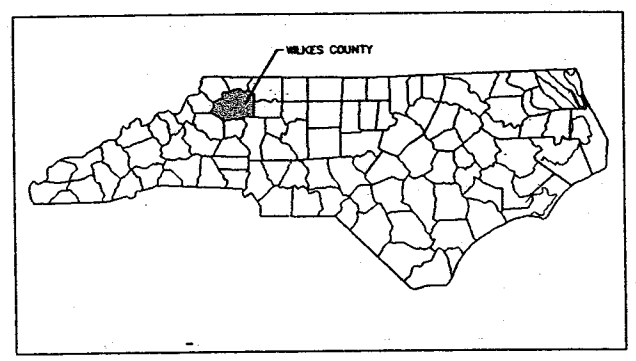
ABTCO
ABT BUILDING PRODUCTS

LANDFILL CLOSURE DESIGN PLAN



VICINITY MAP



STATE & COUNTY LOCATION MAP

DRAWING NO.	TITLE
1	EXISTING SITE CONDITIONS
2	ANNUAL PHASES OF DEVELOPMENT
3	ANNUAL PHASES OF DEVELOPMENT
4	INFERRED GROUNDWATER CONTOURS
5	CLOSURE PLAN
6	DETAILS

DRAWING INDEX

PREPARED FOR:

ABTCO
ABT BUILDING PRODUCTS
HWY. 268, P.O. BOX 98
ROARING RIVER, NORTH CAROLINA 28669

NOVEMBER, 1997

PREPARED BY:

JOYCE ENGINEERING, INC.
436 SPRING GARDEN STREET
GREENSBORO, NC. 27401
(910) 230-1992 FAX: (910) 230-1998

TOPOGRAPHIC SURVEY FOR

ABTCO
ROARING RIVER PLANT

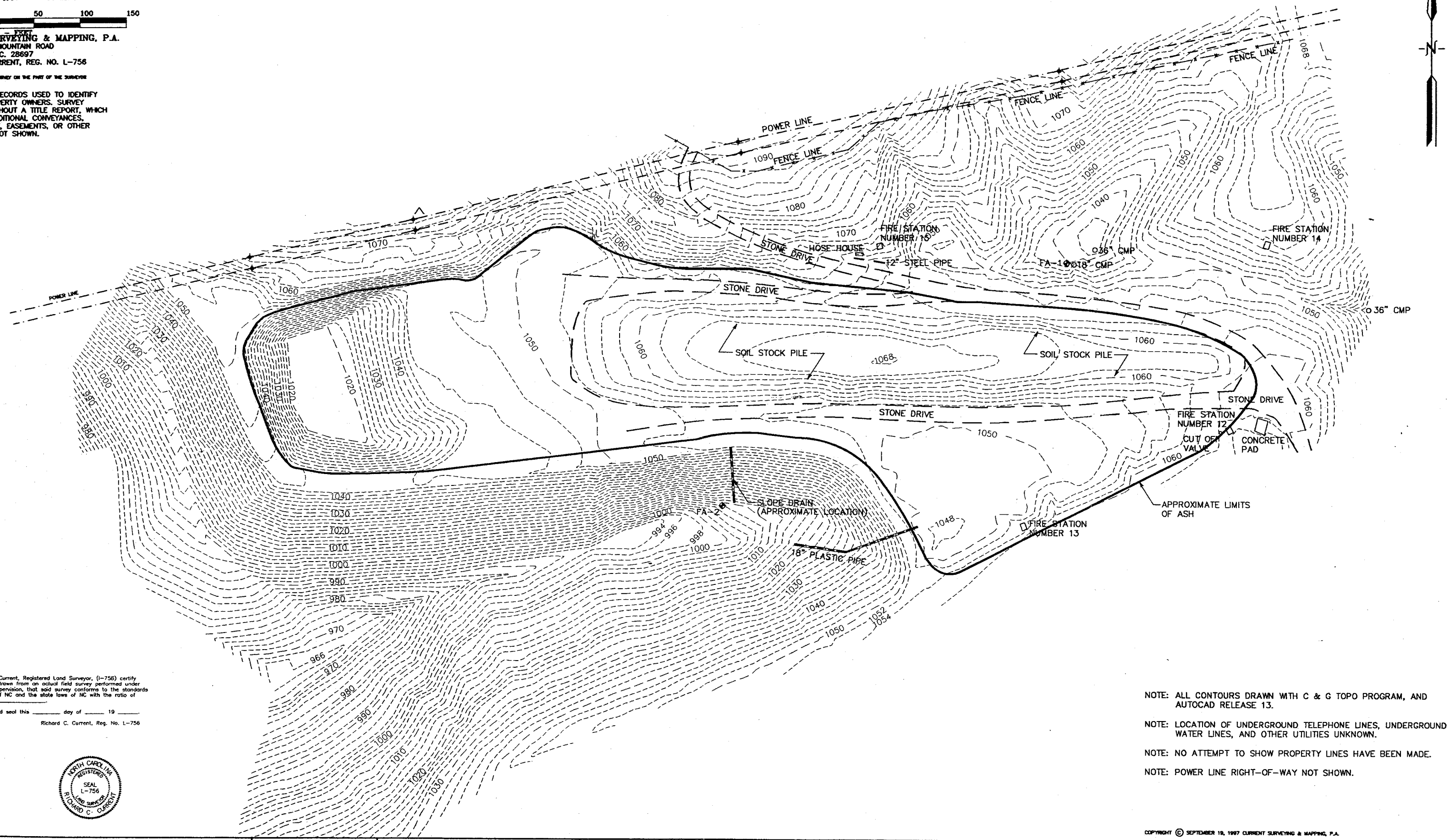
ROCK CREEK TOWNSHIP, WILKES COUNTY, N.C.
SEPTEMBER 19, 1997 SCALE: 1" = 50'

50 0 50 100 150

SURVEYING & MAPPING, P.A.
1353 BRUSHY MOUNTAIN ROAD
WILKESBORO, N.C. 28697
RICHARD C. CURRENT, REG. NO. L-756

ANY LIABILITY FOR THIS SURVEY ON THE PART OF THE SURVEYOR IS SOLELY TO ABTCO

CURRENT TAX RECORDS USED TO IDENTIFY ADJOINING PROPERTY OWNERS. SURVEY PERFORMED WITHOUT A TITLE REPORT, WHICH MAY REVEAL ADDITIONAL CONVEYANCES, RIGHTS-OF-WAY, EASEMENTS, OR OTHER RESTRICTIONS NOT SHOWN.



I, Richard C. Current, Registered Land Surveyor, (L-756) certify that this map was drawn from an actual field survey performed under my direction and supervision, that said survey conforms to the standards of Land Surveyors of NC and the state laws of NC with the ratio of precision is 1: _____

Witness my hand and seal this _____ day of _____ 19 _____

Richard C. Current, Reg. No. L-756

NORTH CAROLINA REGISTERED SEAL L-756 LAND SURVEYOR RICHARD C. CURRENT

NOTE: ALL CONTOURS DRAWN WITH C & G TOPO PROGRAM, AND AUTOCAD RELEASE 13.

NOTE: LOCATION OF UNDERGROUND TELEPHONE LINES, UNDERGROUND WATER LINES, AND OTHER UTILITIES UNKNOWN.

NOTE: NO ATTEMPT TO SHOW PROPERTY LINES HAVE BEEN MADE.

NOTE: POWER LINE RIGHT-OF-WAY NOT SHOWN.

COPYRIGHT © SEPTEMBER 19, 1997 CURRENT SURVEYING & MAPPING, P.A.

NO	REVISIONS AND RECORD OF ISSUE	BY	CK	APP	DATE

DESIGNED J.D.
DRAWN CADD/S.F.
CHECKED J.D.
APPROVED
DATE 11/17/97

JOYCE ENGINEERING, INC.

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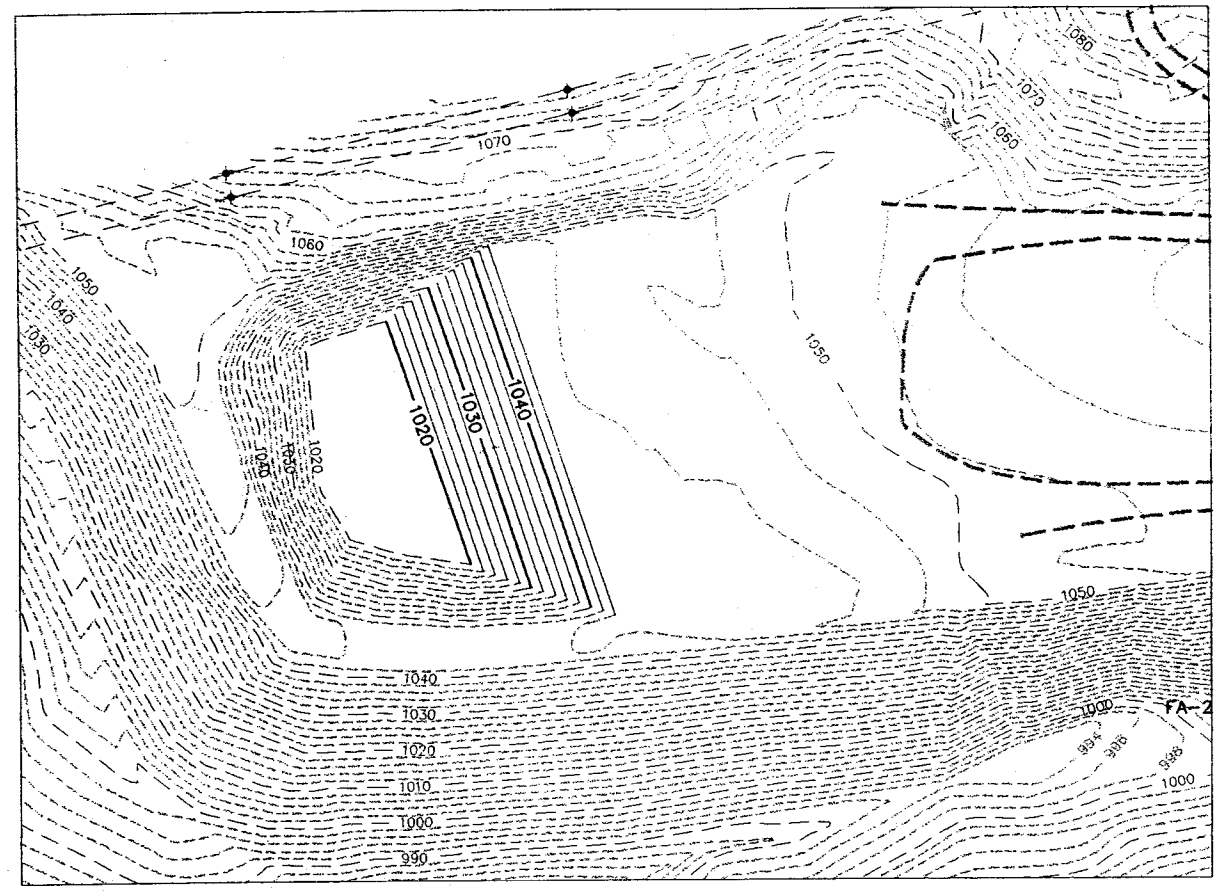
SCALE 1"=100'

PROJECT NO. 364.01

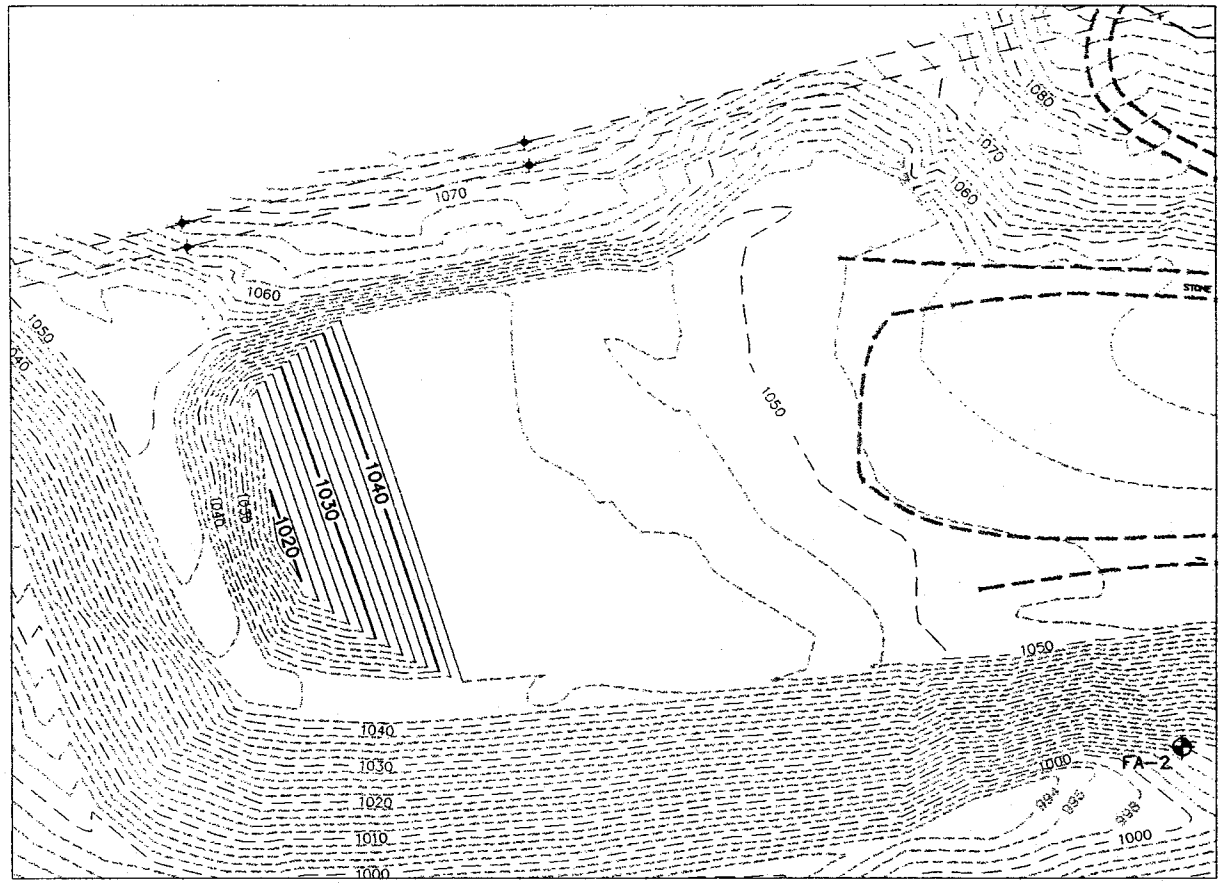
ABTCO - ABT BUILDING PRODUCTS
ROARING RIVER, NORTH CAROLINA

EXISTING SITE CONDITIONS

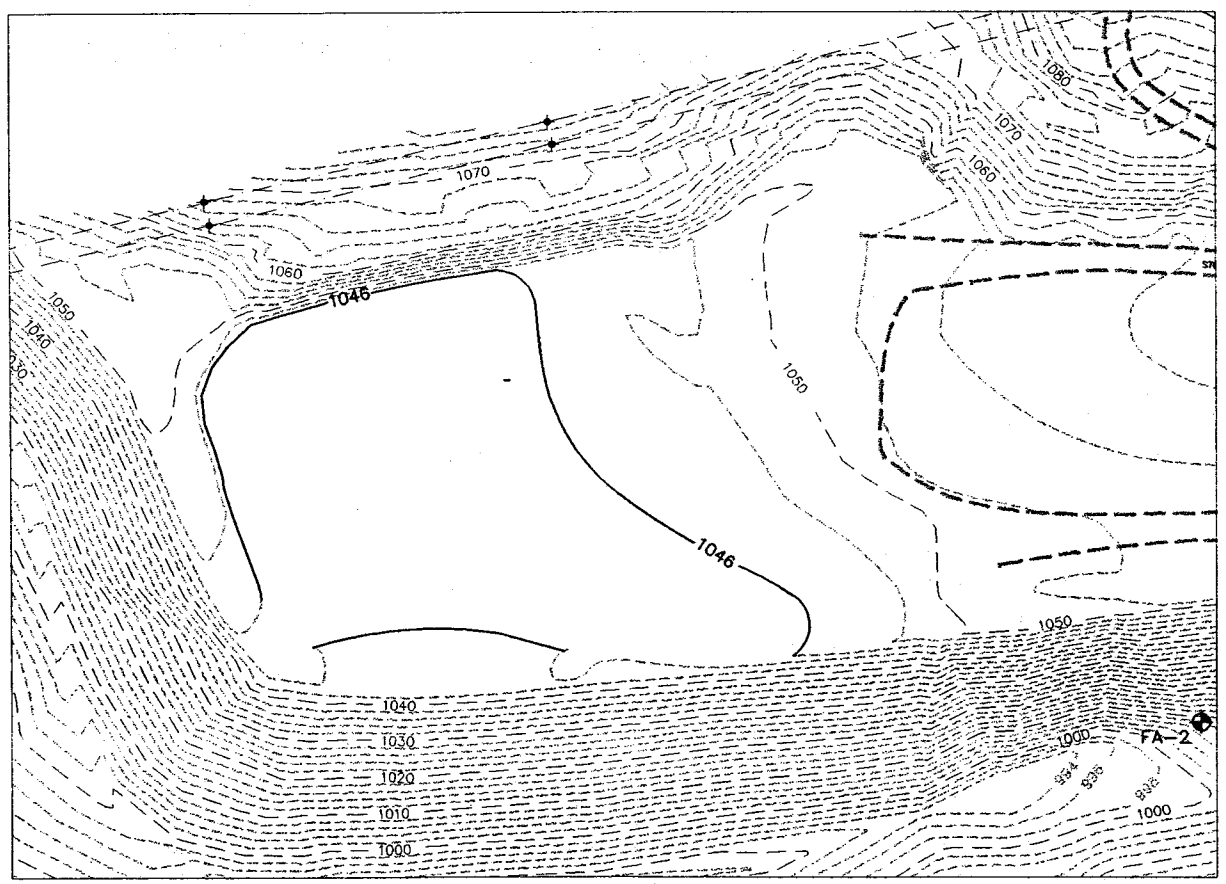
DRAWING NO. 1



GRADES AS OF JAN. 1, 1998



PHASE 1 (END OF 1998)



PHASE 2 (END OF 1999)

LEGEND

EXISTING CONTOUR — — — 1050 — — —

PROPOSED CONTOUR ——— 1056 ———

EXISTING MONITORING WELL FA-2

60 0 60 120

SCALE:1"=60'

DATE	REVISIONS AND RECORD OF ISSUE	NO	BY	CK	APP

DESIGNED J.D./S.F.
DRAWN CADD/S.F.
CHECKED J.D.
APPROVED
DATE 11/17/97

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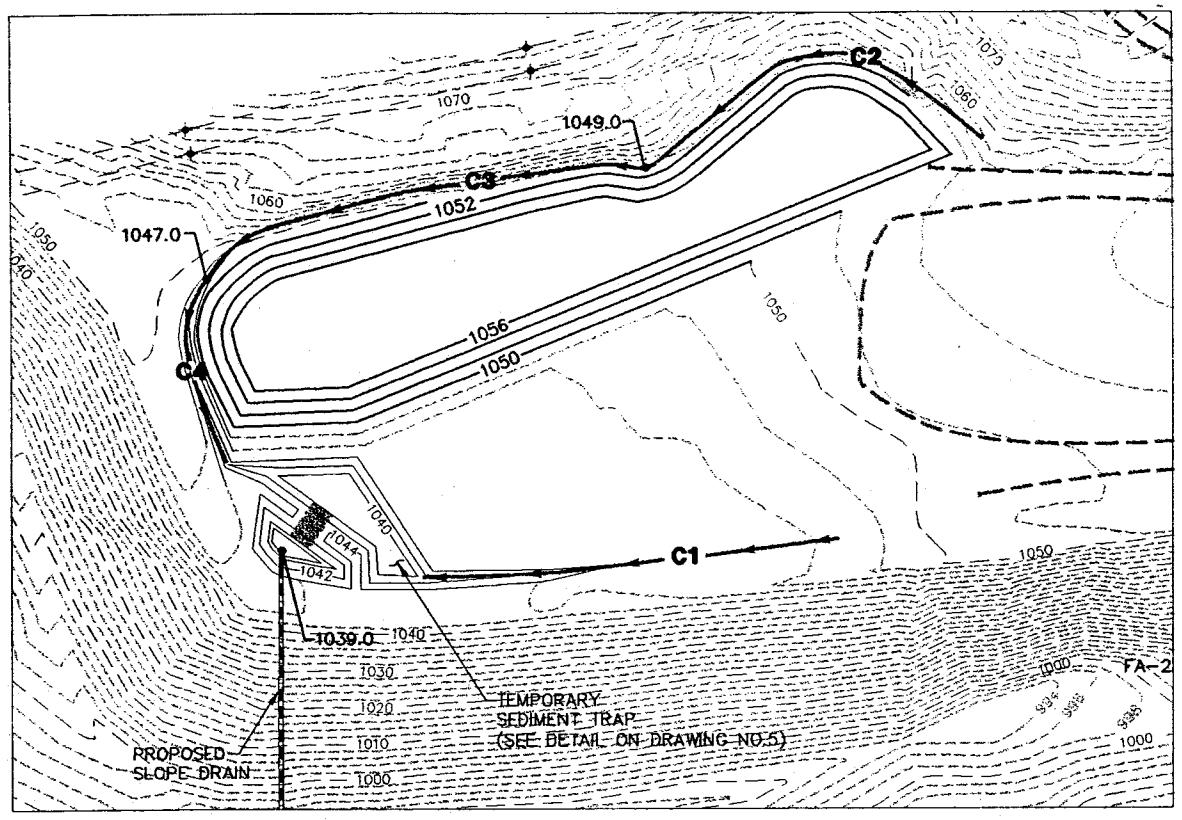
SCALE 1"=100'

PROJECT NO. 364.01

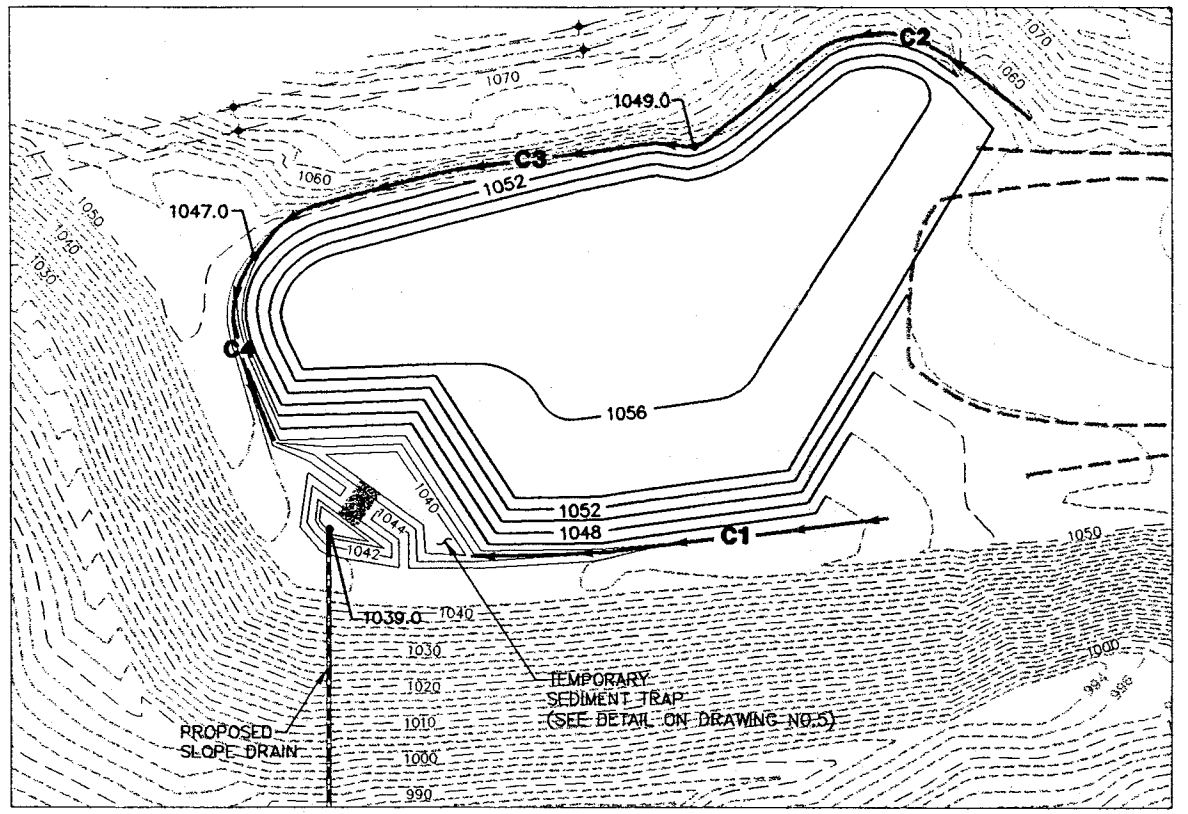
ABTCO – ABT BUILDING PRODUCTS
ROARING RIVER, NORTH CAROLINA

ANNUAL PHASES OF DEVELOPMENT

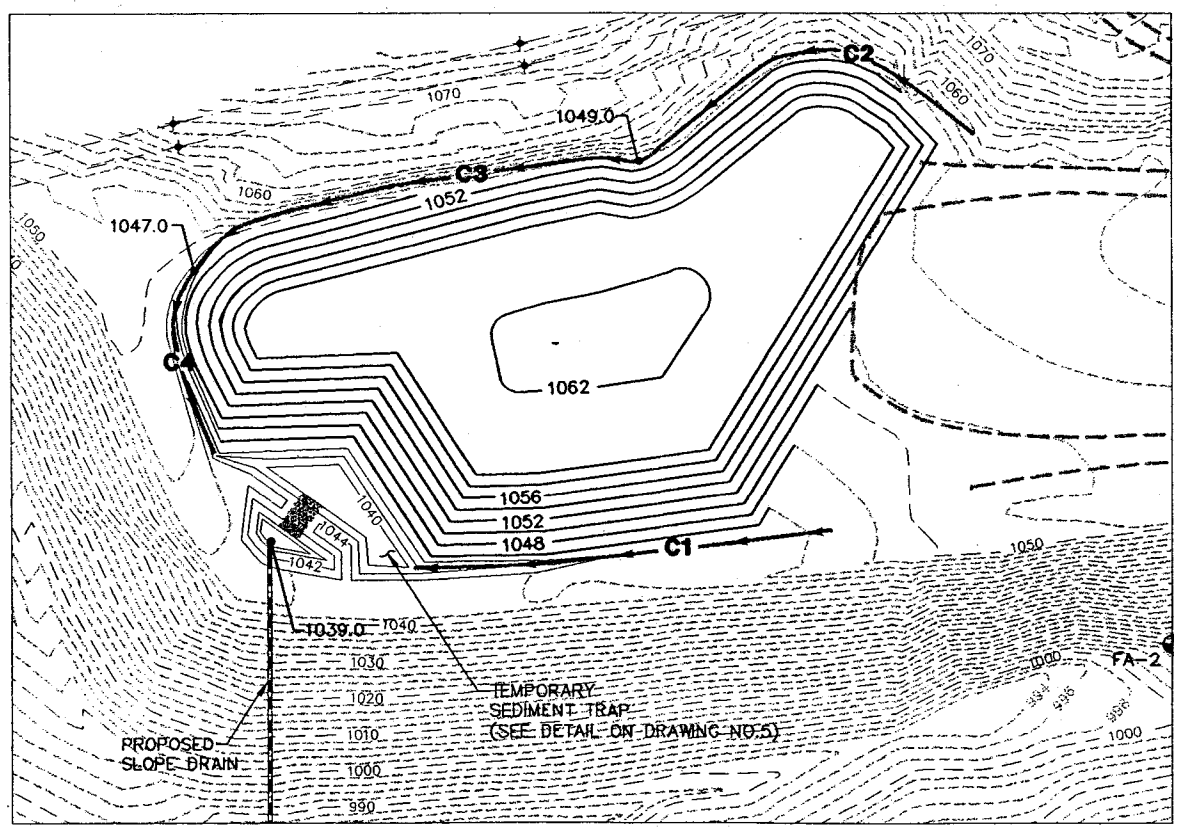
DRAWING NO. 2



PHASE 3 (END OF 2000)



PHASE 4 (END OF 2001)



PHASE 5 (END OF 2002)

CHANNEL	SLOPE
C1	2.1%
C2	3.68%
C3	0.87%
C4	2.22%

LEGEND

- PROPOSED CHANNEL (SEE DETAIL ON DRAWING NO. 5)
- PROPOSED CHANNEL INVERT ELEVATION — 1056.0
- CHANNEL DESIGNATION — C2
- EXISTING CONTOUR — 1050
- PROPOSED CONTOUR — 1056
- EXISTING MONITORING WELL — FA-2

60 0 60 120
SCALE: 1"=60'

DATE	REVISIONS AND RECORD OF ISSUE	NO	BY	CK	APP

DESIGNED J.D./S.F.
DRAWN CADD/S.F.
CHECKED J.D.
APPROVED
DATE 11/17/97

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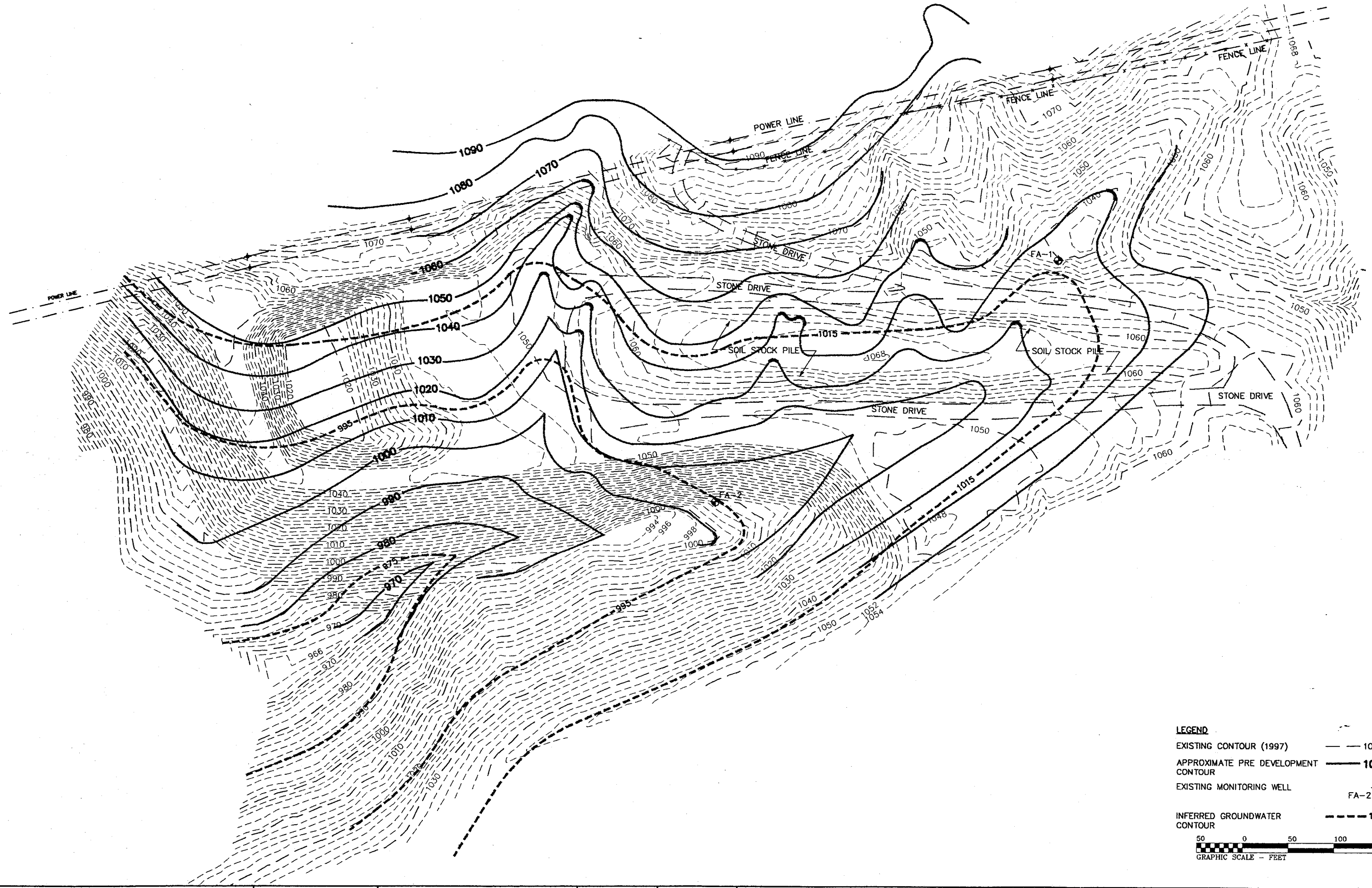
SCALE 1"=100'

PROJECT NO. 364.01

ABTCO – ABT BUILDING PRODUCTS
ROARING RIVER, NORTH CAROLINA

ANNAUL PHASES OF DEVELOPMENT

DRAWING NO. 3



LEGEND

EXISTING CONTOUR (1997) — — 1050 — — —

APPROXIMATE PRE DEVELOPMENT CONTOUR ——— 1060 ———

EXISTING MONITORING WELL ◆ FA-2

INFERRED GROUNDWATER CONTOUR - - - - 1015 - - - -

50 0 50 100 150
GRAPHIC SCALE – FEET

DATE	REVISIONS AND RECORD OF ISSUE	NO	BY	CK	APP

DESIGNED N.M.
DRAWN CADD/S.F.
CHECKED N.M.
APPROVED
DATE 11/17/97

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SCALE 1"=100'

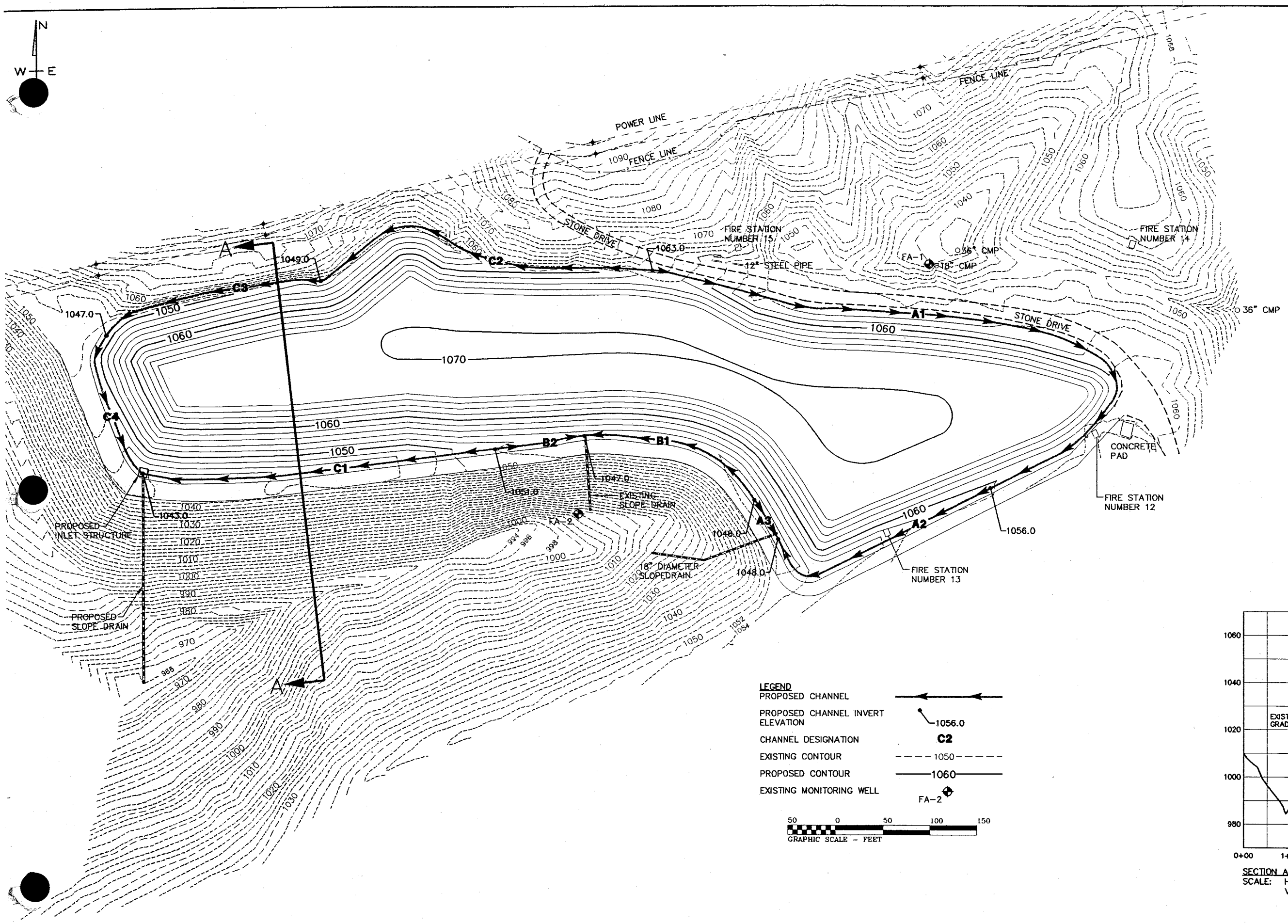
PROJECT NO. 364.01

ABTCO – ABT BUILDING PRODUCTS
ROARING RIVER, NORTH CAROLINA

INFERRED GROUNDWATER CONTOURS

DRAWING NO. 4

CHANNEL	SLOPE
A1	1.01%
A2	2.9%
A3	2.5%
B1	0.5%
B2	4.0%
C1	2.1%
C2	3.68%
C3	0.87%
C4	2.22%



LEGEND

PROPOSED CHANNEL

PROPOSED CHANNEL INVERT ELEVATION — 1056.0

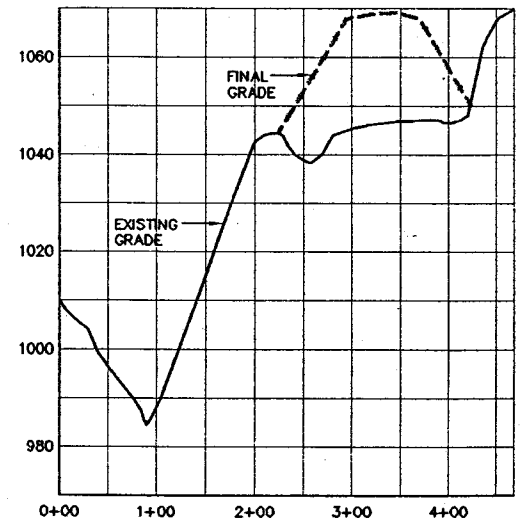
CHANNEL DESIGNATION — C2

EXISTING CONTOUR — 1050

PROPOSED CONTOUR — 1060

EXISTING MONITORING WELL — FA-2

50 0 50 100 150
GRAPHIC SCALE - FEET



SECTION A-A
SCALE: H: 1"=200'
V: 1"=40'

DATE	REVISIONS AND RECORD OF ISSUE	NO	BY	CK	APP

DESIGNED J.D./S.F.
DRAWN CADD/S.F.
CHECKED J.D.
APPROVED
DATE 11/17/97

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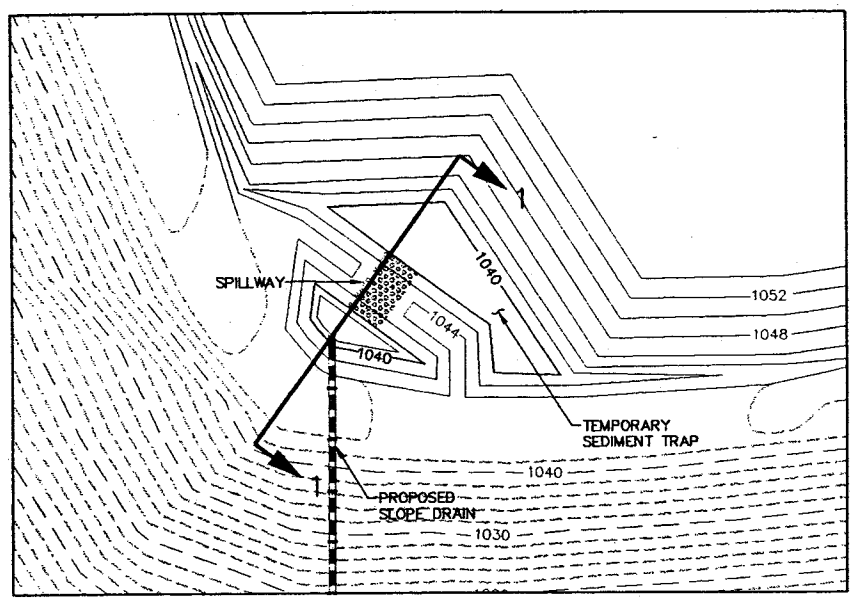
SCALE: 1"=100'

PROJECT NO.: 364.01

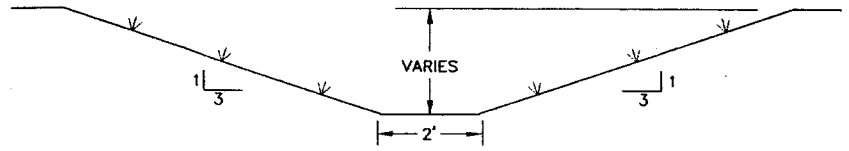
ABTCO - ABT BUILDING PRODUCTS
ROARING RIVER, NORTH CAROLINA

CLOSURE PLAN

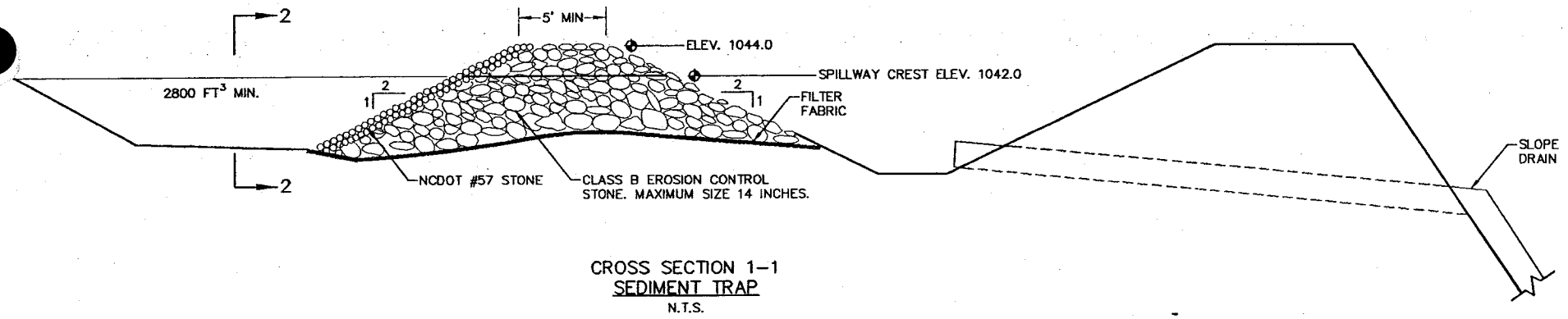
DRAWING NO.: 5



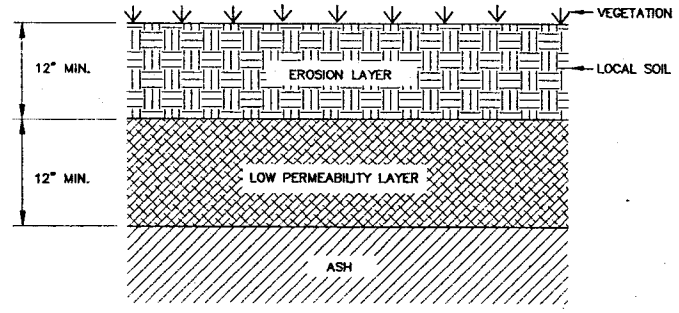
SEDIMENT TRAP
SCALE: 1"=60'



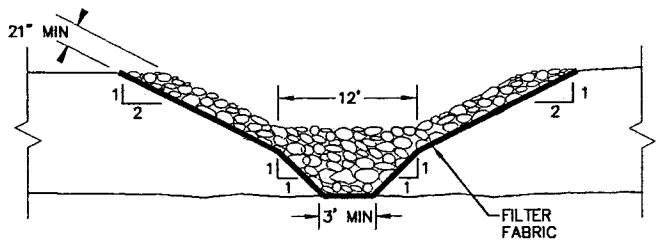
GRASSLINED CHANNEL
N.T.S.



CROSS SECTION 1-1
SEDIMENT TRAP
N.T.S.



PROPOSED CLOSURE CAP CROSS-SECTION
N.T.S.



CROSS SECTION 2-2
N.T.S.

DATE	REVISIONS AND RECORD OF ISSUE	NO	BY	CK	APP

DESIGNED J.D./S.F.
DRAWN CADD/S.F.
CHECKED J.D.
APPROVED
DATE 11/17/97

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SCALE: AS SHOWN

PROJECT NO.: 364.01

ABTCO – ABT BUILDING PRODUCTS
ROARING RIVER, NORTH CAROLINA

DETAILS

DRAWING NO.: 6

APPENDIX I

Miscellaneous Correspondence

State of North Carolina
Department of Environment,
Health and Natural Resources
Division of Waste Management

James B. Hunt, Jr., Governor
Jonathan B. Howes, Secretary
William L. Meyer, Director

DEHNR

June 2, 1997

Mr. Erich Burke
ABTco, Inc.
P. O. Box 98, Highway 268
Roaring River, NC 28669

RE: Preliminary Evaluation, ABTco Industrial Landfill, Wilkes County, Permit Number 97-03

Dear Mr. Burke:

In accordance with the requirements of Rule .0503(2)(d)(ii), the Solid Waste Section has completed its preliminary evaluation of the information submitted for the referenced landfill. Rule .0503(2)(d)(ii) establishes the requirements for the operators of new industrial waste landfills, lateral expansions of existing landfills, and industrial landfills operating after January 1, 1998. The rule requires the submittal of a design that ensures that the ground water standards established under 15A NCAC 2L (2L) will not be exceeded in the uppermost aquifer at the compliance boundary **or** a design with a leachate collection system, a closure cap system, and a composite liner system.

Since the referenced landfill is an existing unlined landfill and it is not economically or technically feasible to retrofit an existing landfill with liners and a leachate collection system, the Rule effectively requires the operator to submit a closure cap design that ensures compliance with 2L or close before January 1, 1998.

The Section required the submittal of waste and site characterization, including available water quality data to assist in a preliminary evaluation of the existing landfill. The purpose of this submittal was to determine if a final determination of compliance with Rule .0503(2)(d)(ii) could be made based upon this information. This letter serves as notification that the information submitted to date does not provide adequate information to make a final determination as to compliance with that Rule.

In order to meet the requirements of Rule .0503(2)(d)(ii) and to provide adequate landfill capacity while evaluating the landfill design for compliance with those requirements, the Section requires the submittal of a landfill design plan including the following:

A construction and operational plan which limits development of the landfill to the lateral expansion of the waste "footprint" established as of January 1, 1998. The plan shall be developed in one-year phases and operated in such a manner that the landfill may be closed at any time.

P.O. Box 27687,
Raleigh, North Carolina 27611-7687
Voice 919-733-4996

NRC Reduce Reuse Recycle

FAX 919-715-3605
An Equal Opportunity Affirmative Action Employer
50% recycled/10% post-consumer paper

The capacity of the landfill design plan shall not exceed five (5) years.

A water quality monitoring plan including additional wells located, sampled, and analyzed in a way that demonstrates compliance with 2L. Please contact Bobby Lutfy of the Section concerning monitoring and sampling parameters.

A closure plan including a final cap system designed to ensure compliance with 2L as demonstrated by modelling methods acceptable to the Section.

The submittal of this information and acknowledgement of receipt by the Section prior to January 1, 1998, will constitute compliance with Rule .0503(2)(d)(ii). However; this does **not** constitute final determination by the Section that the design ensures that the ground water standards established under 15A NCAC 2L will not be exceeded in the uppermost aquifer at the compliance boundary. It should be noted that a lateral expansion beyond the 1998 footprint or a new landfill must meet all the permit requirements of Rules .0503-.0505, including a demonstration that the proposed design meets the requirements of Rule .0503(2)(d)(ii).

This letter serves as notification to the owner/operator that the information previously described as necessary to complete the final determination of compliance with Rule .0503(2)(d)(ii) shall be submitted to the Section thirty (30) days prior to January 1, 1998.

If there are any questions concerning this letter, please contact Susan Leistiko at (919) 733-0692 extension 262.

Sincerely,

James C. Coffey

James C. Coffey, Supervisor
Permitting Branch
Solid Waste Section

cc: Dexter Matthews
Susan Leistiko
Bobby Lutfy
Julian Foscue
Brent Rockett

APPENDIX II

Correspondence Regarding

Fiber-Cement Byproduct

State of North Carolina
Department of Environment,
Health and Natural Resources
Division of Waste Management

James B. Hunt, Jr., Governor
Jonathan B. Howes, Secretary
William L. Meyer, Director

DEHNR

April 9, 1997

Mr. Erich Burke
ABTco,Inc; Siding Division
P.O. Box 98 Highway 268
Roaring River, NC 28669

Dear Mr. Burke:

The attached copy of the "Recovery and Reuse Policy Number A" contains a revision requiring that an annual report be submitted to the Division by August 1. This requirement was inadvertently omitted from the initial policy as issued. The annual summary shall be for the period of July 1 through June 30 and shall report the volume (tons) of recovered material utilized (reused) in those twelve months.

Please destroy all copies of the initial issue and substitute this revision in its place. The date of issuance remains March 31, 1997. Please excuse any inconvenience that this substitution may cause. If you have any questions about this matter, please telephone me at 919-733-0692, extension 260.

Sincerely,

William R. Hocutt

William R. Hocutt
Waste Determination Coordinator

cc: Jim Coffey
Dexter Matthews
Phil Prete
Julian Foscue
Terry Dover

c:wp6docs/letter/abtco02.97

RECOVERY AND REUSE POLICY NUMBER A
March 31, 1997

Recovered Material

Construction siding material composed of: 40% to 65% sand (silica), 30% to 50% portland cement, 1% to 10% cellulose and 1% to 10% clay.

Generator/User

This policy is for reuse of waste concrete siding construction material generated during and after the sampling period specified for each generator listed in the appendix to this policy. Any use must have a beneficial purpose as an objective and must not be managed in a way that constitutes disposal of the material.

Determination

The Division has determined that this waste material can be classified as recovered material as described in North Carolina Statute GS 130A-309.05(c). The classification requirements are summarized on the cover page to this policy. This designation excludes reuse of this material from regulation by the Division of Waste Management as long as the recovered material classification remains.

This policy specifies no sampling and analytical protocols and no siting, design, construction, operation and closure requirements. Also there are no notification and no recordation requirements for projects utilizing this material.

Demonstration

Submitted TCLP leaching data was obtained on a single composite sample. The appendix to this policy shows the leaching solution utilized in the TCLP extraction procedure. The data showed no organics, no herbicides or pesticides and very low metals concentrations. These results were obtained at acceptably low detection limits.

Annual Reporting

By August 1 of each year, the generator of the recovered material shall submit an annual summary to the Division. The annual summary shall be for the period of July 1 through June 31 and shall report the volume (tons) of recovered material utilized (reused).

Responsibility

Please note that the generator continues to have responsibility for any violation(s) of the recovered materials requirements and any contamination(s) to the environment which might occur. The Division of Waste Management is issuing this policy based on information furnished by the generator and the recovered materials designation has no stipulations directed at the suitability of this material for any type of beneficial reuse. That determination needs to be made by the generator and/or the user of the recovered material.

James C Coffey

James C. Coffey
Permitting Branch Supervisor
Solid Waste Section

APPENDIX

Generators Qualified for This Policy:

1.0 ABTco, Inc.; Siding Division; P.O. Box 98 Highway 268; Roaring River, NC 28669. Policy contact person: Mr. Erich Burke; phone (910) 696-2751 and fax (910) 696 3441.The product period begins in April, 1997 with the plant start-up. SW 846 leaching solution was used in the TCLP analysis.

ABTCO
ABT BUILDING PRODUCTS CORPORATION
ABTco, Inc.
Siding Divison
P.O. Box 98 Highway 268
Roaring River, North Carolina 28669

December 31, 1996

Mr. Bill Hocutt
Solid Waste Management Division
P.O. Box 27687
Raleigh, NC 27611

Dear Mr. Hocutt,

Please review the enclosed data on an excess material or byproduct which will be produced by a new production facility currently under construction at our Roaring River mill site. The material is a fiber and cement based product typically consisting of the following ranges of materials:

Sand (Silica)	40% to 65%
Portland Cement	30% to 50%
Cellulose	1% to 10%
Clay	1% to 10%

The analysis was conducted on new material as well as artificially weathered material. The weathered material was subjected to the equivalent of 2.7 years of exposure to the elements using accepted procedures in a weatherometer. The analytical results show that there is no significant difference between the new and the weathered samples. On both samples, the analytical results show no organics, no herbicides or pesticides and extremely low metals concentrations.

Due to the inert nature of the material and the analytical results which demonstrates no constituents of concern, we propose to reuse this material in a number of ways. The material is well suited to clean fill applications such as road bed stabilization, structural fill or similar landscaping applications. In addition, we would like to pursue direct or indirect sale of the material to consumers as a landscaping material similar to the way the brick industry markets brick waste as brick chips for landscaping.

We seek policy approval to be able to proceed with the various reuse options we are exploring for this material. With the enclosed analysis demonstrating that there is no environmental concern with this material, we feel that we are justified in making this request at this time.

If you have any questions or require any further information, please do not hesitate to contact me at my office.

Sincerely,

Erich Burke, P.E.
Environmental Engineer

cc: Hugh Browder
Mike Blosser

Fiber Cement TCLP Analysis

[redacted]tant	Required Detection Limit	Actual Detection Limit	New Analytical Results	Weathered Analytical Results	Notes
METALS					
Arsenic	0.50	0.003	BDL	BDL	
Barium	10.00	0.005	0.107	0.115	
Cadmium	0.10	0.001	BDL	BDL	
Chromium	0.50	0.005	0.032	0.028	
Lead	0.50	0.01	BDL	BDL	
Mercury	0.02	0.0002	0.0002	0.0003	
Selenium	0.10	0.003	BDL	BDL	
Silver	0.50	0.001	BDL	BDL	
HERBS + PESTS					
Chlordane	0.003	0.003	BDL	BDL (<.005)	
Endrin	0.002	0.001	BDL	BDL	
Heptachlor	0.0008	0.0005	BDL	BDL	
Lindane	0.04	0.0005	BDL	BDL	
Methoxychlor	1.00	0.005	BDL	BDL	
Toxaphene	0.05	0.01	BDL	BDL	
2,4 - D	1.00	0.1	BDL	BDL	
2, 4, 5 - TP Silvex	0.10	0.1	BDL	BDL	
ORGANICS					
[redacted]zene	0.05	0.001	BDL	BDL	
Carbon Tetrachloride	0.05	0.001	BDL	BDL	
Chlorobenzene	10	0.001	BDL	BDL	
Chloroform	0.60	0.001	BDL	BDL	
0-Cresol	20	0.05	BDL	BDL	2-Methylphenol
M-Cresol	20	0.05	BDL	BDL	3-Methylphenol
P-Cresol	20	0.05	BDL	BDL	4-Methylphenol
1,4 Dichlorobenzene	0.75	0.05	BDL	BDL	
1,2 Dichloroethane	0.05	0.001	BDL	BDL	
1,1 Dichloroethylene	0.07	0.001	BDL	BDL	
2,4 Dinitrotoluene	0.013	0.013	BDL	BDL (<0.05)	
Hexachlorobenzene	0.013	0.013	BDL	BDL (<0.05)	
Hexchloro - 1,3 Butadiene	0.05	0.05	BDL	BDL	
Hexachloroethane	0.30	0.05	BDL	BDL	
Methyl Ethyl Ketone	20	0.1	BDL	BDL	2-Butanone
Nitrobenzene	0.20	0.05	BDL	BDL	
Pentachlorophenol	10	0.25	BDL	BDL	
Pyridine	0.50	0.50	BDL	BDL	
Tetrachloroethylene	0.07	0.001	BDL	BDL	
Trichloroethylene	0.05	0.001	BDL	BDL	Trichloroethene
2,4,5 Trichlorophenol	40	0.25	BDL	BDL	
2,4,6 Trichlorophenol	0.20	0.05	BDL	BDL	
Vinyl Chloride	0.02	0.005	BDL	BDL	

HYDROLOGIC, INC.

COMPANY NAME:	Hydrologic-Asheville, Inc
COMPANY PROJECT NUMBER:	ABTCO
HYDROLOGIC PROJECT NUMBER:	FL9615279
HYDROLOGIC SAMPLE NUMBER:	9615279
HYDROLOGIC LAB ID #:	399
SAMPLE IDENTIFICATION:	ABTCO FC
DATE SAMPLED:	9/27/96
DATE EXTRACTED:	10/03/96
DATE/TIME ANALYZED:	10/08/96

METHOD TCLP 8080

ANALYSIS	CAS NO.	SDL (mg/l)	RESULT (mg/l)
Heptachlor	76-44-8	0.0005	BDL
Endrin	72-20-8	0.001	BDL
Chlordane	57-74-9	0.003	BDL
Toxaphene	8001-35-2	0.01	BDL
Methoxychlor	72-43-5	0.005	BDL
Lindane	58-89-9	0.0005	BDL
Surrogate Recovery: DBC			70%

BDL = Below Sample Detection Limit
SDL = Sample Detection Limit

COMMENTS: _____

HYDROLOGIC, INC.

COMPANY NAME:	Hydrologic-Asheville, Inc
COMPANY PROJECT NUMBER:	ABTCO
HYDROLOGIC PROJECT NUMBER:	FL9615279
HYDROLOGIC SAMPLE NUMBER:	9615279
HYDROLOGIC LAB ID #:	399
SAMPLE IDENTIFICATION:	ABTCO FC
DATE SAMPLED:	9/27/96
DATE EXTRACTED:	10/03/96
DATE/TIME ANALYZED:	10/07/96

METHOD TCLP 8270

ANALYSIS	CAS NO.	SDL (mg/l)	RESULT (mg/l)
1,4-Dichlorobenzene	106-46-7	0.05	BDL
2-Methylphenol	95-48-7	0.05	BDL
3-Methylphenol	108-39-4	0.05	BDL
4-Methylphenol	106-44-5	0.05	BDL
Hexachloroethane	67-72-1	0.05	BDL
Nitrobenzene	98-95-3	0.05	BDL
Hexachlorobutadiene	87-68-3	0.05	BDL
2,4,6-Trichlorophenol	88-06-2	0.05	BDL
2,4,5-Trichlorophenol	95-95-4	0.25	BDL
2,4-Dinitrotoluene	121-14-2	0.013	BDL
Hexachlorobenzene	118-74-1	0.013	BDL
Pentachlorophenol	87-86-5	0.25	BDL
Pyridine	110-86-1	0.50	BDL
Surrogate Recoveries:			
2-Fluorophenol			90%
Phenol-D6			91%
Nitrobenzene-D5			68%
2-Fluorobiphenyl			88%
2,4,6-Tribromophenol			75%
Terphenyl-D14			74%

BDL = Below Sample Detection Limit
SDL = Sample Detection Limit

COMMENTS: COMPOUNDS WITH ELEVATED SDL ARE DUE TO A SAMPLE DILUTION.

