

## **APPENDIX D - TRIAD Report**

A copy of the report prepared for MSHA by TRIAD Engineering, Inc., is provided on the following pages. This copy of the TRIAD report has been reformatted to appear in this text as closely as possible to the original printed version. Due to the large size of this Appendix, the full text is available only in the digital version of the MSHA Report of Investigation.

FINAL REPORT  
SUBSURFACE INVESTIGATION

BIG BRANCH SLURRY IMPOUNDMENT  
MARTIN COUNTY, KENTUCKY

TRIAD PROJECT NO. C00553

*Prepared on behalf of:*

UNITED STATES DEPARTMENT OF LABOR  
MINE SAFETY AND HEALTH ADMINISTRATION

*Prepared by:*

TRIAD ENGINEERING, INCORPORATED  
St. Albans, West Virginia

MARCH 2001



TRIAD ENGINEERING, INC.

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ST. ALBANS, WEST VIRGINIA**

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March 30, 2001

United States Department of Labor  
Mine Safety and Health Administration  
1301 Airport Road  
Beaver, WV 25813-9426

Attention: Mr. Jack Spadaro, Superintendent

Subject: **SUBSURFACE INVESTIGATION**  
Big Branch Slurry Impoundment  
Martin County, Kentucky  
Triad Project No. C00553

Dear Mr. Spadaro:

In accordance with your request, Triad Engineering, Inc. has performed a subsurface investigation of the suspected breakthrough area for the subject project located on the facilities of Martin County Coal Corporation near Inez, Kentucky. Authorization to proceed with the investigation was provided by Contract No. J2R12004 dated November 17, 2000.

Presented in this report are the results of the field and laboratory investigation performed to determine the subsurface conditions at the subject site, as well as our interpretations and conclusions from the data.

We appreciate the opportunity to have assisted you on this project and trust this report satisfies your needs at this time. Please feel free to contact us if you have any questions concerning this report, or if we can provide any further assistance.

Very truly yours,

TRIAD ENGINEERING, INC.

Charles E. Montgomery, P.G.  
Project Geologist

John E. Nottingham, P.E.  
Senior Engineer

Larry C. Nottingham, Ph.D., P.E.  
Principal Engineer

## **PROJECT DESCRIPTION**

The project consists of a subsurface investigation of a portion of Martin County Coal Corporation's Big Branch coal slurry impoundment located near Inez, Kentucky. A breakthrough of the 68-acre impoundment occurred on October 11, 2000, whereby approximately 300 million gallons of coal slurry discharged into adjacent abandoned underground mine workings and ultimately into the nearby watersheds of Coldwater Fork and Wolf Creek. The mine workings are part of the 1-C Mine, located within the Coalburg Coal seam, which outcrops approximately 90 to 100 ft. below the pre-breach slurry level within the impoundment. Test borings were drilled by Triad personnel as part of a subsurface investigation to determine the location and cause of the slurry breakthrough into the mine workings. The boring locations were specified by Mine Safety and Health Administration (MSHA) personnel and located in the field by a Triad survey crew. A site plan showing the boring locations is provided on Drawing No. C00553-1.

## **SUBSURFACE INVESTIGATION**

The subsurface investigation consisted of forty seven (47) test borings drilled in the slurry impoundment as shown on Drawing No. C00553-1. Four lines of borings were located along the centerline of four mine entries thought to be closest to the slurry breakthrough location. For the purposes of the investigation and in this report, these entries are referred to as Entry No. 1, Entry No. 2, Entry No. 3, and Entry No. 4. Borings were designated according to which line they were located along, i.e., DH3-4 would designate the fourth drill hole located along line or Entry No. 3. Borings located outside of these lines or areas were designated with an "X", i.e., DHX-1.

The borings were advanced to depths ranging from 84.4 ft. to 120.1 ft. below the existing ground surface. Prior to drill rig mobilization, a drill pad had been constructed by Martin County Coal Co. personnel along the edge of the impoundment in the general vicinity of the suspected slurry breakthrough. The pad was constructed with coarse coal refuse and other available onsite spoil material.

Full time inspection for each drill rig was provided by Triad's onsite geologist(s). The borings were advanced using two rubber tire-mounted ATV rotary drill rigs. The borings were advanced through the unconsolidated overburden material using 3.25 in. I.D. hollow stem augers or 4 in. I.D. flush-joint casing. Standard penetration testing and sampling was performed in selected borings within the unconsolidated overburden material through the hollow stem augers or casing at designated intervals. The standard penetration testing and sampling was performed in accordance with ASTM D 1586. Standard penetration testing is performed by driving a 2.0-in. O.D. split-barrel sampler into the soil with a 140-lb. hammer dropping a distance of 30 inches. The sampler is driven a distance of either 18 or 24 inches in three or four 6-inch increments and the number of blows required to produce the second and third 6-inch increments of penetration is termed the Standard Penetration Number or "N" value. These values provide an indication of the consistency or relative density of the soil. In Boring DH2-9, a portion of the unconsolidated

overburden material was sampled using a 3-in. O.D. split-barrel sampler. In addition to standard penetration testing, undisturbed (Shelby tube) 3-in. I.D. samples were procured within the overburden material in designated borings at various depths.

Continuous core samples of bedrock were obtained in most of the borings using an NQ double tube core barrel equipped with a diamond-impregnated bit in accordance with ASTM D2113. Following completion of drilling, most of the borings in which mine voids were encountered were cased to bedrock with 2 in. I.D. flush-joint PVC pipe to enable sampling of the mine void material and allow video photography of the borings. The PVC casing prevented the caving of unconsolidated material into the open boreholes.

Following completion of drilling, all coreholes were sealed with a Portland cement grout from the bottom of the boring to the top of rock. The remainder of the borings were backfilled with auger cuttings. In borings in which a void was encountered, a plug was installed above the void to prevent loss of grout into the mine opening. Following installation of the plug, the coreholes were grouted to the top of rock or above, followed by auger cuttings to the top of ground.

Sampling of the material encountered within the mine workings was also conducted using various methods. These include:

- 2 in. split barrel sampler w/plastic trap
- 2 in. split barrel sampler w/butterfly and flap valve
- 3 in. split barrel sampler w/ plastic trap
- 3 in. split barrel sampler w/flap valve
- 2 in. PVC sampler w/butterfly and flap valve
- 1.5 in. PVC sampler w/plastic trap
- 1.5 in. PVC sampler w/flap valve

All split spoon, rock core, and mine void samples were visually classified in the field by Triad's onsite geologists. Split spoon samples were placed in air-tight glass jars. Rock core samples were placed in partitioned wooden boxes. Mine void samples were placed in zip-lock plastic bags. All samples were delivered to the Triad laboratory in Scott Depot, West Virginia.

Groundwater level observations were made by our geologists during drilling operations, at drilling completion, and at various times thereafter. Groundwater observations are presented on the boring logs and are discussed in the "Subsurface Conditions" section of this report. The results of the subsurface investigation are provided on the boring logs (Figures 1 through 189).

### LABORATORY TESTING

Laboratory tests were performed on the selected rock core, mine void, and undisturbed (Shelby tube) samples to generally classify and evaluate the materials. These tests consisted of:

- Atterberg Limits Testing
- Grain Size Distribution
- Triaxial Shear Strength
- Unit Weight
- Permeability
- Specific Gravity
- Uniaxial Compressive Strength (rock core)
- Modulus of Rupture (rock core)

Atterberg limits testing, grain size distribution, unit weight, and specific gravity determination aid in classification of the material and provide a basis for estimating their engineering properties. Triaxial shear, uniaxial compression, and modulus of rupture testing provide a basis for evaluating the strength of tested materials. Permeability testing was performed to determine the coefficient of permeability of the suspected seepage barrier material as well as natural ground material. The results of the lab testing are presented on the boring logs (Figure Nos. 1 through 189) as well as in Appendix A.

In addition to testing of the samples obtained from the borings, the grain size distribution was determined for a bulk sample of material weighing approximately 950 lbs. The material was excavated using a bulldozer and placed in sample bags for delivery to our laboratory. It is our understanding the material is representative of that which was used to construct a seepage barrier around a portion of the slurry impoundment.

Chemical analysis of selected slurry samples was performed by CT & E Environmental Services, Inc. of Charleston, West Virginia. The slurry samples consisted of material sampled from the mine void and "grab" samples obtained by MSHA personnel from various locations. The results of the chemical analysis are provided in Appendix B. The following is a summary of the samples selected for chemical analysis:

- Grab sample from Big Branch Slurry Impoundment
- Two samples from mine void in Boring DH2-9
- Grab sample from Wolf Creek
- Grab sample from Coldwater Creek
- Sample from mine void in Boring DH1-11



### **SURVEYING AND MAPPING**

Surveying and mapping of the project site was conducted by Triad personnel employing conventional land surveying techniques. All traverse runs were “closed loop” using the direct angle measurement and closed horizon technique. Our average error of closure was 1 ft. in 100,000 ft. The surveying instrument used for the project was a Topcon GTS-311 Total Station Theodolite in combination with a Hewlett-Packard 48GX calculator equipped with SMI Version 6 CVCE software for data collection. The traverses were run using Topcon single prisms on fixed-target tripods.

Prior to commencement of drilling activities, locations and coordinates of Global Positioning System (GPS) control points used by Martin County Coal Corporation were provided to our survey personnel. It is our understanding these control points have been used by Martin County Coal for layout of their mining operations. Our survey crew verified these control points by checking bearing and distance between the points. These were also checked with recently established control points located on the property. The survey control information provided by Martin County Coal was found to be accurate.

At the request of MSHA personnel, the survey data was further verified by locating existing structures, entries, and ribs in the North Portals #1 area. These features located by the Triad survey crew accurately reflected information provided on Martin County Coal mine maps for the area.

Following verification of two older control points (MC #1 and #4462) that had been used to establish the aforementioned GPS points, new control points were established by Triad for the subsurface investigation prior to beginning drilling operations. A portion of the mine workings in the suspected failure area was then surveyed and outlined on the ground surface and several pre-determined boring locations were established. Our survey crew returned to the site periodically to locate additional borings as they were drilled.

### **GEOPHYSICAL INVESTIGATION**

A mise-a-la-masse electrical profiling survey of the project area was conducted by Enviroscan, Inc. This method was employed in an attempt to locate the breakthrough area by energizing the mine workings by way of an electrode placed in one of the borings and mapping the electrically conductive subsurface body. The geophysical field work was conducted during the course of drilling activities by Triad. As such, several borings which were completed following the survey are not depicted on the drawings provided by Enviroscan. A copy of the geophysical report is provided in Appendix C of this report. As can be seen in the report, two primary

electrical peaks or anomalies were detected during the course of Enviroscan's investigation. One peak was located adjacent to (outside) the south rib of Entry No. 1. A larger anomaly was detected near the northern edge of one of the pillars between Entry Nos. 2 and 3. Borings were drilled in these areas to investigate the findings of the electrical survey and are further discussed in the "Subsurface/Geologic Conditions" section of this report.

## **SUBSURFACE/GEOLOGIC CONDITIONS**

### **General Overview**

Rock strata in the area belong to the Breathitt Group, Princess Formation of the Pennsylvanian System. The two coal seams of primary importance at the project site are the Stockton and Coalburg Coals. These seams are included within the Broas Coal Zone and the Peach Orchard Coal Zone, respectively, as identified in Kentucky geological nomenclature. Both seams have been extensively mined in the area. The Stockton Coal, which is located approximately 100 to 125 ft. above the Coalburg Coal, lies just above the surface elevation of the slurry pond. The failure occurred when slurry broke through and discharged into mine workings in the Coalburg seam, located 90 to 100 ft. below the slurry level.

Massive sandstone units are present above the Stockton Coal and between the Stockton and Coalburg Coals. The stratum of sandstone above the Stockton Coal is exposed in the highwall adjacent to the Big Branch slurry impoundment. In appearance, it is generally gray, weathering to brown, and medium grained. It appeared to be approximately 150 to 200 ft. thick in some locations where it was exposed. Regularly spaced joints, essentially vertical, were observed throughout exposed portions of this stratum at the project site. The stratum of sandstone between the Stockton and Coalburg coals is generally gray, massive in character, and medium to coarse grained. A stratum of shale is sometimes present at the base of this sandstone and above the Coalburg Coal. This stratum was generally absent in borings which encountered a mine void. It is likely the shale was taken as "draw rock" during the mining process or may have sloughed off.

### **Site Conditions**

As was previously mentioned, a drill pad had been constructed for the investigation prior to mobilization of the drill rigs. It is our understanding the pad was constructed with readily available spoil material consisting of a mixture of sand, clay, and sandstone fragments of varying size. This material was capped with a layer of coarse coal refuse. Standard penetration testing and sampling indicate the two layers of fill material were variable in thickness, but generally increased in thickness away from the former edge of the slurry pond.

According to information provided by MSHA personnel, a seepage barrier had been placed on the hillside around a portion of the slurry impoundment by Martin County Coal in 1995. One of the original objectives of the subsurface investigation was to delineate the seepage barrier and determine its extent and thickness in the area of the breakthrough. However, because the seepage barrier was constructed of the same material as the spoil that was used to construct the drill pad, no clear distinction between the two layers could be inferred from the drilling. However, a denser layer of soil beneath the spoil could be discerned and was identified by consistently higher standard penetration blow counts and an overall more uniform appearance than the fill above it. This separate layer is thought to be original or natural ground and is depicted on Profiles A-A through D-D (Drawing Nos. C00553-2 through C00553-5, respectively).

Entry No. 1

A total of 13 borings (DH1-1 through DH1-13) were advanced near the centerline of Entry No. 1 (please see Drawing No. C00553-1 for boring locations). Several additional borings were drilled in areas immediately adjacent to Entry No. 1 to further delineate subsurface conditions in this area. These included DHX-1 through DHX-9, DHX-11 through DHX-13, and DHX-16. Along Entry No. 1, the top layer of coarse coal refuse encountered at the ground surface ranged in thickness from less than one foot to approximately 60 ft. Many of the borings were advanced through this layer of material to the underlying layer of fill material without sampling.

Beneath the coarse refuse, a layer of fill material was encountered which extended to depths ranging from approximately 26 to 74 ft. below the existing ground surface. This fill consisted of a mixture of brown and gray clay, sand and sandstone fragments. Standard penetration testing indicates the fill layer below the coarse coal refuse is highly variable in composition and density, with some samples consisting of nearly all sandstone fragments while others consisted mostly of cohesive material. Groundwater was encountered within this layer in most of the borings. Drawing No. C00553-2 illustrates the depths at which groundwater was encountered during drilling operations.

Beneath the fill, a stratum of brown clayey sand was encountered which appeared to be natural ground. The layer extended to the top of bedrock in most of the borings. Standard penetration testing "N" values were consistently higher within this layer, and the material itself was more consistent in appearance and composition than the overlying fill material. Sandstone fragments increased in percentage and size as depth increased, with sandstone boulders often being encountered in the lower horizon of this soil stratum.

Sandstone bedrock was encountered at depths ranging from approximately 26 ft. (elev. 1031.8 ft.) in Boring DH1-11 to 81 ft. (elev. 971.4 ft.) in Boring DH1-1. Borings DH1-6, DH1-7, and DH1-9 were drilled beyond the extent of the mine roof sandstone. A zone of weathering was observed at the top of the sandstone in many of the borings, varying in extent. The weathered portion of the sandstone was generally brown in color and less hard than the unweathered material. The majority of the sandstone was gray and medium grained in texture, with occasional carbonaceous and shale laminations as noted on the boring logs.

The sandstone was underlain by either the Coalburg Coal or the mine workings in the coal seam. In a few of the borings, a thin layer of shale was present above the Coalburg Coal. The top of the mine void was generally encountered between the elevations of 967 and 969 ft., with the exception of Boring DH1-10, in which a void was encountered at an elevation of approximately 971.5 ft. The top of the mine was denoted during the drilling process by a decrease in drilling water circulation pressure and/or a sudden drop in the drilling tools as they advanced during the coring process. These depths as measured during drilling were subsequently checked with core recovery for verification. After encountering the void, the drilling rods were allowed to advance, without rotation, to the floor of the mine, which was encountered at elevations ranging between approximately 957 and 959 ft. If the drilling rods encountered resistance within the void before reaching the level of the mine floor because of boulders, mine rubble, etc., rotation was resumed. The mine floor was composed of soft gray clay shale which graded into sandstone.

As can be seen in Drawing C00553-1 and C00553-2, Boring DH1-1, DH1-6, DH1-7, DH1-9, and DH1-10 were drilled in areas beyond the limits of mining as depicted on Martin County Coal mine maps, but within the zone designated as part of the outcrop barrier. In Boring DH1-10, advanced approximately 5 ft. beyond the depicted limits of mining, a void was encountered at the horizon of the Coalburg seam. In Boring DH1-1, drilled approximately 12 ft. beyond the depicted limits of mining, approximately 1.2 ft. of broken coal was recovered from the Coalburg horizon. The drill rig operator indicated that the tools advanced erratically at the elevation of the coal seam. It was initially suspected that poor core recovery in a weathered/broken zone of coal was responsible for the small amount of coal recovered, however, as will be explained later, subsequent borings drilled in immediately adjacent areas indicated that a significant portion of the coal seam was missing from this area.

In Boring DH1-7, approximately 6.5 ft. of coal was encountered. At this location, however, it appears that the Coalburg seam is not entirely present because the seam is thinning at the outcrop. There was no sandstone overlying the coal at this point. This was confirmed in Boring DH1-6, in which less than a foot of coal was encountered. Approximately 1.9 ft. of coal slurry or "filter cake" was recovered immediately above the coal in this boring. Standard penetration testing was conducted at five foot intervals in DH1-6, starting at a depth of 35 ft.

Each test extended 18 inches (except in those encountering "refusal" on a boulder or obstruction). Between the depths of 85 and 88.3 ft., continuous sampling of the material was conducted. Following split spoon refusal at a depth of 88.3 ft., continuous rock coring was conducted to the termination depth of 99.8 ft. As in the case of Boring DH1-7, there was no sandstone overlying the Coalburg Coal. In Boring DH1-9, the bedrock surface (shale) was encountered at an elevation of 958.6 ft., or at the approximate base of the Coalburg horizon. The rapid diminishing of the coal seam at the outcrop is demonstrated between Borings DH1-7, DH1-6, and DH1-9 as shown on Profile A-A on Drawing No. C00553-2.

As was previously mentioned, several "X" borings were advanced in areas adjacent to Entry No. 1 in an attempt to further delineate subsurface features encountered in the area. Borings DHX-3 through DHX-6 and DHX-8 and DHX-9 were drilled near the end of Entry No. 1 to confirm areas of missing coal. Borings DHX-12 and DHX-13 were advanced to better define the Coalburg outcrop.

In Borings DHX-4, DHX-5, and DHX-8, portions of the Coalburg Coal were found to be absent. In Boring DHX-4, drilled adjacent to Boring DH1-1, continuous split spoon sampling was conducted from a depth of 65 to a depth of 91.2 ft, where split spoon refusal was encountered at the top of rock. Standard penetration testing "N" values indicated the material between the coarse coal refuse and the top of rock was very soft. At several sample intervals, the sampler advanced under the weight of the drilling rods without hammering. Coal slurry was also found to be present in many of the samples. This material was found to be present to the depth at which split spoon refusal was obtained in the Coalburg Coal. The original/natural ground material encountered in other borings was absent at this location, as was the stratum of sandstone above the coal. Split spoon refusal was obtained in the Coalburg Coal at a depth of 91.2 ft. (elevation 960.6 ft.). Only approximately 2 ft. of coal was present at this location. This boring served to confirm the data obtained from the adjacent Boring DH1-1, in which very little coal was recovered. The continuous sampling conducted in Boring DHX-4 confirms that the sandstone roof and most of the Coalburg Coal are absent at this location. Nearly identical conditions were encountered in Boring DHX-8, advanced in a similar method as DHX-4. Again, the layer of original/natural ground was absent, as was the sandstone roof and most of the Coalburg Coal. Split spoon refusal was obtained in the coal at a depth of 90 ft. (elev. 961.4 ft.). Approximately 3 ft. of coal was present at this location. In Boring DHX-5, the sandstone roof was present, as was the layer of original ground. A void was encountered at the base of the sandstone, however, with only approximately 1.2 ft. of coal present at the bottom of the void.

In several of the borings drilled along Entry No. 1, sandstone boulders/fragments were encountered within the mine void. These borings include DH1-3, DH1-4, DH1-10, and DHX-1.

The sandstone ranged in thickness from 0.5 ft. to 3.9 ft. The possible origin of these sandstone fragments will be discussed later in the "Conclusions" section of this report.

Profile A-A illustrates the subsurface conditions parallel to Entry No. 1. Profile D-D illustrates the conditions in this area as they appear perpendicular to the outcrop of the Coalburg Coal. The coal outcrop does not run perpendicular to the mine entries in this area, therefore, profiles drawn parallel to the entries exaggerate the thickness of the outcrop barrier.

Weighted tape measurements taken within the mine voids following drilling indicated that most of the void space was filled with soil and/or slurry. As was explained in the "Subsurface Investigation" section of this report, several methods were employed to sample the material within the void. However, the presence of cobble and boulder size material in the void (which was larger in diameter than the sampling devices) hindered sample recovery efforts. Table No. 1 presents a summary of sampling efforts within the mine void along and adjacent to Entry No. 1. Laboratory tests (including grain size analyses) were conducted on several of the samples listed in Table No. 1. The laboratory results are presented in Appendix A of this report.

**TABLE NO. 1 - ENTRY NO. 1 MINE VOID SAMPLES**

<b>Boring No.</b>	<b>Sample Depth (ft.)</b>	<b>Sample Description</b>
DH1-5	87.3 - 90.6	Brown Sand and Gravel
DH1-8	85.0 - 91.4	Brown Sand and Gravel
DH1-10	80.6 - 85.7	Brown Silty Sand with Gravel
DH1-11	91.8 - 95.8	Brown Sand with trace Gravel
DH1-11	92.6 - 96.2	Brown Silty Sand with Gravel
DH1-11	96.1 - 97.1	Coal Slurry and Sand
DH1-12	89.4 - 99.4	Brown Silty Sand with trace Coal Slurry, Gravel
DH1-12	90.1 - 99.7	Brown Silty Sand with trace Coal Slurry, Gravel
DH1-12	90.7 - 99.2	Brown Silty Sand with trace Gravel, Plant Roots
DH1-13	85.7 - 87.7	Brown and gray Silty Sand with Gravel
DH1-13	87.7 - 89.7	Brown and gray Silty Sand with Gravel

**TABLE NO. 1 (CONTINUED)**

<b>Boring No.</b>	<b>Sample Depth (ft.)</b>	<b>Sample Description</b>
DH1-13	89.7 - 91.7	Brown and gray Silty Sand with Gravel
DH1-13	91.7 - 93.7	Brown and gray Silty Sand with Gravel
DH1-13	93.7 - 95.6	Brown and gray Silty Sand with Gravel
DHX-1	89.4 - 91.9	Brown Silty Sand with Gravel
DHX-2	N/A	Coal Slurry, with Silty Sand and trace Gravel
DHX-5	79.7 - 82.7	Brown Sand

*Entry No. 2*

A total of nine borings (DH2-1 through DH2-9) were drilled near the centerline of Entry No. 2 (please refer to Drawing No. C00553-1 for boring locations). The general subsurface stratigraphy encountered along Entry No. 2 was essentially the same as along Entry No. 1. The Coalburg Coal, however, was found to be present at the end of the entry approximately as depicted by the mining limits on the Martin County Coal mine map provided to Triad.

As in the area of Entry No. 1, the coal barrier at the end of Entry No. 2 appears to be considerably thinner than that which is depicted on documents provided by Martin County Coal. In Borings DH2-4 and DH2-5, split spoon refusal on shale bedrock was obtained below the horizon of the Coalburg Coal. Drilling data indicates the coal seam thins out in the area between Borings DH2-5 and DH2-6. Approximately 3.5 ft. of outcrop coal was encountered in Boring DH2-6. Profile B-B (Drawing No. C00553-3) illustrates the subsurface conditions encountered in this area.

Mine void samples collected from borings along Entry No. 2 are described in Table No. 2.

**TABLE NO. 2 - ENTRY NO. 2 MINE VOID SAMPLES**

<b>Boring No.</b>	<b>Sample Depth (ft.)</b>	<b>Sample Description</b>
DH2-9	89.8 - 91.8	Coal Slurry with Sand and Gravel
DH2-9	91.8 - 93.8	Coal Slurry with Sand and Gravel

**TABLE NO. 2 (CONTINUED)**

<b>Boring No.</b>	<b>Sample Depth (ft.)</b>	<b>Sample Description</b>
DH2-9	93.8 - 95.8	Coal Slurry with Sand and Gravel
DH2-9	95.8 - 97.8	Sand and Gravel
DH2-9	97.8 - 99.9	Coal Slurry with Sand and Gravel

Entry No. 3

A total of four borings were drilled near the centerline of Entry No. 3 (Borings DH3-1 through DH3-4). Subsurface conditions encountered in the area of Entry No. 3 were similar to those encountered along Entry No. 2. The Coalburg Coal was found to be intact at the end of the entry as depicted on mine maps provided to Triad. However, as in Entries No. 1 and 2, the thickness of the coal barrier is less than that depicted on Martin County Coal documents. Profile C-C (Drawing No. C00553-4) illustrates the subsurface conditions found in this area. The mine void encountered in Boring DH3-4 was sampled. Material collected from the void was a mixture of coal slurry and sand.

Entry No. 4

One boring (DH4-1) was drilled in the area of Entry No. 4 to confirm the presence of the coal barrier beyond the entry. The full Coalburg seam overlain by approximately 5 ft. of sandstone was encountered at this location.

"P" Borings

Two borings DHP-1 and DHP-2, were advanced to confirm the presence of pillars as depicted on mine maps (please refer to Drawing No. C00553-1 for boring locations). The pillars were found to be intact in both borings. Some fracturing of the sandstone above the pillars was observed and is noted on the boring logs.

Miscellaneous "X" Borings

Borings DHX-10, DHX-14, and DHX-15 were advanced to confirm the presence of coal as depicted on mine maps. A void was encountered in Boring DHX-10 at the elevation of the Coalburg Coal in an area depicted as being beyond the limits of mining. Solid coal was



subsequently encountered in DHX-14. Likewise, a void was encountered in Boring DHX-15, indicating mining in Entry No. 4 was conducted beyond the limits as depicted on mine maps. Boring DHX-18 was drilled in a cross-cut adjacent to Entry No. 1 for the purpose of sampling the material in the mine void. Silty sand and gravel was sampled from the mine void at this location.

As was previously mentioned, several borings were drilled in the areas identified by Enviroscan as possible slurry breakthrough locations based on electrical voltage peaks detected during their survey. These include Borings DH2-9, DHP-2, DHX-16, and DHX-17. There was no evidence found in any of these borings of a possible slurry breakthrough at these locations. In Boring DHP-2, however, a significant amount of weathering and iron-stained fracturing was encountered in the sandstone above the Coalburg Coal. It is our opinion the large electrical anomaly in this area is due to the fracturing observed in Boring DHP-2. As noted in Enviroscan's report, voltage peaks "can occur along natural mineralized or oxidized near-vertical joints or fractures intersecting the mine workings." The other smaller electrical anomaly adjacent to Entry No. 1 is also likely related to subsurface fracturing or jointing.

#### Groundwater Conditions

Two separate groundwater levels were encountered during the subsurface investigation. An upper groundwater level was encountered while advancing through the fill/spoil material. A second (lower) level was measured in those borings which encountered mine voids. This level was generally 3 to 4 ft. above the top of the mine. Groundwater measurements are provided on the boring logs (Figure Nos. 1 through 189), in Table No. 3 below, and on Drawing Nos. C00553-2 through C00553-5. It should be noted that the final groundwater measurements for those borings which did not encounter mine voids may not be representative of actual conditions since large volumes of water were introduced into the borehole during the coring process and the water level may not have had sufficient time to stabilize. Initial groundwater levels were recorded during drilling before coring water was introduced into the borehole, and therefore may be more representative of actual groundwater conditions.

**TABLE NO. 3 - BORING GROUNDWATER MEASUREMENTS**

<b>Boring Number</b>	<b>Initial Groundwater Level Depth/Elevation (ft.)</b>	<b>Final Groundwater Level. Depth/Elevation (ft.)</b>
DH1-1	50.0/1002.4	80.7/971.7
DH1-2	50.0/1002.4	79.8/972.6
DH1-3	40.0/1015.6	84.2/971.4

**TABLE NO. 3 (CONTINUED)**

<b>Boring Number</b>	<b>Initial Groundwater Level Depth/Elevation (ft.)</b>	<b>Final Groundwater Level. Depth/Elevation (ft.)</b>
DH1-4	N/A	83.6/971.3
DH1-5	31.5/1022.9	83.0/971.4
DH1-6	40.0/1011.4	29.6/1021.8
DH1-7	50.0/1002.1	N/A
DH1-8	50.0/1003.2	81.5/971.7
DH1-9	50.0/1001.1	29.0/1022.1
DH1-10	50.0/1002.1	79.2/972.9
DH1-11	N/A	86.7/971.1
DH1-12	N/A	84.9/971.3
DH1-13	N/A	77.0/911.0
DH2-1	39.0/1013.4	81.5/970.9
DH2-2	35.0/1018.4	82.2/971.2
DH2-3	N/A	83.9/971.0
DH2-4	40.0/1009.5	26.0/1023.5
DH2-5	45.0/1006.2	23.4/1027.8
DH2-6	50.0/1002.0	29.4/1022.6
DH2-7	45.0/1006.7	24.5/1027.2
DH2-8	N/A	N/A
DH2-9	N/A	N/A
DH3-1	45.0/1005.0	26.0/1024.0
DH3-2	40.0/1011.4	29.2/1022.2
DH3-3	35.0/1017.7	17.7/1035.0
DH3-4	35.0/1018.9	83.0/970.9

**TABLE NO. 3 (CONTINUED)**

<b>Boring Number</b>	<b>Initial Groundwater Level Depth/Elevation (ft.)</b>	<b>Final Groundwater Level. Depth/Elevation (ft.)</b>
DH4-1	43.0/1007.9	34.4/1016.5
DHP-1	N/A	75.5/980.5
DHP-2	45.0/1010.7	N/A
DHX-1	N/A	84.6/971.2
DHX-2	N/A	83.9/971.6
DHX-3	50.0/1002.3	31.7/1020.6
DHX-4	67.0/984.8	80.1/971.7
DHX-5	65.0/986.2	78.0/973.2
DHX-6	65.0/986.8	47.5/1004.3
DHX-7	77.0/975.4	26.8/1025.6
DHX-8	65.0/986.4	55.6/995.8
DHX-9	60.0/992.0	N/A
DHX-10	N/A	84.0/971.3
DHX-11	N/A	20.3/1034.2
DHX-12	60.0/991.5	14.3/1037.2
DHX-13	60.0/991.1	28.1/1023.0
DHX-14	N/A	N/A
DHX-15	N/A	85.0/968.1
DHX-16	60.0/992.9	81.9/971.0
DHX-17	N/A	N/A
DHX-18	N/A	85.2/971.6

## CONCLUSIONS

Based on the results of the subsurface investigation, it is our opinion the slurry breakthrough occurred at the end of what has been designated Entry No. 1. Test borings drilled in this area indicate that the Coalburg Coal is either partially or completely missing beyond the limits of mining as depicted on documents provided to Triad Engineering and the actual coal outcrop barrier is nearly non-existent. These borings included DH1-1, DH1-10, DHX-4, DHX-5, and DHX-8.

In addition, sampling of the mine void along Entry No. 1 as well as areas where the coal is missing beyond the depicted mined limits of Entry No. 1 indicate the entry is nearly full of sand, gravel, and sandstone cobbles and boulders. According to accounts by Martin County Coal personnel, material was bulldozed into the impoundment for several hours in an attempt to plug the slurry leak. This material was composed of readily available onsite material consisting of a mixture of sand and silt, clay, and sandstone fragments ranging in size from gravel to boulders. This material eventually stopped the flow of slurry into the adjacent mine workings. The material sampled in the mine workings in Entry No. 1 is representative of the type of material that was bulldozed into the impoundment the night of the failure. The large fragments of sandstone encountered within the mine void in Borings DH1-3, DH1-4, DH1-10, and DHX-1 noted in the "Subsurface Conditions" section of this report are most likely boulders that were bulldozed into the impoundment and drawn into Entry No. 1 while the breakthrough was occurring. By contrast, slurry was present in other areas of the mine. According to information provided to Triad Engineering, slurry was previously pumped into the mine workings in this area by Martin County Coal. The material sampled from areas outside of Entry No. 1 may be the slurry originally present in the mine or slurry which entered during the breakthrough.

On the Boring Location Plan (Drawing No. C00553-1) three lines are drawn which represent the Coalburg Coal. The purple line represents the outcrop as defined by the Martin County Coal maps. The green line represents the "line of zero coal thickness" as determined from the drilling data. According to our drilling data, the Coalburg coal did not have a surficial expression in this area (at the time it was mined) because it was covered by natural unconsolidated material (soil).

Of perhaps greater significance is the red line on Drawing No. C00553-1, which represents the point at which the Coalburg seam begins its transition from full thickness (8 to 10 ft.) to zero thickness. This is also the point at which unconsolidated material instead of sandstone overlies the coal seam. As interpreted from our subsurface investigation, there was approximately 15 to 18 ft. of "full thickness" coal between the end of the mine workings in Entry No. 1 as depicted on Martin County Coal mine maps and unconsolidated material (pre-breakthrough). As was

previously mentioned, however, a significant portion of that coal was found to be either partially or completely missing. Possible causes for the missing coal include:

- It was mined beyond the depicted limits.
- It was washed away during the slurry breakthrough
- A combination of the two

Since the Coalburg seam did not have a surficial expression in this area and did not have an “outcrop” as typically defined, the effective outcrop (and for the purposes of this report) is the point at which the coal seam comes in contact with unconsolidated material. It is clear from the drilling that the end of Entry No. 1 is substantially closer to the outcrop of the Coalburg seam (as defined for this report) than what is depicted on Martin County Coal mine maps. Such close proximity to the outcrop, in addition to resulting in a smaller coal outcrop barrier, presents additional consequences.

- The amount of weathering increases significantly near the outcrop. Because the outcrop barrier is significantly thinner at this location, the barrier that is present is more weathered and therefore weaker.
- The sandstone above the Coalburg Coal thins out rapidly and exhibits increased weathering as it nears the outcrop. The remaining coal barrier is substantially weakened when it no longer has a sandstone roof. Based on our subsurface information, the sandstone roof appears to have thinned to 12 ft. or less at the end of the depicted mining limits. If the workings extended beyond the depicted mining limits as they did in Borings DHX-10 and DHX-15, the roof would have been even thinner, or possibly non-existent. An isopach map illustrating the thickness of the sandstone above the mine workings is provided on Drawing No. C00553-6.

The aforementioned conditions are the primary factors which significantly increased the chances of a slurry breakthrough. We believe a process referred to in geotechnical literature as “piping” triggered the breakthrough. Over an extended period of time, groundwater and water seeping from the impoundment flowed through the weathered coal outcrop via fractures, joints, cleats, etc. commonly present in coal. As the water flowed, it dislodged particles from the walls of the flow channels and carried them into the mine void. The groundwater flow increased the oxidation and deterioration along the avenues of infiltration, enlarging them and allowing increased infiltration and piping. The increasing coal slurry level also acted to increase piping due to increased hydrostatic pressure. The infiltration eventually eroded and weakened the barrier to a point where it could no longer withstand the pressure being exerted by the coal slurry, resulting in

a catastrophic failure and rapid discharge of the slurry into the mine workings. The rush of material into the mine workings removed a portion of the coal barrier, which was found to be absent in several borings advanced just beyond Entry No. 1. In addition, the removal of a portion of the coal outcrop barrier may have resulted in the collapse of a portion of the thin lip of sandstone above the Coalburg Coal beyond the end of Entry No. 1, allowing an even greater discharge of coal slurry into the mine workings.

Piping through the seepage barrier and natural ground likely occurred through zones of higher permeability within these layers. Although testing of undisturbed samples from these areas indicate relatively low permeabilities, these samples are likely not representative of the permeability conditions in general. Undisturbed (Shelby tube) samples were only successfully obtained within the more cohesive zones with a lower percentage of rock fragments. Although several Shelby tube samples were attempted, only a small percentage were usable. The majority were damaged due to large rock fragments or could not be advanced more than a few inches due to the percentage of rock fragments. Standard penetration testing indicated the fill material contained a large percentage of rock fragments. The results of the grain size analysis on the bulk sample representative of the seepage barrier construction material, when compared to published data, correlates to permeabilities on the order of  $10^{-3}$  cm/sec, which is 3 orders of magnitude greater than that obtained in the Shelby tube.

In summary, the results of our investigation indicate the impoundment failure is a consequence of mining operations in the Coalburg Coal advancing in close proximity to the outcrop of the coal seam. The August 8, 1994 plan view drawing submitted by Martin County Coal as part of the impoundment sealing plan indicated that a minimum scaled distance of approximately 70 ft. (as measured perpendicular to the Coalburg outcrop) existed between the end of Entry No. 1 and the Coalburg outcrop line. The test borings indicate that the net distance between the end of Entry No. 1 as depicted on Martin County Coal maps and the actual coal seam outcrop (point at which the top of the coal seam meets unconsolidated material) was on the order of 15 to 18 ft. Considering that some entries were found to extend beyond the depicted limits of mining in other nearby locations of the mine, the actual coal barrier at the end of Entry No. 1 may have been less than 15 ft. This minimal thickness of solid coal barrier combined with the continually increasing hydrostatic pressure as a result of the rising slurry level resulted in piping/erosion of the barrier and eventual breakthrough of slurry into the mine workings.

May 22, 2001

United States Department of Labor  
Mine Safety and Health Administration  
5012 Mountaineer Mall  
Morgantown, WV 26501

Attention: Mr. Timothy Thompson, District Manager

Subject: Big Branch Slurry Impoundment  
Martin County, Kentucky  
Triad Project No. C00553

Dear Mr. Thompson:

Pursuant to our May 21, 2001 phone conversation regarding the subject project, we would like to submit the following clarifications regarding our conclusions outlined in the March 30, 2001 Final Report of the Big Branch Slurry Impoundment Subsurface Investigation. It has come to our attention that certain erroneous conclusions may be inferred from our statements concerning our opinions as to the cause of the impoundment failure. The areas of concern include statements contained within the final paragraph of Page 17 as noted below:

- “In summary, the results of our investigation indicate the impoundment failure is a consequence of mining operations in the Coalburg Coal advancing in close proximity to the outcrop of the coal seam.” The purpose of this statement is to indicate that the ultimate cause of the failure, in our opinion, was the minimal amount of solid, competent coal/bedrock between the end of the mine workings in Entry No. 1 and unconsolidated material at the base of the impoundment. We are aware that the mining in the Coalburg seam occurred before the construction of the slurry impoundment and did not intend to infer otherwise.
- The second sentence references an August 8, 1994 plan view drawing submitted by Martin County Coal. We understand that this document is only a portion of an impoundment sealing plan that was developed to limit the amount of seepage into the mine workings and to create a blockage in the event of a breakthrough. Triad was provided with the referenced drawing at the outset of the investigation, as well as a typical seepage barrier section. No other portion of the impoundment sealing plan was provided. The existence or absence of an impoundment sealing plan does not alter our opinion regarding the cause and likely mechanism of failure.