HYDROLOGIC, INC.

FINAL REPORT OF ANALYSES

ABTco, INC.
SIDING DIVISION
PO BOX 98, HWY 268
ROARING RIVER, NC 28669-
Attn: ERIC ROGERS EXT 274

PROJECT NAME: ABTCo TCLP
REPORT DATE: 04/12/96

SAMPLE NUMBER- 83084 SAMPLE ID- ABTCo FCB-W
DATE SAMPLED- 04/02/96
DATE RECEIVED- 04/04/96 SAMPLER- ERICH BURKE
TIME RECEIVED- 0945 DELIVERED BY- UPS

SAMPLE MATRIX- OT
TIME SAMPLED- 1300
RECEIVED BY- DHT

ANALYSIS	METHOD	SAMPLE PREP DATE	ANALYSIS BY	DATE	BY	RESULT	UNITS	DET LIM
TOX. CHAR. LEACHING PROCEDURE	6010	04/08/96	LJP	04/09/96	BDL			
ARSENIC, TOTAL	6010					< 0.003	mg/l	0.
CADMIUM, TOTAL	6010					< 0.001	mg/l	0.
CHROMIUM, TOTAL	6010					0.028	mg/l	0.
MERCURY, TOTAL	6010					0.0003	mg/l	0.0
SELENIUM, TOTAL	6010					< 0.003	mg/l	0
SILVER, TOTAL	6010					< 0.001	mg/l	0
BARIUM, TOTAL	6010					0.115	mg/l	0
LEAD, TOTAL	6010					< 0.010	mg/l	0

LABORATORY DIRECTOR _____

P.O. BOX 8029 ASHEVILLE NC 28814-0029
704-254-5169 FAX: 704-252-9711 / TOLL FREE : 800-344-5759

HYDROLOGIC, INC

COMPANY NAME: Hydrologic-Asheville, Inc
COMPANY PROJECT NUMBER:

HYDROLOGIC PROJECT NUMBER: FL965635
HYDROLOGIC SAMPLE NUMBER: 965635
HYDROLOGIC LAB I.D.#: 399
SAMPLE IDENTIFICATION: ABTCO FCB-W
DATE SAMPLED: 4/2/96
DATE EXTRACTED: 4/08/96
DATE/TIME ANALYZED: 4/13/96

METHOD TCLP 8270

ANALYSIS	CAS NO.	SDL (mg/l)	RESULT (mg/l)
1,4-Dichlorobenzene	106-46-7	0.05	BDL
2-Methylphenol	95-48-7	0.05	BDL
3-Methylphenol	108-39-4	0.05	BDL
4-Methylphenol	106-44-5	0.05	BDL
Hexachloroethane	67-72-1	0.05	BDL
Nitrobenzene	98-95-3	0.05	BDL
Hexachlorobutadiene	87-68-3	0.05	BDL
2,4,6-Trichlorophenol	88-06-2	0.05	BDL
2,4,5-Trichlorophenol	95-95-4	0.25	BDL
2,4-Dinitrotoluene	121-14-2	0.05	BDL
Hexachlorobenzene	118-74-1	0.05	BDL
Pentachlorophenol	87-86-5	0.25	BDL
Pyridine	110-86-1	0.50	BDL
Surrogate Recoveries:			
2-Fluorophenol			107%
Phenol-D6			108%
Nitrobenzene-D5			106%
2-Fluorobiphenyl			68%
2,4,6-Tribromophenol			111%
Terphenyl-D14			105%

BDL = Below Sample Detection Limit
SDL = Sample Detection Limit

COMMENTS: _____

COMPANY NAME: Hydrologic-Asheville, Inc
COMPANY PROJECT NUMBER:

HYDROLOGIC PROJECT NUMBER: FL965635
HYDROLOGIC SAMPLE NUMBER: 965635
HYDROLOGIC LAB I.D.#: 399
SAMPLE IDENTIFICATION: ABICO FCB-W
DATE SAMPLED: 4/2/96
DATE EXTRACTED: 4/08/96
DATE/TIME ANALYZED: 4/09/96

METHOD TCLP 8240

ANALYSIS	CAS NO.	SDL (mg/L)	RESULT (mg/L)
Benzene	71-43-2	0.001	BDL
Carbon Tetrachloride	56-23-5	0.001	BDL
Chlorobenzene	108-90-7	0.001	BDL
Chloroform	67-66-3	0.001	BDL
1,4-Dichlorobenzene	106-46-7	0.001	BDL
1,2-Dichloroethane	107-06-2	0.001	BDL
1,1-Dichloroethene	75-35-4	0.001	BDL
2-Butanone	78-93-3	0.100	BDL
Tetrachloroethene	127-18-4	0.001	BDL
Trichloroethene	79-01-6	0.001	BDL
Vinyl Chloride	75-01-4	0.005	BDL
Surrogate Recoveries:			
1,2-Dichloroethane-D4			108%
Toluene-D8			98%
Bromofluorobenzene			100%

BDL = Below Sample Detection Limit
SDL = Sample Detection Limit

COMMENTS: _____

COMPANY NAME: Hydrologic-Asheville, Inc
COMPANY PROJECT NUMBER:

HYDROLOGIC PROJECT NUMBER: FL965635
HYDROLOGIC SAMPLE NUMBER: 965635
HYDROLOGIC LAB I.D.#: 399
SAMPLE IDENTIFICATION: ABICO FCB-W
DATE SAMPLED: 4/2/96
DATE EXTRACTED: 4/08/96
DATE/TIME ANALYZED: 4/11/96

METHOD TCLP 8080

ANALYSIS	CAS NO.	SDL (mg/l)	RESULT (mg/l)
Heptachlor	76-44-8	0.0005	BDL
Endrin	72-20-8	0.001	BDL
Chlordane	57-74-9	0.005	BDL
Toxaphene	8001-35-2	0.01	BDL
Methoxychlor	72-43-5	0.005	BDL
Lindane	58-89-9	0.0005	BDL
Surrogate Recovery:			
DBC			90%

BDL = Below Sample Detection Limit
SDL = Sample Detection Limit

COMMENTS: _____

COMPANY NAME: Hydrologic-Asheville, Inc
COMPANY PROJECT NUMBER:

HYDROLOGIC PROJECT NUMBER: FL965635
HYDROLOGIC SAMPLE NUMBER: 965635
HYDROLOGIC LAB I.D.#: 399
SAMPLE IDENTIFICATION: ABTCO FCB-W
DATE SAMPLED: 4/2/96
DATE EXTRACTED: 4/08/96
DATE/TIME ANALYZED: 4/12/96

METHOD TCLP 8150

ANALYSIS	CAS NO.	SDL (mg/l)	RESULT (mg/l)
2,4-D	94-75-7	0.1	BDL
2,4,5-TP (silvex)	93-72-1	0.1	BDL

BDL = Below Sample Detection Limit
SDL = Sample Detection Limit

COMMENTS: _____

HYDROLOGIC, INC.

FINAL REPORT OF ANALYSES

ABTco, INC.
SIDING DIVISION
PO BOX 98, HWY 268
ROARING RIVER, NC 28669-
Attn: ERIC ROGERS EXT 274

PROJECT NAME: ABTCo TCLP
REPORT DATE: 04/12/96

SAMPLE NUMBER- 83083 SAMPLE ID- ABTCo FCB-NEW
DATE SAMPLED- 04/02/96
DATE RECEIVED- 04/04/96 SAMPLER- ERICH BURKE
TIME RECEIVED- 0945 DELIVERED BY- UPS

SAMPLE MATRIX- OT
TIME SAMPLED- 1300
RECEIVED BY- DHT

Page 1 of 1

ALYSIS	METHOD	SAMPLE PREP DATE	BY	ANALYSIS DATE	BY	RESULT	UNITS	DET LIM
TOX. CHAR. LEACHING PROCEDURE	6010	04/08/96	LJP	04/09/96	BDL			
ARSENIC, TOTAL	6010					< 0.003	mg/l	0.
CADMIUM, TOTAL	6010					< 0.001	mg/l	0.
CHROMIUM, TOTAL	6010					0.032	mg/l	0.
MERCURY, TOTAL	6010					0.0002	mg/l	0.0
SELENIUM, TOTAL	6010					< 0.003	mg/l	0.
SILVER, TOTAL	6010					< 0.001	mg/l	0.
BARIUM, TOTAL	6010					0.107	mg/l	0.
LEAD, TOTAL	6010					< 0.010	mg/l	0.

LABORATORY DIRECTOR

COMPANY NAME: Hydrologic-Asheville, Inc
COMPANY PROJECT NUMBER:

HYDROLOGIC PROJECT NUMBER: FL965635
HYDROLOGIC SAMPLE NUMBER: 965636
HYDROLOGIC LAB I.D.#: 399
SAMPLE IDENTIFICATION: ABTCO FCB-NEW
DATE SAMPLED: 4/2/96
DATE EXTRACTED: 4/08/96
DATE/TIME ANALYZED: 4/11/96

METHOD TCLP 8080

ANALYSIS	CAS NO.	SDL (mg/l)	RESULT (mg/l)
Heptachlor	76-44-8	0.0005	BDL
Endrin	72-20-8	0.001	BDL
Chlordane	57-74-9	0.005	BDL
Toxaphene	8001-35-2	0.01	BDL
Methoxychlor	72-43-5	0.005	BDL
Lindane	58-89-9	0.0005	BDL
Surrogate Recovery:			
DBC			98%

BDL = Below Sample Detection Limit
SDL = Sample Detection Limit

COMMENTS: _____

HYDROLOGIC, INC

COMPANY NAME: Hydrologic-Asheville, Inc
COMPANY PROJECT NUMBER:

HYDROLOGIC PROJECT NUMBER: FL965635
HYDROLOGIC SAMPLE NUMBER: 965636
HYDROLOGIC LAB I.D.#: 399
SAMPLE IDENTIFICATION: ABTCO FCB-NEW
DATE SAMPLED: 4/2/96
DATE EXTRACTED: 4/08/96
DATE/TIME ANALYZED: 4/13/96

METHOD TCLP 8270

ANALYSIS	CAS NO.	SDL (mg/l)	RESULT (mg/l)
1,4-Dichlorobenzene	106-46-7	0.05	BDL
2-Methylphenol	95-48-7	0.05	BDL
3-Methylphenol	108-39-4	0.05	BDL
4-Methylphenol	106-44-5	0.05	BDL
Hexachloroethane	67-72-1	0.05	BDL
Nitrobenzene	98-95-3	0.05	BDL
Hexachlorobutadiene	87-68-3	0.05	BDL
2,4,6-Trichlorophenol	88-06-2	0.05	BDL
2,4,5-Trichlorophenol	95-95-4	0.25	BDL
2,4-Dinitrotoluene	121-14-2	0.05	BDL
Hexachlorobenzene	118-74-1	0.05	BDL
Pentachlorophenol	87-86-5	0.25	BDL
Pyridine	110-86-1	0.50	BDL
Surrogate Recoveries:			
2-Fluorophenol			106%
Phenol-D6			120%
Nitrobenzene-D5			112%
2-Fluorobiphenyl			62%
2,4,6-Tribromophenol			89%
Terphenyl-D14			100%

BDL = Below Sample Detection Limit
SDL = Sample Detection Limit

COMMENTS: _____

COMPANY NAME: Hydrologic-Asheville, Inc
COMPANY PROJECT NUMBER:

HYDROLOGIC PROJECT NUMBER: FL965635
HYDROLOGIC SAMPLE NUMBER: 965636
HYDROLOGIC LAB I.D.#: 399
SAMPLE IDENTIFICATION: ABTCO FCB-NEW
DATE SAMPLED: 4/2/96
DATE EXTRACTED: 4/08/96
DATE/TIME ANALYZED: 4/09/96

METHOD TCLP 8240

ANALYSIS	CAS NO.	SDL (mg/L)	RESULT (mg/L)
Benzene	71-43-2	0.001	BDL
Carbon Tetrachloride	56-23-5	0.001	BDL
Chlorobenzene	108-90-7	0.001	BDL
Chloroform	67-66-3	0.001	BDL
1,4-Dichlorobenzene	106-46-7	0.001	BDL
1,2-Dichloroethane	107-06-2	0.001	BDL
1,1-Dichloroethene	75-35-4	0.001	BDL
2-Butanone	78-93-3	0.100	BDL
Tetrachloroethene	127-18-4	0.001	BDL
Trichloroethene	79-01-6	0.001	BDL
Vinyl Chloride	75-01-4	0.005	BDL
Surrogate Recoveries:			
1,2-Dichloroethane-D4			112%
Toluene-D8			108%
Bromofluorobenzene			116%

BDL = Below Sample Detection Limit
SDL = Sample Detection Limit

COMMENTS: _____

HYDROLOGIC, INC

COMPANY NAME: Hydrologic-Asheville, Inc
COMPANY PROJECT NUMBER:

HYDROLOGIC PROJECT NUMBER: FL965635
HYDROLOGIC SAMPLE NUMBER: 965636
HYDROLOGIC LAB I.D.#: 399
SAMPLE IDENTIFICATION: ABTCO FCB-NEW
DATE SAMPLED: 4/2/96
DATE EXTRACTED: 4/08/96
DATE/TIME ANALYZED: 4/12/96

METHOD TCLP 8150

ANALYSIS	CAS NO.	SDL (mg/l)	RESULT (mg/l)
2,4-D	94-75-7	0.1	BDL
2,4,5-TP (silvex)	93-72-1	0.1	BDL

BDL = Below Sample Detection Limit
SDL = Sample Detection Limit

COMMENTS: _____

APPENDIX III

Erosion and Sediment Control Plan

I. NARRATIVE

Project Description

The purpose of the project is to vertically expand an existing waste ash disposal facility. In conjunction with the expansion, plans have been prepared to show development of the landfill for a period of five years beginning January 1, 1998. Also, a conceptual plan has been prepared which shows the facility developed at its ultimate capacity (about 12½ years after January 1, 1998). Because permitting of the facility by the Solid Waste Section is limited to five years, the erosion and control plan has been prepared to serve anticipated development during the first five years only.

Site Description

The existing landfill is constructed on a hillside. Earth berms constructed on the south and west sides of the facility serve to contain the ash and to provide access around the perimeter of the disposal area. The berms reach a maximum height of about sixty feet at the west end of the facility. Ash has accumulated to the top of the berms throughout most of the disposal area. The one exception is at the west end where there remains a large unfilled area. The unfilled area is estimated to provide sufficient storage for about two years of ash disposal at the current rate of ash generation.

Adjacent Property

The facility is located in a forested area at the ABTco plant site. There is no development immediately adjacent to the disposal area. About 3 ½ acres of undeveloped land drains toward the landfill from the upper part of the hill. Other areas adjacent to the landfill drain to natural drainageways leading away from the landfill.

Planned Erosion and Sediment Control Measures: The proposed erosion and sediment control features are intended to serve the facility through five years of development. At the end of five years, the erosion and sediment control plan will need to be revised as needed to serve disturbed areas of the subsequent expansion.

1. Grass-lined Channels: Grass-lined channels will be provided at the perimeter of the landfill to convey runoff away from the active areas. Temporary liners will be provided as needed to stabilize channels which are subject to erosion prior to the establishment of channel vegetation. Runoff from disturbed areas will be diverted to one of the sediment control features discussed below. Runoff from off-site areas will be diverted so that it does not flow across the landfill surface. Concentrated runoff will be conveyed to the toe of the landfill via permanent slope drains strategically located on the landfill sides. From the toe, runoff will be directed to natural drainageways at the site.

2. Silt Fences: Temporary silt fences will be used as needed at the perimeter of disturbed areas not served by a sediment trap. Silt fences are proposed to be used when the disposed ash has reached the top of the existing berms, but has not been placed to a height above the berms such that a sediment trap is required. For example, silt fences will be erected during the latter part of phase two (the second year), but will be replaced by a sediment trap at the appropriate point in time during phase three (the third year).

3. Sediment Trap: A temporary sediment trap is proposed to be constructed at the southwest corner of the disposal area as shown on the drawings. The location provides a convenient point for the collection of sediment-laden runoff before it is conveyed to the toe of the landfill. Runoff from disturbed areas as well as runoff from off-site areas will flow to the trap, which will provide in excess of 1800 cubic feet of storage for each disturbed acre draining to it. Accumulated sediment is to be removed from the trap when the sediment has reached a depth of one foot. The sediment trap spillway is sized to accommodate the peak flow resulting from a 25-year storm.

4. Outlet Stabilization Structure: Riprap aprons will be located at the outlets of the three slope drains to minimize potential scour.

5. Surface stabilization: Surface stabilization will be accomplished with vegetation and mulch as specified in the vegetation plan.

II. CONSTRUCTION SCHEDULE

1. Obtain plan approval and other applicable permits.

2. Continue waste disposal under the provisions of the current erosion and sediment control plan as long as accumulated ash remains below or at the level of the top of the existing berms.

3. When the existing storage area is nearing depletion (accumulated ash is nearing the top of the berms), construct a sufficient length of the flow diversion channels at the perimeter of the landfill to serve the facility through the first five-year expansion period. This would include channels on the north, south and west sides of the expansion area.

4. Construct new slope drain and riprap apron at the southwest corner of the facility as shown on the drawings.

5. Install silt fencing at the perimeter of the active disposal area to minimize sediment carried by runoff flowing to the perimeter ditches. Maintain silt fences throughout the disposal period until such time that conditions preclude the use of silt fences. When the use of silt fences is no longer appropriate, construct the sediment trap in accordance with the drawings. Conditions which will trigger the replacement of the silt fence with a sediment trap are any one of the following:
   - The drainage area exceeds ¼ acre per 100 ft. of fence.
   - The slope length behind the silt fence exceeds 100 ft at a 2% slope.
   - The slope length behind the silt fence exceeds 75 ft at a 2 to 5% slope.
   - The slope length behind the silt fence exceeds 50 ft at a 5 to 10% slope.
   - The slope length behind the silt fence exceeds 25 ft at a 10 to 20% slope.
   - The slope length behind the silt fence exceeds 15 ft at a slope greater than 20%.

6. As ash disposal progresses, check sediment trap for accumulation of sediment. Periodically restore trap to its design capacity by the removal of sediment when the accumulated depth reaches one foot.

7. Provide surface stabilization in accordance with the vegetation plan.

III. MAINTENANCE PLAN

1. Check erosion and sediment control features for stability and operation following each rainfall-producing event and at least once each week. Make repairs immediately to maintain all features as designed.

2. Remove sediment from behind the silt fence when it reaches a depth of about six inches. Repair silt fence as necessary to maintain a functioning barrier.

3. Remove sediment from the sediment trap when the depth of accumulated sediment is about one foot. Clean or replace gravel when the sediment trap no longer drains properly.

4. Fertilize, reseed as necessary, and mulch seeded areas according to the specifications in the vegetative plan to maintain a vigorous, dense vegetative cover.

IV. VEGETATIVE PLAN

A. Seedbed Preparation

Temporary seeding for fill slopes 3:1 or steeper.

1) Leave a loose, uncompacted surface. Remove large clods, rocks and debris which might hold netting above the surface.
2) Spread lime and fertilizer evenly at rates recommended by soil tests.
3) Roughen or groove the soil surface on the contour to promote the retention of soil amendments and seed.

Permanent seeding for fill slopes 3:1 or steeper (seed with hydraulic seeder).

1) Leave the last 4 to 6 inches of fill loose and uncompacted, allowing rocks, roots, large clods and other debris to remain on the slope.
2) Roughen slope faces by making grooves 2 to 3 inches deep, perpendicular to the slope.
3) Spread lime evenly over slopes at rates recommended by soil tests.

Gentle or flat slopes where topsoil is not used.

1) Remove rocks and debris.
2) Apply lime and fertilizer at rates recommended by soil tests; spread evenly and incorporate into the top 6 inches with a disk, chisel plow, or rotary tiller.
3) Break up large clods and rake into a loose, uniform seedbed.
4) Rake to loosen surface just prior to applying seed.

B. Seeding Methods

Gentle to flat slopes and temporary seedings

1) Spread seed at the recommended rate with a cyclone seeder, drop spreader, or cultipacker seeder.
2) Rake seed into the soil and lightly pack to establish good contact.

Permanent seedings for fill slopes steeper than 3:1.

1) Use hydraulic seeding equipment to apply seed and fertilizer.

C. Mulch

1) Apply 4,000 lb/acre grain straw. Anchor straw by tacking with asphalt, netting, or roving or by crimping with a mulch anchoring tool. A disk with blades set nearly straight can be used as a mulch anchoring tool.

Temporary Seedings

1) Apply 90 lb/1,000 ft ^{2} (4000 lb/acre) grain straw and tack with 0.1 gal/yd^2 asphalt (11 gal/1,000ft^2).

Grass-lined channels

1) Install excelsior mat in the channel, extend up to the top of the channel banks, and secure according to manufacturer's specifications.
2) On channel shoulders, apply 100 lb/1,000 ft^2 grain straw and anchor with 0.1 gal/yd^2 (11 gal/1,000 ft^2) asphalt.

D. Maintenance

1) Refertilize in the second year unless growth is fully adequate. May be mowed once or twice per year, but mowing is not necessary. Reseed, fertilize, and mulch damaged areas immediately.

V. SEEDING MIXTURE

Seeding Mixture for Slopes 3H:1V or Less in Mountain Region, Average Soils, Low Maintenance Reference: Table 6.11e, North Carolina Erosion and Sediment Control Planning and Design Manual

Species	Rate (lb/acre)
Tall Fescue	60
Kentucky bluegrass	10
Sericea lespedeza	15
Korean lespedeza	10

Seeding Notes

1) After August 15, use unscarified sericea seed.
2) Where appearance is a consideration, omit sericea lespedeza and increase Korean lespedeza to 40 lb/acre.

Nurse Plants

1) Between May 1 and Aug. 15, add 10 lb/acre German millet or 15 lb/acre Sudangrass. Prior to May 1 or after Aug.15, add 40 lb/acre rye (grain).

Seeding dates

Best	Possible
Aug. 15 - Sept. 1	July 25 - Sept. 15
Mar. 1 - Apr. 1	Mar. 1 - May 10

Soil Amendments

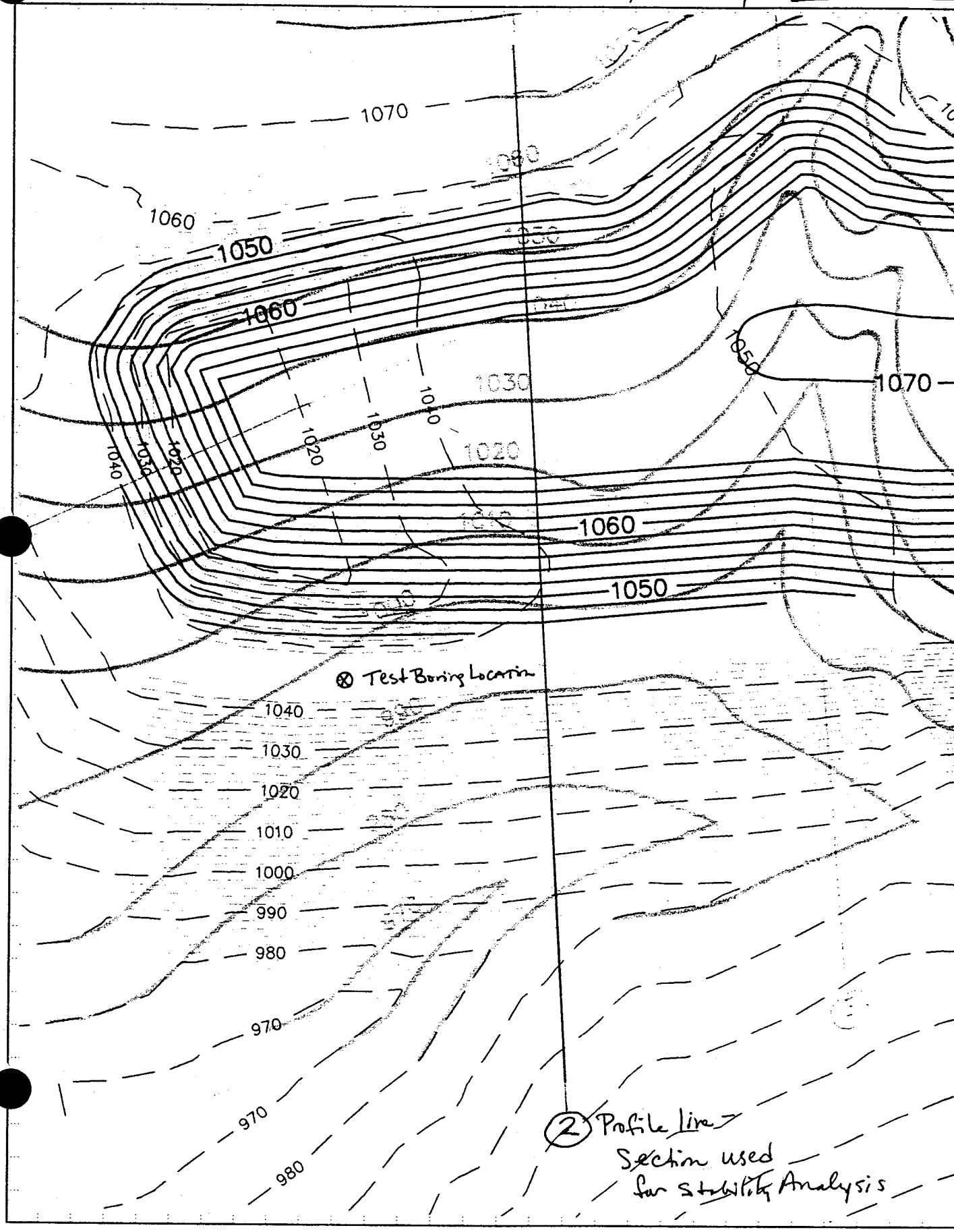
1) Apply lime and fertilizer according to soil tests, or apply 4,000 lb/acre ground agricultural limestone and 1,000 lb/acre 10-10-10 fertilizer.

APPENDIX IV

Slope Stability Calculations

JOYCE ENGINEERING, INC.

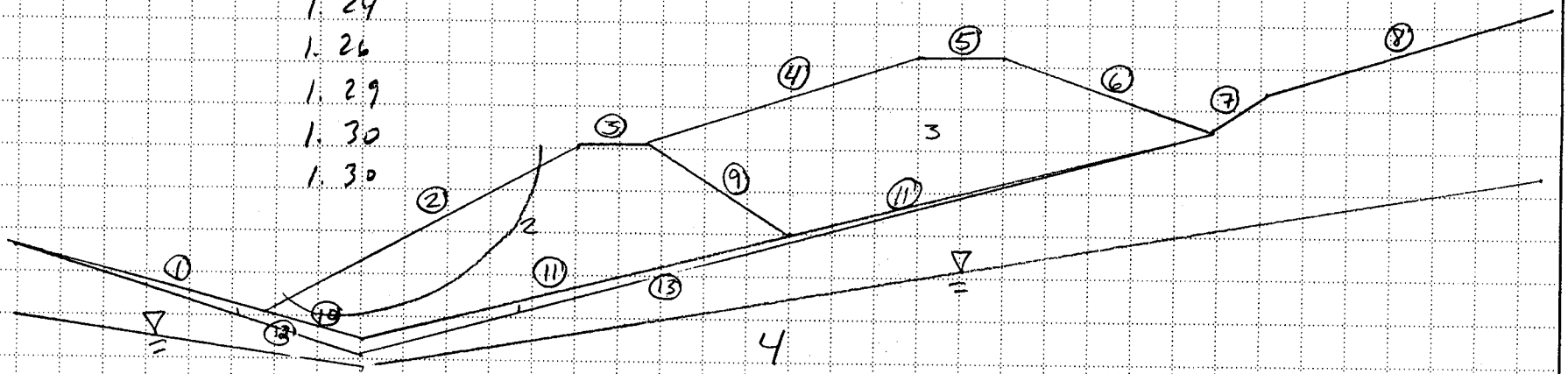
JOB ABTco Ash Monofill
JOB NO. 3640 T01 SHEET NO. 1
CALCULATED BY MCM DATE
CHECKED BY DATE
SUBJECT Slope Stability - Final SCALE 1"



JOB ASTC. Ash Monofill
JOB NO. 364.00, T01 SHEET NO. 2
CALCULATED BY MEM DATE 11/
CHECKED BY DATE
SUBJECT Slope Stability - Final SCALE 1"

Critical Circle - FS - All Face circles through Steep Fill

1.22
1.24
1.26
1.29
1.30
1.30



Boundary #	Left x	Left y	Right x	Right y	Soil	γ_m	γ_{SAT}	c	ϕ	u	u_c	Piez.
1	100	1010	188	985	1	105	115	800*	16*	0	0	0
2	188	985	300	1045	2	120	125	100	34	0	0	0
3	300	1045	326	1046	2							
4	326	1046	415	1075	3	40	50	100	36	0	0	0
5	415	1075	445	1076	3							
6	445	1076	525	1051	3							
7	525	1051	542	1064	4	110	120	300	28	0	0	1
8	542	1064	700	1113	4							
9	326	1046	377	1014	2							
10	188	985	226	975	1							
11	226	975	525	1051	1							
12	100	1010	226	970	4							
13	226	970	525	1051	4							

** PCSTABL5M **

by
Purdue University

1

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date:	11-21-97
Time of Run:	12:39pm
Run By:	NEM
Input Data Filename:	C:2FINAL
Output Filename:	C:2FINAL.OUT
Unit:	ENGLISH
Plotted Output Filename:	C:2FINAL.PLT

PROBLEM DESCRIPTION ABTco Landfill, Profile #2
Final Landfill Slopes

BOUNDARY COORDINATES

8 Top Boundaries
13 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	100.00	210.00	188.00	185.00	1
2	188.00	185.00	300.00	245.00	2
3	300.00	245.00	326.00	246.00	2
4	326.00	246.00	415.00	275.00	3
5	415.00	275.00	445.00	276.00	3
6	445.00	276.00	525.00	251.00	3
7	525.00	251.00	542.00	264.00	4
8	542.00	264.00	700.00	313.00	4
9	326.00	246.00	377.00	214.00	2
10	188.00	185.00	226.00	175.00	1
11	226.00	175.00	525.00	251.00	1
12	100.00	210.00	226.00	170.00	4
13	226.00	170.00	525.00	251.00	4

ISOTROPIC SOIL PARAMETERS

4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	105.0	115.0	800.0	16.0	.00	.0	0
2	120.0	125.0	200.0	32.0	.00	.0	0
3	40.0	50.0	100.0	36.0	.00	.0	0
4	110.0	120.0	300.0	28.0	.00	.0	1

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 3 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	100.00	190.00
2	226.00	165.00
3	700.00	240.00

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

100 Trial Surfaces Have Been Generated.

10 Surfaces Initiate From Each Of 10 Points Equally Spaced Along The Ground Surface Between X = 175.00 ft.
and X = 225.00 ft.

Each Surface Terminates Between X = 275.00 ft.
and X = 445.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y =100.00 ft.

23.00 ft. Line Segments Define Each Trial Failure Surface.

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	197.22	189.94
2	220.12	187.82
3	242.45	193.36
4	261.70	205.94
5	275.74	224.16
6	278.91	233.70

Circle Center At X = 215.1 ; Y = 254.8 and Radius, 67.2

*** 1.215 ***

Individual data on the 5 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	22.9	19775.7	.0	.0	.0	.0	.0	.0	.0
2	22.3	49117.8	28146.2	50825.1	.0	.0	.0	.0	.0
3	19.3	47366.1	9096.8	37823.4	.0	.0	.0	.0	.0
4	14.0	22999.7	.0	15721.3	.0	.0	.0	.0	.0
5	3.2	1494.2	.0	.0	.0	.0	.0	.0	.0

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	202.78	192.92
2	225.78	193.08
3	247.78	199.80
4	266.95	212.50
5	281.70	230.15
6	284.52	236.71

Circle Center At X = 214.0 ; Y = 270.2 and Radius, 78.1

*** 1.239 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	202.78	192.92
2	225.74	191.66
3	248.32	196.09
4	269.11	205.91
5	286.86	220.53
6	300.49	239.07
7	302.94	245.11

Circle Center At X = 219.3 ; Y = 284.5 and Radius, 93.0

*** 1.263 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	208.33	195.89
2	231.33	196.34
3	253.40	202.81
4	273.00	214.84
5	288.76	231.60
6	294.26	241.92

Circle Center At X = 218.5 ; Y = 280.2 and Radius, 84.9

*** 1.287 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	191.67	186.96
2	214.57	184.80
3	237.46	186.96
4	259.55	193.36
5	280.06	203.79
6	298.25	217.86
7	313.49	235.09
8	319.83	245.76

Circle Center At X = 214.7 ; Y = 305.8 and Radius, 121.1

*** 1.296 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	197.22	189.94
2	219.84	194.14
3	241.42	202.09
4	261.35	213.57
5	279.06	228.24
6	287.87	238.50

Circle Center At X = 184.6 ; Y = 322.5 and Radius, 133.1

*** 1.303 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	208.33	195.89
2	231.20	198.34
3	253.18	205.12
4	273.44	216.00
5	291.25	230.57
6	303.31	245.13

Circle Center At X = 207.4 ; Y = 313.9 and Radius, 118.0

*** 1.308 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	191.67	186.96
2	214.35	190.74
3	236.37	197.39
4	257.36	206.79
5	276.98	218.79
6	294.91	233.20
7	306.49	245.25

Circle Center At X = 173.5 ; Y = 365.8 and Radius, 179.8

*** 1.315 ***

```
        Y       A   X   I   S       F   T

        .00    87.50   175.00   262.50   350.00   437.50

X      .00 +---------+---------+---------+---------+---------+
        -
        -
        -
        -
        -
     87.50 +
        -              W *
        -
        -
        -
        -
A    175.00 +                ..
        -              .*
        -             ... 1
        -             .**129
        -             ....547.
        -            ......12.
X    262.50 +            ......501..
        -            .......5.411
        -            .........3424
        -            ...........3*
        -            ....... ....*
        -            ..............
I    350.00 +            ..............
        -             ..............
        -              ......*......
        -               ............
        -                ..........*
        -                 .........
S    437.50 +                    .......
        -                        *
        -
        -
        -
        -
    525.00 +                      *
        -                     *
        -
        -
        -
        -
F    612.50 +
        -
        -
        -
        -
        -
T    700.00 +                    W      *
```

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	213.89	198.87
2	236.86	199.94
3	258.07	208.84
4	274.93	224.48
5	279.92	234.24

Circle Center At X = 222.4 ; Y = 264.2 and Radius, 65.9

*** 1.333 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	202.78	192.92
2	225.35	188.47
3	248.16	191.37
4	268.91	201.29
5	285.47	217.25
6	296.17	237.61
7	297.13	243.46

Circle Center At X = 227.8 ; Y = 260.5 and Radius, 72.1

*** 1.346 ***

Boring / Well Construction Log

ENGINEERING, INC.

[redacted]. Number	B-1 Page 1 of 2	Purpose	Subsurface Investigation
Project Name	ABTco Industrial Landfill	Contractor	AMERIDRILL Corp.
Project No.	364.01	Registration No.	
Engineer	Nancy E. Marshall, P.E.	Driller	Randy Cutter
Start Date	11/10/97 Complete Date 11/10/97	Equipment	CME-55

Drilling Method: 2.25" ID, 4.25" OD Hollow stem augers

Comments: Obtain and log split-spoons at five-foot intervals

Obtain undisturbed sample from 37 to 39 feet

Well Construction Information (bgs)		Depth (ft.) From - To	Soil / Rock Description / Comments	Blow Counts a Sample Recove
Borehole Dia.		3.5 - 5.0	(SM) Tan and brown medium to fine-grained silty SAND -	8 - 9 - 13
Riser Type			medium dense, moist - fill	REC = 72%
Riser Diameter				
Screen Type		8.5 - 10.0	(SM) Tan medium to fine-grained silty micaceous SAND-	3 - 4 - 4
[redacted]een Diameter			loose, moist - fill	REC = 83%
Riser Interval				
Screen Interval		13.5 - 15.0	(SM) Brown and gray medium to fine-grained silty SAND-	8 - 9 - 14
Screen Slot Size			medium dense, moist - fill	REC = 100%
Grout Type				
Grout Interval		18.5 - 20.0	(SM) Tan medium to fine-grained silty micaceous SAND-	6 - 6 - 8
Bentonite Type			medium dense, moist - fill	REC = 100%
Bentonite Interval				
Gravel Pack		23.5 - 25.0	(SM) Tan medium to fine-grained silty micaceous SAND-	2 - 3 - 2
Gravel Pack Interval			loose, moist - fill	REC = 83%
Total Depth				
Ground Elevation		28.5 - 30.0	(SM) Tan medium to fine-grained silty micaceous SAND-	6 - 5 - 5
TOC Elevation			loose, moist - fill	REC = 56%
Water Level Information				
Date	**W.L. BGS**	33.5 - 35.0	(SM) Tan medium to fine-grained silty micaceous SAND-	2 - 4 - 4
TOB	Dry		loose, moist - fill	REC = 100%
24-hr	Dry			

[redacted]= Reference Point

BC = Blow Counts Per 6"

TBM = Temporary Benchmark

BGS = Below Ground Surface

MSL = Mean Sea Level

TOB = Time of Boring

Boring / Well Construction Log

ENGINEERING, INC.

Number	B-1 Page 2 of 2	Purpose	Subsurface Investigation
Project Name	ABTco	Contractor	AMERDRILL Corp.
Project No.	364.01	Registration No.	
Engineer	Nancy E. Marshall	Driller	Randy Cutter
Start Date	11/10/97 Complete Date 11/10/97	Equipment	CME-55

Drilling Method: 2.25" ID, 4.25" OD Hollow stem augers

Comments: Obtain and log split-spoons at five-foot intervals

Well Construction Information (bgs)		Depth (ft.) From - To	Soil / Rock Description / Comments	Blow Counts a Sample Recove
Borehole Dia.		38.5 - 40.0	(ML) Tan and gray fine-grained sandy very clayey SILT -	1 - 2 - 4
Riser Type			medium stiff, moist - probable residual	REC = 72%
Riser Diameter				
Screen Type		43.5 - 45.0	(ML) Tan fine-grained sandy SILT - stiff, moist - residual	4 - 7 - 6
Screen Diameter			soils	REC = 100%
Riser Interval				
Screen Interval		48.5 - 50.0	(ML) Tan fine-grained sandy SILT - very stiff, moist -	8 - 9 - 14
Screen Slot Size			residual soils	REC = 100%
Grout Type				
Grout Interval			Boring terminated at 50.0'	
Bentonite Type				
Bentonite Interval			-Cave-in to 42.10' bgs at TOB	
Gravel Pack				
Gravel Pack Interval				
Total Depth				
Ground Elevation				
TOC Elevation				
Water Level Information				
Date	**W.L. BGS**			
TOB	Dry			
24-hr	Dry			

Reference Point

BC = Blow Counts Per 6"

TBM = Temporary Benchmark

BGS = Below Ground Surface

MSL = Mean Sea Level

TOB = Time of Boring

AMERIDRILL Corp.

TEST BORING LOG

Auger Size = 2 1/4
Rig Make = CME 5

PROJECT NAME Roaring River Site
SHEET 1 OF
LOCATION Roaring River N.C.
BORING # B-
CLIENT Joyce Engineering
PROJECT # 364.0
DRILL TEAM NAMES Randy Frank
DATE 11-10-

SAMPLE DEPTH FROM / TO	TYPE OF SAMPLE	BLOWS PER 6 INCHES ON SAMPLER				IDENTIFICATION	S
		0 TO 6	6 TO 12	12 TO 18	18 TO 24	TOPSOIL= FILL	NO
3.5 / 5.0		8	9	13		Tan, BRN, Fi, med, SA, wood	1
/							
8.5 / 10.0		3	4	4		Tan, Fi, med, mic, SA FILL	2
/							
13.5 / 15.0		8	9	14		BLK Fi, med, SA, FILL	3
/							
18.5 / 20.0		6	6	8		Tan, Fi, mic, Si	4
/							
23.5 / 25.0		2	3	2		Same	5
/							
28.5 / 30.0		6	5	5		Same	6
/							
33.5 / 35.0		2	4	4		Same	7
/							
38.5 / 40.0		1	2	4		Tan, BLK Fi Si, moist FILL	8
/						FILL TO 42.0	
43.5 / 45.0		4	7	6		Tan, Fi, SA	9
/							
48.5 / 50.0		8	9	14		Tan, Fi, SA, moist	10

WATER AT TIME OF DRILLING moist
WATER AT COMPLETION OF DRILLING NONE
24 HOUR WATER LEVEL DRY
CAVED DEPTH AT COMPLETION OF DRILLING 42.
CAVED DEPTH AFTER 24 HOURS 4210

APPENDIX V

Soil Laboratory Test Results

ENGINEERING CONSULTANTS, INC.

P.O. Box 18846 • Zip 27419-8846 • 313 Gallimore Dairy Rd. • Greensboro, N.C. 27409 • (910) 668-0093 • FAX (910) 668-3

LETTER OF TRANSMITTAL

To: Ms. Nancy Marshall
Joyce Engineering
436 Spring Garden Street
Greensboro, NC 27401

Date: November 24, 1997

Regular Mail _____
Express Mail _____
Federal Express _____
Hand Carried XXXX
Other _____

COPIES	PAGES	DESCRIPTION
3	10	Laboratory test results for Joyce Engineering Project No. 364.01.

COMMENTS: _____

SIGNATURE: J. D. Hardister

J. Dean Hardister, E.I.T.
Staff Engineer

TRIGON JOB NO. 011-97-199

SUMMARY OF LABORATORY TEST DATA

JOYCE ENGINEERING PROJECT #364.01
GREENSBORO, NORTH CAROLINA
TRIGON JOB NO. 011-97-199

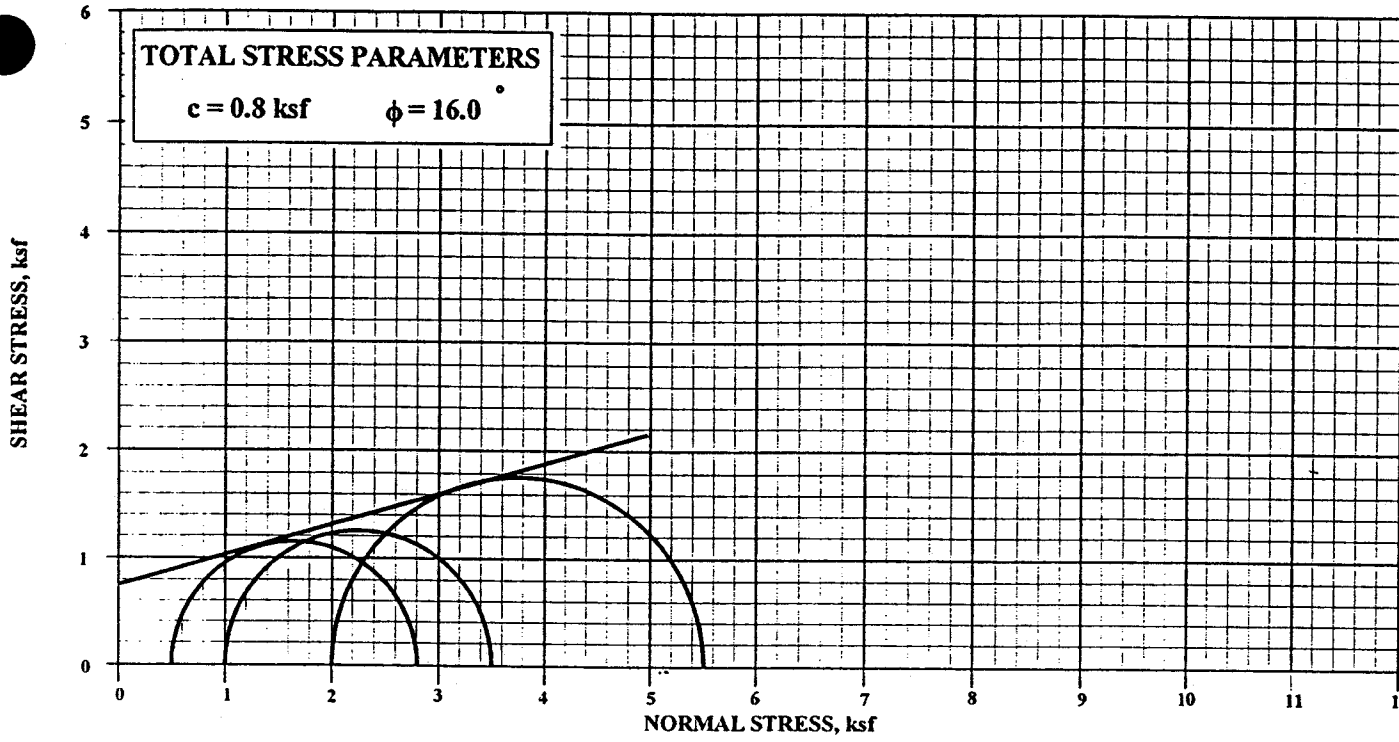
Sample	Sample Depth (ft.)	Sample Type[2]	Natural Moisture Content (%)	Triaxial Shear Data				Standard Proctor Curve		Remolded Data		Permeability (cm\sec.)
				Total Stress		Effective Stress		Max. Dry Density (pcf)	Opt. Water Content (%)	Dry Density (pcf)	Water Content (%)	
				c (ksf)	ϕ	c (ksf)	ϕ					
Stockpile	N/A	Bag	N/A					123.0	8.9	121.2	11.9	5.6×10^{-6}
Borrow	N/A	Bag	N/A					89.0	32.1	88.1	34.1	1.5×10^{-7}
50-50	N/A	Bag	N/A					84.5	26.8	81.0	28.5	3.4×10^{-6}
50-30-20	N/A	Bag	N/A					50.0	67.3	48.5	72.5	1.1×10^{-6}
UD	37 - 39	UD	71.0	0.8	16.0	0.4	31.5					

[1]Graphic Presentations of Results of Triaxial, Consolidation, CBR, Proctor, Grain Size, and other tests follow this summary.

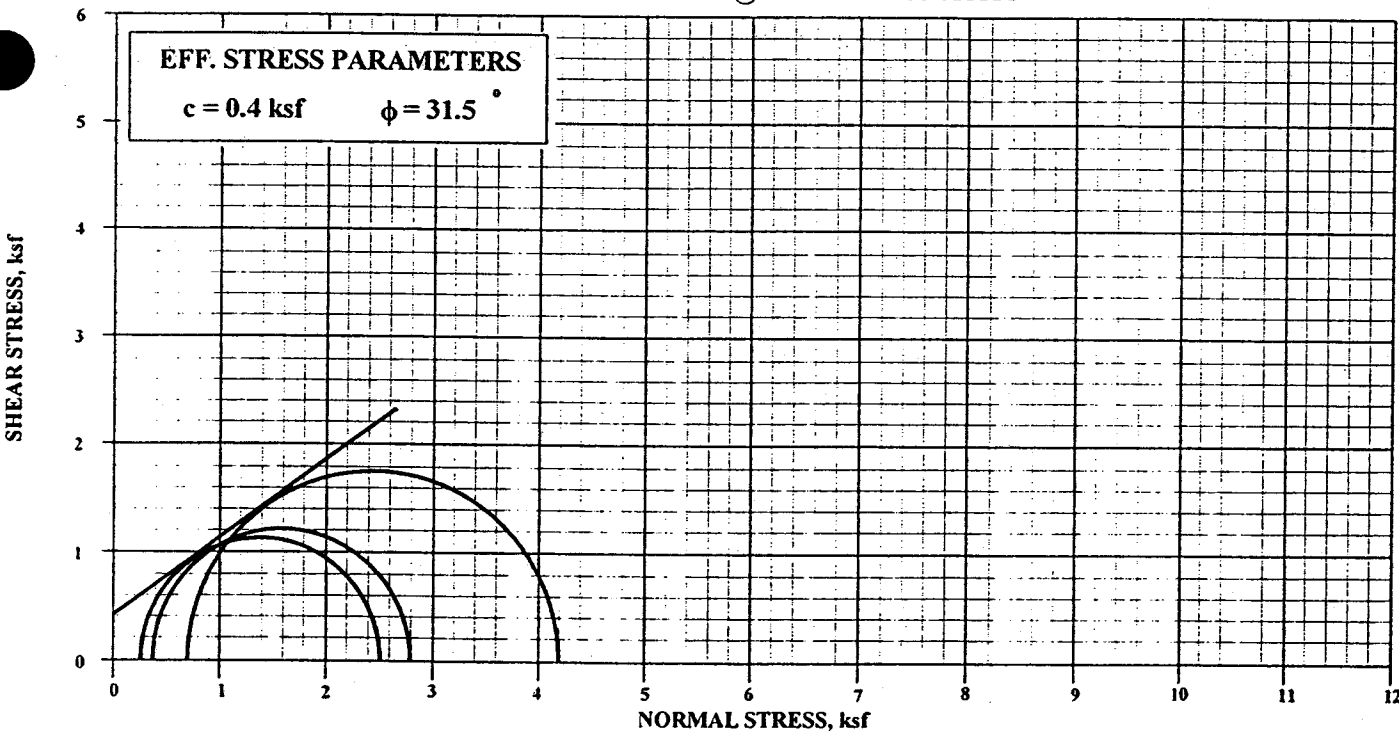
[2]SS = Split Spoon Sample (ASTM D-1586)
UD = Undisturbed Sample (ASTM D-1587)

TRIGON ENGINEERING CONSULTANTS, INC.
GREENSBORO, NORTH CAROLINA

TOTAL STRESS @ MAX. STRESS RATIO



EFFECTIVE STRESS @ MAX. STRESS RATIO



TRIGON
ENGINEERING CONSULTANTS, INC.

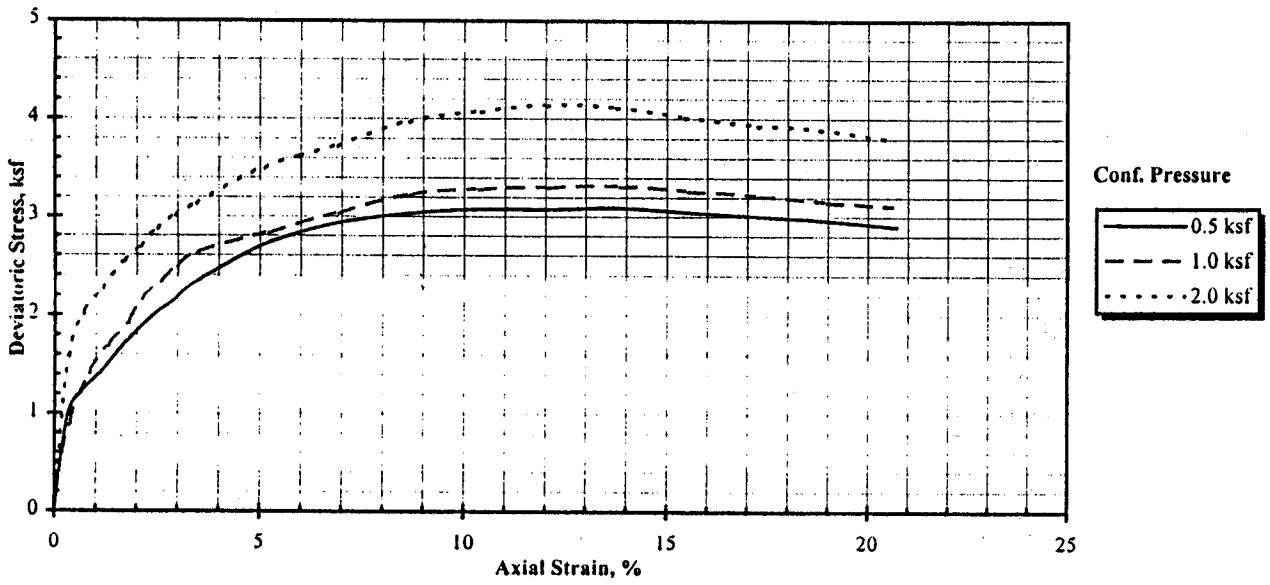
FAILURE ENVELOPES

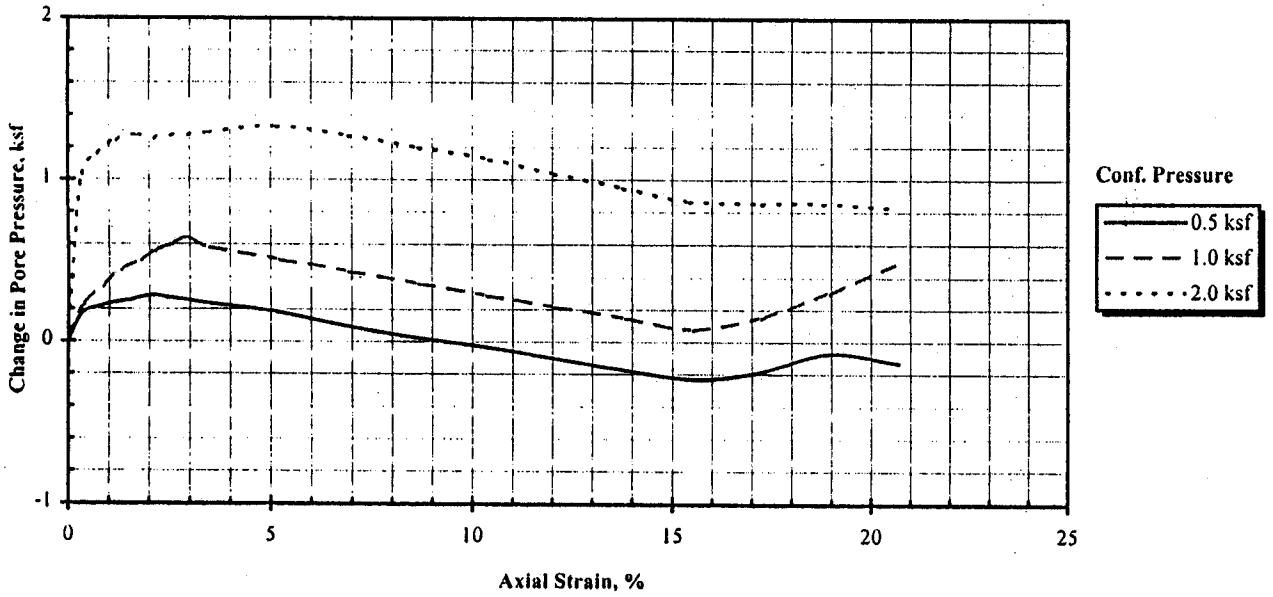
JOYCE ENG. PROJECT NO. 364.01
GREENSBORO, NORTH CAROLINA

Date 11/18/97	Sample: UD Depth: 37 - 39 Fe
Drawn by DH	Drawing No. 011-97-199-1

11/14/97

CONTROLLED STRAIN 0.005 in./min.





Date	11/20/97
Project Number:	011-97-199
Project Name:	Joyce Eng. Proj. 364.01 Greensboro, NC
Boring Number:	N/A
Specimen Type:	Undisturbed
Depth:	37 - 39 Feet

Specimen No.	1	2	3
Water Content, %	71.0	71.0	71.0
Dry Density, pcf	53.3	56.0	56.2
Saturation, %	100	100	100
Void Ratio	N/A	N/A	N/A
Initial Diameter, in.	2.85	2.85	2.85
Initial Height, in.	5.8	5.8	5.8
Minor Principal Stress, ksf	0.5	1.0	2.0
Maximum Deviator Stress, ksf	3.1	3.3	4.1

LL	PL	PI	G_s

Soil Description:

Brown Clayey Med. to Fine Sandy SILT

NOTES:

Project: Joyce Eng. Proj. 364.01
Boring: N/A
Depth (feet): 37 - 39
Eff. Conf. Pressure (psi): 3.5

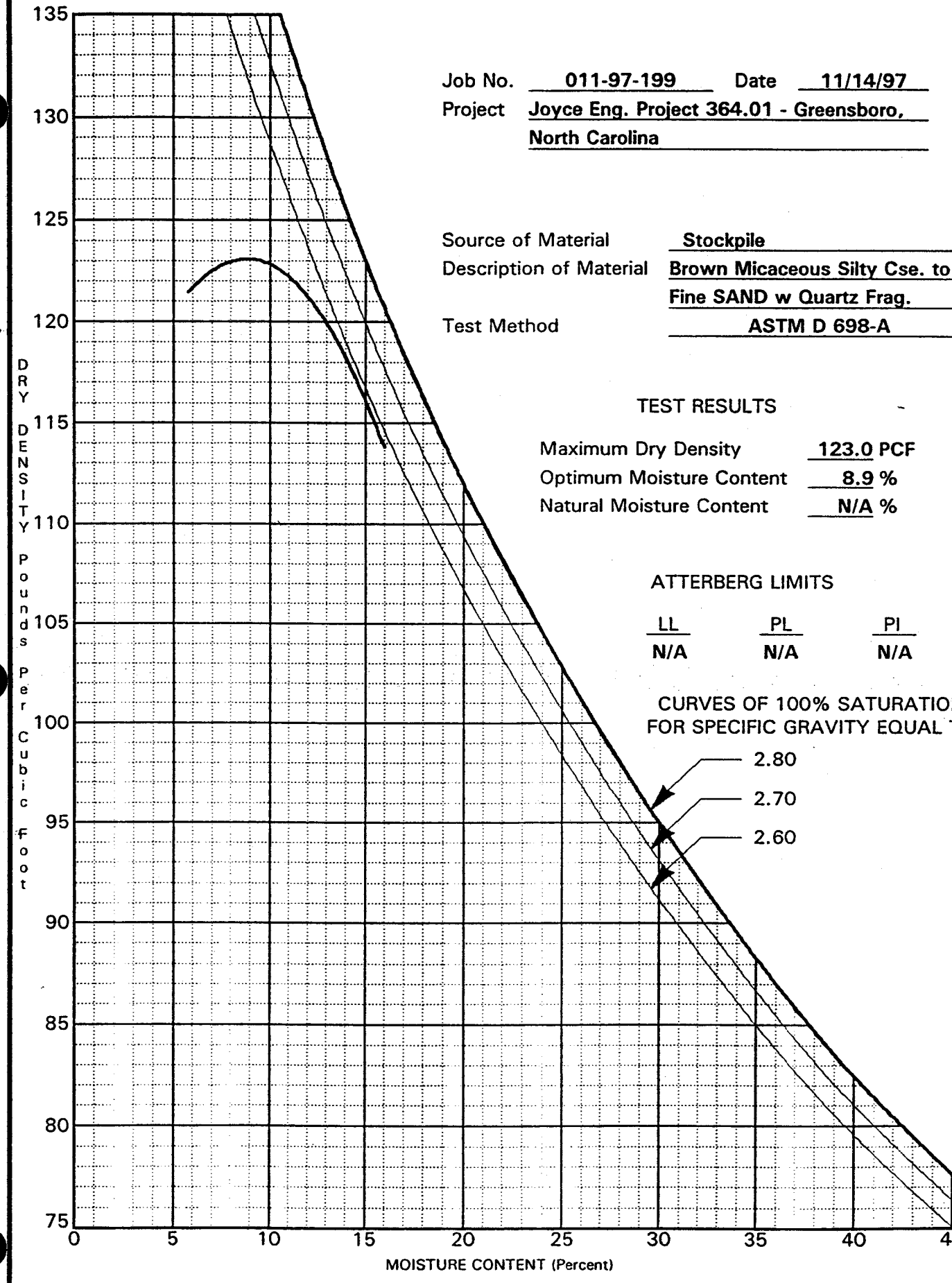
Deform. Dial Reading (inches)	Strain %	Corrected Area (in^2)	Load (#)	Pore Pressure (psi)	Change in Pore Press. (ksf)	Effect. Pressure (ksf)	A-value	Deviatoric Stress (ksf)	Shear Stress (ksf)	p' (ksf)	Stress Ratio
0.000	0.000	6.38	0.0	50.2	0.00	0.50	0.00	0.00	0.00	0.50	0.00
0.019	0.33	6.40	45.0	51.4	0.17	0.33	0.17	1.01	0.51	0.84	4.06
0.042	0.72	6.43	56.0	51.7	0.22	0.29	0.17	1.25	0.63	0.92	5.36
0.066	1.14	6.45	64.0	51.9	0.24	0.26	0.17	1.43	0.71	0.97	6.51
0.090	1.55	6.48	74.0	52.0	0.26	0.24	0.16	1.64	0.82	1.07	7.72
0.118	2.03	6.51	84.0	52.2	0.29	0.22	0.16	1.86	0.93	1.14	9.60
0.144	2.48	6.54	92.0	52.1	0.27	0.23	0.14	2.02	1.01	1.24	9.79
0.169	2.91	6.57	98.0	52.0	0.26	0.24	0.12	2.15	1.07	1.32	9.77
0.191	3.29	6.60	105.0	51.9	0.24	0.26	0.11	2.29	1.15	1.41	9.84
0.293	5.05	6.72	126.0	51.5	0.19	0.32	0.07	2.70	1.35	1.67	9.52
0.395	6.81	6.85	139.0	50.9	0.10	0.40	0.03	2.92	1.46	1.87	8.25
0.497	8.57	6.98	147.0	50.4	0.03	0.48	0.01	3.03	1.52	1.99	7.38
0.593	10.22	7.11	152.0	50.0	-0.03	0.53	-0.01	3.08	1.54	2.07	6.78
0.695	11.98	7.25	155.0	49.5	-0.10	0.60	-0.03	3.08	1.54	2.14	6.09
0.797	13.74	7.40	159.0	49.0	-0.17	0.68	-0.06	3.10	1.55	2.22	5.57
0.902	15.55	7.55	160.0	48.6	-0.23	0.73	-0.08	3.05	1.52	2.26	5.15
0.994	17.14	7.70	161.0	48.9	-0.19	0.69	-0.06	3.01	1.51	2.20	5.36
1.099	18.95	7.87	162.0	49.7	-0.07	0.58	-0.02	2.96	1.48	2.06	6.15
1.201	20.71	8.05	162.0	49.3	-0.13	0.63	-0.04	2.90	1.45	2.08	5.58

Project: Joyce Eng. Proj. 364.01
Boring: N/A
Depth (feet): 37 - 39
Eff. Conf. Pressure (psi): 7.0

Deform. Dial Reading (inches)	Strain %	Corrected Area (in^2)	Load (#)	Pore Pressure (psi)	Change in Pore Press. (ksf)	Effect. Pressure (ksf)	A-value	Deviatoric Stress (ksf)	Shear Stress (ksf)	p' (ksf)	Stress Ratio
0.001	0.00	6.38	0.0	50.0	0.00	1.01	0.00	0.00	0.00	1.01	0.00
0.022	0.38	6.40	39.0	51.5	0.22	0.79	0.25	0.88	0.44	1.23	2.11
0.049	0.84	6.43	62.0	52.3	0.33	0.68	0.24	1.39	0.69	1.37	3.05
0.074	1.28	6.46	75.0	53.0	0.43	0.58	0.26	1.67	0.84	1.41	3.90
0.104	1.79	6.50	86.0	53.4	0.49	0.52	0.26	1.91	0.95	1.47	4.68
0.123	2.12	6.52	97.0	53.8	0.55	0.46	0.26	2.14	1.07	1.53	5.65
0.148	2.55	6.55	105.0	54.1	0.59	0.42	0.26	2.31	1.15	1.57	6.53
0.173	2.98	6.58	113.0	54.4	0.63	0.37	0.26	2.47	1.24	1.61	7.61
0.201	3.47	6.61	120.0	54.0	0.58	0.43	0.22	2.61	1.31	1.74	7.05
0.301	5.19	6.73	132.0	53.5	0.50	0.50	0.18	2.82	1.41	1.92	6.60
0.400	6.90	6.85	144.0	53.0	0.43	0.58	0.14	3.03	1.51	2.09	6.25
0.501	8.64	6.98	156.0	52.5	0.36	0.65	0.11	3.22	1.61	2.26	5.96
0.599	10.33	7.11	162.0	52.0	0.29	0.72	0.09	3.28	1.64	2.36	5.55
0.698	12.03	7.25	166.0	51.5	0.22	0.79	0.07	3.30	1.65	2.44	5.16
0.801	13.81	7.40	170.0	51.0	0.14	0.86	0.04	3.31	1.65	2.52	4.83
0.899	15.50	7.55	171.0	50.5	0.07	0.94	0.02	3.26	1.63	2.57	4.48
0.999	17.22	7.71	172.0	51.0	0.14	0.86	0.04	3.21	1.61	2.47	4.72
1.099	18.95	7.87	172.0	52.1	0.30	0.71	0.10	3.15	1.57	2.28	5.46
1.199	20.67	8.04	173.0	53.3	0.48	0.53	0.15	3.10	1.55	2.08	6.81

Project: Joyce Eng. Proj. 364.01
Boring: N/A
Depth (feet): 37 - 39
Eff. Conf. Pressure (psi): 14.0

Deform. Dial Reading (inches)	Strain %	Corrected Area (in^2)	Load (#)	Pore Pressure (psi)	Change in Pore Press. (ksf)	Effect. Pressure (ksf)	A-value	Deviatoric Stress (ksf)	Shear Stress (ksf)	p' (ksf)	Stress Ratio
0.000	0.00	6.38	0.0	45.2	0.00	2.02	0.00	0.00	0.00	2.02	0.00
0.021	0.36	6.40	70.0	52.3	1.02	0.99	0.65	1.57	0.79	1.78	2.58
0.041	0.71	6.43	89.0	53.2	1.15	0.86	0.58	1.99	1.00	1.86	3.31
0.068	1.17	6.46	101.0	53.8	1.24	0.78	0.55	2.25	1.13	1.90	3.90
0.099	1.71	6.49	114.0	54.0	1.27	0.75	0.50	2.53	1.26	2.01	4.38
0.122	2.10	6.52	121.0	53.9	1.25	0.76	0.47	2.67	1.34	2.10	4.50
0.145	2.50	6.54	130.0	54.0	1.27	0.75	0.44	2.86	1.43	2.18	4.82
0.170	2.93	6.57	137.0	54.0	1.27	0.75	0.42	3.00	1.50	2.25	5.01
0.200	3.45	6.61	143.0	54.1	1.28	0.73	0.41	3.12	1.56	2.29	5.24
0.296	5.10	6.72	163.0	54.4	1.32	0.69	0.38	3.49	1.75	2.44	6.05
0.399	6.88	6.85	177.0	54.0	1.27	0.75	0.34	3.72	1.86	2.61	5.97
0.500	8.62	6.98	192.0	53.5	1.20	0.82	0.30	3.96	1.98	2.80	5.82
0.602	10.38	7.12	201.0	53.0	1.12	0.89	0.28	4.07	2.03	2.93	5.55
0.696	12.00	7.25	208.0	52.4	1.04	0.98	0.25	4.13	2.07	3.04	5.22
0.796	13.72	7.39	211.0	51.8	0.95	1.07	0.23	4.11	2.05	3.12	4.86
0.893	15.40	7.54	210.0	51.2	0.86	1.15	0.22	4.01	2.01	3.16	4.48
0.999	17.22	7.71	210.0	51.1	0.85	1.17	0.22	3.92	1.96	3.13	4.36
1.088	18.76	7.85	212.0	51.1	0.85	1.17	0.22	3.89	1.94	3.11	4.33
1.193	20.57	8.03	211.0	50.9	0.82	1.20	0.22	3.78	1.89	3.09	4.17



Job No. 011-97-199 Date 11/14/97

Project Joyce Eng. Project 364.01 - Greensboro, North Carolina

Source of Material Stockpile

Description of Material Brown Micaceous Silty Cse. to Fine SAND w Quartz Frag.

Test Method ASTM D 698-A

TEST RESULTS

Maximum Dry Density	123.0 PCF
Optimum Moisture Content	8.9 %
Natural Moisture Content	N/A %

ATTERBERG LIMITS

LL	PL	PI
N/A	N/A	N/A

CURVES OF 100% SATURATIO
FOR SPECIFIC GRAVITY EQUAL

2.80

2.70

2.60

MOISTURE-DENSITY RELATIONSHIP

TRIGON ENGINEERING CONSULTANTS, INC.

Greensboro, North Carolina

Job No. 011-97-199 Date 11/14/97

Project Joyce Eng. Project 364.01 - Greensboro, North Carolina

Source of Material Borrow Soil

Description of Material Red Slightly Micaceous Coarse to Fine Sandy SILT

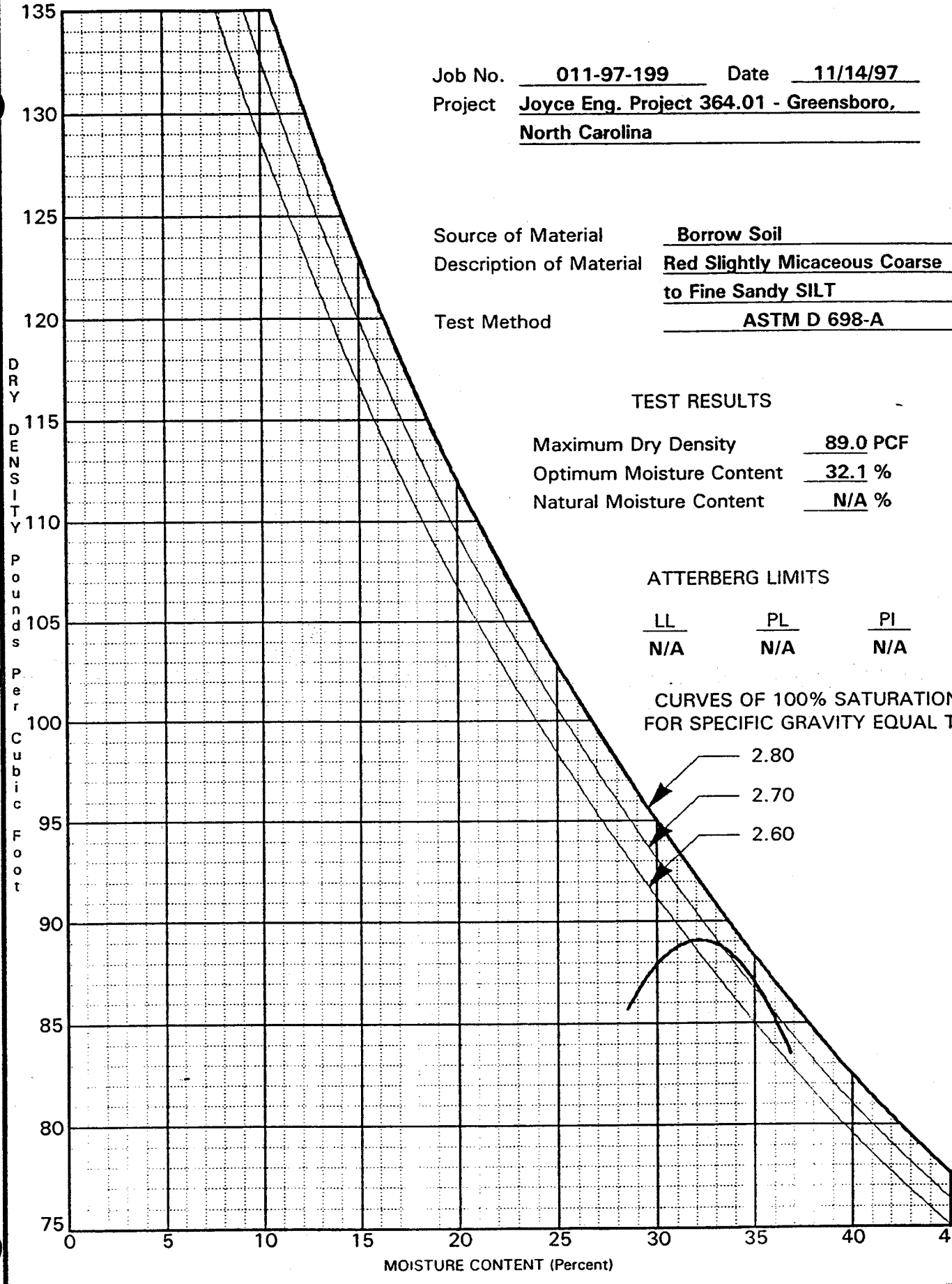
Test Method ASTM D 698-A

TEST RESULTS

Maximum Dry Density	89.0 PCF
Optimum Moisture Content	32.1 %
Natural Moisture Content	N/A %

ATTERBERG LIMITS

LL	PL	PI
N/A	N/A	N/A



MOISTURE-DENSITY RELATIONSHIP

TRIGON ENGINEERING CONSULTANTS, INC.

Greensboro, North Carolina

Job No. 011-97-197 Date 11/14/97

Project Joyce Eng. Project 364.01 - Greensboro, North Carolina

Source of Material Stockpile/Ash

Description of Material 50% Stockpile/50% Ash

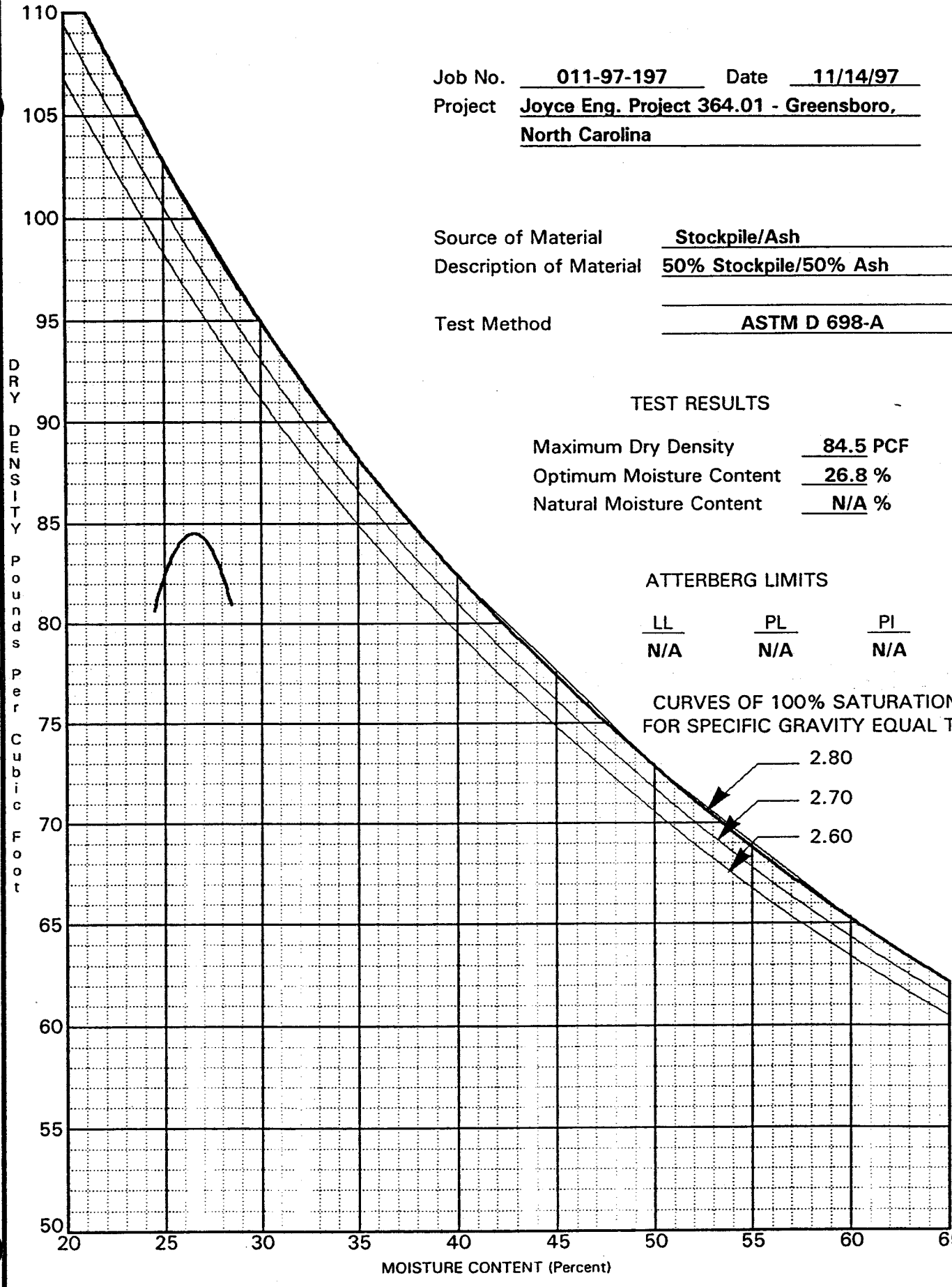
Test Method ASTM D 698-A

TEST RESULTS

Maximum Dry Density	84.5 PCF
Optimum Moisture Content	26.8 %
Natural Moisture Content	N/A %

ATTERBERG LIMITS

LL	PL	PI
N/A	N/A	N/A



MOISTURE-DENSITY RELATIONSHIP

TRIGON ENGINEERING CONSULTANTS, INC.

Greensboro, North Carolina

Job No. 011-97-199 Date 11/14/97

Project Joyce Eng. Project 364.01 -
Greensboro, North Carolina

Source of Material Stockpile/Ash/Sludge

Description of Material 50% Stockpile/30% Ash/20% Sludge

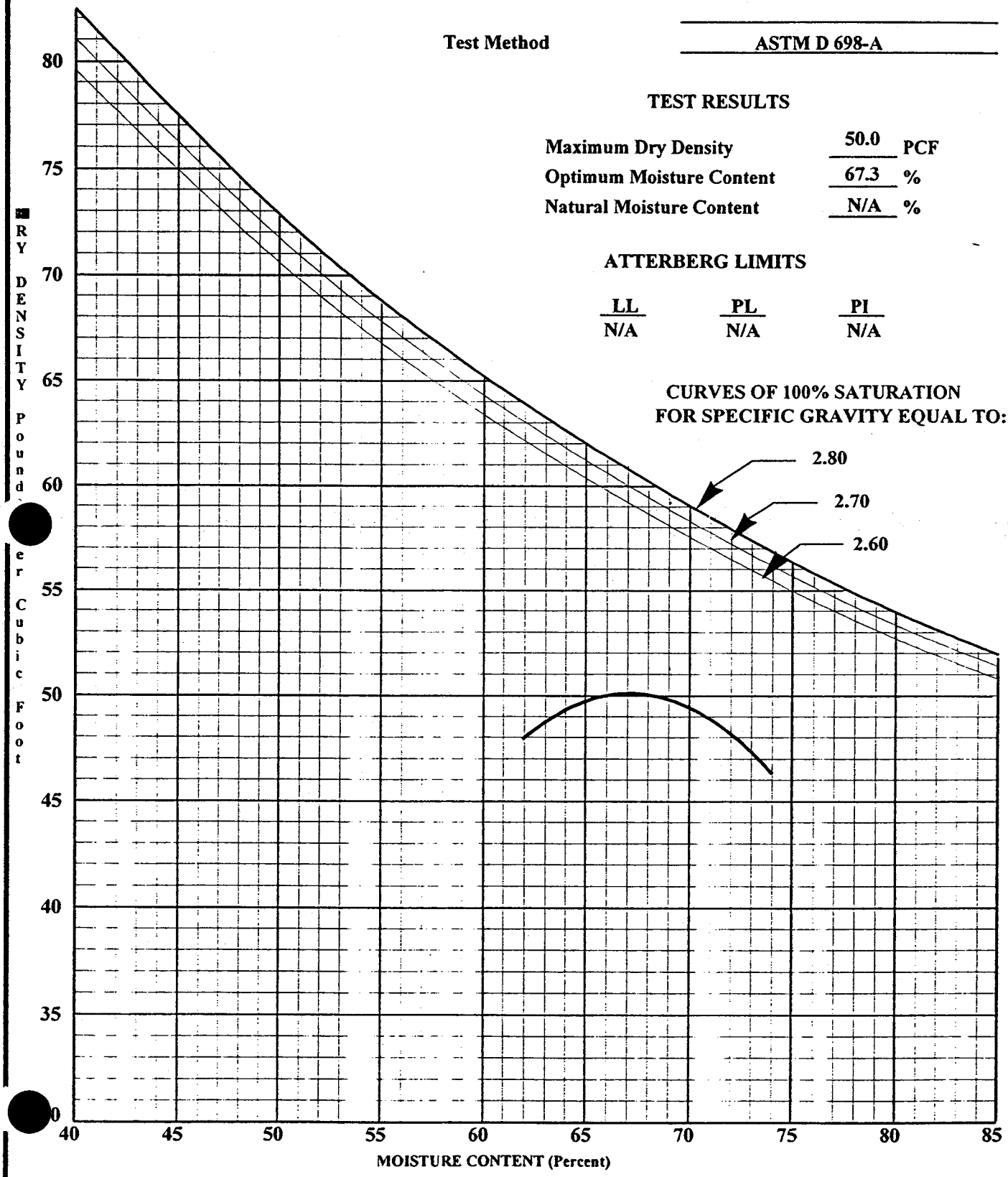
Test Method ASTM D 698-A

TEST RESULTS

Maximum Dry Density	50.0	PCF
Optimum Moisture Content	67.3	%
Natural Moisture Content	N/A	%

ATTERBERG LIMITS

LL	PL	PI
N/A	N/A	N/A



MOISTURE-DENSITY RELATIONSHIP

TRIGON ENGINEERING CONSULTANTS, INC.

Greensboro, North Carolina

APPENDIX VI

Well Construction Records and Correspondence Regarding the Monitoring Well Network

ABITIBI-PRICE

ABITIBI-PRICE CORPORATION, Building Products Division
P.O. Box 98, Highway 268, Roaring River, N.C. 28669, (919) 696-2751

November 22, 1989

Mr. Bobby Lutfy
Hydrogeological Technician
North Carolina Department of
Environment, Health, &
Natural Resources
Division of Solid Waste Management
PO Box 27687
Raleigh, NC 27611-7687

Dear Mr. Lutfy

Enclosed is the information you requested, by letter, on October 23, 1989.

Environmental Testing will perform our annual ground and surface water monitoring extractions. The samples will be taken on April 2, 1990.

If we can be of further service, please contact us.

Sincerely,

David C. Doyle

David C. Doyle

zy

Enclosures

N. C. Department of Human Resources
Division of Health Services

WELL COMPLETION RECORD

COMPLETE ALL INFORMATION REQUESTED BELOW FOR EACH WELL INSTALLED, AND RETURN FORM TO THE N
DEPARTMENT OF HUMAN RESOURCES, SOLID AND HAZARDOUS WASTE MANAGEMENT BRANC
P. O. BOX 2091, RALEIGH, N.C. 27602

NAME OF SITE: Abitibi - Price

PERMIT NO.: 97-03

ADDRESS: Hwy 268 Roaring River, NC. 28669

OWNER (print): Abitibi - Price

DRILLING CONTRACTOR: Newman Brothers Inc.

REGISTRATION NO.:

Casing Type:	Steel	dia.	4	in.	Grout Depth:	from 3	to 12	ft. - dia.	13
Casing Depth:	from 0	to 4	ft. - dia.	4	in.	Bentonite Seal:	from 12	to 13	ft. - dia.	13
Screen Type:	Slotted PVC	dia.	2	in.	Sand/Gravel PK:	from 13	to 28	ft. - dia.	13
Screen Depth:	from 18	to 28	ft. - dia.	2	in.	Total Well Depth:	from 0	to 28	ft. - dia.	13

Static Water Level: 24.4 feet from top of casing Date Measured ___/___/___

Yield (gpm): N/A Method of Testing: N/A Casing is 1 feet above land surf

DRILLING LOG

DEPTH FROM	TO	FORMATION DESCRIPTION

LOCATION SKETCH

(show distance to numbered roads, or other map reference point

See the Attached

REMARKS: This well, # FA1, is the upgradient well. Samples will be taken on 4/2/90.

DATE: 11/22/89 SIGNATURE: David C. Doyle

3342 (6/85)
& Hazardous Waste Management Branch

N. C. Department of Human Resources
Division of Health Services

WELL COMPLETION RECORD

OMPLETE ALL INFORMATION REQUESTED BELOW FOR EACH WELL INSTALLED, AND RETURN FORM TO THE N.
EPARTMENT OF HUMAN RESOURCES, SOLID AND HAZARDOUS WASTE MANAGEMENT BRANCH
O. BOX 2091, RALEIGH, N.C. 27602

AME OF SITE: Abitibi - Price Fly Ash Site
PERMIT NO.: 97-03

DDRESS: Hwy 268 Roaring River NC 28669
OWNER (print): Abitibi - Price

RILLING CONTRACTOR: Newman Brothers Inc.
REGISTRATION NO.:

sing Type: Steel dia. 4 in. Grout Depth: from 3 to 13 ft. - dia. 13 i
sing Depth: from 0 to 4 ft. - dia. 4 in. Bentonite Seal: from 13 to 14 ft. - dia. 13 i
een Type: Slo Hed PVC dia. 2 in. Sand/Gravel PK: from 14 to 29 ft. - dia. 13 i
een Depth: from 19 to 29 ft. - dia. 2 in. Total Well Depth: from 0 to 29 ft. - dia. 13 i

tic Water Level: 12.4 feet from top of casing Date Measured ___ / ___ / ___

ld (gpm): N/A Method of Testing: N/A Casing is 1' feet above land surfac

DRILLING LOG			LOCATION SKETCH
DEPTH			(show distance to numbered roads, or other map reference points)
FROM	TO	FORMATION DESCRIPTION	See the Attached

MARKS: This well # FA2 is the downgradient well. Samples will be taken on 4/2/90

TE: 11/22/89 SIGNATURE: David C. Doyle

3342 (6/85)
& Hazardous Waste Management Branch

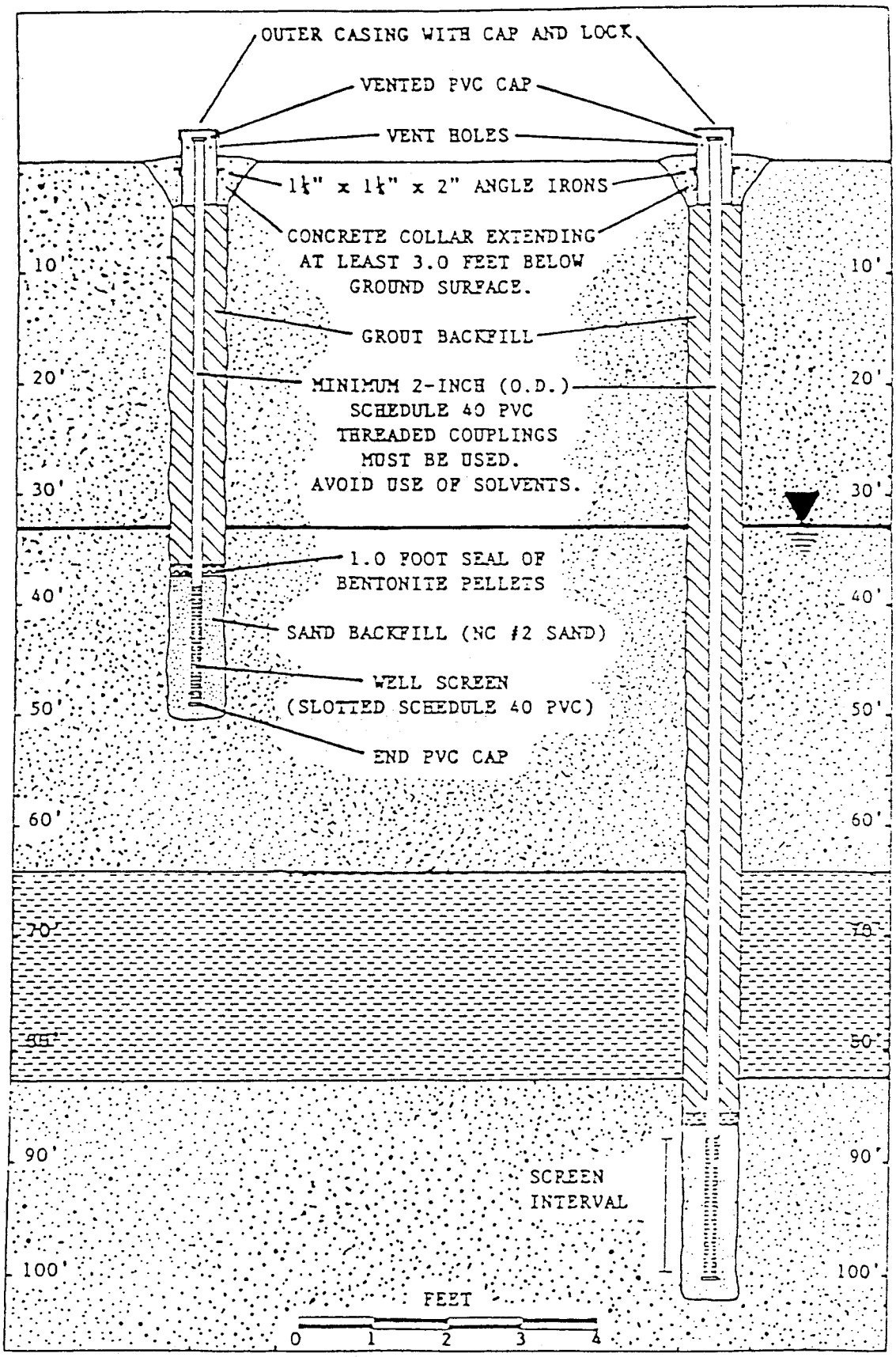


Figure 5. Typical ground-water monitoring well nest schematic.

State of North Carolina
Department of Environment,
Health and Natural Resources
Division of Waste Management

James B. Hunt, Jr., Governor
Jonathan B. Howes, Secretary
William L. Meyer, Director

DEHNR

November 18, 1996

Mr. Erich Burke
Environmental Engineer
ABTCo, Inc.
Hwy. 268, P.O. Box 98
Roaring River, N.C. 28669

RE: Ground-water Monitoring At The ABTCo Industrial Landfill (Permit # 97-03)

Dear Mr. Burke,

Thank you for the opportunity to meet with you this past Thursday and to walk over the wood ash landfill and inspect the ground-water monitoring wells. This letter is written to document our discussion and outline what further steps ABTCo needs to take in the next few months in order to provide some additional information necessary for evaluation of the ash landfill and its ground-water monitoring system.

- The large drawing submitted in the document prepared for ABTCo by Trigon Engineering Consultants (dated May 24, 1996) has incorrect locations for the ground-water monitoring wells. Therefore this drawing is to be deleted from the report. The smaller map at the very end of the report shows the locations for the monitoring wells accurately.

- Boring Logs for the monitoring wells would be useful in evaluating the wells. Are the wells screened in the soil or in fractured bedrock? ABTCo will make an effort to see if the well driller has any Boring Logs or descriptions of the materials drilled during the construction of the monitoring wells.

- The upgradient well (FA-1) is screened a little too shallow and is located too close to the waste to be a true background well. The limited water column of about five feet could yield turbid samples which could result in higher total metals values.

P.O. Box 27687,
Raleigh, North Carolina 27611-7687
Voice 919-733-4996

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- For the next sampling event turbidity will be measured and dissolved analyses from filtered samples will be done for the metals in addition to the total (unfiltered) metals analyses. This will assist in the evaluation of the reason for some of the elevated metals values that have been reported in the past for the two monitoring wells.

- For the next sampling event, the two monitoring wells should be analyzed for the following: field measurements - pH, temperature, turbidity, and specific conductivity, and lab measurements - Arsenic, Barium, Beryllium, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Selenium, Silver, Sulfates, Total Dissolved Solids, Zinc, a Volatile Organic Compound scan for the constituents in the list attached using EPA method 8260, and a semi-volatile scan using EPA method 8270. Be sure the 8270 scan includes naphthalenes (such as naphthalene and acenaphthylene) and phenols (such as 2,4-dinitrophenol).

- Additional TCLP analyses of the ash needs to be done for 2,4-Dinitrotoluene and Hexachlorobenzene at detection limits less than or equal to .013 mg/l, which is the regulatory limit for materials that may be disposed in an unlined landfill in North Carolina.

- The downgradient well (FA-2) appears to be located in an excellent location. It appears this well may be screened slightly deeper than is ideal, however otherwise it appears to be a properly designed monitoring well.

- Pending the evaluation of the boring logs and the next set of sampling results, the existing monitoring system appears generally adequate.

The additional information discussed in this letter will be useful in the evaluation of the ABTCo Ash Landfill and its ground-water monitoring system. If you have any questions regarding this letter, please call me at (919) 733-0692, extension 258.

Sincerely,

Bobby Lutfy

Bobby Lutfy, Hydrogeologist
Solid Waste Section

APPENDIX I ORGANIC CONSTITUENTS

ORGANIC CONSTITUENT	PQL (UG/L)	ORGANIC CONSTITUENT	PQL (UG/L)
(16) ACETONE	100	(40) T-1,3-DICHLOROPROPENE	10
(17) ACRYLONITRILE	200	(41) ETHYLBENZENE	5
(18) BENZENE	5	(42) METHYL BUTYL KETONE	50
(19) BROMOCHLOROMETHANE	5	(43) METHYL BROMIDE	10
(20) BROMODICHLOROMETHANE	5	(44) METHYL CHLORIDE	10
(21) BROMOFORM	5	(45) METHYLENE BROMIDE	10
(22) CARBON DISULFIDE	100	(46) METHYLENE CHLORIDE	10
(23) CARBON TETRACHLORIDE	10	(47) MEK: 2-BUTANONE	100
(24) CHLOROBENZENE	5	(48) METHYL IODIDE	10
(25) CHLOROETHANE	10	(49) METHYL ISOBUTYL KETONE	100
(26) CHLOROFORM	5	(50) STYRENE	10
(27) CHLORODIBROMOMETHANE	5	(51) 1,1,1,2-TETRACHLOROETHANE	5
(28) DBCP	25	(52) 1,1,2,2-TETRACHLOROETHANE	5
(29) ETHYLENE DIBROMIDE	5	(53) TETRACHLOROETHYLENE	5
(30) O-DICHLOROBENZENE	5	(54) TOLUENE	5
(31) P-DICHLOROBENZENE	5	(55) 1,1,1,-TRICHLOROETHANE	5
(32) T-1,4-DICHLORO-2-BUTENE	100	(56) 1,1,2-TRICHLOROETHANE	5
(33) 1,1-DICHLOROETHANE	5	(57) TRICHLOROETHYLENE	5
(34) ETHYLENE DICHLORIDE	5	(58) CFC-11	5
(35) VINYLIDENE CHLORIDE	5	(59) 1,2,3-TRICHLOROPROPANE	15
(36) CIS-1,2-DICHLOROETHENE	5	(60) VINYL ACETATE	50
(37) T-1,2-DICHLOROETHENE	5	(61) VINYL CHLORIDE	10
(38) PROPYLENE DICHLORIDE	5	(62) XYLENES	5
(39) CIS-1,3-DICHLOROPROPENE	10		

ALSO KNOWN AS: (21)-TRIBROMOMETHANE, (25)-ETHYL CHLORIDE, (26)-TRICHLOROMETHANE, (27)-DIBROMOCHLOROMETHANE, (28)-1,2-DIBROMO-3-CHLOROPROPANE, (29)-1,2-DIBROMOETHANE, (30)-1,2-DICHLOROBENZENE, (31)-1,4-DICHLOROBENZENE, (33)-ETHYLIDENE CHLORIDE, (34)-1,2-DICHLOROETHANE, (35)-1,1-DICHLOROETHENE (ETHYLENE), (36)-CIS-1,2-DICHLOROETHYLENE, (37)-TRANS-1,2-DICHLOROETHYLENE, (38)-1,2-DICHLOROPROPANE, (42)-2-HEXANONE, (43)-BROMOMETHANE, (44)-CHLOROMETHANE, (45)-DIBROMOMETHANE, (46)-DICHLOROMETHANE, (47)-METHYL ETHYL KETONE, (48)-IODOMETHANE, (49)-4-METHYL-2-PENTANONE, (53)-TETRACHLOROETHENE, PERCHLOROETHYLENE, (55)-METHYLCHLOROFORM, (57)-TRICHLOROETHENE (58)-TRICHLOROFLUOROMETHANE

ABTco, Inc.
Siding Divison
P.O. Box 98 Highway 268
Roaring River, North Carolina 28669

December 30, 1996

Mr. Bob Lufty
Solid Waste Section
NC D.E.H.N.R.
PO BOX 27687
Raleigh, NC 27611-7687

Dear Mr. Lufty,

Please accept this letter as a response to your letter of November 18, 1996. All the items in your letter are addressed in this letter.

- Per our conversation, the large drawing submitted by Trigon was in error. The well locations are those on the other plans, maps and in the Solid Waste file.

- ABTco made an effort to obtain well boring logs for the landfill wells. However, conversations with Newman Brothers, Elkin NC, who installed the wells did not reveal these documents. Additional conversations with Larry Pierce of Newman Brothers who was the drill operator who actually installed these wells did reveal that these well were not in fractured bedrock, but were rather installed with the screened portion in dirt.

- The upstream well is not ideal but shall suffice for this evaluation.

- The next groundwater sampling event which will be scheduled in early 1997 will include the requested parameters in your letter. This sampling event will be scheduled in February and shall be coordinated with the Division to allow your attendance should the Division decide to send a representative. This sampling shall also be used as one of the annual routine sampling events required by the Division.

- You shall find enclosed the additional TCLP data you requested in your letter. The compounds for which the mandated detection limits were not met were reanalyzed for and the results are attached. None of the compounds which were analyzed for at the lower detection limits were detected in this analysis.

We feel confident that the landfill has not presented any threat to the environment and as such we feel that it should be allowed to operate in a manner consistent with historical practices beyond the December 31, 1997 statutory closure date. If you have any questions or require any further information, please do not hesitate to contact me at my office.

Sincerely,

Erich Burke, P.E.
Environmental Engineer

Enclosure

cc: Hugh Browder
Mike Blosser

HYDROLOGIC, INC.

December 5, 1996

REPORTING:

Hydrologic-Asheville, Inc
122 Lyman Street
Asheville, NC 28801

INVOICING:

Hydrologic-Asheville, Inc
122 Lyman Street
Asheville, NC 28801

PROJECT NUMBER: FL9619039

DATE COMPLETED: December 5, 1996
DATE RECEIVED: November 29, 1996

PROJECT DESCRIPTION:

ABT Co.--1 sample received and analyzed for the following: TCLP-8080/8150.

Enclosed is the laboratory report for the project described above. If you have any questions or if we can be of further assistance, please feel free to contact Jack Hale Jr. at 1-800-728-2251. We appreciate your business and look forward to serving you again soon.

Respectfully,

Walter Hogg
QA/QC Officer

HYDROLOGIC, INC.

COMPANY NAME:	Hydrologic-Asheville, Inc
COMPANY PROJECT NUMBER:	ABT Co.
HYDROLOGIC PROJECT NUMBER:	FL9619039
HYDROLOGIC SAMPLE NUMBER:	9619039
HYDROLOGIC LAB ID #:	399
SAMPLE IDENTIFICATION:	ABTco Ash
DATE SAMPLED:	11/21/96
DATE EXTRACTED:	12/02/96
DATE/TIME ANALYZED:	12/04/96

METHOD TCLP 8080

ANALYSIS	CAS NO.	SDL (mg/l)	RESULT (mg/l)
Heptachlor	76-44-8	0.0005	BDL
Endrin	72-20-8	0.001	BDL
Chlordane	57-74-9	0.003	BDL
Toxaphene	8001-35-2	0.01	BDL
Methoxychlor	72-43-5	0.005	BDL
Lindane	58-89-9	0.0005	BDL
Surrogate Recovery:			
DBC			102%

BDL = Below Sample Detection Limit
SDL = Sample Detection Limit

COMMENTS: _____

1491 TWILIGHT TRAIL FRANKFORT, KY 40601
502-223-0251 FAX 502-875-8016 / TOLL FREE 800-726-2251

HYDROLOGIC, INC.

COMPANY NAME:	Hydrologic-Asheville, Inc
COMPANY PROJECT NUMBER:	ABT Co.
HYDROLOGIC PROJECT NUMBER:	FL9619039
HYDROLOGIC SAMPLE NUMBER:	9619039
HYDROLOGIC LAB ID #:	399
SAMPLE IDENTIFICATION:	ABTco Ash
DATE SAMPLED:	11/21/96
DATE EXTRACTED:	12/01/96
DATE/TIME ANALYZED:	12/04/96

METHOD TCLP 8270

ANALYSIS	CAS NO.	SDL (mg/kg)	RESULT (mg/kg)
2,4-Dinitrotoluene	121-14-2	0.013	BDL
Hexachlorobenzene	118-74-1	0.013	BDL
Surrogate Recovery:			
2-Fluorobiphenyl			102%
Nitrobenzene-d5			114%
4-Terphenyl-D14			82%
2-Fluorophenol			58%
Phenol-D5			48%
2,4,6-Tribromophenol			72%

BDL = Below Sample Detection Limit
SDL = Sample Detection Limit

COMMENTS: _____

APPENDIX VII

Summaries of Historical Groundwater Monitoring Well Data

TABLE VII - 1
Summary of Recent Historical Data
ABTco Industrial Landfill

Parameter	NC 2L Standard	Date	Concentration (mg/L) FA-1	Concentration (mg/L) FA-2
Arsenic	0.05	4/9 - 10/95	ND	ND
		Apr-96	0.004	< 0.003
		Oct-96	< 0.003	< 0.003
		Feb-97	< 0.003	< 0.003
		Aug-97	0.48	0.504
Barium	2	4/9 - 10/95	ND - 3.740	ND - 0.110
		Apr-96	0.392	0.089
		Oct-96	0.110	0.064
		Feb-97	0.093	0.080
		Aug-97	0.920	1.782
Beryllium	(0.002)	4/9 - 10/95	0.001	ND
		Feb-97	< 0.001	< 0.001
BOD	NE	4/9 - 10/95	ND - 69	ND - 16
		Apr-96	2	3.9
		Oct-96	30	6.3
		Feb-97	-	-
		Aug-97	< 2	< 2
Cadmium	0.005	4/9 - 10/95	ND - 0.017	ND - 0.013
		Apr-96	0.011	< 0.001
		Feb-97	0.002	< 0.001
Chemical Oxygen Demand	NE	4/9 - 10/95	ND - 75	ND - 55
		Apr-96	< 10	< 10
		Oct-96	126	21
		Feb-97	-	-
		Aug-97	42	<10
Chloride	250	4/9 - 10/95	ND - 69	6.56 - 14
		Apr-96	2.2	12
		Oct-96	1.7	10.1
		Feb-97	-	-
		Aug-97	1.7	14
Chromium	0.05	4/9 - 10/95	ND - 0.283	ND - 0.012
		Apr-96	0.233	0.011
		Oct-96	0.020	< 0.005
		Feb-97	0.011	< 0.005
		Aug-97	0.057	0.180

Printed on recycled paper

TABLE VII - 1
Summary of Recent Historical Data
ABTco Industrial Landfill

Parameter	NC 2L Standard	Date	Concentration (mg/L)	
			FA-1	FA-2
Cobalt	(0.002)	4/9 - 10/95	ND - 0.109	ND
		Oct-96	0.007	< 0.005
		Aug-97	0.044	< 0.005
Conductivity	NE	Apr-96	164	398
		Oct-96	334	362
		Feb-97	418	400
		Aug-97	137	386
Copper	1	4/9 - 10/95	ND - 0.184	ND - 0.032
		Apr-96	0.238	< 0.005
		Feb-97	0.015	< 0.005
		Oct-96	0.026	< 0.005
Flouride	2	4/9 - 10/95	ND - 0.63	ND - 0.10
		Apr-96	< 0.10	< 0.10
		Oct-96	< 0.10	< 0.10
		Feb-97	-	-
		Aug-97	0.09	0.06
Iron	0.3	4/9 - 10/95	0.488 - 154.3	0.025 - 4.19
		Apr-96	113.486	0.241
		Oct-96	13.838	0.391
		Aug-97	69.400	0.140
Lead	0.015	4/9 - 10/95	ND - 0.017	ND - 0.121
		Apr-96	0.16	< 0.010
		Oct-96	< 0.01	< 0.010
		Feb-97	< 0.01	< 0.01
		Aug-97	< 0.01	< 0.01
Magnesium	NE	Apr-96	25.005	19.574
Maganese	0.05	4/9 - 10/95	0.101 - 10.85	ND - 0.260
		Oct-96	0.17	< 0.010
		Aug-97	0.22	0.45
Mercury	0.0011	4/9 - 10/95	ND - 0.0029	ND
		Apr-96	0.0002	< 0.0002
		Oct-96	< 0.0002	< 0.0002
		Feb-97	0.0002	0.0002
		Aug-97	< 0.0005	< 0.0005
Nickel	0.1	Feb-97	0.006	0.008

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TABLE VII - 1
Summary of Recent Historical Data
ABTco Industrial Landfill

Parameter	NC 2L Standard	Date	Concentration (mg/L) FA-1	Concentration (mg/L) FA-2
Nitrate, Nitrogen	10	4/9 - 10/95	0.194 - 0.865	0.460 - 13
		Apr-96	0.37	4.13
pH	6.5 - 8.5	Apr-96	5.60	5.88
		Oct-96	5.80	5.54
		Feb-97	5.97	5.75
		Aug-97	5.36	5.71
Selenium	0.05	4/9 - 10/95	ND	ND
		Apr-96	< 0.003	< 0.003
		Oct-96	< 0.003	< 0.003
		Feb-97	< 0.003	< 0.003
		Aug-97	< 0.025	< 0.025
Silver	0.018	4/9 - 10/95	ND - 0.016	ND - 0.345
		Apr-96	< 0.001	< 0.001
		Oct-96	< 0.001	< 0.001
		Feb-97	< 0.001	< 0.001
		Aug-97	< 0.001	< 0.001
Sulfate	250	4/9 - 10/95	ND - 27.0	ND - 110.2
		Apr-96	34.2	89.4
		Oct-96	28.5	69.5
		Feb-97	49.9	86.2
		Aug-97	19.7	104.3
Total Dissoved Solids	NE	4/9 - 10/95	24 - 224	80 - 280
		Apr-96	121	215
		Oct-96	3	203
		Feb-97	283	261
		Aug-97	86.5	245
Total Organic Carbon	NE	4/9 - 10/95	ND - 6.1	ND - 18.2
		Apr-96	3.3	< 1.0
		Oct-96	3.6	4.3
		Aug-97	4.0	2.0
Total Organic Halides	NE	4/9 - 10/95	ND - 0.490	ND - 27
		Apr-96	0.100	0.055
		Oct-96	< 0.005	< 0.005
		Aug-97	< 0.005	0.020

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TABLE VII - 1
Summary of Recent Historical Data
ABTco Industrial Landfill

Parameter	NC 2L Standard	Date	Concentration (mg/L) FA-1	Concentration (mg/L) FA-2
Total Solids	NE	4/9 - 10/95	57.5 - 4,078	83.7 - 1,105
		Apr-96	772.9	252.2
		Oct-96	1052.9	206
		Feb-97	52	9
		Aug-97	463.5	23
Total Suspended Solids	NE	4/9 - 10/95	453	9.5
		Apr-96	556	8
Zinc	2.1	4/9 - 10/95	ND - 0.215	ND - 0.084
		Apr-96	0.212	0.115
		Oct-96	0.011	< 0.010
		Feb-97	0.066	0.039
		Aug-97	0.160	0.080

Notes:

1. 2L Standard = Groundwater quality standard established under 15A NCAC 2L
2. 2L standards listed in parentheses are proposed standards that are not yet adopted.
3. NE = Not established
4. All concentrations are in milligrams per liter (mg/L)
5. Twelve sampling events were performed between April 1990 and October 1995. Not all parameters were sampled at each event. The data is summarized from a table presented by Trigon Engineering Consultants, Inc. in a May 1996 report. The summary table from Trigon is provided in this appendix.
6. FA-1 is the upgradient groundwater monitoring well.
7. FA-2 is the downgradient groundwater monitoring well.
8. ND = Not detectected at the laboratory's reporting limit, which was not available.
9. < = Not detected at or above the listed concentration.
10. - = Not sampled

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GROUNDWATER MONITOR[illegible]VELL RESULTS (mg/ℓ) - FA2

ANALYSIS	NCAC 15A 2L	10/95	05/95	10-11/94	04/94	10/93	04/93	04-05/92	06/91	04/90	08/90	04/89	04/88
BOD		12	0.9	5.4	ND	8.0	16	1.7	2.7	4.7	ND	2.4	7.9
TSS			9.5										
TS		270		250	230	200	280%	290	242	1,105			83.7
TDS	500.0	270	255.0	210	210	280	258	170	134	237	138	80	
Chloride	250.0	11.1	13.4	14	14	12	12	13	12	8.17	11.3	7.8	6.56
COD		<1.0	<2	55	ND	39	ND	ND	ND	ND	ND	4.0	19.9
TOC		1.1	<1.0	3	ND	11	18.2	1.2	3.2	3.09	ND	0.39	1.72
Fluoride	2.0	<0.50	<0.5	ND	ND	ND	ND	ND	ND	0.10	ND	<0.100	<0.100
Nitrogen, Nitrate	10.0						13	3.2	6.58	1.07	1.80	0.965	0.460
Sulfate	250.0	96.8	110.2	100	100	82	75	70	43	12.0	18.5	1.4	<1.0
Arsenic, Total	0.05	<0.005	<0.005	ND	ND	ND	ND	ND	ND	ND	ND	<0.005	<0.010
Mercury, Total	0.0011	<0.0002	<0.0002	ND	ND	ND	ND	ND	ND	ND	ND	<0.0002	<0.0005
Selenium, Total	0.05	<0.005	<0.005	ND	ND	ND	ND	ND	ND	ND	ND	<0.005	<0.005
TOX		0.38 (MG/L)	0.130 (MG/L)	ND	ND	0.064	0.004	0.014	0.007	27	ND	0.018	0.022
Silver, Total	0.18	<0.001	<0.001	ND	ND	ND	0.345	ND	ND	ND	ND	<0.010	<0.010
Barium, Total	2.0	0.073		0.074	0.072	0.110	0.079	0.067	0.078	0.084	ND	0.072	<0.050
Cadmium, Total	0.005				ND		ND	ND	0.013	0.012	ND	0.013	<0.005
Chromium, Total	0.05	<0.005	<0.005	ND	ND	ND	ND	ND	0.011	0.012	ND	<0.010	<0.010
Copper, Total	1.0	0.005	<0.005	ND	ND	ND	ND	0.018	0.032	0.024	ND	0.010	<0.010
Iron, Total	0.3	0.025	0.048	0.100	0.223	0.471	0.112	0.870	4.19	1.29	0.06	0.910	0.291
Lead, Total	0.015	<0.010	0.010	ND	0.121	ND	ND	0.007	ND	ND	ND	<0.005	0.082
Manganese, Total	0.05	<0.010	<0.010	ND	ND	0.020	ND	0.022	0.122	0.044	ND	0.260	0.126
Zinc, Total	2.1	0.010	0.010	ND	0.027	0.057	0.036	0.056	0.084	0.058	ND	0.041	0.040
Cobalt, Total		<0.005	<0.005	ND		ND							
Beryllium, Total			<0.001										

BOD - Biochemical Oxygen Demand
COD - Chemical Oxygen Demand
ND - Not detected at or above the method detection limit
TSS - Total Suspended Solids
TOC - Total Organic Carbon
TS - Total Solids
TOX - Total Organic Halides
TSD - Total Dissolved Solids
mg/ℓ - milligrams per liter

GROUNDWATER MONITORING WELL RESULTS (mg/ℓ) - FA1

ANALYSIS	NCAC 15A 2L	10/95	05/95	10-11/94	04/94	10/93	04/93	04-05/92	06/91	04/90	08/90	04/89*	04/88*
BOD		3	1.4	ND	2.4	13	69	ND	3.0	3.3	ND	1.0	7.6
TSS			453.0										
TS		4,078		540	710	240	160%	1,000	874	263			57.5
TDS	500.0	89	99.0	48	100	62	102	36	24.0	224	96	60	
Chloride	250.0	2.0	3.4	4.9	2.4	2.0	1.9	1.9	2.9	2.40	1.9	<5.0	<5.0
COD		<10	<2	10	75	15	ND	ND	19	ND	ND	8.0	49.0
TOC		2.3	1.4	ND	2	4.5	6.1	1.8	5.5	1.70	ND	0.52	1.71
Fluoride	2.0	<0.50	<0.5	ND	ND	ND	ND	0.63	ND	0.17	ND	<0.100	<0.100
Nitrogen, Nitrate	10.0						0.41	0.64	0.865	0.839	0.481	0.793	0.194
Sulfate	250.0	7.0	19.9	ND	25	5.0	24	2.0	7.0	27.0	6	<1.0	<1.0
Arsenic, Total	0.05	<0.005	<0.005	ND	ND	ND	ND	ND	ND	ND	ND	<0.010	<0.010
Mercury, Total	0.0011	<0.0002	<0.0002	ND	ND	ND	ND	ND	0.0029	ND	ND	<0.0002	<0.0005
Selenium, Total	0.05	<0.005	<0.005	ND	ND	ND	ND	ND	ND	ND	ND	<0.005	<0.005
TOX		0.294 (MG/L)	0.490 (MG/L)	ND	ND	0.043	0.082	0.017	0.018	ND	0.019	<0.005	0.091
Silver, Total	0.18	<0.001	<0.001	ND	ND	ND	0.016	ND	ND	ND	ND	<0.010	<0.010
Barium, Total	2.0	0.644		0.113	0.123	0.081	0.077	0.436	0.252	0.359	ND	3,740	0.487
Cadmium, Total	0.005				ND		ND	0.0048	0.011	0.017	ND	<0.010	<0.005
Chromium, Total	0.05	0.283	0.106	0.024	ND	0.010	0.018	0.039	0.103	0.112	ND	<0.010	0.010
Copper, Total	1.0	<0.005	0.104	0.037	0.015	0.015	0.014	0.090	0.161	0.168	0.015	0.184	0.036
Iron, Total	0.3	154.3	53.151	12	3.25	4.25	7.4	23.7	5.37	63.4	3.97	0.488	2.26
Lead, Total	0.015	<0.010	0.011	ND	ND	ND	ND	0.017	ND	ND	ND	0.007	0.017
Manganese, Total	0.05	2.056	0.949	0.354	0.373	0.122	0.116	0.738	1.07	2.61	0.101	10.85	0.812
Zinc, Total	2.1	0.180	0.061	0.042	0.064	0.067	0.039	0.136	0.168	0.163	ND	0.215	0.058
Cobalt, Total		0.109	0.045	ND		ND							
Beryllium, Total			0.001										

OD - Biochemical Oxygen Demand
OD - Chemical Oxygen Demand
D - Not detected at or above the method detection limit

TSS - Total Suspended Solids
TOC - Total Organic Carbon

TS - Total Solids
TOX - Total Organic Halides

TSD - Total Dissolved Solids
mg/ℓ - milligrams per liter

Appendix VIII

Results of TLCP Analysis on Ash

TABLE VIII - 1
Summary of TCLP Results on ABTco, Inc. Wood Ash

PARAMETER	2L STANDARD (mg/L)	CONCENTRATION (mg/L)					
		Jun-91		Apr-96		Nov-97	
		DL	Ash Leachate	DL	Ash Leachate	DL	Ash Leachate
Antimony	(0.006)	0.100	ND	-	-	0.04	0.06
Arsenic	0.05	0.005	0.015	0.003	ND	0.005	ND
Barium	2.0	0.010	5.1	0.005	7.917	1.0	24
Beryllium	(0.002)	0.010	ND	-	-	0.002	0.002
Cadmium	0.005	0.010	ND	0.001	0.004	0.0005	0.0017
Chloride	250	-	-	-	-	1	1600
Chromium	0.05	0.010	0.018	0.005	0.015	0.01	0.01
Cobalt	(0.002)	-	-	-	-	0.01	0.04
Copper	1.0	0.010	ND	-	-	0.01	0.02
Cyanide	0.15	-	-	-	-	0.02	0.020
Flouride	2.0	-	-	-	-	0.1	9.6
Iron	0.3	-	-	-	-	0.01	0.06
Lead	0.015	0.100	ND	0.01	ND	0.001	0.003
Manganese	0.05	0.010	4.94	-	-	0.01	ND
Mercury	0.0011	-	-	0.0002	0.0003	0.0002	ND
Nickel	0.1	0.020	0.053	-	-	0.02	0.04
Nitrate	10	-	-	-	-	0.01	ND
Nitrite	1.0	-	-	-	-	0.05	0.53
Selenium	0.05	0.005	ND	0.003	ND	0.005	ND
Silver	0.018	0.010	ND	0.001	ND	0.01	0.03
Sulfate	250	-	-	-	-	1	7.7
Thallium	(0.0002)	0.100	ND	-	-	0.002	ND
Vanadium	(0.025)	-	-	-	-	0.016	0.085
Zinc	2.1	0.010	0.094	-	-	0.05	ND

TABLE VIII - 1
Summary of TCLP Results on ABTco, Inc. Wood Ash

Notes:

1. 2L Standard = Groundwater quality standard established under 15A NCAC 2L
2. 2L standards listed in parentheses are proposed standards that are not yet adopted.
3. All concentrations are in milligrams per liter (mg/L)
4. DL = Laboratory detection limit
5. ND = Not detected at the laboratory's reporting limit
6. - = Not sampled

EnviroTech Mid-Atlantic Laboratories

1861 Pratt Dr. • Blacksburg, VA 24060
(540) 231-3983 • Fax (540) 231-3984

November 18, 1997

Client Contact		Report Information	
Attn.:	Nancy Marshall	ETMA Project #:	16660 -
Fax No.:	910-230-1998	Date ETMA Rec'd:	11/7/97

Client Information		Sample Information	
Name:	Joyce Engineering, Inc.	Client Project:	Industrial Landfill Wilkes Co.
Address:	436 Spring Garden Street	Client Project #:	-
	Greensboro, NC 27401	P.O. #:	-

Sample Identification

Sample submitted and identified by client:

Sample	Field Identification	Matrix	Date	Time Collected
16660A	ash	Other	-	-

All analyses were performed in accordance with EPA methods referenced in Code of Federal Regulations, Section 40 Part 136, "Methods for Chemical Analysis of Water and Wastes", EPA 600/4-79 revised March 1983 and/or "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, 3rd Edition.