Triad Engineering, Inc.

Morgantown • St. Albans • Logan  
West Virginia

Greensburg  
Pennsylvania

Winchester • Harrisonburg  
Virginia

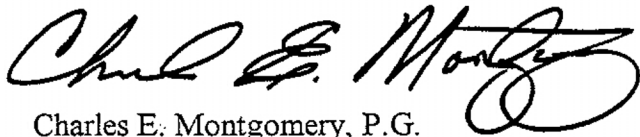
- The Martin County Coal plan view drawing was referenced to indicate the discrepancy between the Coalburg outcrop line as indicated on the drawing and the actual amount of competent, effective coal/bedrock present between the end of the mine entries and the impoundment as determined by our subsurface investigation. Although there may have been 70 horizontal feet of material between the end of Entry No. 1 and the base of the slurry impoundment, only a fraction of this material was competent coal/bedrock.
- It should not be inferred from our report that we believe the failure path of the slurry into Entry No. 1 was entirely along a horizontal path. We suspect the failure path of the slurry through the unconsolidated strata (natural soil and seepage barrier material) was at an angle. This flow path probably corresponded to the shortest distance between the bottom of the slurry impoundment and the point where the coal seam (coal barrier for Entry No. 1) met unconsolidated material. After penetrating the unconsolidated material, we believe the slurry flowed basically horizontally through the remaining portion of the coal (coal barrier) or along the interface between the top of the coal seam and overlying sandstone bedrock. We suspect prolonged seepage over an extended period of time caused erosion and deterioration of the coal barrier, leading to a piping condition and subsequent catastrophic failure. As discussed in our report, the amount of coal barrier present beyond the end of Entry No. 1 was at most 15 to 18 ft. thick, measured horizontally. If the end of Entry No. 1 were extended beyond the limits depicted on Martin County Coal drawing, as was the case in other areas of the mine, the actual coal barrier would have been less than 15 to 18 ft. During the rapid inflow of slurry into the end of Entry No. 1, the force of the flowing slurry eroded away all but a small portion of the coal barrier and a portion of the sandstone roof, as depicted on Drawing No. C00553-5 (Profile D-D) of our report.



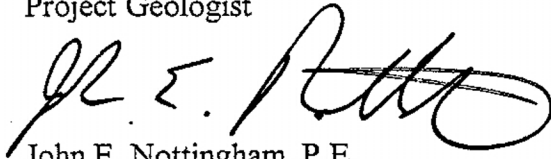
We hope this letter clarifies the conclusions presented in our report and addresses the concerns brought to our attention. Please feel free to contact us if you have any questions concerning this report, or if we can provide any further assistance.

Very truly yours,

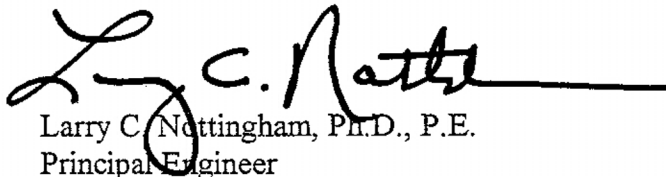
TRIAD ENGINEERING, INC.



Charles E. Montgomery, P.G.  
Project Geologist



John E. Nottingham, P.E.  
Senior Engineer



Larry C. Nottingham, Ph.D., P.E.  
Principal Engineer

***FIGURES***

# LOG OF BORING NO. DH1- 1

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**

triadeng.com



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1052.4 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<b>MATERIAL DESCRIPTION</b>									
5	●	X	Coarse <u>COAL REFUSE</u>									
10	●	X				4-3-3						
15	●	X										
20	●	X	Brown <u>CLAYEY SAND</u> with sandstone fragments, damp, loose to medium dense	20.0		7-4-3						
25	●	X	- more clayey (25.0' - 26.5')			3-5-9						
30	●	X	- SPOIL/FILL -									

BORING C00553.GPJ 2/27/01

Completion Depth: **96.8 feet**  
 Date Boring Started: **12/1/00**  
 Date Boring Completed: **12/2/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of approximately 35 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DH1- 1

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1052.4 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			MATERIAL DESCRIPTION									
	X	○	Brown <u>CLAYEY SAND</u> with sandstone fragments, damp to wet, loose to medium dense - w/few coal fragments (30.0' - 31.5')  - wet @ 35 ft., w/some sub-angular sandstone and shale fragments (35.0' - 36.5')  - numerous sandstone fragments and some root traces  - brown sand lens (55.0' - 55.5')  - gray sandstone boulder (57.0' - 60.5')  - SPOIL/FILL -			5-6-15						
35	X	○		5-5-6								
40	X	○		10-12-9								
45	X	○		11-9-8								
50	X	○		2-3-3								
55	X	○		10-9-7								
60	X	○										

BORING C00553.GPJ 2/27/01

Completion Depth: **96.8 feet**  
 Date Boring Started: **12/1/00**  
 Date Boring Completed: **12/2/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of approximately 35 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DH1- 1

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1052.4 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;"> <p>⊗ Split Spoon</p> <p>⊠ Shelby Tube</p> <p>▬ Rock Core</p> </div> <div style="width: 80%;"> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p> </div> </div>										
			Brown <u>CLAYEY SAND</u> with sandstone fragments, damp to wet, loose to medium dense  - SPOIL/FILL -			50/2"							
65			Brown and gray <u>CLAYEY SAND to SANDY CLAY</u> with some sandstone fragments, damp, dense to very dense	65.0		10-14-19							
70						19-21-21							
75						11-34-39							
80			Brown <u>SANDSTONE</u> , medium hard, weathered, friable gray, fractured (82.5' - 83.6')	81.0	50	0	50/1"						
85			VOID  (Partially Filled)										
85					17	4							
90													

BORING C00553.GPJ 2/27/01

Completion Depth: **96.8 feet**  
 Date Boring Started: **12/1/00**  
 Date Boring Completed: **12/2/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of approximately 35 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DH1- 1

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1052.4 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<b>MATERIAL DESCRIPTION</b>									
			VOID	91.5								
			<u>COAL</u> , broken	92.9								
95			Gray <u>CLAY SHALE</u> , very soft to soft, becoming sandier and medium hard with depth	100	70							
			96.8									
			Bottom of Test Boring @ 96.8 ft.									
100												
105												
110												
115												
120												

Completion Depth: **96.8 feet**  
 Date Boring Started: **12/1/00**  
 Date Boring Completed: **12/2/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of approximately 35 ft. during drilling operations.**

BORING - C00553.GPJ 2/27/01

# LOG OF BORING NO. DH1- 2

Project Description: **Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1052.4 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<div style="display: flex; align-items: center;"> <div style="width: 20px; height: 20px; border: 1px solid black; margin-right: 5px;"></div> Split Spoon  <div style="width: 20px; height: 20px; border: 1px solid black; margin-right: 5px; background: repeating-linear-gradient(45deg, transparent, transparent 2px, black 2px, black 4px);"></div> Shelby Tube  <div style="width: 20px; height: 20px; border: 1px solid black; margin-right: 5px; background-color: black;"></div> Rock Core                 </div> <p style="text-align: center; margin-top: 10px;"><b>MATERIAL DESCRIPTION</b></p>									
		X	Coarse <u>COAL REFUSE</u>									
5		o	Brown <u>CLAYEY SAND</u> with sandstone fragments, damp, loose to very dense									
10		X				4-5-5						
15		X	- boulder (17.0' - 18.0')			4-4-4						
20		X				6-5-6						
25		X	- more clayey, with plant root traces (25.0' - 26.5')			3-5-5						
			- SPOIL/FILL -									
30			- boulder (29.5' - 30.5')									

BORING C00553.GPJ 2/27/01

Completion Depth: **101.9 feet**  
 Date Boring Started: **12/4/00**  
 Date Boring Completed: **12/4/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 50 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DH1- 2

**Project Description: Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1052.4 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;"> <p>⊗ Split Spoon</p> <p>⊗ Shelby Tube</p> <p>■ Rock Core</p> </div> <div style="width: 80%;"> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p> </div> </div>										
	⊗	○	Brown <u>CLAYEY SAND</u> with some sandstone fragments, damp, loose to very dense			29-5-4							
35	⊗	○	- boulder (35.0' - 36.0')			50/5"							
			- boulder (38.5' - 39.2')										
40	⊗	○	- very clayey, w/possible slurry laminations (40.0' - 41.5')			7-10-40							
			- possible slurry laminations (46.0' - 46.5')										
45	⊗	○				21-25-38							
			- wet, w/possible slurry fines @ 50.0 ft.										
			- SPOIL/FILL -										
50	⊗	○				16-12-11							
55	⊗	○	Brown <u>CLAYEY SAND to SANDY CLAY</u> with some sandstone fragments, wet, very dense			24-12-28							
			55.0										
60													

BORING C00553.GPJ 2/28/01

Completion Depth: **101.9 feet**  
 Date Boring Started: **12/4/00**  
 Date Boring Completed: **12/4/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 50 ft. during drilling operations.**

*Continued Next Page*



# LOG OF BORING NO. DH1- 2

Project Description: **Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1052.4 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<b>MATERIAL DESCRIPTION</b>									
	X	□	Brown <u>CLAYEY SAND</u> to <u>SANDY CLAY</u> with some sandstone fragments, wet, very dense			12-25-39						
65	X	□	65.8			30-50/4"						
		□	Brown <u>SANDSTONE</u> , medium hard, fine to medium grained, weathered, friable									
70	X	□		75	48	50/3"						
		□	- gray and brown with occasional carbonaceous laminations (74.1' - 83.4')									
75				100	78							
			83.4									
85			VOID  (Partially Filled)									
90				26	23							

BORING C00553.GPJ 2/28/01

Completion Depth: **101.9 feet**  
 Date Boring Started: **12/4/00**  
 Date Boring Completed: **12/4/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 50 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DH1- 2

**Project Description: Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1052.4 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;"> <p>⊠ Split Spoon</p> <p>⊞ Shelby Tube</p> <p>■ Rock Core</p> </div> <div style="width: 80%;"> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p> </div> </div>										
			VOID (Partially Filled)										
95		⊠	Gray <u>CLAY SHALE</u> , very soft to soft, becoming sandier and medium hard with depth	94.4									
			Gray <u>SANDSTONE</u> with shale laminations, medium hard to hard, fine grained	97.5									
100				98	98								
			Bottom of Test Boring @ 101.9 ft.										
105													
110													
115													
120													

BORING C00553.GPJ 2/27/01

Completion Depth: **101.9 feet**  
 Date Boring Started: **12/4/00**  
 Date Boring Completed: **12/4/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 50 ft. during drilling operations.**

# LOG OF BORING NO. DH1-3

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**

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Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1055.6 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 30%;"> <p>Location: <b>See Drawing No. C00553-1</b></p> <p>Surface El.: <b>1055.6 feet</b></p> <p> <span style="display: inline-block; width: 15px; height: 10px; border: 1px solid black; border-left: none; border-right: none; border-bottom: none; border-top: 1px dashed black;"></span> Split Spoon  <span style="display: inline-block; width: 15px; height: 10px; border: 1px solid black; border-left: none; border-right: none; border-bottom: none; border-top: 1px dashed black;"></span> Shelby Tube  <span style="display: inline-block; width: 15px; height: 10px; border: 1px solid black; border-left: none; border-right: none; border-bottom: none; border-top: 1px dashed black;"></span> Rock Core                 </p> </div> <div style="width: 65%;"> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p> </div> </div>										
		X	Coarse <u>COAL REFUSE</u>										
2.0			Brown <u>CLAYEY SAND</u> with sandstone fragments, damp, loose to medium dense										
5													
10		X				6-6-9							
15		X	- trace coal fragments (15.0' - 16.5')			5-4-2							
20		X				3-5-6							
25		X				6-4-4							
30			-SPOIL/FILL-										

BORING C00553.GPJ 2/27/01

Completion Depth: **106.9 feet**  
 Date Boring Started: **12/4/00**  
 Date Boring Completed: **12/5/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 40.0 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DH1- 3

Project Description: **Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1055.6 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;"> <p>⊗ Split Spoon</p> <p>⊗ Shelby Tube</p> <p>▬ Rock Core</p> </div> <div style="width: 80%;"> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p> </div> </div>										
	⊗	○	Brown <u>CLAYEY SAND</u> with sandstone fragments, damp, loose to medium dense  - SPOIL/FILL -			12-5-15							
35	⊗	○	Brown <u>CLAYEY SAND to SANDY CLAY</u> with some sandstone fragments, moist, medium dense	35.0		16-24-23							
40	⊗	○	Brown <u>SANDSTONE</u> , medium hard, medium grained, weathered, friable	40.5		17-50/5"							
45	▬	▬	- gray, medium hard to hard from 43.4 ft.  - occasional carbonaceous laminations (46.9' - 54.6')	95	71	50/0"							
50	▬	▬	- occasional iron stains ((53.8' - 55.7'))										
55	▬	▬		100	94								
60	▬	▬											

BORING: C00553.GPJ 2/27/01

Completion Depth: **106.9 feet**  
 Date Boring Started: **12/4/00**  
 Date Boring Completed: **12/5/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 40.0 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DH1- 3

**Project Description: Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**

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Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1055.6 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 30%;"> <p>⊠ Split Spoon</p> <p>⊠ Shelby Tube</p> <p>⊠ Rock Core</p> </div> <div style="width: 65%; text-align: center;"> <p><b>MATERIAL DESCRIPTION</b></p> </div> </div>										
65		/	<p>Gray <u>SANDSTONE</u>, medium hard to hard, medium grained</p> <p>- iron-stained horizontal fracture @ 66.0 ft.</p> <p>- brown w/some iron-staining (68.9' - 70.1') and (70.6' - 71.1')</p>	99	85								
70		/											
75		/		100	95								
80		/	<p>- modulus of rupture (84.2' - 85.0') - 485 psi (85.4' - 86.0') - 346 psi</p> <p>- unconfined compressive strength (83.9' - 84.2') - 6,100 psi (85.0' - 85.4') - 5,464 psi</p> <p>- iron-stained @ 87.5 ft.</p>										
85		/		55	50								
87.6		/	VOID										
90		/											

BORING\_C00553.GPJ 3/2/01

Completion Depth: **106.9 feet**  
 Date Boring Started: **12/4/00**  
 Date Boring Completed: **12/5/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

**Remarks: Groundwater was first noted at a depth of 40.0 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DH1- 3

Project Description: **Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**

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Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1055.6 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<b>MATERIAL DESCRIPTION</b>									
			VOID									
		[Symbol]	Gray <u>SANDSTONE</u> , medium hard to hard, medium grained, iron-stained	91.5								
95				70	56							
			VOID									
			Gray <u>CLAY SHALE</u> , very soft to soft, becoming sandier and medium hard with depth	95.4								
100				76	64							
			Gray <u>SANDSTONE</u> with shale laminations, medium hard, fine to medium grained	97.4								
105				100	100							
			Bottom of Test Boring @ 106.9 ft.	103.5								
110				106.9								
115												
120												

BORING: C00553.GPJ 2/27/01

Completion Depth: **106.9 feet**  
 Date Boring Started: **12/4/00**  
 Date Boring Completed: **12/5/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 40.0 ft. during drilling operations.**

# LOG OF BORING NO. DH1-4

Project Description: **Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1054.9 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 30%;"> <p> <span style="border: 1px solid black; padding: 2px;">X</span> Split Spoon  <span style="border: 1px solid black; padding: 2px;">X</span> Shelby Tube  <span style="border: 1px solid black; padding: 2px;">█</span> Rock Core                 </p> </div> <div style="width: 65%;"> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p> </div> </div>										
		X	Coarse <u>COAL REFUSE</u>										
2.0			Brown <u>CLAYEY SAND</u> with sandstone fragments, damp, loose to medium dense										
5													
10		X	- trace coal and organic fragments (10.0' - 11.5')			6-5-8							
15		X	- mostly sandstone fragments (15.0' - 16.5')			14-12-6							
20		X				4-3-4							
25		X				4-5-5							
30			- SPOIL/FILL - - brown and gray, with trace coal, wood fragments, possible slurry fines (30.0' - 31.5')										

BORING C00553.GPJ 2/27/01

Completion Depth: **106.7 feet**  
 Date Boring Started: **12/6/00**  
 Date Boring Completed: **12/6/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks: **Water was noted at a depth of 83.9 ft. upon drilling completion.**

*Continued Next Page*

# LOG OF BORING NO. DH1- 4



**Project Description: Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**

Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1054.9 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<b>MATERIAL DESCRIPTION</b>									
	X	○	Brown <u>CLAYEY SAND</u> with sandstone fragments, damp, loose to medium dense			13-8-7						
35	X	○	- few wood fragments (35.0' - 36.5')			6-7-7						
40	X	○	- brown and gray w/trace wood fragments (40.0' - 41.5')			5-6-6						
			- SPOIL/FILL -									
45	X	○		45.0								
	X	○	Brown <u>CLAYEY SAND</u> to <u>SANDY CLAY</u> with some sandstone fragments, damp, very dense			31-38-42						
50	X	○		50.3		50/4"						
	█	█	Gray <u>SANDSTONE</u> , medium hard to hard, medium grained	100	0							
			- coal band (50.3' - 50.7')									
55			- iron-stained, w/occasional carbonaceous laminations (50.7' - 51.0')	99	84							
			- iron-stained (53.2' - 53.5') and (54.0' - 57.0')									
60												

BORING C00553.GPJ 2/27/01

Completion Depth: **106.7 feet**  
 Date Boring Started: **12/6/00**  
 Date Boring Completed: **12/6/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks: **Water was noted at a depth of 83.9 ft. upon drilling completion.**

*Continued Next Page*



# LOG OF BORING NO. DH1- 4

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1054.9 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 40%;"> <p>⊠ Split Spoon</p> <p>⊡ Shelby Tube</p> <p>■ Rock Core</p> </div> <div style="width: 55%; text-align: center;"> <p><b>MATERIAL DESCRIPTION</b></p> </div> </div>										
65		⊠	<p>Gray <u>SANDSTONE</u>, medium hard to hard, medium grained</p> <p>- iron-stained, w/occasional carbonaceous inclusions (63.4' - 68.0')</p> <p>- weathered, w/numerous diagonal fractures (65.8' - 67.4')</p>	100	69								
70		⊠											
75		⊠	<p>- unconfined compressive strength (78.9' - 79.3') - 4,950 psi (83.2' - 83.8') - 3,291 psi</p>	100	100								
80		⊠	<p>- modulus of rupture (78.0' - 78.7') - 280 psi (84.0' - 84.5') - 388 psi</p>										
85		⊠	<p>- vertical fracture w/iron stain (81.7' - 83.2') and (84.5' - 85.5')</p>										
		⊠	VOID  (Partially Filled)	47	21								
85.5		⊠											
90		⊠											

BORING: C00553.GPJ 3/7/01

Completion Depth: **106.7 feet**  
 Date Boring Started: **12/6/00**  
 Date Boring Completed: **12/6/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks: **Water was noted at a depth of 83.9 ft. upon drilling completion.**

*Continued Next Page*

# LOG OF BORING NO. DH1- 4

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1054.9 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<b>MATERIAL DESCRIPTION</b>									
			VOID									
		☒	Gray <u>SHALEY SANDSTONE</u>	91.1								
				91.8								
			VOID (Partially Filled)									
95				12	0							
				96.2								
		☒	Gray <u>SANDSTONE</u>	96.7								
				0	0							
			Gray <u>CLAY SHALE</u> , very soft to soft, becoming sandier and medium hard with depth									
100				93	89							
				103.9								
		☒	Gray <u>SANDSTONE</u> with shale laminations, medium hard, fine grained									
105				100	100							
				106.7								
			Bottom of Test Boring @ 106.7 ft.									
110												
115												
120												

BORING C00553.GPJ 3/7/01

Completion Depth: **106.7 feet**  
 Date Boring Started: **12/6/00**  
 Date Boring Completed: **12/6/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks: **Water was noted at a depth of 83.9 ft. upon drilling completion.**

# LOG OF BORING NO. DH1- 5

**Project Description: Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1054.4 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;"> <p> <span style="border: 1px solid black; padding: 2px;">X</span> Split Spoon  <span style="border: 1px solid black; padding: 2px;">X</span> Shelby Tube  <span style="border: 1px solid black; padding: 2px;">■</span> Rock Core                 </p> </div> <div style="width: 80%;"> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p> </div> </div>										
		X	Coarse <u>COAL REFUSE</u>										
		○	Brown <u>CLAYEY SAND</u> with sandstone fragments, damp, loose to dense										
5		○											
10		X				6-5-7							
15		X	- mostly sandstone fragments (15.0' - 16.5')			5-7-6							
20		X	- more clayey (20.0' - 26.5')			4-4-4							
25		X	- root and plant traces (25.0' - 26.5')			11-8-4							
30		○	- wet @ 30.0 ft.										
			- SPOIL/FILL										

BORING C00553.GPJ 2/27/01

**Completion Depth: 109.3 feet**  
**Date Boring Started: 12/6/00**  
**Date Boring Completed: 12/8/00**  
**Engineer/Geologist: JEN/JTS**  
**Project No.: C00553**

**Remarks: Groundwater was first noted at a depth of 31.5 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DH1- 5

**Project Description:** Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1054.4 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;"> <p>⊗ Split Spoon</p> <p>⊠ Shelby Tube</p> <p>▣ Rock Core</p> </div> <div style="width: 80%;"> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p> </div> </div>										
			Brown <u>CLAYEY SAND</u> with sandstone fragments, damp, loose to dense  - boulder (31.5' - 33.0')			16-13-36							
35						6-5-25							
40			- trace coal fragments (40.0' - 41.0')  - boulder (41.0' - 43.5')			1-11-50/5"							
45			- SPOIL/FILL -										
			45.0										
			Brown <u>SANDY CLAY</u> to <u>CLAYEY SAND</u> with some sandstone fragments, damp, dense			11-50/3"							
50						17-20-21							
55						50/3"							
			55.0										
			Brown <u>SANDSTONE</u> , medium hard, medium grained, weathered, friable										
60													

BORING C00553.GPJ 2/27/01

Completion Depth: **109.3 feet**  
 Date Boring Started: **12/6/00**  
 Date Boring Completed: **12/8/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

**Remarks:** Groundwater was first noted at a depth of 31.5 ft. during drilling operations.

*Continued Next Page*

# LOG OF BORING NO. DH1- 5

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**Project Description: Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**

Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1054.4 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			ⓧ Split Spoon ⊠ Shelby Tube ◻ Rock Core <b>MATERIAL DESCRIPTION</b>									
			Brown <u>SANDSTONE</u> , medium hard, medium grained, weathered, friable	100	100	50/3"						
			- gray, medium hard to hard from 60.6 ft.									
65			- diagonal fracture @ 65.2 ft.									
			- vertical fracture (66.6' - 66.9')	99	74							
70			- occasional carbonaceous inclusions (67.5' - 86.1')									
75												
80			- modulus of rupture (82.0' - 82.5') - 249 psi (84.0' - 84.6') - 275 psi									
			- unconfined compressive strength (83.2' - 83.7') - 5,920 psi (84.6' - 85.1') - 4,230 psi									
85			- sandy shale band (85.4' - 86.1')									
			86.1									
			VOID									
			- void sample (87.3' - 90.6') brown sand and gravel	31	30							

BORING C00553.GPJ 3/2/01

Completion Depth: **109.3 feet**  
 Date Boring Started: **12/6/00**  
 Date Boring Completed: **12/8/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 31.5 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DH1-5

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**

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Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1054.4 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<div style="display: flex; align-items: center;"> <div style="width: 15px; height: 15px; border: 1px solid black; margin-right: 5px;"></div> Split Spoon  <div style="width: 15px; height: 15px; border: 1px solid black; margin-right: 5px; background: repeating-linear-gradient(45deg, transparent, transparent 2px, black 2px, black 4px);"></div> Shelby Tube  <div style="width: 15px; height: 15px; border: 1px solid black; margin-right: 5px; background-color: gray;"></div> Rock Core                 </div> <p style="text-align: center; margin-top: 10px;"><b>MATERIAL DESCRIPTION</b></p>									
95			VOID  (Partially Filled)									
		[Wavy pattern]		96.4								
100		[Wavy pattern]	Gray <u>CLAY SHALE</u> , very soft to soft, becoming sandier and medium hard with depth	50	34							
		[Wavy pattern]		103.6								
105		[Diagonal lines]	Gray <u>SANDSTONE</u> with shale laminations, medium hard, fine to medium grained	100	100							
		[Diagonal lines]		109.3								
110			Bottom of Test Boring @ 109.3 ft.									
115												
120												

BORING C00553.GPJ 2/27/01

Completion Depth: **109.3 feet**  
 Date Boring Started: **12/6/00**  
 Date Boring Completed: **12/8/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 31.5 ft. during drilling operations.**

# LOG OF BORING NO. DH1- 6

Project Description: **Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1051.4 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			MATERIAL DESCRIPTION									
5		X	Coarse <u>COAL REFUSE</u>									
10		X										
15		X										
20		X										
25		X										
30		X										

BORING C00553.GPJ 2/27/01

Completion Depth: **99.8 feet**  
 Date Boring Started: **12/8/00**  
 Date Boring Completed: **12/8/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 40.0 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DH1- 6

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1051.4 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<p><b>MATERIAL DESCRIPTION</b></p> <p>  Split Spoon   Shelby Tube   Rock Core                 </p>									
			Coarse <u>COAL REFUSE</u>									
35				35.0								
			Brown and gray <u>CLAYEY SAND</u> with sandstone fragments, damp, loose to dense			8-8-11						
40			- wet @ 40.0 ft.	75			17	46	37			
			- shelly tube (40.0' - 42.0') brown and gray silty to clayey sand with sandstone fragments									
45				80								
			- shelly tube (45.0' - 46.0') large sandstone fragment with some silty sand									
50						8-8-10						
			- mostly sandstone fragments ( 50.0' - 61.5')									
55						11-25-24						
			- SPOIL/FILL -									
60												

BORING C00553.GPJ 3/2/01

Completion Depth: **99.8 feet**  
 Date Boring Started: **12/8/00**  
 Date Boring Completed: **12/8/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 40.0 ft. during drilling operations.**

*Continued Next Page*



# LOG OF BORING NO. DH1- 6

**Project Description: Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1051.4 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<p><b>MATERIAL DESCRIPTION</b></p> <p>Brown and gray <u>CLAYEY SAND</u> with sandstone fragments, damp to wet, loose to medium dense</p> <p>- trace coal fragments (60.0' - 61.5')</p> <p style="text-align: center;">- SPOIL/FILL -</p>			9-10-11						
65						12-18-14						
70			70.0			19-25-26						
75			Brown <u>CLAYEY SAND</u> to <u>SANDY CLAY</u> with some sandstone fragments, damp, dense to very dense			24-49-50/6"						
80						35-36-24						
85						9-15-19-27						
88.3			88.3			20-40-50/3"						
90			<u>COAL SLURRY</u>									

BORING C00553.GPJ 3/2/01

Completion Depth: **99.8 feet**  
 Date Boring Started: **12/8/00**  
 Date Boring Completed: **12/8/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 40.0 ft. during drilling operations.**

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# LOG OF BORING NO. DH1- 6

Project Description: **Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**

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Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1051.4 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<div style="display: flex; align-items: center;"> <div style="width: 20px; height: 20px; border: 1px solid black; margin-right: 5px;"></div> <div>Split Spoon</div> </div> <div style="display: flex; align-items: center; margin-top: 5px;"> <div style="width: 20px; height: 20px; border: 1px solid black; border-style: dashed; margin-right: 5px;"></div> <div>Shelby Tube</div> </div> <div style="display: flex; align-items: center; margin-top: 5px;"> <div style="width: 20px; height: 20px; border: 1px solid black; margin-right: 5px;"></div> <div>Rock Core</div> </div> <p style="text-align: center; margin-top: 10px;"><b>MATERIAL DESCRIPTION</b></p>									
90.2 90.9		COAL		98	45							
95		CLAY SHALE	Gray <u>CLAY SHALE</u> , very soft to soft, becoming sandier and medium hard with depth									
98.1				100	42							
100		SANDSTONE	Gray <u>SANDSTONE</u> with shale laminations, medium hard, fine to medium grained									
100			Bottom of Test Boring @ 99.8 ft.									
105												
110												
115												
120												
Completion Depth: <b>99.8 feet</b> Date Boring Started: <b>12/8/00</b> Date Boring Completed: <b>12/8/00</b> Engineer/Geologist: <b>JEN/JTS</b> Project No.: <b>C00553</b>				Remarks: <b>Groundwater was first noted at a depth of 40.0 ft. during drilling operations.</b>								

BORING C00553.GPJ 2/27/01

# LOG OF BORING NO. DH1-7

Project Description: **Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1052.1 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;"> <p>☒ Split Spoon</p> <p>☒ Shelby Tube</p> <p>☐ Rock Core</p> </div> <div style="width: 80%;"> <p><b>MATERIAL DESCRIPTION</b></p> </div> </div>										
5			<p>Coarse <u>COAL REFUSE</u></p>										
10													
15													
20													
25													
30													

BORING C00553.GPJ 2/27/01

Completion Depth: **100.4 feet**  
 Date Boring Started: **12/8/00**  
 Date Boring Completed: **12/9/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 50.0 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DH1-7

Project Description: **Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1052.1 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<p><b>MATERIAL DESCRIPTION</b></p> <p>Coarse <u>COAL REFUSE</u></p> <p style="text-align: right;">32.0</p> <p>Brown <u>CLAYEY SAND</u> with sandstone fragments, damp, loose to very dense</p>									
35	X					14-8-5						
40	X					8-7-6						
45	X		- very clayey ( 45.0 - 51.5 ft. )			4-4-4						
50	X		- with some plant roots ( 50.0 - 51.5 ft. )			4-4-5						
55	X		- wet @ 55.0 ft.			14-24-26						
			- mostly sandstone fragments ( 55.0 - 56.5 ft. )									
			- SPOIL/FILL -									

BORING C00553.GPJ 2/27/01

Completion Depth: **100.4 feet**  
 Date Boring Started: **12/8/00**  
 Date Boring Completed: **12/9/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 50.0 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DH1-7

Project Description: **Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1052.1 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;"> <p>⊗ Split Spoon</p> <p>⊠ Shelby Tube</p> <p>■ Rock Core</p> </div> <div style="width: 80%;"> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p> </div> </div>										
		o	Brown <u>CLAYEY SAND</u> with sandstone fragments, damp, loose to very dense			5-13-11							
			- SPOIL/FILL -										
65		o	Brown <u>CLAYEY SAND</u> to <u>SANDY CLAY</u> with some sandstone fragments, damp, dense to very dense			8-15-16							
			- boulder @ 73.7 ft.										
70		o				19-22-27-40							
						21-26-64-50/2"							
75		■		21	0								
80		■		14	0								
85		■											
			<u>COAL</u>	94	0								
90													

Completion Depth: **100.4 feet**  
 Date Boring Started: **12/8/00**  
 Date Boring Completed: **12/9/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 50.0 ft. during drilling operations.**

*Continued Next Page*

BORING C00553.GPJ 2/27/01

# LOG OF BORING NO. DH1-7

Project Description: **Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1052.1 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<p><b>MATERIAL DESCRIPTION</b></p> <p>☒ Split Spoon ☒ Shelby Tube ☐ Rock Core</p>									
		COAL										
92.0		☒										
95		☒	Gray <u>CLAY SHALE</u> , very soft to soft, becoming sandier and medium hard with depth	100	68							
99.5		☒										
100		☒	Gray <u>SANDSTONE</u> with shale laminations, medium hard, fine grained									
			Bottom of Test Boring @ 100.4 ft.									
100.4												
105												
110												
115												
120												

BORING C00553.GPJ 2/28/01

Completion Depth: **100.4 feet**  
 Date Boring Started: **12/8/00**  
 Date Boring Completed: **12/9/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 50.0 ft. during drilling operations.**

# LOG OF BORING NO. DH1- 8

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**Project Description: Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**

Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1053.2 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;"> <p>⊠ Split Spoon</p> <p>⊞ Shelby Tube</p> <p>■ Rock Core</p> </div> <div style="width: 80%;"> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p> </div> </div>										
5		⊠	Coarse <u>COAL REFUSE</u>										
5.0		○	Brown <u>CLAYEY SAND</u> with sandstone fragments, damp, dense to very dense										
10		○											
15		○											
20		○											
25		○											
30		○	- SPOIL/FILL -										

BORING C00553.GPJ 2/27/01

Completion Depth: **105.1 feet**  
 Date Boring Started: **12/11/00**  
 Date Boring Completed: **12/11/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Water was noted at a depth of 82.0 ft. upon drilling completion.**

*Continued Next Page*

# LOG OF BORING NO. DH1- 8

triadeng.com



**Project Description: Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**

Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1053.2 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; align-items: flex-start;"> <div style="width: 15%; text-align: center;"> <p>35</p> <p>40</p> <p>45</p> <p>50</p> <p>55</p> <p>60</p> </div> <div style="width: 10%; text-align: center;"> <p>×</p> <p>×</p> <p>×</p> </div> <div style="width: 85%;"> <p><b>MATERIAL DESCRIPTION</b></p> <p>Brown <u>CLAYEY SAND</u> with sandstone fragments, damp, dense to very dense</p> </div> </div>										
			- SPOIL/FILL -			17-15-23							
			55.0			26-50/1"							
			<div style="display: flex; align-items: flex-start;"> <div style="width: 15%; text-align: center;"> <p>60</p> </div> <div style="width: 85%;"> <p>Brown <u>CLAYEY SAND to SANDY CLAY</u> with some sandstone fragments, damp, very dense</p> </div> </div>										

BORING C00553.GPJ 2/27/01

Completion Depth: **105.1 feet**  
 Date Boring Started: **12/11/00**  
 Date Boring Completed: **12/11/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

**Remarks: Water was noted at a depth of 82.0 ft. upon drilling completion.**

*Continued Next Page*



# LOG OF BORING NO. DH1- 8

**Project Description: Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1053.2 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
	X	□	Brown <u>CLAYEY SAND</u> to <u>SANDY CLAY</u> with some sandstone fragments, damp, very dense  65.0			28-26-32						
65	X	□		Brown <u>SANDSTONE</u> , medium hard, medium to coarse grained, weathered, friable  - high angle fracture ( 67.0 - 67.6 ft. )  - with occasional diagonal fractures ( 67.6 - 68.7 ft. )  - gray ( 67.6 - 84.2 ft. )  - modulus of rupture (79.5' - 80.1') - 344 psi (83.0' - 83.8') - 398 psi  - unconfined compressive strength (81.2' - 81.7') - 5,700 psi (82.6' - 83.0') - 4,125 psi  - void ( 84.0 - 84.2 ft. )  - gray shale ( 84.2 - 85.0 ft. )	92	73	50/2"					
70												
75				102	89							
80												
85			VOID									
			VOID									
			VOID									
90			VOID									

Completion Depth: **105.1 feet**  
 Date Boring Started: **12/11/00**  
 Date Boring Completed: **12/11/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Water was noted at a depth of 82.0 ft. upon drilling completion.**

*Continued Next Page*

BORING\_C00553.GPJ 3/2/01

# LOG OF BORING NO. DH1- 8

**Project Description: Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1053.2 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<div style="font-size: small;"> <span style="display: inline-block; width: 15px; height: 15px; border: 1px solid black; border-style: dashed; margin-right: 5px;"></span> Split Spoon  <span style="display: inline-block; width: 15px; height: 15px; border: 1px solid black; border-style: solid; margin-right: 5px;"></span> Shelby Tube  <span style="display: inline-block; width: 15px; height: 15px; border: 1px solid black; margin-right: 5px;"></span> Rock Core                 </div> <p style="text-align: center; margin-top: 10px;"><b>MATERIAL DESCRIPTION</b></p>									
95			VOID  (filled w/sand and gravel)	100	90							
		95.3										
100			Gray <u>CLAY SHALE</u> , very soft to soft, becoming sandier and medium hard with depth									
		104.3		100	94							
105			Gray <u>SANDSTONE</u> with shale laminations, medium hard, fine to medium grained									
		105.1	Bottom of Test Boring @ 105.1 ft.									
110												
115												
120												

BORING C00553.GPJ 2/27/01

Completion Depth: **105.1 feet**  
 Date Boring Started: **12/11/00**  
 Date Boring Completed: **12/11/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Water was noted at a depth of 82.0 ft. upon drilling completion.**

# LOG OF BORING NO. DH1- 9

Project Description: **Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**

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Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1051.1 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<div style="display: flex; align-items: flex-start;"> <div style="width: 150px; border-right: 1px solid black; margin-right: 5px;"> </div> <div> <p><b>MATERIAL DESCRIPTION</b></p> <p>Coarse <u>COAL REFUSE</u></p> </div> </div>									
5												
10												
15												
20												
25												
30												

BORING C00553.GPJ 2/27/01

Completion Depth: **104.8 feet**  
 Date Boring Started: **12/12/00**  
 Date Boring Completed: **12/12/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Water was noted at a depth of 29.0 ft. upon drilling completion.**

*Continued Next Page*

# LOG OF BORING NO. DH1- 9

Project Description: **Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1051.1 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;"> <p> <span style="border: 1px solid black; padding: 2px;">X</span> Split Spoon  <span style="border: 1px solid black; padding: 2px;">X</span> Shelby Tube  <span style="border: 1px solid black; padding: 2px;">■</span> Rock Core                 </p> </div> <div style="width: 80%;"> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p> </div> </div>										
35		X	Coarse <u>COAL REFUSE</u>										
40		X											
45		X											
50		X	- wet @ 50.0 ft.										
55		X	55.0										
60		X	Brown and gray <u>CLAYEY SAND</u> with sandstone fragments, damp to wet, medium dense to very dense										
		X	- SPOIL/FILL -										

BORING C00553.GPJ 2/27/01

Completion Depth: **104.8 feet**  
 Date Boring Started: **12/12/00**  
 Date Boring Completed: **12/12/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Water was noted at a depth of 29.0 ft. upon drilling completion.**

*Continued Next Page*

# LOG OF BORING NO. DH1- 9

Project Description: **Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1051.1 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;"> <p>  Split Spoon   Shelby Tube   Rock Core                 </p> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p> </div> <div style="width: 75%;"> <p>Brown and gray <u>CLAYEY SAND</u> with sandstone fragments, damp to wet, medium dense to very dense</p> <p>- boulder @ 66.0 ft.</p> <p>- mostly brown @ 68 ft., w/trace coal fragments</p> <p>- w/trace wood fragments (70.0' - 74.0')</p> <p style="text-align: center;">- SPOIL/FILL -</p> </div> </div>			15-11-16-18							
						14-21-18-16							
65						16-15-14-15							
						50/3"							
						37-15-47-24							
70						9-18-14-37							
						10-17-28-50/3"							
			74.0			35-39-46-42							
75						24-38-39-50/5"							
						16-27-44-42							
80						31-36-55-54							
						50-82/6"							
85													
				10	0								
90													

BORING C00553.GPJ 2/27/01

Completion Depth: **104.8 feet**  
 Date Boring Started: **12/12/00**  
 Date Boring Completed: **12/12/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Water was noted at a depth of 29.0 ft. upon drilling completion.**

*Continued Next Page*

# LOG OF BORING NO. DH1-9

**Project Description: Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**

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Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1051.1 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<div style="font-size: small;"> <span style="display: inline-block; width: 1em; height: 1em; border: 1px solid black; margin-right: 5px;"></span> Split Spoon  <span style="display: inline-block; width: 1em; height: 1em; border: 1px solid black; margin-right: 5px;"></span> Shelby Tube  <span style="display: inline-block; width: 1em; height: 1em; border: 1px solid black; margin-right: 5px;"></span> Rock Core                 </div> <p style="text-align: center; margin-top: 10px;"><b>MATERIAL DESCRIPTION</b></p>									
92.5		[Symbol]	Brown <u>CLAYEY SAND to SANDY CLAY</u> with some sandstone fragments, damp to wet, very dense - trace coal fragments @ 92 ft.	56	0							
95		[Symbol]	Gray <u>CLAY SHALE</u> , very soft to soft, becoming sandier and medium hard with depth									
100		[Symbol]	Gray <u>SANDSTONE</u> with shale laminations, medium hard to hard, fine to medium grained	101	91							
101.0		[Symbol]										
104.8		[Symbol]	Bottom of Test Boring @ 104.8 ft.									
105		[Symbol]										
110		[Symbol]										
115		[Symbol]										
120		[Symbol]										

BORING C00553.GPJ 2/27/01

Completion Depth: **104.8 feet**  
 Date Boring Started: **12/12/00**  
 Date Boring Completed: **12/12/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

**Remarks: Water was noted at a depth of 29.0 ft. upon drilling completion.**

# LOG OF BORING NO. DH1-10

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**

triadeng.com



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1052.1 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			MATERIAL DESCRIPTION									
5		X	Coarse <u>COAL REFUSE</u>									
10		X										
15		X										
17.0		X										
20		O	Brown and gray <u>CLAYEY SAND</u> with sandstone fragments, damp, medium dense to very dense									
25		O										
30		O	- SPOIL/FILL -									

BORING C00553.GPJ 2/27/01

Completion Depth: **109.9 feet**  
 Date Boring Started: **12/13/00**  
 Date Boring Completed: **12/13/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 50.0 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DH1-10

Project Description: **Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1052.1 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 30%;"> <p> <span style="border: 1px solid black; padding: 2px;">X</span> Split Spoon  <span style="border: 1px solid black; padding: 2px;">X</span> Shelby Tube  <span style="border: 1px solid black; padding: 2px;"> </span> Rock Core                 </p> </div> <div style="width: 65%; text-align: center;"> <p><b>MATERIAL DESCRIPTION</b></p> </div> </div>										
35		○	Brown and gray <u>CLAYEY SAND</u> with sandstone fragments, damp, medium dense to very dense										
45		X				29-13-12							
50		X	- wet @ 50.0 ft.			6-7-7							
55		X				15-13-13							
60		○	- SPOIL/FILL -										

BORING C00553.GPJ 2/28/01

Completion Depth: **109.9 feet**  
 Date Boring Started: **12/13/00**  
 Date Boring Completed: **12/13/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 50.0 ft. during drilling operations.**

*Continued Next Page*



# LOG OF BORING NO. DH1-10

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1052.1 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<div style="font-size: small;"> <span style="display: inline-block; width: 15px; height: 10px; border: 1px solid black; border-bottom: 3px double black; margin-right: 5px;"></span> Split Spoon  <span style="display: inline-block; width: 15px; height: 10px; border: 1px solid black; border-bottom: 3px double black; margin-right: 5px;"></span> Shelby Tube  <span style="display: inline-block; width: 15px; height: 10px; border: 1px solid black; margin-right: 5px;"></span> Rock Core                 </div> <p style="text-align: center; font-weight: bold; margin-top: 10px;">MATERIAL DESCRIPTION</p>									
	X	o	Brown and gray <u>CLAYEY SAND</u> with some sandstone fragments, damp to wet, medium dense to dense  - SPOIL/FILL -			18-19-25						
65	X	o	Brown <u>SANDY CLAY</u> to <u>CLAYEY SAND</u> with some sandstone fragments, damp, medium dense to very dense	65.0		13-20-31						
70	X	o				23-36-47-28						
75	X	o				18-15-10-11						
77	X	o				12-17-9-9						
77.0	X	o				20-16-50/4"						
80	X	o	Brown <u>SANDSTONE</u> , medium hard, medium grained, weathered, friable			50/1"						
80.6	X	o		88	33							
			VOID									
85			- void sample (80.6' - 85.7') brown silty sand with rock fragments  7.2% gravel 82.6% sand 10.2% silt and clay	15	0							
90												

BORING C00553.GPJ 2/27/01

Completion Depth: **109.9 feet**  
 Date Boring Started: **12/13/00**  
 Date Boring Completed: **12/13/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 50.0 ft. during drilling operations.**

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# LOG OF BORING NO. DH1-10

Project Description: **Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**

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Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1052.1 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
		Split Spoon Shelby Tube Rock Core	<b>MATERIAL DESCRIPTION</b>									
			<u>SANDSTONE BOULDER</u>	90.3 91.3	37	7						
			VOID									
95			Gray <u>CLAY SHALE</u> , very soft to soft, becoming sandier and medium hard with depth	94.4								
100					100	80						
105			Gray <u>SANDSTONE</u> with shale laminations, medium hard, fine grained	104.9								
110				109.9	100	94						
			Bottom of Test Boring @ 109.9 ft.									
115												
120												

BORING C00553.GPJ 2/27/01

Completion Depth: **109.9 feet**  
 Date Boring Started: **12/13/00**  
 Date Boring Completed: **12/13/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 50.0 ft. during drilling operations.**

# LOG OF BORING NO. DH1-11

**Project Description: Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1057.8 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 40%;"> <p>⊠ Split Spoon</p> <p>⊠ Shelby Tube</p> <p>■ Rock Core</p> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p> </div> <div style="width: 55%;"> <p>Coarse <u>COAL REFUSE</u> 0.5</p> <p>Brown <u>CLAYEY SAND</u> with some sandstone fragments, damp</p> <p style="text-align: center;">AUGER W/OUT SAMPLING</p> </div> </div>										
5													
10													
15													
20													
25													
30			26.0										
			Gray <u>SANDSTONE</u> , medium hard to hard, medium grained										

BORING C00553.GPJ 2/28/01

Completion Depth: **111.0 feet**  
 Date Boring Started: **12/13/00**  
 Date Boring Completed: **12/14/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks: **Water was noted at a depth of 86.5 ft. upon drilling completion.**

*Continued Next Page*

# LOG OF BORING NO. DH1-11

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**

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Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1057.8 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<div style="display: flex; align-items: flex-start;"> <div style="width: 15px; height: 15px; border: 1px solid black; margin-right: 5px;"></div> Split Spoon  <div style="width: 15px; height: 15px; border: 1px solid black; margin-right: 5px; background: repeating-linear-gradient(45deg, transparent, transparent 2px, black 2px, black 4px);"></div> Shelby Tube  <div style="width: 15px; height: 15px; border: 1px solid black; margin-right: 5px; background-color: black;"></div> Rock Core                 </div> <p style="text-align: center; margin-top: 10px;"><b>MATERIAL DESCRIPTION</b></p>									
35			Gray <u>SANDSTONE</u> , medium hard to hard, medium grained - weathered, soft to medium hard (26.0' - 32.0')  - occasional coal laminations (34.8' - 38.4')  - occasional shale clasts (35.5' - 39.0')	100	68							
45			- iron-stained (48.2' - 51.1')  - vertical fracture (50.3' - 51.0')	97	90							
55			- occasional carbonaceous laminations (52.1' - 59.1')	97	87							
60												

BORING C00553.GPJ 2/27/01

Completion Depth: **111.0 feet**  
 Date Boring Started: **12/13/00**  
 Date Boring Completed: **12/14/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks: **Water was noted at a depth of 86.5 ft. upon drilling completion.**

*Continued Next Page*

# LOG OF BORING NO. DH1-11

Project Description: **Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**

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Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1057.8 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 40%;"> <p>⊠ Split Spoon</p> <p>⊠ Shelby Tube</p> <p>▣ Rock Core</p> </div> <div style="width: 55%; text-align: center;"> <p><b>MATERIAL DESCRIPTION</b></p> </div> </div>										
65		⊠	<p>Gray <u>SANDSTONE</u>, medium hard to hard, medium grained</p> <p>- fractured (66.1' - 66.5')</p>	100	91								
70		⊠	<p>- occasional carbonaceous laminations (69.1' - 90.4')</p>										
75		⊠		100	92								
80		⊠											
85		⊠	<p>- iron-stained (83.6' - 86.0')</p>	89	89								
90		⊠											
<p>Completion Depth: <b>111.0 feet</b></p> <p>Date Boring Started: <b>12/13/00</b></p> <p>Date Boring Completed: <b>12/14/00</b></p> <p>Engineer/Geologist: <b>JEN/JTS</b></p> <p>Project No.: <b>C00553</b></p>			<p>Remarks: <b>Water was noted at a depth of 86.5 ft. upon drilling completion.</b></p>										

BORING C00553.GPJ 2/27/01

*Continued Next Page*

# LOG OF BORING NO. DH1-11

**Project Description: Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1057.8 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<b>MATERIAL DESCRIPTION</b>									
90.4		▽	VOID									
95			- void sample (92.6' - 96.2') brown silty sand with rock fragments	0	0							
			1.3% gravel 93.3% sand 5.4% silt and clay									
100			- void sample (96.1' - 97.1') gray silty sand with rock fragments									
			15.8% gravel 55.0% sand 29.2% silt and clay									
100.5		/ / / / /	Gray <u>CLAY SHALE</u> , very soft to soft, becoming sandier and medium hard with depth	0	0							
105				100	92							
106.3		/ / / / /	Gray <u>SANDSTONE</u> with shale laminations, medium hard, fine to medium grained									
110				100	60							
111.0			Bottom of Test Boring @ 111.0 ft.									

BORING\_C00553.GPJ 2/28/01

Completion Depth: **111.0 feet**  
 Date Boring Started: **12/13/00**  
 Date Boring Completed: **12/14/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks: **Water was noted at a depth of 86.5 ft. upon drilling completion.**

# LOG OF BORING NO. DH1-12

**Project Description: Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1056.2 feet</b> Split Spoon Shelby Tube Rock Core									
			Coarse <u>COAL REFUSE</u> 1.0									
			Brown <u>CLAYEY SAND</u> with some sandstone fragments, damp									
5			AUGER W/OUT SAMPLING									
10												
15												
20												
25												
30												

BORING C00553.GPJ 2/28/01

Completion Depth: **99.4 feet**  
 Date Boring Started: **1/4/01**  
 Date Boring Completed: **1/4/01**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks:

*Continued Next Page*

# LOG OF BORING NO. DH1-12

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1056.2 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<p> <input type="checkbox"/> Split Spoon  <input type="checkbox"/> Shelby Tube  <input type="checkbox"/> Rock Core                 </p> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p>									
		o	Brown <u>CLAYEY SAND</u> with some sandstone fragments, damp		32.0							
35		/	Brown <u>SANDSTONE</u> , medium hard, medium grained, weathered and iron-stained	100	28							
			- gray, medium hard to hard from approx. 37 ft.									
40			- clay lens @ 37.8 ft.	100	68							
45				100	86							
50			- numerous carbonaceous laminations (49.7' - 54.0')									
55				98	92							
60												

BORING C00553.GPJ 2/27/01

Completion Depth: **99.4 feet**  
 Date Boring Started: **1/4/01**  
 Date Boring Completed: **1/4/01**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks:

*Continued Next Page*



# LOG OF BORING NO. DH1-12

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**

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Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1056.2 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 40%;"> <p>Location: <b>See Drawing No. C00553-1</b></p> <p>Surface El.: <b>1056.2 feet</b></p> <p> <span style="display: inline-block; width: 15px; height: 10px; border: 1px solid black; border-style: dashed; margin-right: 5px;"></span> Split Spoon  <span style="display: inline-block; width: 15px; height: 10px; border: 1px solid black; border-style: solid; margin-right: 5px;"></span> Shelby Tube  <span style="display: inline-block; width: 15px; height: 10px; border: 1px solid black; margin-right: 5px;"></span> Rock Core                 </p> </div> <div style="width: 55%; text-align: center;"> <p><b>MATERIAL DESCRIPTION</b></p> </div> </div>										
65		✓	Gray <u>SANDSTONE</u> , medium hard to hard, medium grained  - iron-stained vertical fracture @ 65.3 ft.  - fractured, w/occasional shale clasts (66.6' - 67.6')  - carbonaceous laminations (68.1' - 69.1')  - vertical fracture (72.3' - 72.7')	100	56								
70		✓											
75		✓		100	96								
80		✓											
85		✓		93	93								
89.4		✓		89.1									

BORING C00553.GPJ 2/27/01

Completion Depth: **99.4 feet**  
 Date Boring Started: **1/4/01**  
 Date Boring Completed: **1/4/01**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks:

*Continued Next Page*

# LOG OF BORING NO. DH1-12

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1056.2 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
		<div style="display: flex; justify-content: space-between;"> <div style="width: 30%;"> <p> Split Spoon</p> <p> Shelby Tube</p> <p> Rock Core</p> </div> <div style="width: 65%; text-align: center;"> <p><b>MATERIAL DESCRIPTION</b></p> </div> </div>											
-95			VOID										
			- void sample (89.4' - 99.4') brown silty sand with rock fragments, trace coal slurry 39.3% gravel; 35.8% sand; 24.9% silt and clay	13	0								
			- void sample (93.7' - 96.0') - brown silty sand with rock fragments 42.7% gravel; 37.2% sand; 20.1% silt and clay										
			99.2										
-100			Gray CLAY SHALE, very soft										
			99.4										
			Bottom of Test Boring @ 99.4 ft.										
-105													
-110													
-115													
-120													

BORING C00553.GPJ 2/28/01

Completion Depth: **99.4 feet**  
 Date Boring Started: **1/4/01**  
 Date Boring Completed: **1/4/01**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks:

# LOG OF BORING NO. DH1-13

Project Description: **Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**

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Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1054.0 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 20px;">  Split Spoon   Shelby Tube   Rock Core                 </div> <div style="width: 70%;"> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p> </div> </div>										
0.0		X	Coarse <u>COAL REFUSE</u>										
5.0		O	Brown <u>CLAYEY SAND</u> with sandstone fragments										
10.0		O	CASING ADVANCE W/OUT SAMPLING										
15.0		O											
20.0		O											
25.0		O											
30.0		O	- SPOIL/FILL -										

BORING C00553.GPJ 2/27/01

Completion Depth: **96.0 feet**  
 Date Boring Started: **1/10/01**  
 Date Boring Completed: **1/11/01**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Water was noted at a depth of 78.4 ft. upon drilling completion.**

*Continued Next Page*

# LOG OF BORING NO. DH1-13

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**

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Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1054.0 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			MATERIAL DESCRIPTION									
35		○	Brown <u>CLAYEY SAND</u> with sandstone fragments									
40		○	CASING ADVANCE W/OUT SAMPLING									
45		○	- SPOIL/FILL -									
50		○	50.0									
55		○	Brown <u>CLAYEY SAND to SANDY CLAY</u> with some sandstone fragments									
60		○										

BORING C00553.GPJ 2/27/01

Completion Depth: **96.0 feet**  
 Date Boring Started: **1/10/01**  
 Date Boring Completed: **1/11/01**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Water was noted at a depth of 78.4 ft. upon drilling completion.**

*Continued Next Page*

# LOG OF BORING NO. DH1-13

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1054.0 feet</b> Legend: ☒ Split Spoon ⊠ Shelby Tube ◻ Rock Core									
			Brown <u>CLAYEY SAND</u> to <u>SANDY CLAY</u> with sandstone fragments <span style="float: right;">63.0</span>									
65			Gray <u>SANDSTONE</u> , hard, medium grained  CASING ADVANCE W/OUT SAMPLING									
70												
75												
80												
85			VOID <span style="float: right;">85.5</span> - trace sand recovered (85.7' - 87.7') - brown and gray silty sand with some gravel, trace roots (87.7' - 89.7')	0		WOT/1.5' - 4						
90				30		94/2'	34	43	24			
Completion Depth: <b>96.0 feet</b> Date Boring Started: <b>1/10/01</b> Date Boring Completed: <b>1/11/01</b> Engineer/Geologist: <b>JEN/CEM</b> Project No.: <b>C00553</b>				Remarks: <b>Water was noted at a depth of 78.4 ft. upon drilling completion.</b>								

BORING C00553.GPJ 2/28/01

*Continued Next Page*

# LOG OF BORING NO. DH1-13

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1054.0 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 40%;"> <p>Location: <b>See Drawing No. C00553-1</b></p> <p>Surface El.: <b>1054.0 feet</b></p> <p> <span style="display: inline-block; width: 10px; height: 10px; border: 1px solid black; border-style: dashed; margin-right: 5px;"></span> Split Spoon  <span style="display: inline-block; width: 10px; height: 10px; border: 1px solid black; border-style: solid; margin-right: 5px;"></span> Shelby Tube  <span style="display: inline-block; width: 10px; height: 10px; border: 1px solid black; margin-right: 5px;"></span> Rock Core                 </p> </div> <div style="width: 55%;"> <p><b>MATERIAL DESCRIPTION</b></p> </div> </div>										
	X		VOID	25		160/2'	29	61	10				
	X		- less clayey, w/ cobble size sandstone fragments (89.7' - 91.7')	15		18/2'	47	35	18				
	X		- sand, gravel, and cobbles (91.7' - 95.6')	52		67/2.3'	43	37	20				
95	X		95.6										
	M		96.0										
			Gray <u>CLAY SHALE</u> , very soft to soft										
			Bottom of Test Boring @ 96.0 ft.										
100													
105													
110													
115													
120													

BORING: C00553.GPJ 3/2/01

Completion Depth: **96.0 feet**  
 Date Boring Started: **1/10/01**  
 Date Boring Completed: **1/11/01**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Water was noted at a depth of 78.4 ft. upon drilling completion.**

# LOG OF BORING NO. DH2-1

Project Description: **Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1052.4 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; align-items: center;"> <div style="width: 20px; height: 20px; border: 1px solid black; margin-right: 5px; position: relative;"> <span style="position: absolute; top: 50%; left: 50%; transform: translate(-50%, -50%); font-size: 8px;">X</span> </div> <span>Split Spoon</span> </div> <div style="display: flex; align-items: center; margin-top: 5px;"> <div style="width: 20px; height: 20px; border: 1px solid black; margin-right: 5px; position: relative;"> <span style="position: absolute; top: 50%; left: 50%; transform: translate(-50%, -50%); font-size: 8px;">X</span> </div> <span>Shelby Tube</span> </div> <div style="display: flex; align-items: center; margin-top: 5px;"> <div style="width: 20px; height: 20px; border: 1px solid black; margin-right: 5px; position: relative;"> <span style="position: absolute; top: 50%; left: 50%; transform: translate(-50%, -50%); font-size: 8px;">X</span> </div> <span>Rock Core</span> </div>										
			<b>MATERIAL DESCRIPTION</b>										
			Coarse <u>COAL REFUSE</u>										
5			5.0										
			Brown <u>CLAYEY SAND</u> with sandstone fragments, damp, very loose to very dense										
10						5-3-5							
15						2-6-3							
20						3-3-4							
25						4-4-6							
			- SPOIL/FILL -										
30													

BORING C00553.GPJ 2/27/01

Completion Depth: **100.5 feet**  
 Date Boring Started: **11/28/00**  
 Date Boring Completed: **11/28/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 39.0 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DH2-1

Project Description: **Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1052.4 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p><b>MATERIAL DESCRIPTION</b></p> <p>Brown <u>CLAYEY SAND</u> with sandstone fragments, damp, very loose to very dense</p> <p>- wet @ 39.0 ft.</p> <p style="text-align: center;">- SPOIL/FILL -</p> <p>Brown <u>SANDY CLAY to CLAYEY SAND</u> with some sandstone fragments, damp, dense to very dense</p> </div> <div style="width: 45%;"> <p>3-4-6</p> <p>2-15-9-8</p> <p>4-4-9-7</p> <p>4-7-11-13</p> <p>18-1-1-1</p> <p>4-6-6-7</p> <p>7-7-9-9</p> <p>2-5-8-10</p> <p>4-4-12-11</p> <p>12-30-28-23</p> <p>8-24-25-29</p> <p>15-26-27-37</p> <p>16-28-28-28</p> </div> </div>										
35													
40													
45													
50													
55			55.0										
60													

BORING: C00553.GPJ 2/27/01

Completion Depth: **100.5 feet**  
 Date Boring Started: **11/28/00**  
 Date Boring Completed: **11/28/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 39.0 ft. during drilling operations.**

*Continued Next Page*



# LOG OF BORING NO. DH2-1

**Project Description: Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**

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Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1052.4 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;"> <p>⊗ Split Spoon</p> <p>⊠ Shelby Tube</p> <p>▣ Rock Core</p> </div> <div style="width: 80%;"> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p> </div> </div>										
65			Brown <u>SANDY CLAY</u> to <u>CLAYEY SAND</u> with some sandstone fragments, damp, dense to very dense			26-26-30-33							
							11-24-18-31						
							19-21-23-25						
							18-18-29-37						
							16-24-25-38						
70				70.5		11-60/6"							
			Brown <u>SANDSTONE</u> , medium hard, medium grained, weathered, friable										
75			- very soft and weathered @ 73.2 ft. and 74.5 ft.	95	91								
80													
85				73	26								
			- tool drop (86.5' - 88.0')										
				88.0									
			<u>COAL</u>										

BORING C00553.GPJ 2/27/01

Completion Depth: **100.5 feet**  
 Date Boring Started: **11/28/00**  
 Date Boring Completed: **11/28/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 39.0 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DH2-1

Project Description: **Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**

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Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1052.4 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<p><b>MATERIAL DESCRIPTION</b></p> <p><u>COAL</u></p> <p>- unconfined compressive strength (91.5' - 91.7') - 1,290 psi</p> <p>- unconfined compressive strength (95.0' - 95.3') - 3,690 psi</p>									
95		[Symbol: Split Spoon]	96.0	100	27							
		[Symbol: Shelby Tube]	<p>Gray <u>CLAY SHALE</u>, very soft to soft</p>									
100		[Symbol: Rock Core]	100.5									
			<p>Bottom of Test Boring @ 100.5 ft.</p>									
105												
110												
115												
120												

Completion Depth: **100.5 feet**  
 Date Boring Started: **11/28/00**  
 Date Boring Completed: **11/28/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 39.0 ft. during drilling operations.**

BORING C00553.GPJ 2/27/01

# LOG OF BORING NO. DH2-2

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1053.4 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;"> <p>⊠ Split Spoon</p> <p>⊠ Shelby Tube</p> <p>■ Rock Core</p> </div> <div style="width: 80%;"> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p> </div> </div>										
		⊠	Coarse <u>COAL REFUSE</u>										
4.0													
5		○	Brown and gray <u>CLAYEY SAND</u> with sandstone fragments, damp, loose to medium dense										
10		⊠				3-4-7							
15		⊠				4-2-5							
20		⊠				2-3-4							
25		⊠				4-4-5							
30			- SPOIL/FILL -										

BORING: C00553.GPJ 2/27/01

Completion Depth: **100.5 feet**  
 Date Boring Started: **11/29/00**  
 Date Boring Completed: **11/30/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 35 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DH2-2

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1053.4 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			MATERIAL DESCRIPTION									
35	X	○	Brown and gray <u>CLAYEY SAND</u> with sandstone fragments, damp, loose to medium dense			4-9-9						
			- wet, w/mostly sandstone fragments @ 35.0 ft.			8-7-9						
40	X	○				5-5-9						
45	X	○				9-8-10						
50	X	○	- SPOIL/FILL -									
			50.0									
	X	○	Brown <u>SANDY CLAY</u> to <u>CLAYEY SAND</u> with some sandstone fragments, damp, dense			13-16-27						
55	X	○				13-15-26						
60	X	○										

BORING C00553.GPJ 2/27/01

Completion Depth: **100.5 feet**  
 Date Boring Started: **11/29/00**  
 Date Boring Completed: **11/30/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 35 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DH2-2

Project Description: **Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1053.4 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<div style="font-size: small;"> <span style="display: inline-block; width: 15px; height: 15px; border: 1px solid black; border-style: dashed; margin-right: 5px;"></span> Split Spoon  <span style="display: inline-block; width: 15px; height: 15px; border: 1px solid black; border-style: solid; margin-right: 5px;"></span> Shelby Tube  <span style="display: inline-block; width: 15px; height: 15px; border: 1px solid black; margin-right: 5px;"></span> Rock Core                 </div> <p style="text-align: center; margin-top: 10px;"><b>MATERIAL DESCRIPTION</b></p>									
	X	•••••	Brown <u>SANDY CLAY</u> to <u>CLAYEY SAND</u> with some sandstone fragments, damp, dense			28-19-18						
65	X	•••••	65.5			16-50/5"						
		/ / / / /	Brown <u>SANDSTONE</u> , medium hard, medium grained  - weathered and iron-stained (65.6' - 69.2')  - gray, hard from 69.2 ft.	89	76							
70		/ / / / /										
		/ / / / /		100	100							
75		/ / / / /										
		/ / / / /										
80		/ / / / /										
		/ / / / /										
85		/ / / / /	86.7									
		/ / / / /	VOID  (Partilly Filled)									
90		/ / / / /										

BORING C00553.GPJ 2/27/01

Completion Depth: **100.5 feet**  
 Date Boring Started: **11/29/00**  
 Date Boring Completed: **11/30/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 35 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DH2-2

Project Description: **Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**

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Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1053.4 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;"> <p>  Split Spoon   Shelby Tube   Rock Core                 </p> </div> <div style="width: 75%;"> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p> </div> </div>										
95			VOID (Partially Filled)	49	40								
		~ ~ ~ ~ ~	Gray <u>CLAY SHALE</u> , very soft to soft										
100			96.8										
			Bottom of Test Boring @ 100.5 ft.										
100.5			100.5										
105													
110													
115													
120													

BORING C00553.GPJ 3/2/01

Completion Depth: **100.5 feet**  
 Date Boring Started: **11/29/00**  
 Date Boring Completed: **11/30/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 35 ft. during drilling operations.**

# LOG OF BORING NO. DH2-3

**Project Description: Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**

triadeng.com



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1054.9 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<div style="display: flex; align-items: flex-start;"> <div style="width: 15%; text-align: center;"> <p>5</p> <p>10</p> <p>15</p> <p>20</p> <p>25</p> <p>30</p> </div> <div style="width: 85%;"> <p><b>Coarse COAL REFUSE</b></p> <hr style="border: 0.5px solid black;"/> <p><b>Brown CLAYEY SAND</b> with sandstone fragments, damp, medium dense</p> <p style="text-align: right; margin-right: 20px;">5.0</p> <p style="text-align: center;">- mostly sandstone fragments (30.0' - 31.5')</p> <p style="text-align: center;">- SPOIL/FILL -</p> </div> </div>									
						7-4-5						
						5-9-14						
						6-50/5"						
						6-4-6						

BORING C00553.GPJ 3/14/01

Completion Depth: **100.5 feet**  
 Date Boring Started: **11/30/00**  
 Date Boring Completed: **11/30/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Water was noted at a depth of 83.9 ft. upon drilling completion.**

*Continued Next Page*

# LOG OF BORING NO. DH2-3

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1054.9 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			MATERIAL DESCRIPTION									
	X	○	Brown <u>CLAYEY SAND</u> with sandstone fragments, damp, medium dense			10-8-12						
35	X	○	- sandstone boulder @ 35.0 ft.			50/5"						
40	X	○	- mostly sandstone fragments (40.0' - 41.5')			14-18-7						
			- SPOIL/FILL -									
45	X	○		45.0								
	X	○	Brown <u>SANDY CLAY to CLAYEY SAND</u> with some sandstone fragments, damp, dense			22-22-23						
50	X	○				16-21-22						
55	X	○				17-18-19						
60	X	○	Brown <u>SANDSTONE</u> , medium hard									
				59.0								

BORING C00553.GPJ 2/27/01

Completion Depth: **100.5 feet**  
 Date Boring Started: **11/30/00**  
 Date Boring Completed: **11/30/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Water was noted at a depth of 83.9 ft. upon drilling completion.**

*Continued Next Page*



# LOG OF BORING NO. DH2-3

Project Description: **Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1054.9 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
		<div style="display: flex; justify-content: space-between;"> <div style="width: 15%;"> <p>☒ Split Spoon</p> <p>☒ Shelby Tube</p> <p>☐ Rock Core</p> </div> <div style="width: 85%;"> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p> </div> </div>											
		☒	Brown <u>SANDSTONE</u> , medium hard, medium grained  - diagonal fracture @ 64.6 ft.  - clay seam @ 65.6 ft.  - gray, hard, with occasional carbonaceous inclusions from 67.6 ft.	98	66	50/1"							
65		☒											
70		☒											
75		☒		100	85								
80		☒											
85		☒											
88.4		☒	VOID										
90		☒											

BORING C00553.GPJ 2/27/01

Completion Depth: **100.5 feet**  
 Date Boring Started: **11/30/00**  
 Date Boring Completed: **11/30/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Water was noted at a depth of 83.9 ft. upon drilling completion.**

*Continued Next Page*

# LOG OF BORING NO. DH2-3

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1054.9 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<div style="display: flex; align-items: center;"> <div style="width: 15px; height: 15px; border: 1px solid black; margin-right: 5px; margin-bottom: 5px;"></div> Split Spoon  <div style="width: 15px; height: 15px; border: 1px solid black; margin-right: 5px; margin-bottom: 5px; background: repeating-linear-gradient(45deg, transparent, transparent 2px, black 2px, black 4px);"></div> Shelby Tube  <div style="width: 15px; height: 15px; border: 1px solid black; margin-right: 5px; margin-bottom: 5px; background-color: black;"></div> Rock Core                 </div> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p>									
95			VOID  (Partially Filled)	40	33							
98.9		~ ~ ~ ~ ~										
100		~ ~ ~ ~ ~	Gray <u>CLAY SHALE</u> , very soft to soft									
			Bottom of Test Boring @ 100.5 ft.									
105												
110												
115												
120												

BORING C00553.GPJ 2/27/01

Completion Depth: **100.5 feet**  
 Date Boring Started: **11/30/00**  
 Date Boring Completed: **11/30/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Water was noted at a depth of 83.9 ft. upon drilling completion.**

# LOG OF BORING NO. DH2-4

**Project Description:** Big Branch Slurry Impoundment Investigation  
 Martin County, Kentucky



Depth, feet	Sample Type	Symbol / USCS	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			Location: See Drawing No. C00553-1 Surface El.: 1049.5 feet Split Spoon Shelby Tube Rock Core									
5		X	Coarse <u>COAL REFUSE</u>									
10		X										
15		X										
20		X										
25		X										
30		X										

BORING C00553.GPJ 2/27/01

Completion Depth: **120.1 feet**  
 Date Boring Started: **11/30/00**  
 Date Boring Completed: **12/1/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 40 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DH2-4

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1049.5 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<p><b>MATERIAL DESCRIPTION</b></p> <p>Coarse <u>COAL REFUSE</u></p> <p>- wet @ 33.0 ft., w/some possible slurry</p>									
35												
40				40.0		8-9-8						
			<p>Brown <u>CLAYEY SAND</u> with sandstone fragments, damp, medium dense to very dense</p>									
45						4-8-8						
50						7-7-10						
55						10-7-8						
			- SPOIL/FILL -									
60												

Completion Depth: **120.1 feet**  
 Date Boring Started: **11/30/00**  
 Date Boring Completed: **12/1/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 40 ft. during drilling operations.**

*Continued Next Page*

BORING C00553.GPJ 2/27/01

# LOG OF BORING NO. DH2-4

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**

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Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1049.5 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<p><b>MATERIAL DESCRIPTION</b></p> <p>Brown <u>CLAYEY SAND</u> with sandstone fragments, damp, medium dense to very dense</p> <p>- mostly sandstone fragments with some clay (60.0' - 71.5')</p> <p>- w/some possible coal fines (65.0' - 66.5')</p> <p>- very sandy (75.0' - 76.5')</p> <p>- filter cake (80.0' - 81.5')</p> <p style="text-align: center;">- SPOIL/FILL -</p>			4-10-4						
65						13-15-16						
70						10-13-9						
75						25-20-33						
80						5-7-8						
85			85.0			27-29-38						
			Brown <u>SANDY CLAY to CLAYEY SAND</u> with some sandstone fragments, damp, dense to very dense			20-21-20						
90												

BORING: C00553.GPJ 2/28/01

Completion Depth: **120.1 feet**  
 Date Boring Started: **11/30/00**  
 Date Boring Completed: **12/1/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 40 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DH2-4

**Project Description: Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1049.5 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;"> <p>⊗ Split Spoon</p> <p>⊠ Shelby Tube</p> <p>▣ Rock Core</p> </div> <div style="width: 80%;"> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p> </div> </div>									
95	⊗	⊗	Brown <u>SANDY CLAY</u> to <u>CLAYEY SAND</u> with some sandstone fragments, damp, dense to very dense			53-62/6"						
				24-29-29-29								
				14-25-20-25								
				23-36-33								
100			Brown <u>SHALE</u> , soft, weathered	100.0		50/2"						
101				101.0								
105			Gray <u>SANDSTONE</u> with shale laminations, medium hard, fine to medium grained - iron-stained to 102.1 ft.  - vertical fracture @ 103.6 ft. and 108.5 ft.	93	71							
110												
115			- coal/shale band (116.0' - 116.5')	100	75							
117												
118			<u>COAL</u>									
120			Gray <u>CLAY SHALE</u> , soft									

BORING: C00553.GPJ 2/28/01

Completion Depth: **120.1 feet**  
 Date Boring Started: **11/30/00**  
 Date Boring Completed: **12/1/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 40 ft. during drilling operations.**

*Continued Next Page*

**LOG OF BORING NO. DH2-4**



Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**

Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1049.5 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
125 130 135 140 145 150		<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>☒ Split Spoon</p> <p>☒ Shelby Tube</p> <p>▬ Rock Core</p> </div> <div style="width: 50%; text-align: center;"> <p><b>MATERIAL DESCRIPTION</b></p> </div> </div>	<p>Bottom of Test Boring @ 120.1 ft.</p> <p style="text-align: right; margin-right: 20px;">120.1</p>									
Completion Depth: <b>120.1 feet</b> Date Boring Started: <b>11/30/00</b> Date Boring Completed: <b>12/1/00</b> Engineer/Geologist: <b>JEN/CEM</b> Project No.: <b>C00553</b>			Remarks: <b>Groundwater was first noted at a depth of 40 ft. during drilling operations.</b>									

BORING C00553.GPJ 2/27/01

# LOG OF BORING NO. DH2-5

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1051.2 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			MATERIAL DESCRIPTION									
5		X	Coarse <u>COAL REFUSE</u>									
10		X										
15		X										
20		X										
25		X										
30		X										
30		X										
30		X										
30		X										
30		X										

BORING C00553.GPJ 2/27/01

Completion Depth: **110.0 feet**  
 Date Boring Started: **12/1/00**  
 Date Boring Completed: **12/2/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 45 ft. during drilling operations.**

*Continued Next Page*



# LOG OF BORING NO. DH2-5

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1051.2 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			MATERIAL DESCRIPTION									
	X	○	Brown <u>CLAYEY SAND</u> with sandstone fragments, damp, very loose to medium dense			3-2-2						
35	X	○				5-8-12						
40	X	○	- trace coal fragments @ 40.0 ft.			8-11-19						
45	X	○	- wet @ 45 ft., w/mostly sandstone fragments			10-8-16						
50	X	○	- gray sandstone fragments (50.0' - 51.5')			6-5-7						
55	X	○	- mostly sand w/some sandstone fragments (55.0' - 56.5')			7-8-13						
			- SPOIL/FILL -									

BORING C00553.GPJ 2/27/01

Completion Depth: **110.0 feet**  
 Date Boring Started: **12/1/00**  
 Date Boring Completed: **12/2/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 45 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DH2-5

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1051.2 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<p><b>MATERIAL DESCRIPTION</b></p> <p>Brown and gray <u>CLAYEY SAND</u> with sandstone fragments, damp to wet, very loose to medium dense</p> <p>- mostly gravel-size sandstone fragments (60.0' - 61.5')</p>			12-6-7						
65						10-15-13						
70						5-6-9						
75			- SPOIL/FILL -									
			76.0			10-16-24						
			Brown <u>SANDY CLAY to CLAYEY SAND</u> with some sandstone fragments, damp, very dense									
80						22-27-28						
85						20-50/5"						
90												

Completion Depth: **110.0 feet**  
 Date Boring Started: **12/1/00**  
 Date Boring Completed: **12/2/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 45 ft. during drilling operations.**

*Continued Next Page*

BORING C00553.GPJ 2/27/01

# LOG OF BORING NO. DH2-5

Project Description: **Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1051.2 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<b>MATERIAL DESCRIPTION</b>									
	X	X	Brown <u>SANDY CLAY</u> to <u>CLAYEY SAND</u> with some sandstone fragments, damp, very dense			16-24-30						
	X	X	- very clayey @ 92.5 ft., w/some coal fragments			20-26-27						
95				95.0		50/1"						
		W	Gray <u>CLAY SHALE</u> , very soft to soft		84	39						
100												
				102.1								
		S	Gray <u>SANDSTONE</u> with shale laminations, medium hard, fine to medium grained		98	90						
105												
				110.0								
110			Bottom of Test Boring @ 110.0 ft.									
115												
120												

Completion Depth: **110.0 feet**  
 Date Boring Started: **12/1/00**  
 Date Boring Completed: **12/2/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 45 ft. during drilling operations.**

BORING C00553.GPJ 2/27/01

# LOG OF BORING NO. DH2-6

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1052.0 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
0												
5			Coarse <u>COAL REFUSE</u>									
10												
15												
20												
25												
30												
												30.0

BORING C00553.GPJ 2/27/01

Completion Depth: **105.2 feet**  
 Date Boring Started: **12/2/00**  
 Date Boring Completed: **12/4/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Goundwater was first noted at a depth of 50 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DH2-6