Client Project: Industrial Landfill Wilkes Co.
Client Project #: -
P.O. #: -

Analysis	LOQ	16660A *ash*
TCLP Metals (mg/L)		
Antimony (Sb)	**0.04**	0.060
Arsenic (As)	**0.005**	BLQ
Barium (Ba)	**1.0**	24
Beryllium (Be)	**0.002**	0.002
Cadmium (Cd)	**0.0005**	0.0017
Chromium (Cr)	**0.01**	0.01
Cobalt (Co)	**0.01**	0.04
Copper (Cu)	**0.01**	0.02
Iron (Fe)	**0.01**	0.06
Lead (Pb)	**0.001**	0.003
Manganese (Mn)	**0.01**	BLQ
Mercury (Hg)	**0.0002**	BLQ
Nickel (Ni)	**0.02**	0.04
Selenium (Se)	**0.005**	BLQ
Silver (Ag)	**0.01**	0.03
Thallium (Tl)	**0.002**	BLQ
Vanadium (V)	**0.016**	0.085
Zinc (Zn)	**0.05**	BLQ
TCLP Chloride (mg/L)	**1.0**	1600
TCLP Cyanide (mg/L)	**0.02**	0.020
TCLP Fluoride (mg/L)	**0.1**	9.6
TCLP Nitrate (mg/L)	**0.01**	BLQ
TCLP Nitrite (mg/L)	**0.05**	0.53
TCLP Sulfate (mg/L)	**1.0**	7.7
TCLP Extraction		
Initial pH	-	10.91
Extraction Fluid #	-	2
Extraction Started (Date)	-	11/12/97
Extraction Started (Time)	-	2:55pm
Extraction Ended (Date)	-	11/13/97
Extraction Ended (Time)	-	9:05a
Final pH	-	11.73

**Note:* *These analyses not yet complete.*

Client Project: Industrial Landfill Wilkes Co.
Client Project #: -
P.O. #: -

Quality Control Data

Analysis	%STD	%Spike	%RD	Method #	Analyst	Date Analyzed
TCLP Metals						
Antimony (Sb)	101	89	4.8	7041	J. Reid	11/18/97
Arsenic (As)	106	100	15	7060A	J. Reid	11/17/97
Barium (Ba)	101	79	8.0	6010A	A. Stancil	11/17/97
Beryllium (Be)	100	84	<1.0	6010A	A. Stancil	11/17/97
Cadmium (Cd)	90	108	<1.0	7131A	J. Reid	11/18/97
Chromium (Cr)	100	85	2.3	6010A	A. Stancil	11/17/97
Cobalt (Co)	104	103	12	6010A	A. Stancil	11/17/97
Copper (Cu)	99	92	1.2	6010A	J. Reid	11/18/97
Iron (Fe)	103	87	6.7	6010A	A. Stancil	11/17/97
Lead (Pb)	104	89	7.2	7421	J. Reid	11/18/97
Manganese (Mn)	102	101	<1.0	6010A	A. Stancil	11/17/97
Mercury (Hg)	99	105	6.0	7470A	J. Reid	11/18/97
Nickel (Ni)	105	91	13	6010A	A. Stancil	11/17/97
Selenium (Se)	93	106	2.8	7740	J. Reid	11/17/97
Silver (Ag)	90	80	2.2	6010A	A. Stancil	11/17/97
Thallium (Tl)	107	91	15	8741	J. Reid	11/18/97
Vanadium (V)	106	112	1.3	7911	J. Reid	11/18/97
Zinc (Zn)	104	90	3.9	6010A	A. Stancil	11/17/97
TCLP Chloride	101	110	<1.0	9252A	J. Kantrovich	11/17/97
TCLP Cyanide	111	82	<1.0	9010A	A. Beckman	11/13/97
TCLP Fluoride	92	87	<1.0	9214	J. Kantrovich	11/17/97
TCLP Nitrate	94	24	8.0	353.3	J. Kantrovich	11/18/97
TCLP Nitrite	105	38	5.0	354.1	J. Kantrovich	11/13/97
TCLP Sulfate	104	133	4.0	9038	J. Kantrovich	11/17/97
TCLP Extraction	-	-	-	1311	A. Stancil	11/12-13/97

**Note: These anaylses not yet complete.*

C. Brian Kidd
Laboratory Director

Reviewed By

EnviroTech Mid-Atlantic

1861 Pratt Drive, Blacksburg, VA 24060
Phone (540) 231-3983 Fax (540) 231-3984
WWW.ETMALAB.COM

Chain of Custody and Analysis Request

Important!
Please See Reverse Side For Instructions

- ☐ 10 Working Days (Standard)
- ☐ 5 Working Days (Rush)
- ☐ 24 - 48 Hour (Rush)

Billing Client: ABTCo Inc. / Joyce

Project Name/Number: Industrial Landfill Wilkes Co Due 11/14/97

Address:

Project Manager (please print):

Sampler Name (please print):

City: State: Zip:

Phone: Fax:

Purchase Order: Quotation Number:

Requested Analysis

Sample Description and/or Location	Sample Information: Grab	Comp	Date	Time	Matrix: Liquid	Soil	Other	ETMA Code	Number of Containers	Preservation Method: Nitric Acid	Hydrochloric Acid	Sulfuric Acid	Thiosulfate	Sodium Hydroxide	TCLP for Sb, As, Ba, Be, Cd, Cr, Co, Cu, Fe, Pb, Mn, Hg, Ni, Se, Ag, Tl, V, Zn	TCLP Chloride	" Cyanide	" Fluoride	" Nitrate	" Nitrite	" Sulfate		Appearance
								16660 A							✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	

Sample Received Temp: (°C)

Sample Received pH: (pHU)

Special Remarks: all analyses are to be performed on TCLP extract

Relinquished by:	Date	Time	Relinquished by:	Date	Time	Relinquished by:	Date	Time

Appendix IX

HELP Model

```
**********************************************************************************
**********************************************************************************
**                                                                              **
**                                                                              **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE                   **
**                HELP MODEL VERSION 3.04   (10 APRIL 1995)                     **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                       **
**                    USAE WATERWAYS EXPERIMENT STATION                         **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY                  **
**                                                                              **
**                                                                              **
**********************************************************************************
**********************************************************************************


PRECIPITATION DATA FILE:     C:\A-ENGINR\HELP3\ABTCO\AB-PR.D4
TEMPERATURE DATA FILE:       C:\A-ENGINR\HELP3\ABTCO\AB-TE.D7
SOLAR RADIATION DATA FILE:   C:\A-ENGINR\HELP3\ABTCO\AB-SR.D13
EVAPOTRANSPIRATION DATA:     C:\A-ENGINR\HELP3\ABTCO\AB-EV.D11
SOIL AND DESIGN DATA FILE:   C:\A-ENGINR\HELP3\ABTCO\AB-SDD3.D10
OUTPUT DATA FILE:            C:\A-ENGINR\HELP3\ABTCO\AB-OUT3.OUT


TIME:  12:43      DATE:  11/21/1997


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

     TITLE:  ABT CORPORATION CLOSURE PLAN (50-50)

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


    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  22
     THICKNESS                     =     12.00   INCHES
     POROSITY                      =      0.4190 VOL/VOL
     FIELD CAPACITY                =      0.3070 VOL/VOL
     WILTING POINT                 =      0.1800 VOL/VOL
     INITIAL SOIL WATER CONTENT    =      0.2932 VOL/VOL
     EFFECTIVE SAT. HYD. COND.     =  0.189999992000E-04 CM/SEC
   NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  1.80
             FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.


                                LAYER  2
                                --------

                  TYPE 3 - BARRIER SOIL LINER
                      MATERIAL TEXTURE NUMBER  55
     THICKNESS                     =     12.00   INCHES
     POROSITY                      =      0.4270 VOL/VOL
     FIELD CAPACITY                =      0.4180 VOL/VOL
     WILTING POINT                 =      0.3670 VOL/VOL
     INITIAL SOIL WATER CONTENT    =      0.4270 VOL/VOL
     EFFECTIVE SAT. HYD. COND.     =  0.339999997000E-05 CM/SEC
```

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER	=	79.00	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	12.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	3.519	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	5.028	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	2.160	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	8.643	INCHES
TOTAL INITIAL WATER	=	8.643	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
GREENSBORO NORTH CAROLINA

STATION LATITUDE	=	35.13	DEGREES
MAXIMUM LEAF AREA INDEX	=	1.00	
START OF GROWING SEASON (JULIAN DATE)	=	90	
END OF GROWING SEASON (JULIAN DATE)	=	305	
EVAPORATIVE ZONE DEPTH	=	12.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	7.60	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	66.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	68.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	74.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	70.00	%

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

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.55	3.43	3.69	2.91	3.67	3.66
4.38	4.44	3.29	2.73	2.87	3.14

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

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
37.50	39.90	48.00	58.30	66.50	73.50
77.20	76.30	69.90	58.40	48.50	40.20

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR GREENSBORO NORTH CAROLINA
AND STATION LATITUDE = 35.13 DEGREES

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ANNUAL TOTALS FOR YEAR 1

	INCHES	CU. FEET	PERCENT

PRECIPITATION	39.15	142114.484	100.00
RUNOFF	1.421	5156.655	3.63
EVAPOTRANSPIRATION	31.809	115465.734	81.25
PERC./LEAKAGE THROUGH LAYER 2	5.924588	21506.256	15.13
AVG. HEAD ON TOP OF LAYER 2	0.3591		
CHANGE IN WATER STORAGE	-0.004	-14.159	-0.01
SOIL WATER AT START OF YEAR	8.643	31373.770	
SOIL WATER AT END OF YEAR	8.639	31359.611	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.009	0.00

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ANNUAL TOTALS FOR YEAR 2

	INCHES	CU. FEET	PERCENT
PRECIPITATION	44.90	162986.984	100.00
RUNOFF	4.069	14770.103	9.06
EVAPOTRANSPIRATION	31.046	112698.008	69.15
PERC./LEAKAGE THROUGH LAYER 2	10.029665	36407.684	22.34
AVG. HEAD ON TOP OF LAYER 2	0.6314		
CHANGE IN WATER STORAGE	-0.245	-888.758	-0.55
SOIL WATER AT START OF YEAR	8.639	31359.611	
SOIL WATER AT END OF YEAR	8.394	30470.854	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.048	0.00

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ANNUAL TOTALS FOR YEAR 3

	INCHES	CU. FEET	PERCENT
PRECIPITATION	61.74	224116.172	100.00
RUNOFF	14.756	53565.641	23.90
EVAPOTRANSPIRATION	32.809	119095.375	53.14
PERC./LEAKAGE THROUGH LAYER 2	14.150573	51366.578	22.92
AVG. HEAD ON TOP OF LAYER 2	1.0080		

CHANGE IN WATER STORAGE	0.024	88.616	0.04
SOIL WATER AT START OF YEAR	8.394	30470.854	
SOIL WATER AT END OF YEAR	8.419	30559.471	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.031	0.00

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ANNUAL TOTALS FOR YEAR 4

	INCHES	CU. FEET	PERCENT
PRECIPITATION	38.86	141061.766	100.00
RUNOFF	2.984	10831.436	7.68
EVAPOTRANSPIRATION	30.403	110361.406	78.24
PERC./LEAKAGE THROUGH LAYER 2	5.353087	19431.707	13.78
AVG. HEAD ON TOP OF LAYER 2	0.2191		
CHANGE IN WATER STORAGE	0.120	437.254	0.31
SOIL WATER AT START OF YEAR	8.419	30559.471	
SOIL WATER AT END OF YEAR	8.539	30996.725	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.045	0.00

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ANNUAL TOTALS FOR YEAR 5

	INCHES	CU. FEET	PERCENT
PRECIPITATION	39.67	144002.109	100.00
RUNOFF	2.156	7825.121	5.43
EVAPOTRANSPIRATION	30.884	112110.344	77.85
PERC./LEAKAGE THROUGH LAYER 2	6.058756	21993.285	15.27
AVG. HEAD ON TOP OF LAYER 2	0.2302		
CHANGE IN WATER STORAGE	0.571	2073.340	1.44
SOIL WATER AT START OF YEAR	8.539	30996.725	
SOIL WATER AT END OF YEAR	9.110	33070.062	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00

ANNUAL WATER BUDGET BALANCE	0.0000	0.019	0.00

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 5

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	3.27	2.81	4.37	2.63	3.53	5.42
	4.57	6.26	2.81	3.77	2.52	2.90
STD. DEVIATIONS	2.95	0.95	1.30	1.89	2.64	1.99
	2.29	5.93	1.69	2.69	1.66	1.28
RUNOFF						
TOTALS	0.638	0.048	0.383	0.034	0.290	0.354
	0.396	1.335	0.686	0.489	0.073	0.350
STD. DEVIATIONS	1.290	0.088	0.434	0.077	0.648	0.416
	0.279	2.812	1.101	0.858	0.101	0.416
EVAPOTRANSPIRATION						
TOTALS	1.473	1.890	2.767	3.020	3.120	4.004
	4.140	3.410	2.629	2.202	1.504	1.230
STD. DEVIATIONS	0.157	0.182	0.192	0.967	1.588	1.158
	1.719	1.379	1.359	0.790	0.806	0.170
PERCOLATION/LEAKAGE THROUGH LAYER 2						
TOTALS	0.9273	0.9411	0.9384	0.4545	0.3955	0.6500
	0.2724	0.9006	0.3214	0.7668	0.6857	1.0495
STD. DEVIATIONS	1.1450	0.8951	0.5553	0.6727	0.7873	0.9007
	0.4462	1.3663	0.5471	1.1272	0.6650	1.0259

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 2						
AVERAGES	0.8322	0.6816	0.5693	0.1010	0.3841	0.5394
	0.1442	0.7666	0.2797	0.6215	0.2361	0.7189
STD. DEVIATIONS	1.2751	0.6890	0.5504	0.1910	0.8466	0.7588
	0.3051	1.6196	0.6194	0.9486	0.3402	0.7501

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 5

	INCHES	CU. FEET	PERCENT
PRECIPITATION	44.86 (9.753)	162856.3	100.00
RUNOFF	5.077 (5.4998)	18429.79	11.317

EVAPOTRANSPIRATION	31.390	(0.9403)	113946.17	69.967
PERCOLATION/LEAKAGE THROUGH LAYER 2	8.30333	(3.76068)	30141.104	18.50779
AVERAGE HEAD ON TOP OF LAYER 2	0.490	(0.334)		
CHANGE IN WATER STORAGE	0.093	(0.2990)	339.26	0.208

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 5

	(INCHES)	(CU. FT.)
PRECIPITATION	5.22	18948.600
RUNOFF	3.924	14245.2090
PERCOLATION/LEAKAGE THROUGH LAYER 2	0.227191	824.70453
AVERAGE HEAD ON TOP OF LAYER 2	11.573	
SNOW WATER	2.09	7587.2231

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.4190
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.1800

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FINAL WATER STORAGE AT END OF YEAR 5

LAYER	(INCHES)	(VOL/VOL)
1	3.9863	0.3322
2	5.1240	0.4270
SNOW WATER	0.000	

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**                                                                  **
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**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE        **
**                HELP MODEL VERSION 3.04   (10 APRIL 1995)         **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY           **
**                   USAE WATERWAYS EXPERIMENT STATION              **
**              FOR USEPA RISK REDUCTION ENGINEERING LABORATORY      **
**                                                                  **
**                                                                  **
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PRECIPITATION DATA FILE:     C:\A-ENGINR\HELP3\ABTCO\AB-PR.D4
TEMPERATURE DATA FILE:       C:\A-ENGINR\HELP3\ABTCO\AB-TE.D7
SOLAR RADIATION DATA FILE:   C:\A-ENGINR\HELP3\ABTCO\AB-SR.D13
EVAPOTRANSPIRATION DATA:     C:\A-ENGINR\HELP3\ABTCO\AB-EV.D11
SOIL AND DESIGN DATA FILE:   C:\A-ENGINR\HELP3\ABTCO\AB-SDD3P.D10
OUTPUT DATA FILE:            C:\A-ENGINR\HELP3\ABTCO\AB-OUT3P.OUT


TIME:  12:46     DATE:  11/21/1997


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     TITLE:  ABT CORPORATION CLOSURE PLAN (50-50) - (NO BARRIER)

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


                                LAYER  1
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                  TYPE 1 - VERTICAL PERCOLATION LAYER
                      MATERIAL TEXTURE NUMBER  22
          THICKNESS                     =     12.00   INCHES
          POROSITY                      =      0.4190 VOL/VOL
          FIELD CAPACITY                =      0.3070 VOL/VOL
          WILTING POINT                 =      0.1800 VOL/VOL
          INITIAL SOIL WATER CONTENT    =      0.3168 VOL/VOL
          EFFECTIVE SAT. HYD. COND.     =  0.189999992000E-04 CM/SEC
        NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  1.80
                  FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.


                                LAYER  2
                                --------

                  TYPE 1 - VERTICAL PERCOLATION LAYER
                      MATERIAL TEXTURE NUMBER  55
          THICKNESS                     =     12.00   INCHES
          POROSITY                      =      0.4270 VOL/VOL
          FIELD CAPACITY                =      0.4180 VOL/VOL
          WILTING POINT                 =      0.3670 VOL/VOL
          INITIAL SOIL WATER CONTENT    =      0.4148 VOL/VOL
          EFFECTIVE SAT. HYD. COND.     =  0.339999997000E-05 CM/SEC
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GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER	=	79.00	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	21.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	7.513	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	8.871	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	5.463	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	8.779	INCHES
TOTAL INITIAL WATER	=	8.779	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
GREENSBORO NORTH CAROLINA

STATION LATITUDE	=	35.13	DEGREES
MAXIMUM LEAF AREA INDEX	=	1.00	
START OF GROWING SEASON (JULIAN DATE)	=	90	
END OF GROWING SEASON (JULIAN DATE)	=	305	
EVAPORATIVE ZONE DEPTH	=	21.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	7.60	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	66.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	68.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	74.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	70.00	%

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

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.55	3.43	3.69	2.91	3.67	3.66
4.38	4.44	3.29	2.73	2.87	3.14

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

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
37.50	39.90	48.00	58.30	66.50	73.50
77.20	76.30	69.90	58.40	48.50	40.20

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR GREENSBORO NORTH CAROLINA
AND STATION LATITUDE = 35.13 DEGREES

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ANNUAL TOTALS FOR YEAR 1

	INCHES	CU. FEET	PERCENT

PRECIPITATION	39.15	142114.484	100.00
RUNOFF	1.583	5745.078	4.04
EVAPOTRANSPIRATION	33.129	120259.094	84.62
PERC./LEAKAGE THROUGH LAYER 2	4.434282	16096.444	11.33
CHANGE IN WATER STORAGE	0.004	13.854	0.01
SOIL WATER AT START OF YEAR	8.779	31867.213	
SOIL WATER AT END OF YEAR	8.783	31881.068	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.007	0.00

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ANNUAL TOTALS FOR YEAR 2

	INCHES	CU. FEET	PERCENT
PRECIPITATION	44.90	162986.984	100.00
RUNOFF	4.883	17726.320	10.88
EVAPOTRANSPIRATION	32.613	118383.930	72.63
PERC./LEAKAGE THROUGH LAYER 2	7.880370	28605.742	17.55
CHANGE IN WATER STORAGE	-0.476	-1728.994	-1.06
SOIL WATER AT START OF YEAR	8.783	31881.068	
SOIL WATER AT END OF YEAR	8.306	30152.074	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.003	0.00

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ANNUAL TOTALS FOR YEAR 3

	INCHES	CU. FEET	PERCENT
PRECIPITATION	61.74	224116.172	100.00
RUNOFF	17.056	61914.449	27.63
EVAPOTRANSPIRATION	33.402	121250.164	54.10
PERC./LEAKAGE THROUGH LAYER 2	11.308009	41048.074	18.32
CHANGE IN WATER STORAGE	-0.027	-96.509	-0.04
SOIL WATER AT START OF YEAR	8.306	30152.074	
SOIL WATER AT END OF YEAR	8.280	30055.564	

SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.003	0.00

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ANNUAL TOTALS FOR YEAR 4

	INCHES	CU. FEET	PERCENT
PRECIPITATION	38.86	141061.766	100.00
RUNOFF	3.151	11438.581	8.11
EVAPOTRANSPIRATION	30.768	111687.523	79.18
PERC./LEAKAGE THROUGH LAYER 2	4.537332	16470.516	11.68
CHANGE IN WATER STORAGE	0.404	1465.219	1.04
SOIL WATER AT START OF YEAR	8.280	30055.564	
SOIL WATER AT END OF YEAR	8.683	31520.783	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.074	0.00

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ANNUAL TOTALS FOR YEAR 5

	INCHES	CU. FEET	PERCENT
PRECIPITATION	39.67	144002.109	100.00
RUNOFF	2.403	8721.780	6.06
EVAPOTRANSPIRATION	32.456	117816.133	81.82
PERC./LEAKAGE THROUGH LAYER 2	4.347079	15779.897	10.96
CHANGE IN WATER STORAGE	0.464	1684.316	1.17
SOIL WATER AT START OF YEAR	8.683	31520.783	
SOIL WATER AT END OF YEAR	9.147	33205.102	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.016	0.00

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 5

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	3.27	2.81	4.37	2.63	3.53	5.42
	4.57	6.26	2.81	3.77	2.52	2.90
STD. DEVIATIONS	2.95	0.95	1.30	1.89	2.64	1.99
	2.29	5.93	1.69	2.69	1.66	1.28
RUNOFF						
TOTALS	0.754	0.127	0.416	0.044	0.378	0.397
	0.412	1.516	0.780	0.526	0.086	0.379
STD. DEVIATIONS	1.536	0.119	0.495	0.099	0.845	0.431
	0.279	3.239	1.305	0.942	0.119	0.436
EVAPOTRANSPIRATION						
TOTALS	1.468	1.889	2.816	3.171	3.365	4.052
	4.413	3.443	2.646	2.466	1.536	1.208
STD. DEVIATIONS	0.157	0.181	0.131	0.875	1.410	1.027
	1.407	1.372	1.264	0.585	0.515	0.172
PERCOLATION/LEAKAGE THROUGH LAYER 2						
TOTALS	0.8030	0.9270	0.9054	0.4257	0.2594	0.3146
	0.2050	0.4454	0.2866	0.5195	0.5492	0.8607
STD. DEVIATIONS	0.7299	1.0047	0.6010	0.5605	0.4147	0.5127
	0.2394	0.8835	0.4866	0.8107	0.4907	0.7126

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 5

	INCHES		CU. FEET	PERCENT
PRECIPITATION	44.86	(9.753)	162856.3	100.00
RUNOFF	5.815	(6.4009)	21109.24	12.962
EVAPOTRANSPIRATION	32.474	(1.0272)	117879.37	72.382
PERCOLATION/LEAKAGE THROUGH LAYER 2	6.50141	(3.07314)	23600.135	14.49139
CHANGE IN WATER STORAGE	0.074	(0.3803)	267.58	0.164

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 5

	(INCHES)	(CU. FT.)
PRECIPITATION	5.22	18948.600
RUNOFF	3.965	14392.0557
PERCOLATION/LEAKAGE THROUGH LAYER 2	0.115652	419.81561
SNOW WATER	2.09	7587.2231

MAXIMUM VEG. SOIL WATER (VOL/VOL) 0.4220

MINIMUM VEG. SOIL WATER (VOL/VOL) 0.2601

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FINAL WATER STORAGE AT END OF YEAR 5

LAYER	(INCHES)	(VOL/VOL)
1	4.0515	0.3376
2	5.0959	0.4247
SNOW WATER	0.000	

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**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE                   **
**                HELP MODEL VERSION 3.04   (10 APRIL 1995)                     **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                       **
**                    USAE WATERWAYS EXPERIMENT STATION                         **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY                  **
**                                                                              **
**                                                                              **
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PRECIPITATION DATA FILE:     C:\A-ENGINR\HELP3\ABTCO\AB-PR.D4
TEMPERATURE DATA FILE:       C:\A-ENGINR\HELP3\ABTCO\AB-TE.D7
SOLAR RADIATION DATA FILE:   C:\A-ENGINR\HELP3\ABTCO\AB-SR.D13
EVAPOTRANSPIRATION DATA:     C:\A-ENGINR\HELP3\ABTCO\AB-EV.D11
SOIL AND DESIGN DATA FILE:   C:\A-ENGINR\HELP3\ABTCO\AB-SDD4P.D10
OUTPUT DATA FILE:            C:\A-ENGINR\HELP3\ABTCO\AB-OUT4P.OUT


TIME:  12:56     DATE:  11/21/1997


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     TITLE:  ABT CORPORATION CLOSURE PLAN - STOCKPILE SOIL -(NO BARRIER)

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     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  22
          THICKNESS                    =     12.00   INCHES
          POROSITY                     =      0.4190 VOL/VOL
          FIELD CAPACITY               =      0.3070 VOL/VOL
          WILTING POINT                =      0.1800 VOL/VOL
          INITIAL SOIL WATER CONTENT   =      0.3073 VOL/VOL
          EFFECTIVE SAT. HYD. COND.    =  0.189999992000E-04 CM/SEC
        NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  1.80
                 FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.