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**

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Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1052.0 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<p><b>MATERIAL DESCRIPTION</b></p> <p>Brown <u>CLAYEY SAND</u> with sandstone fragments, damp, medium dense</p>			6-5-7						
35						5-7-8						
40			- very sandy, with numerous gray sandstone fragments (45.0' - 46.5')			20-15-13						
45						4-3-18						
50			- wet @ 50.0 ft.			11-8-8						
55			- brown and gray, very sandy, w/some coal fragments (55.0' - 56.5')			7-7-10						
			- SPOIL/FILL -									
60												

BORING C00553.GPJ 2/27/01

Completion Depth: **105.2 feet**  
 Date Boring Started: **12/2/00**  
 Date Boring Completed: **12/4/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Goundwater was first noted at a depth of 50 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DH2-6

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1052.0 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			MATERIAL DESCRIPTION									
65	X	○	Brown and gray <u>CLAYEY SAND</u> with sandstone fragments, damp, medium dense  - w/small wood fragments @ 60 ft.			5-7-6						
70	X	○	- SPOIL/FILL -			11-11-19						
75	X	○	Brown <u>SANDY CLAY to CLAYEY SAND</u> with some sandstone fragments, damp, dense to very dense  w/gray mottling from 75 ft.			17-25-31						
80	X	○				17-25-31						
85	X	○				21-32-31						
90	X	○				13-23-18						

BORING C00553.GPJ 2/27/01

Completion Depth: **105.2 feet**  
 Date Boring Started: **12/2/00**  
 Date Boring Completed: **12/4/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 50 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DH2-6

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**

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Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1052.0 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<u>COAL</u>			22-27-37						
			93.5			15-18-37						
95			Gray <u>CLAY SHALE</u> , very soft to soft			50/2"						
100			100.7	100	90							
			Gray <u>SANDSTONE</u> with shale laminations, medium hard to hard, fine to medium grained									
105			105.2									
			Bottom of Test Boring @ 105.2 ft.									
110												
115												
120												

Completion Depth: **105.2 feet**  
 Date Boring Started: **12/2/00**  
 Date Boring Completed: **12/4/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 50 ft. during drilling operations.**

BORING C00553.GPJ 2/27/01

# LOG OF BORING NO. DH2-7

**Project Description:** Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky

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Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1051.7 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			MATERIAL DESCRIPTION									
5		X	Coarse <u>COAL REFUSE</u>									
10		X										
15		X										
20		X										
23.0		X										
25		O	Brown and gray <u>CLAYEY SAND</u> with sandstone fragments, damp, medium dense to very dense									
30		O	- SPOIL/FILL -									

BORING C00553.GPJ 2/27/01

Completion Depth: **105.5 feet**  
 Date Boring Started: **12/14/00**  
 Date Boring Completed: **12/15/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

**Remarks:** Groundwater was first noted at a depth of 45 ft. during drilling operations.

*Continued Next Page*



# LOG OF BORING NO. DH2-7

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1051.7 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<b>MATERIAL DESCRIPTION</b>									
35			Brown and gray <u>CLAYEY SAND</u> with sandstone fragments, damp, medium dense to very dense									
45			- wet, w/sandstone boulder @ 45 ft.			50-17-14						
50						5-7-9						
55			- mostly sandstone fragments (55.0' - 56.5')			11-9-14						
60			- SPOIL/FILL -									

Completion Depth: **105.5 feet**  
 Date Boring Started: **12/14/00**  
 Date Boring Completed: **12/15/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 45 ft. during drilling operations.**

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BORING C00553.GPJ 2/27/01

# LOG OF BORING NO. DH2-7

**Project Description: Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**

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Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1051.7 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;"> <p>⊠ Split Spoon</p> <p>⊠ Shelby Tube</p> <p>■ Rock Core</p> </div> <div style="width: 80%;"> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p> </div> </div>										
			Brown and gray <u>CLAYEY SAND</u> with sandstone fragments, damp, medium dense to very dense  - SPOIL/FILL -			50/2"							
65	⊠		Brown and gray <u>SANDY CLAY to CLAYEY SAND</u> with some sandstone fragments, damp, medium dense to very dense			11-11-17							
70	⊠					25-25-28							
75	⊠					50/4"							
80	■			37	0								
81.3			Brown <u>SANDSTONE</u> , medium hard, medium grained, weathered										
83.5				88	42								
85			Gray <u>SHALE</u> , soft - interbedded sandstone (84.3' - 84.8')										
86.0													
			<u>COAL</u>										

BORING: C00553.GPJ 2/28/01

Completion Depth: **105.5 feet**  
 Date Boring Started: **12/14/00**  
 Date Boring Completed: **12/15/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

**Remarks: Groundwater was first noted at a depth of 45 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DH2-7

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1051.7 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;"> <p>☒ Split Spoon</p> <p>☒ Shelby Tube</p> <p>☐ Rock Core</p> </div> <div style="width: 80%;"> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p> </div> </div>										
			<u>COAL</u>	93	9								
95			94.1 Gray <u>CLAY SHALE</u> , very soft to soft, becoming sandier and medium hard w/depth										
100			101.6 Gray <u>SANDSTONE</u> with shale laminations, medium hard, fine to medium grained	99	86								
105			105.5 Bottom of Test Boring @ 105.5 ft.										
110													
115													
120													

BORING C00553.GPJ 2/27/01

Completion Depth: **105.5 feet**  
 Date Boring Started: **12/14/00**  
 Date Boring Completed: **12/15/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 45 ft. during drilling operations.**

# LOG OF BORING NO. DH2-8

**Project Description:** Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1057.0 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<p><b>MATERIAL DESCRIPTION</b></p> <p>Coarse <u>COAL REFUSE</u> 1.3</p> <p>Brown <u>CLAYEY SAND</u> with sandstone fragments, damp, medium dense to very dense</p>									
5												
10						4-4-12						
15						7-8-10						
20						5-44-50/4"						
25			- SPOIL/FILL -									
26.0						13-24-24						
			Brown <u>SANDY CLAY</u> to <u>CLAYEY SAND</u> with some sandstone fragments, damp, dense to very dense									
30												

BORING C00553.GPJ 2/27/01

Completion Depth: **84.4 feet**  
 Date Boring Started: **12/8/00**  
 Date Boring Completed: **12/9/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks:

*Continued Next Page*

# LOG OF BORING NO. DH2-8

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1057.0 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<p><b>MATERIAL DESCRIPTION</b></p> <p>⊗ Split Spoon                      ⊠ Shelby Tube                      ■ Rock Core</p>									
			Brown <b>SANDY CLAY</b> to <b>CLAYEY SAND</b> with some sandstone fragments, damp, dense to very dense			16-37-35						
35						13-24-24						
			37.0									
40			Gray <b>SANDSTONE</b> , medium hard to hard, medium grained - iron-stained (37.0' - 39.5')			50/2"						
			- occasional carbonaceous laminations (39.5' - 44.1')	100	75							
45												
			- numerous carbonaceous laminations (47.0' - 52.4')	100	84							
50												
			- iron-stained vertical fracture (59.9' - 60.4')									
55												
60												

BORING C00553.GPJ 2/27/01

Completion Depth: **84.4 feet**  
 Date Boring Started: **12/8/00**  
 Date Boring Completed: **12/9/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks:

*Continued Next Page*

# LOG OF BORING NO. DH2-8

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1057.0 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
		<div style="display: flex; justify-content: space-between;"> <div style="width: 30%;"> <p> Split Spoon</p> <p> Shelby Tube</p> <p> Rock Core</p> </div> <div style="width: 65%;"> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p> </div> </div>											
65		[Diagonal hatching symbol]	Gray <u>SANDSTONE</u> , medium hard to hard, medium grained  - iron-stained (59.9' - 63.9')	99	79								
70		[Diagonal hatching symbol]		100	100								
75		[Diagonal hatching symbol]											
80		[Diagonal hatching symbol]	- clay seam (79.1' - 80.0')  - Boring abandoned @ 84.4 ft. after drilling rods became stuck in hole	40	6								
85		[Diagonal hatching symbol]	Bottom of Test Boring @ 84.4 ft.										

BORING C00553.GPJ 2/27/01

Completion Depth: **84.4 feet**  
 Date Boring Started: **12/8/00**  
 Date Boring Completed: **12/9/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks:

# LOG OF BORING NO. DH2-9

**Project Description: Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1056.0 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;"> <p>⊗ Split Spoon</p> <p>⊗ Shelby Tube</p> <p>■ Rock Core</p> </div> <div style="width: 80%;"> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p> </div> </div>										
		⊗	Coarse <u>COAL REFUSE</u>										
		○	Brown <u>CLAYEY SAND</u> with sandstone fragments, damp, medium dense to very dense										
5			CASING ADVANCE W/OUT SAMPLING										
10													
15													
20		⊗				12-12-10-54							
25		⊗				39-20-14-9							
25		⊗				34-35-26-20							
25		⊗				16-23-50/2"							
25		⊗				50/1"							
			- SPOIL/FILL -										
30													

BORING C00553.GPJ 2/28/01

Completion Depth: **100.1 feet**  
 Date Boring Started: **1/17/01**  
 Date Boring Completed: **1/18/01**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks: **Water was noted at a depth of 84.7 ft. upon drilling completion.**

*Continued Next Page*

# LOG OF BORING NO. DH2-9

Project Description: **Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1056.0 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<p><b>MATERIAL DESCRIPTION</b></p> <p>  Split Spoon   Shelby Tube   Rock Core                 </p>									
			Brown <u>CLAYEY SAND</u> sandstone fragments, damp, medium dense to very dense  - SPOIL/FILL -			50/1"						
35			Brown <u>CLAYEY SAND</u> to <u>SANDY CLAY</u> with some sandstone fragments, damp to wet, dense to very dense			5-14-18-17						
			34.0			18-30-36-41						
						32-75/5"						
						29-57-50/1"						
40						28-42-42-40						
						21-27-30-32						
45			CASING ADVANCE W/OUT SAMPLING (46.0' - 51.6')			27-24-27-29						
			49.5									
50			Brown <u>SANDSTONE</u> , medium hard, medium grained, weathered, friable									
55			- occasional diagonal fractures (56.1' - 61.4')	98	46							
60												

BORING C00553.GPJ 2/28/01

Completion Depth: **100.1 feet**  
 Date Boring Started: **1/17/01**  
 Date Boring Completed: **1/18/01**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks: **Water was noted at a depth of 84.7 ft. upon drilling completion.**

*Continued Next Page*



# LOG OF BORING NO. DH2-9

**Project Description: Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**

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Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1056.0 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;"> <p>⊠ Split Spoon</p> <p>⊞ Shelby Tube</p> <p>▣ Rock Core</p> </div> <div style="width: 80%;"> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p> </div> </div>										
65		/ \	Brown SANDSTONE, medium hard, medium grained, weathered, friable	98	52								
70		/ \	- gray, medium hard to hard from 66.9 ft.										
75		/ \		100	100								
80		/ \											
85		/ \		100	95								
89.5		/ \	- resume casing advance @ 88.0 ft.										
90		/ \		89.5									

BORING C00553.GPJ 2/28/01

Completion Depth: **100.1 feet**  
 Date Boring Started: **1/17/01**  
 Date Boring Completed: **1/18/01**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks: **Water was noted at a depth of 84.7 ft. upon drilling completion.**

*Continued Next Page*

# LOG OF BORING NO. DH2-9

**Project Description: Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1056.0 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<b>MATERIAL DESCRIPTION</b>  <div style="font-size: small;"> <span style="display: inline-block; width: 10px; height: 10px; border: 1px solid black; margin-right: 5px;"></span> Split Spoon  <span style="display: inline-block; width: 10px; height: 10px; border: 1px solid black; margin-right: 5px;"></span> Shelby Tube  <span style="display: inline-block; width: 10px; height: 10px; border: 1px solid black; margin-right: 5px;"></span> Rock Core                 </div>									
95	X		VOID - slurry w/sand and gravel (89.8' - 93.1') - gray sandstone cobble (93.1' - 93.8') - slurry, sand, and gravel (93.8' - 95.8') - silty sand with rock fragments (95.8' - 97.8') - slurry with sand and gravel (97.8' - 99.9') - gray clay shale (mine floor) @ 99.9 ft.			wot/2'						
						21/2'	27	32	41			
						40/2'	34	24	42		27	21
						37/2'	47	42	11			
						wot/2.1'	21	31	48		33	26
100	X		Bottom of Test Boring @ 100.1 ft.			20/2"						
105												
110												
115												
120												

BORING C00553.GPJ 3/2/01

**Completion Depth: 100.1 feet**  
**Date Boring Started: 1/17/01**  
**Date Boring Completed: 1/18/01**  
**Engineer/Geologist: JEN/JTS**  
**Project No.: C00553**

**Remarks: Water was noted at a depth of 84.7 ft. upon drilling completion.**



# LOG OF BORING NO. DH3-1

**Project Description: Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1050.0 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;"> <p>⊠ Split Spoon</p> <p>⊞ Shelby Tube</p> <p>■ Rock Core</p> </div> <div style="width: 80%;"> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p> </div> </div>										
35		⊠	Coarse <u>COAL REFUSE</u>										
40		⊠											
45		⊠	- wet @ 45 ft.			6-6-6							
50		⊠	50.5			4-18-30							
55		⊠	Brown <u>CLAYEY SAND</u> with sandstone fragments, damp, medium dense to dense										
60		⊠	- SPOIL/FILL -			5-4-7							

BORING C00553.GPJ 2/27/01

Completion Depth: **120.1 feet**  
 Date Boring Started: **12/5/00**  
 Date Boring Completed: **12/5/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

**Remarks: Groundwater was first noted at a depth of 45 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DH3-1

**Project Description: Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1050.0 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<p><b>MATERIAL DESCRIPTION</b></p> <p>Brown <u>CLAYEY SAND</u> with sandstone fragments, damp, medium dense to dense</p>			6-10-11						
65						12-19-16						
70						9-9-8						
			- SPOIL/FILL -									
75			75.0			5-10-39						
			Brown <u>SANDY CLAY to CLAYEY SAND</u> with some sandstone fragments, damp, very dense									
80						16-26-32-29						
						20-50/3"						
						50/1"						
85				20	0							

BORING C00553.GPJ 2/27/01

Completion Depth: **120.1 feet**  
 Date Boring Started: **12/5/00**  
 Date Boring Completed: **12/5/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 45 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DH3-1

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1050.0 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;"> <p>⊠ Split Spoon</p> <p>⊠ Shelby Tube</p> <p>■ Rock Core</p> </div> <div style="width: 75%;"> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p> </div> </div>										
95		⊠	Brown <u>SANDY CLAY</u> to <u>CLAYEY SAND</u> with some sandstone fragments, damp, very dense	48	14								
100		⊠	101.8	8	8								
105		⊠	Gray <u>SANDSTONE</u> with shale laminations, medium hard, fine to medium grained	88	81								
110		⊠											
115		⊠		100	98								
120		⊠											

BORING: C00553.GPJ 2/27/01

Completion Depth: **120.1 feet**  
 Date Boring Started: **12/5/00**  
 Date Boring Completed: **12/5/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 45 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DH3-1

Project Description: **Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**

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Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1050.0 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 60%;"> <p> <span style="display: inline-block; width: 1em; height: 1em; border: 1px solid black; border-style: dashed; margin-right: 0.5em;"></span> Split Spoon  <span style="display: inline-block; width: 1em; height: 1em; border: 1px solid black; border-style: solid; margin-right: 0.5em;"></span> Shelby Tube  <span style="display: inline-block; width: 1em; height: 1em; border: 1px solid black; margin-right: 0.5em;"></span> Rock Core                 </p> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p> </div> <div style="width: 35%; text-align: right;"> <p>120.1</p> </div> </div>										
125			Bottom of Test Boring @ 120.1 ft.										
130													
135													
140													
145													
150													

BORING C00553.GPJ 2/27/01

Completion Depth: **120.1 feet**  
 Date Boring Started: **12/5/00**  
 Date Boring Completed: **12/5/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 45 ft. during drilling operations.**





# LOG OF BORING NO. DH3-2

Project Description: **Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1051.4 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;"> <p>Location: See Drawing No. C00553-1</p> <p>Surface El.: 1051.4 feet</p> <p> <input type="checkbox"/> Split Spoon  <input type="checkbox"/> Shelby Tube  <input type="checkbox"/> Rock Core                 </p> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p> </div> <div style="width: 75%;"> <p>Coarse <u>COAL REFUSE</u></p> <p style="text-align: right;">32.0</p> <p>Brown and gray <u>CLAYEY SAND</u> with sandstone fragments, damp, medium dense to dense</p> <p style="text-align: center;">- wet @ 40 ft.</p> <p style="text-align: center;">- boulder @ 51 ft.</p> <p style="text-align: center;">- SPOIL/FILL -</p> <p style="text-align: right;">60.0</p> </div> </div>										
35						5-8-7							
40						7-6-21							
45						5-9-6							
50						8-15-13							
55						7-20-50/1"							
60													

BORING C00553.GPJ 2/27/01

Completion Depth: **110.5 feet**  
 Date Boring Started: **12/6/00**  
 Date Boring Completed: **12/6/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 40 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DH3-2

**Project Description: Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1051.4 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<b>MATERIAL DESCRIPTION</b>									
	X		Brown <u>SANDY CLAY to CLAYEY SAND</u> with some sandstone fragments, damp, medium dense to dense			20-26-33						
65	X		- boulder @ 65 ft.			50/6"						
70	X		- trace coal fragments @ 70 ft.			17-19-20						
75	X					17-19-17						
80	X					6-5-10						
85	X					38-18-22-28						
	X		- SPOIL/FILL -			14-30-50/2"						
			87.8									
			<u>COAL</u>									

BORING C00553.GPJ 2/27/01

Completion Depth: **110.5 feet**  
 Date Boring Started: **12/6/00**  
 Date Boring Completed: **12/6/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

**Remarks: Groundwater was first noted at a depth of 40 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DH3-2

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1051.4 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;"> <p>⊠ Split Spoon</p> <p>⊠ Shelby Tube</p> <p>■ Rock Core</p> </div> <div style="width: 80%;"> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p> </div> </div>										
			<u>COAL</u>	73	0								
95.0		95.0	Gray <u>CLAY SHALE</u> , very soft to soft, becoming sandier and medium hard with depth.	100	40								
103.0		103.0	Gray <u>SANDSTONE</u> with shale laminations, medium hard, fine to medium grained	100	96								
110.5		110.5	Bottom of Test Boring @ 110.5 ft.										

BORING C00553.GPJ 2/27/01

Completion Depth: **110.5 feet**  
 Date Boring Started: **12/6/00**  
 Date Boring Completed: **12/6/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 40 ft. during drilling operations.**

# LOG OF BORING NO. DH3-3

Project Description: **Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1052.7 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; align-items: flex-start;"> <div style="width: 20px; height: 100%; border-left: 1px solid black; margin-right: 5px;"></div> <div style="width: 100%; height: 100%; border-left: 1px solid black; border-right: 1px solid black; position: relative;"> <!-- Material Description --> <div style="position: absolute; top: 0; left: 0; right: 0; height: 100%; background-color: #f0f0f0; border: 1px solid black; display: flex; align-items: center; justify-content: center; text-align: center;"> <p>Coarse <u>COAL REFUSE</u></p> </div> <!-- Stratification Lines --> <div style="position: absolute; top: 0; left: 0; right: 0; height: 100%; border-left: 1px dashed black; border-right: 1px dashed black; border-bottom: 1px dashed black;"></div> </div> </div>										
5													
10													
15													
20													
25													
30			30.0										

BORING C00553.GPJ 2/27/01

Completion Depth: **105.1 feet**  
 Date Boring Started: **12/6/00**  
 Date Boring Completed: **12/7/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 35 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DH3-3

Project Description: **Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1052.7 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<div style="font-size: small;"> <span style="display: inline-block; width: 15px; height: 15px; border: 1px solid black; border-style: dashed; margin-right: 5px;"></span> Split Spoon  <span style="display: inline-block; width: 15px; height: 15px; border: 1px solid black; border-style: solid; margin-right: 5px;"></span> Shelby Tube  <span style="display: inline-block; width: 15px; height: 15px; border: 1px solid black; margin-right: 5px;"></span> Rock Core                 </div> <p style="text-align: center; margin-top: 10px;"><b>MATERIAL DESCRIPTION</b></p>									
35	X	○	Brown and gray <u>CLAYEY SAND</u> with sandstone fragments, damp, loose to medium dense  - wet @ 35 ft.			5-3-6						
40	X	○	- Unable to push shelly tube @ 40 ft. due to rock fragments			3-3-6						
45	X	○				31-28-9						
50	X	○	- SPOIL/FILL			3-6-21						
55	X	○				23-26-28						
60	X	○	Brown <u>SANDY CLAY</u> to <u>CLAYEY SAND</u> with some sandstone fragments, damp, dense			18-25-26						

BORING C00553.GPJ 2/27/01

Completion Depth: **105.1 feet**  
 Date Boring Started: **12/6/00**  
 Date Boring Completed: **12/7/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 35 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DH3-3

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1052.7 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<p><b>MATERIAL DESCRIPTION</b></p> <p>Legend:   Split Spoon   Shelby Tube   Rock Core</p>									
	X		Brown <u>SANDY CLAY to CLAYEY SAND</u> with some sandstone fragments, damp, dense			32-24-22						
65	X		- boulder @ 65 ft.			50/3"						
70			Gray <u>SANDSTONE</u> , fine to medium grained, medium hard to hard	70.0		50/2"						
75			- iron-stained vertical fracture (70.8' - 71.1')	89	81							
85				99	66							
86.7			<u>COAL</u>									
90												

BORING C00553.GPJ 2/27/01

Completion Depth: **105.1 feet**  
 Date Boring Started: **12/6/00**  
 Date Boring Completed: **12/7/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 35 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DH3-3

**Project Description: Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1052.7 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<p><b>MATERIAL DESCRIPTION</b></p> <p>☒ Split Spoon ☒ Shelby Tube ☐ Rock Core</p>									
			<p><u>COAL</u></p> <p>- unconfined compressive strength (93.0' - 93.3') - 3,600 psi</p> <p>- unconfined compressive strength (95.5' - 95.8') - 3,780 psi</p> <p style="text-align: right;">96.6</p>	100	22							
			<p>Gray <u>CLAY SHALE</u>, very soft to soft, becoming sandier and medium hard with depth</p> <p style="text-align: right;">101.8</p>									
			<p>Gray <u>SANDSTONE</u> with shale laminations, medium hard to hard, fine to medium grained</p> <p style="text-align: right;">105.1</p>	100	100							
			<p>Bottom of Test Boring @ 105.1 ft.</p>									

BORING C00553.GPJ 2/27/01

Completion Depth: **105.1 feet**  
 Date Boring Started: **12/6/00**  
 Date Boring Completed: **12/7/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 35 ft. during drilling operations.**

# LOG OF BORING NO. DH3-4

**Project Description: Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1053.9 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<div style="display: flex; align-items: center;"> <div style="width: 15px; height: 15px; border: 1px solid black; margin-right: 5px;"></div> Split Spoon  <div style="width: 15px; height: 15px; border: 1px solid black; margin-right: 5px; margin-top: 5px;"></div> Shelby Tube  <div style="width: 15px; height: 15px; border: 1px solid black; margin-right: 5px; margin-top: 5px;"></div> Rock Core                 </div> <p style="text-align: center; margin-top: 10px;"><b>MATERIAL DESCRIPTION</b></p>									
5		○	Coarse <u>COAL REFUSE</u>									
10		○										
15		○										
18.0		○										
20		○	Brown <u>CLAYEY SAND</u> with sandstone fragments, damp, medium dense to dense  - shelly tube (20.0' - 21.2') brown and gray clayey sand with sandstone fragments	83								
25		○	- mostly sandstone fragments (25.0' - 26.5')  - attempted shelly tube @ 25.0 ft. (no recovery)	0		24-10-8						
30		○	- SPOIL/FILL -									

BORING C00553.GPJ 2/28/01

**Completion Depth: 105.1 feet**  
**Date Boring Started: 12/7/00**  
**Date Boring Completed: 12/7/00**  
**Engineer/Geologist: JEN/CEM**  
**Project No.: C00553**

**Remarks: Groundwater was first noted at a depth of 35 ft. during drilling operations.**

*Continued Next Page*



# LOG OF BORING NO. DH3-4

**Project Description: Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1053.9 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<p><b>MATERIAL DESCRIPTION</b></p> <p>Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1053.9 feet</b></p> <p> <input type="checkbox"/> Split Spoon  <input type="checkbox"/> Shelby Tube  <input type="checkbox"/> Rock Core                 </p>									
	X	•••••	Brown <u>CLAYEY SAND</u> with sandstone fragments, damp, medium dense to dense			4-5-29						
35	X	•••••				31-21-11						
40	X	•••••				10-10-11						
			- SPOIL/FILL -									
45	X	•••••	Brown <u>SANDY CLAY</u> to <u>CLAYEY SAND</u> with some sandstone fragments, damp, very dense	45.0		22-26-27						
50	X	•••••				20-23-30						
55	X	•••••	Gray <u>SANDSTONE</u> , medium hard to hard, medium grained, with occasional coal laminations	55.0		50/5"						
			- iron-stained, moderately weathered (55.0' - 64.2')									
60												

BORING C00553.GPJ 2/27/01

Completion Depth: **105.1 feet**  
 Date Boring Started: **12/7/00**  
 Date Boring Completed: **12/7/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

**Remarks: Groundwater was first noted at a depth of 35 ft. during drilling operations.**

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# LOG OF BORING NO. DH3-4

Project Description: **Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1053.9 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<div style="font-size: small;"> <span style="display: inline-block; width: 10px; height: 10px; border: 1px solid black; margin-right: 5px;"></span> Split Spoon  <span style="display: inline-block; width: 10px; height: 10px; border: 1px solid black; margin-right: 5px;"></span> Shelby Tube  <span style="display: inline-block; width: 10px; height: 10px; border: 1px solid black; margin-right: 5px;"></span> Rock Core                 </div> <p style="text-align: center; margin-top: 10px;"><b>MATERIAL DESCRIPTION</b></p>									
65		✓	Gray <u>SANDSTONE</u> , medium hard to hard, medium grained, with occasional coal laminations  - diagonal fracture @ 62.5 ft.  - iron-stained diagonal fracture (66.6' - 66.8')	96	74	50/1"						
70		✓		100	94							
75		✓										
80		✓		99	99							
85		✓										
87.6		✓	VOID									
90		✓										

BORING: C00553.GPJ 2/27/01

Completion Depth: **105.1 feet**  
 Date Boring Started: **12/7/00**  
 Date Boring Completed: **12/7/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 35 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DH3-4

Project Description: **Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**

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Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1053.9 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<b>MATERIAL DESCRIPTION</b>  <div style="text-align: center;">VOID</div> - void sample (87.6' - 97)' slurry and sand  1.1% gravel 78.9% sand 20.0% silt and clay	34	17							
95			97.0									
			Broken Coal and Mine Rubble									
			98.1									
100			Gray <u>CLAY SHALE</u> , very soft to soft, becoming sandier and medium hard increasing depth									
			102.8	100	42							
105			Gray <u>SANDSTONE</u> with shale laminations, medium hard, fine to medium grained									
			105.1									
			Bottom of Test Boring @ 105.1 ft.									
110												
115												
120												

BORING C00553.GPJ 2/28/01

Completion Depth: **105.1 feet**  
 Date Boring Started: **12/7/00**  
 Date Boring Completed: **12/7/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 35 ft. during drilling operations.**

# LOG OF BORING NO. DH4-1

**Project Description: Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1050.9 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			MATERIAL DESCRIPTION									
5		X	Coarse <u>COAL REFUSE</u>									
10		X										
15		X										
20		X										
25		X										
30		X										

BORING C00553.GPJ 2/27/01

Completion Depth: **111.2 feet**  
 Date Boring Started: **12/14/00**  
 Date Boring Completed: **12/18/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

**Remarks: Groundwater was first noted at a depth of 43 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DH4-1

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1050.9 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 30%;"> <p> <span style="display: inline-block; width: 15px; height: 15px; border: 1px solid black; border-style: dashed; margin-right: 5px;"></span> Split Spoon  <span style="display: inline-block; width: 15px; height: 15px; border: 1px solid black; border-style: solid; margin-right: 5px;"></span> Shelby Tube  <span style="display: inline-block; width: 15px; height: 15px; border: 1px solid black; margin-right: 5px;"></span> Rock Core                 </p> </div> <div style="width: 65%;"> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p> </div> </div>										
35		X	Coarse <u>COAL REFUSE</u>										
43.0			43.0										
45		O	Brown and gray <u>CLAYEY SAND</u> with sandstone fragments, damp to wet, medium dense to dense										
			- very sandy (43.0' - 51.0')			5-7-10-16							
						8-9-16-17							
50		X				10-18-22-12							
						7-10-10-10							
						5-6-9-10							
55		X				5-10-18-17							
						7-18-29-15							
			- SPOIL/FILL -			15-13-11-15							
60		X											

BORING: C00553.GPJ 2/27/01

Completion Depth: **111.2 feet**  
 Date Boring Started: **12/14/00**  
 Date Boring Completed: **12/18/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 43 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DH4-1

**Project Description: Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1050.9 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 30%;"> <p>⊠ Split Spoon</p> <p>⊡ Shelby Tube</p> <p>■ Rock Core</p> </div> <div style="width: 65%;"> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p> </div> </div>										
65	X	o	Brown and gray <u>CLAYEY SAND</u> with sandstone fragments, damp to wet, medium dense to dense  - root traces (61.0' - 63.0')  - SPOIL/FILL -			15-13-11-15							
			66.9			8-9-8-9							
						3-8-20-28							
70	X	o	Brown <u>SANDY CLAY</u> to <u>CLAYEY SAND</u> with some sandstone fragments, damp, dense to very dense - some gray mottling and trace coal fragments (67.0' - 69.0')			8-30-48-75							
				71		28-52-37-43							
75	X	o	- shelly tube (71.0' - 71.7') brown and gray clayey sand to sandy clay with some sandstone fragments			15-10-18-19							
						50/3"							
80	X	o	Brown <u>SANDSTONE</u> , soft, weathered, friable, fine grained			20-34-29-20							
			80.0			4-40-59-60							
						42-65-74-56							
85	X	o				81-64/2"							
			85.2			36-50/2"							
			<u>COAL</u>	95	0								

BORING C00553.GPJ 2/27/01

Completion Depth: **111.2 feet**  
 Date Boring Started: **12/14/00**  
 Date Boring Completed: **12/18/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 43 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DH4-1

Project Description: **Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**

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Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1050.9 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<div style="display: flex; align-items: center;"> <div style="width: 20px; height: 20px; border: 1px solid black; margin-right: 5px;"></div> <div style="font-size: 0.8em;">Split Spoon</div> </div> <div style="display: flex; align-items: center; margin-top: 5px;"> <div style="width: 20px; height: 20px; border: 1px solid black; border-style: dashed; margin-right: 5px;"></div> <div style="font-size: 0.8em;">Shelby Tube</div> </div> <div style="display: flex; align-items: center; margin-top: 5px;"> <div style="width: 20px; height: 20px; border: 2px solid black; margin-right: 5px;"></div> <div style="font-size: 0.8em;">Rock Core</div> </div> <p style="text-align: center; margin-top: 10px;"><b>MATERIAL DESCRIPTION</b></p>									
		■	<u>COAL</u>									
94.5		~	Gray <u>CLAY SHALE</u> , very soft to soft, becoming sandier and medium hard with depth	100	24							
101.4		/	Gray <u>SANDSTONE</u> with shale laminations, medium hard, fine to medium grained	100	92							
111.2		/	- iron-stained (107.5' - 108.0')	100	96							
			Bottom of Test Boring @ 111.2 ft.									

BORING C00553.GPJ 2/27/01

Completion Depth: **111.2 feet**  
 Date Boring Started: **12/14/00**  
 Date Boring Completed: **12/18/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 43 ft. during drilling operations.**

# LOG OF BORING NO. DHP-1

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1056.0 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 30%;"> <p> <span style="display: inline-block; width: 15px; height: 15px; border: 1px solid black; border-style: dashed; margin-right: 5px;"></span> Split Spoon  <span style="display: inline-block; width: 15px; height: 15px; border: 1px solid black; border-style: solid; margin-right: 5px;"></span> Shelby Tube  <span style="display: inline-block; width: 15px; height: 15px; background-color: black; margin-right: 5px;"></span> Rock Core                 </p> </div> <div style="width: 65%;"> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p> </div> </div>										
		XXXXXX	Coarse <u>COAL REFUSE</u>										
		(dots)	Brown <u>CLAYEY SAND</u> with sandstone fragments, damp, medium dense										
5													
10		XXXXXX				9-8-4							
15			- trace slurry (15.0' - 16.5')			6-9-7							
20						3-5-6							
25			- boulders (21.7' - 27.0')			50/0"							
30			- SPOIL/FILL -										
					30.0								

BORING C00553.GPJ 2/27/01

Completion Depth: **107.0 feet**  
 Date Boring Started: **12/5/00**  
 Date Boring Completed: **12/6/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks: **Water was noted at a depth of 75.5 ft. upon drilling completion.**

*Continued Next Page*



# LOG OF BORING NO. DHP-1

**Project Description: Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**

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Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1056.0 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<div style="display: flex; align-items: center;"> <div style="width: 15px; height: 15px; border: 1px solid black; margin-right: 5px;"></div> Split Spoon  <div style="width: 15px; height: 15px; border: 1px solid black; margin-right: 5px; background: repeating-linear-gradient(45deg, transparent, transparent 2px, black 2px, black 4px);"></div> Shelby Tube  <div style="width: 15px; height: 15px; border: 1px solid black; margin-right: 5px; background-color: black;"></div> Rock Core                 </div> <p style="text-align: center; margin-top: 10px;"><b>MATERIAL DESCRIPTION</b></p>									
35	X	-	Brown <u>SANDY CLAY</u> to <u>CLAYEY SAND</u> with some sandstone fragments, damp, very dense			18-28-28						
39.5						12-17-38						
40	X	-	Brown <u>SANDSTONE</u> , medium hard, medium grained, moderately weathered, friable	85	20	50/0"						
45			- gray, hard from 43 ft.									
50				99	80							
55			- w/occasional carbonaceous laminations (43.0' - 53.8')									
60				100	97							

BORING C00553.GPJ 2/27/01

**Completion Depth: 107.0 feet**  
**Date Boring Started: 12/5/00**  
**Date Boring Completed: 12/6/00**  
**Engineer/Geologist: JEN/JTS**  
**Project No.: C00553**

**Remarks: Water was noted at a depth of 75.5 ft. upon drilling completion.**

*Continued Next Page*

# LOG OF BORING NO. DHP-1

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1056.0 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<b>MATERIAL DESCRIPTION</b>									
65		[Symbol]	Gray <u>SANDSTONE</u> , hard, medium grained									
			- iron-stained (63.5' - 66.4')									
			- fractured (65.9' - 66.4')	99	87							
70			- iron-stained (70.0' - 72.8') and (76.4' - 76.6')									
			- iron-stained vertical fracture ((77.0' - 77.4')	99	93							
75												
80												
85												
				100	81							
90			Gray <u>SHALE</u> , soft to medium hard	88.7								

BORING: C00553.GPJ 2/27/01

Completion Depth: **107.0 feet**  
 Date Boring Started: **12/5/00**  
 Date Boring Completed: **12/6/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks: **Water was noted at a depth of 75.5 ft. upon drilling completion.**

*Continued Next Page*

# LOG OF BORING NO. DHP-1

**Project Description: Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**

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Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1056.0 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;"> <p>☒ Split Spoon</p> <p>☒ Shelby Tube</p> <p>☐ Rock Core</p> </div> <div style="width: 80%;"> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p> </div> </div>										
90.8		☐	<b>COAL</b>										
			- unconfined compressive strength (91.3' - 91.5') - 3,970 psi										
95			- unconfined compressive strength (96.6' - 96.9') - 4,040 psi										
			- unconfined compressive strength (97.5' - 97.8') - 2,940 psi	99	24								
98.4													
100		☒	Gray <b>CLAY SHALE</b> , very soft to soft, becoming sandier and medium hard with depth										
105				100	86								
105.6													
107.0			Gray <b>SANDSTONE</b> with shale laminations, medium hard, fine to medium grained.										
			Bottom of Test Boring @ 107 ft.										
110													
115													
120													

BORING C00553.GPJ 2/27/01

Completion Depth: **107.0 feet**  
 Date Boring Started: **12/5/00**  
 Date Boring Completed: **12/6/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks: **Water was noted at a depth of 75.5 ft. upon drilling completion.**

# LOG OF BORING NO. DHP-2

**Project Description: Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1055.7 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			MATERIAL DESCRIPTION									
5	●		AUGER WITHOUT SAMPLING									
10	●											
15	●											
20	●											
25	●											
30	●											

BORING C00553.GPJ 2/27/01

Completion Depth: **105.0 feet**  
 Date Boring Started: **1/9/00**  
 Date Boring Completed: **1/9/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 45 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DHP-2

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1055.7 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
35			AUGER WITHOUT SAMPLING									
40												
45												
50				50.0								
55		[Diagonal Fracture Symbol]	Gray <u>SANDSTONE</u> , medium hard to hard, medium grained - soft weathered zone @ 53.2 ft.  - iron-stained (53.2' - 54.0') and (56.7' - 57.5')  - diagonal fracture @ 51.3 ft. and 56.8 ft.	94	63							
60												

BORING C00553.GPJ 2/27/01

Completion Depth: **105.0 feet**  
 Date Boring Started: **1/9/00**  
 Date Boring Completed: **1/9/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 45 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DHP-2

**Project Description:** Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1055.7 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			MATERIAL DESCRIPTION									
65		✓	Gray SANDSTONE, medium hard to hard, medium grained  - low-angle fracture @ 62.3 ft.  - fractured (62.8' - 63.8')  - iron-stained, w/occasional vugs (62.8' - 67.8')  - clay seam (66.8' - 67.0')  - iron-stained (70.9' - 71.9')	100	67							
75		✓	- iron-stained vertical fracture (81.3' - 84.3') and (87.0' - 87.3')	100	100							
85		✓	- iron-stained (80.0' - 87.5')	80	29							
90		✓										

BORING C00553.GPJ 2/27/01

Completion Depth: **105.0 feet**  
 Date Boring Started: **1/9/00**  
 Date Boring Completed: **1/9/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

**Remarks:** Groundwater was first noted at a depth of 45 ft. during drilling operations.

*Continued Next Page*

# LOG OF BORING NO. DHP-2

Project Description: **Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1055.7 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<div style="display: flex; align-items: flex-start;"> <div style="margin-right: 10px;"> <p>☒ Split Spoon</p> <p>☒ Shelby Tube</p> <p>☐ Rock Core</p> </div> <p><b>MATERIAL DESCRIPTION</b></p> </div>									
90.3		☒	Dark gray <u>CARBONACEOUS SHALE</u> , medium hard									
91.6		☒	<u>COAL</u>									
95		☒		100	10							
100		☒	Gray <u>CLAY SHALE</u> , very soft to soft									
100.3		☒										
105		☒	Bottom of Test Boring @ 105 ft.	95	58							
105.0		☒										
110		☒										
115		☒										
120		☒										

BORING: C00553.GPJ 2/27/01

Completion Depth: **105.0 feet**  
 Date Boring Started: **1/9/00**  
 Date Boring Completed: **1/9/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 45 ft. during drilling operations.**

# LOG OF BORING NO. DHX- 1

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1055.8 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
		<div style="display: flex; justify-content: space-between;"> <div style="width: 15%;"> <p>☒ Split Spoon</p> <p>☒ Shelby Tube</p> <p>■ Rock Core</p> </div> <div style="width: 80%;"> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p> </div> </div>											
			<p>Coarse <u>COAL REFUSE</u> <span style="float: right;">0.5</span></p> <p>Brown <u>CLAYEY SAND</u> with sandstone fragments, damp, medium dense to very dense</p>										
5													
10						10-16-14							
15			- boulder ( 15.0 - 16.5 ft. )			45-27-36							
			-boulder ( 20.0 - 22.0 ft. )										
			- boulder ( 25.0 - 26.0 ft. )										
20						50/2"							
25						47-50/4"							
			- SPOIL/FILL -										
30				30.0									

BORING C00553.GPJ 2/27/01

Completion Depth: **106.8 feet**  
 Date Boring Started: **12/11/00**  
 Date Boring Completed: **12/11/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks: **Water was noted at a depth of 84.6 ft. upon drilling completion.**

*Continued Next Page*



# LOG OF BORING NO. DHX- 1

**Project Description: Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1055.8 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<p><b>MATERIAL DESCRIPTION</b></p> <p>Legend:  <span style="border: 1px solid black; padding: 2px;">X</span> Split Spoon  <span style="border: 1px solid black; padding: 2px;">/</span> Shelby Tube  <span style="border: 1px solid black; padding: 2px;">■</span> Rock Core</p>									
35	X	[Symbol]	Brown <u>SANDY CLAY</u> to <u>CLAYEY SAND</u> with some sandstone fragments, damp, medium dense to very dense			7-13-10						
38.0						15-48-50/3"						
40	X	[Symbol]	Gray <u>SANDSTONE</u> , medium hard to hard, medium grained  - brown, weathered and friable (38.0' - 40.4')  - with occasional carbonaceous laminations (42.1 - 48.6 ft.)  - iron stained vertical fracture (49.7 - 50.0 ft.)	93	0	50/3"						
45												
50			- with numerous carbonaceous laminations (48.6 - 56.5 ft.)	100	86							
55												
60				99	90							

BORING C00553.GPJ 2/28/01

Completion Depth: **106.8 feet**  
 Date Boring Started: **12/11/00**  
 Date Boring Completed: **12/11/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks: **Water was noted at a depth of 84.6 ft. upon drilling completion.**

*Continued Next Page*

# LOG OF BORING NO. DHX-1

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**

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Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1055.8 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 30%;"> <p>⊠ Split Spoon</p> <p>⊞ Shelby Tube</p> <p>□ Rock Core</p> </div> <div style="width: 65%;"> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p> </div> </div>										
65		⊠	Gray <u>SANDSTONE</u> , medium hard to hard, medium grained  - fractured ( 68.0 - 68.3 ft. )  - iron stained ( 70.2 - 71.8 ft. )  - vertical iron stained fracture ( 76.6 - 76.9 ft. )  - vertical iron stained fracture ( 77.8 - 78.4 ft. )	100	93								
70		⊠											
75		⊠		95	77								
80		⊠											
85		⊠		100	100								
		⊠		87.4									
		⊠	<u>VOID</u>	89.4									
90		⊠		18	8								

BORING C00553.GPJ 2/27/01

Completion Depth: **106.8 feet**  
 Date Boring Started: **12/11/00**  
 Date Boring Completed: **12/11/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks: **Water was noted at a depth of 84.6 ft. upon drilling completion.**

*Continued Next Page*

# LOG OF BORING NO. DHX- 1

Project Description: **Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1055.8 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<p>Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1055.8 feet</b></p> <p> <input type="checkbox"/> Split Spoon  <input type="checkbox"/> Shelby Tube  <input type="checkbox"/> Rock Core                 </p> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p>									
			<p>Gray <u>SANDSTONE</u>, iron stained, medium hard to hard, fine to medium grained</p> <p style="text-align: right;">90.7</p>									
			<p><u>VOID</u></p> <p>- void sample (89.4' - 91.9') brown silty sand with rock fragments</p> <p>17.9% gravel 55.0% sand 27.1% silt and clay</p> <p style="text-align: right;">96.9</p>	42	18							
-95			<p>Gray <u>SHALE</u>, soft to medium hard</p> <p>- with occasional siltstone lenses ( 96.9 - 98.2 ft. )</p> <p>- clayey, soft ( 98.2 - 99.6 ft. )</p> <p>- silty, medium hard ( 99.6 - 103.7 ft. )</p> <p style="text-align: right;">103.7</p>									
-100			<p>Gray <u>SANDSTONE</u> with occasional shale laminations, medium hard, fine grained</p> <p style="text-align: right;">106.8</p>	98	70							
-105			<p>Bottom of Test Boring @ 106.8 ft.</p>									
-110												
-115												
-120												

BORING C00553.GPJ 2/28/01

Completion Depth: **106.8 feet**  
 Date Boring Started: **12/11/00**  
 Date Boring Completed: **12/11/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks: **Water was noted at a depth of 84.6 ft. upon drilling completion.**

# LOG OF BORING NO. DHX- 2

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1055.5 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 80%;"> <p> <span style="border: 1px solid black; padding: 2px;">X</span> Split Spoon  <span style="border: 1px solid black; padding: 2px;">X</span> Shelby Tube  <span style="border: 1px solid black; padding: 2px;">■</span> Rock Core                 </p> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p> </div> <div style="width: 15%; text-align: right;">0.7</div> </div>										
		X	Coarse <u>COAL REFUSE</u>										
		○	Brown <u>CLAYEY SAND</u> with sandstone fragments, damp, medium dense to very dense										
5			AUGER W/OUT SAMPLING										
10													
15													
20													
25													
30			- SPOIL/FILL -										

BORING C00553.GPJ 2/28/01

Completion Depth: **106.6 feet**  
 Date Boring Started: **12/12/00**  
 Date Boring Completed: **12/13/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks: **Water was noted at a depth of 83.9 ft. upon drilling completion.**

*Continued Next Page*

# LOG OF BORING NO. DHX- 2

Project Description: **Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1055.5 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 30%;"> <p>⊗ Split Spoon</p> <p>⊠ Shelby Tube</p> <p>□ Rock Core</p> </div> <div style="width: 65%;"> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p> </div> </div>										
35		○	Brown <u>CLAYEY SAND</u> with sandstone fragments, damp, medium dense to very dense										
40		○	AUGER W/OUT SAMPLING										
45		○											
50		○	- SPOIL/FILL -										
52.0		○											
55		▧	Gray <u>SANDSTONE</u> , medium hard to hard, medium grained										
56.4		▧	- brown, weathered and friable (52.0' - 56.4')	100	97								
60		▧											

BORING C00553.GPJ 3/2/01

Completion Depth: **106.6 feet**  
 Date Boring Started: **12/12/00**  
 Date Boring Completed: **12/13/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks: **Water was noted at a depth of 83.9 ft. upon drilling completion.**

*Continued Next Page*

# LOG OF BORING NO. DHX- 2

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1055.5 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;"> <p>⊠ Split Spoon</p> <p>⊡ Shelby Tube</p> <p>□ Rock Core</p> </div> <div style="width: 80%;"> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p> </div> </div>										
		⊠	Gray <u>SANDSTONE</u> , medium hard to hard, medium grained	100	100								
65		⊠	- weathered, iron stained, with occasional clayey shale lenses, soft	99	71								
		⊠	- iron stained ( 69.5 - 70.1 ft. )										
70		⊠	- iron stained vertical fracture ( 69.8 - 70.1 ft. )										
75		⊠		100	89								
80		⊠											
85		⊠											
88.5		⊠											
90		⊠	VOID	39	38								

BORING: C00553.GPJ 2/27/01

Completion Depth: **106.6 feet**  
 Date Boring Started: **12/12/00**  
 Date Boring Completed: **12/13/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks: **Water was noted at a depth of 83.9 ft. upon drilling completion.**

*Continued Next Page*

# LOG OF BORING NO. DHX- 2

Project Description: **Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1055.5 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			MATERIAL DESCRIPTION									
95			VOID  - void sample - coal slurry with sand and gravel  3.2% gravel 26.7% sand 70.1% silt and clay									
			98.5									
100		~	Gray <u>SHALE</u> , soft to medium hard - clayey, soft ( 98.5 - 101.7 ft. )  - silty, medium ( 101.7 - 104.3 ft. )	89	60							
			104.3									
105		/	Gray <u>SANDSTONE</u> with occasional shale laminations, medium hard, fine grained									
			106.6									
110			Bottom of Test Boring @ 106.6 ft.									
115												
120												

BORING C00553.GPJ 3/27/01

Completion Depth: **106.6 feet**  
 Date Boring Started: **12/12/00**  
 Date Boring Completed: **12/13/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks: **Water was noted at a depth of 83.9 ft. upon drilling completion.**

# LOG OF BORING NO. DHX- 3

Project Description: **Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1052.3 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;"> <p>⊗ Split Spoon</p> <p>⊠ Shelby Tube</p> <p>■ Rock Core</p> </div> <div style="width: 80%;"> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p> </div> </div>										
5		⊗	Coarse <u>COAL REFUSE</u>										
5.0		○	Brown <u>CLAYEY SAND</u> with sandstone fragments, damp, medium dense to very dense										
10		○											
15		○											
20		○											
25		○											
30		○	- SPOIL/FILL -										

BORING: C00553.GPJ 2/27/01

Completion Depth: **105.4 feet**  
 Date Boring Started: **12/11/00**  
 Date Boring Completed: **12/11/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 50.0 ft. during drilling operations.**

*Continued Next Page*



# LOG OF BORING NO. DHX- 3

Project Description: **Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**

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Depth, feet	Sample Type	Symbol / USCS	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1052.3 feet</b>												
		Split Spoon Shelby Tube Rock Core										
35	●	○	Brown <u>CLAYEY SAND</u> with sandstone fragments, damp, medium dense to very dense									
40	●	○										
45	●	○										
50	●	○										
55	●	○										
60	●	○	- SPOIL/FILL -	60.0								

BORING C00553.GPJ 2/28/01

Completion Depth: **105.4 feet**  
 Date Boring Started: **12/11/00**  
 Date Boring Completed: **12/11/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 50.0 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DHX- 3

Project Description: **Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1052.3 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<p><b>MATERIAL DESCRIPTION</b></p> <p>⊗ Split Spoon                      ⊠ Shelby Tube                      ◻ Rock Core</p>										
			Brown <b>SANDY CLAY</b> to <b>CLAYEY SAND</b> with some sandstone fragments, damp, medium dense to very dense			12-21-28							
65							22-31-32						
70			Brown <b>SANDSTONE</b> , medium hard, medium to coarse grained, moderately weathered, friable - diagonal fracture at 72.1 ft.	70.0		50/1"							
75					95	56							
80			<b>COAL</b>  - unconfined compressive strength (89.5' - 89.8') - 4,770 psi  - unconfined compressive strength (91.6' - 91.9') - 3,100 psi										
				82.5									
85					2	0							
90				100	86								

BORING C00553.GPJ 2/28/01

Completion Depth: **105.4 feet**  
 Date Boring Started: **12/11/00**  
 Date Boring Completed: **12/11/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 50.0 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DHX- 3

Project Description: **Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**

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Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1052.3 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<p><b>MATERIAL DESCRIPTION</b></p> <p> <span style="display: inline-block; width: 1em; height: 1em; border: 1px solid black; margin-right: 0.5em;"></span> Split Spoon  <span style="display: inline-block; width: 1em; height: 1em; border: 1px solid black; margin-right: 0.5em;"></span> Shelby Tube  <span style="display: inline-block; width: 1em; height: 1em; border: 1px solid black; margin-right: 0.5em;"></span> Rock Core                 </p>									
		COAL	<p>- unconfined compressive strength (93.5' - 93.8') - 3,270 psi</p>		93.8							
95		[Wavy pattern]	Gray <u>CLAY SHALE</u> , very soft to soft	100	56							
100		[Diagonal lines]	Gray <u>SANDSTONE</u> with shale laminations, medium hard, fine grained	46	22							
105		[Diagonal lines]	Bottom of Test Boring @ 105.4 ft.		105.4							
110												
115												
120												

BORING: C00553.GPJ 2/28/01

Completion Depth: **105.4 feet**  
 Date Boring Started: **12/11/00**  
 Date Boring Completed: **12/11/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 50.0 ft. during drilling operations.**

# LOG OF BORING NO. DHX- 4

**Project Description: Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. c00553-1 Surface El.: 1051.8 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			MATERIAL DESCRIPTION									
5		X	Coarse <u>COAL REFUSE</u>									
10		X										
15		X										
20		X										
25		X	- SPOIL/FILL -									
26.0		X										
30		O	Brown <u>CLAYEY SAND</u> with sandstone fragments, damp, medium dense to very dense									

BORING C00553.GPJ 2/27/01

Completion Depth: **104.8 feet**  
 Date Boring Started: **12/14/00**  
 Date Boring Completed: **12/15/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

**Remarks: Groundwater was first noted at a depth of 67 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DHX- 4

Project Description: **Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. c00553-1</b> Surface El.: <b>1051.8 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
		<div style="display: flex; justify-content: space-between;"> <div style="width: 40%;"> <p>⊗ Split Spoon</p> <p>⊠ Shelby Tube</p> <p>■ Rock Core</p> </div> <div style="width: 60%; text-align: center;"> <p><b>MATERIAL DESCRIPTION</b></p> </div> </div>											
35		○	Brown <u>CLAYEY SAND</u> with sandstone fragments, damp, medium dense to very dense										
40		○											
45		○											
50		○											
55		○											
60		○	- SPOIL/FILL -										

BORING C00553.GPJ 2/27/01

Completion Depth: **104.8 feet**  
 Date Boring Started: **12/14/00**  
 Date Boring Completed: **12/15/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 67 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DHX- 4

**Project Description:** Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. c00553-1 Surface El.: 1051.8 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			MATERIAL DESCRIPTION									
65			Brown <u>CLAYEY SAND</u> with sandstone fragments, damp, medium dense to very dense									
			- with some plant roots at 69.0 ft.			4-5-8-6						
			- less sand with trace of coal slurry (69.0 - 71.0 ft.)			3-6-7-5						
70			- with coal slurry and sandstone fragments (73.0 - 75.0 ft.)			1/12"-2-3						
			- with numerous sandstone fragments (77.0 - 79.0 ft.)			WOT/24"						
75						WOT/12"-4-2						
						11-12-10-16						
						15-10-6-6						
80						WOT/24"						
						40-20-14-10						
						3-8-6-9						
85			- with trace slurry (85.0 - 91.0 ft.)			WOT/12"-5-2						
						5-6-4-5						
			- SPOIL/FILL -									

BORING C00553.GPJ 2/28/01

Completion Depth: **104.8 feet**  
 Date Boring Started: **12/14/00**  
 Date Boring Completed: **12/15/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

**Remarks:** Groundwater was first noted at a depth of 67 ft. during drilling operations.

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# LOG OF BORING NO. DHX- 4

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**

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Depth, feet	Sample Type	Symbol / USCS	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			Location: <b>See Drawing No. c00553-1</b> Surface El.: <b>1051.8 feet</b>									
			<div style="display: flex; justify-content: space-between;"> <div style="width: 20px;">  Split Spoon   Shelby Tube   Rock Core                 </div> <div> <b>MATERIAL DESCRIPTION</b> </div> </div>									
			Brown <b>CLAYEY SAND</b> with sandstone fragments, damp to wet, medium dense to very dense 91.0			WOT/18"-7 50/2"						
			<b>COAL</b> 93.0	92	28							
95			Gray <b>CLAY SHALE</b> , very soft to soft, becoming sandier and medium hard with depth									
100				98	94							
			103.9 Gray <b>SANDSTONE</b> with shale laminations, medium hard, fine to medium grained 104.8									
105			Bottom of Test Boring @ 104.8 ft.									
110												
115												
120												

BORING: C00553.GPJ 2/28/01

Completion Depth: **104.8 feet**  
 Date Boring Started: **12/14/00**  
 Date Boring Completed: **12/15/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 67 ft. during drilling operations.**

# LOG OF BORING NO. DHX- 5

Project Description: **Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1051.2 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			MATERIAL DESCRIPTION									
5		X	Coarse <u>COAL REFUSE</u>									
10		X										
15		X										
20		O	Brown <u>CLAYEY SAND</u> with sandstone fragments, damp, medium dense to very dense									
25		O										
30		O	- SPOIL/FILL -									

BORING C00553.GPJ 2/27/01

Completion Depth: **104.8 feet**  
 Date Boring Started: **12/15/00**  
 Date Boring Completed: **12/18/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 65 ft. during drilling operations.**

*Continued Next Page*



# LOG OF BORING NO. DHX- 5

**Project Description: Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1051.2 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<div style="display: flex; align-items: flex-start;"> <div style="width: 150px; border-right: 1px solid black; padding-right: 5px;"> </div> <div style="padding-left: 10px;"> <p><b>MATERIAL DESCRIPTION</b></p> <p>Brown <u>CLAYEY SAND</u> with sandstone fragments, damp, medium dense to very dense</p> </div> </div>									
			- SPOIL/FILL -									

BORING C00553.GPJ 2/27/01

Completion Depth: **104.8 feet**  
 Date Boring Started: **12/15/00**  
 Date Boring Completed: **12/18/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 65 ft. during drilling operations.**

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# LOG OF BORING NO. DHX- 5

**Project Description: Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**

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Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1051.2 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 15%;"> <p>⊗ Split Spoon</p> <p>⊗ Shelby Tube</p> <p>▬ Rock Core</p> </div> <div style="width: 80%;"> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p> </div> </div>										
65	⊗	○	Brown <u>CLAYEY SAND</u> with sandstone fragments, damp, medium dense to very dense  - SPOIL/FILL -										
			65.0			27-50/5"							
	⊗	○	Brown <u>SANDY CLAY</u> to <u>CLAYEY SAND</u> with some sandstone fragments, damp, very dense			1.4							
70	⊗	○				17-28-35-50/6"							
			70.5			50/3"							
	⊗	○	Brown <u>SANDSTONE</u> , medium hard, medium to coarse grained, moderately weathered, friable	94	31								
75	⊗	○											
			77.1										
			VOID  - void sample (79.7' - 82.7') brown silty sand  0.1% gravel 93.9% sand 6.0% silt and clay										
80													
85				33	23								
90													

BORING\_C00553.GPJ 2/27/01

Completion Depth: **104.8 feet**  
 Date Boring Started: **12/15/00**  
 Date Boring Completed: **12/18/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

**Remarks: Groundwater was first noted at a depth of 65 ft. during drilling operations.**

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# LOG OF BORING NO. DHX- 5

**Project Description: Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**

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Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1051.2 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<div style="display: flex; justify-content: space-between;"> <div style="width: 20px;"> <p>⊠ Split Spoon</p> <p>⊞ Shelby Tube</p> <p>▣ Rock Core</p> </div> <div style="width: 80%;"> <p><b>MATERIAL DESCRIPTION</b></p> </div> </div>									
			VOID 90.8									
			COAL 92.0									
95		[Wavy Pattern]	Gray <u>CLAY SHALE</u> , very soft to soft, becoming sandier and medium hard with depth									
100		[Wavy Pattern]		98	85							
			101.8									
		[Diagonal Pattern]	Gray <u>SANDSTONE</u> with shale laminations, medium hard, fine to medium grained									
105			104.8									
			Bottom of Test Boring @ 104.8 ft.									
110												
115												
120												

BORING\_C00553.GPJ 2/28/01

Completion Depth: **104.8 feet**  
 Date Boring Started: **12/15/00**  
 Date Boring Completed: **12/18/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

**Remarks: Groundwater was first noted at a depth of 65 ft. during drilling operations.**

# LOG OF BORING NO. DHX- 6

**Project Description: Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1051.8 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;"> <p>⊗ Split Spoon</p> <p>⊠ Shelby Tube</p> <p>■ Rock Core</p> </div> <div style="width: 80%;"> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p> </div> </div>										
5		⊗	Coarse <u>COAL REFUSE</u>										
5.0		○	Brown <u>CLAYEY SAND</u> with sandstone fragments, damp, medium dense to very dense										
10		○											
15		○											
20		○											
25		○											
30		○	- SPOIL/FILL -										

BORING C00553.GPJ 2/28/01

Completion Depth: **105.8 feet**  
 Date Boring Started: **12/18/00**  
 Date Boring Completed: **12/19/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 65 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DHX- 6

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**

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Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1051.8 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<div style="display: flex; align-items: flex-start;"> <div style="width: 150px; border-right: 1px solid black; padding-right: 5px;"> </div> <div style="padding-left: 10px;"> <p><b>Legend:</b></p> <p> Split Spoon</p> <p> Shelby Tube</p> <p> Rock Core</p> </div> </div> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p> <p>Brown <u>CLAYEY SAND</u> with sandstone fragments, damp, medium dense to very dense</p>									
35												
40												
45												
50												
55												
60			- SPOIL/FILL -									

BORING C00553.GPJ 2/28/01

Completion Depth: **105.8 feet**  
 Date Boring Started: **12/18/00**  
 Date Boring Completed: **12/19/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 65 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DHX- 6

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**

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Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1051.8 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<p><b>MATERIAL DESCRIPTION</b></p> <p>⊗ Split Spoon                      ⊠ Shelby Tube                      ◻ Rock Core</p>									
			Brown <u>CLAYEY SAND</u> with sandstone fragments, damp, medium dense to very dense  - SPOIL/FILL -									
65				65.0								
			Brown <u>CLAYEY SAND</u> to <u>SANDY CLAY</u> with some sandstone fragments, damp, very dense - boulder at 67.9 ft.									
69.3				69	0							
70			Brown <u>SANDSTONE</u> , medium hard, medium to coarse grained, moderately weathered, friable									
75				97	59							
			- weathered, clayey, very soft ( 81.1 - 81.9 ft. )									
80				81.9								
			Gray <u>SHALE</u> , soft									
85				84.9								
			<u>COAL</u>	99	12							
90												

BORING C00553.GPJ 2/28/01

Completion Depth: **105.8 feet**  
 Date Boring Started: **12/18/00**  
 Date Boring Completed: **12/19/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 65 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DHX- 6

Project Description: **Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**

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Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1051.8 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			MATERIAL DESCRIPTION									
		☒	<u>COAL</u>									
93.5		☒										
95		☒	Gray <u>CLAYEY SHALE</u> , very soft to soft, becoming sandier and medium hard with depth  - core loss (100.8' - 105.8') due to core barrel malfunction	95	60							
100		☒										
105		☒	- sandstone @ 105.8 ft.	2	0							
105.8		☒										
		☒	Bottom of Test Boring @ 105.8 ft.									
110		☒										
115		☒										
120		☒										

BORING C00553.GPJ 2/28/01

Completion Depth: **105.8 feet**  
 Date Boring Started: **12/18/00**  
 Date Boring Completed: **12/19/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 65 ft. during drilling operations.**

# LOG OF BORING NO. DHX-7

Project Description: **Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1052.4 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;"> <p>⊗ Split Spoon</p> <p>⊠ Shelby Tube</p> <p>■ Rock Core</p> </div> <div style="width: 80%;"> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p> </div> </div>										
5		⊗	<p>Coarse <u>COAL REFUSE</u></p>										
10		⊗											
15		⊗											
18.0		⊗											
20		⊠	<p>Brown <u>CLAYEY SAND</u> with sandstone fragments, damp, medium dense to very dense</p>										
25		⊠											
30		⊠	- SPOIL/FILL -										

BORING C00553.GPJ 2/27/01

Completion Depth: **101.4 feet**  
 Date Boring Started: **12/19/00**  
 Date Boring Completed: **12/19/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 77 ft. during drilling operations.**

*Continued Next Page*



# LOG OF BORING NO. DHX-7

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1052.4 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;"> <p>⊠ Split Spoon</p> <p>⊞ Shelby Tube</p> <p>■ Rock Core</p> </div> <div style="width: 80%;"> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p> </div> </div>										
35		○	<p>Brown <u>CLAYEY SAND</u> with sandstone fragments, damp, medium dense to very dense</p>										
40		○											
45		○											
50		○											
55		○											
60		○											
		○		- SPOIL/FILL -									

BORING C00553.GPJ 2/28/01

Completion Depth: **101.4 feet**  
 Date Boring Started: **12/19/00**  
 Date Boring Completed: **12/19/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 77 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DHX-7

**Project Description: Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1052.4 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;"> <p>⊗ Split Spoon</p> <p>⊠ Shelby Tube</p> <p>■ Rock Core</p> </div> <div style="width: 80%;"> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p> </div> </div>										
			Brown <u>CLAYEY SAND</u> with sandstone fragments, damp, medium dense to very dense  - SPOIL/FILL -										
65			65.0										
			Brown <u>CLAYEY SAND</u> to <u>SANDY CLAY</u> with some sandstone fragments, damp, dense to very dense  - with some coal fragments and organics ( 69.0 - 71.5 ft. )  - boulder at 71.5 ft.  - with some gray mottling ( 73.0 - 75.0 ft. )  - wet ( 77.0 - 79.0 ft. )			19-32-24-27  14-27-30-31  10-24-25-30  30-50/2"  19-28-28-19  24-21-22-23  15-16-15-15  wot/18"							
70													
75													
			- sampler advanced from weight of tools ( 79.0 - 80.5 ft. )										
80			80.5										
			Brown <u>SANDSTONE</u> , medium hard, medium to coarse grained, moderately weathered, friable			2-33-48-38							
			<u>COAL</u>			25-50/6"-50/2"							
85													
			- clayey shale lens ( 88.7 - 89.3 ft. )	100	0								
90													

BORING C00553.GPJ 2/28/01

Completion Depth: **101.4 feet**  
 Date Boring Started: **12/19/00**  
 Date Boring Completed: **12/19/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

**Remarks: Groundwater was first noted at a depth of 77 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DHX-7

Project Description: **Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**

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Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1052.4 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			MATERIAL DESCRIPTION									
		☒	<u>COAL</u>	91.6								
		☒	Gray <u>SHALE</u> , soft to medium hard - clayey, soft ( 91.6 - 94.3 ft. )  - silty medium hard ( 94.3 - 95.5 ft. )									
95		☒	Gray <u>SANDSTONE</u> with shale laminations, medium hard, fine to medium grained	95.5								
		☒		100	87							
100		☒		101.4								
			Bottom of Test Boring @ 101.4 ft.									
105												
110												
115												
120												

BORING C00553.GPJ 2/27/01

Completion Depth: **101.4 feet**  
 Date Boring Started: **12/19/00**  
 Date Boring Completed: **12/19/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 77 ft. during drilling operations.**

# LOG OF BORING NO. DHX- 8

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**

triadeng.com



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1051.4 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			MATERIAL DESCRIPTION									
5		X	Coarse <u>COAL REFUSE</u>									
10		X										
15		X										
20		X										
25		X	25.0									
25		o	Brown <u>CLAYEY SAND</u> with sandstone fragments, damp to wet, very loose to medium dense									
30		o	- SPOIL/FILL -									

BORING C00553.GPJ 2/27/01

Completion Depth: **100.0 feet**  
 Date Boring Started: **12/19/00**  
 Date Boring Completed: **12/19/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 65 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DHX- 8

**Project Description: Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**

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Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1051.4 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; align-items: flex-start;"> <div style="width: 15%; border-right: 1px solid black; padding-right: 5px;"> <p style="text-align: center;">35</p> <p style="text-align: center;">40</p> <p style="text-align: center;">45</p> <p style="text-align: center;">50</p> <p style="text-align: center;">55</p> <p style="text-align: center;">60</p> </div> <div style="width: 85%; padding-left: 5px;"> <p><b>MATERIAL DESCRIPTION</b></p> <p>Brown <u>CLAYEY SAND</u> with sandstone fragments, damp to wet, very soft to medium dense</p> <p style="text-align: center; margin-top: 200px;">- FILL/SPOIL -</p> </div> </div>										

BORING C00553.GPJ 2/27/01

Completion Depth: **100.0 feet**  
 Date Boring Started: **12/19/00**  
 Date Boring Completed: **12/19/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 65 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DHX- 8

**Project Description: Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1051.4 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<p><b>MATERIAL DESCRIPTION</b></p> <p>Brown <u>CLAYEY SAND</u> with sandstone fragments, damp to wet, very loose to medium dense</p>									
65						16-6-6-4						
			- with trace coal fragments ( 67.0 - 69.0 ft. )			wot/12"-4-4						
70						2-3-2-2						
			- with trace root fragments ( 69.0 - 71.0 ft. )			12-6-4-6						
75						wot/12"-4-6						
						5-5-5-7						
80						27-50/2"						
			- with some slurry and weathered coal fragments ( 81.0 - 83.0 ft. )			17-12-10-11						
85						7-8-9-13						
			- with numerous sandstone fragments ( 85.0 - 87.0 ft. )			wot/18"-5						
			- with some weathered coal and shale fragments at 88.5 ft.			4-6-7-6						
			- SPOIL/FILL -			wot/24"						
90												

BORING C00553.GPJ 2/28/01

Completion Depth: **100.0 feet**  
 Date Boring Started: **12/19/00**  
 Date Boring Completed: **12/19/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

**Remarks: Groundwater was first noted at a depth of 65 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DHX- 8



**Project Description: Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**

Depth, feet	Sample Type	Symbol / USCS	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1051.4 feet</b> Split Spoon Shelby Tube Rock Core									
			<u>COAL</u>			50/3"						
95			Gray <u>CLAYEY SHALE</u> , very soft to soft, becoming sandier with depth  - very sandy ( 99.0 - 100.0 ft. )	91	51							
100			Bottom of Test Boring @ 100.0 ft.									
105												
110												
115												
120												

BORING C00553.GPJ 2/27/01

Completion Depth: **100.0 feet**  
 Date Boring Started: **12/19/00**  
 Date Boring Completed: **12/19/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

**Remarks: Groundwater was first noted at a depth of 65 ft. during drilling operations.**

# LOG OF BORING NO. DHX- 9

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1052.0 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			MATERIAL DESCRIPTION									
5		X	Coarse <u>COAL REFUSE</u>									
10		X										
15		o	Brown and gray <u>CLAYEY SAND</u> with sandstone fragments, damp									
20		o										
25		o	- SPOIL/FILL -									
30		o										

BORING\_C00553.GPJ 2/27/01

Completion Depth: **105.0 feet**  
 Date Boring Started: **12/20/00**  
 Date Boring Completed: **12/20/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 60 ft. during drilling operations.**

*Continued Next Page*





# LOG OF BORING NO. DHX- 9

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1052.0 feet</b> Split Spoon Shelby Tube Rock Core									
65			Brown and gray <u>CLAYEY SAND</u> with some sandstone fragments, damp,  - SPOIL/FILL -	65.0								
			Brown <u>CLAYEY SAND</u> to <u>SANDY CLAY</u> with little sandstone fragments, damp, very dense  - boulders @ 67 ft. and 69 ft.			20-30-50/5"						
						49-50/4"						
						50/6"						
70			Brown <u>SANDSTONE</u> , medium hard, medium grained, weathered and friable - diagonal fracture (71.3' - 71.7')  - vertical fracture (73.7' - 74.0') and 79.2' - 79.5')	70.6								
				89	43							
			- shale band (81.8' - 83.0')									
			<u>COAL</u>	96	18							
90												

BORING C00553.GPJ 2/27/01

Completion Depth: **105.0 feet**  
 Date Boring Started: **12/20/00**  
 Date Boring Completed: **12/20/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 60 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DHX- 9

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1052.0 feet</b>									
			<b>COAL</b>									
92.5			92.5									
95			Gray <u>CLAY SHALE</u> , very soft to soft, becoming sandier and medium hard with increasing depth	97	54							
100												
103.9			103.9									
105			Gray <u>SANDSTONE</u> with shale laminations, medium hard, fine to medium grained	100	96							
105.0			105.0									
			Bottom of Test Boring @ 105.0 ft.									
110												
115												
120												

BORING C00553.GPJ 2/27/01

Completion Depth: **105.0 feet**  
 Date Boring Started: **12/20/00**  
 Date Boring Completed: **12/20/00**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 60 ft. during drilling operations.**

# LOG OF BORING NO. DHX-10

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**

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Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1055.3 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			MATERIAL DESCRIPTION									
1.5		☒	Coarse <u>COAL REFUSE</u>									
5		○	Brown <u>CLAYEY SAND</u> with sandstone fragments, damp									
10		○										
15		○										
20		○										
25		○										
30		○	- SPOIL/FILL -									

BORING C00553.GPJ 2/27/01

Completion Depth: **106.7 feet**  
 Date Boring Started: **12/20/00**  
 Date Boring Completed: **12/20/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks:

*Continued Next Page*

# LOG OF BORING NO. DHX-10

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1055.3 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<div style="display: flex; align-items: center;"> <div style="width: 15px; height: 15px; border: 1px solid black; margin-right: 5px;"></div> Split Spoon  <div style="width: 15px; height: 15px; border: 1px solid black; margin-right: 5px; background: repeating-linear-gradient(45deg, transparent, transparent 2px, black 2px, black 4px);"></div> Shelby Tube  <div style="width: 15px; height: 15px; border: 1px solid black; margin-right: 5px; background-color: black;"></div> Rock Core                 </div> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p>									
35		○	Brown <u>CLAYEY SAND</u> with sandstone fragments, damp									
40		○										
45		○	- SPOIL/FILL -	45.0								
45	X	X	Brown <u>SANDY CLAY to CLAYEY SAND</u> with some sandstone fragments, damp, medium dense to very dense			8-5-6-11						
50	X	X				23-14-30-41						
50	X	X		50.9		38-34-42-55/5"						
55	X	X	Brown <u>SANDSTONE</u> , medium hard, medium grained, weathered and friable - medium hard ( 54.4 - 57.8 ft. )			30-65-60-69						
55	X	X				23-33-50/5"						
60	X	X	- gray, medium hard to hard from approximately 56 ft.	100	91							

BORING C00553.GPJ 2/27/01

Completion Depth: **106.7 feet**  
 Date Boring Started: **12/20/00**  
 Date Boring Completed: **12/20/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks:

*Continued Next Page*

# LOG OF BORING NO. DHX-10

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1055.3 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 30%;"> <p>⊠ Split Spoon</p> <p>⊡ Shelby Tube</p> <p>□ Rock Core</p> </div> <div style="width: 65%; text-align: center;"> <p><b>MATERIAL DESCRIPTION</b></p> </div> </div>										
65		⊠	<p>Gray <u>SANDSTONE</u>, medium hard to hard, medium grained</p> <p>- with occasional carbonaceous laminations ( 61.1 - 62.2 ft. )</p> <p>- iron stained, weathered, medium hard ( 62.2 - 62.4 ft. )</p> <p>- iron stained ( 62.9 - 65.5 ft. )</p> <p>- weathered, medium hard ( 66.7 - 67.5 ft. )</p> <p>- with occasional coal spars ( 76.2 - 77.3 ft. )</p> <p>- fractured ( 76.4 - 76.7 ft. )</p> <p>- iron stained ( 80.3 - 84.7 ft. )</p>	100	81								
70		⊠											
75		⊠		100	92								
80		⊠											
85		⊠	84.7										
		□	VOID  (Partially Filled)	32	29								

BORING C00553.GPJ 2/28/01

Completion Depth: **106.7 feet**  
 Date Boring Started: **12/20/00**  
 Date Boring Completed: **12/20/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks:

*Continued Next Page*

# LOG OF BORING NO. DHX-10

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**

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Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1055.3 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<b>VOID</b>  (Partially Filled)									
95			95.1									
			Gray <u>SHALE</u> , soft to medium hard									
			- clayey, soft ( 95.1 - 97.6 ft. )	61	5							
			- silty, medium hard ( 97.6 - 98.1 ft. )									
100			- sandstone lens, medium hard ( 98.1 - 98.7 ft. )									
			- silty, medium hard ( 98.7 - 102.4 ft. )									
			102.4									
			Gray <u>SANDSTONE</u> , medium hard to hard, fine grained									
105				98	98							
			106.7									
			Bottom of Test Boring @ 106.7 ft.									
110												
115												
120												

BORING C00553.GPJ 2/28/01

Completion Depth: **106.7 feet**  
 Date Boring Started: **12/20/00**  
 Date Boring Completed: **12/20/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks:

# LOG OF BORING NO. DHX-11

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**

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Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1054.5 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;"> <p>⊠ Split Spoon</p> <p>⊞ Shelby Tube</p> <p>□ Rock Core</p> </div> <div style="width: 80%;"> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p> </div> </div>										
5		○	Brown <u>CLAYEY SAND TO SANDY CLAY</u> with sandstone fragments, damp										
10		○											
15		○											
20		○											
25		○											
30		○											

BORING C00553.GPJ 2/27/01

Completion Depth: **106.3 feet**  
 Date Boring Started: **12/20/00**  
 Date Boring Completed: **12/21/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks:

*Continued Next Page*



# LOG OF BORING NO. DHX-11

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**

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Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1054.5 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; align-items: flex-start;"> <div style="margin-right: 10px;"> <p>⊠ Split Spoon</p> <p>⊞ Shelby Tube</p> <p>■ Rock Core</p> </div> <div> <p><b>MATERIAL DESCRIPTION</b></p> </div> </div>										
35		○	Brown <u>CLAYEY SAND TO SANDY CLAY</u> with sandstone fragments, damp										
40		○											
45		○											
50		○											
55		▽	Brown <u>SANDSTONE</u> , medium hard, medium grained, weathered and friable - soft to medium hard ( 52.0 - 56.5 ft. )  - with occasional clay lenses, soft ( 56.7 - 57.2 ft. )  - fractured ( 57.5 - 57.7 ft. )	81	50								
60		▽											

BORING C00553.GPJ 2/27/01

Completion Depth: **106.3 feet**  
 Date Boring Started: **12/20/00**  
 Date Boring Completed: **12/21/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks:

*Continued Next Page*

# LOG OF BORING NO. DHX-11

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1054.5 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 30%;"> <p>⊠ Split Spoon</p> <p>⊡ Shelby Tube</p> <p>▣ Rock Core</p> </div> <div style="width: 65%;"> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p> </div> </div>										
65		⊠	Brown <u>SANDSTONE</u> , medium hard, medium grained, weathered and friable - gray ( 66.3 - 66.9 ft. )  - gray shale lens ( 66.1 - 66.3 ft. )  - gray, medium hard to hard from 69 ft.	99	89								
70		⊠	- with occasional coal spars ( 72.9 - 78.8 ft. )										
75		⊠		99	94								
80		⊠											
85		⊠		90	75								
		⊠	85.7										
		⊠	87.1										
		⊠	<u>COAL</u>	100	0								
90		⊠											