                                LAYER  2
                                --------

                  TYPE 1 - VERTICAL PERCOLATION LAYER
                      MATERIAL TEXTURE NUMBER  55
          THICKNESS                    =     12.00   INCHES
          POROSITY                     =      0.4270 VOL/VOL
          FIELD CAPACITY               =      0.4180 VOL/VOL
          WILTING POINT                =      0.3670 VOL/VOL
          INITIAL SOIL WATER CONTENT   =      0.4033 VOL/VOL
          EFFECTIVE SAT. HYD. COND.    =  0.559999989000E-05 CM/SEC
```

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER	=	79.00	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	21.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	7.289	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	8.871	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	5.463	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	8.526	INCHES
TOTAL INITIAL WATER	=	8.526	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
GREENSBORO NORTH CAROLINA

STATION LATITUDE	=	35.13 DEGREES
MAXIMUM LEAF AREA INDEX	=	1.00
START OF GROWING SEASON (JULIAN DATE)	=	90
END OF GROWING SEASON (JULIAN DATE)	=	305
EVAPORATIVE ZONE DEPTH	=	21.0 INCHES
AVERAGE ANNUAL WIND SPEED	=	7.60 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	66.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	68.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	74.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	70.00 %

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

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.55	3.43	3.69	2.91	3.67	3.66
4.38	4.44	3.29	2.73	2.87	3.14

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

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
37.50	39.90	48.00	58.30	66.50	73.50
77.20	76.30	69.90	58.40	48.50	40.20

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR GREENSBORO NORTH CAROLINA
AND STATION LATITUDE = 35.13 DEGREES

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ANNUAL TOTALS FOR YEAR 1

	INCHES	CU. FEET	PERCENT

PRECIPITATION	39.15	142114.484	100.00
RUNOFF	1.400	5080.526	3.57
EVAPOTRANSPIRATION	32.857	119272.289	83.93
PERC./LEAKAGE THROUGH LAYER 2	4.874873	17695.789	12.45
CHANGE IN WATER STORAGE	0.018	65.886	0.05
SOIL WATER AT START OF YEAR	8.526	30950.691	
SOIL WATER AT END OF YEAR	8.545	31016.578	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.014	0.00

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ANNUAL TOTALS FOR YEAR 2

	INCHES	CU. FEET	PERCENT
PRECIPITATION	44.90	162986.984	100.00
RUNOFF	4.151	15067.473	9.24
EVAPOTRANSPIRATION	32.434	117734.305	72.24
PERC./LEAKAGE THROUGH LAYER 2	8.624378	31306.492	19.21
CHANGE IN WATER STORAGE	-0.309	-1121.244	-0.69
SOIL WATER AT START OF YEAR	8.545	31016.578	
SOIL WATER AT END OF YEAR	8.236	29895.334	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.035	0.00

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ANNUAL TOTALS FOR YEAR 3

	INCHES	CU. FEET	PERCENT
PRECIPITATION	61.74	224116.172	100.00
RUNOFF	14.889	54046.543	24.12
EVAPOTRANSPIRATION	33.391	121210.547	54.08
PERC./LEAKAGE THROUGH LAYER 2	13.506679	49029.242	21.88
CHANGE IN WATER STORAGE	-0.047	-170.177	-0.08
SOIL WATER AT START OF YEAR	8.236	29895.334	
SOIL WATER AT END OF YEAR	8.189	29725.156	

SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.024	0.00

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ANNUAL TOTALS FOR YEAR 4

	INCHES	CU. FEET	PERCENT
PRECIPITATION	38.86	141061.766	100.00
RUNOFF	3.016	10948.350	7.76
EVAPOTRANSPIRATION	30.713	111486.406	79.03
PERC./LEAKAGE THROUGH LAYER 2	4.846498	17592.787	12.47
CHANGE IN WATER STORAGE	0.285	1034.269	0.73
SOIL WATER AT START OF YEAR	8.189	29725.156	
SOIL WATER AT END OF YEAR	8.474	30759.426	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.054	0.00

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ANNUAL TOTALS FOR YEAR 5

	INCHES	CU. FEET	PERCENT
PRECIPITATION	39.67	144002.109	100.00
RUNOFF	2.309	8382.435	5.82
EVAPOTRANSPIRATION	32.242	117039.695	81.28
PERC./LEAKAGE THROUGH LAYER 2	4.666763	16940.352	11.76
CHANGE IN WATER STORAGE	0.452	1639.609	1.14
SOIL WATER AT START OF YEAR	8.474	30759.426	
SOIL WATER AT END OF YEAR	8.925	32399.035	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.017	0.00

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 5

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	3.27	2.81	4.37	2.63	3.53	5.42
	4.57	6.26	2.81	3.77	2.52	2.90
STD. DEVIATIONS	2.95	0.95	1.30	1.89	2.64	1.99
	2.29	5.93	1.69	2.69	1.66	1.28
RUNOFF						
TOTALS	0.638	0.064	0.375	0.044	0.298	0.366
	0.413	1.370	0.672	0.483	0.086	0.344
STD. DEVIATIONS	1.306	0.109	0.415	0.099	0.667	0.410
	0.280	2.913	1.072	0.846	0.119	0.385
EVAPOTRANSPIRATION						
TOTALS	1.468	1.889	2.813	3.171	3.269	4.102
	4.343	3.449	2.636	2.459	1.520	1.210
STD. DEVIATIONS	0.155	0.181	0.131	0.876	1.478	1.061
	1.449	1.372	1.271	0.602	0.560	0.173
PERCOLATION/LEAKAGE THROUGH LAYER 2						
TOTALS	0.9119	0.9066	0.9358	0.4129	0.3593	0.4394
	0.1348	0.7009	0.3382	0.6004	0.5468	1.0169
STD. DEVIATIONS	1.0366	0.9432	0.6217	0.5659	0.6531	0.6575
	0.2567	1.4158	0.5756	0.9313	0.4739	0.8204

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 5

	INCHES		CU. FEET	PERCENT
PRECIPITATION	44.86	(9.753)	162856.3	100.00
RUNOFF	5.153	(5.5347)	18705.06	11.486
EVAPOTRANSPIRATION	32.327	(1.0047)	117348.66	72.057
PERCOLATION/LEAKAGE THROUGH LAYER 2	7.30384	(3.84420)	26512.934	16.27996
CHANGE IN WATER STORAGE	0.080	(0.2964)	289.67	0.178

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 5

	(INCHES)	(CU. FT.)
PRECIPITATION	5.22	18948.600
RUNOFF	3.953	14351.0947
PERCOLATION/LEAKAGE THROUGH LAYER 2	0.190485	691.46100
SNOW WATER	2.09	7587.2231

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.4222
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.2601

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FINAL WATER STORAGE AT END OF YEAR 5

LAYER	(INCHES)	(VOL/VOL)
1	3.9595	0.3300
2	4.9658	0.4138
SNOW WATER	0.000	

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**                                                                              **
**                                                                              **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE                   **
**                HELP MODEL VERSION 3.04   (10 APRIL 1995)                     **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                       **
**                    USAE WATERWAYS EXPERIMENT STATION                         **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY                  **
**                                                                              **
**                                                                              **
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PRECIPITATION DATA FILE:     C:\A-ENGINR\HELP3\ABTCO\AB-PR.D4
TEMPERATURE DATA FILE:       C:\A-ENGINR\HELP3\ABTCO\AB-TE.D7
SOLAR RADIATION DATA FILE:   C:\A-ENGINR\HELP3\ABTCO\AB-SR.D13
EVAPOTRANSPIRATION DATA:     C:\A-ENGINR\HELP3\ABTCO\AB-EV.D11
SOIL AND DESIGN DATA FILE:   C:\A-ENGINR\HELP3\ABTCO\AB-SDD4.D10
OUTPUT DATA FILE:            C:\A-ENGINR\HELP3\ABTCO\AB-OUT4.OUT


TIME:  12:54     DATE:  11/21/1997


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     TITLE:  ABT CORPORATION CLOSURE PLAN - STOCKPILE SOIL

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     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  22
          THICKNESS                     =     12.00   INCHES
          POROSITY                      =      0.4190 VOL/VOL
          FIELD CAPACITY                =      0.3070 VOL/VOL
          WILTING POINT                 =      0.1800 VOL/VOL
          INITIAL SOIL WATER CONTENT    =      0.2916 VOL/VOL
          EFFECTIVE SAT. HYD. COND.     =  0.189999992000E-04 CM/SEC
        NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  1.80
                 FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.


                                  LAYER  2
                                  --------

                  TYPE 3 - BARRIER SOIL LINER
                      MATERIAL TEXTURE NUMBER  55
          THICKNESS                     =     12.00   INCHES
          POROSITY                      =      0.4270 VOL/VOL
          FIELD CAPACITY                =      0.4180 VOL/VOL
          WILTING POINT                 =      0.3670 VOL/VOL
          INITIAL SOIL WATER CONTENT    =      0.4270 VOL/VOL
          EFFECTIVE SAT. HYD. COND.     =  0.559999989000E-05 CM/SEC
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GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER	=	79.00	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	12.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	3.499	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	5.028	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	2.160	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	8.623	INCHES
TOTAL INITIAL WATER	=	8.623	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
GREENSBORO NORTH CAROLINA

STATION LATITUDE	=	35.13 DEGREES
MAXIMUM LEAF AREA INDEX	=	1.00
START OF GROWING SEASON (JULIAN DATE)	=	90
END OF GROWING SEASON (JULIAN DATE)	=	305
EVAPORATIVE ZONE DEPTH	=	12.0 INCHES
AVERAGE ANNUAL WIND SPEED	=	7.60 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	66.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	68.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	74.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	70.00 %

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

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.55	3.43	3.69	2.91	3.67	3.66
4.38	4.44	3.29	2.73	2.87	3.14

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

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
37.50	39.90	48.00	58.30	66.50	73.50
77.20	76.30	69.90	58.40	48.50	40.20

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR GREENSBORO NORTH CAROLINA
AND STATION LATITUDE = 35.13 DEGREES

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ANNUAL TOTALS FOR YEAR 1

	INCHES	CU. FEET	PERCENT

PRECIPITATION	39.15	142114.484	100.00
RUNOFF	1.419	5152.086	3.63
EVAPOTRANSPIRATION	31.769	115322.453	81.15
PERC./LEAKAGE THROUGH LAYER 2	5.951558	21604.156	15.20
AVG. HEAD ON TOP OF LAYER 2	0.1780		
CHANGE IN WATER STORAGE	0.010	35.816	0.03
SOIL WATER AT START OF YEAR	8.623	31302.723	
SOIL WATER AT END OF YEAR	8.633	31338.539	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.031	0.00

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ANNUAL TOTALS FOR YEAR 2

	INCHES	CU. FEET	PERCENT
PRECIPITATION	44.90	162986.984	100.00
RUNOFF	3.485	12649.331	7.76
EVAPOTRANSPIRATION	30.882	112102.875	68.78
PERC./LEAKAGE THROUGH LAYER 2	10.788715	39163.035	24.03
AVG. HEAD ON TOP OF LAYER 2	0.3589		
CHANGE IN WATER STORAGE	-0.256	-928.247	-0.57
SOIL WATER AT START OF YEAR	8.633	31338.539	
SOIL WATER AT END OF YEAR	8.377	30410.293	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.007	0.00

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ANNUAL TOTALS FOR YEAR 3

	INCHES	CU. FEET	PERCENT
PRECIPITATION	61.74	224116.172	100.00
RUNOFF	12.812	46506.293	20.75
EVAPOTRANSPIRATION	32.861	119284.695	53.22
PERC./LEAKAGE THROUGH LAYER 2	16.025331	58171.953	25.96
AVG. HEAD ON TOP OF LAYER 2	0.6227		

CHANGE IN WATER STORAGE	0.042	153.259	0.07
SOIL WATER AT START OF YEAR	8.377	30410.293	
SOIL WATER AT END OF YEAR	8.420	30563.551	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.021	0.00

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ANNUAL TOTALS FOR YEAR 4

	INCHES	CU. FEET	PERCENT
PRECIPITATION	38.86	141061.766	100.00
RUNOFF	2.675	9709.260	6.88
EVAPOTRANSPIRATION	30.387	110305.984	78.20
PERC./LEAKAGE THROUGH LAYER 2	5.654765	20526.795	14.55
AVG. HEAD ON TOP OF LAYER 2	0.1417		
CHANGE IN WATER STORAGE	0.143	519.760	0.37
SOIL WATER AT START OF YEAR	8.420	30563.551	
SOIL WATER AT END OF YEAR	8.563	31083.312	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.040	0.00

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ANNUAL TOTALS FOR YEAR 5

	INCHES	CU. FEET	PERCENT
PRECIPITATION	39.67	144002.109	100.00
RUNOFF	2.142	7774.384	5.40
EVAPOTRANSPIRATION	30.835	111931.422	77.73
PERC./LEAKAGE THROUGH LAYER 2	6.339220	23011.369	15.98
AVG. HEAD ON TOP OF LAYER 2	0.1332		
CHANGE IN WATER STORAGE	0.354	1284.861	0.89
SOIL WATER AT START OF YEAR	8.563	31083.312	
SOIL WATER AT END OF YEAR	8.917	32368.172	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00

ANNUAL WATER BUDGET BALANCE	0.0000	0.073	0.00

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 5

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	3.27	2.81	4.37	2.63	3.53	5.42
	4.57	6.26	2.81	3.77	2.52	2.90
STD. DEVIATIONS	2.95	0.95	1.30	1.89	2.64	1.99
	2.29	5.93	1.69	2.69	1.66	1.28
RUNOFF						
TOTALS	0.566	0.048	0.338	0.034	0.267	0.349
	0.396	1.196	0.552	0.397	0.073	0.288
STD. DEVIATIONS	1.131	0.088	0.351	0.077	0.598	0.414
	0.279	2.502	0.814	0.659	0.101	0.301
EVAPOTRANSPIRATION						
TOTALS	1.473	1.891	2.781	3.021	3.120	3.976
	4.119	3.400	2.631	2.197	1.507	1.231
STD. DEVIATIONS	0.158	0.184	0.173	0.966	1.587	1.161
	1.758	1.383	1.364	0.782	0.807	0.171
PERCOLATION/LEAKAGE THROUGH LAYER 2						
TOTALS	1.0433	0.9468	0.9121	0.4764	0.4198	0.7082
	0.2458	1.1045	0.3934	0.8700	0.6848	1.1468
STD. DEVIATIONS	1.3753	0.8178	0.6042	0.7150	0.8957	0.9669
	0.4534	1.7951	0.7065	1.3256	0.6654	1.0426

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 2						
AVERAGES	0.5521	0.3104	0.2836	0.0567	0.1986	0.2912
	0.0806	0.4804	0.2124	0.4047	0.1251	0.4472
STD. DEVIATIONS	0.8895	0.2825	0.3560	0.1048	0.4423	0.3975
	0.1736	1.0301	0.4684	0.6645	0.1738	0.4693

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 5

	INCHES		CU. FEET	PERCENT
PRECIPITATION	44.86	(9.753)	162856.3	100.00
RUNOFF	4.506	(4.7037)	16358.27	10.045

EVAPOTRANSPIRATION	31.347	(0.9835)	113789.48	69.871
PERCOLATION/LEAKAGE THROUGH LAYER 2	8.95192	(4.47511)	32495.461	19.95346
AVERAGE HEAD ON TOP OF LAYER 2	0.287	(0.209)		
CHANGE IN WATER STORAGE	0.059	(0.2213)	213.09	0.131

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 5

	(INCHES)	(CU. FT.)
PRECIPITATION	5.22	18948.600
RUNOFF	3.925	14249.1484
PERCOLATION/LEAKAGE THROUGH LAYER 2	0.377312	1369.64148
AVERAGE HEAD ON TOP OF LAYER 2	11.769	
SNOW WATER	2.09	7587.2231

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.4190
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.1800

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FINAL WATER STORAGE AT END OF YEAR 5

LAYER	(INCHES)	(VOL/VOL)
1	3.7929	0.3161
2	5.1240	0.4270
SNOW WATER	0.000	

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Drawings Under Seperate Cover

Table 1
Historical Summary of Groundwater Analytical Results - FA-1[4]

PARAMETER[1]	NC2L[2]	LOCATION/SAMPLE DATE															
		FA-1 04/88	FA-1 04/89	FA-1 08/90	FA-1 04/90	FA-1 06/91	FA-1 04/05/92	FA-1 04/93	FA-1 10/93	FA-1 04/94	FA-1 11/94	FA-1 05/95	FA-1 10/95	FA-1 04/96	FA-1 10/96	FA-1 02/97	FA-1 08/97
Metals																	
Antimony	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	2.0	**0.5**	**3.740**	ND	**0.359**	**0.252**	**0.436**	**0.077**	**0.08**	**0.123**	**0.113**	NA	**0.644**	**0.392**	**0.11**	**0.093**	**0.92**
Beryllium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**0.001**	NA	NA	NA	<0.001	NA
Cadmium	0.00175	<0.005	**<0.01**	ND	**0.017**	**0.011**	**0.0048**	ND	NA	ND	NA	NA	NA	**0.011**	NA	**0.002**	NA
Cobalt	--	NA	NA	NA	NA	NA	NA	NA	ND	NA	ND	**0.045**	**0.109**	NA	**0.007**	NA	**0.044**
Manganese	0.05	**0.812**	**10.85**	**0.101**	**2.61**	**1.07**	**0.738**	**0.116**	**0.122**	**0.373**	**0.354**	**0.949**	**2.056**	NA	**0.17**	NA	**0.22**
Nickel	0.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**0.006**	NA
Silver	0.0175	<0.01	<0.01	ND	ND	ND	ND	**0.016**	ND	ND	ND	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Vanadium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Wet Chemistry																	
Chloride	250	<5.0	<5.0	**1.9**	**2.4**	**2.9**	**1.9**	**1.9**	**2.0**	**2.4**	**4.9**	**3.4**	**2.0**	**2.2**	**1.7**	NA	**1.7**
Fluoride	2.0	<0.1	<0.1	ND	**0.17**	ND	**0.63**	ND	ND	ND	ND	<0.5	<0.5	<0.1	<0.1	NA	**0.09**
Nitrogen, nitrate	10.0	**0.194**	**0.793**	**0.481**	**0.839**	**0.865**	**0.64**	**0.41**	NA	NA	NA	NA	NA	0.37	NA	NA	NA
Field Parameters																	
Specific Conductance (µmhos/cm)	--	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	164[3]	334[3]	418[3]	137[3]
pH (standard units)	6.5-8.5	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	**5.6**[3]	**5.8**[3]	**5.97**[3]	**5.36**[3]
Temperature (°C)	--	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
Turbidity (NTU)	--	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM

[1] Analytical results are reported in milligrams per liter (mg/L) unless otherwise noted.

[2] Groundwater quality standards specified by Title 15A subchapter 2L of the North Carolina Administrative Code (15A NCAC2L).

[3] Measurements taken from ABTco, Inc. Landfill Design Plan, Appendix VII.

[4] FA-1 has been abandoned.

< - Concentration less than the Quantitation Limit.

NA - Not analyzed.

ND - Not detected at the laboratory's reporting limit, which was not available.

NM - Not measured.

Bolding indicates constituent detection.

Shading indicates concentration exceeds comparison criteria.

Table 1
Historical Summary of Groundwater Analytical Results - FA-2

PARAMETER[1]	NC2L[2]	LOCATION/SAMPLE DATE																
		FA-2 04/88	FA-2 04/89	FA-2 08/90	FA-2 04/90	FA-2 06/91	FA-2 04/05/92	FA-2 04/93	FA-2 10/93	FA-2 04/94	FA-2 11/94	FA-2 05/95	FA-2 10/95	FA-2 04/96	FA-2 10/96	FA-2 02/97	FA-2 08/97	FA-2 06/99	FA-2 02/04/03
Metals																			
Antimony	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.03	NA
Barium	2.0	<0.05	**0.072**	ND	**0.084**	**0.078**	**0.067**	**0.079**	**0.11**	**0.072**	**0.074**	NA	**0.073**	**0.089**	**0.064**	**0.08**	**1.782**	<0.5	<0.1
Beryllium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.001	NA	NA	<0.001	NA	<0.002	NA
Cadmium	0.00175	<0.005	**0.013**	ND	**0.012**	**0.013**	ND	ND	NA	ND	NA	NA	NA	<0.001	NA	<0.001	NA	<0.001	<0.001
Cobalt	--	NA	NA	NA	NA	NA	NA	NA	ND	NA	ND	<0.005	<0.005	NA	<0.005	NA	<0.005	<0.01	NA
Manganese	0.05	**0.126**	**0.26**	ND	**0.044**	**0.122**	**0.022**	ND	**0.02**	ND	ND	<0.01	<0.01	NA	<0.01	NA	**0.45**	NA	NA
Nickel	0.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**0.008**	NA	<0.05	NA
Silver	0.0175	<0.01	<0.01	ND	ND	ND	ND	**0.345**	ND	ND	ND	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005
Vanadium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.04	NA
Wet Chemistry																			
Chloride	250	**6.56**	**7.8**	**11.3**	**8.17**	**12**	**13**	**12**	**12**	**14**	**14**	**13.4**	**11.1**	**12**	**10.1**	NA	**14**	NA	**16**
Fluoride	2.0	<0.1	<0.1	ND	**0.1**	ND	ND	ND	ND	ND	ND	<0.5	<0.5	<0.1	<0.1	NA	**0.06**	NA	NA
Nitrogen, nitrate	10.0	**0.46**	**0.965**	**1.8**	**1.07**	**6.58**	**3.2**	**13**	NA	NA	NA	NA	NA	**4.13**	NA	NA	NA	NA	NA
Field Parameters																			
Specific Conductance (µmhos/cm)	--	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	398[3]	362[3]	400[3]	386[3]	NM	350
pH (standard units)	6.5-8.5	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	**5.88**[3]	**5.54**[3]	**5.75**[3]	**5.71**[3]	NM	**5.36**
Temperature (°C)	--	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	15
Turbidity (NTU)	--	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	1.4

PARAMETER[1]	NC2L[2]	LOCATION/SAMPLE DATE								
		FA-2 08/05/03	FA-2 02/11/04	FA-2 08/10/04	FA-2 02/09/05	FA-2 08/02/05	FA-2 02/07/06	FA-2 08/01/06	FA-2 02/13/07	FA-2 08/07/07
Metals										
Antimony	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	2.0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**0.102**	<0.06	<0.089
Beryllium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	0.00175	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cobalt	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	0.05	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	0.1	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	0.0175	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
Wet Chemistry										
Chloride	250	**12**	**4**	**28**	**12**	**15**	**9**	**15**	**6**	**12**
Fluoride	2.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrogen, nitrate	10.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
Field Parameters										
Specific Conductance (µmhos/cm)	--	177	294	313	222	322	354	404	393	423
pH (standard units)	6.5-8.5	**5.51**	**5.33**	**5.46**	**5.36**	**5.82**	**5.58**	**5.58**	**5.66**	**5.79**
Temperature (°C)	--	14	14.7	14.3	15	14.5	14.7	14.8	14.5	14.7
Turbidity (NTU)	--	1.1	8.9	1.3	0.38	0.75	0.84	11	11	32

(1) Analytical results are reported in milligrams per liter (mg/L) unless otherwise noted.

(2) Groundwater quality standards specified by Title 15A subchapter 2L of the North Carolina Administrative Code (15A NCAC2L).

(3) Measurements taken from ABTco, Inc. Landfill Design Plan, Appendix VII.

< - Concentration less than the Quantitation Limit.

NA - Not analyzed.

ND - Not detected at the laboratory's reporting limit, which was not available.

NM - Not measured.

Bolding indicates constituent detection.

Shading indicates concentration exceeds comparison criteria.

Table 1
Historical Summary of Groundwater Analytical Results - FA-3

PARAMETER[1]	NC2L[2]	LOCATION/SAMPLE DATE										
		FA-3 06/99	FA-3 02/04/03	FA-3 08/05/03	FA-3 2/11/2004	FA-3 08/10/04	FA-3 02/09/05	FA-3 08/02/05	FA-3 02/07/06	FA-3 08/01/06	FA-3 02/13/06	FA-3 08/07/07
Metals												
Antimony	--	<0.03	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	2.0	<0.5	<0.1	<0.1	**0.147**	<0.1	<0.1	<0.1	**0.104**	**0.129**	**0.111**	**0.235**
Beryllium	--	<0.002	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	0.00175	**0.002**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cobalt	--	**0.016**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	0.05	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	0.1	<0.05	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	0.0175	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium	--	<0.04	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Wet Chemistry												
Chloride	250	NA	**11**	**17**	**16**	**24**	**16**	**23**	**7**	**12**	**6**	**12**
Fluoride	2.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate, Nitrogen	10.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Field Parameters												
Specific Conductance (µmhos/cm)	--	NM	206	219	236	206	243	213	224	318	336	324
pH (standard units)	6.5-8.5	NM	**5.51**	**5.58**	**5.48**	**5.81**	**5.62**	**5.83**	**5.45**	**5.53**	**5.58**	**5.64**
Temperature (°C)	--	NM	15.1	15.5	14.7	15.3	15.1	15.7	15.1	15.7	13.4	15.3
Turbidity (NTU)	--	NM	125	32	190	100	160	15.1	110	150	32	400

[1] Analytical results are reported in milligrams per liter (mg/L) unless otherwise noted.
[2] Groundwater quality standards specified by Title 15A subchapter 2L of the North Carolina Administrative Code (15A NCAC2L).
< - Concentration less than the Quantitation Limit.
NA - Not analyzed.
ND - Not detected at the laboratory's reporting limit, which was not available.
NM - Not measured.
Bolding indicates constituent detection.
Shading indicates concentration exceeds comparison criteria.

Table 1
Historical Summary of Groundwater Analytical Results - FA-4

PARAMETER[1]	NC2L[2]	LOCATION/SAMPLE DATE										
		FA-4 06/01/99	FA-4 02/04/03	FA-4 08/05/03	FA-4 02/11/04	FA-4 08/10/04	FA-4 02/09/05	FA-4 08/02/05	FA-4 02/07/06	FA-4 08/01/06	FA-4 02/13/07	FA-4 08/07/07
Metals												
Antimony	--	<0.03	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	2.0	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.06	<0.06
Beryllium	--	<0.002	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	0.00175	**0.005**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cobalt	--	**0.043**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	0.05	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	0.1	<0.05	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	0.0175	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium	--	<0.04	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Wet Chemistry												
Chloride	250	NA	**15**	**25**	**9**	**12**	**9**	**15**	**4**	**8**	**1**	**2**
Fluoride	2.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate, Nitrogen	10.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Field Parameters												
Specific Conductance (µmhos/cm)	--	NM	87	38	42	34	35	29	32	38	36	34
pH (standard units)	6.5-8.5	NM	**6.15**	**5.46**	**5.51**	**5.48**	**6.41**	**5.55**	**5.06**	**5.69**	**5.52**	**6.62**
Temperature (°C)	--	NM	14.6	14.1	13.8	14.5	14.4	14.7	14.3	14.8	14.3	15
Turbidity (NTU)	--	NM	600	5	38	5.4	4.1	2.6	8.1	28	7	15

[1] Analytical results are reported in milligrams per liter (mg/L) unless otherwise noted.

[2] Groundwater quality standards specified by Title 15A subchapter 2L of the North Carolina Administrative Code (15A NCAC2L).

< - Concentration less than the Quantitation Limit.

NA - Not analyzed.

ND - Not detected at the laboratory's reporting limit, which was not available.

NM - Not measured.

Bolding indicates constituent detection.

Shading indicates concentration exceeds comparison criteria.

Table 1
Historical Summary of Groundwater Analytical Results - Stream

PARAMETER[1]	NC2L[2]	LOCATION/SAMPLE DATE									
		STREAM 02/04/03	STREAM 08/05/03	STREAM 02/11/04	STREAM 08/10/04	STREAM 02/09/05	STREAM 08/02/05	STREAM 02/07/06	STREAM 08/01/06	STREAM 02/13/07	STREAM 08/07/07
Metals											
Antimony	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	2.0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.072	DRY
Beryllium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	0.00175	<0.001	**0.001**	<0.001	<0.001	**0.007**	<0.001	<0.001	**0.002**	<0.001	DRY
Cobalt	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	0.05	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	0.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	0.0175	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	DRY
Vanadium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Wet Chemistry											
Chloride	250	**8**	**16**	**7**	**12**	**7**	**27**	**6**	**12**	**7**	DRY
Fluoride	2.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate, Nitrogen	10.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Field Parameters											
Specific Conductance (µmhos/cm)	--	222	209	203	221	318	426	166	208	158	DRY
pH (standard units)	6.5-8.5	**5.58**	**5.33**	**5.82**	**6.26**	**5.93**	**6.34**	**5.72**	**6.06**	**6.39**	DRY
Temperature (°C)	--	10.8	16.9	7.6	17.2	7.7	19.3	9.3	19.9	5.9	DRY
Turbidity (NTU)	--	0.95	0.75	12	1.8	1.1	6.5	90	16	5	DRY

(1) Analytical results are reported in milligrams per liter (mg/L) unless otherwise noted.

(2) Groundwater quality standards specified by Title 15A subchapter 2L of the North Carolina Administrative Code (15A NCAC2L).

< - Concentration less than the Quantitation Limit.

NA - Not analyzed.

ND - Not detected at the laboratory's reporting limit, which was not available.

NM - Not measured.

Bolding indicates constituent detection.

Shading indicates concentration exceeds comparison criteria.

September 17, 1999

Joyce Engineering, Inc.
Henderson Building, Suite 203
2301 West Meadowview Road
Greensboro, North Carolina 27407
Tel (336) 323-0092
Fax (336) 323-0093
www.joyceengineering.com

Ms. Cheryl Marks
NCDENR/Solid Waste Section
P.O. Box 27687
Raleigh, North Carolina 27611-7687

RE: MONITORING WELL INSTALLATION AND ANALYSIS
ABTCO, INC.
JEI PROJECT 364.00, Task 03

Dear Ms. Marks:

As discussed in out telephone conversation of September 17, I am forwarding two copies of additional pages to be inserted into the text of the August 31, 1999 report *Louisiana Pacific/ABTco, Inc. Monitoring Well Installation and Analysis*. Please insert these pages into your copy of the report, as well as the copy furnished to Mr. Larry Rose of the Compliance Branch at the Section.

Please note that the additional text supports the opinion of Joyce Engineering Inc. that existing information about the landfill site is sufficient to demonstrate compliance with Rule .0503(2)(d)(ii)(A) of the Solid Waste Management Rules, and that additional groundwater modeling is not necessary at the facility.

Thank you for your assistance with this project. If you have any questions, please contact us at (336) 323-0092.

Sincerely,
JOYCE ENGINEERING, INC.

James T. Bateson, P.G.
Senior Project Hydrogeologist

C: Erich Burke, P.E. - ABTco

Attachments
G:\DataShared\Projects\ABTCO\Task-03\network upgrade\marksltr.doc

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August 31, 1999

Mr. Erich J. Burke, P.E.
Louisiana Pacific/ABTco, Inc.
Highway 268
P.O. Box 98
Roaring River, North Carolina 28669

RE: MONITORING WELL INSTALLATION AND ANALYSIS
ABTCO, INC.
JEI PROJECT 364.00, Task 03

Dear Mr. Burke:

Enclosed is a report documenting the field procedures and technical services Joyce Engineering, Inc. has provided in association with the installation of two groundwater monitoring wells (FA-3 and FA-4) at ABTco, Inc. located in Roaring River, North Carolina. The well installation and associated investigation was performed in response to Ms. Cheryl Marks' correspondence dated December 9, 1998 to demonstrate compliance with Rule .0503(2)(d)(ii)(A) of the Solid Waste Management Rules.

A copy of the report has been forwarded to Ms. Marks at the Permitting Branch of the North Carolina Solid Waste Section. An additional copy was forwarded to Mr. Larry Rose of the Compliance Branch at the Section, so that the analytical results will be able to meet the requirements for the second semiannual sampling event for the landfill.

If you have any questions, please contact us at (336) 323-0092. Thank you for the opportunity to be of service to Louisiana Pacific/ABTco, Inc.

Sincerely,
JOYCE ENGINEERING, INC.

Matthew J. Tischler
Staff Geologist

James T. Bateson, P.G.
Senior Project Hydrogeologist

Enclosure

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- Table No. 1 Summary of Subsurface Test Results
- Table No. 2 Summary of Well Construction Data
- Table No. 3 Summary of Groundwater Elevations
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- Table No. 5 Summary of Hydraulic Gradients and Linear Flow Velocities
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- Figure No. 1 Site Location Map

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APPENDICES

- Appendix I Subsurface Test Results
- Appendix II Well Construction Information
- Appendix III Monitoring Well Survey
- Appendix IV Slug Test Results
- Appendix V Groundwater Analytical Results

The slug test estimates of K range from 1.2×10^{-3} cm/sec to 3.1×10^{-3} cm/sec. The results suggest that the regolith water table aquifer is relatively homogeneous across the site. The K value determined for the well screened in the soil/bedrock interface was 2.7×10^{-3} cm/sec.

The geometric mean of the regolith and bedrock well slug test K values is 1.86×10^{-3} cm/sec. Estimates of hydraulic conductivity obtained from slug tests on individual wells at this site are considered to be higher than actual conductivities for site-scale movement of groundwater. Curves generated by the recovery data indicate that the data are dominated by near-field, or skin effects, and are reflective, in part, of the properties of the filter pack. Also, one well (FA-4) tested is partially screened in weathered fractured rock. Connectivity, and therefore transmissivity, in this medium will be a function of scale. Fracture connectivity will be greater for the scale involved in slug test drawdown, than for the scale involved in site-scale groundwater flow. For this reason, calculated linear flow velocities for the regolith aquifer at the site could be as much as an order of magnitude high. A summary of hydraulic gradients and linear flow velocities are shown in Table 5.

3.0 RESULTS AND DISCUSSION

3.1 Groundwater Flow Directions

Current groundwater flow directions beneath the ABTco facility were inferred from the surrounding wells and the original and current topography. Groundwater flow patterns most likely mimic the present topography. Based on groundwater elevations obtained from the four monitoring wells on site, inferred groundwater contours were developed for the landfill area (Drawing No. 1).

Based on the original and current site contours and knowledge of groundwater flow patterns in the Piedmont physiographic province, groundwater from beneath the majority of the landfill flows towards a west southwest-trending creek located immediately south of the facility. It then flows west towards an unnamed southeast-trending tributary to the Yadkin River. Both of these streams are likely to serve as effective groundwater divides and discharge points for groundwater flowing from the facility. The west-southwest trending creek parallels the strike of the Brevard Fault zone, located just south of the facility, and the southeast-trending creek is oriented parallel to a regional tensional fracture set known to occur in the region. The hydrologic importance of these two preferential fracture orientations was demonstrated through measurements taken from outcrops at the Wilkes County Roaring River Landfill during a 1998 Design Hydrogeologic Study for the current Phase II expansion of that facility (*Application for Permit to Construct, Wilkes County Landfill*, JEI, December 31, 1998). Steep topography at the Ash Landfill site, plus the apparent fracture control on the two creeks, suggests that they are effective groundwater divides for groundwater flowing from the facility.

3.2 Analytical Results

Laboratory analytical results, along with the sampling field logs, for the June 1999 sampling of newly installed and existing wells are included in Appendix V. No organic compounds were detected in wells at the facility during the June 1999 event. A summary of results for the detected inorganic constituents for the event is shown in Table 6.

Four inorganic compounds were detected in well FA-3. None of these were detected at levels greater than the established NC 2L Drinking Water Standard. Four inorganic compounds were detected in upgradient well FA-4. Of these, none were detected at levels greater than the established NC 2L Standard. No inorganic compounds were detected in well FA-2 during the June 1999 event.

Total dissolved solids were measured below the established NC 2L Standard in all three wells.

3.3 Groundwater Quality in the Surficial Aquifer Beneath the Site

Information presented in this report suggests that groundwater flowing from the Roaring River Ash Landfill is not likely to cause an exceedence of the NC 2L Drinking Water Standards at the site compliance boundary. The site has a number of aspects that are advantageous in this regard:

1. A broad slope extends over 1000 feet above the site to the north (see Figure 1 and Drawing 1), providing a significant upgradient recharge area for the surficial aquifer beneath the landfill. Groundwater flow from this recharge area converges toward the fill area and the two streams which form the discharge point to the southwest of the landfill.

2. Regolith is relatively thick beneath the site, (24 feet at FA-3; 55 feet at FA-4), and the water table is within regolith. On the basis is of the boring logs for FA-3 and FA-4 (Appendix II) and the groundwater map (Drawing 1), it is conservative to infer that the saturated part of regolith is at least ten feet thick.

3. Site-wide hydraulic gradients beneath the site are steep, approximately 0.10 ft/ft (Table 5).

4. Hydraulic conductivity of the regolith and upper bedrock is conservatively estimated to be in the range of 10^{-4} cm/sec, on the basis of single-well tests of on-site monitoring wells.

Taken together, the above characteristics suggest that the surficial aquifer has considerable capacity for dilution of groundwater recharged through waste at the facility.

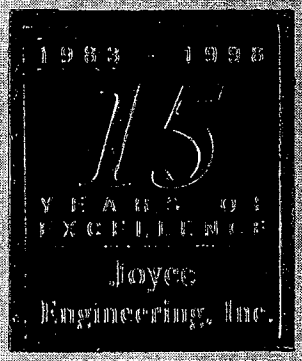
The waste at the Ash Landfill is relatively non-reactive. Alkali in the wood ash will lower pH, and limit solubility of most of the RCRA metals of potential concern in the ash. Results of TCLP analyses on ash from the facility, plus available laboratory analyses of compliance wells at the facility (summarized in *ABTco, Inc. Landfill Design Plan*, JEI, November 24, 1997; Table 6 and Appendix V of this report) bear this out.

3.4 Conclusions

The characteristics of the site and the innocuous nature of the waste will protect groundwater from exceedences of the NC 2L Drinking Water Standards. Current knowledge of the site provides sufficient demonstration of compliance with section .0503(2)(d)(ii)(A) of the NC Solid Waste Management Rules (15A NCAC 13B), and we recommend that no further hydrologic modeling be done.

Prepared For:

ABTco, Inc.
Highway 268, P.O. Box 98
Roaring River, North Carolina 28669
JEI Project No. 364.00, Task 03



LOUISIANA PACIFIC/ABTco, INC. MONITORING WELL INSTALLATION AND ANALYSIS

August 31, 1999

Prepared By:

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- Appendix III Monitoring Well Survey
- Appendix IV Slug Test Results
- Appendix V Groundwater Analytical Results

1.0 INTRODUCTION

This report describes the installation and sampling of two new groundwater monitoring wells the ash monofill at the Louisiana Pacific/ABTco, Inc. hardboard plant in Roaring River, North Carolina. This landfill unit is regulated and permitted by the NC Department of Environment and Natural Resources, Solid Waste Section (referred to as the Section) as an industrial landfill, Permit No. 97-03. In a letter dated December 9, 1998, the Section requested that ABTco upgrade its water quality monitoring system and characterize the aquifer beneath the landfill. In addition to well installation, this report describes subsurface soils testing, aquifer analysis, definition of the groundwater flow regime, including groundwater sampling and analysis of new and existing wells at the facility.

The ABTco, Inc. ash landfill is located off State Route 268, west of Roaring River, North Carolina. The general topography of the area is indicated on an enlarged section of the Roaring River 7.5 minute USGS quadrangle shown as Figure 1. The landfill was constructed on the slope of a north-northeast trending valley. Elevations of the topographic highs surrounding the site are approximately 1100 feet (MSL) to the north, and 1140 feet (MSL) to the northwest. Elevations in the lower end of the valley below the landfill range to approximately 970 feet (MSL).

The ABTco facility produces building products from hardwood and softwood. Wood chips are used as fuel to fire a boiler, and the resulting ash is landfilled on site in an unlined land disposal unit. The Landfill is monitoring groundwater in accordance with Section .0500 of the North Carolina Solid Waste Management Rules for industrial, construction and demolition, and sanitary landfills closed prior to October 9, 1991.

The sampling results reported in this report are intended to fulfill the requirements for the second semiannual monitoring event for 1999 at the facility. Groundwater samples were obtained from existing well FA-2 and from newly installed wells FA-3 and FA-4.

During an onsite meeting with the Section, it was agreed that well FA-1 would be dropped from the routine detection monitoring system. The well is located on the upgradient side of the landfill, in a small drainage swale that has been blocked by landfill construction. The well is only 60 feet from the edge of waste. Normally, the well has only a few feet of standing water. The well is not located or constructed such that it provides useful information about water quality at the facility.

2.0 FIELD ACTIVITIES

Field activities were performed between June and August 1999. The field work consisted of installation and development of two monitoring wells, a survey of the new and existing monitoring well locations, subsurface soils analysis, aquifer analysis, measurement of static groundwater elevations, and collection of groundwater samples for laboratory analysis. The field activities are described below.