BORING C00553.GPJ 2/28/01

Completion Depth: **106.3 feet**  
 Date Boring Started: **12/20/00**  
 Date Boring Completed: **12/21/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks:

*Continued Next Page*

# LOG OF BORING NO. DHX-11

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1054.5 feet</b> Split Spoon Shelby Tube Rock Core									
			<b>COAL</b> - poor recovery due to inner barrel malfunction ( 91.3 - 97.0 ft. )	100	0							
95				32	0							
			96.3									
			<b>Gray SHALE</b> , soft to medium hard - clayey, soft ( 96.3 - 98.5 ft. )  - silty, medium hard ( 98.5 - 105.5 ft. )	99	99							
100												
			105.5									
105			<b>Gray SANDSTONE</b> with shale laminations, medium hard, fine to medium grained									
			106.3									
			Bottom of Test Boring @ 106.3 ft.									
110												
115												
120												

BORING C00553.GPJ 2/27/01

Completion Depth: **106.3 feet**  
 Date Boring Started: **12/20/00**  
 Date Boring Completed: **12/21/00**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks:



# LOG OF BORING NO. DHX-12

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1051.5 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<div style="display: flex; align-items: center;"> <div style="width: 20px; height: 20px; border: 1px solid black; margin-right: 5px;"></div> Split Spoon  <div style="width: 20px; height: 20px; border: 1px solid black; margin-right: 5px; background: repeating-linear-gradient(45deg, transparent, transparent 2px, black 2px, black 4px);"></div> Shelby Tube  <div style="width: 20px; height: 20px; border: 1px solid black; margin-right: 5px; background-color: black;"></div> Rock Core                 </div> <p style="text-align: center; margin-top: 10px;"><b>MATERIAL DESCRIPTION</b></p>									
35			Coarse <u>COAL REFUSE</u>									
40												
45												
50												
			51.0			11-27-16-10						
			Brown <u>CLAYEY SAND</u> with sandstone fragments, damp, very dense			woh/18"-5						
55						3-5-10-9						
						8-14-20-13						
60			- SPOIL/FILL -			9-9-11-26						

BORING C00553.GPJ 2/27/01

Completion Depth: **100.0 feet**  
 Date Boring Started: **1/4/01**  
 Date Boring Completed: **1/4/01**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 60 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DHX-12

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1051.5 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<p><b>MATERIAL DESCRIPTION</b></p> <p>⊗ Split Spoon                      ⊠ Shelby Tube                      ■ Rock Core</p>									
65	⊗	○	Brown <u>CLAYEY SAND</u> with sandstone fragments, damp, very dense  - SPOIL/FILL -  - shelly tube (66.0' - 67.0') - interface between fill material and natural ground	66.5	90	4-25-20-15 18-11-23-19 20-35-44-47						
70	⊗	○	Brown <u>CLAYEY SAND TO SANDY CLAY</u> with some sandstone fragments, damp, very dense - shelly tube (68.0' - 69.0') brown clayey sand to sandy clay with some sandstone fragments  - shelly tube (72.0' - 72.8') brown clayey sand to sandy clay with sandstone fragments			11-17-27-42	13	45	42			
75	⊗	○	- gray at 74.0 ft.  - brown at 78.0 ft.  - shelly tube (80.0' - 80.5')		100	29-41-48-50/5" 31-26-46-48						
80	⊗	○	- weathered shale at 82.0 ft.		60	20-22-27-36						
82.5	⊗	○				21-50/5"						
85	■	■	<u>COAL</u>									
90	■	■			89	6						

BORING C00553.GPJ 3/2/01

Completion Depth: **100.0 feet**  
 Date Boring Started: **1/4/01**  
 Date Boring Completed: **1/4/01**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 60 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DHX-12

**Project Description: Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**

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Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1051.5 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<b>MATERIAL DESCRIPTION</b>									
		☒	<u>COAL</u>									
92.3		☒	Gray <u>CLAY SHALE</u> , very soft to soft -becomes sandier and medium hard with depth	100	65							
95		☒										
100.0		☒	Bottom of Test Boring @ 100.0 ft.									
100		☒										
105		☒										
110		☒										
115		☒										
120		☒										

BORING C00553.GPJ 2/27/01

Completion Depth: **100.0 feet**  
 Date Boring Started: **1/4/01**  
 Date Boring Completed: **1/4/01**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

**Remarks: Groundwater was first noted at a depth of 60 ft. during drilling operations.**

## LOG OF BORING NO. DHX-13

Project Description: **Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1051.1 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			MATERIAL DESCRIPTION									
5	●	△	Coarse <u>COAL REFUSE</u>									
10	●	△										
15	●	△										
20	●	△										
25	●	△										
30	●	△										

BORING C00553.GPJ 2/27/01

Completion Depth: **105.5 feet**  
 Date Boring Started: **12/21/00**  
 Date Boring Completed: **1/3/01**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 60 ft. during drilling operations.**

*Continued Next Page*



# LOG OF BORING NO. DHX-13

**Project Description: Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1051.1 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; align-items: flex-start;"> <div style="margin-right: 10px;"> <p>☒ Split Spoon</p> <p>☒ Shelby Tube</p> <p>☐ Rock Core</p> </div> <div> <p><b>MATERIAL DESCRIPTION</b></p> <p>Coarse <u>COAL REFUSE</u></p> </div> </div>										
35													
40													
45													
50													
55													
60			60.0										

BORING C00553.GPJ 2/27/01

Completion Depth: **105.5 feet**  
 Date Boring Started: **12/21/00**  
 Date Boring Completed: **1/3/01**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 60 ft. during drilling operations.**

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# LOG OF BORING NO. DHX-13

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1051.1 feet</b>												
		Split Spoon Shelby Tube Rock Core										
65	X	o	Brown <u>CLAYEY SAND</u> with sandstone fragments, wet, medium dense to dense  - with less clay and numerous sandstone fragments ( 64.0 - 66.0 ft. )			17-17-9-12						
						4-11-11-11						
						10-10-11-9						
						13-14-17-13						
70	X	o	- very wet at 70.0 ft.  - SPOIL/FILL -			10-8-8-11						
						WOH/18"-14-18						
			73.0			19-20-15-31						
75	X	o	Brown <u>CLAYEY SAND TO SANDY CLAY</u> with some sandstone fragments, damp, very dense  - shelby tube (74.0' - 75.0') and (76.0' - 77.3')									
80	X	o				21-38-50/2"						
						38-41-43-48						
						31-32-30-50/6"						
85	X	o	- shelby tube (84.0' - 86.0') gray clayey sand with sandstone fragments									
						22-56-34-30						
						27-57-50/3"						
90	X	o	- sandstone boulder at 89.0 ft.									

BORING: C00553.GPJ 2/28/01

Completion Depth: **105.5 feet**  
 Date Boring Started: **12/21/00**  
 Date Boring Completed: **1/3/01**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 60 ft. during drilling operations.**

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# LOG OF BORING NO. DHX-13

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1051.1 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<div style="font-size: small;"> <span style="display: inline-block; width: 10px; height: 10px; border: 1px solid black; border-style: dashed; margin-right: 5px;"></span> Split Spoon  <span style="display: inline-block; width: 10px; height: 10px; border: 1px solid black; border-style: solid; margin-right: 5px;"></span> Shelby Tube  <span style="display: inline-block; width: 10px; height: 10px; border: 1px solid black; margin-right: 5px;"></span> Rock Core                 </div> <p style="text-align: center; margin-top: 10px;"><b>MATERIAL DESCRIPTION</b></p>									
95	X	X	Brown <u>CLAYEY SAND TO SANDY CLAY</u> with some sandstone fragments, damp, very dense - sandstone boulder at 89.0 ft.	39	12	50-62-55-60 60/5"						
95.6												
100		W	Gray <u>CLAY SHALE</u> , very soft to soft, becoming sandier and medium hard with depth	100	94							
102.0												
105		W	Gray <u>SANDSTONE</u> with shale laminations, medium hard, fine to medium grained									
105.5												
110			Bottom of Test Boring @ 105.5 ft.									
115												
120												

BORING C00553.GPJ 2/27/01

Completion Depth: **105.5 feet**  
 Date Boring Started: **12/21/00**  
 Date Boring Completed: **1/3/01**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 60 ft. during drilling operations.**

# LOG OF BORING NO. DHX-14

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1054.4 feet</b> Split Spoon Shelby Tube Rock Core									
0.5			Coarse <u>COAL REFUSE</u>									
5			Brown <u>CLAYEY SAND</u> with sandstone fragments, damp									
10			AUGER W/OUT SAMPLING									
15												
20												
25												
30												

BORING\_C00553.GPJ 2/28/01

Completion Depth: **102.4 feet**  
 Date Boring Started: **1/14/01**  
 Date Boring Completed: **1/14/01**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks:

*Continued Next Page*

# LOG OF BORING NO. DHX-14

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**

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Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1054.4 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;"> <p>⊗ Split Spoon</p> <p>⊠ Shelby Tube</p> <p>▣ Rock Core</p> </div> <div style="width: 80%;"> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p> </div> </div>										
35		○	Brown <u>CLAYEY SAND</u> with sandstone fragments, damp										
40		○	AUGER W/OUT SAMPLING										
45		○											
50		○											
55		○											
56.0		○											
60		▣	Brown <u>SANDSTONE</u> , medium hard, medium grained, weathered and friable										

BORING: C00553.GPJ 2/28/01

Completion Depth: **102.4 feet**  
 Date Boring Started: **1/14/01**  
 Date Boring Completed: **1/14/01**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks:

*Continued Next Page*

# LOG OF BORING NO. DHX-14

**Project Description: Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1054.4 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<div style="font-size: small;"> <span style="display: inline-block; width: 15px; height: 15px; border: 1px solid black; margin-right: 5px;"></span> Split Spoon  <span style="display: inline-block; width: 15px; height: 15px; border: 1px solid black; margin-right: 5px;"></span> Shelby Tube  <span style="display: inline-block; width: 15px; height: 15px; border: 1px solid black; margin-right: 5px;"></span> Rock Core                 </div> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p>									
65			Brown SANDSTONE, medium hard, medium grained, weathered and friable	100	30							
70			- gray, medium hard to hard from 65 ft.	100	92							
75			- with occasional coal spars ( 75.2 - 76.0 ft. )									
80			- iron-stained ( 77.8 - 80.2 ft. )	99	95							
85			<u>COAL</u>	98	44							
84.3			- gray shale lens, soft ( 84.3 - 85.3 ft. )									

BORING\_C00553.GPJ 2/28/01

Completion Depth: **102.4 feet**  
 Date Boring Started: **1/14/01**  
 Date Boring Completed: **1/14/01**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks:

*Continued Next Page*

# LOG OF BORING NO. DHX-14

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1054.4 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<p><b>COAL</b></p> <p>- gray shale lens, soft ( 91.9 - 92.4 ft. )</p>	100	0							
95		94.3	<p>Gray <b>SHALE</b>, soft to medium hard</p> <p>- clayey, soft ( 94.3 - 98.1 ft. )</p> <p>- silty, medium hard ( 98.1 - 101.1 ft. )</p>	98	65							
100		101.1										
		102.4	<p>Gray <b>SANDSTONE</b>, medium hard to hard, fine grained</p> <p>Bottom of Test Boring @ 102.4 ft.</p>									

Completion Depth: **102.4 feet**  
 Date Boring Started: **1/14/01**  
 Date Boring Completed: **1/14/01**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks:

BORING\_C00553.GPJ 2/28/01

# LOG OF BORING NO. DHX-15

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1053.1 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;"> <p>⊗ Split Spoon</p> <p>⊠ Shelby Tube</p> <p>■ Rock Core</p> </div> <div style="width: 80%;"> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p> <p style="text-align: center; font-size: 1.2em;">AUGER W/OUT SAMPLING</p> </div> </div>										
5													
10													
15													
20													
25													
30													

BORING: C00553.GPJ 2/28/01

Completion Depth: **100.2 feet**  
 Date Boring Started: **1/9/01**  
 Date Boring Completed: **1/9/01**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Water was noted at a depth of 85 ft. upon drilling completion.**

*Continued Next Page*



# LOG OF BORING NO. DHX-15

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**

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Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1053.1 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;"> <p>⊠ Split Spoon</p> <p>⊞ Shelby Tube</p> <p>■ Rock Core</p> </div> <div style="width: 80%;"> <p><b>MATERIAL DESCRIPTION</b></p> </div> </div>										
35		⊠	AUGER W/OUT SAMPLING										
40		⊠											
45		⊠											
50		⊠											
55		⊠											
60		⊠											

BORING\_C00553.GPJ 2/28/01

Completion Depth: **100.2 feet**  
 Date Boring Started: **1/9/01**  
 Date Boring Completed: **1/9/01**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Water was noted at a depth of 85 ft. upon drilling completion.**

*Continued Next Page*

# LOG OF BORING NO. DHX-15



**Project Description:** Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky

Depth, feet	Sample Type	Symbol / USCS	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			Location: See Drawing No. C00553-1 Surface El.: 1053.1 feet									
			<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;"> <p>⊠ Split Spoon</p> <p>⊞ Shelby Tube</p> <p>■ Rock Core</p> </div> <div style="width: 80%;"> <p><b>MATERIAL DESCRIPTION</b></p> </div> </div>									
65		⊠	AUGER W/OUT SAMPLING									
70		⊠										
75		⊠		75.0								
80		⊠	Gray <u>SANDSTONE</u> , hard, medium grained	98	98							
85		⊠										
87.1		⊠										
90		⊠	<u>VOID</u>	46	44							
Completion Depth: <b>100.2 feet</b> Date Boring Started: <b>1/9/01</b> Date Boring Completed: <b>1/9/01</b> Engineer/Geologist: <b>JEN/CEM</b> Project No.: <b>C00553</b>			<b>Remarks:</b> Water was noted at a depth of 85 ft. upon drilling completion.									

BORING C00553.GPJ 2/28/01

*Continued Next Page*

# LOG OF BORING NO. DHX-15

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**

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Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1053.1 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<u>VOID</u>									
95			- coal and mine rubble ( 96.1 - 97.1 ft. )									
		[Wavy Line Symbol]	Gray <u>CLAY SHALE</u> , very soft to soft	98	46							
100			Bottom of Test Boring @ 100.2 ft.									
105												
110												
115												
120												

BORING: C00553.GPJ 2/27/01

Completion Depth: **100.2 feet**  
 Date Boring Started: **1/9/01**  
 Date Boring Completed: **1/9/01**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Water was noted at a depth of 85 ft. upon drilling completion.**

# LOG OF BORING NO. DHX-16

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**

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Depth, feet	Sample Type	Symbol / USCS	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1052.9 feet</b> Split Spoon Shelby Tube Rock Core			AUGER W/OUT SAMPLING									
5												
10												
15												
20												
25												
30												

BORING C00553.GPJ 2/28/01

Completion Depth: **95.1 feet**  
 Date Boring Started: **1/10/01**  
 Date Boring Completed: **1/10/01**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 60 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DHX-16

**Project Description: Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1052.9 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 30%;"> <p>⊠ Split Spoon</p> <p>⊞ Shelby Tube</p> <p>■ Rock Core</p> </div> <div style="width: 65%;"> <p><b>MATERIAL DESCRIPTION</b></p> </div> </div>										
35		⊠	AUGER W/OUT SAMPLING										
40		⊠											
45		⊠											
50		⊠											
55		⊠											
60		⊠											

BORING C00553.GPJ 2/28/01

Completion Depth: **95.1 feet**  
 Date Boring Started: **1/10/01**  
 Date Boring Completed: **1/10/01**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 60 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DHX-16

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**

triadeng.com



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1052.9 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<b>MATERIAL DESCRIPTION</b>									
			AUGER W/OUT SAMPLING									
65				65.0								
			Gray <u>SANDSTONE</u> , medium hard to hard, medium grained	98	49							
			- brown, weathered and friable (65.0' - 69.9')									
70												
				100	99							
75												
				98	90							
80												
			Gray <u>SHALE</u> , soft	83.2								
85				84.9								
			<u>COAL</u>									
90												

BORING: C00553.GPJ 2/28/01

Completion Depth: **95.1 feet**  
 Date Boring Started: **1/10/01**  
 Date Boring Completed: **1/10/01**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

Remarks: **Groundwater was first noted at a depth of 60 ft. during drilling operations.**

*Continued Next Page*

# LOG OF BORING NO. DHX-16

**Project Description: Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**

triadeng.com



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1052.9 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; align-items: center;"> <div style="width: 20px; height: 20px; border: 1px solid black; margin-right: 5px;"> <div style="border: 1px solid black; width: 10px; height: 10px; margin: 2px; display: flex; align-items: center; justify-content: center;"> <span style="font-size: 8px;">X</span> </div> </div> Split Spoon  <div style="width: 20px; height: 20px; border: 1px solid black; margin-right: 5px;"> <div style="border: 1px solid black; width: 10px; height: 10px; margin: 2px; display: flex; align-items: center; justify-content: center;"> <span style="font-size: 8px;">X</span> </div> </div> Shelby Tube  <div style="width: 20px; height: 20px; border: 1px solid black; margin-right: 5px;"> <div style="border: 1px solid black; width: 10px; height: 10px; margin: 2px; display: flex; align-items: center; justify-content: center;"> <span style="font-size: 8px;">X</span> </div> </div> Rock Core                 </div>										
		COAL		100	1								
95.1		[Wavy Line Symbol]											
95		Gray CLAY SHALE, very soft	95.1										
			Bottom of Test Boring @ 95.1 ft.										
100													
105													
110													
115													
120													

BORING C00553.GPJ 2/27/01

Completion Depth: **95.1 feet**  
 Date Boring Started: **1/10/01**  
 Date Boring Completed: **1/10/01**  
 Engineer/Geologist: **JEN/CEM**  
 Project No.: **C00553**

**Remarks: Groundwater was first noted at a depth of 60 ft. during drilling operations.**

# LOG OF BORING NO. DHX-17

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1056.7 feet</b> Split Spoon Shelby Tube Rock Core									
			Coarse <u>COAL REFUSE</u> <span style="float: right;">0.5</span>									
			Brown <u>CLAYEY SAND TO SANDY CLAY</u> with little sandstone fragments, damp, very dense									
5			AUGER W/OUT SAMPLING									
10												
15												
20												
25												
30												

BORING C00553.GPJ 2/28/01

Completion Depth: **101.1 feet**  
 Date Boring Started: **1/22/01**  
 Date Boring Completed: **1/22/01**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks:

*Continued Next Page*



# LOG OF BORING NO. DHX-17

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1056.7 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<div style="display: flex; justify-content: space-between;"> <div style="width: 30%;"> <p>⊠ Split Spoon</p> <p>⊡ Shelby Tube</p> <p>▣ Rock Core</p> </div> <div style="width: 65%;"> <p><b>MATERIAL DESCRIPTION</b></p> </div> </div>									
35	●	○	<p>Brown <u>CLAYEY SAND TO SANDY CLAY</u> with little sandstone fragments, damp, very dense</p> <p style="text-align: center;">AUGER W/OUT SAMPLING</p>									
43.0	●	○										
45	●	▧	<p>Gray <u>SANDSTONE</u>, hard, fine to medium grained</p>									
50	●	▧	<p>- with numerous carbonaceous laminations ( 50.4 - 51.3 ft. )</p> <p>- iron stained, medium hard to hard ( 51.5 - 52.0 ft. )</p>	75	53							
55	●	▧		100	100							
60	●	▧										

BORING C00553.GPJ 2/28/01

Completion Depth: **101.1 feet**  
 Date Boring Started: **1/22/01**  
 Date Boring Completed: **1/22/01**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks:

*Continued Next Page*

# LOG OF BORING NO. DHX-17

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1056.7 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<p><b>MATERIAL DESCRIPTION</b></p> <p>Gray <u>SANDSTONE</u>, hard, fine to medium grained</p> <p>- iron-stained, medium hard to hard ( 61.4 - 66.4 ft. )</p> <p>- clayey shale lens, soft ( 62.6 - 62.7 ft. )</p> <p>- diagonal fracture ( 62.7 - 62.9 ft. )</p> <p>- diagonal fracture ( 63.1 - 63.6 ft. )</p> <p>- clayey shale lens, soft ( 63.3 - 63.5 ft. )</p> <p>- clayey shale lens, soft ( 65.3 - 66.1 ft. )</p>									
65				100	56							
70												
75				100	100							
80												
85				100	100							
90												

BORING C00553.GPJ 2/28/01

Completion Depth: **101.1 feet**  
 Date Boring Started: **1/22/01**  
 Date Boring Completed: **1/22/01**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks:

*Continued Next Page*

# LOG OF BORING NO. DHX-17

Project Description: **Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1056.7 feet</b>			☒ Split Spoon ☒ Shelby Tube ☐ Rock Core									
			Gray SANDSTONE, hard, fine to medium grained	91.1	86	57						
-95			VOID - void sample (91.6' - 99.0') coal slurry with sand  0.7% gravel 22.2% sand 77.1% silt and clay									
-100				101.1								
			Bottom of Test Boring @ 101.1 ft.									
-105												
-110												
-115												
-120												

Completion Depth: **101.1 feet**  
 Date Boring Started: **1/22/01**  
 Date Boring Completed: **1/22/01**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks:

BORING C00553.GPJ 2/28/01

# LOG OF BORING NO. DHX-18

Project Description: **Big Branch Slurry Impoundment Investigation**  
**Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1056.8 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<b>MATERIAL DESCRIPTION</b>									
0		☒	Coarse <u>COAL REFUSE</u> <span style="float: right;">0.5</span>									
5		○	Brown <u>CLAYEY SAND</u> with sandstone fragments									
10		○	CASING ADVANCE W/OUT SAMPLING									
15		○										
20		○										
25		○										
29.2		☑	Gray <u>SANDSTONE</u> , medium hard to hard <span style="float: right;">29.2</span>									
30		☑										

BORING C00553.GPJ 2/28/01

Completion Depth: **97.6 feet**  
 Date Boring Started: **1/22/01**  
 Date Boring Completed: **1/23/01**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks: **Water was noted at a depth of 85.2 ft. upon drilling completion.**

*Continued Next Page*

# LOG OF BORING NO. DHX-18

Project Description: **Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1056.8 feet</b> Split Spoon Shelby Tube Rock Core									
35			Gray <u>SANDSTONE</u> , medium hard to hard, medium grained  CASING ADVANCE W/OUT SAMPLING									
40												
45												
50												
55												
60												

BORING C00553.GPJ 2/28/01

Completion Depth: **97.6 feet**  
 Date Boring Started: **1/22/01**  
 Date Boring Completed: **1/23/01**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks: **Water was noted at a depth of 85.2 ft. upon drilling completion.**

*Continued Next Page*

# LOG OF BORING NO. DHX-18

Project Description: **Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: See Drawing No. C00553-1 Surface El.: 1056.8 feet	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit	
			<div style="display: flex; justify-content: space-between;"> <div style="width: 30%;"> <p>⊗ Split Spoon</p> <p>⊠ Shelby Tube</p> <p>■ Rock Core</p> </div> <div style="width: 65%;"> <p style="text-align: center;"><b>MATERIAL DESCRIPTION</b></p> <p style="text-align: center;">Gray <u>SANDSTONE</u>, medium hard to hard</p> </div> </div>										
65													
70													
75													
80													
85													
87.9			87.9										
90			VOID										

BORING C00553.GPJ 2/28/01

Completion Depth: **97.6 feet**  
 Date Boring Started: **1/22/01**  
 Date Boring Completed: **1/23/01**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks: **Water was noted at a depth of 85.2 ft. upon drilling completion.**

*Continued Next Page*

# LOG OF BORING NO. DHX-18

Project Description: **Big Branch Slurry Impoundment Investigation  
Martin County, Kentucky**



Depth, feet	Sample Type	Symbol / USCS	Location: <b>See Drawing No. C00553-1</b> Surface El.: <b>1056.8 feet</b>	Recovery %	RQD	Penetration Blows / 6 inches	Gravel %	Sand %	Silt and Clay %	Water Content %	Liquid Limit	Plastic Limit
			<b>MATERIAL DESCRIPTION</b>									
95	X		VOID - no recovery (88.3' - 90.3')  - silty sand and gravel (90.3' - 92.3')  - silty sand w/trace gravel (92.3' - 94.3')  - silty sand w/trace gravel (94.3' - 96.3')  - gravel (96.3' - 97.6')									
97.6			Bottom of Test Boring @ 97.6 ft.									

BORING C00553.GPJ 2/28/01

Completion Depth: **97.6 feet**  
 Date Boring Started: **1/22/01**  
 Date Boring Completed: **1/23/01**  
 Engineer/Geologist: **JEN/JTS**  
 Project No.: **C00553**

Remarks: **Water was noted at a depth of 85.2 ft. upon drilling completion.**

***APPENDIX A***

***LABORATORY TESTING***

**GRAIN SIZE DISTRIBUTION**

**TRIAXIAL SHEAR STRENGTH**

**PERMEABILITY**

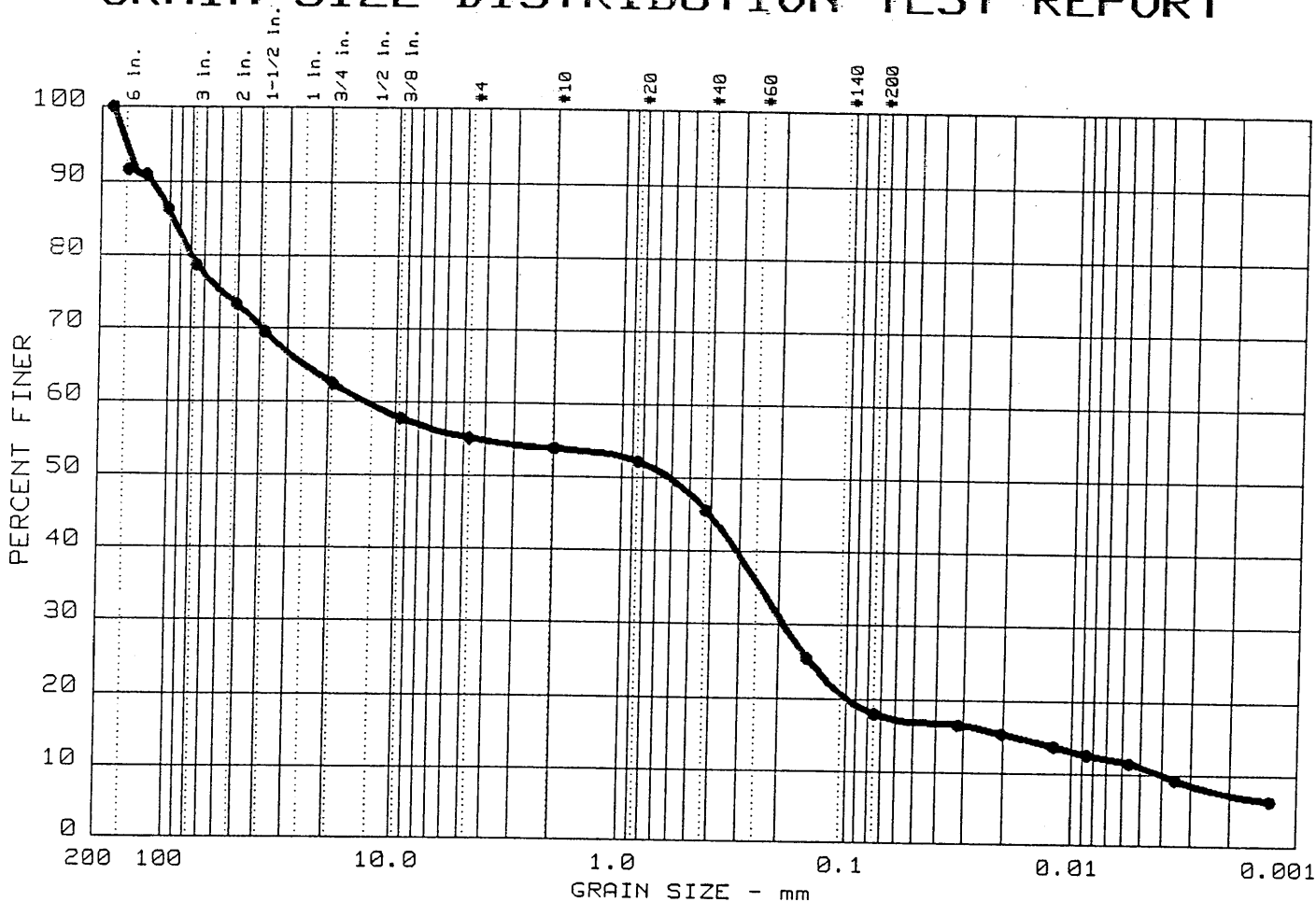
**UNIAXIAL COMPRESSIVE STRENGTH**

**MODULUS OF RUPTURE**



***GRAIN SIZE DISTRIBUTION***

# GRAIN SIZE DISTRIBUTION TEST REPORT



	% +75 <sub>mm</sub>	% GRAVEL	% SAND	% SILT	% CLAY
●	21.3	23.5	37.1	6.9	11.2

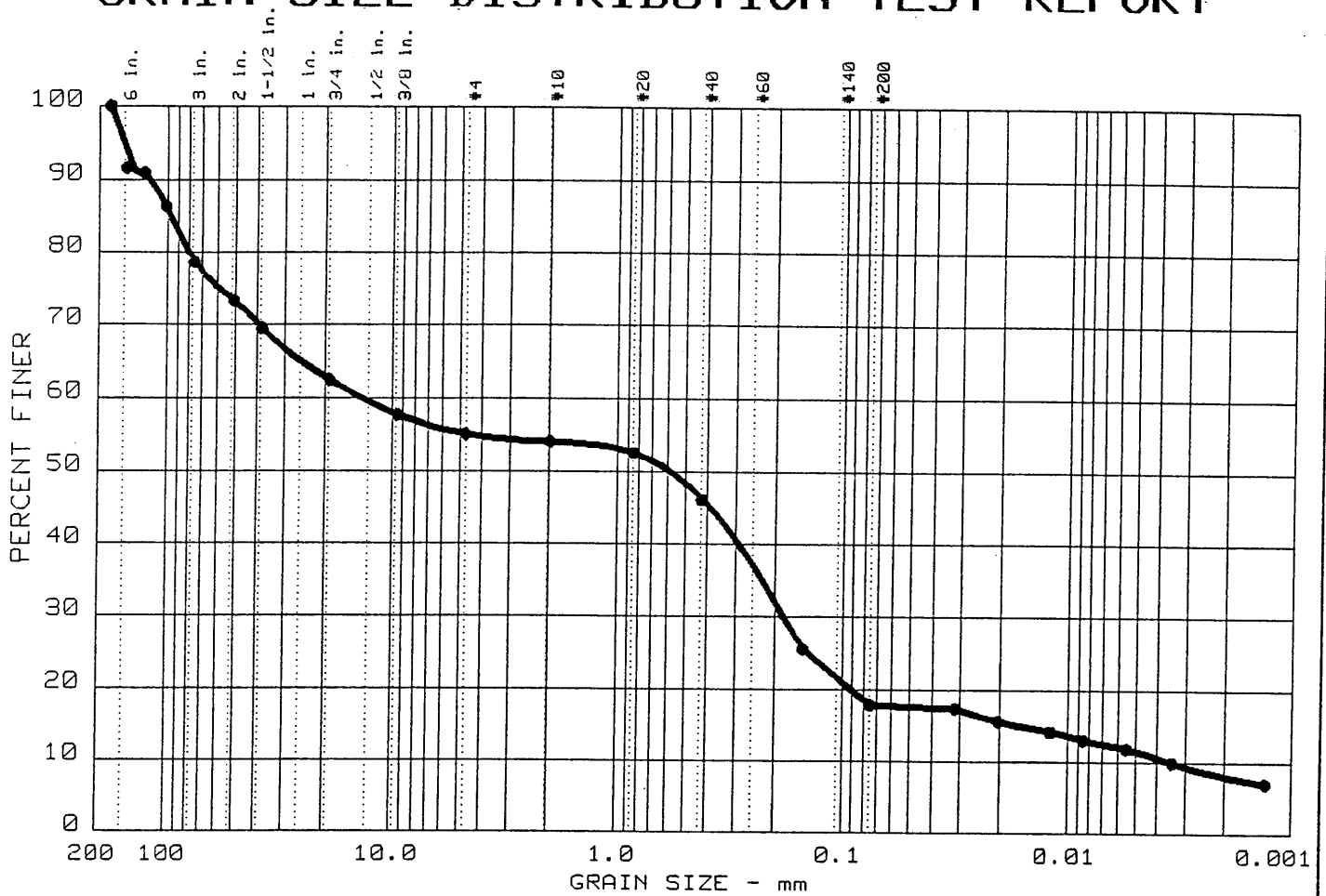
LL	PI	D <sub>85</sub>	D <sub>60</sub>	D <sub>50</sub>	D <sub>30</sub>	D <sub>15</sub>	D <sub>10</sub>	C <sub>c</sub>	C <sub>u</sub>
● NP	NP	96.61	13.34	0.60	0.191	0.0162	0.0039	0.69	3388.4

MATERIAL DESCRIPTION	USCS	AASHTO
● LT. BROWN SILTY SAND WITH ROCK FRAGMENTS	GM	A-1-b

Project No.: C00553  
 Project: BIG BRANCH SLURRY IMPOUNDMENT  
 ● Location: TP-1, S-1  
  
 Date: 03/01/01

Remarks:  
 Specific Gravity = 2.7  
  
 Figure No. \_\_\_\_\_

# GRAIN SIZE DISTRIBUTION TEST REPORT



% +75 mm	% GRAVEL	% SAND	% SILT	% CLAY
21.3	23.5	37.2	6.3	11.7

LL	PI	D <sub>85</sub>	D <sub>60</sub>	D <sub>50</sub>	D <sub>30</sub>	D <sub>15</sub>	D <sub>10</sub>	C <sub>c</sub>	C <sub>u</sub>
NP	NP	96.61	13.34	0.58	0.184	0.0144	0.0034	0.75	3944.6

MATERIAL DESCRIPTION	USCS	AASHTO
● LT. BROWN SILTY SAND WITH ROCK FRAGMENTS	GM	A-1-b

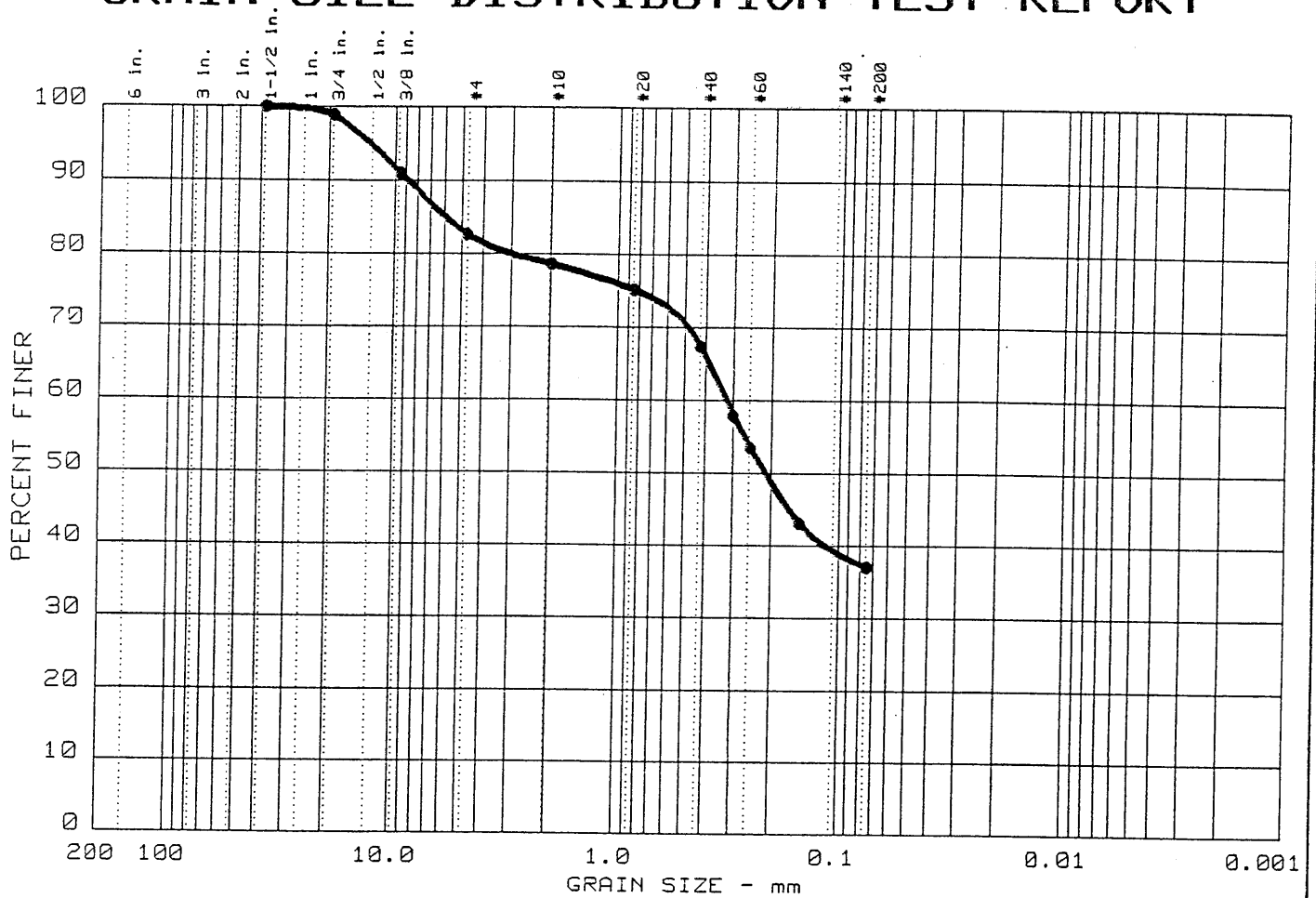
Project No.: C00553  
 Project: BIG BRANCH SLURRY IMPOUNDMENT  
 ● Location: TP-1, S-2  
  
 Date: 03/01/01

Remarks:  
 Specific Gravity = 2.7

GRAIN SIZE DISTRIBUTION TEST REPORT  
**TRIAD ENGINEERING, INC.**

Figure No. \_\_\_\_\_

# GRAIN SIZE DISTRIBUTION TEST REPORT



%+75 <sub>mm</sub>	% GRAVEL	% SAND	% SILT	% CLAY
0.0	17.3	45.6	37.1	

LL	PI	D <sub>85</sub>	D <sub>60</sub>	D <sub>50</sub>	D <sub>30</sub>	D <sub>15</sub>	D <sub>10</sub>	C <sub>c</sub>	C <sub>u</sub>
		5.89	0.32	0.21					