2.1 Groundwater Monitoring Well Installation

Two groundwater monitoring wells (FA-3 and FA-4) were installed at the ABTco, Inc. ash landfill on June 4, 1999 (see Drawing No. 1). Well installation was performed by Geologic Exploration, Inc. of Statesville, North Carolina. The drilling equipment consisted of a Dietrich D120 rotary drilling rig equipped with 8.25-inch hollow-stem augers, and a Drilltech D25K air rotary drilling rig equipped with a 6.25-inch OD rock hammer. An experienced Joyce Engineering geologist was present to observe the drilling, log the boreholes, supervise the construction, and develop the monitoring wells.

Well construction was performed in general accordance with the standards described in *the RCRA Technical Enforcement Guidance Document and the Draft North Carolina Water Quality Monitoring Guidance Document for Solid Waste Facilities*. The drill equipment and well construction materials were cleaned with high pressure steam without soaps or detergents before the start of drilling at each location to avoid contaminating the wells with foreign materials and to prevent cross contamination.

Split-spoon samples and drill cuttings were obtained at five-foot intervals and logged by the geologist. Selected soil samples were analyzed for particle size analysis and natural moisture content. Table 1 provides a summary of the test results. Appendix I contains the laboratory copy of the subsurface test results. Drillers were unable to obtain undisturbed samples of the saturated portions of the regolith profile. The lower parts of regolith are either too resistant or rocky to allow pushing a shelby tube.

The wells were constructed using 2-inch diameter Schedule 40 PVC casing and 0.010-inch slotted well screen. Flush threaded connections were used to connect casings and screens to eliminate the use of PVC solvents and glues.

Monitoring well FA-3 was installed in soil to a depth of approximately 24 feet below the ground surface. The screened interval in FA-3 is fifteen feet in length and intersects the air/water interface to accommodate seasonal fluctuations in groundwater elevations. Well FA-3 will serve to monitor any potential releases from the western portion of the landfill. Well FA-4 was installed to a depth of approximately 60 feet below the ground surface and will serve as the facility's new background well. Well FA-4 also has a screen fifteen feet in length, installed in the soil/bedrock interface.

A clean, fine quartz sandpack was placed in the annular space in each well to a height of 2 feet above the top of the screen to prevent formation material from entering the screen. Bentonite pellets were poured in the annular space directly above the sandpack and then hydrated with distilled water to seal the screened section from vertical infiltration of surface water along the well casing.

After the bentonite seal cured, a mix of number 1 Portland cement/grout was placed in the annulus above the seal. Lockable expansion caps were installed into the top of each well casing. Protective steel stand-pipes were installed into 2 x 2 x 0.5-foot concrete aprons to protect the integrity of the wells. The well construction information and boring logs for the two new and existing groundwater

monitoring wells are contained in Appendix II.

Following construction, the wells were developed with an electric submersible pump and surge block to remove accumulated sediments resulting from the drilling and well construction process, and to hydraulically connect the wells with the surrounding soils. The surge block was used to loosen the disturbed sediments. Once the wells were thoroughly surged, the water-sediment mixture was removed with the pump, and the wells were allowed to recharge. This process was repeated until sediment free water could be obtained from the wells. Approximately 25 gallons of water were removed from each well during the development process.

2.2 Survey of Monitoring Wells

The newly installed monitoring wells (FA-3 and FA-4), and the two existing wells (FA-1 and FA-2) were surveyed on August 6, 1999 by Current Land Surveying & Mapping, P.A. of Wilkesboro, North Carolina. Elevations and horizontal locations were referenced to a nearby N.C. Grid monument. The monitoring well survey map prepared by the surveyor is provided as Appendix III.

A summary of the well installation data for the new and existing wells, including surveyed elevations, well depths, screened intervals, and lithology at the screened interval is provided in Table 2.

2.3 Groundwater Measurements

Static water level measurements were collected on June 24, 1999 in the four monitoring wells (FA-1, -2, -3, and –4) located at the site. The measurements were collected using a decontaminated electric water level meter. The surveyed point on the top of the well casing was used as reference, and the measurements were recorded to within 0.01 foot. The groundwater data was used to construct a groundwater potentiometric surface map for the ABTco facility, and to infer groundwater flow directions in the area. A summary of the static groundwater elevations for the June 1999 event is included in Table 3. A potentiometric surface map is included on Drawing No. 1.

2.4 Groundwater Sampling

Groundwater samples were obtained from selected wells (FA-2, -3, and -4) on June 24, 1999. Prior to sampling, each well was purged by removing three well volumes of water with a disposable bailer suspended on new, clean nylon cord. Field measurements of temperature, specific conductivity, pH, and turbidity were obtained after each well volume and recorded on groundwater sampling logs.

Subsequent to sampling, the bottleware was labeled with a tag identifying the sample number, date, time, location, analysis to be conducted, and the sampler's initials. All samples were placed in a cooler and chilled to approximately 4° C.

The samples were sent to Environmental Conservation Laboratories, Inc., of Cary, North Carolina for analysis. To ensure sample integrity, samples were transported to the laboratory using EPA

approved chain-of-custody procedures and relinquished to laboratory personnel with time, date, and signature recorded. The requested analyses consisted of the EPA Appendix I list of constituents by SW-846, Method 8270 including phenols and naphthalenes, and Total Dissolved Solids.

2.5 Hydrogeologic Testing

Following rigorous well development, the two new monitoring wells (FA-3 and FA-4) and existing monitoring well FA-2 were chosen for aquifer testing during the field investigation. Monitoring well FA-1 could not be tested for aquifer parameters due to an insufficient volume of water. The purpose of the testing was to assess the values of horizontal hydraulic conductivity at various locations within the water table and bedrock aquifers at the site. In situ rising- and falling-head tests (slug tests) were chosen for the assessment.

In situ rising- and falling-head tests were performed on the monitoring wells June 24, 1999. Prior to slug testing, the monitoring wells were opened and groundwater levels were allowed to equilibrate for approximately fifteen minutes. Water level measurements were then collected using an electric water level probe referenced to a point on the top of casing. This point was marked on the cable, and the distance to the nearest five-foot interval was measured and recorded to within 0.01 foot. A 15 pounds per square inch (psi) pressure transducer was then lowered inside the well casing and placed approximately one foot from the bottom of the well. The pressure transducer was then attached to an In-Situ SE 1000C electronic data logger. A polyvinyl chloride (PVC) slug measuring five feet in length was then used to displace water inside the wells.

The first portion of the test was a falling head test that measured the rate water levels fell back to static after the injection of the PVC slug. Water level data from the transducer were recorded at logarithmic time intervals by the data logger. Data from the transducer/data logger were verified with hand held water level readings. Falling head tests were terminated after water levels had recovered to within 95% of their pre-test level.

A rising head test was performed on each well after the falling head test was completed. The rising head test was conducted by initiating a new logarithmic recording step on the data logger simultaneous with the removal of the PVC slug. The data were checked with hand held readings, and the test was terminated after water levels had recovered to within 95% of the pre-test level.

In situ rising- and falling-head tests provide a quantitative estimate of horizontal hydraulic conductivity (K) in water-bearing units. The slug test data were analyzed using the Bower and Rice (1976 and 1989) equation, which is applicable to fully or partially penetrating wells in unconfined or confined aquifers. An aquifer thickness of 15 and 40 feet was assumed for the water table aquifer, and 30 feet was assumed for the bedrock aquifer based upon information supplied on the boring logs. A packing porosity of 30% was assumed for the well filter pack. Computer software produced by Starpoint Software, Inc. was utilized to assist in the analysis and plotting of data. The individual data points and computer plots of time versus water level change are presented in Appendix IV. A summary of the aquifer testing performed at the site is included in Table 4.

The slug test estimates of K range from 1.2×10^{-3} cm/sec to 3.1×10^{-3} cm/sec. The results suggest that the regolith water table aquifer is relatively homogeneous across the site. The K value determined for the well screened in the soil/bedrock interface was 2.7×10^{-3} cm/sec.

The geometric mean of the regolith and bedrock well slug test K values is 1.86×10^{-3} cm/sec. Estimates of hydraulic conductivity obtained from slug tests on individual wells at this site are considered to be higher than actual conductivities for site-scale movement of groundwater. Curves generated by the recovery data indicate that the data are dominated by near-field, or skin effects, and are reflective, in part, of the properties of the filter pack. Also, one well (FA-4) tested is partially screened in weathered fractured rock. Connectivity, and therefore transmissivity, in this medium will be a function of scale. Fracture connectivity will be greater for the scale involved in slug test drawdown, than for the scale involved in site-scale groundwater flow. For this reason, calculated linear flow velocities for the regolith aquifer at the site could be as much as an order of magnitude high. A summary of hydraulic gradients and linear flow velocities are shown in Table 5.

3.0 RESULTS AND DISCUSSION

3.1 Groundwater Flow Directions

Current groundwater flow directions beneath the ABTco facility were inferred from the surrounding wells and the original and current topography. Groundwater flow patterns most likely mimic the present topography. Based on the original and current site contours and knowledge of groundwater flow patterns in the Piedmont physiographic province, groundwater from beneath the majority of the landfill flows south towards the bottom of the valley, then flows west towards an unnamed tributary to the Yakin River. Based on groundwater elevations obtained from the four monitoring wells on site, inferred groundwater contours were developed for the landfill area (Drawing No. 1).

3.2 Analytical Results

Laboratory analytical results, along with the sampling field logs, for the June 1999 sampling of newly installed and existing wells are included in Appendix V. A summary of results for detected components for the June 1999 sampling event is shown in Table 6.

No organic compounds were detected during the June 1999 event. However, four inorganic compounds were detected in well FA-3. None of these were detected at levels greater than the established NC 2L Drinking Water Standard.

Four inorganic compounds were detected in upgradient well FA-4 during the June 1999 event. Of these, cadmium was detected at a level equal to the established NC 2L Standard of 5.0 parts per billion.

No inorganic compounds were detected in FA-2 during the June 1999 event.

Total dissolved solids were measured below the established NC 2L Standard in all three wells.

TABLE 1
SUMMARY OF SUBSURFACE TEST RESULTS
ABTco, Inc.
Roaring River, North Carolina
JEI Project No, 364.00, Task 03

BORING NUMBER	SAMPLE DEPTH (feet)	SAMPLE TYPE	USCS CLASSIFICATION	NATURAL MOISTURE CONTENT (%)
FA-3	4 - 6	SS	ML	28
FA-3	9 - 11	SS	ML	34
FA-3	14 - 16	SS	ML	29
FA-4	25	BAG	ML	38
FA-4	45	BAG	ML	40
FA-4	56	BAG	ML	35

NOTES:
1. SS = Split Spoon Sample (ASTM D-1586)
2. BAG = Bulk Sample of Drill Cuttings

TABLE 2
SUMMARY OF WELL CONSTRUCTION DATA
ABTco, Inc.
Roaring River, North Carolina
JEI Project No. 364.00, Task 03

WELL NUMBER	DATE INSTALLED	CASING DIAMETER	WELL ELEVATION		TOTAL DEPTH		TOP OF BEDROCK		SCREENED INTERVAL				LITHOLOGY OF SCREENED INTERVAL
			GROUND SURFACE	T.O.C.	B.G.S.	B.T.O.C.	DEPTH	ELEV.	DEPTH B.G.S.		ELEV. M.S.L.		
		inches	feet above M.S.L.		feet	feet	feet B.G.S.	feet M.S.L.	from	to	from	to	
FA-1	11/22/89	2	1040.00	1039.07	28	1011.07	NE	-	18	28	1022.0	1012.0	SAPROLITE
FA-2	11/22/89	2	1007.30	1007.51	29	978.51	NE	-	19	29	988.3	978.3	SAPROLITE
FA-3	06/04/99	2	976.27	979.30	24	955.30	24	952.27	9	24	967.3	952.3	SAPROLITE
FA-4	06/04/99	2	1095.57	1098.19	60	1038.19	53	1042.57	45	60	1050.6	1035.6	SAPROLITE/BEDROCK

NOTES:

1. Well FA-1 and FA-2 were installed by Newman Brothers, Inc. in November 1989.
2. Wells FA-3 and FA-4 were installed by Joyce Engineering in June 1999.
3. All elevations are referenced to mean sea level; depths are referenced to ground surface.
4. All wells were constructed using 2-inch (inside diameter) casing.
5. B.G.S. = Below ground surface.
6. M.S.L. = Mean sea level.
7. B.T.O.C. = Below top of casing.
8. T.O.C. = Top of casing.
9. NE = Not encountered.

TABLE 3
SUMMARY OF GROUNDWATER ELEVATIONS
ABTco, Inc.
Roaring River, North Carolina
JEI Project No. 364.00, Task 03

WELL NO.	TOP OF CASING Elevation	Jun-99 Elevation
FA-1	1039.07	1012.22
FA-2	1007.51	990.37
FA-3	979.30	966.65
FA-4	1098.19	1042.34

NOTES:

1. All elevations are referenced to mean sea level.
2. Top of casing elevations were surveyed by Current Surveying and Mapping, P.A.

TABLE 4
SUMMARY OF SLUG TEST DATA
ABTco, Inc.
Roaring River, North Carolina
JEI Project No. 364.00, Task 03

WELL NUMBER	SATURATED AQUIFER THICKNESS VALUE (feet)	SCREEN LENGTH (feet)	EFFECTIVE RADIUS (inches)	SLUG TEST TYPE	K (cm/s)	SCREENED LITHOLOGY
FA-2	40	10	6.5	Falling	1.2×10^{-3}	Saprolite
				Rising	1.9×10^{-3}	
FA-3	15	15	4.125	Falling*	3.1×10^{-3}	Saprolite
				Rising	2.0×10^{-3}	
FA-4	30	15	3	Falling*	1.8×10^{-3}	Saprolite/Bedrock
				Rising	2.7×10^{-3}	

NOTES:
1. Aquifer analysis was performed by Joyce Engineering, Inc. in June 1999.
2. * Falling head test results are not considered applicable, as screened intervals intersect the water table.

TABLE 5
HYDRAULIC GRADIENTS AND LINEAR FLOW VELOCITIES
ABTco, Inc.
Roaring River, North Carolina
JEI Project No. 364.00, Task 03

WELL PAIR	HYDRAULIC CONDUCTIVITY (K, cm/s)	DISTANCE BETWEEN PAIRS (ft)	FLOW DIRECTION	6/24/99 Groundwater Elevations		
				Elevation (ft, MSL)	Gradient (ft/ft)	Velocity (ft/yr)
FA-2 FA-3	1.95E-03	438	SW	990.37 966.65	0.05	546.38
FA-4 FA-2	2.70E-03	525	SSW	1042.34 990.37	0.10	1382.84
FA-4 FA-3	2.70E-03	854	SSW	1042.34 966.65	0.09	1238.11
FA-1 FA-2	1.90E-03	456	SW	1012.22 990.37	0.05	471.04

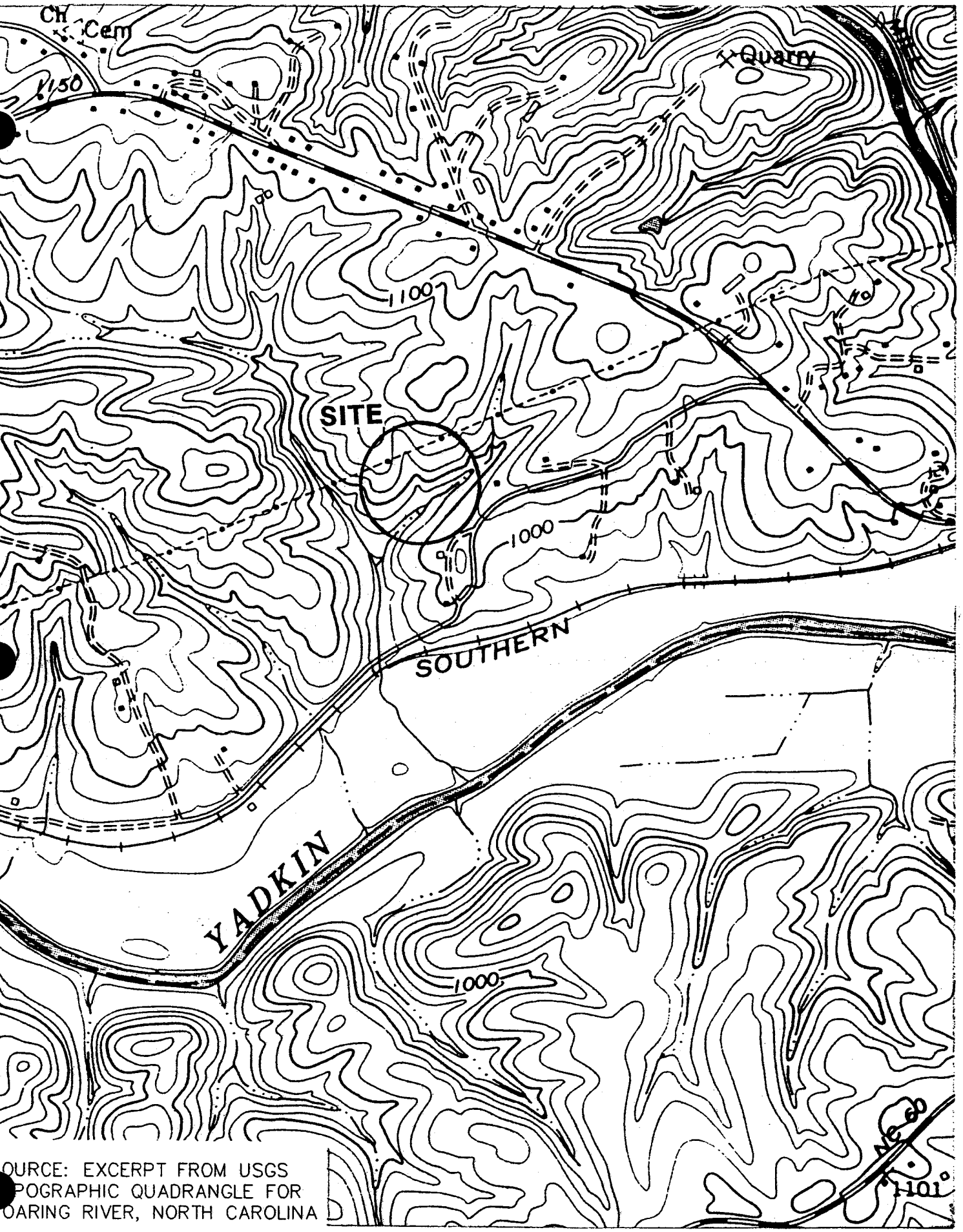
Notes: 1. Linear flow velocities in plain type = Ki/n, with an assumed effective porosity (n) of 0.20 for porous regolith.

TABLE 6
SUMMARY OF DETECTED CONSTITUENTS
ABTco, Inc.
Roaring River, North Carolina
JEI Project No. 364.00, Task 03

Parameter	NC 2L Standard (ug/l)	EPA MCL (ug/l)	Date	DL (ug/l)	QL (ug/l)	Concentration in Groundwater (ug/l)			
						FA-2	FA-3	FA-4	Blank
Antimony	-	6	Jun-99	5.0	30	ND	ND	ND	ND
Arsenic	50	50	Jun-99	8.0	10	ND	ND	ND	ND
Barium	2000	2000	Jun-99	2.0	500	ND	ND	ND	ND
Beryllium	-	4	Jun-99	1.0	2.0	ND	ND	ND	ND
Cadmium	5	5	Jun-99	1.0	1.0	ND	2	5.0	ND
Chromium	-	100	Jun-99	3.0	10	ND	45	48	ND
Cobalt	1000	-	Jun-99	2.0	10	ND	16	43	ND
Copper	-	1300	Jun-99	2.0	200	ND	2.0 J	ND	ND
Lead	15	15	Jun-99	3.0	10	ND	ND	ND	ND
Nickel	100	100	Jun-99	4.0	50	ND	ND	ND	ND
Thallium	-	2	Jun-99	0.3	10	ND	ND	ND	ND
Silver	-	100*	Jun-99	1.0	10	ND	ND	ND	ND
Vanadium	-	-	Jun-99	1.0	40	ND	ND	ND	ND
Zinc	2100	5000	Jun-99	23	50	ND	ND	60	ND
TDS	500,000	-	Jun-99	-	-	280,000	150,000	24,000	4,000

NOTES:

1. Well FA-4 is the facility background monitoring well.
2. Concentrations are shown with **shading** if they are equal to or greater than the NC 2L groundwater standard.
3. Concentrations are shown with **shading** if they are equal to or greater than EPA's maximum contaminant limit (MCL).
4. NC 2L Standard = North Carolina's groundwater quality standard established under 15A NCAC 2L, .0202.
5. EPA MCL = U.S. Environmental Protection Agency's Maximum Contaminant Level.
6. * = EPA's Secondary MCL
7. TDS = Total dissolved solids
8. DL = Lab-specific detection limit
9. QL = Lab-specific quantitation limit
10. ND = Not detected at or above the DL
11. J = Estimated value; the concentration is between the laboratory DL and QL
12. (ug/l) = Parts per billion



OURCE: EXCERPT FROM USGS
POGRAPHIC QUADRANGLE FOR
OARING RIVER, NORTH CAROLINA

FIGURE 1	JOYCE ENGINEERING INC.	SCALE 1"=1000'	PROJECT NO. 364.01	ABTCo INDUSTRIAL LANDFILL SITE LOCATION MAP 11/17/97

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Drawing Under Seperate Cover

APPENDIX I

Subsurface Test Results

TRIGON
ENGINEERING CONSULTANTS, INC.

P.O. Box 18846 • Zip 27419-8846 • 313 Gallimore Dairy Rd. • Greensboro, N.C. 27409 • (336) 668-0093 • FAX (336) 668-3868

LETTER OF TRANSMITTAL

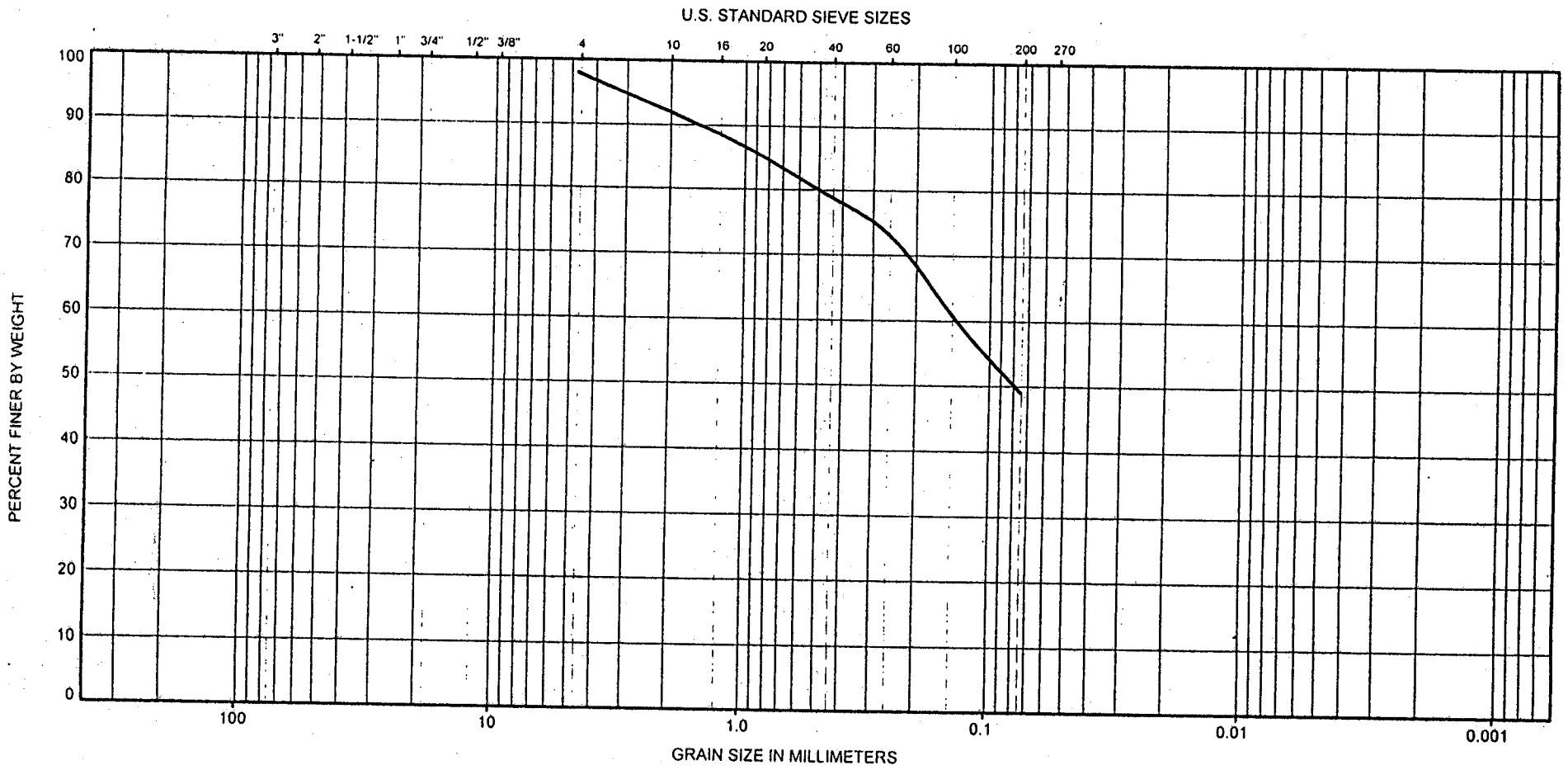
TO: Ms. Rachel Pressley
Joyce Engineering, Inc.
436 Spring Garden Street
Greensboro, NC 27401

Date: June 24, 1999
Regular Mail: XXX
Express Mail:
Federal Express:
Hand Carried:
Other:

COPIES	PAGES	DESCRIPTION	COMMENTS
1	6	ABTco Lab Results	

SIGNATURE: _____

Trigon Project No. 013-99-064



BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

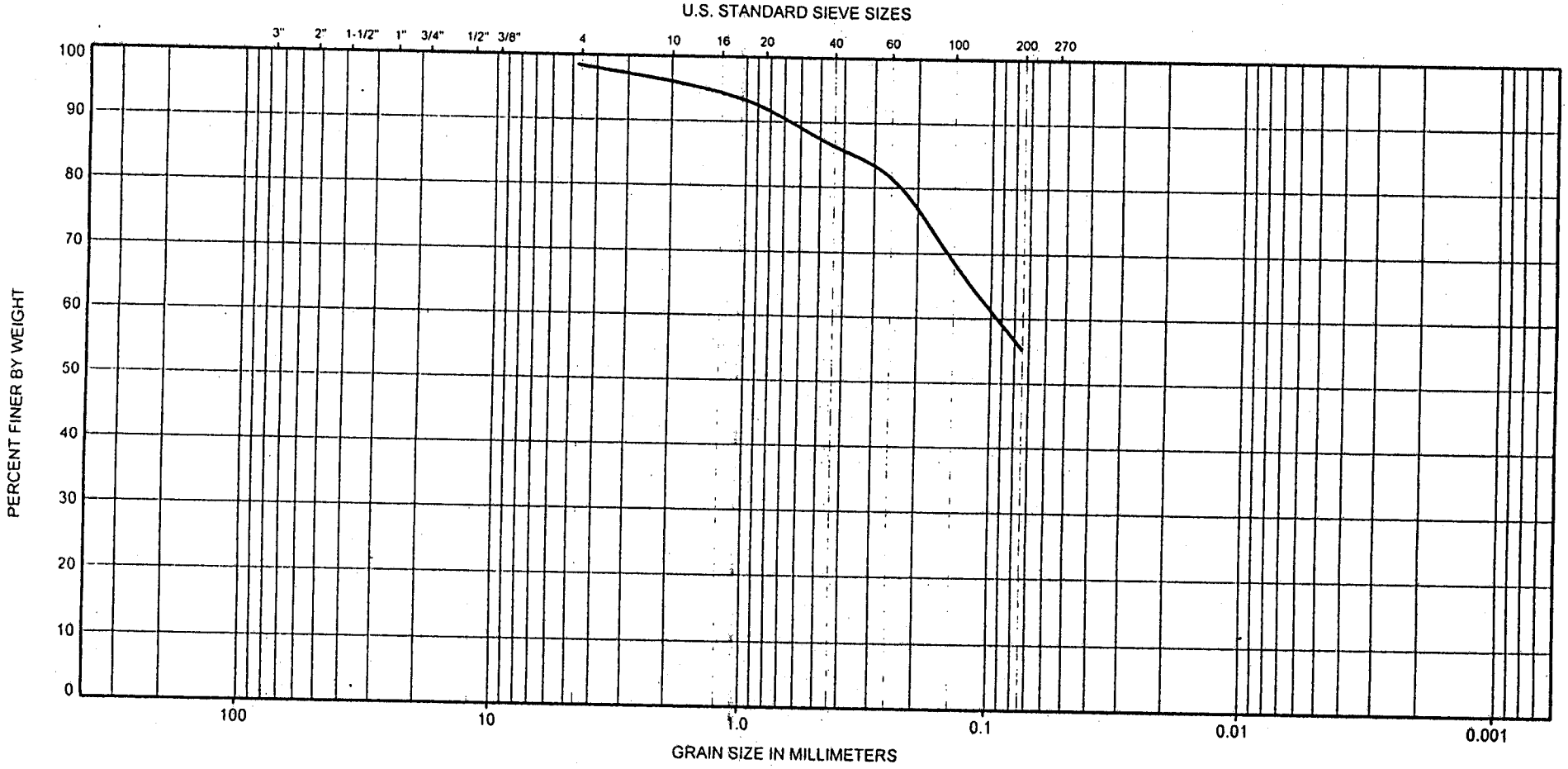
BORING NO.	DEPTH(FT)	NMC %	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
FA-3	6.0	28				Brown Slightly Micaceous Medium to Fine Sandy SILT

GRAIN SIZE DISTRIBUTION

ABTC -

JOB NO. 013-99-107

TRIGON



BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

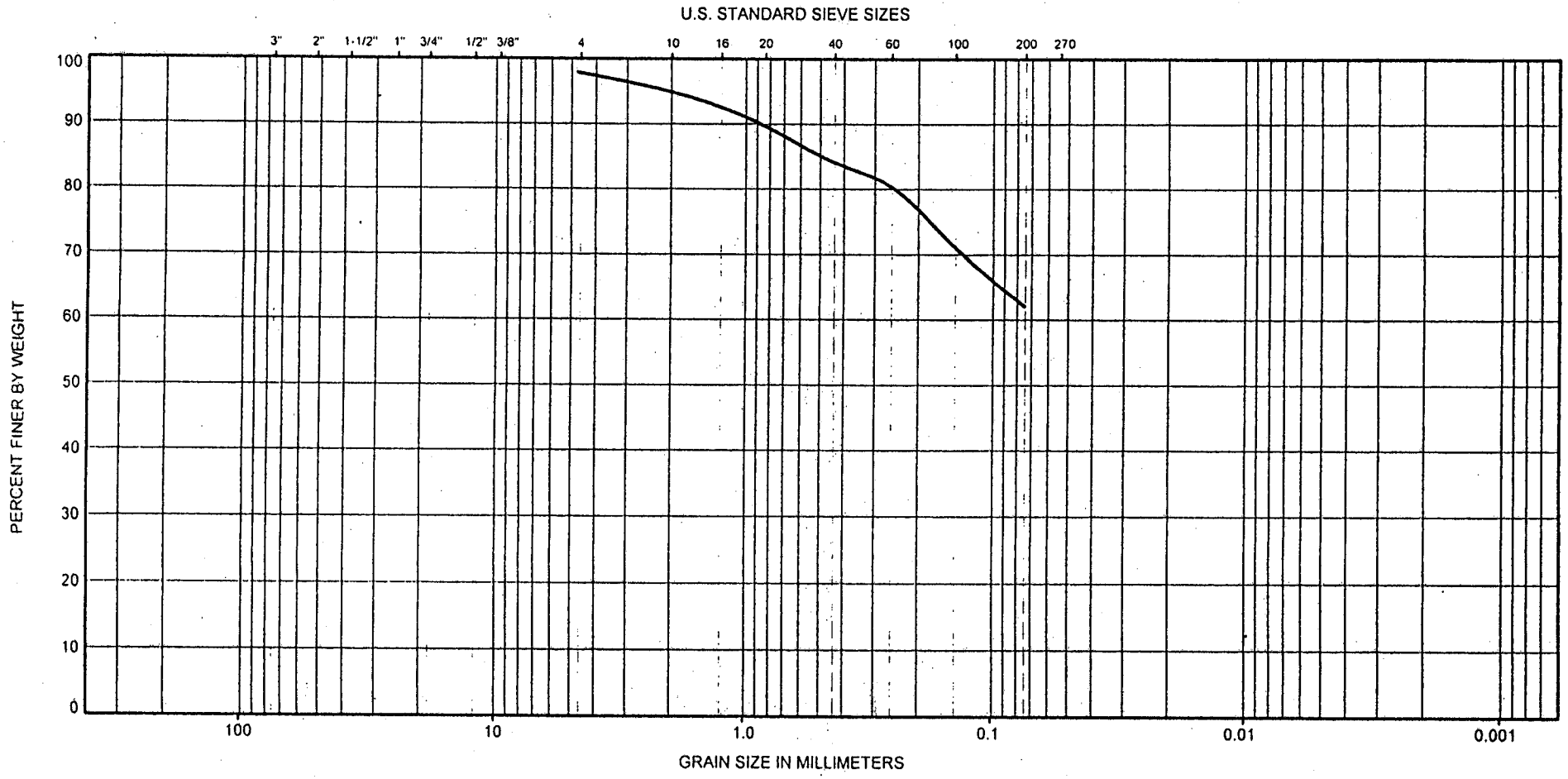
BORING NO.	DEPTH(FT)	NMC %	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
FA-3	11.0	34				Brown Slightly Micaceous Medium to Fine Sandy SILT

GRAIN SIZE DISTRIBUTION

ABTC -

JOB NO. 013-99-107

TRIGON



BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

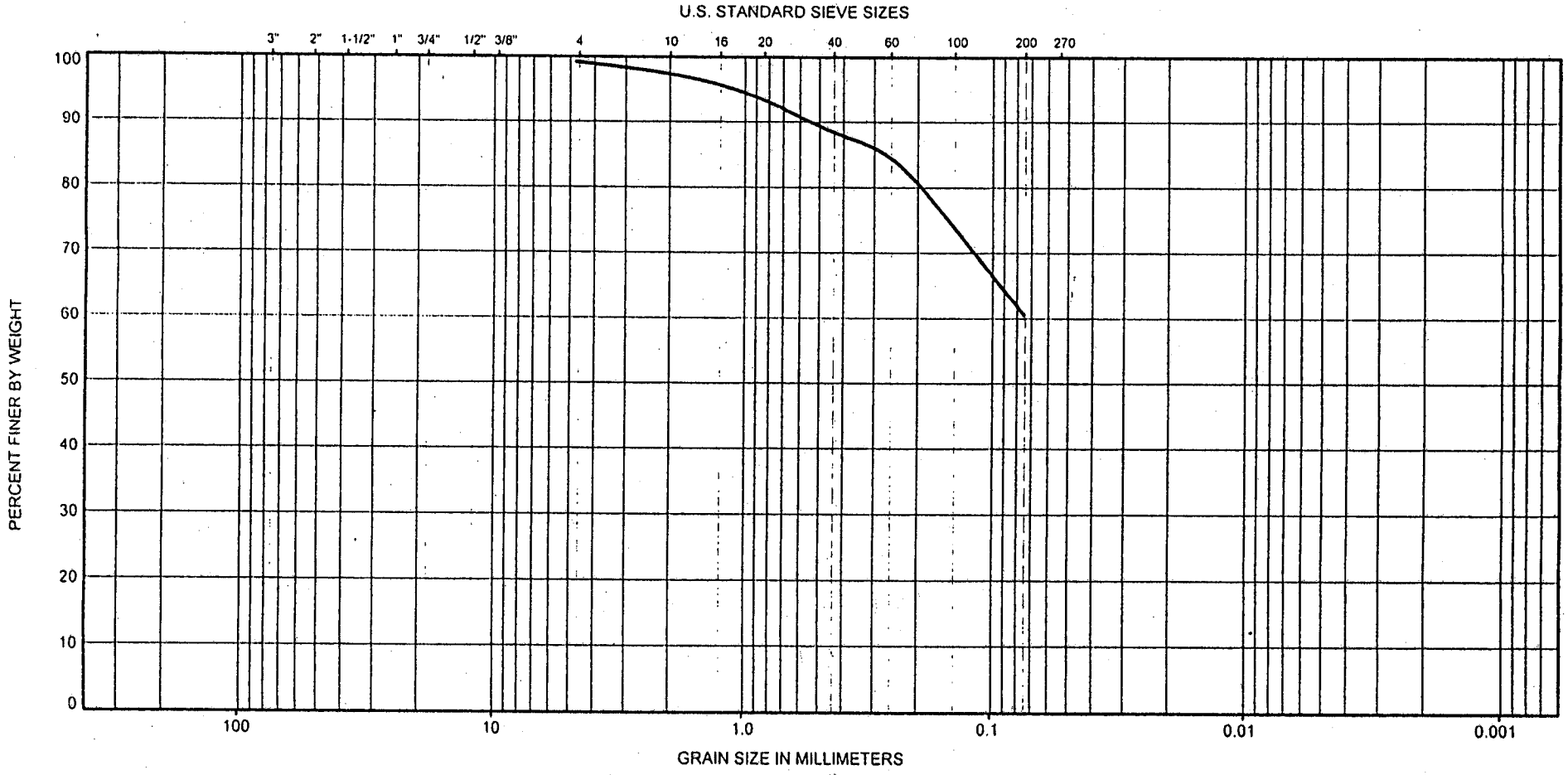
BORING NO.	DEPTH(FT)	NMC %	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
FA-3	16.0	29				Brown Slightly Micaceous Medium to Fine Sandy SILT

GRAIN SIZE DISTRIBUTION

ABTC -

JOB NO. 013-99-107

TRIGON



BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

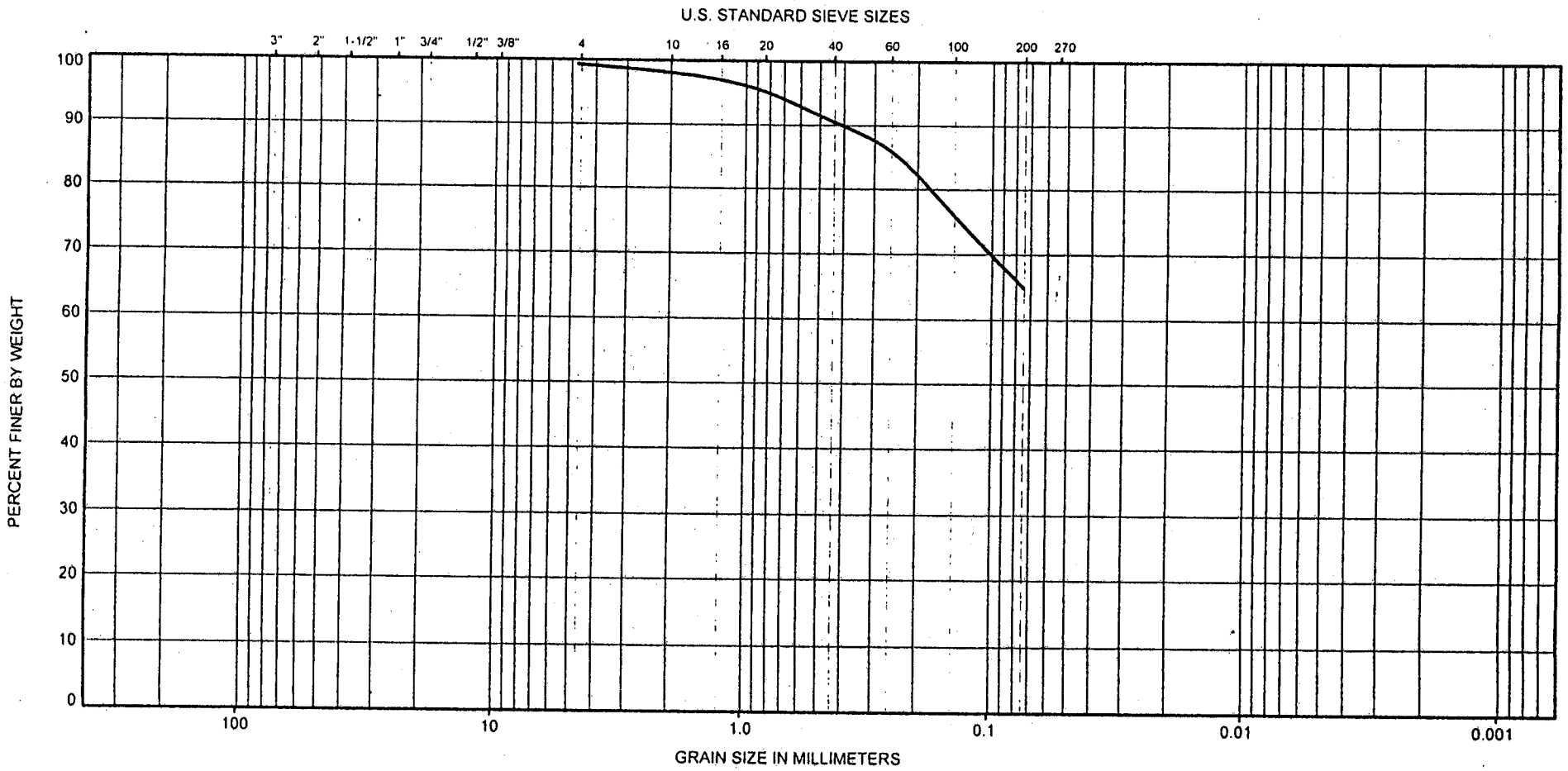
BORING NO.	DEPTH(FT)	NMC %	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
FA-4	25.0	38				Red-Brown Medium to Fine Sandy SILT

GRAIN SIZE DISTRIBUTION

ABTC -

JOB NO. 013-99-107

TRIGON



BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

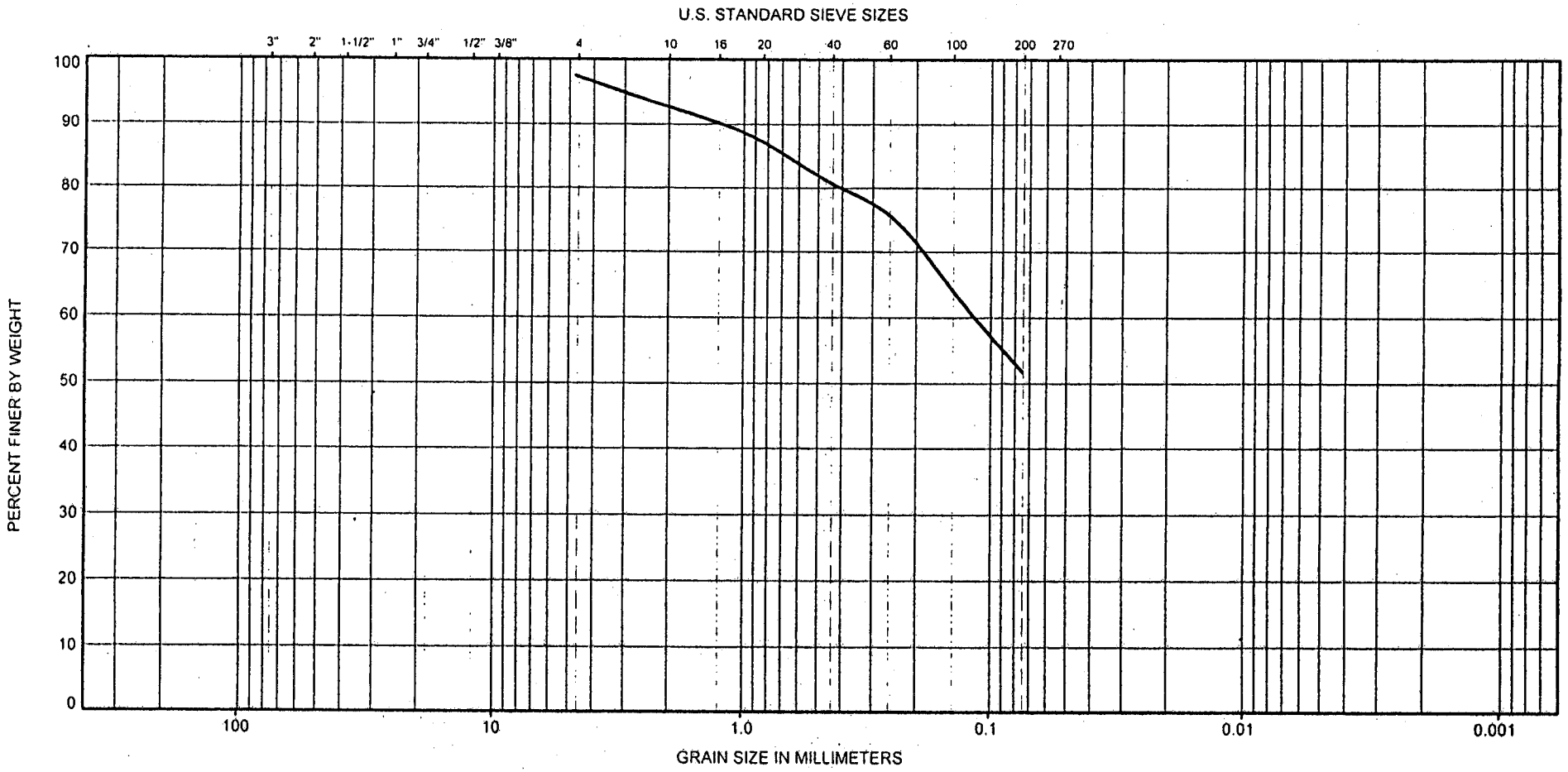
BORING NO.	DEPTH(FT)	NMC %	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
FA-4	45.0	40				Red-Brown Medium to Fine Sandy SILT

GRAIN SIZE DISTRIBUTION

ABTC -

JOB NO. 013-99-107

TRIGON



BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

BORING NO.	DEPTH(FT)	NMC %	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
FA-4	55.0	35				Red-Brown Medium to Fine Sandy SILT

GRAIN SIZE DISTRIBUTION

ABTC -

JOB NO. 013-99-107

TRIGON

APPENDIX II

Well Construction Information

N. C. Department of Human Resources
Division of Health Services

WELL COMPLETION RECORD

PLETE ALL INFORMATION REQUESTED BELOW FOR EACH WELL INSTALLED, AND RETURN FORM TO THE N.C. PARTMENT OF HUMAN RESOURCES, SOLID AND HAZARDOUS WASTE MANAGEMENT BRANCH, O. BOX 2091, RALEIGH, N.C. 27602

AME OF SITE: Abitibi - Price

PERMIT NO.: 97-03

DDRESS: Hwy 268 Roaring River, NC. 28669

OWNER (print): Abitibi - Price

RILLING CONTRACTOR: Newman Brothers Inc.

REGISTRATION NO.:

sing Type: Steel dia. 4 in.
sing Depth: from 0 to 4 ft. - dia. 4 in.
reen Type: Slotted PVC dia. 2 in.
reen Depth: from 18 to 28 ft. - dia. 2 in.

Grout Depth: from 3 to 12 ft. - dia. 13 in.
Bentonite Seal: from 12 to 13 ft. - dia. 13 in.
Sand/Gravel PK: from 13 to 28 ft. - dia. 13 in.
Total Well Depth: from 0 to 28 ft. - dia. 13 in.

atic Water Level: 24.4 feet from top of casing

Date Measured ___/___/___

eld (gpm): N/A Method of Testing: N/A

Casing is 1 feet above land surface

DRILLING LOG

DEPTH M	DEPTH TO	FORMATION DESCRIPTION

LOCATION SKETCH

(show distance to numbered roads, or other map reference points)

See the Attached

MARKS: This well, # FA1 is the upgradient well. Samples will be taken on 4/2/90

TE: 11/22/89 SIGNATURE: David C. Eagle

N. C. Department of Human Resources
Division of Health Services

WELL COMPLETION RECORD

PLETE ALL INFORMATION REQUESTED BELOW FOR EACH WELL INSTALLED, AND RETURN FORM TO THE N.C. EPARTMENT OF HUMAN RESOURCES, SOLID AND HAZARDOUS WASTE MANAGEMENT BRANCH, O. BOX 2091, RALEIGH, N.C. 27602

AME OF SITE: Abitibi - Price Fly Ash Site	PERMIT NO.: 97-03
DDRESS: Hwy 268 Roaring River NC 28669	OWNER (print): Abitibi - Price
RILLING CONTRACTOR: Newman Brothers Inc.	REGISTRATION NO.:

sing Type:	Steel	dia. 4 in.	Grout Depth:	from 3	to 13	ft. - dia. 13	in.
sing Depth:	from 0 to 4	ft. - dia. 4 in.	Bentonite Seal:	from 13	to 14	ft. - dia. 13	in.
een Type:	Slotted PVC	dia. 2 in.	Sand/Gravel PK:	from 14	to 29	ft. - dia. 13	in.
een Depth:	from 19 to 29	ft. - dia. 2 in.	Total Well Depth:	from 0	to 29	ft. - dia. 13	in.

tic Water Level: 12.4 feet from top of casing

Date Measured ___/___/___

ld (gpm): N/A Method of Testing: N/A Casing is 1' feet above land surface

DRILLING LOG

DEPTH M	TO	FORMATION DESCRIPTION

LOCATION SKETCH

(show distance to numbered roads, or other map reference points)

See the attached

MARKS: This well # FA2 is the downgradient well. Samples will be taken on 4/2/90

TE: 11/22/89 SIGNATURE: David C. [signature]

1342 (6-85)
Hazardous Waste Management Branch

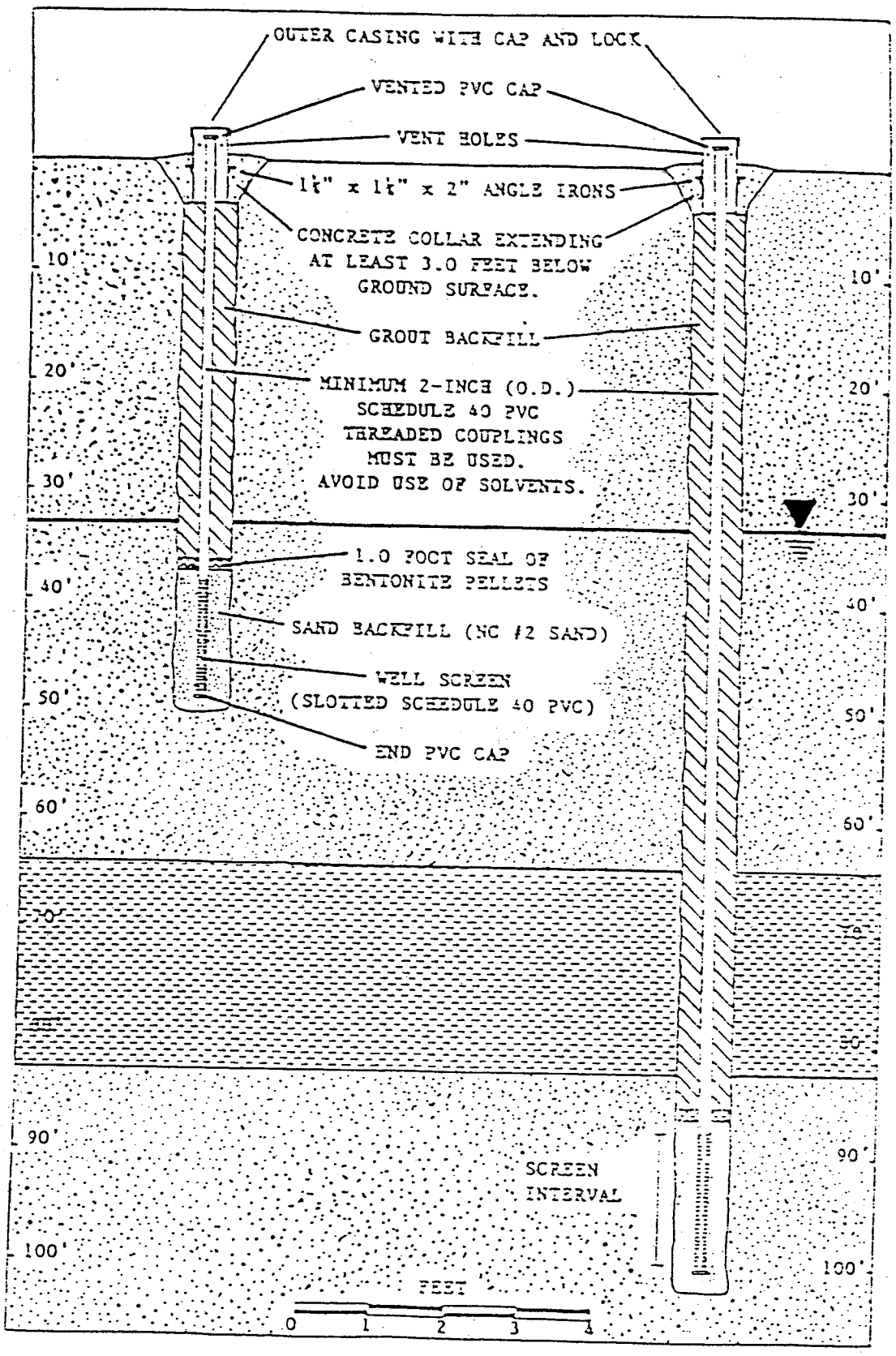


Figure 5. Typical ground-water monitoring well nest schematic.

Joyce Engineering, Inc.
Greensboro, NC
336-323-0092

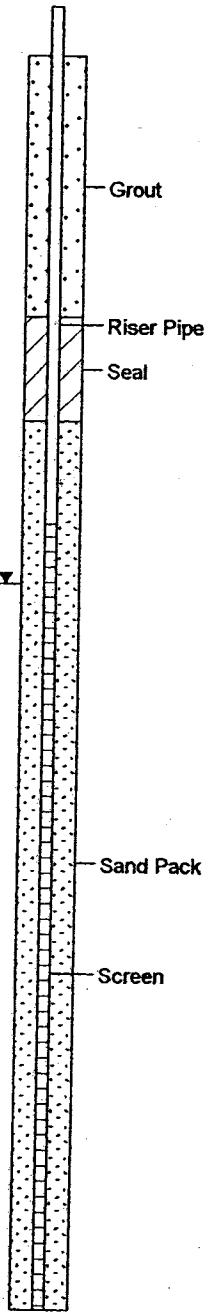
LOG OF BORING FA-3

ABTco, Inc.
Wilkesboro, NC

Monitoring Well Network Upgrade
JEI Project No. 364.00; Task 03

Date Started	: 06/04/99	Drilling Company	: Geologic Exploration, Inc.
Date Completed	: 06/04/99	Northing Coord.	: N 898008.400
Hole Diameter	: 8.25"	Easting Coord.	: E 1397749.674
Drilling Method	: Hollow Stem Auger	Survey By	: Current Surveying
Sampling Method	: Split-Spoon	Logged By	: Rachael Pressley

Depth in Feet	Surf. Elev. 976.27	USCS	DESCRIPTION	Blow Count	Samples
0	976	CL	SILTY CLAY, light brown, micaceous with minor organic debris and minor gravel, moist, medium stiff	3 3 3 4	
5	971				
10	966	CL	SILTY CLAY, light brown, micaceous, with minor gravel and minor relict rock structure, moist, stiff	3 4 4 4	
15	961	CL	SILTY CLAY, light brown, with minor gravel and pebbles, moist to wet, hard	4 5 5 6	
20	956		Auger refusal at 24' Boring terminated	8 50/1"	
25					



Well Construction Information

WELL CONSTRUCTION

Date Compl.	: 06/04/99
Hole Diameter(s)	: 8.25-inch
Drilling Method(s)	: Hollow Stem Auger
Company Rep.	: Brian Thomas

SURFACE CASING

Material	: NA
Diameter	: NA
Joints	: NA
Approx. Csg. Stickup	: NA

WELL CASING

Material	: Schedule 40 PVC
Diameter	: 2-inch
Joints	: Threaded, flush-coupled
Approx. Csg. Stickup	: 2.5-feet

WELL SCREEN

Material	: Schedule 40 PVC
Diameter	: 2-inch
Joints	: Thredded, flush-coupled
Opening	: 0.010 inch, slotted

GRAVEL PACK

Type : DSI # 2 Sand

WELL SCREEN SEAL

Type : 3/8" Bentonite pellets

ANNULUS SEAL

Type : No. 1 Portland grout

PROTECTIVE CSG.

Type : 4 in X 4 in, locking

WELL PAD

Type : 4 ft X 4 ft X 0.5 ft

NOTES

1. Hollow stem auger drilling performed with a Dietrich D-120 drilling rig utilizing 7 5/8-inch OD augers with a 8 1/4-inch cutter head.
2. Split-spoon samples obtained at 5-foot intervals and other.

c:\mtech5\projects\abtco\fa-3.bor

Joyce Engineering, Inc.
Greensboro, NC
336-323-0092

LOG OF BORING FA-4

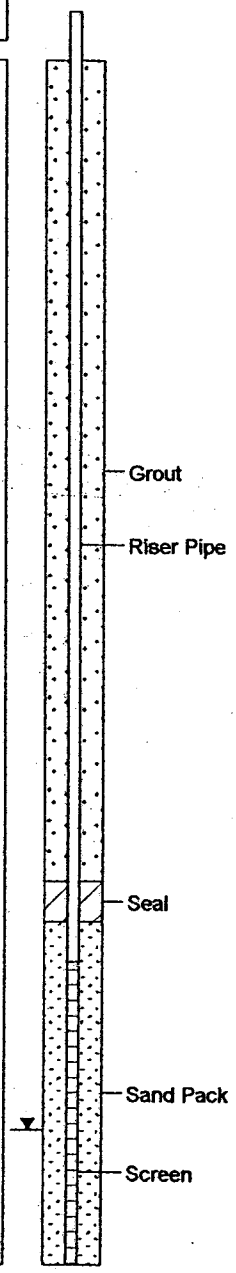
ABTco, Inc.
Wilkesboro, NC

Monitoring Well Network Upgrade

JEI Project No. 364.00; Task 03

Date Started	: 06/04/99	Drilling Company	: Geologic Exploration, Inc.
Date Completed	: 06/04/99	Northing Coord.	: N 898650.705
Hole Diameter	: 6.125"	Easting Coord.	: E 1398321.322
Drilling Method	: Air Rotary	Survey By	: Current Surveying
Sampling Method	: Log Cuttings	Logged By	: Mathew J.Tischler

Depth in Feet	Surf. Elev. 1095.57	USCS	DESCRIPTION	Blow Count	Samples
0	1095	ML	CLAYEY SILT, light brown micaceous, moist		
5	1090				
10	1085				
15	1080				
20	1075				
25	1070	CL	SILTY CLAY, reddish brown, micaceous, with pebble sized rock fragments, moist		
30	1065	PWR	PARTIALLY WEATHERED BEDROCK, dark brown, fine to coarse-grained, sandy silt, micaceous, moist,		
35	1060				
40	1055				
45	1050				
50	1045				
55	1040	BR	FRACTURED BEDROCK, gray rock flour with angular pebble sized rock fragments, slightly moist - gneiss and schist		
60	1035		Boring terminated at 60'		
65					



Well Construction Information

WELL CONSTRUCTION

Date Compl.	: 06/04/99
Hole Diameter(s)	: 6.125-inch
Drilling Method(s)	: Air Rotary
Company Rep.	: Neil Pardue

SURFACE CASING

Material	: NA
Diameter	: NA
Joints	: NA
Approx. Csg. Stickup	: NA

WELL CASING

Material	: Schedule 40 PVC
Diameter	: 2-inch
Joints	: Threaded, flush-coupled
Approx. Csg. Stickup	: 2.5-feet

WELL SCREEN

Material	: Schedule 40 PVC
Diameter	: 2-inch
Joints	: Thredded, flush-coupled
Opening	: 0.010 inch, slotted

GRAVEL PACK

Type : DSI # 2 Sand

WELL SCREEN SEAL

Type : 3/8" Bentonite pellets

ANNULUS SEAL

Type : No. 1 Portland grout

PROTECTIVE CSG.

Type : 4 in X 4 in, locking

WELL PAD

Type : 4 ft X 4 ft X 0.5 ft

NOTES

1. Air rotary drilling performed with a Drilltech D25K drilling rig utilizing a 6 1/8-inch OD rock hammer.

c:\mtech5\projects\abtco\fa-4.bor

North Carolina - Department of Environment, Health, and Natural Resources
Division of Environmental Management - Groundwater Section
P.O. Box 29535 - Raleigh, N.C. 27626-0535
Phone (919) 733-3221

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: Geologic Exploration, Inc.

FOR OFFICE USE ONLY
QUAD NO _____ SERIAL NO _____
Lat _____ Long _____ RO _____
Minor Basin _____
Basin Code _____
Header Ent _____ GW-1 Ent _____

STATE WELL CONSTRUCTION
DRILLER REGISTRATION NUMBER: 1175 PERMIT NUMBER: _____

1. WELL LOCATION: (Show sketch of the location below)

Nearest Town: ROARING RIVER County: WILKES

HIGHWAY 268
(Road, Community, or Subdivision and Lot No.)

2. OWNER ABTCO, INC.

ADDRESS P O BOX 98
(Street or Route No.)

ROARING RIVER NC 28669
City or Town State Zip Code

3. DATE DRILLED 06-04-99 USE OF WELL MONITOR
4. TOTAL DEPTH 24.0' FEET
5. CUTTINGS COLLECTED YES |X| NO | |
6. DOES WELL REPLACE EXISTING WELL? YES |__| NO |X|
7. STATIC WATER LEVEL Below Top of Casing: _____ FT
(Use "+" if Above Top of Casing)
8. TOP OF CASING IS 2.5 FT Above Land Surface*

***Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118**

9. YIELD (gpm): N/A METHOD OF TEST N/A
10. WATER ZONES (depth): N/A
11. CHLORINATION: Type N/A Amount N/A
12. CASING:

	Depth From	Depth To		Diameter	Wall Thickness or Weight/Ft.	Material
	0.0	9.0	Ft.	2 INCH	SCH 40	PVC
			Ft.			
			Ft.			

13. GROUT:

	Depth From	Depth To		Material	Method
	0.0	5.0	Ft.	PORTLAND BENTONITE	SLURRY
			Ft.		

14. SCREEN:

	Depth From	Depth To		Diameter		Slot Size		Material
	9.0	24.0	Ft.	2.0	in.	.010	in.	PVC
			Ft.		in.		in.	
			Ft.		in.		in.	

15. SAND/GRAVEL PACK:

	Depth From	Depth To		Size	Material
	7.0	24.0	Ft.	8-20	FINE SILICA SAND
			Ft.		

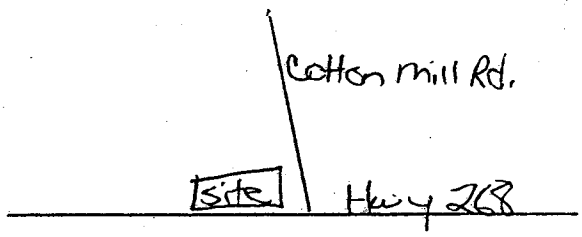
16. REMARKS: FA-3 BENTONITE SEAL FROM 5.0 TO 7.0 FEET

DEPTH From	DEPTH To	DRILLING LOG Formation Description
0.0'	15.0'	TAN SILTY CLAY
15.0'	24.0'	PARTIALLY WEATHERED ROCK

If additional space is needed use back of form

LOCATION OF SKETCH

(Show direction and distance from at least two State Roads, or othe map reference points.)



I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Ste Jr 6-23-99
SIGNATURE OF CONTRACTOR OR AGENT DATE

GW-1 REV. 9/91

Submit original to Division of Environmental Management and copy to well owner.

North Carolina - Department of Environment, Health, and Natural Resources
Division of Environmental Management - Groundwater Section
P.O. Box 29535 - Raleigh, N.C. 27626-0535
Phone (919) 733-3221

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: Geologic Exploration, Inc.

FOR OFFICE USE ONLY
QUAD NO _____ SERIAL NO _____
Lat _____ Long _____ RO _____
Minor Basin _____
Basin Code _____
Header Ent _____ GW-1 Ent _____

STATE WELL CONSTRUCTION
DRILLER REGISTRATION NUMBER: 1175 PERMIT NUMBER: _____

1. WELL LOCATION: (Show sketch of the location below)

Nearest Town: ROARING RIVER County: WILKES

HIGHWAY 268
(Road, Community, or Subdivision and Lot No.)

2. OWNER ABTCO, INC.

ADDRESS P O BOX 98
(Street or Route No.)

ROARING RIVER NC 28669
City or Town State Zip Code

3. DATE DRILLED 06-04-99 USE OF WELL MONITOR
4. TOTAL DEPTH 60.0' FEET
5. CUTTINGS COLLECTED YES |X| NO | |
6. DOES WELL REPLACE EXISTING WELL? YES |__| NO |X|
7. STATIC WATER LEVEL Below Top of Casing: _____ FT
(Use "+" if Above Top of Casing)
8. TOP OF CASING IS 2.5 FT Above Land Surface*

***Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118**

9. YIELD (gpm): N/A METHOD OF TEST N/A
10. WATER ZONES (depth): N/A
11. CHLORINATION: Type N/A Amount N/A
12. CASING:

From	To	Depth Ft.	Diameter	Wall Thickness or Weight/Ft.	Material
0.0	45.0		2 INCH	SCH 40	PVC

13. GROUT:

From	To	Depth Ft.	Material	Method
0.0	42.0		PORTLAND BENTONITE	SLURRY

14. SCREEN:

From	To	Depth Ft.	Diameter in.	Slot Size in.	Material
45.0	60.0		2.0	.010	PVC

15. SAND/GRAVEL PACK:

From	To	Depth Ft.	Size	Material
43.0	60.0		8-20	FINE SILICA SAND

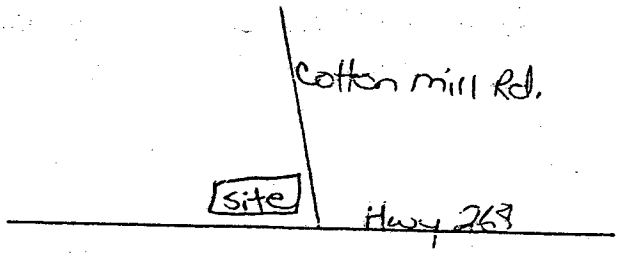
16. REMARKS: FA-4 BENTONITE SEAL FROM 42.0 TO 43.0 FEET

DEPTH From	To	DRILLING LOG Formation Description
0.0'	30.0'	TAN SILTY CLAY
30.0'	52.0'	PARTIALLY WEATHERED ROCK
52.0'	60.0'	ROCK

If additional space is needed use back of form

LOCATION OF SKETCH

(Show direction and distance from at least two State Roads, or othe map reference points.)



I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

SIGNATURE OF CONTRACTOR OR AGENT 6-23-99 DATE

GW-1 REV. 9/91

Submit original to Division of Environmental Management and copy to well owner.

APPENDIX III

Monitoring Well Survey

APPENDIX IV

Slug Test Results

Aquifer Analysis

Site Name: ABTco, Inc.
Test Date: 06/24/99
Import File: C:\mats docs\slugtest\projects\abtco\Fa-2-f

Well Label: FA-2-F
Aquifer Thickness: 40. feet
Screen Length: 10. feet
Casing Radius: 1.188 inches
Effective Radius: 6.5 inches
Gravel Pack Porosity: 30. %
Corrected Casing Radius: 3.696 inches
Static Water Level: 17.15 feet
Water Table to Screen Bottom: 11.88 feet
Anisotropy Ratio: 1.
Time Adjustment: 23. Seconds
Test starts with trial 39
There are 188 time and drawdown measurements
Maximum head is 2.058 feet
Minimum head is 0. feet

Trial	Time (minutes)	Adjusted Time (minutes)	Drawdown (feet)	Head (feet)	Head Ratio
1	0.	-0.3833	17.15	1.e-003	4.859e-004
2	3.3e-003	-0.38	17.15	1.e-003	4.859e-004
3	6.6e-003	-0.3767	17.15	1.e-003	4.859e-004
4	1.e-002	-0.3733	17.15	1.e-003	4.859e-004
5	1.33e-002	-0.37	17.15	1.e-003	4.859e-004
6	1.66e-002	-0.3667	17.14	6.e-003	2.915e-003
7	2.e-002	-0.3633	17.15	1.e-003	4.859e-004
8	2.33e-002	-0.36	17.15	1.e-003	4.859e-004
9	2.66e-002	-0.3567	17.15	1.e-003	4.859e-004
10	3.e-002	-0.3533	17.15	1.e-003	4.859e-004
11	3.33e-002	-0.35	17.15	1.e-003	4.859e-004
12	3.66e-002	-0.3467	17.15	1.e-003	4.859e-004
13	4.e-002	-0.3433	17.15	1.e-003	4.859e-004
14	4.33e-002	-0.34	17.15	1.e-003	4.859e-004
15	4.66e-002	-0.3367	17.15	1.e-003	4.859e-004
16	5.e-002	-0.3333	17.14	6.e-003	2.915e-003
17	5.33e-002	-0.33	17.15	1.e-003	4.859e-004
18	5.66e-002	-0.3267	17.15	1.e-003	4.859e-004
19	6.e-002	-0.3233	17.14	6.e-003	2.915e-003
20	6.33e-002	-0.32	17.15	1.e-003	4.859e-004
21	6.66e-002	-0.3167	16.57	0.576	0.2799
22	7.e-002	-0.3133	17.04	0.115	5.588e-002
23	7.33e-002	-0.31	16.66	0.495	0.2405
24	7.66e-002	-0.3067	16.47	0.68	0.3304
25	8.e-002	-0.3033	16.72	0.433	0.2104
26	8.33e-002	-0.3	16.43	0.718	0.3489
27	8.66e-002	-0.2967	16.17	0.979	0.4757
28	9.e-002	-0.2933	16.17	0.979	0.4757
29	9.33e-002	-0.29	16.31	0.842	0.4091
30	9.66e-002	-0.2867	16.22	0.927	0.4504
31	0.1	-0.2833	15.9	1.255	0.6098
32	0.1033	-0.28	16.01	1.141	0.5544
33	0.1066	-0.2767	15.62	1.535	0.7459
34	0.11	-0.2733	15.86	1.293	0.6283

35	0.1133	-0.27	15.72	1.431	0.6953
36	0.1166	-0.2667	15.53	1.621	0.7877
37	0.12	-0.2633	15.32	1.825	0.8868
38	0.1233	-0.26	15.84	1.312	0.6375
39	0.1266	-0.2567	15.72	1.426	0.6929
40	0.13	-0.2533	15.09	2.058	1.
41	0.1333	-0.25	15.4	1.754	0.8523
42	0.1366	-0.2467	15.48	1.668	0.8105
43	0.14	-0.2433	15.59	1.564	0.76
44	0.1433	-0.24	15.14	2.015	0.9791
45	0.1466	-0.2367	15.55	1.597	0.776
46	0.15	-0.2333	15.43	1.72	0.8358
47	0.1533	-0.23	15.39	1.758	0.8542
48	0.1566	-0.2267	15.38	1.768	0.8591
49	0.16	-0.2233	15.44	1.706	0.829
50	0.1633	-0.22	15.45	1.701	0.8265
51	0.1666	-0.2167	15.47	1.682	0.8173
52	0.17	-0.2133	15.48	1.668	0.8105
53	0.1733	-0.21	15.16	1.986	0.965
54	0.1766	-0.2067	15.68	1.473	0.7157
55	0.18	-0.2033	15.32	1.834	0.8912
56	0.1833	-0.2	15.43	1.72	0.8358
57	0.1866	-0.1967	15.66	1.492	0.725
58	0.19	-0.1933	15.49	1.659	0.8061
59	0.1933	-0.19	15.46	1.692	0.8222
60	0.1966	-0.1867	15.52	1.635	0.7945
61	0.2	-0.1833	15.54	1.606	0.7804
62	0.2033	-0.18	15.55	1.602	0.7784
63	0.2066	-0.1767	15.57	1.583	0.7692
64	0.21	-0.1733	15.57	1.578	0.7668
65	0.2133	-0.17	15.59	1.559	0.7575
66	0.2166	-0.1667	15.59	1.559	0.7575
67	0.22	-0.1633	15.62	1.53	0.7434
68	0.2233	-0.16	15.62	1.535	0.7459
69	0.2266	-0.1567	15.64	1.511	0.7342
70	0.23	-0.1533	15.66	1.492	0.725
71	0.2333	-0.15	15.66	1.488	0.723
72	0.2366	-0.1467	15.66	1.492	0.725
73	0.24	-0.1433	15.74	1.412	0.6861
74	0.2433	-0.14	15.7	1.45	0.7046
75	0.2466	-0.1367	15.71	1.445	0.7021
76	0.25	-0.1333	15.72	1.426	0.6929
77	0.2533	-0.13	15.73	1.416	0.688
78	0.2566	-0.1267	15.74	1.407	0.6837
79	0.26	-0.1233	15.75	1.397	0.6788
80	0.2633	-0.12	15.76	1.388	0.6744
81	0.2666	-0.1167	15.78	1.374	0.6676
82	0.27	-0.1133	15.79	1.364	0.6628
83	0.2733	-0.11	15.8	1.355	0.6584
84	0.2766	-0.1067	15.81	1.345	0.6535
85	0.28	-0.1033	15.82	1.335	0.6487
86	0.2833	-1.e-001	15.82	1.326	0.6443
87	0.2866	-9.67e-002	15.83	1.317	0.6399
88	0.29	-9.33e-002	15.84	1.307	0.6351
89	0.2933	-9.e-002	15.85	1.298	0.6307
90	0.2966	-8.67e-002	15.86	1.288	0.6259
91	0.3	-8.33e-002	15.87	1.279	0.6215

92	0.3033	-8.e-002	15.88	1.269	0.6166
93	0.3066	-7.67e-002	15.72	1.426	0.6929
94	0.31	-7.33e-002	16.03	1.117	0.5428
95	0.3133	-7.e-002	15.86	1.288	0.6259
96	0.3166	-6.67e-002	15.82	1.331	0.6467
97	0.32	-6.33e-002	16.	1.15	0.5588
98	0.3233	-6.e-002	15.82	1.326	0.6443
99	0.3266	-5.67e-002	15.9	1.25	0.6074
100	0.33	-5.33e-002	16.13	1.017	0.4942
101	0.3333	-5.e-002	15.61	1.545	0.7507
102	0.35	-3.33e-002	15.84	1.312	0.6375
103	0.3666	-1.67e-002	15.85	1.302	0.6327
104	0.3833	0.	15.99	1.16	0.5637
105	0.4	1.67e-002	16.03	1.117	0.5428
106	0.4166	3.33e-002	16.07	1.079	0.5243
107	0.4333	5.e-002	16.1	1.046	0.5083
108	0.45	6.67e-002	16.14	1.008	0.4898
109	0.4666	8.33e-002	16.18	0.975	0.4738
110	0.4833	0.1	16.2	0.946	0.4597
111	0.5	0.1167	16.24	0.913	0.4436
112	0.5166	0.1333	16.27	0.884	0.4295
113	0.5333	0.15	16.29	0.861	0.4184
114	0.55	0.1667	16.32	0.832	0.4043
115	0.5666	0.1833	16.33	0.823	0.3999
116	0.5833	0.2	16.31	0.837	0.4067
117	0.6	0.2167	16.34	0.813	0.395
118	0.6166	0.2333	16.36	0.789	0.3834
119	0.6333	0.25	16.39	0.765	0.3717
120	0.65	0.2667	16.41	0.742	0.3605
121	0.6666	0.2833	16.43	0.723	0.3513
122	0.6833	0.3	16.45	0.699	0.3397
123	0.7	0.3167	16.47	0.68	0.3304
124	0.7166	0.3333	16.49	0.661	0.3212
125	0.7333	0.35	16.5	0.647	0.3144
126	0.75	0.3667	16.52	0.628	0.3052
127	0.7666	0.3833	16.54	0.609	0.2959
128	0.7833	0.4	16.56	0.595	0.2891
129	0.8	0.4167	16.57	0.58	0.2818
130	0.8166	0.4333	16.59	0.561	0.2726
131	0.8333	0.45	16.6	0.547	0.2658
132	0.85	0.4667	16.61	0.538	0.2614
133	0.8666	0.4833	16.63	0.519	0.2522
134	0.8833	0.5	16.64	0.509	0.2473
135	0.9	0.5167	16.66	0.495	0.2405
136	0.9166	0.5333	16.66	0.485	0.2357
137	0.9333	0.55	16.68	0.471	0.2289
138	0.95	0.5667	16.69	0.462	0.2245
139	0.9666	0.5833	16.7	0.447	0.2172
140	0.9833	0.6	16.71	0.438	0.2128
141	1.	0.6167	16.72	0.428	0.208
142	1.2	0.8167	16.84	0.305	0.1482
143	1.4	1.017	16.91	0.238	0.1156
144	1.6	1.217	16.96	0.191	9.281e-002
145	1.8	1.417	16.99	0.158	7.677e-002
146	2.	1.617	17.02	0.129	6.268e-002
147	2.2	1.817	17.04	0.11	5.345e-002
148	2.4	2.017	17.05	9.6e-002	4.665e-002

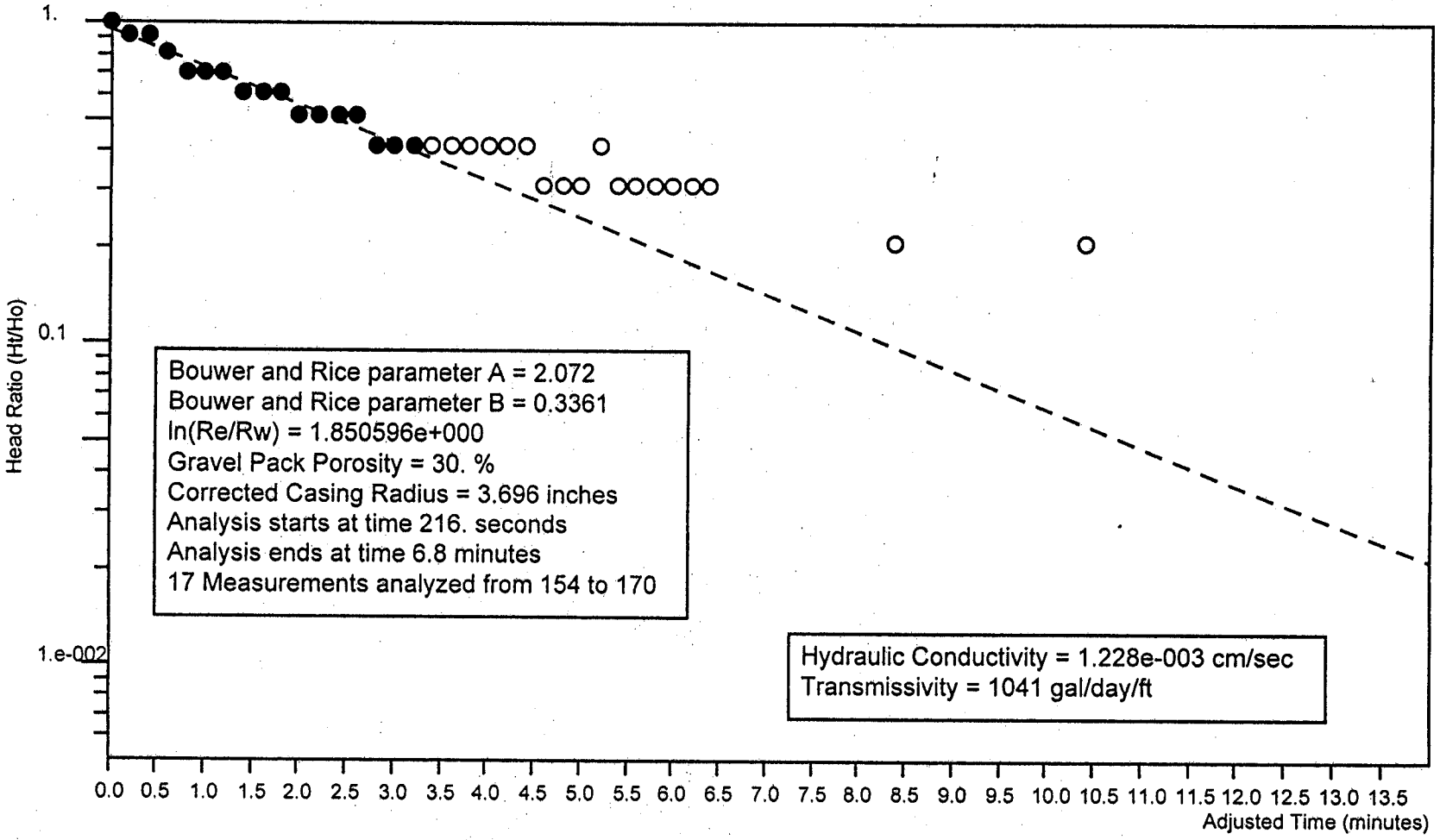
149	2.6	2.217	17.07	8.2e-002	3.984e-002
150	2.8	2.417	17.08	7.2e-002	3.499e-002
151	3.	2.617	17.09	6.3e-002	3.061e-002
152	3.2	2.817	17.09	5.8e-002	2.818e-002
153	3.4	3.017	17.1	5.3e-002	2.575e-002
154	3.6	3.217	17.1	4.8e-002	2.332e-002
155	3.8	3.417	17.11	4.4e-002	2.138e-002
156	4.	3.617	17.11	4.4e-002	2.138e-002
157	4.2	3.817	17.11	3.9e-002	1.895e-002
158	4.4	4.017	17.12	3.4e-002	1.652e-002
159	4.6	4.217	17.12	3.4e-002	1.652e-002
160	4.8	4.417	17.12	3.4e-002	1.652e-002
161	5.	4.617	17.12	2.9e-002	1.409e-002
162	5.2	4.817	17.12	2.9e-002	1.409e-002
163	5.4	5.017	17.12	2.9e-002	1.409e-002
164	5.6	5.217	17.13	2.5e-002	1.215e-002
165	5.8	5.417	17.13	2.5e-002	1.215e-002
166	6.	5.617	17.13	2.5e-002	1.215e-002
167	6.2	5.817	17.13	2.5e-002	1.215e-002
168	6.4	6.017	17.13	2.e-002	9.718e-003
169	6.6	6.217	17.13	2.e-002	9.718e-003
170	6.8	6.417	17.13	2.e-002	9.718e-003
171	7.	6.617	17.13	2.e-002	9.718e-003
172	7.2	6.817	17.13	2.e-002	9.718e-003
173	7.4	7.017	17.13	2.e-002	9.718e-003
174	7.6	7.217	17.13	2.e-002	9.718e-003
175	7.8	7.417	17.13	2.e-002	9.718e-003
176	8.	7.617	17.13	2.e-002	9.718e-003
177	8.2	7.817	17.14	1.5e-002	7.289e-003
178	8.4	8.017	17.14	1.5e-002	7.289e-003
179	8.6	8.217	17.14	1.5e-002	7.289e-003
180	8.8	8.417	17.13	2.e-002	9.718e-003
181	9.	8.617	17.14	1.5e-002	7.289e-003
182	9.2	8.817	17.14	1.5e-002	7.289e-003
183	9.4	9.017	17.14	1.5e-002	7.289e-003
184	9.6	9.217	17.14	1.5e-002	7.289e-003
185	9.8	9.417	17.14	1.5e-002	7.289e-003
186	10.	9.617	17.14	1.5e-002	7.289e-003
187	12.	11.62	17.14	1.e-002	4.859e-003
188	14.	13.62	17.14	1.e-002	4.859e-003

Aquifer Analysis 06/24/99

Bouwer and Rice Graph

ABTco, Inc.

FA-2-F



Analysis by MJT of Joyce Engineering, Inc.

Ho is 4.8e-002 feet at 216. seconds

Aquifer Analysis

Site Name: ABTco, Inc.
Test Date: 06/24/99
Import File: C:\mats docs\slugtest\projects\abtco\Fa-2-r

Well Label: FA-2-R
Aquifer Thickness: 40. feet
Screen Length: 10. feet
Casing Radius: 1.188 inches
Effective Radius: 6.5 inches
Gravel Pack Porosity: 30. %
Corrected Casing Radius: 3.696 inches
Static Water Level: 17.13 feet
Water Table to Screen Bottom: 11.88 feet
Anisotropy Ratio: 1.
Time Adjustment: 3.396 Seconds
Test starts with trial 17
There are 187 time and drawdown measurements
Maximum head is 1.4 feet
Minimum head is 0. feet

Trial	Time (minutes)	Adjusted Time (minutes)	Drawdown (feet)	Head (feet)	Head Ratio
1	0.	-5.66e-002	17.14	5.e-003	3.571e-003
2	3.3e-003	-5.33e-002	17.13	0.	0.
3	6.6e-003	-5.e-002	17.14	5.e-003	3.571e-003
4	1.e-002	-4.66e-002	17.14	5.e-003	3.571e-003
5	1.33e-002	-4.33e-002	17.36	0.228	0.1629
6	1.66e-002	-4.e-002	17.27	0.143	0.1021
7	2.e-002	-3.66e-002	17.35	0.223	0.1593
8	2.33e-002	-3.33e-002	17.36	0.233	0.1664