MATERIAL DESCRIPTION	USCS	AASHTO
● LT. BROWN SANDY SILT WITH ROCK FRAGMENTS	SM	A-4(0.0)

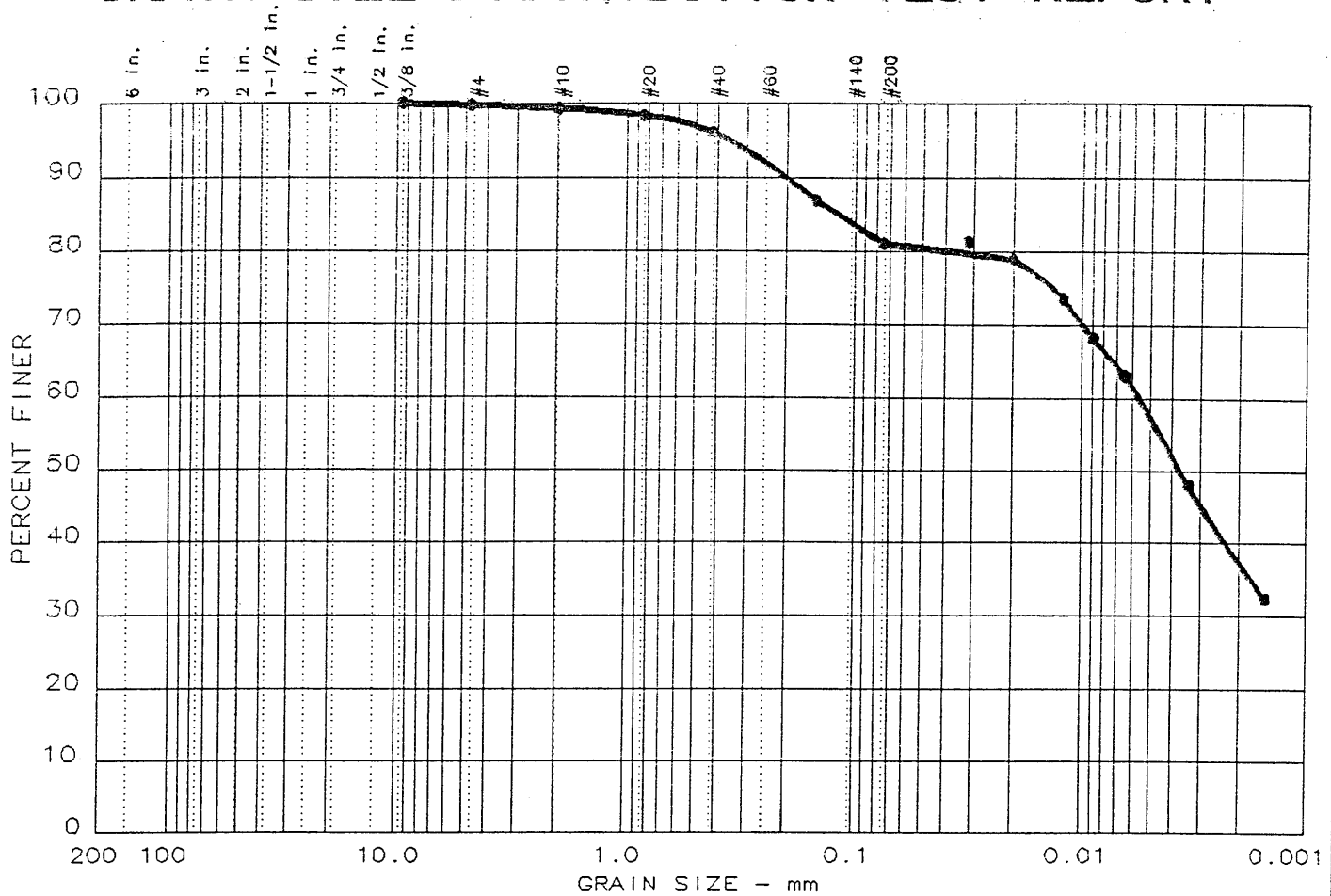
Project No.: C00553  
 Project: BIG BRANCH SLURRY IMPOUNDMENT  
 ● Location: DH1-6, DEPTH: 40.0' - 42.0'

Date: 03/01/01

Remarks:

Figure No. \_\_\_\_\_

# GRAIN SIZE DISTRIBUTION TEST REPORT



%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.3	18.7	23.5	57.5

LL	PI	D <sub>85</sub>	D <sub>60</sub>	D <sub>50</sub>	D <sub>30</sub>	D <sub>15</sub>	D <sub>10</sub>	C <sub>c</sub>	C <sub>u</sub>
		0.12		0.00					

MATERIAL DESCRIPTION	USCS	AASHTO
● BLACK SANDY CLAY (SLURRY)	ML	A-4(0.0)

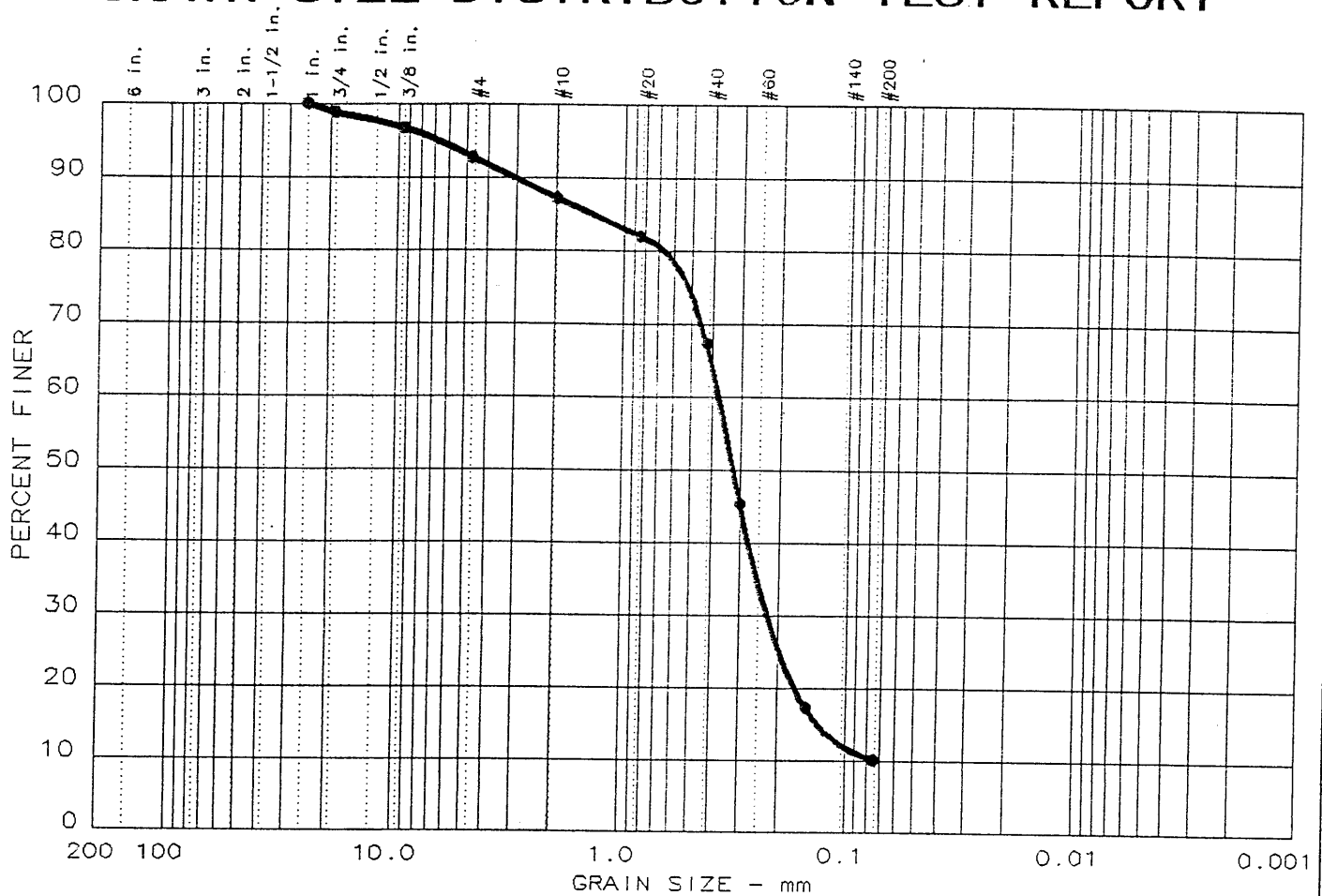
Project No.: C00553  
 Project: BIG BRANCH SLURRY IMPOUNDMENT  
 ● Location: DH1-6 (88.3' - 90.2')

Date: 02/23/2001

Remarks:

Specific Gravity = 2.15

# GRAIN SIZE DISTRIBUTION TEST REPORT



%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
0.0	7.2	82.6	10.2	

LL	PI	D <sub>85</sub>	D <sub>60</sub>	D <sub>50</sub>	D <sub>30</sub>	D <sub>15</sub>	D <sub>10</sub>	C <sub>c</sub>	C <sub>u</sub>
		1.41	0.37	0.32	0.223	0.1314			

MATERIAL DESCRIPTION	USCS	AASHTO
● BROWN SILTY SAND WITH ROCK FRAGMENTS	SP-SM	A-3

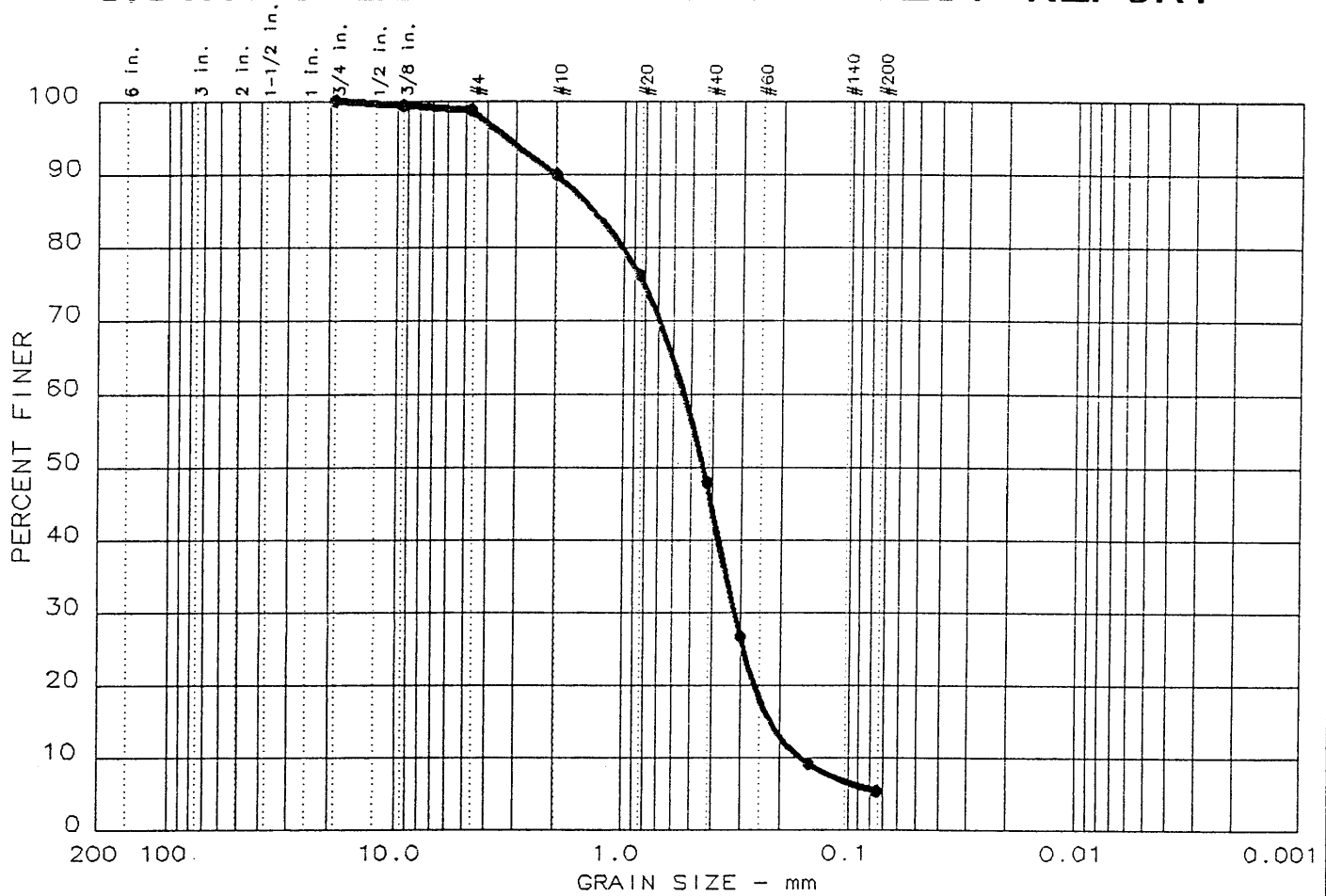
Project No.: C00553  
 Project: BIG BRANCH SLURRY IMPOUNDMENT  
 ● Location: DH1-10, DEPTH: 80.6' - 85.7'  
  
 Date: 02/19/2001

GRAIN SIZE DISTRIBUTION TEST REPORT  
**TRIAD ENGINEERING, INC.**

Remarks:

Figure No. \_\_\_\_\_

# GRAIN SIZE DISTRIBUTION TEST REPORT



%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
0.0	1.3	93.3	5.4	

LL	PI	D <sub>85</sub>	D <sub>60</sub>	D <sub>50</sub>	D <sub>30</sub>	D <sub>15</sub>	D <sub>10</sub>	C <sub>c</sub>	C <sub>u</sub>
		1.35	0.53	0.44	0.318	0.2195	0.1627	1.16	3.3

MATERIAL DESCRIPTION	USCS	AASHTO
● BROWN SILTY SAND WITH ROCK FRAGMENTS	SP-SM	A-1-b

Project No.: C00553  
 Project: BIG BRANCH SLURRY IMPOUNDMENT  
 ● Location: DH1-11, DEPTH: 92.6' - 96.2'

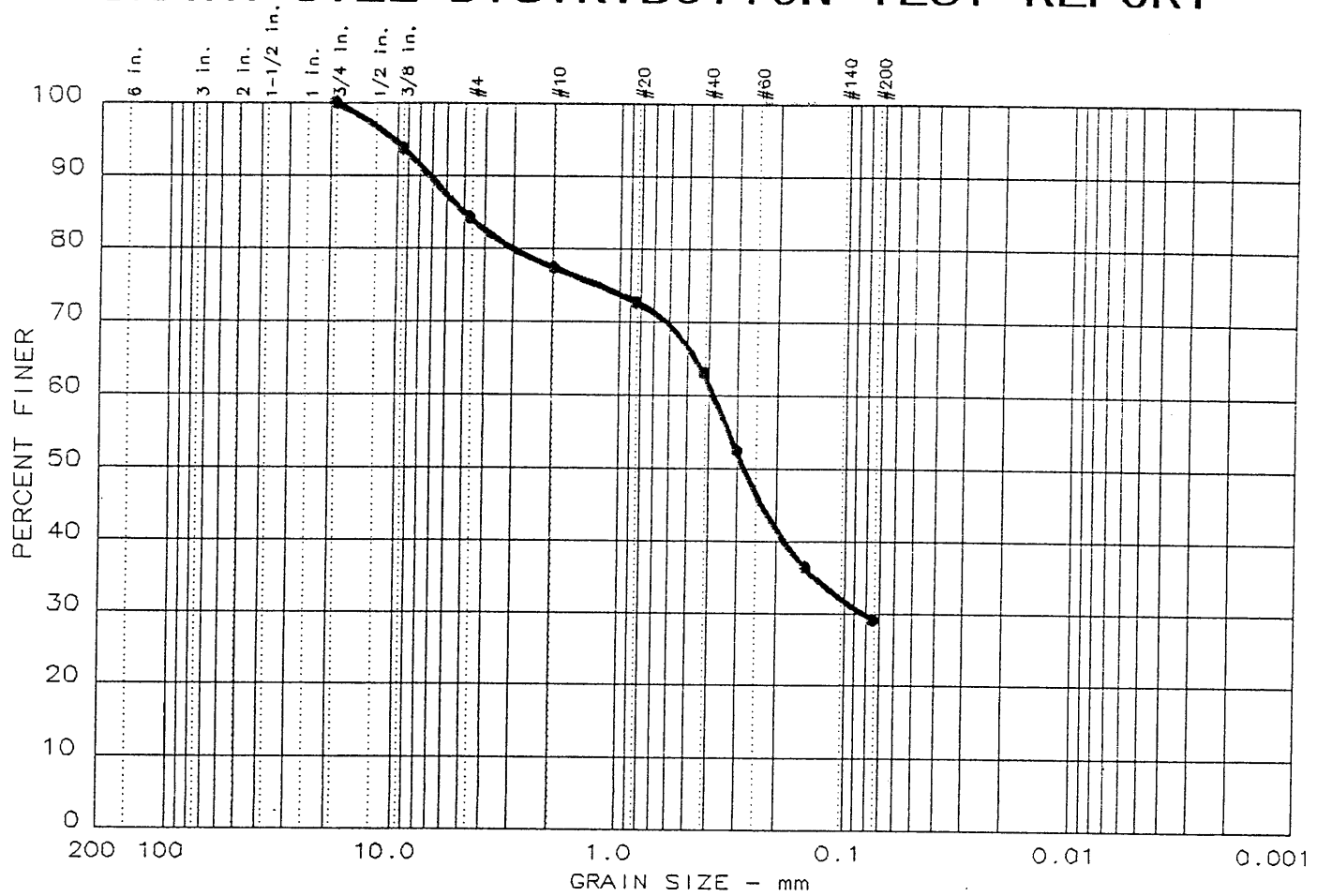
Date: 02/19/2001

GRAIN SIZE DISTRIBUTION TEST REPORT  
**TRIAD ENGINEERING, INC.**

Remarks:

Figure No. \_\_\_\_\_

# GRAIN SIZE DISTRIBUTION TEST REPORT



	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	15.8	55.0	29.2	

LL	PI	D <sub>85</sub>	D <sub>60</sub>	D <sub>50</sub>	D <sub>30</sub>	D <sub>15</sub>	D <sub>10</sub>	C <sub>c</sub>	C <sub>u</sub>
		5.01	0.38	0.28	0.083				

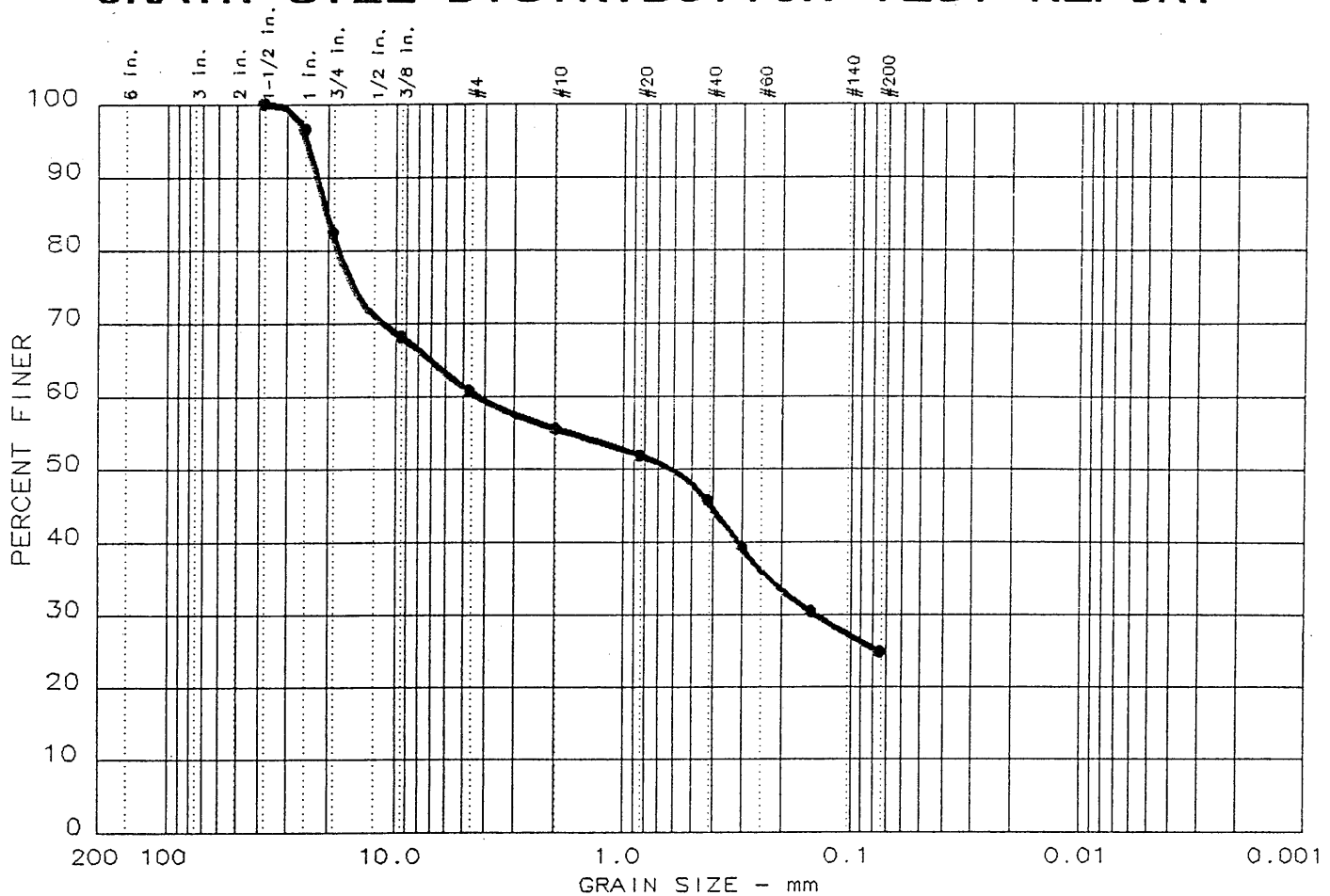
MATERIAL DESCRIPTION	USCS	AASHTO
● GRAY SILTY SAND WITH ROCK FRAGMENTS	SM	A-2-4(0.0)

Project No.: C00553  
 Project: BIG BRANCH SLURRY IMPOUNDMENT  
 ● Location: DH1-11, DEPTH: 96.1' - 97.1'  
  
 Date: 02/19/2001

Remarks:  
  
  
  
 Figure No. \_\_\_\_\_



# GRAIN SIZE DISTRIBUTION TEST REPORT



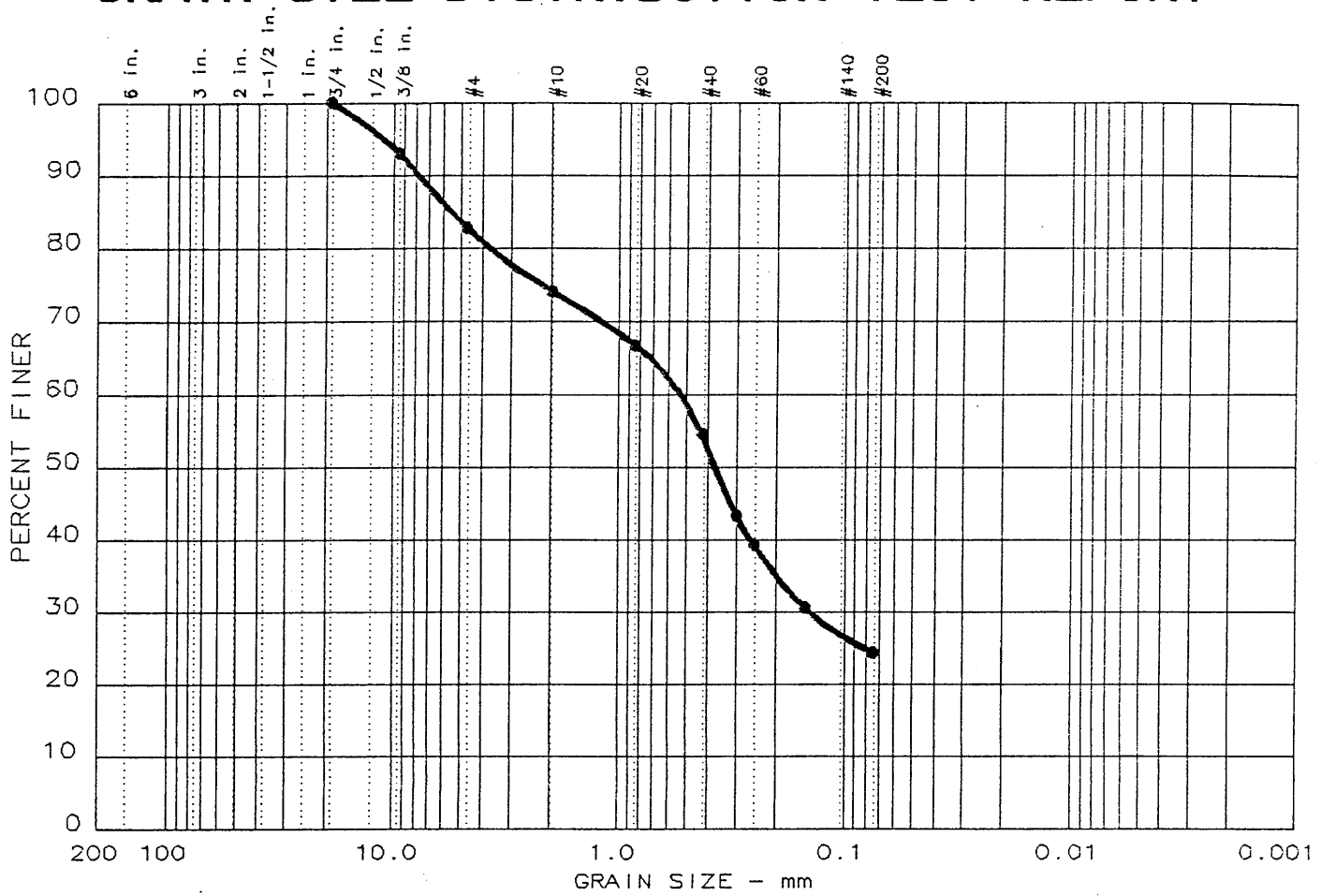
%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
0.0	39.3	35.8	24.9	

LL	PI	D <sub>85</sub>	D <sub>60</sub>	D <sub>50</sub>	D <sub>30</sub>	D <sub>15</sub>	D <sub>10</sub>	C <sub>c</sub>	C <sub>u</sub>
		20.16	4.36	0.62	0.143				

MATERIAL DESCRIPTION	USCS	AASHTO
● BROWN SILTY SAND WITH ROCK FRAGMENTS	GM	A-1-b

<p>Project No.: C00553                  Project: BIG BRANCH SLURRY IMPOUNDMENT                  ● Location: DH1-12, DEPTH: 89.4' - 99.4'</p> <p>Date: 02/19/2001</p> <p style="text-align: center;"><b>GRAIN SIZE DISTRIBUTION TEST REPORT</b>  <b>TRIAD ENGINEERING, INC.</b></p>	<p>Remarks:</p>      <p>Figure No. _____</p>
------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	----------------------------------------------------------------

# GRAIN SIZE DISTRIBUTION TEST REPORT



%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
0.0	17.2	58.3	24.5	

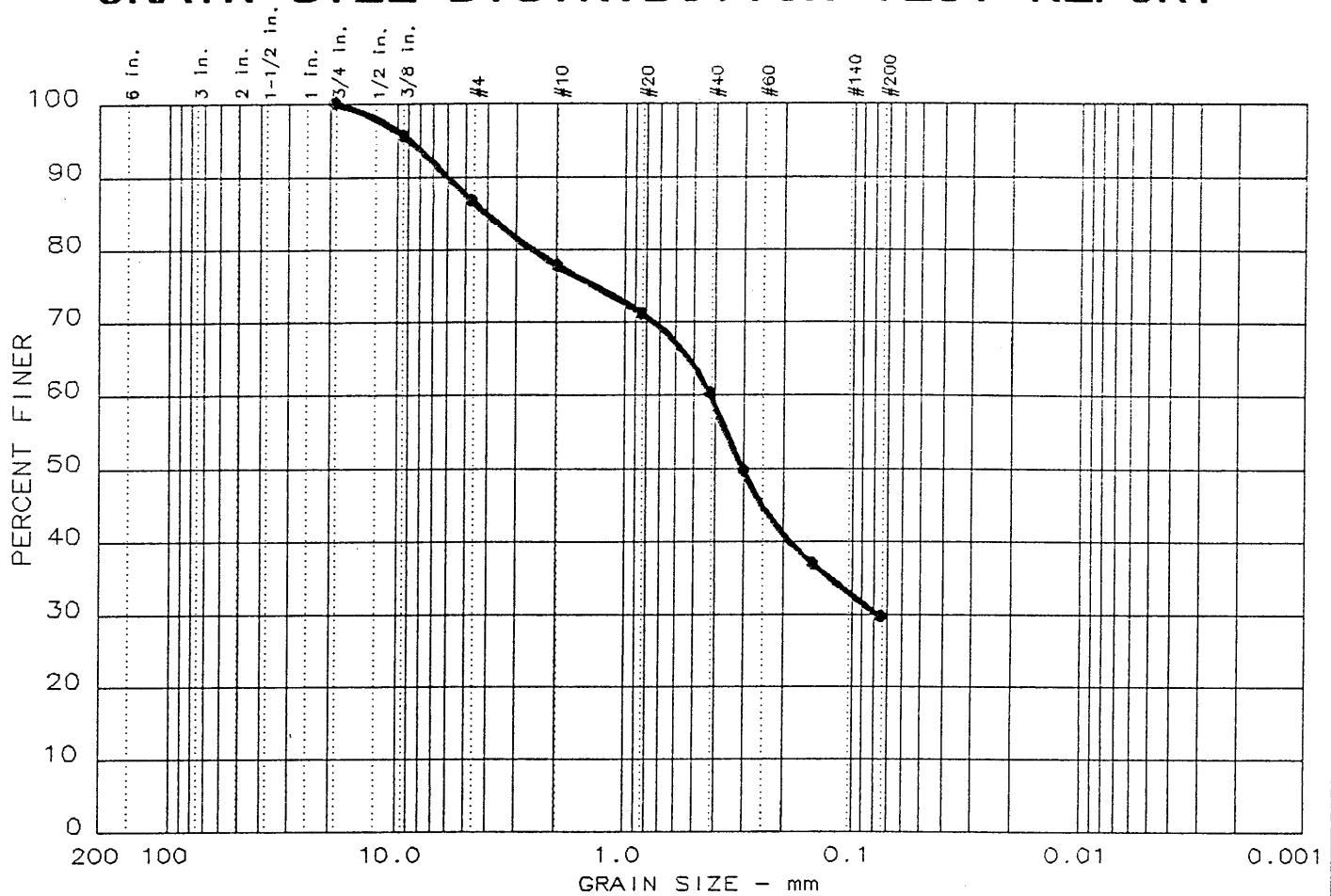
LL	PI	D <sub>85</sub>	D <sub>60</sub>	D <sub>50</sub>	D <sub>30</sub>	D <sub>15</sub>	D <sub>10</sub>	C <sub>c</sub>	C <sub>u</sub>
		5.56	0.52	0.37	0.142				

MATERIAL DESCRIPTION	USCS	AASHTO
● GRAY SILTY SAND WITH ROCK FRAGMENTS	SM	A-2-4(0.0)

Project No.: C00553  
 Project: BIG BRANCH SLURRY IMPOUNDMENT  
 ● Location: DH1-12, DEPTH: 90.1' - 99.4'  
 Date: 02/23/2001

Remarks:

# GRAIN SIZE DISTRIBUTION TEST REPORT



%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
0.0	13.3	56.9	29.8	

LL	PI	D <sub>85</sub>	D <sub>60</sub>	D <sub>50</sub>	D <sub>30</sub>	D <sub>15</sub>	D <sub>10</sub>	C <sub>c</sub>	C <sub>u</sub>
		4.12	0.42	0.30	0.076				

MATERIAL DESCRIPTION	USCS	AASHTO
● BROWN SILTY SAND WITH ROCK FRAGMENTS	SM	A-2-4(0.0)

Project No.: C00553  
 Project: BIG BRANCH SLURRY IMPOUNDMENT  
 ● Location: DH1-12, DEPTH: 90.7' - 99.2'

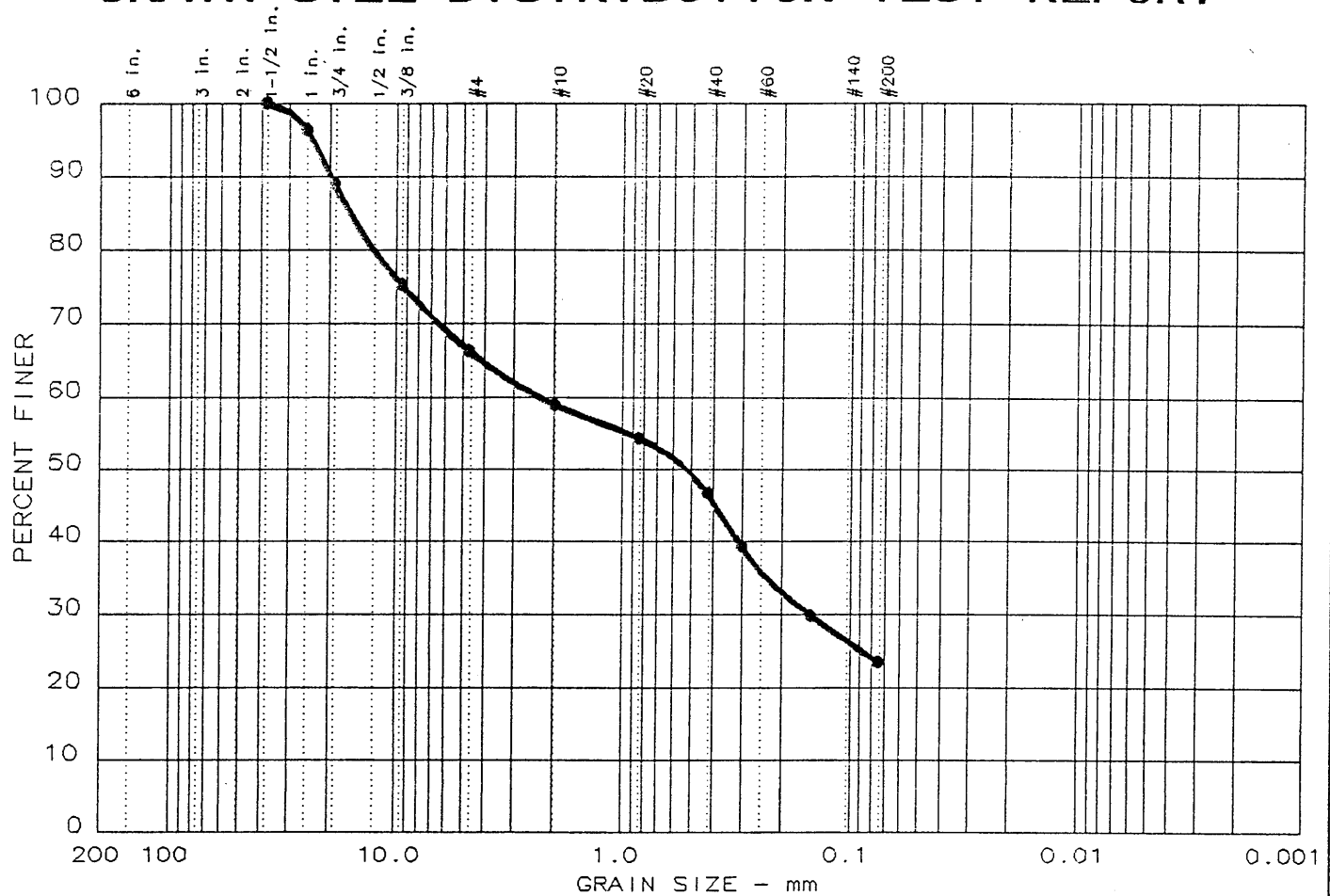
Date: 02/19/2001

**GRAIN SIZE DISTRIBUTION TEST REPORT**  
**TRIAD ENGINEERING, INC.**

Remarks:

Figure No. \_\_\_\_\_

# GRAIN SIZE DISTRIBUTION TEST REPORT



%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
0.0	33.7	42.7	23.6	

LL	PI	D <sub>85</sub>	D <sub>60</sub>	D <sub>50</sub>	D <sub>30</sub>	D <sub>15</sub>	D <sub>10</sub>	C <sub>c</sub>	C <sub>u</sub>
		16.20	2.34	0.52	0.151				

MATERIAL DESCRIPTION	USCS	AASHTO
● BROWN & GRAY SILTY SAND WITH ROCK FRAGMENTS	SM	A-1-b

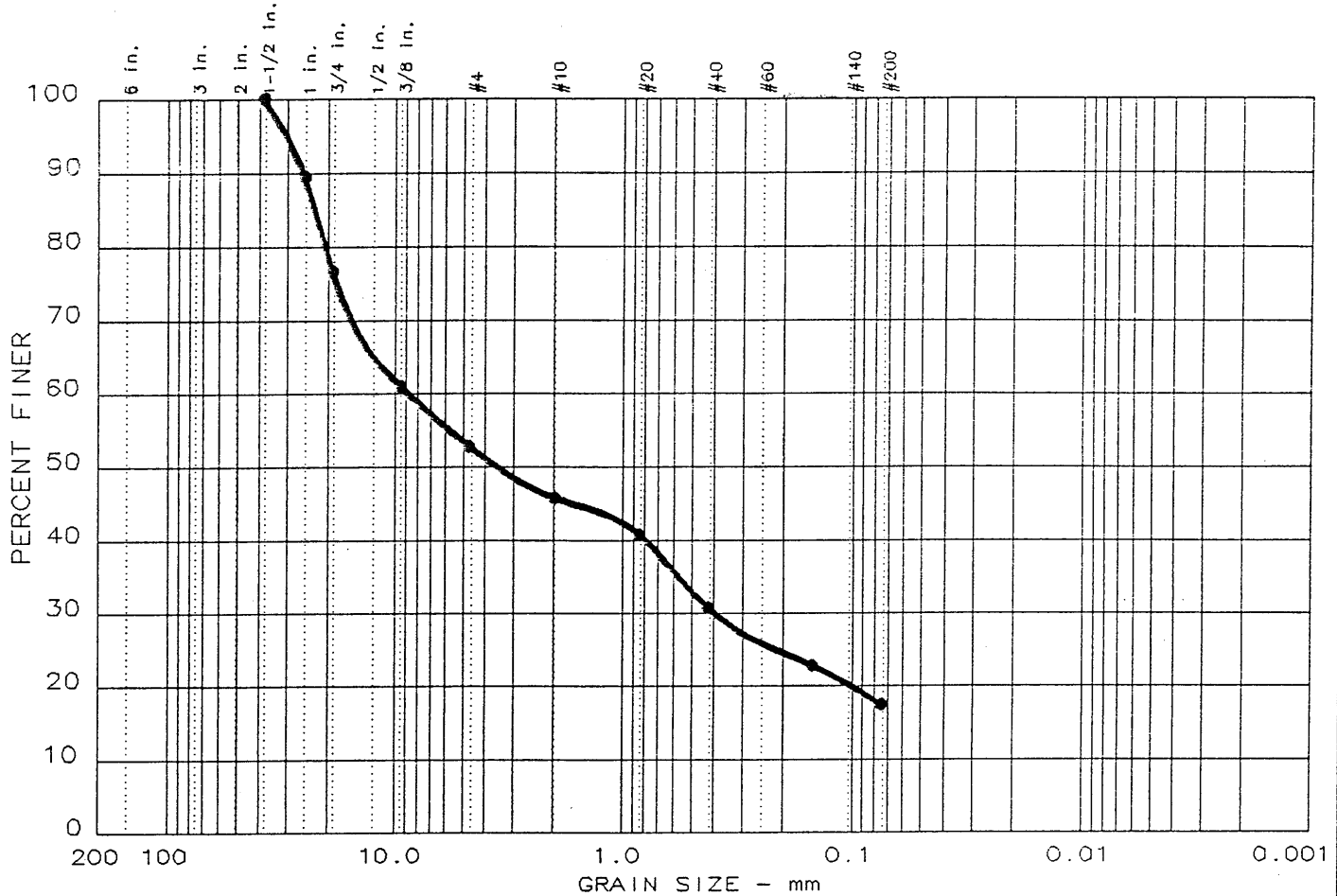
Project No.: C00553  
 Project: BIG BRANCH SLURRY IMPOUNDMENT  
 ● Location: DH1-13, DEPTH: 87.7' - 89.7'