9	2.66e-002	-3.e-002	17.52	0.385	0.275
10	3.e-002	-2.66e-002	17.56	0.432	0.3086
11	3.33e-002	-2.33e-002	17.72	0.589	0.4207
12	3.66e-002	-2.e-002	17.82	0.693	0.495
13	4.e-002	-1.66e-002	17.95	0.821	0.5864
14	4.33e-002	-1.33e-002	18.06	0.926	0.6614
15	4.66e-002	-1.e-002	18.22	1.092	0.78
16	5.e-002	-6.6e-003	18.36	1.225	0.875
17	5.33e-002	-3.3e-003	18.42	1.286	0.9186
18	5.66e-002	0.	18.53	1.4	1.
19	6.e-002	3.4e-003	18.53	1.4	1.
20	6.33e-002	6.7e-003	18.53	1.4	1.
21	6.66e-002	1.e-002	18.52	1.386	0.99
22	7.e-002	1.34e-002	18.5	1.372	0.98
23	7.33e-002	1.67e-002	18.49	1.362	0.9729
24	7.66e-002	2.e-002	18.48	1.353	0.9664
25	8.e-002	2.34e-002	18.47	1.339	0.9564
26	8.33e-002	2.67e-002	18.46	1.334	0.9529
27	8.66e-002	3.e-002	18.45	1.324	0.9457
28	9.e-002	3.34e-002	18.45	1.315	0.9393
29	9.33e-002	3.67e-002	18.43	1.305	0.9321
30	9.66e-002	4.e-002	18.43	1.296	0.9257
31	0.1	4.34e-002	18.42	1.286	0.9186
32	0.1033	4.67e-002	18.41	1.282	0.9157
33	0.1066	5.e-002	18.4	1.272	0.9086
34	0.11	5.34e-002	18.39	1.263	0.9021

35	0.1133	5.67e-002	18.39	1.258	0.8986
36	0.1166	6.e-002	18.38	1.249	0.8921
37	0.12	6.34e-002	18.37	1.244	0.8886
38	0.1233	6.67e-002	18.36	1.234	0.8814
39	0.1266	7.e-002	18.36	1.23	0.8786
40	0.13	7.34e-002	18.35	1.22	0.8714
41	0.1333	7.67e-002	18.34	1.215	0.8679
42	0.1366	8.e-002	18.34	1.206	0.8614
43	0.14	8.34e-002	18.33	1.201	0.8579
44	0.1433	8.67e-002	18.32	1.192	0.8514
45	0.1466	9.e-002	18.32	1.187	0.8479
46	0.15	9.34e-002	18.31	1.182	0.8443
47	0.1533	9.67e-002	18.3	1.173	0.8379
48	0.1566	1.e-001	18.3	1.168	0.8343
49	0.16	0.1034	18.29	1.163	0.8307
50	0.1633	0.1067	18.28	1.154	0.8243
51	0.1666	0.11	18.28	1.149	0.8207
52	0.17	0.1134	18.27	1.144	0.8171
53	0.1733	0.1167	18.27	1.139	0.8136
54	0.1766	0.12	18.26	1.13	0.8071
55	0.18	0.1234	18.25	1.125	0.8036
56	0.1833	0.1267	18.25	1.12	0.8
57	0.1866	0.13	18.25	1.116	0.7971
58	0.19	0.1334	18.24	1.111	0.7936
59	0.1933	0.1367	18.24	1.106	0.79
60	0.1966	0.14	18.23	1.097	0.7836
61	0.2	0.1434	18.22	1.092	0.78
62	0.2033	0.1467	18.22	1.087	0.7764
63	0.2066	0.15	18.21	1.082	0.7729
64	0.21	0.1534	18.21	1.078	0.77
65	0.2133	0.1567	18.2	1.073	0.7664
66	0.2166	0.16	18.19	1.063	0.7593
67	0.22	0.1634	18.19	1.063	0.7593
68	0.2233	0.1667	18.18	1.054	0.7529
69	0.2266	0.17	18.18	1.049	0.7493
70	0.23	0.1734	18.17	1.044	0.7457
71	0.2333	0.1767	18.17	1.04	0.7429
72	0.2366	0.18	18.16	1.035	0.7393
73	0.24	0.1834	18.16	1.03	0.7357
74	0.2433	0.1867	18.16	1.025	0.7321
75	0.2466	0.19	18.15	1.021	0.7293
76	0.25	0.1934	18.15	1.016	0.7257
77	0.2533	0.1967	18.14	1.011	0.7221
78	0.2566	0.2	18.14	1.006	0.7186
79	0.26	0.2034	18.13	1.002	0.7157
80	0.2633	0.2067	18.13	0.997	0.7121
81	0.2666	0.21	18.12	0.992	0.7086
82	0.27	0.2134	18.12	0.987	0.705
83	0.2733	0.2167	18.11	0.983	0.7021
84	0.2766	0.22	18.11	0.978	0.6986
85	0.28	0.2234	18.11	0.978	0.6986
86	0.2833	0.2267	18.1	0.969	0.6921
87	0.2866	0.23	18.1	0.969	0.6921
88	0.29	0.2334	18.09	0.964	0.6886
89	0.2933	0.2367	18.09	0.959	0.685
90	0.2966	0.24	18.08	0.954	0.6814
91	0.3	0.2434	18.08	0.949	0.6779

92	0.3033	0.2467	18.07	0.945	0.675
93	0.3066	0.25	18.07	0.94	0.6714
94	0.31	0.2534	18.07	0.94	0.6714
95	0.3133	0.2567	18.07	0.935	0.6679
96	0.3166	0.26	18.06	0.931	0.665
97	0.32	0.2634	18.06	0.926	0.6614
98	0.3233	0.2667	18.06	0.931	0.665
99	0.3266	0.27	18.05	0.916	0.6543
100	0.33	0.2734	18.04	0.912	0.6514
101	0.3333	0.2767	18.04	0.912	0.6514
102	0.35	0.2934	18.02	0.888	0.6343
103	0.3666	0.31	18.	0.869	0.6207
104	0.3833	0.3267	17.98	0.85	0.6071
105	0.4	0.3434	17.96	0.831	0.5936
106	0.4166	0.36	17.94	0.812	0.58
107	0.4333	0.3767	17.92	0.793	0.5664
108	0.45	0.3934	17.9	0.774	0.5529
109	0.4666	0.41	17.89	0.76	0.5429
110	0.4833	0.4267	17.88	0.745	0.5321
111	0.5	0.4434	17.86	0.731	0.5221
112	0.5166	0.46	17.85	0.717	0.5121
113	0.5333	0.4767	17.83	0.703	0.5021
114	0.55	0.4934	17.82	0.688	0.4914
115	0.5666	0.51	17.8	0.674	0.4814
116	0.5833	0.5267	17.79	0.66	0.4714
117	0.6	0.5434	17.78	0.646	0.4614
118	0.6166	0.56	17.77	0.636	0.4543
119	0.6333	0.5767	17.75	0.622	0.4443
120	0.65	0.5934	17.74	0.613	0.4379
121	0.6666	0.61	17.73	0.598	0.4271
122	0.6833	0.6267	17.72	0.589	0.4207
123	0.7	0.6434	17.7	0.575	0.4107
124	0.7166	0.66	17.7	0.565	0.4036
125	0.7333	0.6767	17.69	0.556	0.3971
126	0.75	0.6934	17.68	0.546	0.39
127	0.7666	0.71	17.67	0.537	0.3836
128	0.7833	0.7267	17.66	0.527	0.3764
129	0.8	0.7434	17.64	0.513	0.3664
130	0.8166	0.76	17.63	0.503	0.3593
131	0.8333	0.7767	17.63	0.499	0.3564
132	0.85	0.7934	17.62	0.489	0.3493
133	0.8666	0.81	17.61	0.48	0.3429
134	0.8833	0.8267	17.6	0.47	0.3357
135	0.9	0.8434	17.59	0.461	0.3293
136	0.9166	0.86	17.59	0.456	0.3257
137	0.9333	0.8767	17.58	0.446	0.3186
138	0.95	0.8934	17.57	0.437	0.3121
139	0.9666	0.91	17.56	0.432	0.3086
140	0.9833	0.9267	17.55	0.423	0.3021
141	1.	0.9434	17.54	0.413	0.295
142	1.2	1.143	17.46	0.328	0.2343
143	1.4	1.343	17.4	0.271	0.1936
144	1.6	1.543	17.35	0.223	0.1593
145	1.8	1.743	17.32	0.185	0.1321
146	2.	1.943	17.29	0.157	0.1121
147	2.2	2.143	17.26	0.133	9.5e-002
148	2.4	2.343	17.24	0.114	8.143e-002

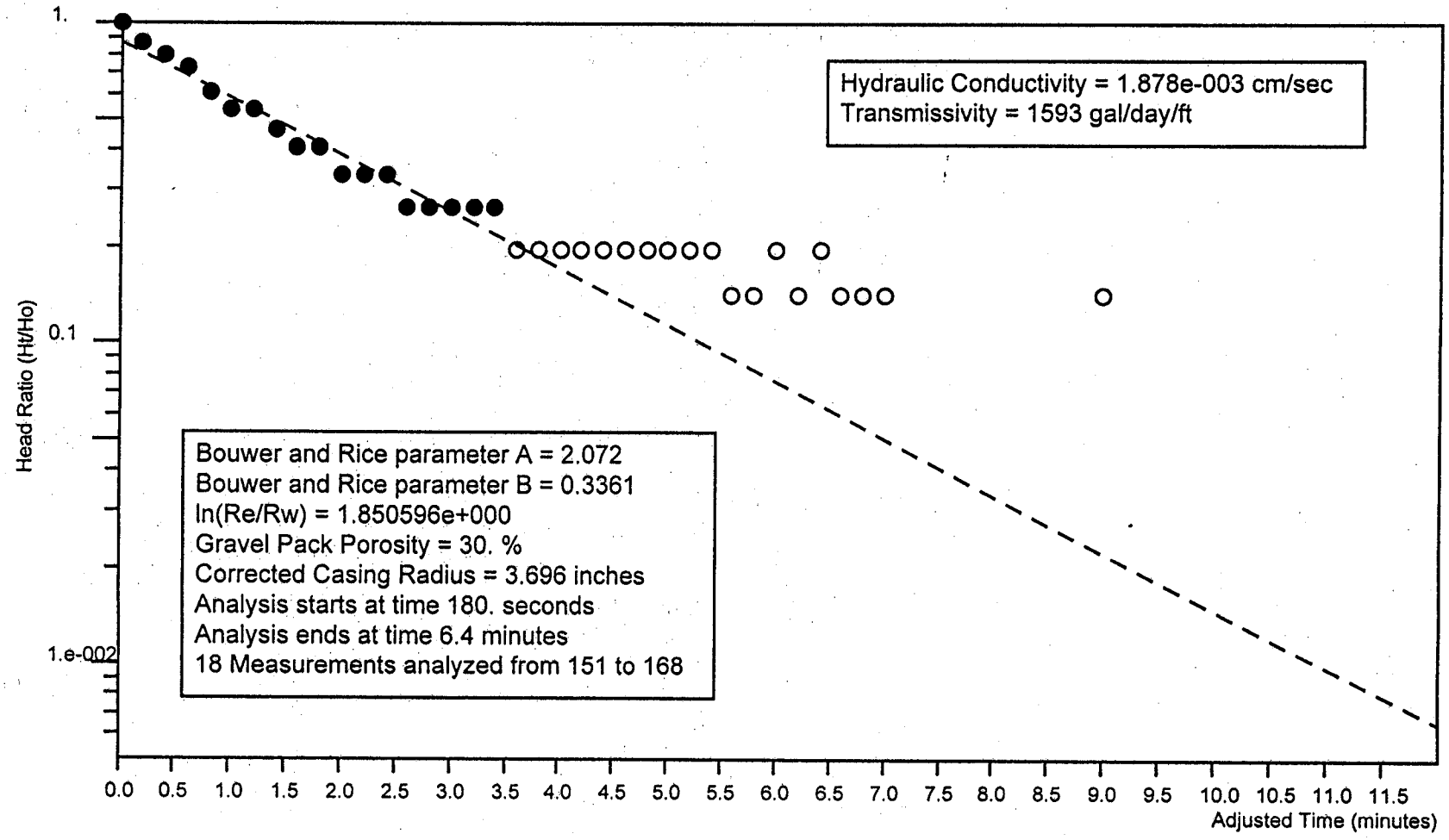
149	2.6	2.543	17.23	9.5e-002	6.786e-002
150	2.8	2.743	17.22	8.6e-002	6.143e-002
151	3.	2.943	17.2	7.1e-002	5.071e-002
152	3.2	3.143	17.19	6.2e-002	4.429e-002
153	3.4	3.343	17.19	5.7e-002	4.071e-002
154	3.6	3.543	17.18	5.2e-002	3.714e-002
155	3.8	3.743	17.17	4.3e-002	3.071e-002
156	4.	3.943	17.17	3.8e-002	2.714e-002
157	4.2	4.143	17.17	3.8e-002	2.714e-002
158	4.4	4.343	17.16	3.3e-002	2.357e-002
159	4.6	4.543	17.16	2.9e-002	2.071e-002
160	4.8	4.743	17.16	2.9e-002	2.071e-002
161	5.	4.943	17.15	2.4e-002	1.714e-002
162	5.2	5.143	17.15	2.4e-002	1.714e-002
163	5.4	5.343	17.15	2.4e-002	1.714e-002
164	5.6	5.543	17.15	1.9e-002	1.357e-002
165	5.8	5.743	17.15	1.9e-002	1.357e-002
166	6.	5.943	17.15	1.9e-002	1.357e-002
167	6.2	6.143	17.15	1.9e-002	1.357e-002
168	6.4	6.343	17.15	1.9e-002	1.357e-002
169	6.6	6.543	17.14	1.4e-002	1.e-002
170	6.8	6.743	17.14	1.4e-002	1.e-002
171	7.	6.943	17.14	1.4e-002	1.e-002
172	7.2	7.143	17.14	1.4e-002	1.e-002
173	7.4	7.343	17.14	1.4e-002	1.e-002
174	7.6	7.543	17.14	1.4e-002	1.e-002
175	7.8	7.743	17.14	1.4e-002	1.e-002
176	8.	7.943	17.14	1.4e-002	1.e-002
177	8.2	8.143	17.14	1.4e-002	1.e-002
178	8.4	8.343	17.14	1.4e-002	1.e-002
179	8.6	8.543	17.14	1.e-002	7.143e-003
180	8.8	8.743	17.14	1.e-002	7.143e-003
181	9.	8.943	17.14	1.4e-002	1.e-002
182	9.2	9.143	17.14	1.e-002	7.143e-003
183	9.4	9.343	17.14	1.4e-002	1.e-002
184	9.6	9.543	17.14	1.e-002	7.143e-003
185	9.8	9.743	17.14	1.e-002	7.143e-003
186	10.	9.943	17.14	1.e-002	7.143e-003
187	12.	11.94	17.14	1.e-002	7.143e-003

Aquifer Analysis 06/24/99

Bouwer and Rice Graph

ABTco, Inc.

FA-2-R



Analysis by MJT of Page 1

Ho is 7.1e-002 feet at 180. seconds

Aquifer Analysis

Site Name: ABTco, Inc.
Test Date: 06/24/99
Import File: C:\mats docs\slugtest\projects\abtco\Fa-3-f

Well Label: FA-3-F
Aquifer Thickness: 15. feet
Screen Length: 15. feet
Casing Radius: 1.188 inches
Effective Radius: 4.125 inches
Gravel Pack Porosity: 30. %
Corrected Casing Radius: 2.468 inches
Static Water Level: 12.78 feet
Water Table to Screen Bottom: 14.35 feet
Anisotropy Ratio: 1.
Time Adjustment: 10.2 Seconds
Test starts with trial 51
There are 198 time and drawdown measurements
Maximum head is 1.077 feet
Minimum head is 0. feet

Trial	Time (minutes)	Adjusted Time (minutes)	Drawdown (feet)	Head (feet)	Head Ratio
1	0.	-0.17	12.78	2.e-003	1.857e-003
2	3.3e-003	-0.1667	12.77	7.e-003	6.5e-003
3	6.6e-003	-0.1634	12.78	2.e-003	1.857e-003
4	1.e-002	-0.16	12.77	7.e-003	6.5e-003
5	1.33e-002	-0.1567	12.78	2.e-003	1.857e-003
6	1.66e-002	-0.1534	12.78	2.e-003	1.857e-003
7	2.e-002	-0.15	12.77	7.e-003	6.5e-003
8	2.33e-002	-0.1467	12.77	7.e-003	6.5e-003
9	2.66e-002	-0.1434	12.77	7.e-003	6.5e-003
10	3.e-002	-0.14	12.78	2.e-003	1.857e-003
11	3.33e-002	-0.1367	12.78	2.e-003	1.857e-003
12	3.66e-002	-0.1334	12.78	2.e-003	1.857e-003
13	4.e-002	-0.13	12.77	7.e-003	6.5e-003
14	4.33e-002	-0.1267	12.78	2.e-003	1.857e-003
15	4.66e-002	-0.1234	12.78	2.e-003	1.857e-003
16	5.e-002	-0.12	12.78	2.e-003	1.857e-003
17	5.33e-002	-0.1167	12.78	2.e-003	1.857e-003
18	5.66e-002	-0.1134	12.78	2.e-003	1.857e-003
19	6.e-002	-0.11	12.78	2.e-003	1.857e-003
20	6.33e-002	-0.1067	12.78	2.e-003	1.857e-003
21	6.66e-002	-0.1034	12.78	2.e-003	1.857e-003
22	7.e-002	-0.1	12.78	2.e-003	1.857e-003
23	7.33e-002	-9.67e-002	12.78	2.e-003	1.857e-003
24	7.66e-002	-9.34e-002	12.78	2.e-003	1.857e-003
25	8.e-002	-9.e-002	12.78	2.e-003	1.857e-003
26	8.33e-002	-8.67e-002	12.77	7.e-003	6.5e-003
27	8.66e-002	-8.34e-002	12.77	7.e-003	6.5e-003
28	9.e-002	-8.e-002	12.75	3.1e-002	2.878e-002
29	9.33e-002	-7.67e-002	12.63	0.154	0.143
30	9.66e-002	-7.34e-002	12.54	0.245	0.2275
31	0.1	-7.e-002	12.43	0.349	0.324
32	0.1033	-6.67e-002	12.36	0.42	0.39
33	0.1066	-6.34e-002	12.27	0.511	0.4745
34	0.11	-6.e-002	12.15	0.625	0.5803

35	0.1133	-5.67e-002	12.08	0.696	0.6462
36	0.1166	-5.34e-002	11.96	0.825	0.766
37	0.12	-5.e-002	12.04	0.739	0.6862
38	0.1233	-4.67e-002	12.	0.782	0.7261
39	0.1266	-4.34e-002	11.95	0.834	0.7744
40	0.13	-4.e-002	11.88	0.901	0.8366
41	0.1333	-3.67e-002	11.9	0.882	0.8189
42	0.1366	-3.34e-002	11.71	1.072	0.9954
43	0.14	-3.e-002	11.95	0.834	0.7744
44	0.1433	-2.67e-002	11.8	0.977	0.9071
45	0.1466	-2.34e-002	11.78	1.005	0.9331
46	0.15	-2.e-002	11.84	0.943	0.8756
47	0.1533	-1.67e-002	11.86	0.92	0.8542
48	0.1566	-1.34e-002	11.77	1.015	0.9424
49	0.16	-1.e-002	11.78	0.996	0.9248
50	0.1633	-6.7e-003	11.81	0.967	0.8979
51	0.1666	-3.4e-003	11.77	1.01	0.9378
52	0.17	0.	11.7	1.077	1.
53	0.1733	3.3e-003	11.84	0.939	0.8719
54	0.1766	6.6e-003	11.73	1.053	0.9777
55	0.18	1.e-002	11.9	0.882	0.8189
56	0.1833	1.33e-002	11.84	0.943	0.8756
57	0.1866	1.66e-002	11.82	0.962	0.8932
58	0.19	2.e-002	11.8	0.977	0.9071
59	0.1933	2.33e-002	11.82	0.958	0.8895
60	0.1966	2.66e-002	11.84	0.939	0.8719
61	0.2	3.e-002	11.86	0.924	0.8579
62	0.2033	3.33e-002	11.86	0.92	0.8542
63	0.2066	3.66e-002	11.86	0.92	0.8542
64	0.21	4.e-002	11.87	0.915	0.8496
65	0.2133	4.33e-002	11.88	0.901	0.8366
66	0.2166	4.66e-002	11.88	0.896	0.8319
67	0.22	5.e-002	11.89	0.891	0.8273
68	0.2233	5.33e-002	11.9	0.882	0.8189
69	0.2266	5.66e-002	11.9	0.877	0.8143
70	0.23	6.e-002	11.91	0.872	0.8097
71	0.2333	6.33e-002	11.91	0.867	0.805
72	0.2366	6.66e-002	11.92	0.863	0.8013
73	0.24	7.e-002	11.93	0.853	0.792
74	0.2433	7.33e-002	11.93	0.848	0.7874
75	0.2466	7.66e-002	11.94	0.844	0.7837
76	0.25	8.e-002	11.94	0.839	0.779
77	0.2533	8.33e-002	11.94	0.839	0.779
78	0.2566	8.66e-002	11.95	0.829	0.7697
79	0.26	9.e-002	11.96	0.825	0.766
80	0.2633	9.33e-002	11.97	0.815	0.7567
81	0.2666	9.66e-002	11.97	0.81	0.7521
82	0.27	0.1	11.98	0.801	0.7437
83	0.2733	0.1033	11.98	0.801	0.7437
84	0.2766	0.1066	11.98	0.796	0.7391
85	0.28	0.11	11.99	0.791	0.7344
86	0.2833	0.1133	11.99	0.791	0.7344
87	0.2866	0.1166	11.99	0.786	0.7298
88	0.29	0.12	12.	0.777	0.7214
89	0.2933	0.1233	12.02	0.763	0.7084
90	0.2966	0.1266	12.01	0.772	0.7168
91	0.3	0.13	12.02	0.763	0.7084

92	0.3033	0.1333	12.03	0.753	0.6992
93	0.3066	0.1366	12.1	0.677	0.6286
94	0.31	0.14	11.96	0.82	0.7614
95	0.3133	0.1433	12.07	0.71	0.6592
96	0.3166	0.1466	12.05	0.734	0.6815
97	0.32	0.15	12.06	0.725	0.6732
98	0.3233	0.1533	12.07	0.71	0.6592
99	0.3266	0.1566	12.06	0.72	0.6685
100	0.33	0.16	12.07	0.706	0.6555
101	0.3333	0.1633	12.07	0.71	0.6592
102	0.35	0.18	12.1	0.677	0.6286
103	0.3666	0.1966	12.11	0.668	0.6202
104	0.3833	0.2133	12.14	0.644	0.598
105	0.4	0.23	12.15	0.63	0.585
106	0.4166	0.2466	12.17	0.611	0.5673
107	0.4333	0.2633	12.18	0.596	0.5534
108	0.45	0.28	12.2	0.577	0.5357
109	0.4666	0.2966	12.22	0.563	0.5227
110	0.4833	0.3133	12.23	0.549	0.5097
111	0.5	0.33	12.24	0.535	0.4968
112	0.5166	0.3466	12.26	0.525	0.4875
113	0.5333	0.3633	12.27	0.511	0.4745
114	0.55	0.38	12.28	0.501	0.4652
115	0.5666	0.3966	12.29	0.487	0.4522
116	0.5833	0.4133	12.3	0.477	0.4429
117	0.6	0.43	12.32	0.463	0.4299
118	0.6166	0.4466	12.33	0.454	0.4215
119	0.6333	0.4633	12.34	0.444	0.4123
120	0.65	0.48	12.35	0.435	0.4039
121	0.6666	0.4966	12.36	0.425	0.3946
122	0.6833	0.5133	12.36	0.416	0.3863
123	0.7	0.53	12.37	0.406	0.377
124	0.7166	0.5466	12.38	0.401	0.3723
125	0.7333	0.5633	12.39	0.392	0.364
126	0.75	0.58	12.4	0.382	0.3547
127	0.7666	0.5966	12.4	0.378	0.351
128	0.7833	0.6133	12.41	0.368	0.3417
129	0.8	0.63	12.42	0.359	0.3333
130	0.8166	0.6466	12.43	0.354	0.3287
131	0.8333	0.6633	12.43	0.349	0.324
132	0.85	0.68	12.44	0.34	0.3157
133	0.8666	0.6966	12.45	0.335	0.311
134	0.8833	0.7133	12.46	0.325	0.3018
135	0.9	0.73	12.46	0.321	0.2981
136	0.9166	0.7466	12.46	0.316	0.2934
137	0.9333	0.7633	12.47	0.311	0.2888
138	0.95	0.78	12.47	0.306	0.2841
139	0.9666	0.7966	12.48	0.297	0.2758
140	0.9833	0.8133	12.49	0.292	0.2711
141	1.	0.83	12.49	0.287	0.2665
142	1.2	1.03	12.55	0.23	0.2136
143	1.4	1.23	12.58	0.197	0.1829
144	1.6	1.43	12.6	0.178	0.1653
145	1.8	1.63	12.62	0.159	0.1476
146	2.	1.83	12.63	0.149	0.1383
147	2.2	2.03	12.64	0.145	0.1346
148	2.4	2.23	12.64	0.14	0.13

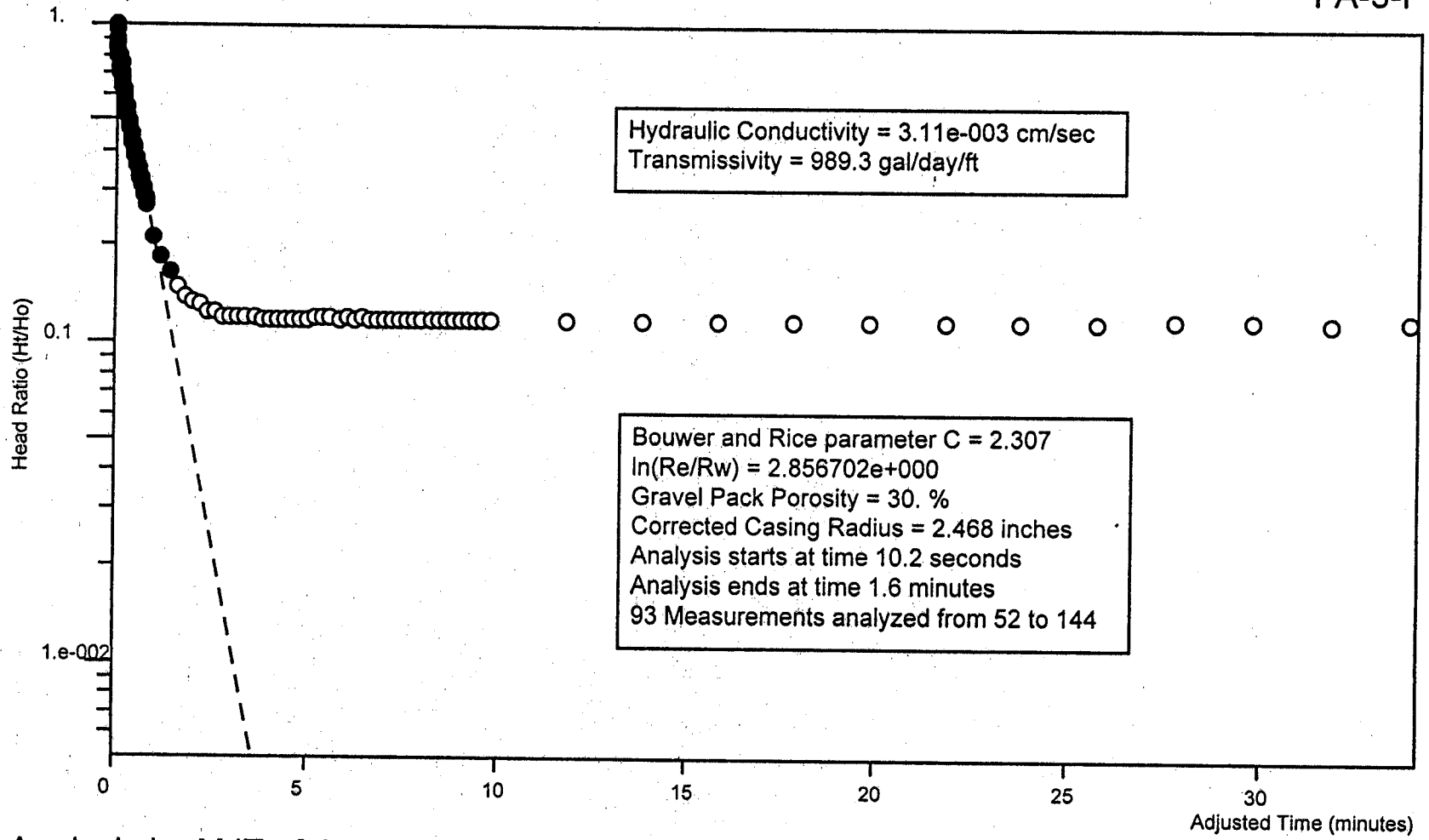
149	2.6	2.43	12.65	0.135	0.1253
150	2.8	2.63	12.65	0.135	0.1253
151	3.	2.83	12.65	0.13	0.1207
152	3.2	3.03	12.65	0.13	0.1207
153	3.4	3.23	12.65	0.13	0.1207
154	3.6	3.43	12.65	0.13	0.1207
155	3.8	3.63	12.65	0.13	0.1207
156	4.	3.83	12.65	0.126	0.117
157	4.2	4.03	12.65	0.126	0.117
158	4.4	4.23	12.65	0.126	0.117
159	4.6	4.43	12.65	0.126	0.117
160	4.8	4.63	12.65	0.126	0.117
161	5.	4.83	12.65	0.126	0.117
162	5.2	5.03	12.65	0.126	0.117
163	5.4	5.23	12.65	0.13	0.1207
164	5.6	5.43	12.65	0.13	0.1207
165	5.8	5.63	12.65	0.13	0.1207
166	6.	5.83	12.65	0.126	0.117
167	6.2	6.03	12.65	0.13	0.1207
168	6.4	6.23	12.65	0.126	0.117
169	6.6	6.43	12.65	0.13	0.1207
170	6.8	6.63	12.65	0.126	0.117
171	7.	6.83	12.65	0.126	0.117
172	7.2	7.03	12.65	0.126	0.117
173	7.4	7.23	12.65	0.126	0.117
174	7.6	7.43	12.65	0.126	0.117
175	7.8	7.63	12.65	0.126	0.117
176	8.	7.83	12.65	0.126	0.117
177	8.2	8.03	12.65	0.126	0.117
178	8.4	8.23	12.65	0.126	0.117
179	8.6	8.43	12.65	0.126	0.117
180	8.8	8.63	12.65	0.126	0.117
181	9.	8.83	12.65	0.126	0.117
182	9.2	9.03	12.65	0.126	0.117
183	9.4	9.23	12.65	0.126	0.117
184	9.6	9.43	12.65	0.126	0.117
185	9.8	9.63	12.65	0.126	0.117
186	10.	9.83	12.65	0.126	0.117
187	12.	11.83	12.65	0.126	0.117
188	14.	13.83	12.65	0.126	0.117
189	16.	15.83	12.65	0.126	0.117
190	18.	17.83	12.65	0.126	0.117
191	20.	19.83	12.65	0.126	0.117
192	22.	21.83	12.65	0.126	0.117
193	24.	23.83	12.65	0.126	0.117
194	26.	25.83	12.65	0.126	0.117
195	28.	27.83	12.65	0.13	0.1207
196	30.	29.83	12.65	0.13	0.1207
197	32.	31.83	12.65	0.126	0.117
198	34.	33.83	12.65	0.13	0.1207

Aquifer Analysis 06/24/99

ABTco, Inc.

Bouwer and Rice Graph

FA-3-F



Analysis by MJT of Joyce Engineering, Inc.

Ho is 1.077 feet at 10.2 seconds

Aquifer Analysis

Site Name: ABTco, Inc.
Test Date: 06/24/99
Import File: C:\mats docs\slugtest\projects\abtco\Fa-3-r

Well Label: FA-3-R
Aquifer Thickness: 15. feet
Screen Length: 15. feet
Casing Radius: 1.188 inches
Effective Radius: 4.125 inches
Gravel Pack Porosity: 30. %
Corrected Casing Radius: 2.468 inches
Static Water Level: 12.59 feet
Water Table to Screen Bottom: 14.35 feet
Anisotropy Ratio: 1.
Time Adjustment: 60. Seconds
Test starts with trial 13
There are 188 time and drawdown measurements
Maximum head is 0.73 feet
Minimum head is 0. feet

Trial	Time (minutes)	Adjusted Time (minutes)	Drawdown (feet)	Head (feet)	Head Ratio
1	0.	-1.	12.59	2.e-003	2.74e-003
2	3.3e-003	-0.9967	12.59	2.e-003	2.74e-003
3	6.6e-003	-0.9934	12.59	2.e-003	2.74e-003
4	1.e-002	-0.99	12.59	2.e-003	2.74e-003
5	1.33e-002	-0.9867	12.81	0.216	0.2959
6	1.66e-002	-0.9834	12.91	0.321	0.4397
7	2.e-002	-0.98	12.89	0.302	0.4137
8	2.33e-002	-0.9767	12.91	0.316	0.4329
9	2.66e-002	-0.9734	12.98	0.392	0.537
10	3.e-002	-0.97	12.98	0.392	0.537
11	3.33e-002	-0.9667	13.15	0.559	0.7658
12	3.66e-002	-0.9634	13.23	0.635	0.8699
13	4.e-002	-0.96	13.27	0.677	0.9274
14	4.33e-002	-0.9567	13.32	0.73	1.
15	4.66e-002	-0.9534	13.28	0.687	0.9411
16	5.e-002	-0.95	13.26	0.668	0.9151
17	5.33e-002	-0.9467	13.26	0.673	0.9219
18	5.66e-002	-0.9434	13.25	0.663	0.9082
19	6.e-002	-0.94	13.21	0.616	0.8438
20	6.33e-002	-0.9367	13.17	0.582	0.7973
21	6.66e-002	-0.9334	13.15	0.563	0.7712
22	7.e-002	-0.93	13.13	0.544	0.7452
23	7.33e-002	-0.9267	13.11	0.521	0.7137
24	7.66e-002	-0.9234	13.1	0.506	0.6932
25	8.e-002	-0.92	13.08	0.487	0.6671
26	8.33e-002	-0.9167	13.07	0.483	0.6616
27	8.66e-002	-0.9134	13.07	0.478	0.6548
28	9.e-002	-0.91	13.06	0.473	0.6479
29	9.33e-002	-0.9067	13.06	0.473	0.6479
30	9.66e-002	-0.9034	13.06	0.473	0.6479
31	0.1	-0.9	13.06	0.473	0.6479
32	0.1033	-0.8967	13.06	0.473	0.6479
33	0.1066	-0.8934	13.06	0.473	0.6479
34	0.11	-0.89	13.06	0.473	0.6479

35	0.1133	-0.8867	13.07	0.478	0.6548
36	0.1166	-0.8834	13.06	0.473	0.6479
37	0.12	-0.88	13.06	0.473	0.6479
38	0.1233	-0.8767	13.06	0.468	0.6411
39	0.1266	-0.8734	13.06	0.468	0.6411
40	0.13	-0.87	13.06	0.473	0.6479
41	0.1333	-0.8667	13.06	0.473	0.6479
42	0.1366	-0.8634	13.06	0.468	0.6411
43	0.14	-0.86	13.06	0.468	0.6411
44	0.1433	-0.8567	13.06	0.473	0.6479
45	0.1466	-0.8534	13.06	0.473	0.6479
46	0.15	-0.85	13.06	0.473	0.6479
47	0.1533	-0.8467	13.06	0.473	0.6479
48	0.1566	-0.8434	13.06	0.468	0.6411
49	0.16	-0.84	13.06	0.473	0.6479
50	0.1633	-0.8367	13.06	0.468	0.6411
51	0.1666	-0.8334	13.06	0.473	0.6479
52	0.17	-0.83	13.06	0.473	0.6479
53	0.1733	-0.8267	13.05	0.459	0.6288
54	0.1766	-0.8234	13.06	0.473	0.6479
55	0.18	-0.82	13.06	0.473	0.6479
56	0.1833	-0.8167	13.06	0.468	0.6411
57	0.1866	-0.8134	13.06	0.473	0.6479
58	0.19	-0.81	13.06	0.473	0.6479
59	0.1933	-0.8067	13.06	0.468	0.6411
60	0.1966	-0.8034	13.06	0.473	0.6479
61	0.2	-0.8	13.06	0.473	0.6479
62	0.2033	-0.7967	13.06	0.468	0.6411
63	0.2066	-0.7934	13.05	0.464	0.6356
64	0.21	-0.79	13.06	0.473	0.6479
65	0.2133	-0.7867	13.06	0.473	0.6479
66	0.2166	-0.7834	13.06	0.473	0.6479
67	0.22	-0.78	13.06	0.468	0.6411
68	0.2233	-0.7767	13.06	0.468	0.6411
69	0.2266	-0.7734	13.05	0.464	0.6356
70	0.23	-0.77	13.05	0.464	0.6356
71	0.2333	-0.7667	13.06	0.468	0.6411
72	0.2366	-0.7634	13.05	0.464	0.6356
73	0.24	-0.76	13.06	0.468	0.6411
74	0.2433	-0.7567	13.06	0.468	0.6411
75	0.2466	-0.7534	13.06	0.468	0.6411
76	0.25	-0.75	13.06	0.468	0.6411
77	0.2533	-0.7467	13.06	0.468	0.6411
78	0.2566	-0.7434	13.05	0.464	0.6356
79	0.26	-0.74	13.05	0.464	0.6356
80	0.2633	-0.7367	13.05	0.464	0.6356
81	0.2666	-0.7334	13.05	0.464	0.6356
82	0.27	-0.73	13.05	0.464	0.6356
83	0.2733	-0.7267	13.06	0.468	0.6411
84	0.2766	-0.7234	13.06	0.468	0.6411
85	0.28	-0.72	13.05	0.459	0.6288
86	0.2833	-0.7167	13.04	0.454	0.6219
87	0.2866	-0.7134	13.05	0.459	0.6288
88	0.29	-0.71	13.05	0.464	0.6356
89	0.2933	-0.7067	13.05	0.464	0.6356
90	0.2966	-0.7034	13.05	0.459	0.6288
91	0.3	-0.7	13.05	0.459	0.6288

92	0.3033	-0.6967	13.05	0.459	0.6288
93	0.3066	-0.6934	13.05	0.459	0.6288
94	0.31	-0.69	13.05	0.464	0.6356
95	0.3133	-0.6867	13.05	0.459	0.6288
96	0.3166	-0.6834	13.05	0.464	0.6356
97	0.32	-0.68	13.05	0.464	0.6356
98	0.3233	-0.6767	13.05	0.459	0.6288
99	0.3266	-0.6734	13.05	0.459	0.6288
100	0.33	-0.67	13.05	0.459	0.6288
101	0.3333	-0.6667	13.05	0.459	0.6288
102	0.35	-0.65	13.05	0.459	0.6288
103	0.3666	-0.6334	13.05	0.459	0.6288
104	0.3833	-0.6167	13.05	0.459	0.6288
105	0.4	-0.6	13.05	0.459	0.6288
106	0.4166	-0.5834	13.04	0.454	0.6219
107	0.4333	-0.5667	13.04	0.454	0.6219
108	0.45	-0.55	13.04	0.454	0.6219
109	0.4666	-0.5334	13.04	0.454	0.6219
110	0.4833	-0.5167	13.04	0.449	0.6151
111	0.5	-0.5	13.04	0.449	0.6151
112	0.5166	-0.4834	13.04	0.449	0.6151
113	0.5333	-0.4667	13.04	0.449	0.6151
114	0.55	-0.45	13.04	0.449	0.6151
115	0.5666	-0.4334	13.04	0.445	0.6096
116	0.5833	-0.4167	13.04	0.445	0.6096
117	0.6	-0.4	13.04	0.445	0.6096
118	0.6166	-0.3834	13.04	0.445	0.6096
119	0.6333	-0.3667	13.04	0.445	0.6096
120	0.65	-0.35	13.03	0.44	0.6027
121	0.6666	-0.3334	13.03	0.44	0.6027
122	0.6833	-0.3167	13.03	0.44	0.6027
123	0.7	-0.3	13.03	0.44	0.6027
124	0.7166	-0.2834	13.03	0.44	0.6027
125	0.7333	-0.2667	13.03	0.44	0.6027
126	0.75	-0.25	13.03	0.435	0.5959
127	0.7666	-0.2334	13.03	0.435	0.5959
128	0.7833	-0.2167	13.03	0.435	0.5959
129	0.8	-0.2	13.03	0.435	0.5959
130	0.8166	-0.1834	13.03	0.435	0.5959
131	0.8333	-0.1667	13.02	0.43	0.589
132	0.85	-0.15	13.02	0.43	0.589
133	0.8666	-0.1334	13.02	0.43	0.589
134	0.8833	-0.1167	13.02	0.43	0.589
135	0.9	-0.1	13.02	0.43	0.589
136	0.9166	-8.34e-002	13.02	0.43	0.589
137	0.9333	-6.67e-002	13.02	0.426	0.5836
138	0.95	-5.e-002	13.02	0.426	0.5836
139	0.9666	-3.34e-002	13.01	0.421	0.5767
140	0.9833	-1.67e-002	13.01	0.421	0.5767
141	1.	0.	13.01	0.421	0.5767
142	1.2	0.2	13.	0.411	0.563
143	1.4	0.4	12.91	0.316	0.4329
144	1.6	0.6	12.82	0.226	0.3096
145	1.8	0.8	12.76	0.174	0.2384
146	2.	1.	12.73	0.145	0.1986
147	2.2	1.2	12.71	0.121	0.1658
148	2.4	1.4	12.7	0.107	0.1466

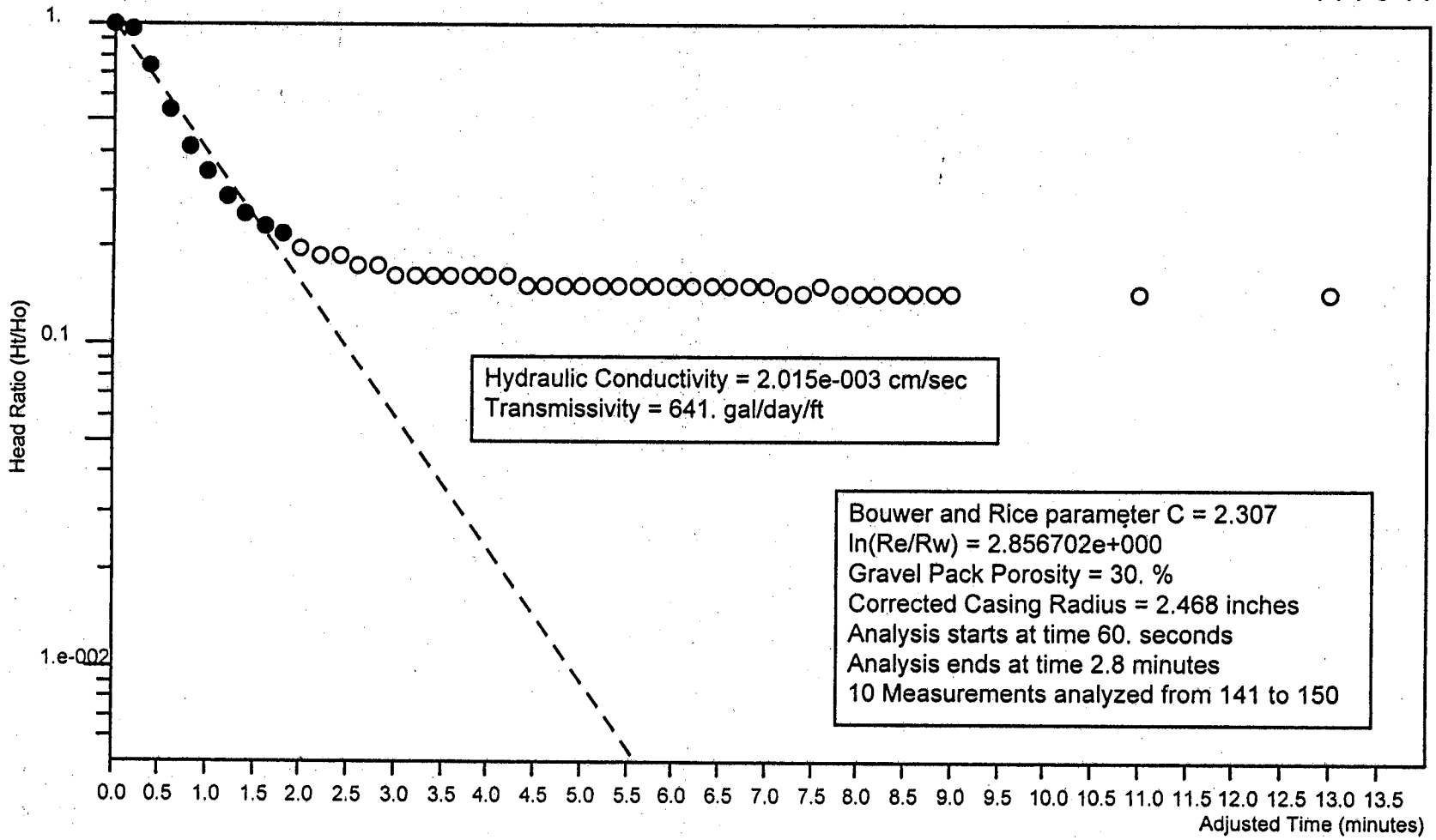
149	2.6	1.6	12.69	9.8e-002	0.1342
150	2.8	1.8	12.68	9.3e-002	0.1274
151	3.	2.	12.67	8.3e-002	0.1137
152	3.2	2.2	12.67	7.9e-002	0.1082
153	3.4	2.4	12.67	7.9e-002	0.1082
154	3.6	2.6	12.66	7.4e-002	0.1014
155	3.8	2.8	12.66	7.4e-002	0.1014
156	4.	3.	12.66	6.9e-002	9.452e-002
157	4.2	3.2	12.66	6.9e-002	9.452e-002
158	4.4	3.4	12.66	6.9e-002	9.452e-002
159	4.6	3.6	12.66	6.9e-002	9.452e-002
160	4.8	3.8	12.66	6.9e-002	9.452e-002
161	5.	4.	12.66	6.9e-002	9.452e-002
162	5.2	4.2	12.66	6.9e-002	9.452e-002
163	5.4	4.4	12.65	6.4e-002	8.767e-002
164	5.6	4.6	12.65	6.4e-002	8.767e-002
165	5.8	4.8	12.65	6.4e-002	8.767e-002
166	6.	5.	12.65	6.4e-002	8.767e-002
167	6.2	5.2	12.65	6.4e-002	8.767e-002
168	6.4	5.4	12.65	6.4e-002	8.767e-002
169	6.6	5.6	12.65	6.4e-002	8.767e-002
170	6.8	5.8	12.65	6.4e-002	8.767e-002
171	7.	6.	12.65	6.4e-002	8.767e-002
172	7.2	6.2	12.65	6.4e-002	8.767e-002
173	7.4	6.4	12.65	6.4e-002	8.767e-002
174	7.6	6.6	12.65	6.4e-002	8.767e-002
175	7.8	6.8	12.65	6.4e-002	8.767e-002
176	8.	7.	12.65	6.4e-002	8.767e-002
177	8.2	7.2	12.65	6.e-002	8.219e-002
178	8.4	7.4	12.65	6.e-002	8.219e-002
179	8.6	7.6	12.65	6.4e-002	8.767e-002
180	8.8	7.8	12.65	6.e-002	8.219e-002
181	9.	8.	12.65	6.e-002	8.219e-002
182	9.2	8.2	12.65	6.e-002	8.219e-002
183	9.4	8.4	12.65	6.e-002	8.219e-002
184	9.6	8.6	12.65	6.e-002	8.219e-002
185	9.8	8.8	12.65	6.e-002	8.219e-002
186	10.	9.	12.65	6.e-002	8.219e-002
187	12.	11.	12.65	6.e-002	8.219e-002
188	14.	13.	12.65	6.e-002	8.219e-002

Aquifer Analysis 06/24/99

Bouwer and Rice Graph

ABTco, Inc.

FA-3-R



Analysis by MJT of Joyce Engineering, Inc.

Ho is 0.421 feet at 60. seconds

Aquifer Analysis

Site Name: ABTco, Inc.
Test Date: 06/24/99
Import File: C:\mats docs\slugtest\projects\abtco\Fa-4-f

Well Label: FA-4-F
Aquifer Thickness: 30. feet
Screen Length: 15. feet
Casing Radius: 1.188 inches
Effective Radius: 3. inches
Gravel Pack Porosity: 30. %
Corrected Casing Radius: 1.92 inches
Static Water Level: 55.85 feet
Water Table to Screen Bottom: 8.1 feet
Anisotropy Ratio: 1.
Time Adjustment: 9. Seconds
Test starts with trial 24
There are 187 time and drawdown measurements
Maximum head is 0.375 feet
Minimum head is 0. feet

Trial	Time (minutes)	Adjusted Time (minutes)	Drawdown (feet)	Head (feet)	Head Ratio
1	0.	-0.15	55.85	0.	0.
2	3.3e-003	-0.1467	55.84	5.e-003	1.333e-002
3	6.6e-003	-0.1434	55.84	5.e-003	1.333e-002
4	1.e-002	-0.14	55.84	5.e-003	1.333e-002
5	1.33e-002	-0.1367	55.84	5.e-003	1.333e-002
6	1.66e-002	-0.1334	55.84	5.e-003	1.333e-002
7	2.e-002	-0.13	55.84	5.e-003	1.333e-002
8	2.33e-002	-0.1267	55.84	5.e-003	1.333e-002
9	2.66e-002	-0.1234	55.84	5.e-003	1.333e-002
10	3.e-002	-0.12	55.84	5.e-003	1.333e-002
11	3.33e-002	-0.1167	55.84	5.e-003	1.333e-002
12	3.66e-002	-0.1134	55.84	5.e-003	1.333e-002
13	4.e-002	-0.11	55.84	5.e-003	1.333e-002
14	4.33e-002	-0.1067	55.84	5.e-003	1.333e-002
15	4.66e-002	-0.1034	55.84	5.e-003	1.333e-002
16	5.e-002	-1.e-001	55.84	5.e-003	1.333e-002
17	5.33e-002	-9.67e-002	55.71	0.138	0.368
18	5.66e-002	-9.34e-002	55.56	0.29	0.7733
19	6.e-002	-9.e-002	55.49	0.356	0.9493
20	6.33e-002	-8.67e-002	55.48	0.37	0.9867
21	6.66e-002	-8.34e-002	55.52	0.328	0.8747
22	7.e-002	-8.e-002	55.54	0.309	0.824
23	7.33e-002	-7.67e-002	55.54	0.313	0.8347
24	7.66e-002	-7.34e-002	55.5	0.351	0.936
25	8.e-002	-7.e-002	55.48	0.375	1.
26	8.33e-002	-6.67e-002	55.5	0.351	0.936
27	8.66e-002	-6.34e-002	55.51	0.342	0.912
28	9.e-002	-6.e-002	55.52	0.328	0.8747
29	9.33e-002	-5.67e-002	55.55	0.304	0.8107
30	9.66e-002	-5.34e-002	55.59	0.256	0.6827
31	0.1	-5.e-002	55.57	0.28	0.7467
32	0.1033	-4.67e-002	55.55	0.304	0.8107
33	0.1066	-4.34e-002	55.52	0.328	0.8747
34	0.11	-4.e-002	55.57	0.28	0.7467

35	0.1133	-3.67e-002	55.61	0.242	0.6453
36	0.1166	-3.34e-002	55.62	0.233	0.6213
37	0.12	-3.e-002	55.6	0.252	0.672
38	0.1233	-2.67e-002	55.57	0.275	0.7333
39	0.1266	-2.34e-002	55.6	0.247	0.6587
40	0.13	-2.e-002	55.69	0.157	0.4187
41	0.1333	-1.67e-002	55.74	0.105	0.28
42	0.1366	-1.34e-002	55.73	0.119	0.3173
43	0.14	-1.e-002	55.68	0.166	0.4427
44	0.1433	-6.7e-003	55.65	0.204	0.544
45	0.1466	-3.4e-003	55.71	0.138	0.368
46	0.15	0.	55.84	1.5e-002	4.e-002
47	0.1533	3.3e-003	55.78	6.7e-002	0.1787
48	0.1566	6.6e-003	55.78	6.7e-002	0.1787
49	0.16	1.e-002	55.78	6.7e-002	0.1787
50	0.1633	1.33e-002	55.79	5.7e-002	0.152
51	0.1666	1.66e-002	55.8	5.3e-002	0.1413
52	0.17	2.e-002	55.81	4.3e-002	0.1147
53	0.1733	2.33e-002	55.81	3.8e-002	0.1013
54	0.1766	2.66e-002	55.82	3.4e-002	9.067e-002
55	0.18	3.e-002	55.82	3.4e-002	9.067e-002
56	0.1833	3.33e-002	55.82	3.4e-002	9.067e-002
57	0.1866	3.66e-002	55.82	2.9e-002	7.733e-002
58	0.19	4.e-002	55.82	3.4e-002	9.067e-002
59	0.1933	4.33e-002	55.82	3.4e-002	9.067e-002
60	0.1966	4.66e-002	55.82	2.9e-002	7.733e-002
61	0.2	5.e-002	55.82	2.9e-002	7.733e-002
62	0.2033	5.33e-002	55.82	2.9e-002	7.733e-002
63	0.2066	5.66e-002	55.82	2.9e-002	7.733e-002
64	0.21	6.e-002	55.82	2.9e-002	7.733e-002
65	0.2133	6.33e-002	55.82	2.9e-002	7.733e-002
66	0.2166	6.66e-002	55.83	2.4e-002	6.4e-002
67	0.22	7.e-002	55.82	2.9e-002	7.733e-002
68	0.2233	7.33e-002	55.82	2.9e-002	7.733e-002
69	0.2266	7.66e-002	55.82	2.9e-002	7.733e-002
70	0.23	8.e-002	55.83	2.4e-002	6.4e-002
71	0.2333	8.33e-002	55.83	2.4e-002	6.4e-002
72	0.2366	8.66e-002	55.83	2.4e-002	6.4e-002
73	0.24	9.e-002	55.83	2.4e-002	6.4e-002
74	0.2433	9.33e-002	55.83	2.4e-002	6.4e-002
75	0.2466	9.66e-002	55.83	2.4e-002	6.4e-002
76	0.25	0.1	55.83	2.4e-002	6.4e-002
77	0.2533	0.1033	55.83	2.4e-002	6.4e-002
78	0.2566	0.1066	55.83	2.4e-002	6.4e-002
79	0.26	0.11	55.83	2.4e-002	6.4e-002
80	0.2633	0.1133	55.83	2.4e-002	6.4e-002
81	0.2666	0.1166	55.83	2.4e-002	6.4e-002
82	0.27	0.12	55.83	2.4e-002	6.4e-002
83	0.2733	0.1233	55.83	1.9e-002	5.067e-002
84	0.2766	0.1266	55.84	1.5e-002	4.e-002
85	0.28	0.13	55.83	1.9e-002	5.067e-002
86	0.2833	0.1333	55.83	2.4e-002	6.4e-002
87	0.2866	0.1366	55.83	1.9e-002	5.067e-002
88	0.29	0.14	55.83	1.9e-002	5.067e-002
89	0.2933	0.1433	55.83	1.9e-002	5.067e-002
90	0.2966	0.1466	55.83	1.9e-002	5.067e-002
91	0.3	0.15	55.83	1.9e-002	5.067e-002

92	0.3033	0.1533	55.83	1.9e-002	5.067e-002
93	0.3066	0.1566	55.83	1.9e-002	5.067e-002
94	0.31	0.16	55.83	1.9e-002	5.067e-002
95	0.3133	0.1633	55.83	1.9e-002	5.067e-002
96	0.3166	0.1666	55.83	1.9e-002	5.067e-002
97	0.32	0.17	55.83	1.9e-002	5.067e-002
98	0.3233	0.1733	55.83	1.9e-002	5.067e-002
99	0.3266	0.1766	55.83	1.9e-002	5.067e-002
100	0.33	0.18	55.83	1.9e-002	5.067e-002
101	0.3333	0.1833	55.83	1.9e-002	5.067e-002
102	0.35	0.2	55.84	1.5e-002	4.e-002
103	0.3666	0.2166	55.84	1.5e-002	4.e-002
104	0.3833	0.2333	55.84	1.5e-002	4.e-002
105	0.4	0.25	55.84	1.5e-002	4.e-002
106	0.4166	0.2666	55.84	1.5e-002	4.e-002
107	0.4333	0.2833	55.84	1.5e-002	4.e-002
108	0.45	0.3	55.84	1.5e-002	4.e-002
109	0.4666	0.3166	55.84	1.e-002	2.667e-002
110	0.4833	0.3333	55.84	1.e-002	2.667e-002
111	0.5	0.35	55.84	1.e-002	2.667e-002
112	0.5166	0.3666	55.84	1.e-002	2.667e-002
113	0.5333	0.3833	55.84	1.e-002	2.667e-002
114	0.55	0.4	55.84	1.e-002	2.667e-002
115	0.5666	0.4166	55.84	1.e-002	2.667e-002
116	0.5833	0.4333	55.84	1.e-002	2.667e-002
117	0.6	0.45	55.84	1.e-002	2.667e-002
118	0.6166	0.4666	55.84	1.e-002	2.667e-002
119	0.6333	0.4833	55.84	1.e-002	2.667e-002
120	0.65	0.5	55.84	1.e-002	2.667e-002
121	0.6666	0.5166	55.84	1.e-002	2.667e-002
122	0.6833	0.5333	55.84	1.e-002	2.667e-002
123	0.7	0.55	55.84	1.e-002	2.667e-002
124	0.7166	0.5666	55.84	1.e-002	2.667e-002
125	0.7333	0.5833	55.84	1.e-002	2.667e-002
126	0.75	0.6	55.84	1.e-002	2.667e-002
127	0.7666	0.6166	55.84	1.e-002	2.667e-002
128	0.7833	0.6333	55.84	1.e-002	2.667e-002
129	0.8	0.65	55.84	1.e-002	2.667e-002
130	0.8166	0.6666	55.84	1.e-002	2.667e-002
131	0.8333	0.6833	55.84	1.e-002	2.667e-002
132	0.85	0.7	55.84	1.e-002	2.667e-002
133	0.8666	0.7166	55.84	1.e-002	2.667e-002
134	0.8833	0.7333	55.84	1.e-002	2.667e-002
135	0.9	0.75	55.84	1.e-002	2.667e-002
136	0.9166	0.7666	55.84	1.e-002	2.667e-002
137	0.9333	0.7833	55.84	1.e-002	2.667e-002
138	0.95	0.8	55.84	1.e-002	2.667e-002
139	0.9666	0.8166	55.84	1.e-002	2.667e-002
140	0.9833	0.8333	55.84	1.e-002	2.667e-002
141	1.	0.85	55.84	1.e-002	2.667e-002
142	1.2	1.05	55.84	5.e-003	1.333e-002
143	1.4	1.25	55.84	5.e-003	1.333e-002
144	1.6	1.45	55.84	5.e-003	1.333e-002
145	1.8	1.65	55.84	5.e-003	1.333e-002
146	2.	1.85	55.84	5.e-003	1.333e-002
147	2.2	2.05	55.84	5.e-003	1.333e-002
148	2.4	2.25	55.84	5.e-003	1.333e-002

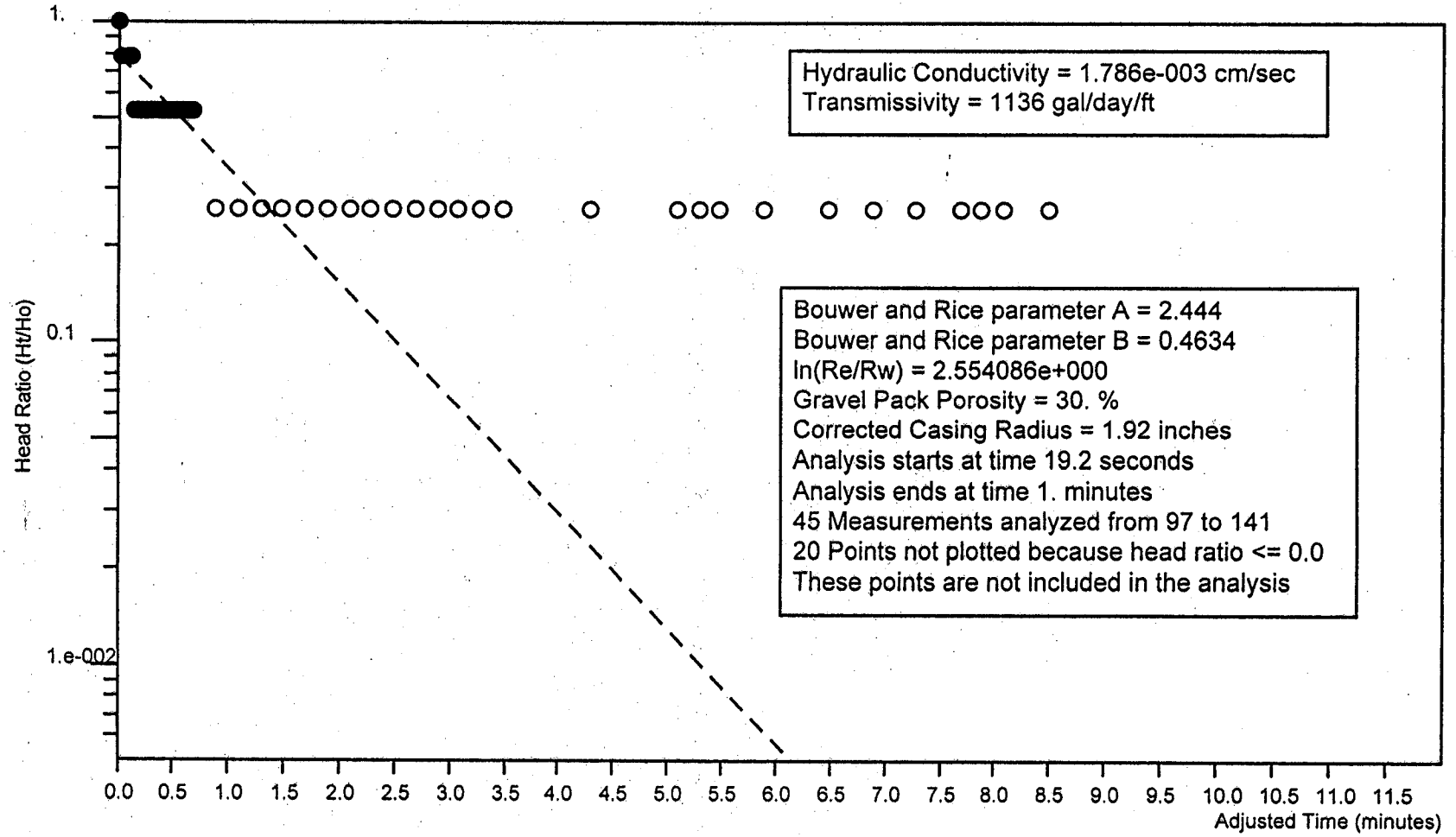
149	2.6	2.45	55.84	5.e-003	1.333e-002
150	2.8	2.65	55.84	5.e-003	1.333e-002
151	3.	2.85	55.84	5.e-003	1.333e-002
152	3.2	3.05	55.84	5.e-003	1.333e-002
153	3.4	3.25	55.84	5.e-003	1.333e-002
154	3.6	3.45	55.84	5.e-003	1.333e-002
155	3.8	3.65	55.84	5.e-003	1.333e-002
156	4.	3.85	55.85	0.	0.
157	4.2	4.05	55.85	0.	0.
158	4.4	4.25	55.85	0.	0.
159	4.6	4.45	55.84	5.e-003	1.333e-002
160	4.8	4.65	55.85	0.	0.
161	5.	4.85	55.85	0.	0.
162	5.2	5.05	55.85	0.	0.
163	5.4	5.25	55.84	5.e-003	1.333e-002
164	5.6	5.45	55.84	5.e-003	1.333e-002
165	5.8	5.65	55.84	5.e-003	1.333e-002
166	6.	5.85	55.85	0.	0.
167	6.2	6.05	55.84	5.e-003	1.333e-002
168	6.4	6.25	55.85	0.	0.
169	6.6	6.45	55.85	0.	0.
170	6.8	6.65	55.84	5.e-003	1.333e-002
171	7.	6.85	55.85	0.	0.
172	7.2	7.05	55.84	5.e-003	1.333e-002
173	7.4	7.25	55.85	0.	0.
174	7.6	7.45	55.84	5.e-003	1.333e-002
175	7.8	7.65	55.85	0.	0.
176	8.	7.85	55.84	5.e-003	1.333e-002
177	8.2	8.05	55.84	5.e-003	1.333e-002
178	8.4	8.25	55.84	5.e-003	1.333e-002
179	8.6	8.45	55.85	0.	0.
180	8.8	8.65	55.84	5.e-003	1.333e-002
181	9.	8.85	55.85	0.	0.
182	9.2	9.05	55.85	0.	0.
183	9.4	9.25	55.85	0.	0.
184	9.6	9.45	55.85	0.	0.
185	9.8	9.65	55.85	0.	0.
186	10.	9.85	55.85	0.	0.
187	12.	11.85	55.85	0.	0.

Aquifer Analysis 06/24/99

Bouwer and Rice Graph

ABTco, Inc.

FA-4-F



Analysis by MJT of Joyce Engineering, Inc.

Ho is 1.9e-002 feet at 19.2 seconds

Aquifer Analysis

Site Name: ABTco, Inc.
Test Date: 06/24/99
Import File: C:\mats docs\slugtest\projects\abtco\Fa-4-r

Well Label: FA-4-R
Aquifer Thickness: 30. feet
Screen Length: 15. feet
Casing Radius: 1.188 inches
Effective Radius: 3. inches
Gravel Pack Porosity: 30. %
Corrected Casing Radius: 1.92 inches
Static Water Level: 55.84 feet
Water Table to Screen Bottom: 8.1 feet
Anisotropy Ratio: 1.
Time Adjustment: 6.6 Seconds
Test starts with trial 23
There are 187 time and drawdown measurements
Maximum head is 0.474 feet
Minimum head is 0. feet

Trial	Time (minutes)	Adjusted Time (minutes)	Drawdown (feet)	Head (feet)	Head Ratio
1	0.	-0.11	55.85	1.e-002	2.11e-002
2	3.3e-003	-0.1067	55.84	5.e-003	1.055e-002
3	6.6e-003	-0.1034	55.84	5.e-003	1.055e-002
4	1.e-002	-0.1	55.84	5.e-003	1.055e-002
5	1.33e-002	-9.67e-002	55.84	5.e-003	1.055e-002
6	1.66e-002	-9.34e-002	55.84	5.e-003	1.055e-002
7	2.e-002	-9.e-002	55.84	5.e-003	1.055e-002
8	2.33e-002	-8.67e-002	55.84	5.e-003	1.055e-002
9	2.66e-002	-8.34e-002	55.86	1.9e-002	4.008e-002
10	3.e-002	-8.e-002	55.99	0.147	0.3101
11	3.33e-002	-7.67e-002	56.08	0.242	0.5105
12	3.66e-002	-7.34e-002	56.09	0.251	0.5295
13	4.e-002	-7.e-002	56.06	0.223	0.4705
14	4.33e-002	-6.67e-002	56.09	0.251	0.5295
15	4.66e-002	-6.34e-002	56.17	0.327	0.6899
16	5.e-002	-6.e-002	56.27	0.427	0.9008
17	5.33e-002	-5.67e-002	56.19	0.346	0.73
18	5.66e-002	-5.34e-002	56.25	0.413	0.8713
19	6.e-002	-5.e-002	56.29	0.455	0.9599
20	6.33e-002	-4.67e-002	56.24	0.403	0.8502
21	6.66e-002	-4.34e-002	56.27	0.427	0.9008
22	7.e-002	-4.e-002	56.3	0.46	0.9705
23	7.33e-002	-3.67e-002	56.31	0.465	0.981
24	7.66e-002	-3.34e-002	56.31	0.474	1.
25	8.e-002	-3.e-002	56.3	0.46	0.9705
26	8.33e-002	-2.67e-002	56.29	0.45	0.9494
27	8.66e-002	-2.34e-002	56.26	0.422	0.8903
28	9.e-002	-2.e-002	56.18	0.337	0.711
29	9.33e-002	-1.67e-002	56.1	0.256	0.5401
30	9.66e-002	-1.34e-002	56.04	0.199	0.4198
31	0.1	-1.e-002	55.99	0.152	0.3207
32	0.1033	-6.7e-003	55.96	0.119	0.2511
33	0.1066	-3.4e-003	55.93	9.e-002	0.1899
34	0.11	0.	55.92	7.6e-002	0.1603

35	0.1133	3.3e-003	55.9	6.2e-002	0.1308
36	0.1166	6.6e-003	55.89	5.2e-002	0.1097
37	0.12	1.e-002	55.89	4.7e-002	9.916e-002
38	0.1233	1.33e-002	55.88	4.3e-002	9.072e-002
39	0.1266	1.66e-002	55.88	3.8e-002	8.017e-002
40	0.13	2.e-002	55.88	3.8e-002	8.017e-002
41	0.1333	2.33e-002	55.88	3.8e-002	8.017e-002
42	0.1366	2.66e-002	55.87	3.3e-002	6.962e-002
43	0.14	3.e-002	55.87	3.3e-002	6.962e-002
44	0.1433	3.33e-002	55.87	3.3e-002	6.962e-002
45	0.1466	3.66e-002	55.88	3.8e-002	8.017e-002
46	0.15	4.e-002	55.87	3.3e-002	6.962e-002
47	0.1533	4.33e-002	55.87	3.3e-002	6.962e-002
48	0.1566	4.66e-002	55.87	3.3e-002	6.962e-002
49	0.16	5.e-002	55.87	3.3e-002	6.962e-002
50	0.1633	5.33e-002	55.87	3.3e-002	6.962e-002
51	0.1666	5.66e-002	55.87	2.9e-002	6.118e-002
52	0.17	6.e-002	55.87	2.9e-002	6.118e-002
53	0.1733	6.33e-002	55.87	3.3e-002	6.962e-002
54	0.1766	6.66e-002	55.87	2.9e-002	6.118e-002
55	0.18	7.e-002	55.87	2.9e-002	6.118e-002
56	0.1833	7.33e-002	55.86	1.9e-002	4.008e-002
57	0.1866	7.66e-002	55.86	1.9e-002	4.008e-002
58	0.19	8.e-002	55.87	2.9e-002	6.118e-002
59	0.1933	8.33e-002	55.86	2.4e-002	5.063e-002
60	0.1966	8.66e-002	55.86	2.4e-002	5.063e-002
61	0.2	9.e-002	55.86	2.4e-002	5.063e-002
62	0.2033	9.33e-002	55.86	2.4e-002	5.063e-002
63	0.2066	9.66e-002	55.86	2.4e-002	5.063e-002
64	0.21	1.e-001	55.86	2.4e-002	5.063e-002
65	0.2133	0.1033	55.89	4.7e-002	9.916e-002
66	0.2166	0.1066	55.86	1.9e-002	4.008e-002
67	0.22	0.11	55.86	2.4e-002	5.063e-002
68	0.2233	0.1133	55.86	2.4e-002	5.063e-002
69	0.2266	0.1166	55.86	1.9e-002	4.008e-002
70	0.23	0.12	55.86	2.4e-002	5.063e-002
71	0.2333	0.1233	55.86	2.4e-002	5.063e-002
72	0.2366	0.1266	55.86	2.4e-002	5.063e-002
73	0.24	0.13	55.86	2.4e-002	5.063e-002
74	0.2433	0.1333	55.86	2.4e-002	5.063e-002
75	0.2466	0.1366	55.86	2.4e-002	5.063e-002
76	0.25	0.14	55.86	1.9e-002	4.008e-002
77	0.2533	0.1433	55.86	1.9e-002	4.008e-002
78	0.2566	0.1466	55.86	2.4e-002	5.063e-002
79	0.26	0.15	55.86	1.9e-002	4.008e-002
80	0.2633	0.1533	55.86	1.9e-002	4.008e-002
81	0.2666	0.1566	55.86	1.9e-002	4.008e-002
82	0.27	0.16	55.86	1.9e-002	4.008e-002
83	0.2733	0.1633	55.86	1.9e-002	4.008e-002
84	0.2766	0.1666	55.86	1.9e-002	4.008e-002
85	0.28	0.17	55.86	1.9e-002	4.008e-002
86	0.2833	0.1733	55.86	1.9e-002	4.008e-002
87	0.2866	0.1766	55.86	1.9e-002	4.008e-002
88	0.29	0.18	55.86	1.9e-002	4.008e-002
89	0.2933	0.1833	55.86	1.9e-002	4.008e-002
90	0.2966	0.1866	55.86	1.9e-002	4.008e-002
91	0.3	0.19	55.86	1.9e-002	4.008e-002

92	0.3033	0.1933	55.86	1.9e-002	4.008e-002
93	0.3066	0.1966	55.86	1.9e-002	4.008e-002
94	0.31	0.2	55.86	1.9e-002	4.008e-002
95	0.3133	0.2033	55.86	1.9e-002	4.008e-002
96	0.3166	0.2066	55.86	1.9e-002	4.008e-002
97	0.32	0.21	55.86	1.9e-002	4.008e-002
98	0.3233	0.2133	55.86	1.9e-002	4.008e-002
99	0.3266	0.2166	55.86	1.9e-002	4.008e-002
100	0.33	0.22	55.86	1.9e-002	4.008e-002
101	0.3333	0.2233	55.86	1.9e-002	4.008e-002
102	0.35	0.24	55.86	1.9e-002	4.008e-002
103	0.3666	0.2566	55.86	1.9e-002	4.008e-002
104	0.3833	0.2733	55.85	1.4e-002	2.954e-002
105	0.4	0.29	55.85	1.4e-002	2.954e-002
106	0.4166	0.3066	55.85	1.4e-002	2.954e-002
107	0.4333	0.3233	55.85	1.4e-002	2.954e-002
108	0.45	0.34	55.85	1.4e-002	2.954e-002
109	0.4666	0.3566	55.85	1.4e-002	2.954e-002
110	0.4833	0.3733	55.85	1.4e-002	2.954e-002
111	0.5	0.39	55.85	1.4e-002	2.954e-002
112	0.5166	0.4066	55.85	1.4e-002	2.954e-002
113	0.5333	0.4233	55.85	1.4e-002	2.954e-002
114	0.55	0.44	55.85	1.4e-002	2.954e-002
115	0.5666	0.4566	55.85	1.4e-002	2.954e-002
116	0.5833	0.4733	55.85	1.4e-002	2.954e-002
117	0.6	0.49	55.85	1.4e-002	2.954e-002
118	0.6166	0.5066	55.85	1.4e-002	2.954e-002
119	0.6333	0.5233	55.85	1.4e-002	2.954e-002
120	0.65	0.54	55.85	1.4e-002	2.954e-002
121	0.6666	0.5566	55.85	1.4e-002	2.954e-002
122	0.6833	0.5733	55.85	1.e-002	2.11e-002
123	0.7	0.59	55.85	1.4e-002	2.954e-002
124	0.7166	0.6066	55.85	1.4e-002	2.954e-002
125	0.7333	0.6233	55.85	1.4e-002	2.954e-002
126	0.75	0.64	55.85	1.4e-002	2.954e-002
127	0.7666	0.6566	55.85	1.e-002	2.11e-002
128	0.7833	0.6733	55.85	1.e-002	2.11e-002
129	0.8	0.69	55.85	1.e-002	2.11e-002
130	0.8166	0.7066	55.85	1.e-002	2.11e-002
131	0.8333	0.7233	55.85	1.e-002	2.11e-002
132	0.85	0.74	55.85	1.e-002	2.11e-002
133	0.8666	0.7566	55.85	1.4e-002	2.954e-002
134	0.8833	0.7733	55.85	1.4e-002	2.954e-002
135	0.9	0.79	55.85	1.e-002	2.11e-002
136	0.9166	0.8066	55.85	1.e-002	2.11e-002
137	0.9333	0.8233	55.85	1.e-002	2.11e-002
138	0.95	0.84	55.85	1.e-002	2.11e-002
139	0.9666	0.8566	55.85	1.4e-002	2.954e-002
140	0.9833	0.8733	55.85	1.e-002	2.11e-002
141	1.	0.89	55.85	1.e-002	2.11e-002
142	1.2	1.09	55.85	1.4e-002	2.954e-002
143	1.4	1.29	55.85	1.e-002	2.11e-002
144	1.6	1.49	55.85	1.e-002	2.11e-002
145	1.8	1.69	55.85	1.e-002	2.11e-002
146	2.	1.89	55.85	1.e-002	2.11e-002
147	2.2	2.09	55.85	1.e-002	2.11e-002
148	2.4	2.29	55.85	1.e-002	2.11e-002

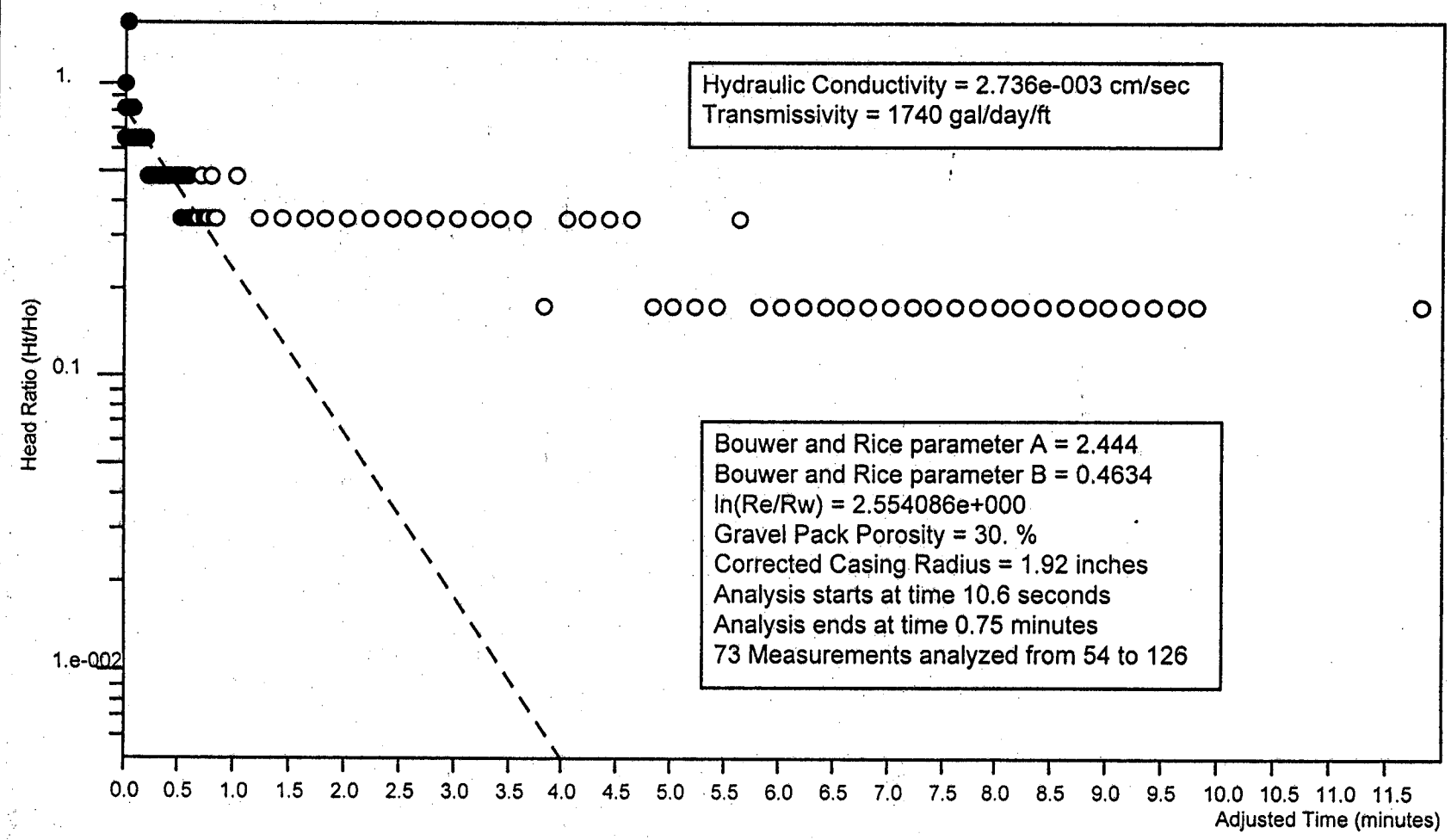
149	2.6	2.49	55.85	1.e-002	2.11e-002
150	2.8	2.69	55.85	1.e-002	2.11e-002
151	3.	2.89	55.85	1.e-002	2.11e-002
152	3.2	3.09	55.85	1.e-002	2.11e-002
153	3.4	3.29	55.85	1.e-002	2.11e-002
154	3.6	3.49	55.85	1.e-002	2.11e-002
155	3.8	3.69	55.85	1.e-002	2.11e-002
156	4.	3.89	55.84	5.e-003	1.055e-002
157	4.2	4.09	55.85	1.e-002	2.11e-002
158	4.4	4.29	55.85	1.e-002	2.11e-002
159	4.6	4.49	55.85	1.e-002	2.11e-002
160	4.8	4.69	55.85	1.e-002	2.11e-002
161	5.	4.89	55.84	5.e-003	1.055e-002
162	5.2	5.09	55.84	5.e-003	1.055e-002
163	5.4	5.29	55.84	5.e-003	1.055e-002
164	5.6	5.49	55.84	5.e-003	1.055e-002
165	5.8	5.69	55.85	1.e-002	2.11e-002
166	6.	5.89	55.84	5.e-003	1.055e-002
167	6.2	6.09	55.84	5.e-003	1.055e-002
168	6.4	6.29	55.84	5.e-003	1.055e-002
169	6.6	6.49	55.84	5.e-003	1.055e-002
170	6.8	6.69	55.84	5.e-003	1.055e-002
171	7.	6.89	55.84	5.e-003	1.055e-002
172	7.2	7.09	55.84	5.e-003	1.055e-002
173	7.4	7.29	55.84	5.e-003	1.055e-002
174	7.6	7.49	55.84	5.e-003	1.055e-002
175	7.8	7.69	55.84	5.e-003	1.055e-002
176	8.	7.89	55.84	5.e-003	1.055e-002
177	8.2	8.09	55.84	5.e-003	1.055e-002
178	8.4	8.29	55.84	5.e-003	1.055e-002
179	8.6	8.49	55.84	5.e-003	1.055e-002
180	8.8	8.69	55.84	5.e-003	1.055e-002
181	9.	8.89	55.84	5.e-003	1.055e-002
182	9.2	9.09	55.84	5.e-003	1.055e-002
183	9.4	9.29	55.84	5.e-003	1.055e-002
184	9.6	9.49	55.84	5.e-003	1.055e-002
185	9.8	9.69	55.84	5.e-003	1.055e-002
186	10.	9.89	55.84	5.e-003	1.055e-002
187	12.	11.89	55.84	5.e-003	1.055e-002

Aquifer Analysis 06/24/99

ABTco, Inc.

Bouwer and Rice Graph

FA-4-R



Analysis by MJT of Joyce Engineering, Inc.

Ho is 2.9e-002 feet at 10.6 seconds

APPENDIX V

Groundwater Analytical Results

Environmental Conservation Laboratories, Inc.
1015 Passport Way
Cary, North Carolina 27513
919 / 677-1669
Fax 919 / 677-9846
www.encolabs.com

ENCO Laboratories

Laboratory Narrative

Client: Joyce Engineering

Project No.: ABTco (364.03)

Lab No.: CR1043

Sample ID(s): Trip Blank, Equipment Blank

Contaminant: 2-Butanone

The above-referenced sample(s) had positive results in the original analysis above the calibrated linear range for 2-butanone. The subsequent dilution caused the RDL to be raised giving a non-detects at the raised level, but the original hits in the trip and equipment blanks were 120 and 450 ug/L respectively. The presence of 2-butanone is suspected as being due to laboratory contamination.

The water used in the trip and equipment blanks originated from the DI system in our Cary laboratory. This system was installed in late April of 1999 using plastic pipe that was glued together. MEK (2-butanone) is a compound that is used in the formulation of the primer and glue used in plumbing and specifically the pipes of our DI water system. Although the system has been flushed extensively, the pipes are still leaching out some of the more volatile constituents in the glue and primer used. A carbon filter is in place at the point of use, but due to the large amount of organics still leaching from the pipes, it experienced breakthrough much sooner than anticipated.
The source of the MEK in the trip and equipment blanks can be attributed to the above situation with a great deal of certainty.

There were no other anomalies encountered with this report.

Environmental Conservation Laboratories, Inc.

Richard M. Henson
Laboratory Manager

cc: Dr. Mark Inman, Corporate Quality Assurance Officer

Environmental Conservation Laboratories, Inc.
1015 Passport Way
Cary, North Carolina 27513
919 / 677-1669
Fax 919 / 677-9846
www.encolabs.com

ENCO Laboratories

CLIENT : Joyce Engineering
ADDRESS: 2301 West Meadowview Rd
Suite 203
Greensboro, NC 27407

REPORT # : CR1043
DATE SUBMITTED: June 25, 1999
DATE REPORTED : July 12, 1999

ATTENTION: Mr. Jim Bateson

SAMPLE IDENTIFICATION

Samples submitted and
identified by client as:

PROJECT #: 364.03

ABTco

06/24/99

#1	- FA-2	@ 12:35
#2	- FA-3	@ 12:48
#3	- FA-4	@ 14:55
#4	- EQUIPMENT BLANK	@ 14:45
#5	- TRIP BLANK	@ 00:00

LAB MANAGER
Richard M. Henson

RESULTS OF ANALYSIS

EPA METHOD APPENDIX I,8260 - VOLATILE ORGANICS	FA-2	FA-3	Units
Chloromethane	10 U	10 U	µg/L
Vinyl Chloride	10 U	10 U	µg/L
Bromomethane	10 U	10 U	µg/L
Chloroethane	10 U	10 U	µg/L
Trichlorofluoromethane	5.0 U	5.0 U	µg/L
1,1-Dichloroethene	5.0 U	5.0 U	µg/L
Acetone	100 U	100 U	µg/L
Iodomethane	10 U	10 U	µg/L
Carbon Disulfide	100 U	100 U	µg/L
Methylene Chloride	10 U	10 U	µg/L
Acrylonitrile	200 U	200 U	µg/L
t-1,2-Dichloroethene	5.0 U	5.0 U	µg/L
1,1-Dichloroethane	5.0 U	5.0 U	µg/L
Vinyl Acetate	50 U	50 U	µg/L
c-1,2-Dichloroethene	5.0 U	5.0 U	µg/L
2-Butanone	100 U	100 U	µg/L
Bromochloromethane	5.0 U	5.0 U	µg/L
Chloroform	5.0 U	5.0 U	µg/L
1,1,1-Trichloroethane	5.0 U	5.0 U	µg/L
Carbon tetrachloride	10 U	10 U	µg/L
Benzene	5.0 U	5.0 U	µg/L
Trichloroethene	5.0 U	5.0 U	µg/L
1,2-Dichloropropane	5.0 U	5.0 U	µg/L

U = Compound was analyzed for but not detected to the level shown.

RESULTS OF ANALYSIS

EPA METHOD APPENDIX I,8260 (cont.) - VOLATILE ORGANICS	FA-2	FA-3	Units
Bromodichloromethane	5.0 U	5.0 U	µg/L
c-1,3-Dichloropropene	10 U	10 U	µg/L
4-Methyl-2-Pentanone	100 U	100 U	µg/L
Toluene	5.0 U	5.0 U	µg/L
t-1,3-Dichloropropene	10 U	10 U	µg/L
1,1,2-Trichloroethane	5.0 U	5.0 U	µg/L
Tetrachloroethene	5.0 U	5.0 U	µg/L
2-Hexanone	50 U	50 U	µg/L
Dibromochloromethane	5.0 U	5.0 U	µg/L
1,2-Dibromoethane	5.0 U	5.0 U	µg/L
Chlorobenzene	5.0 U	5.0 U	µg/L
1,1,1,2-Tetrachloroethane	5.0 U	5.0 U	µg/L
Ethylbenzene	5.0 U	5.0 U	µg/L
m-Xylene & p-Xylene	5.0 U	5.0 U	µg/L
o-Xylene	5.0 U	5.0 U	µg/L
Styrene	10 U	10 U	µg/L
Bromoform	5.0 U	5.0 U	µg/L
1,1,2,2-Tetrachloroethane	5.0 U	5.0 U	µg/L
1,2,3-Trichloropropane	15 U	15 U	µg/L
t-1,4-Dichloro-2-Butene	100 U	100 U	µg/L
1,4-Dichlorobenzene	5.0 U	5.0 U	µg/L
1,2-Dichlorobenzene	5.0 U	5.0 U	µg/L
1,2-Dibromo-3-Chloropropane	25 U	25 U	µg/L
Surrogate:	**% RECOV**	**% RECOV**	**LIMITS**
Dibromofluoromethane	92	97	52-149
D8-Toluene	90	88	70-132
Bromofluorobenzene	99	95	60-135
Date Analyzed	06/30/99	06/30/99	

U = Compound was analyzed for but not detected to the level shown.

RESULTS OF ANALYSIS

EPA METHOD APPENDIXII,8270 - SEMIVOLATILE ORGANICS	FA-2	FA-3	Units
1,2,4,5-Tetrachlorobenzene	10 U	10 U	µg/L
1,2,4-Trichlorobenzene	10 U	10 U	µg/L
1,2-Dichlorobenzene	10 U	10 U	µg/L
1,3,5-Trinitrobenzene	10 U	10 U	µg/L
1,3-Dichlorobenzene	10 U	10 U	µg/L
1,4-Dichlorobenzene	10 U	10 U	µg/L
1,4-Naphthoquinone	10 U	10 U	µg/L
1-Naphthylenamine	10 U	10 U	µg/L
2,3,4,6-Tetrachlorophenol	10 U	10 U	µg/L
2,4,5-Trichlorophenol	10 U	10 U	µg/L
2,4,6-Trichlorophenol	10 U	10 U	µg/L
2,4-Dichlorophenol	10 U	10 U	µg/L
2,4-Dimethylphenol	10 U	10 U	µg/L
2,4-Dinitrophenol	50 U	50 U	µg/L
2,4-Dinitrotoluene	10 U	10 U	µg/L
2,6-Dichlorophenol	10 U	10 U	µg/L
2,6-Dinitrotoluene	10 U	10 U	µg/L
2-Acetylaminofluorene	10 U	10 U	µg/L
2-Chloronaphthalene	10 U	10 U	µg/L
2-Chlorophenol	10 U	10 U	µg/L
2-Methyl-4,6-dinitrophenol	30 U	30 U	µg/L
2-Methylnaphthalene	10 U	10 U	µg/L
2-Methylphenol	10 U	10 U	µg/L
2-Naphthylamine	10 U	10 U	µg/L
2-Nitroaniline	10 U	10 U	µg/L
2-Nitrophenol	10 U	10 U	µg/L
3 & 4-Methylphenol	20 U	20 U	µg/L
3,3'-Dichlorobenzidine	10 U	10 U	µg/L
3,3'-Dimethylbenzidine	10 U	10 U	µg/L
3-Methylcholanthrene	10 U	10 U	µg/L

U = Compound was analyzed for but not detected to the level shown.

RESULTS OF ANALYSIS

EPA METHOD APPENDIXII,8270 (cont.) - SEMIVOLATILE ORGANICS	FA-2	FA-3	Units
3-Nitroaniline	10 U	10 U	µg/L
4-Aminobiphenyl	10 U	10 U	µg/L
4-Bromophenylphenyl ether	10 U	10 U	µg/L
4-Chloro-3-methylphenol	10 U	10 U	µg/L
4-Chloroaniline	10 U	10 U	µg/L
4-Chlorophenyl phenyl ether	10 U	10 U	µg/L
4-Nitroaniline	10 U	10 U	µg/L
4-Nitrophenol	10 U	10 U	µg/L
5-Nitro-o-Toluidine	10 U	10 U	µg/L
7,12-Dimethylbenz(a)anthracene	10 U	10 U	µg/L
Acenaphthene	10 U	10 U	µg/L
Acenaphthylene	10 U	10 U	µg/L
Acetophenone	10 U	10 U	µg/L
Anthracene	10 U	10 U	µg/L
Benzo(a)anthracene	10 U	10 U	µg/L
Benzo(a)pyrene	10 U	10 U	µg/L
Benzo(b)fluoranthene	10 U	10 U	µg/L
Benzo(g,h,i)perylene	10 U	10 U	µg/L
Benzo(k)fluoranthene	10 U	10 U	µg/L
Benzyl Alcohol	10 U	10 U	µg/L
Benzylbutyl phthalate	10 U	10 U	µg/L
Bis(2-chloroethoxy)methane	10 U	10 U	µg/L
Bis(2-chloroethyl)ether	10 U	10 U	µg/L
Bis(2-chloroisopropyl)ether	10 U	10 U	µg/L
Bis(2-ethylhexyl)phthalate	10 U	10 U	µg/L
Chlorobenzilate	10 U	10 U	µg/L
Chrysene	10 U	10 U	µg/L
Di-n-butyl phthalate	10 U	10 U	µg/L
Di-n-octyl phthalate	10 U	10 U	µg/L
Diallate	10 U	10 U	µg/L
Dibenzo(a,h)anthracene	10 U	10 U	µg/L
Dibenzofuran	10 U	10 U	µg/L

U = Compound was analyzed for but not detected to the level shown.

RESULTS OF ANALYSIS

EPA METHOD APPENDIXII,8270 (cont.) - SEMIVOLATILE ORGANICS	FA-2	FA-3	Units
Diethyl phthalate	10 U	10 U	µg/L
Dimethoate	10 U	10 U	µg/L
Dimethyl phthalate	10 U	10 U	µg/L
Dinoseb	10 U	10 U	µg/L
Diphenylamine	10 U	10 U	µg/L
Disulfoton	10 U	10 U	µg/L
Ethyl methanesulfonate	10 U	10 U	µg/L
Famphur	10 U	10 U	µg/L
Fluoranthene	10 U	10 U	µg/L
Fluorene	10 U	10 U	µg/L
Hexachlorobenzene	10 U	10 U	µg/L
Hexachlorobutadiene	10 U	10 U	µg/L
Hexachlorocyclopentadiene	10 U	10 U	µg/L
Hexachloroethane	10 U	10 U	µg/L
Hexachloropropene	10 U	10 U	µg/L
Indeno(1,2,3-cd)pyrene	10 U	10 U	µg/L
Isodrin	10 U	10 U	µg/L
Isophorone	10 U	10 U	µg/L
Isosafrole	10 U	10 U	µg/L
m-Dinitrobenzene	10 U	10 U	µg/L
Methapyriline	10 U	10 U	µg/L
Methyl Parathion	10 U	10 U	µg/L
Methyl methanesulfonate	10 U	10 U	µg/L
N-Nitrosodi-n-Butylamine	10 U	10 U	µg/L
N-Nitrosodipropylamine	10 U	10 U	µg/L
N-Nitrosodiethylamine	10 U	10 U	µg/L
N-Nitrosodimethylamine	10 U	10 U	µg/L
N-Nitrosodiphenylamine	10 U	10 U	µg/L
N-Nitrosomethylethylamine	10 U	10 U	µg/L
N-Nitrosopiperidine	10 U	10 U	µg/L
N-Nitrosopyrrolidine	10 U	10 U	µg/L
Naphthalene	10 U	10 U	µg/L

U = Compound was analyzed for but not detected to the level shown.

RESULTS OF ANALYSIS

EPA METHOD APPENDIXII,8270 (cont.) - SEMIVOLATILE ORGANICS	FA-2	FA-3	Units
Nitrobenzene	10 U	10 U	µg/L
o,o,o-Triethyl Phosphorothioate	10 U	10 U	µg/L
o-Toluidine	10 U	10 U	µg/L
p-(dimethylamino)azobenzene	10 U	10 U	µg/L
p-Phenylenediamine	10 U	10 U	µg/L
Parathion	10 U	10 U	µg/L
Pentachlorobenzene	10 U	10 U	µg/L
Pentachloronitrobenzene	10 U	10 U	µg/L
Pentachlorophenol	10 U	10 U	µg/L
Phenacetin	10 U	10 U	µg/L
Phenanthrene	10 U	10 U	µg/L
Phenol	10 U	10 U	µg/L
Phorate	10 U	10 U	µg/L
Pronamide	10 U	10 U	µg/L
Pyrene	10 U	10 U	µg/L
Safrole	10 U	10 U	µg/L
Thionazin	10 U	10 U	µg/L
Surrogate:	**% RECOV**	**% RECOV**	**LIMITS**
Nitrobenzene -D5	51	74	44-135
2-Fluorobiphenyl	62	78	48-127
Terphenyl -D14	64	90	47-168
Phenol -D5	42	30	6-125
2-Fluorophenol	47	39	27-121
2,4,6-Tribromophenol	71	39#	58-144
Date Extracted	06/29/99	06/29/99	
Date Analyzed	07/01/99	07/01/99	

# = Surrogate recovery is outside laboratory established limits.
U = Compound was analyzed for but not detected to the level shown.

RESULTS OF ANALYSIS

TOTAL METALS	METHOD	FA-2	FA-3	Units
Antimony	7041	0.030 U	0.030 U	mg/L
Date Analyzed		07/04/99	07/04/99	
Arsenic	6010	0.010 U	0.010 U	mg/L
Date Analyzed		06/28/99	06/28/99	
Barium	6010	0.50 U	0.50 U	mg/L
Date Analyzed		06/28/99	06/28/99	
Beryllium	6010	0.0020 U	0.0020 U	mg/L
Date Analyzed		06/28/99	06/28/99	
Cadmium	6010	0.0010 U	**0.0020** I	mg/L
Date Analyzed		06/28/99	06/28/99	
Copper	6010	0.20 U	0.20 U	mg/L
Date Analyzed		06/28/99	06/28/99	
Chromium	6010	0.010 U	**0.045**	mg/L
Date Analyzed		06/28/99	06/28/99	
Cobalt	6010	0.010 U	**0.016**	mg/L
Date Analyzed		06/28/99	06/28/99	
Lead	6010	0.010 U	0.010 U	mg/L
Date Analyzed		06/28/99	06/28/99	

U = Compound was analyzed for but not detected to the level shown.
I = Analyte detected; value is between the Method Detection Level (MDL) and the Practical Quantitation Level (PQL).

RESULTS OF ANALYSIS

TOTAL METALS	METHOD	FA-2	FA-3	Units
Nickel	6010	0.050 U	0.050 U	mg/L
Date Analyzed		06/28/99	06/28/99	
Thallium	7841	0.010 U	0.010 U	mg/L
Date Analyzed		07/06/99	07/06/99	
Silver	6010	0.010 U	0.010 U	mg/L
Date Analyzed		06/28/99	06/28/99	
Vanadium	7911	0.040 U	0.040 U	mg/L
Date Anlayzed		07/07/99	07/07/99	
Zinc	6010	0.050 U	0.050 U	mg/L
Date Analyzed		06/28/99	06/28/99	

MISCELLANEOUS	METHOD	FA-2	FA-3	Units
Total Dis. Solids	160.1	280	150	mg/L
Date Analyzed		06/28/99	06/28/99	

U = Compound was analyzed for but not detected to the level shown.

RESULTS OF ANALYSIS

EPA METHOD APPENDIX I,8260 - VOLATILE ORGANICS	FA-4	EQUIPMENT BLANK	Units
Chloromethane	10 U	10 U	µg/L
Vinyl Chloride	10 U	10 U	µg/L
Bromomethane	10 U	10 U	µg/L
Chloroethane	10 U	10 U	µg/L
Trichlorofluoromethane	5.0 U	5.0 U	µg/L
1,1-Dichloroethene	5.0 U	5.0 U	µg/L
Acetone	100 U	100 U	µg/L
Iodomethane	10 U	10 U	µg/L
Carbon Disulfide	100 U	100 U	µg/L
Methylene Chloride	10 U	10 U	µg/L
Acrylonitrile	200 U	200 U	µg/L
t-1,2-Dichloroethene	5.0 U	5.0 U	µg/L
1,1-Dichloroethane	5.0 U	5.0 U	µg/L
Vinyl Acetate	50 U	50 U	µg/L
c-1,2-Dichloroethene	5.0 U	5.0 U	µg/L
2-Butanone	100 U	1000 U D1	µg/L
Bromochloromethane	5.0 U	5.0 U	µg/L
Chloroform	5.0 U	5.0 U	µg/L
1,1,1-Trichloroethane	5.0 U	5.0 U	µg/L
Carbon tetrachloride	10 U	10 U	µg/L
Benzene	5.0 U	5.0 U	µg/L
Trichloroethene	5.0 U	5.0 U	µg/L
1,2-Dichloropropane	5.0 U	5.0 U	µg/L

U = Compound was analyzed for but not detected to the level shown.
D1 = Analyte value determined from a 1:10 dilution.

RESULTS OF ANALYSIS

EPA METHOD APPENDIX I,8260 (cont.) - VOLATILE ORGANICS	FA-4	EQUIPMENT BLANK	Units
Bromodichloromethane	5.0 U	5.0 U	µg/L
c-1,3-Dichloropropene	10 U	10 U	µg/L
4-Methyl-2-Pentanone	100 U	100 U	µg/L
Toluene	5.0 U	5.0 U	µg/L
t-1,3-Dichloropropene	10 U	10 U	µg/L
1,1,2-Trichloroethane	5.0 U	5.0 U	µg/L
Tetrachloroethene	5.0 U	5.0 U	µg/L
2-Hexanone	50 U	50 U	µg/L
Dibromochloromethane	5.0 U	5.0 U	µg/L
1,2-Dibromoethane	5.0 U	5.0 U	µg/L
Chlorobenzene	5.0 U	5.0 U	µg/L
1,1,1,2-Tetrachloroethane	5.0 U	5.0 U	µg/L
Ethylbenzene	5.0 U	5.0 U	µg/L
m-Xylene & p-Xylene	5.0 U	5.0 U	µg/L
o-Xylene	5.0 U	5.0 U	µg/L
Styrene	10 U	10 U	µg/L
Bromoform	5.0 U	5.0 U	µg/L
1,1,2,2-Tetrachloroethane	5.0 U	5.0 U	µg/L
1,2,3-Trichloropropane	15 U	15 U	µg/L
t-1,4-Dichloro-2-Butene	100 U	100 U	µg/L
1,4-Dichlorobenzene	5.0 U	5.0 U	µg/L
1,2-Dichlorobenzene	5.0 U	5.0 U	µg/L
1,2-Dibromo-3-Chloropropane	25 U	25 U	µg/L
Surrogate:	**% RECOV**	**% RECOV**	**LIMITS**
Dibromofluoromethane	80	88	52-149
D8-Toluene	79	83	70-132
Bromofluorobenzene	89	91	60-135
Date Analyzed	06/30/99	07/01/99	

U = Compound was analyzed for but not detected to the level shown.

RESULTS OF ANALYSIS

EPA METHOD APPENDIXII,8270 - SEMIVOLATILE ORGANICS	FA-4	EQUIPMENT BLANK	Units
1,2,4,5-Tetrachlorobenzene	10 U	10 U	µg/L
1,2,4-Trichlorobenzene	10 U	10 U	µg/L
1,2-Dichlorobenzene	10 U	10 U	µg/L
1,3,5-Trinitrobenzene	10 U	10 U	µg/L
1,3-Dichlorobenzene	10 U	10 U	µg/L
1,4-Dichlorobenzene	10 U	10 U	µg/L
1,4-Naphthoquinone	10 U	10 U	µg/L
1-Naphthylenamine	10 U	10 U	µg/L
2,3,4,6-Tetrachlorophenol	10 U	10 U	µg/L
2,4,5-Trichlorophenol	10 U	10 U	µg/L
2,4,6-Trichlorophenol	10 U	10 U	µg/L
2,4-Dichlorophenol	10 U	10 U	µg/L
2,4-Dimethylphenol	10 U	10 U	µg/L
2,4-Dinitrophenol	50 U	50 U	µg/L
2,4-Dinitrotoluene	10 U	10 U	µg/L
2,6-Dichlorophenol	10 U	10 U	µg/L
2,6-Dinitrotoluene	10 U	10 U	µg/L
2-Acetylaminofluorene	10 U	10 U	µg/L
2-Chloronaphthalene	10 U	10 U	µg/L
2-Chlorophenol	10 U	10 U	µg/L
2-Methyl-4,6-dinitrophenol	30 U	30 U	µg/L
2-Methylnaphthalene	10 U	10 U	µg/L
2-Methylphenol	10 U	10 U	µg/L
2-Naphthylamine	10 U	10 U	µg/L
2-Nitroaniline	10 U	10 U	µg/L
2-Nitrophenol	10 U	10 U	µg/L
3 & 4-Methylphenol	20 U	20 U	µg/L
3,3'-Dichlorobenzidine	10 U	10 U	µg/L
3,3'-Dimethylbenzidine	10 U	10 U	µg/L
3-Methylcholanthrene	10 U	10 U	µg/L

U = Compound was analyzed for but not detected to the level shown.

RESULTS OF ANALYSIS

EPA METHOD APPENDIXII,8270 (cont.) - SEMIVOLATILE ORGANICS	FA-4	EQUIPMENT BLANK	Units
3-Nitroaniline	10 U	10 U	µg/L
4-Aminobiphenyl	10 U	10 U	µg/L
4-Bromophenylphenyl ether	10 U	10 U	µg/L
4-Chloro-3-methylphenol	10 U	10 U	µg/L
4-Chloroaniline	10 U	10 U	µg/L
4-Chlorophenyl phenyl ether	10 U	10 U	µg/L
4-Nitroaniline	10 U	10 U	µg/L
4-Nitrophenol	10 U	10 U	µg/L
5-Nitro-o-Toluidine	10 U	10 U	µg/L
7,12-Dimethylbenz(a)anthracene	10 U	10 U	µg/L
Acenaphthene	10 U	10 U	µg/L
Acenaphthylene	10 U	10 U	µg/L
Acetophenone	10 U	10 U	µg/L
Anthracene	10 U	10 U	µg/L
Benzo(a)anthracene	10 U	10 U	µg/L
Benzo(a)pyrene	10 U	10 U	µg/L
Benzo(b)fluoranthene	10 U	10 U	µg/L
Benzo(g,h,i)perylene	10 U	10 U	µg/L
Benzo(k)fluoranthene	10 U	10 U	µg/L
Benzyl Alcohol	10 U	10 U	µg/L
Benzylbutyl phthalate	10 U	10 U	µg/L
Bis(2-chloroethoxy)methane	10 U	10 U	µg/L
Bis(2-chloroethyl)ether	10 U	10 U	µg/L
Bis(2-chloroisopropyl)ether	10 U	10 U	µg/L
Bis(2-ethylhexyl)phthalate	10 U	10 U	µg/L
Chlorobenzilate	10 U	10 U	µg/L
Chrysene	10 U	10 U	µg/L
Di-n-butyl phthalate	10 U	10 U	µg/L
Di-n-octyl phthalate	10 U	10 U	µg/L
Diallate	10 U	10 U	µg/L
Dibenzo(a,h)anthracene	10 U	10 U	µg/L
Dibenzofuran	10 U	10 U	µg/L

U = Compound was analyzed for but not detected to the level shown.

RESULTS OF ANALYSIS

EPA METHOD APPENDIXII,8270 (cont.) - SEMIVOLATILE ORGANICS	FA-4	EQUIPMENT BLANK	Units
Diethyl phthalate	10 U	10 U	µg/L
Dimethoate	10 U	10 U	µg/L
Dimethyl phthalate	10 U	10 U	µg/L
Dinoseb	10 U	10 U	µg/L
Diphenylamine	10 U	10 U	µg/L
Disulfoton	10 U	10 U	µg/L
Ethyl methanesulfonate	10 U	10 U	µg/L
Famphur	10 U	10 U	µg/L
Fluoranthene	10 U	10 U	µg/L
Fluorene	10 U	10 U	µg/L
Hexachlorobenzene	10 U	10 U	µg/L
Hexachlorobutadiene	10 U	10 U	µg/L
Hexachlorocyclopentadiene	10 U	10 U	µg/L
Hexachloroethane	10 U	10 U	µg/L
Hexachloropropene	10 U	10 U	µg/L
Indeno(1,2,3-cd)pyrene	10 U	10 U	µg/L
Isodrin	10 U	10 U	µg/L
Isophorone	10 U	10 U	µg/L
Isosafrole	10 U	10 U	µg/L
m-Dinitrobenzene	10 U	10 U	µg/L
Methapyriline	10 U	10 U	µg/L
Methyl Parathion	10 U	10 U	µg/L
Methyl methanesulfonate	10 U	10 U	µg/L
N-Nitrosodi-n-Butylamine	10 U	10 U	µg/L
N-Nitrosodipropylamine	10 U	10 U	µg/L
N-Nitrosodiethylamine	10 U	10 U	µg/L
N-Nitrosodimethylamine	10 U	10 U	µg/L
N-Nitrosodiphenylamine	10 U	10 U	µg/L
N-Nitrosomethylethylamine	10 U	10 U	µg/L
N-Nitrosopiperidine	10 U	10 U	µg/L
N-Nitrosopyrrolidine	10 U	10 U	µg/L
Naphthalene	10 U	10 U	µg/L

U = Compound was analyzed for but not detected to the level shown.

RESULTS OF ANALYSIS

EPA METHOD APPENDIXII,8270 (cont.) - SEMIVOLATILE ORGANICS	FA-4	EQUIPMENT BLANK	Units
Nitrobenzene	10 U	10 U	µg/L
o,o,o-Triethyl Phosphorothioate	10 U	10 U	µg/L
o-Toluidine	10 U	10 U	µg/L
p-(dimethylamino)azobenzene	10 U	10 U	µg/L
p-Phenylenediamine	10 U	10 U	µg/L
Parathion	10 U	10 U	µg/L
Pentachlorobenzene	10 U	10 U	µg/L
Pentachloronitrobenzene	10 U	10 U	µg/L
Pentachlorophenol	10 U	10 U	µg/L
Phenacetin	10 U	10 U	µg/L
Phenanthrene	10 U	10 U	µg/L
Phenol	10 U	10 U	µg/L
Phorate	10 U	10 U	µg/L
Pronamide	10 U	10 U	µg/L
Pyrene	10 U	10 U	µg/L
Safrole	10 U	10 U	µg/L
Thionazin	10 U	10 U	µg/L
Surrogate:	**% RECOV**	**% RECOV**	**LIMITS**
Nitrobenzene -D5	76	66	44-135
2-Fluorobiphenyl	80	67	48-127
Terphenyl -D14	102	110	47-168
Phenol -D5	56	54	6-125
2-Fluorophenol	67	63	27-121
2,4,6-Tribromophenol	98	88	58-144
Date Extracted	06/29/99	06/29/99	
Date Analyzed	07/01/99	07/01/99	

U = Compound was analyzed for but not detected to the level shown.

ENCO LABORATORIES
REPORT # : CR1043
DATE REPORTED: July 12, 1999
REFERENCE : 364.03
PROJECT NAME : ABTco

RESULTS OF ANALYSIS

TOTAL METALS	METHOD	FA-4	EQUIPMENT BLANK	Units
Antimony	7041	0.030 U	0.030 U	mg/L
Date Analyzed		07/04/99	07/04/99	
Arsenic	6010	0.010 U	0.010 U	mg/L
Date Analyzed		06/28/99	06/28/99	
Barium	6010	0.50 U	0.50 U	mg/L
Date Analyzed		06/28/99	06/28/99	
Beryllium	6010	0.0020 U	0.0020 U	mg/L
Date Analyzed		06/28/99	06/28/99	
Cadmium	6010	**0.0050**	0.0010 U	mg/L
Date Analyzed		06/28/99	06/28/99	
Copper	6010	0.20 U	0.20 U	mg/L
Date Analyzed		06/28/99	06/28/99	
Chromium	6010	**0.048**	0.010 U	mg/L
Date Analyzed		06/28/99	06/28/99	
Cobalt	6010	**0.043**	0.010 U	mg/L
Date Analyzed		06/28/99	06/28/99	
Lead	6010	0.010 U	0.010 U	mg/L
Date Analyzed		06/28/99	06/28/99	

U = Compound was analyzed for but not detected to the level shown.

ENCO LABORATORIES
REPORT # : CR1043
DATE REPORTED: July 12, 1999
REFERENCE : 364.03
PROJECT NAME : ABTco

RESULTS OF ANALYSIS

TOTAL METALS	METHOD	FA-4	EQUIPMENT BLANK	Units
Nickel	6010	0.050 U	0.050 U	mg/L
Date Analyzed		06/28/99	06/28/99	
Silver	6010-	0.010 U	0.010 U	mg/L
Date Analyzed		06/28/99	06/28/99	
Thallium	7841	0.010 U	0.010 U	mg/L
Date Analyzed		070/06/99	07/06/99	
Vanadium	7911	0.040 U	0.040 U	mg/L
Date Analyzed		07/07/99	07/07/99	
Zinc	6010	**0.060** I	0.050 U	mg/L
Date Analyzed		06/28/99	06/28/99	

MISCELLANEOUS	METHOD	FA-4	EQUIPMENT BLANK	Units
Total Dis. Solids	160.1	**24**	**4.0**	mg/L
Date Analyzed		06/28/99	06/28/99	

U = Compound was analyzed for but not detected to the level shown.
I = Analyte detected; value is between the Method Detection Level (MDL) and the Practical Quantitation Level (PQL).

RESULTS OF ANALYSIS

EPA METHOD APPENDIX I,8260 - VOLATILE ORGANICS	TRIP BLANK		LAB BLANK	Units
Chloromethane	10 U		10 U	µg/L
Vinyl Chloride	10 U		10 U	µg/L
Bromomethane	10 U		10 U	µg/L
Chloroethane	10 U		10 U	µg/L
Trichlorofluoromethane	5.0 U		5.0 U	µg/L
1,1-Dichloroethene	5.0 U		5.0 U	µg/L
Acetone	100 U		100 U	µg/L
Iodomethane	10 U		10 U	µg/L
Carbon Disulfide	100 U		100 U	µg/L
Methylene Chloride	10 U		10 U	µg/L
Acrylonitrile	200 U		200 U	µg/L
t-1,2-Dichloroethene	5.0 U		5.0 U	µg/L
1,1-Dichloroethane	5.0 U		5.0 U	µg/L
Vinyl Acetate	50 U		50 U	µg/L
c-1,2-Dichloroethene	5.0 U		5.0 U	µg/L
2-Butanone	500 U	D2	100 U	µg/L
Bromochloromethane	5.0 U		5.0 U	µg/L
Chloroform	5.0 U		5.0 U	µg/L
1,1,1-Trichloroethane	5.0 U		5.0 U	µg/L
Carbon tetrachloride	10 U		10 U	µg/L
Benzene	5.0 U		5.0 U	µg/L
Trichloroethene	5.0 U		5.0 U	µg/L
1,2-Dichloropropane	5.0 U		5.0 U	µg/L

U = Compound was analyzed for but not detected to the level shown.
D2 = Analyte value determined from a 1:5 dilution.

RESULTS OF ANALYSIS

EPA METHOD APPENDIX I,8260 (cont.) - VOLATILE ORGANICS	TRIP BLANK	LAB BLANK	Units
Bromodichloromethane	5.0 U	5.0 U	µg/L
c-1,3-Dichloropropene	10 U	10 U	µg/L
4-Methyl-2-Pentanone	100 U	100 U	µg/L
Toluene	5.0 U	5.0 U	µg/L
t-1,3-Dichloropropene	10 U	10 U	µg/L
1,1,2-Trichloroethane	5.0 U	5.0 U	µg/L
Tetrachloroethene	5.0 U	5.0 U	µg/L
2-Hexanone	50 U	50 U	µg/L
Dibromochloromethane	5.0 U	5.0 U	µg/L
1,2-Dibromoethane	5.0 U	5.0 U	µg/L
Chlorobenzene	5.0 U	5.0 U	µg/L
1,1,1,2-Tetrachloroethane	5.0 U	5.0 U	µg/L
Ethylbenzene	5.0 U	5.0 U	µg/L
m-Xylene & p-Xylene	5.0 U	5.0 U	µg/L
o-Xylene	5.0 U	5.0 U	µg/L
Styrene	10 U	10 U	µg/L
Bromoform	5.0 U	5.0 U	µg/L
1,1,2,2-Tetrachloroethane	5.0 U	5.0 U	µg/L
1,2,3-Trichloropropane	15 U	15 U	µg/L
t-1,4-Dichloro-2-Butene	100 U	100 U	µg/L
1,4-Dichlorobenzene	5.0 U	5.0 U	µg/L
1,2-Dichlorobenzene	5.0 U	5.0 U	µg/L
1,2-Dibromo-3-Chloropropane	25 U	25 U	µg/L
Surrogate:	**% RECOV**	**% RECOV**	**LIMITS**
Dibromofluoromethane	101	82	52-149
D8-Toluene	92	84	70-132
Bromofluorobenzene	100	92	60-135
Date Analyzed	07/01/99	06/30/99	

U = Compound was analyzed for but not detected to the level shown.

RESULTS OF ANALYSIS

EPA METHOD APPENDIXII,8270 - SEMIVOLATILE ORGANICS	LAB BLANK	Units
1,2,4,5-Tetrachlorobenzene	10 U	µg/L
1,2,4-Trichlorobenzene	10 U	µg/L
1,2-Dichlorobenzene	10 U	µg/L
1,3,5-Trinitrobenzene	10 U	µg/L
1,3-Dichlorobenzene	10 U	µg/L
1,4-Dichlorobenzene	10 U	µg/L
1,4-Naphthoquinone	10 U	µg/L
1-Naphthylenamine	10 U	µg/L
2,3,4,6-Tetrachlorophenol	10 U	µg/L
2,4,5-Trichlorophenol	10 U	µg/L
2,4,6-Trichlorophenol	10 U	µg/L
2,4-Dichlorophenol	10 U	µg/L
2,4-Dimethylphenol	10 U	µg/L
2,4-Dinitrophenol	50 U	µg/L
2,4-Dinitrotoluene	10 U	µg/L
2,6-Dichlorophenol	10 U	µg/L
2,6-Dinitrotoluene	10 U	µg/L
2-Acetylaminofluorene	10 U	µg/L
2-Chloronaphthalene	10 U	µg/L
2-Chlorophenol	10 U	µg/L
2-Methyl-4,6-dinitrophenol	30 U	µg/L
2-Methylnaphthalene	10 U	µg/L
2-Methylphenol	10 U	µg/L
2-Naphthylamine	10 U	µg/L
2-Nitroaniline	10 U	µg/L
2-Nitrophenol	10 U	µg/L
3 & 4-Methylphenol	20 U	µg/L
3,3'-Dichlorobenzidine	10 U	µg/L
3,3'-Dimethylbenzidine	10 U	µg/L
3-Methylcholanthrene	10 U	µg/L

U = Compound was analyzed for but not detected to the level shown.

RESULTS OF ANALYSIS

EPA METHOD APPENDIXII,8270 (cont.) - SEMIVOLATILE ORGANICS	LAB BLANK	Units
3-Nitroaniline	10 U	µg/L
4-Aminobiphenyl	10 U	µg/L
4-Bromophenylphenyl ether	10 U	µg/L
4-Chloro-3-methylphenol	10 U	µg/L
4-Chloroaniline	10 U	µg/L
4-Chlorophenyl phenyl ether	10 U	µg/L
4-Nitroaniline	10 U	µg/L
4-Nitrophenol	10 U	µg/L
5-Nitro-o-Toluidine	10 U	µg/L
7,12-Dimethylbenz(a)anthracene	10 U	µg/L
Acenaphthene	10 U	µg/L
Acenaphthylene	10 U	µg/L
Acetophenone	10 U	µg/L
Anthracene	10 U	µg/L
Benzo(a)anthracene	10 U	µg/L
Benzo(a)pyrene	10 U	µg/L
Benzo(b)fluoranthene	10 U	µg/L
Benzo(g,h,i)perylene	10 U	µg/L
Benzo(k)fluoranthene	10 U	µg/L
Benzyl Alcohol	10 U	µg/L
Benzylbutyl phthalate	10 U	µg/L
Bis(2-chloroethoxy)methane	10 U	µg/L
Bis(2-chloroethyl)ether	10 U	µg/L
Bis(2-chloroisopropyl)ether	10 U	µg/L
Bis(2-ethylhexyl)phthalate	10 U	µg/L
Chlorobenzilate	10 U	µg/L
Chrysene	10 U	µg/L
Di-n-butyl phthalate	10 U	µg/L
Di-n-octyl phthalate	10 U	µg/L
Diallate	10 U	µg/L
Dibenzo(a,h)anthracene	10 U	µg/L
Dibenzofuran	10 U	µg/L

U = Compound was analyzed for but not detected to the level shown.

RESULTS OF ANALYSIS

EPA METHOD APPENDIXII,8270 (cont.) - SEMIVOLATILE ORGANICS	LAB BLANK	Units
Diethyl phthalate	10 U	µg/L
Dimethoate	10 U	µg/L
Dimethyl phthalate	10 U	µg/L
Dinoseb	10 U	µg/L
Diphenylamine	10 U	µg/L
Disulfoton	10 U	µg/L
Ethyl methanesulfonate	10 U	µg/L
Famphur	10 U	µg/L
Fluoranthene	10 U	µg/L
Fluorene	10 U	µg/L
Hexachlorobenzene	10 U	µg/L
Hexachlorobutadiene	10 U	µg/L
Hexachlorocyclopentadiene	10 U	µg/L
Hexachloroethane	10 U	µg/L
Hexachloropropene	10 U	µg/L
Indeno(1,2,3-cd)pyrene	10 U	µg/L
Isodrin	10 U	µg/L
Isophorone	10 U	µg/L
Isosafrole	10 U	µg/L
m-Dinitrobenzene	10 U	µg/L
Methapyriline	10 U	µg/L
Methyl Parathion	10 U	µg/L
Methyl methanesulfonate	10 U	µg/L
N-Nitrosodi-n-Butylamine	10 U	µg/L
N-Nitrosodipropylamine	10 U	µg/L
N-Nitrosodiethylamine	10 U	µg/L
N-Nitrosodimethylamine	10 U	µg/L
N-Nitrosodiphenylamine	10 U	µg/L
N-Nitrosomethylethylamine	10 U	µg/L
N-Nitrosopiperidine	10 U	µg/L
N-Nitrosopyrrolidine	10 U	µg/L
Naphthalene	10 U	µg/L

U = Compound was analyzed for but not detected to the level shown.

RESULTS OF ANALYSIS

EPA METHOD APPENDIXII,8270 (cont.) - SEMIVOLATILE ORGANICS	LAB BLANK	Units
Nitrobenzene	10 U	µg/L
o,o,o-Triethyl Phosphorothioate	10 U	µg/L
o-Toluidine	10 U	µg/L
p-(dimethylamino)azobenzene	10 U	µg/L
p-Phenylenediamine	10 U	µg/L
Parathion	10 U	µg/L
Pentachlorobenzene	10 U	µg/L
Pentachloronitrobenzene	10 U	µg/L
Pentachlorophenol	10 U	µg/L
Phenacetin	10 U	µg/L
Phenanthrene	10 U	µg/L
Phenol	10 U	µg/L
Phorate	10 U	µg/L
Pronamide	10 U	µg/L
Pyrene	10 U	µg/L
Safrole	10 U	µg/L
Thionazin	10 U	µg/L
Surrogate:	**% RECOV**	**LIMITS**
Nitrobenzene -D5	75	44-135
2-Fluorobiphenyl	84	48-127
Terphenyl -D14	117	47-168
Phenol -D5	64	6-125
2-Fluorophenol	78	27-121
2,4,6-Tribromophenol	114	58-144
Date Extracted	06/29/99	
Date Analyzed	07/01/99	

U = Compound was analyzed for but not detected to the level shown.

RESULTS OF ANALYSIS

TOTAL METALS	METHOD	LAB BLANK	Units
Antimony	7041	0.030 U	mg/L
Date Analyzed		07/04/99	
Arsenic	6010	0.010 U	mg/L
Date Analyzed		06/28/99	
Barium	6010	0.50 U	mg/L
Date Analyzed		06/28/99	
Beryllium	6010	0.0020 U	mg/L
Date Analyzed		06/28/99	
Cadmium	6010	0.0010 U	mg/L
Date Analyzed		06/28/99	
Copper	6010	0.20 U	mg/L
Date Analyzed		06/28/99	
Chromium	6010	0.010 U	mg/L
Date Analyzed		06/28/99	
Cobalt	6010	0.010 U	mg/L
Date Analyzed		06/28/99	
Lead	6010	0.010 U	mg/L
Date Analyzed		06/28/99	

U = Compound was analyzed for but not detected to the level shown.

RESULTS OF ANALYSIS

TOTAL METALS	METHOD	LAB BLANK	Units
Nickel	6010	0.050 U	mg/L
Date Analyzed		06/28/99	
Silver	6010	0.010 U	mg/L
Date Analyzed		06/28/99	
Thallium	7841	0.010 U	mg/L
Date Analyzed		07/06/99	
Vanadium	7911	0.040 U	mg/L
Date Analyzed		07/07/99	
Zinc	6010	0.050 U	mg/L
Date Analyzed		06/28/99	

MISCELLANEOUS	METHOD	LAB BLANK	Units
Total Dis. Solids	160.1	1.0 U	mg/L
Date Analyzed		06/28/99	

U = Compound was analyzed for but not detected to the level shown.

QUALITY CONTROL DATA

Parameter	% RECOVERY MS/MSD/LCS	ACCEPT LIMITS	% RPD MS/MSD	ACCEPT LIMITS
EPA Method 8260 (FA-2,FA-3,FA-4,EQUIPMENT BLANK,TRIP BLANK)				
1,1-Dichloroethene	89/ 88/ 94	36-185	1	34
Benzene	122/131/132	65-143	7	25
Trichloroethene	82/ 81/ 79	51-152	1	28
Toluene	106/112/158	62-144	6	24
Chlorobenzene	89/ 88/ 89	64-140	1	23
EPA Method 8270				
Phenol	52/ 48/ 58	29-102	8	44
2-Chlorophenol	92/ 78/ 96	58-124	16	41
1,4-Dichlorobenzene	94/ 76/104	D-127	21	43
N-Nitrosodi-N-Propylamine	87/ 77/ 94	72-118	12	22
1,2,4-Trichlorobenzene	99/ 80/103	78-129	21	43
4-Chloro-3-methylphenol	100/100/110	75-126	<1	22
Acenaphthene	96/ 83/ 98	63-122	14	28
4-Nitrophenol	88/ 68/ 76	D-168	26	52
2,4-Dinitrotoluene	120/114/130	81-151	5	21
Pentachlorophenol	108/ 90/140	27-154	18	42
Pyrene	108/113/110	54-146	4	32

Environmental Conservation Laboratories Comprehensive QA Plan #960038

< = Less Than
MS = Matrix Spike
MSD = Matrix Spike Duplicate
LCS = Laboratory Control Standard
RPD = Relative Percent Difference

This report shall not be reproduced except in full, without the written approval of the laboratory. Results for these procedures apply only to the samples as submitted.

QUALITY CONTROL DATA

Parameter	% RECOVERY MS/MSD/LCS	ACCEPT LIMITS	% RPD MS/MSD	ACCEPT LIMITS
Total Metals				
Arsenic, 200.7	98/ 99/100	64-126	1	12
Barium, 200.7	97/100/104	74-119	3	11
Beryllium, 200.7	102/103/103	76-126	<1	12
Cadmium, 200.7	99/100/104	68-121	1	12
Copper, 200.7	102/103/101	75-123	<1	11
Chromium, 200.7	100/100/104	73-120	<1	10
Cobalt, 200.7	98/ 99/105	76-120	1	17
Lead, 200.7	99/ 99/102	68-126	<1	19
Nickel, 200.7	95/ 96/101	64-126	1	12
Silver, 200.7	105/106/105	69-121	<1	12
Zinc, 200.7	100/102/103	63-131	2	24
Miscellaneous				
Total Dis. Solids, 160.1	NA/ NA/105	-	NA	

Environmental Conservation Laboratories Comprehensive QA Plan #960038

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MSD = Matrix Spike Duplicate
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RPD = Relative Percent Difference

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QSARF #_____

ENVIRONMENTAL CONSERVATION LABORATORIES

4810 Executive Park Court, Suite 211
Jacksonville, Florida 32216-6069
Ph. (904) 296-3007 • Fax (904) 296-6210

10207 General Drive
Orlando, Florida 32824-8529
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1015 Passport Way
Cary, North Carolina 27513
Ph. (919) 677-1669 • Fax (919) 677-9846

ENCO CompQAP No.: 960038G/0

CHAIN OF CUSTODY RECORD

PROJECT REFERENCE	PROJECT NO.	P.O. NUMBER
ABT Co	364.03	

PROJECT LOC. (State)	SAMPLER(s) NAME	PHONE	FAX
	Mike McFeeley	336 323 0092	336 323 0098

CLIENT NAME	CLIENT PROJECT MANAGER
Joyce Engineering	Jim Bateson

CLIENT ADDRESS (CITY, STATE, ZIP)
2301 West Meadowview Rd, Suite 203, Greensboro, NC, 27407

PAGE ____ OF ____

☐ STANDARD REPORT DELIVERY

☐ EXPEDITED REPORT DELIVERY (surcharge)

Date Due:_____

SAMPLE						MATRIX TYPE										REQUIRED ANALYSIS								
STATION	DATE	TIME	GRAB	COMP	SAMPLE IDENTIFICATION	SURFACE WATER	GROUND WATER	WASTEWATER	DRINKING WATER	SOIL/SOLID/SEDIMENT	NONAQUEOUS LIQUID (oil, solvent, etc.)	AIR	SLUDGE	OTHER	PRESERVATIVE	NC APP. I 8270 *	TOTAL DISS. SOLIDS	NC APP I VOA'S ONLY						REMARKS
															NUMBER OF CONTAINERS SUBMITTED								
1 FA-2	6-24-99	12:35	X		FA-2	X									X	X	X							
2 FA-3	6-24-99	12:48	X		FA-3	X									X	X	X							
3 FA-4	6-24-99	14:55	X		FA-4	X									X	X	X							
4 EB	6-24-99	14:45	X		Equipment Blank									X	X	X	X							
5					Trip Blank									X				X						
6																								
7																								
8																								
9																								
10																								
11																								
12																								
13																								
14																								

SAMPLE KIT PREPARED BY: ☐JACKSONVILLE ☐ORLANDO	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME
RELINQUISHED BY: (SIGNATURE)	6-24-99	19:00	RECEIVED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME
RECEIVED BY (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME

RECEIVED FOR LABORATORY BY: (SIGNATURE)	DATE	TIME	CUSTODY INTACT	ENCO LOG NO.	REMARKS
~~Jacksonville~~ Cary ☐ Orlando	06/25/99	10:30	X YES ☐ NO	CR1043	* 8270 ANALYSIS TO INCLUDE NAPTHALENES AND PHENOLS.

DATE: 6-24-99

ENGINEERING, INC.

GROUND WATER SAMPLING LOG

Project Name: ABT CO **Project No./Task No.:** 364.03

Well ID: FA-2 **Sampler(s):** M. McFEELEY / M. TISCHLER

Well Location:

Well Diameter: 2 inches

Initial Depth to Water (DTW): 17.14 feet

Depth to Bottom (DTB): 29.02 feet

Water Column Thickness (WCT): 11.88 feet [DTB-DTW]

Calculation for One Well Volume (WV):

For 2" Well: WCT X 0.163 = 2 gallons

For 4" Well: WCT X 0.653 = gallons

For THREE Well Volumes: WV X 3 = 6 gallons

Actual Amount Purged/Bailed : 6 gallons

Purged with: DISPOSABLE BAILER

Sampled with: DISPOSABLE BAILER

Depth to Water before Sampling : 18.93 feet

Gallons	Time	Temp(°C)	pH	Cond. (mho)	Turb.(ntu)	Initials
0	12:20	18.4	5.77	351	42.5	MMC
2	12:23	17.0	5.85	355	32.3	MMC
4	12:25	16.7	5.87	354	25.4	MMC
6	12:28	16.8	5.93	354	24.3	MMC
Before Sampling	12:35	16.7	5.96	355	23.6	MMC

Comments (weather conditions, odor, color, silt, etc.):

SAMPLE IS CLEAR.

Signature: [signature] **Date:** 6-24-99

QA/QC Sign Off: **Date:**

DATE: 6-24-99

ENGINEERING, INC.

GROUND WATER SAMPLING LOG

Project Name: ABT CO **Project No./Task No.:** 364.03

Well ID: EA-3 **Sampler(s):** M. MCFEELEY / M. TISCHLER

Well Location:

Well Diameter: 2 inches

Initial Depth to Water (DTW): 12.65 feet

Depth to Bottom (DTB): 27.0 feet

Water Column Thickness (WCT): 14.35 feet [DTB-DTW]

Calculation for One Well Volume (WV):

For 2" Well: WCT X 0.163 = 2.3 gallons

For 4" Well: WCT X 0.653 = _____ gallons

For THREE Well Volumes: WV X 3 = 6.9 gallons

Actual Amount Purged/Bailed : 6.9 gallons

Purged with: DISPOSABLE BAILER

Sampled with: DISPOSABLE BAILER

Depth to Water before Sampling : 13.26 feet

Gallons	Time	Temp(°C)	pH	Cond. (mho)	Turb.(ntu)	Initials
0	11:10	20.9	6.80	279	205	
2.3	11:15	19.0	6.83	239	>440	
4.6	11:18	18.5	6.84	228	>440	
6.9	11:21	18.2	7.08	245	>440	
Before Sampling	12:48	18.8	6.93	251	187	

Comments (weather conditions, odor, color, silt, etc.):

SAMPLE IS CLOUDY, YELLOW W/ SILT.

Signature: _____ **Date:** 6-24-99

QA/QC Sign Off: _____ **Date:** _____

DATE: 6-24-99

JOYCE ENGINEERING, INC.

GROUND WATER SAMPLING LOG

Project Name: ABT CO **Project No./Task No.:** 364.03

Well ID: FA-4 **Sampler(s):** M. McFEELEY / M. TISCHLETZ

Well Location:

Well Diameter: 2 inches

Initial Depth to Water (DTW): 55.85 feet

Depth to Bottom (DTB): 63.95 feet

Water Column Thickness (WCT): 8.10 feet [DTB-DTW]

Calculation for One Well Volume (WV):

For 2" Well: WCT X 0.163 = 1.3 gallons

For 4" Well: WCT X 0.653 = _____ gallons

For THREE Well Volumes: WV X 3 = 3.9 gallons

Actual Amount Purged/Bailed : 3.9 gallons

Purged with: DISPOSABLE BAILER

Sampled with: DISPOSABLE BAILER

Depth to Water before Sampling : 56.72 feet

Gallons	Time	Temp(°C)	pH	Cond. (mho)	Turb.(ntu)	Initials
0	14:30	19.5	6.52	99	>440	MLMC
1.3	14:33	17.0	6.52	42	>440	MLMC
2.6	14:35	16.5	6.32	43	>440	MLMC
3.9	14:38	16.3	6.37	47	>440	MLMC
Before Sampling	14:55	16.2	6.35	44	>440	MLMC

Comments (weather conditions, odor, color, silt, etc.):

SAMPLE IS CLOUDY BROWN W/ SILT.

Signature: _____ **Date:** 6-24-99

QA/QC Sign Off: _____ **Date:** _____

Drawing Under Seperate Cover

Operation and Maintenance Procedures

Waste Route

Waste transport vehicles will enter the landfill area through the existing access road. Trucks will unload at the active end of the phase. Temporary access roads will be constructed, modified, and maintained as necessary for each phase of development. Access roads will be maintained as necessary for each phase of development.

Development of Phases

The proposed landfill will consist of three phases. The first phase is currently in operation and is located on the western portion of the footprint. The next two phases will progress in an easterly direction. The phasing progression has been designed to allow subsequent phases to build onto the existing phase with the limited need for the construction of new access roads. Each phase subsequent to the first phase will be ready for waste placement before the preceding phase reaches capacity. Capacity development in advance of disposal need will ensure continuous waste disposal operations and aid in eliminating time lost due to phase preparation. The phasing progression is shown on Sheet 5 of the engineering drawings.

Waste Handling and Placement

The ash and sludge will be stored in stockpiles in the landfill until they can be mixed with a bulldozer (at approximately a 2:1 weight ratio based on projected generation rates). The mixture will then be transported to the active phase of the landfill on the existing access road by dump truck, and spread and compacted with heavy equipment. The waste will be spread to the landfill in thin lifts and compacted by field equipment.

A daily cover is not anticipated to be needed due to the consistency of the ash/sludge mixture and the use of the dust suppression/cooling water system as described in the next section.

Dust Suppression/Cooling Water

The existing water transport network will continue to be used to cool hot ash and minimize dust production. The existing fire suppression system consists of a number of sprinkler heads and fire houses supplying water piped from the mill to the landfill. This system runs continuously when hot ash is being placed in the landfill. With the addition of the Zinc/Borate sludge to the waste stream, the addition of hot fly ash to the landfill should be kept to a minimum due to the hot fly ash being mixed with sludge prior to placement in the landfill. The fire houses are stocked with hosing long enough to respond to brush fires in the surrounding vicinity in the case of an emergency.

Stormwater Monitoring

All surface run- on or run-off from the landfill will be directed to the sediment pond or towards designated discharge locations. Water velocity will be slowed at the discharge locations by riprap in sufficient quantity and shape to minimize erosion downstream. Stormwater discharge from the sediment pond will be controlled by the spillway outlet pipe. The spillway outlet pipe will connect to an existing pipe that discharges downstream to another sediment trap. The pond is sized to retain the run-off from the 10-year frequency, 24-hour storm at the elevation of the principal spillway. The principal spillway has the capacity to carry a 25-year frequency, 24-hour storm event without overflowing into the emergency spillway. Stormwater management details are shown on Sheet 4 of the engineering drawings.

Landfill Maintenance

Pre-closure

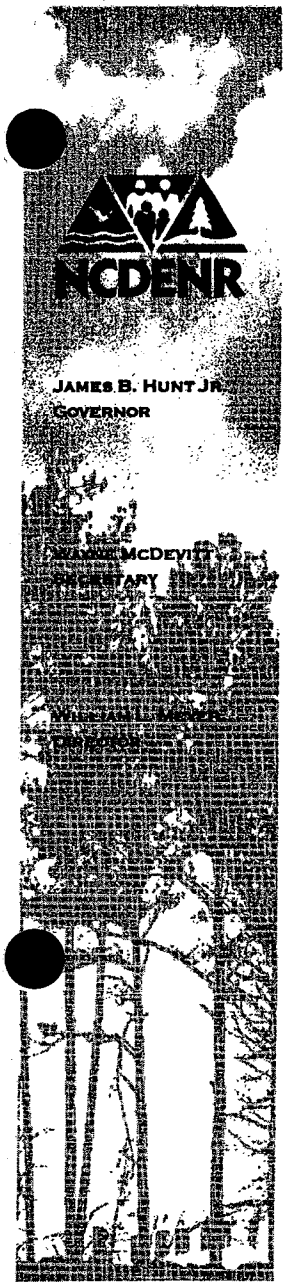
During landfill operation, the landfill will be periodically inspected to check for and document evidence of erosion, run-on and run-off control measures, sediment basin structures, and integrity of the embankments surrounding the landfill. Erosion taking place on the landfill slopes will be repaired immediately and compacted in place using field equipment. Diversion berms will be inspected to make sure surface run-on is not reaching the waste material. Check dams will be inspected to make sure run-off water is being dissipated as designed and downstream erosion is not an issue. The sediment basin will be inspected to make sure the riser pipe and outlet structure are free of obstructions. If a significant amount of sediment has accumulated in the basin, the sediment will be mechanically removed and placed in the landfill.

The embankment to the south and west of the landfill will be periodically bush hogged at least annually to remove any trees and woody vegetation. This will help maintain the slope stability of the embankment.

Post-closure

After phase and final closure, the landfill will receive a periodic walk through to check for and document evidence of settling, subsidence, erosion, and other potential failures of the final cover. These inspections will also encompass the perimeter berm, ditches, channels, and sedimentation basins to ensure stormwater run-on and run-off is being properly routed.

In addition, the landfill will be mowed, fertilized, and seeded as necessary. This will help to protect the final cover against erosion and maintain slope stability. Any vegetation that poses a danger to the integrity of the final cover, such as trees and woody vegetation, will be removed.



NORTH CAROLINA DEPARTMENT OF
ENVIRONMENT AND NATURAL RESOURCES
DIVISION OF WASTE MANAGEMENT

October 27, 1999

Mr. Eric Burke
Environmental Engineer
Louisiana Pacific / ABTco, Inc.
P.O. Box 98
Hwy. 268
Roaring River, N.C. 28669

RE: Water Quality Monitoring at the Industrial Landfill -- Permit # 97-03.

Dear Mr. Burke,

The *Monitoring Well Installation and Analysis* report submitted to the Solid Waste Section addresses most of the requirements requested in the December 9, 1998 letter. Conclusions in the report suggest groundwater standards established under 15A NCAC 2L will not be exceeded in the uppermost aquifer at the compliance boundary. There are a few remaining items that need to be addressed to meliorate the groundwater demonstration.

Have there been any changes to the materials used as boiler fuel? Does the wood ash still serve as a material that could be incorporated as a soil amendment as indicated in the *Waste Analysis* report dated February 1995?

Provide a drawing indicating property boundaries. The area that needs to be defined is south and west of the landfill. A tax property map is acceptable.

There is an intermittent stream downgradient of the ash landfill. A surface water sample needs to be added to the water quality monitoring regime. The surface water sample should be taken as close to the head of the stream as reasonable. The surface water location should be staked to ensure a consistent sampling point.

An initial sampling event has been completed for the recently updated monitoring system. The sampling results verify no volatile or semi-volatile organics in the groundwater. Metal constituents detected are within acceptable groundwater standards. These results allow for modification for future sampling events. Typically a minimum of four monitoring events is required to develop an initial water quality history. Continue to include the following analysis: Field measurements -- Temperature, pH, turbidity, and specific conductivity, and total dissolved solids; RCRA metals; And Chloride.

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This information will be used as a final review to determine if hydrologic modeling will be required. The additional information and the four water quality sampling events may be sufficient to make a final determination of compliance with Rule .0503(2)(d)(ii)(A).

Please contact me if you have any questions. I can be reached at (919) 733-0692, extension ~~346.~~ 342

Sincerely,

Cheryl Marks

Cheryl Marks
Hydrogeologist
Solid Waste Section

cc: James Coffey, Supervisor
Sherri Coghill, Engineer
James Bateson, Joyce Engineering, Inc.