Date: 02/19/2001

Remarks:



# GRAIN SIZE DISTRIBUTION TEST REPORT



%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
0.0	47.2	35.3	17.5	

LL	PI	D <sub>85</sub>	D <sub>60</sub>	D <sub>50</sub>	D <sub>30</sub>	D <sub>15</sub>	D <sub>10</sub>	C <sub>c</sub>	C <sub>u</sub>
		22.91	8.81	3.55	0.398				

MATERIAL DESCRIPTION	USCS	AASHTO
● BROWN SILTY SAND WITH ROCK FRAGMENTS	GM	A-1-b

Project No.: CD0553  
 Project: BIG BRANCH SLURRY IMPOUNDMENT  
 ● Location: DH1-13, DEPTH: 91.7' - 93.7'  
  
 Date: 02/19/2001

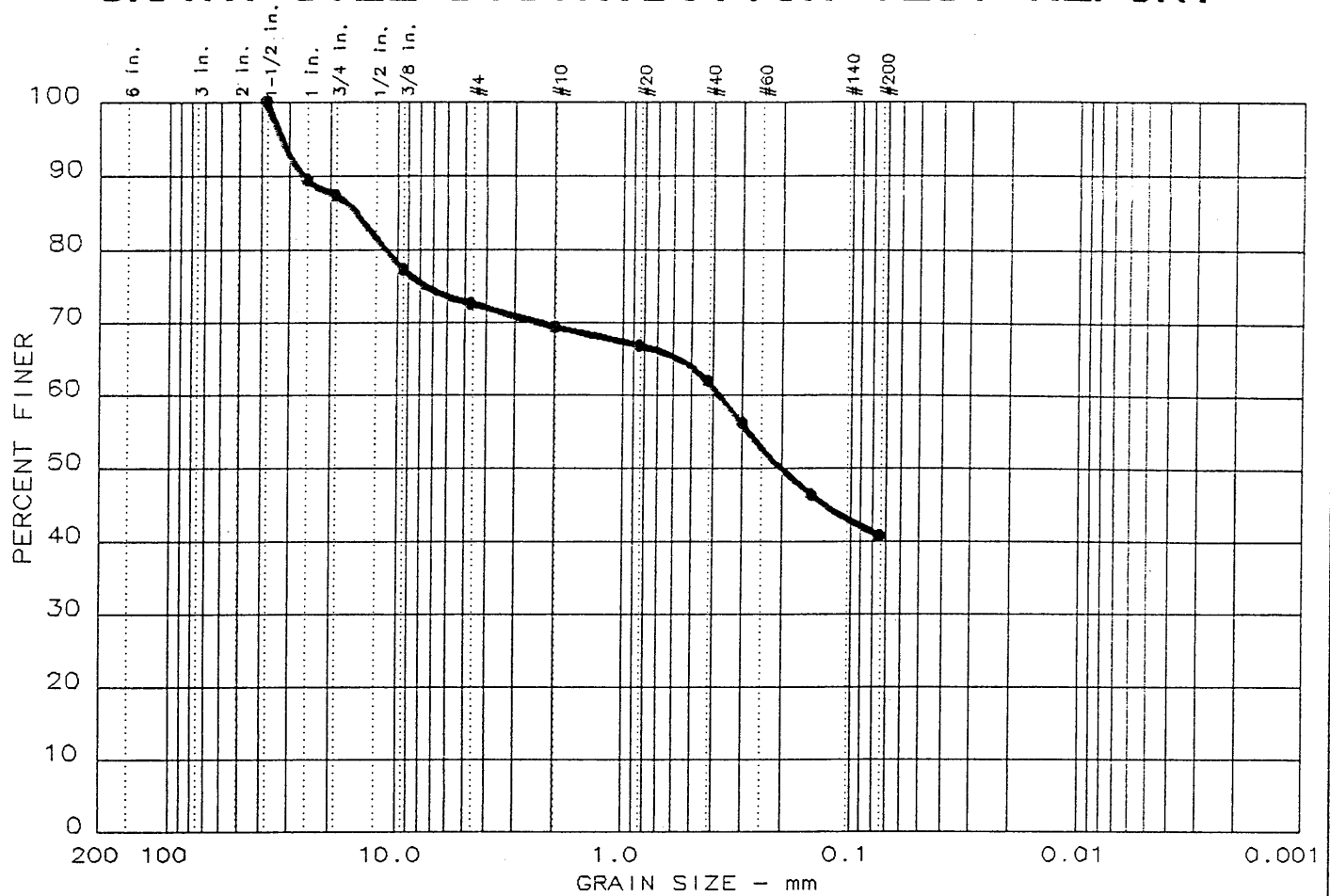
Remarks:







# GRAIN SIZE DISTRIBUTION TEST REPORT



%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
0.0	27.4	31.8	40.8	

LL	PI	D <sub>85</sub>	D <sub>60</sub>	D <sub>50</sub>	D <sub>30</sub>	D <sub>15</sub>	D <sub>10</sub>	C <sub>c</sub>	C <sub>u</sub>
26.8	6	15.31	0.37	0.20					

MATERIAL DESCRIPTION	USCS	AASHTO
● BLACK SANDY SILT WITH ROCK FRAGMENTS (SLURRY)	SC-SM	A-4(0.0)

Project No.: C00553  
 Project: BIG BRANCH SLURRY IMPOUNDMENT  
 ● Location: DH2-9, DEPTH: 93.8' - 95.8'

Date: 02/23/2001

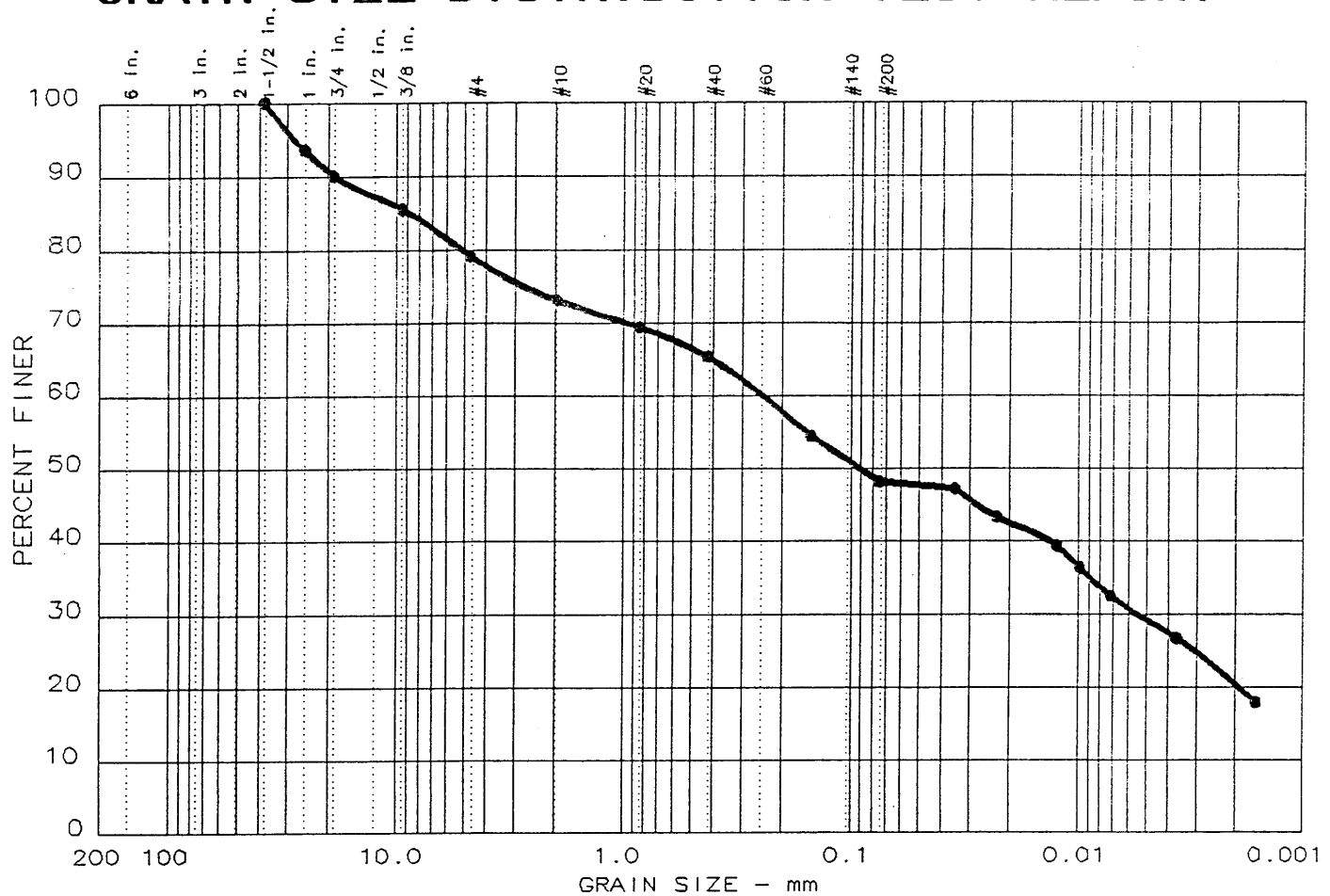
Remarks:

Specific Gravity = 2.03

Figure No. \_\_\_\_\_



# GRAIN SIZE DISTRIBUTION TEST REPORT



%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
0.0	20.9	30.9	19.0	29.2

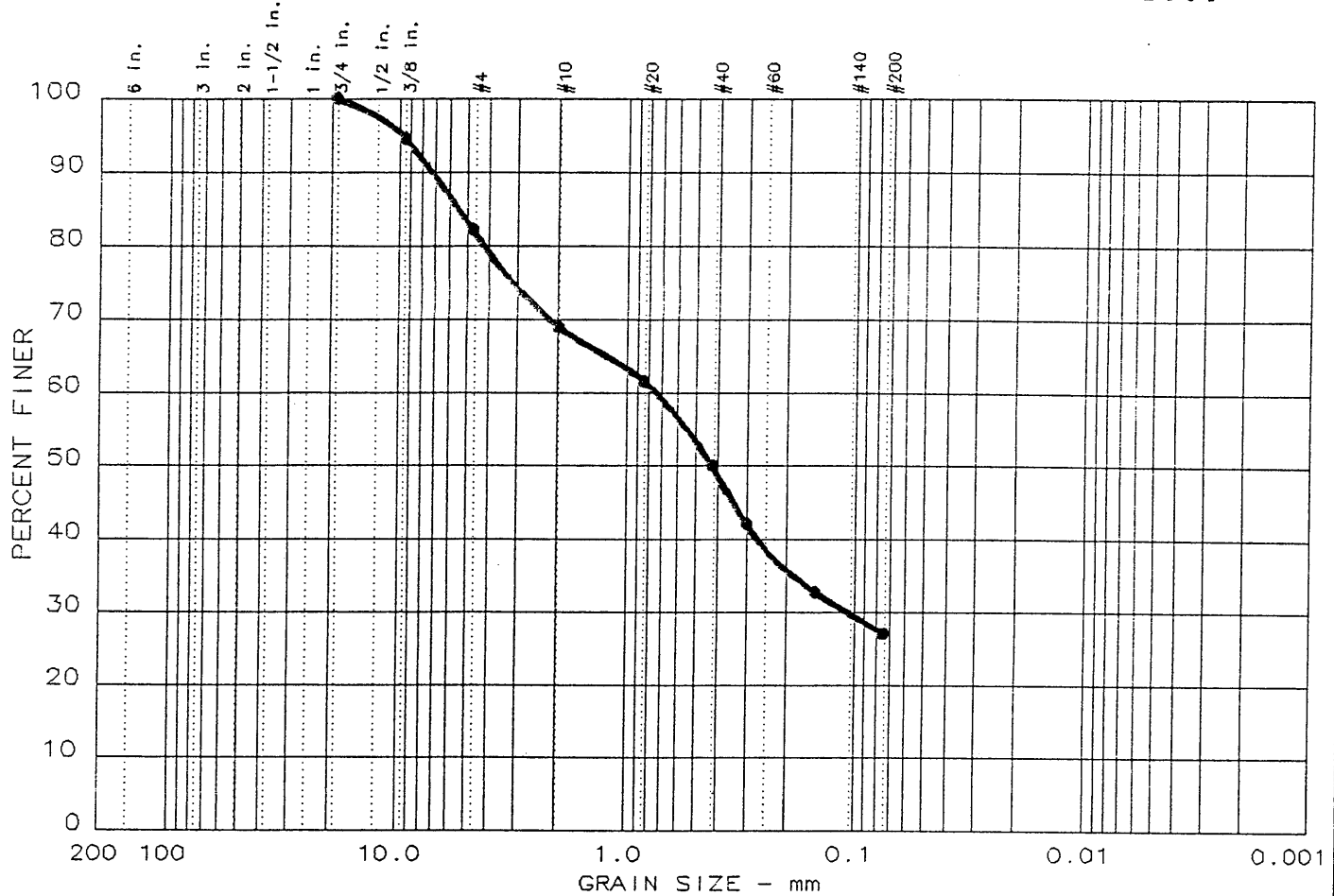
LL	PI	D <sub>85</sub>	D <sub>60</sub>	D <sub>50</sub>	D <sub>30</sub>	D <sub>15</sub>	D <sub>10</sub>	C <sub>c</sub>	C <sub>u</sub>
32.8	6.8	8.91	0.24	0.09	0.005				

MATERIAL DESCRIPTION	USCS	AASHTO
● BLACK SANDY SILT WITH ROCK FRAGMENTS (SLURRY)	SM	A-4(1.2)

Project No.: C00553 Project: BIG BRANCH SLURRY IMPOUNDMENT ● Location: DH2-9, DEPTH: 97.8' - 99.8'  Date: 02/23/2001	Remarks:
GRAIN SIZE DISTRIBUTION TEST REPORT <b>TRIAD ENGINEERING, INC.</b>	
Figure No. _____	



# GRAIN SIZE DISTRIBUTION TEST REPORT



%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
0.0	17.9	55.0	27.1	

LL	PI	D <sub>85</sub>	D <sub>60</sub>	D <sub>50</sub>	D <sub>30</sub>	D <sub>15</sub>	D <sub>10</sub>	C <sub>c</sub>	C <sub>u</sub>
		5.50	0.74	0.42	0.106				

MATERIAL DESCRIPTION	USCS	AASHTO
● BROWN SILTY SAND WITH ROCK FRAGMENTS	SM	A-2-4(0.0)

Project No.: C00553  
 Project: BIG BRANCH SLURRY IMPOUNDMENT  
 ● Location: DHX-1, DEPTH: 89.4' - 91.9'

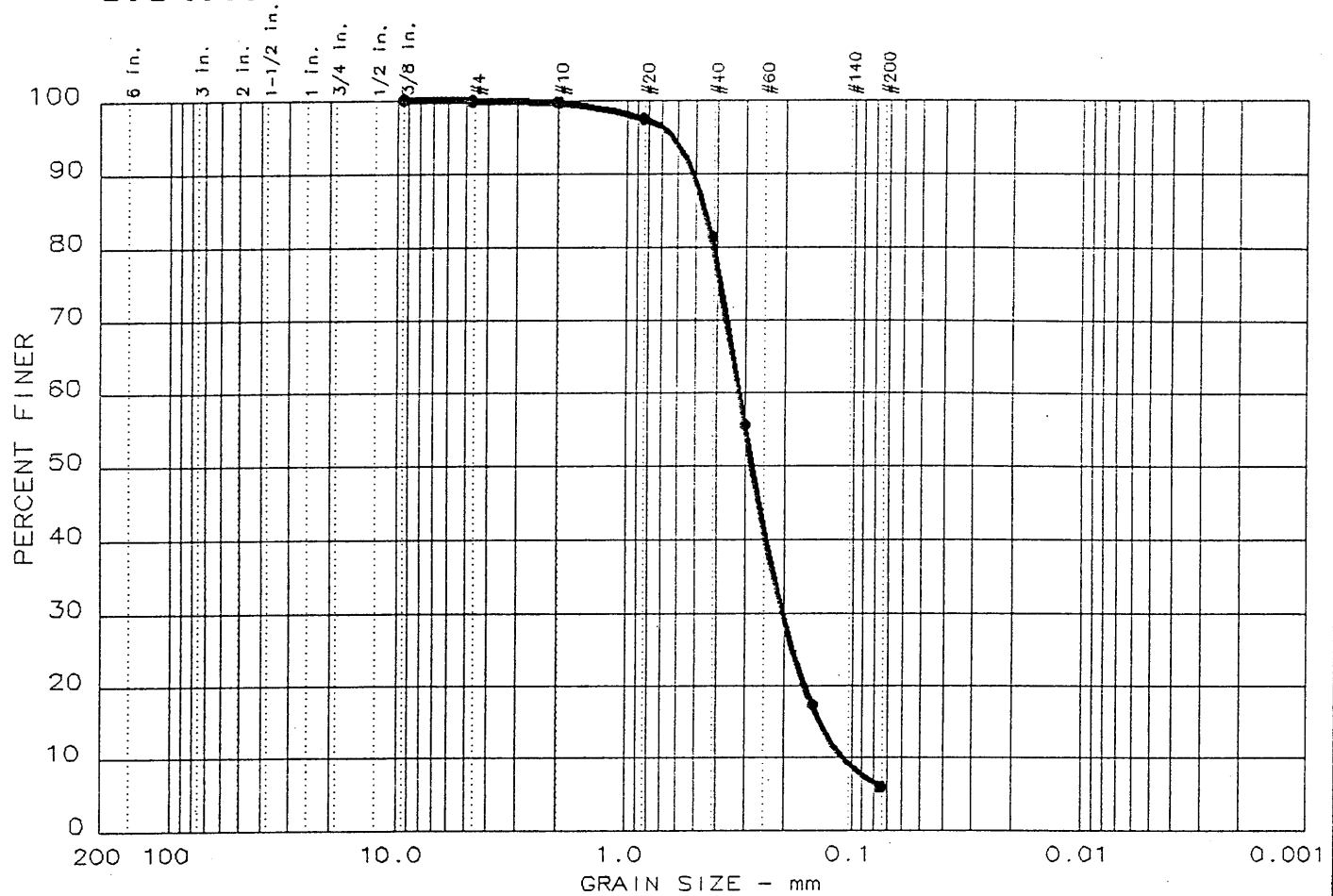
Date: 02/19/2001

Remarks:

Figure No. \_\_\_\_\_



# GRAIN SIZE DISTRIBUTION TEST REPORT



	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	0.1	93.9	6.0	

LL	PI	D <sub>85</sub>	D <sub>60</sub>	D <sub>50</sub>	D <sub>30</sub>	D <sub>15</sub>	D <sub>10</sub>	C <sub>c</sub>	C <sub>u</sub>
●		0.45	0.32	0.28	0.202	0.1380	0.1084	1.18	2.9

MATERIAL DESCRIPTION	USCS	AASHTO
● BROWN SILTY SAND	SP-SM	A-3

Project No.: C00553  
 Project: BIG BRANCH SLURRY IMPOUNDMENT  
 ● Location: DHX-5, DEPTH: 79.7' - 82.7'

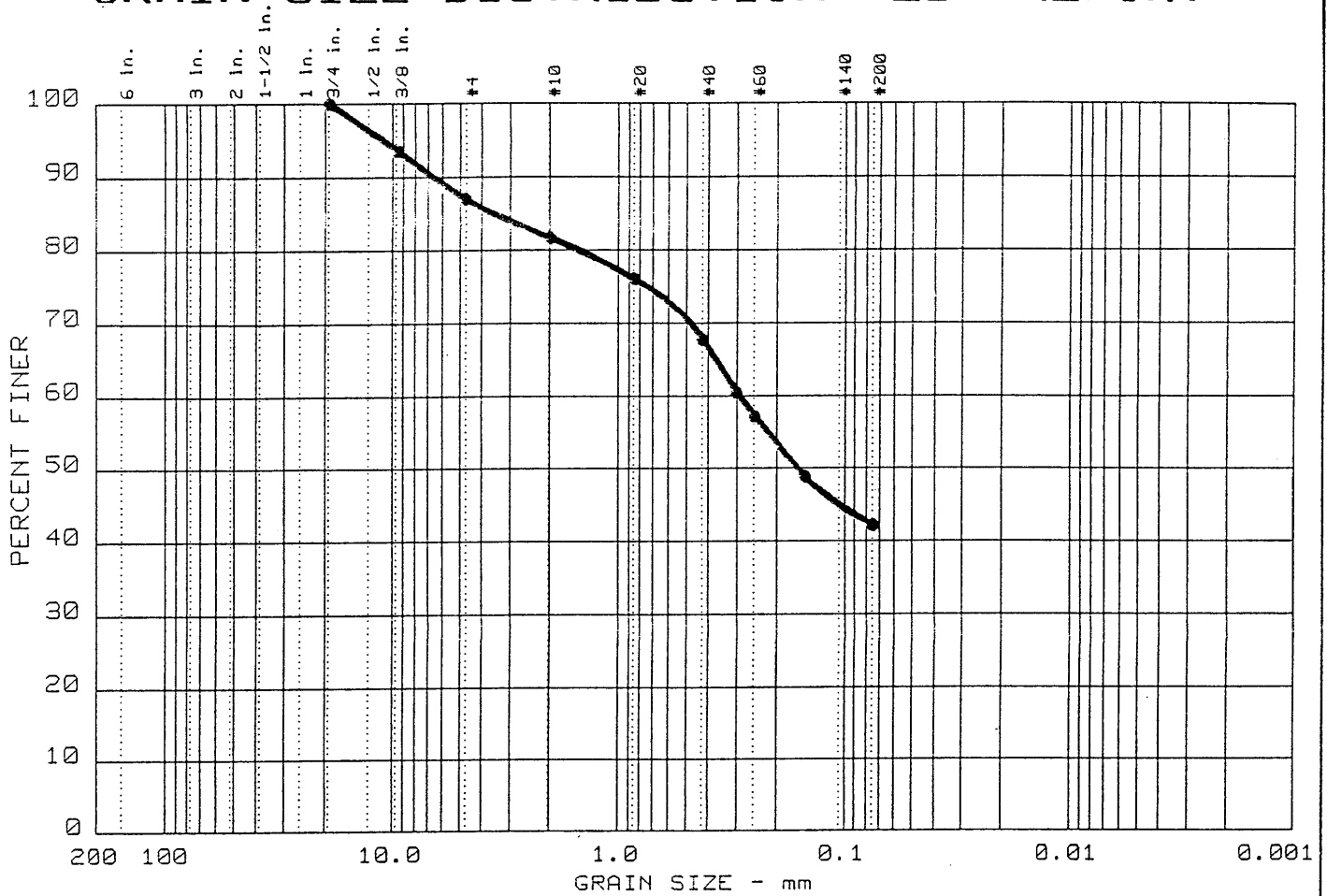
Date: 02/19/2001

GRAIN SIZE DISTRIBUTION TEST REPORT  
**TRIAD ENGINEERING, INC.**

Remarks:

Figure No. \_\_\_\_\_

# GRAIN SIZE DISTRIBUTION TEST REPORT



%+75 mm	% GRAVEL	% SAND	% SILT	% CLAY
0.0	12.9	44.8	42.3	

LL	PI	D <sub>85</sub>	D <sub>60</sub>	D <sub>50</sub>	D <sub>30</sub>	D <sub>15</sub>	D <sub>10</sub>	C <sub>c</sub>	C <sub>u</sub>
		3.51	0.29	0.16					

MATERIAL DESCRIPTION	USCS	AASHTO
● LT. BROWN SANDY SILT WITH ROCK FRAGMENTS	SM	A-4(0.0)

Project No.: C00553  
 Project: BIG BRANCH SLURRY IMPOUNDMENT  
 ● Location: DHX-12, DEPTH: 68.0' - 69.0'

Date: 03/01/01

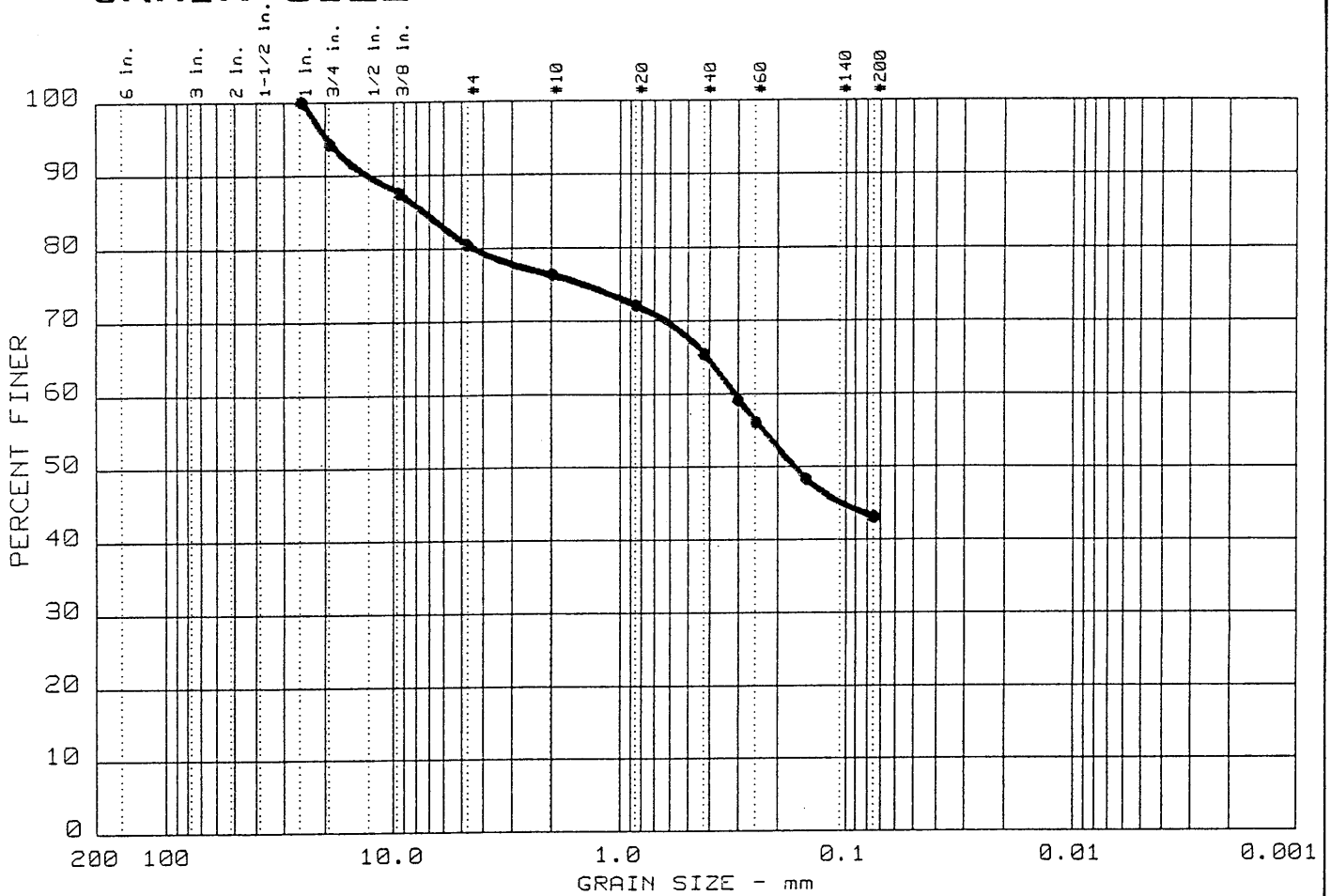
Remarks:

Figure No. \_\_\_\_\_

GRAIN SIZE DISTRIBUTION TEST REPORT  
**TRIAD ENGINEERING, INC.**



# GRAIN SIZE DISTRIBUTION TEST REPORT



●	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
	0.0	19.4	37.3	43.3	

●	LL	PI	D <sub>85</sub>	D <sub>60</sub>	D <sub>50</sub>	D <sub>30</sub>	D <sub>15</sub>	D <sub>10</sub>	C <sub>c</sub>	C <sub>u</sub>
			7.33	0.31	0.17					

MATERIAL DESCRIPTION	USCS	AASHTO
● BROWN SANDY SILT WITH ROCK FRAGMENTS	SM	A-4(0.0)

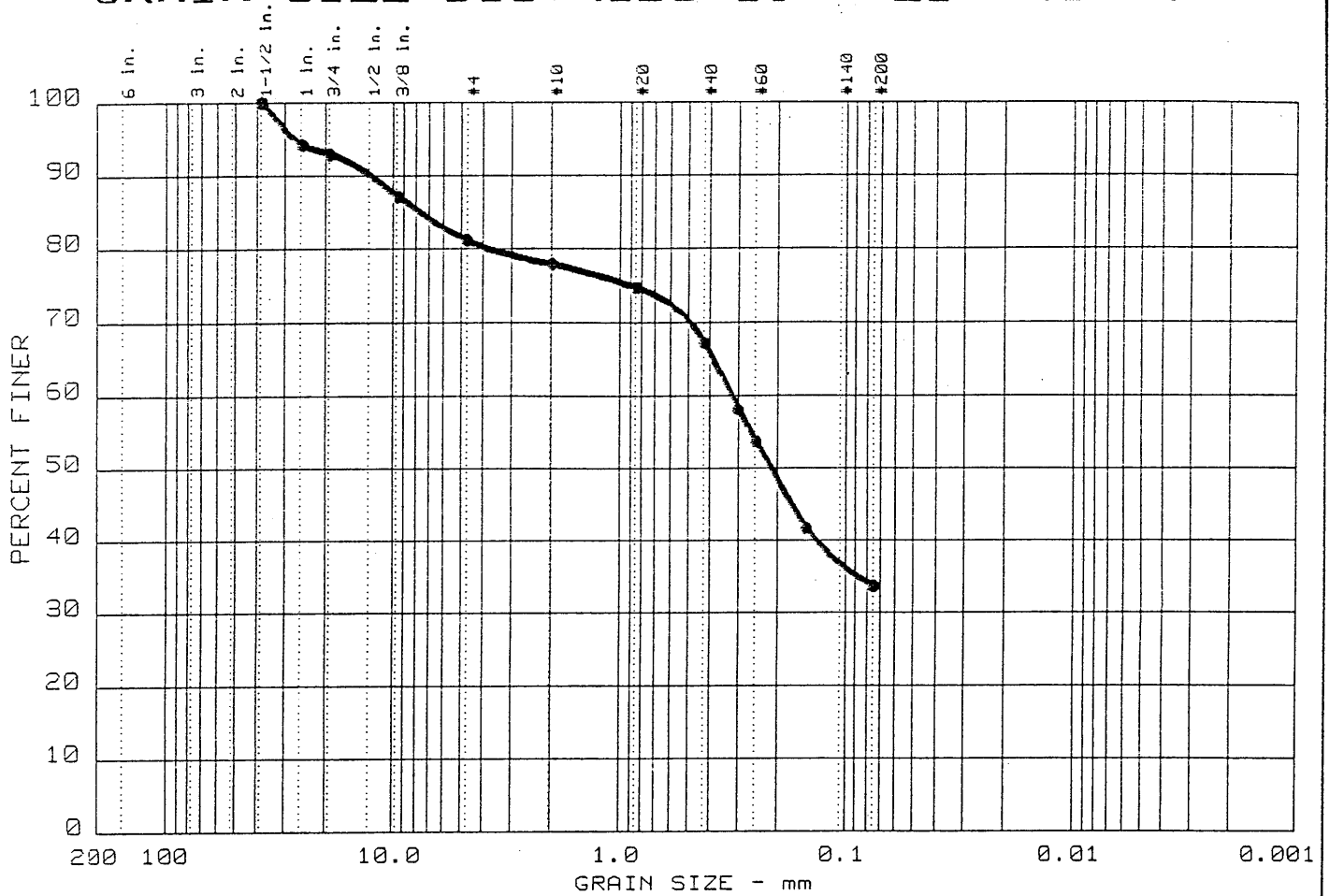
Project No.: C00553  
 Project: BIG BRANCH SLURRY IMPOUNDMENT  
 ● Location: DHX-13, DEPTH: 76.0' - 77.3'

Date: 03/01/01

Remarks:

Figure No. \_\_\_\_\_

# GRAIN SIZE DISTRIBUTION TEST REPORT



% +75 mm	% GRAVEL	% SAND	% SILT	% CLAY
0.0	18.8	47.5	33.7	

LL	PI	D <sub>85</sub>	D <sub>60</sub>	D <sub>50</sub>	D <sub>30</sub>	D <sub>15</sub>	D <sub>10</sub>	C <sub>c</sub>	C <sub>u</sub>
		7.50	0.32	0.21					

MATERIAL DESCRIPTION	USCS	AASHTO
● LT. BROWN SILTY SAND WITH ROCK FRAGMENTS	SM	A-2-4(0.0)

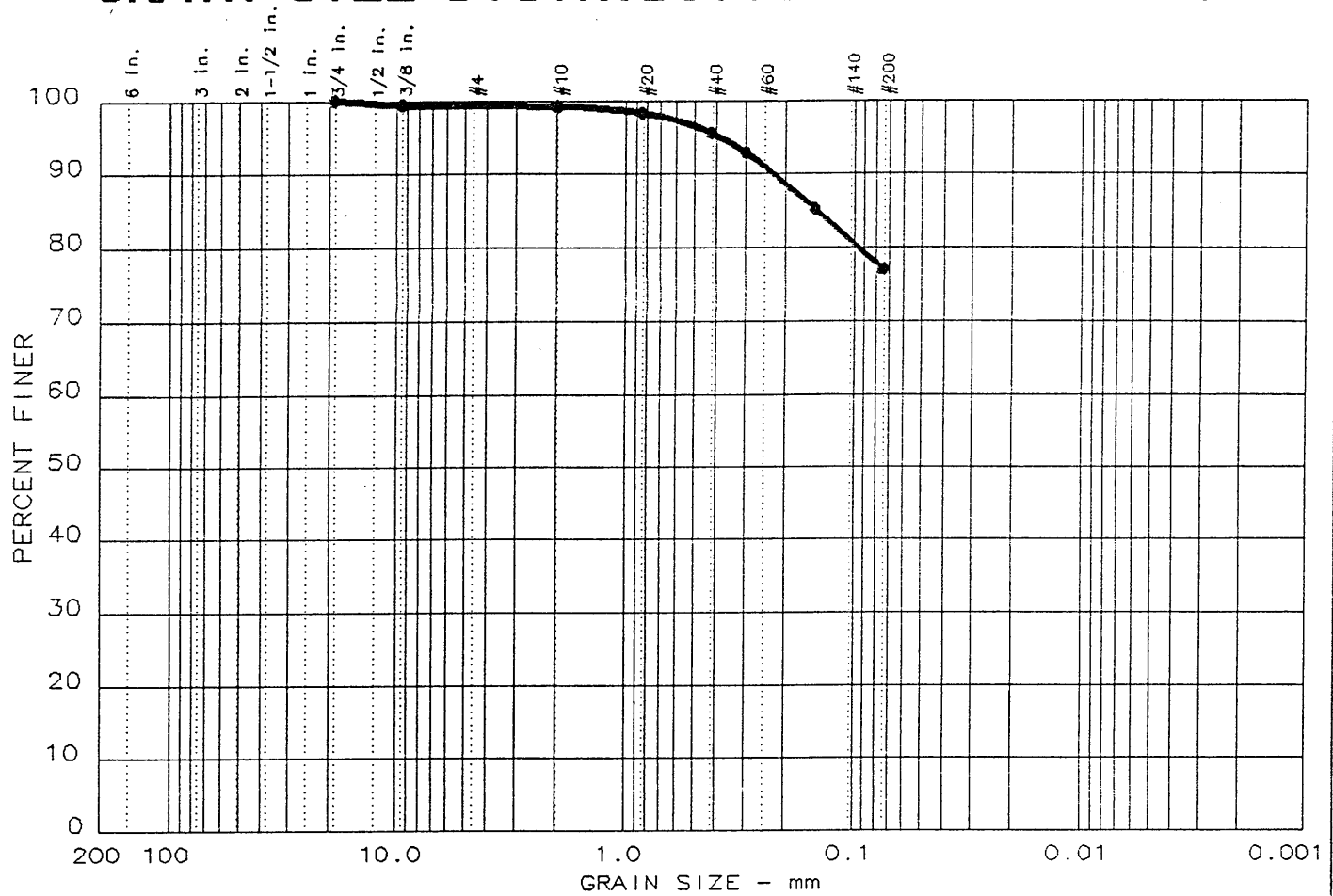
Project No.: C00553  
 Project: BIG BRANCH SLURRY IMPOUNDMENT  
 ● Location: DHX-13, DEPTH: 84.0' - 86.0'

Date: 03/01/01

Remarks:

Figure No. \_\_\_\_\_

# GRAIN SIZE DISTRIBUTION TEST REPORT



%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.7	22.2	77.1	

LL	PI	D <sub>85</sub>	D <sub>60</sub>	D <sub>50</sub>	D <sub>30</sub>	D <sub>15</sub>	D <sub>10</sub>	C <sub>c</sub>	C <sub>u</sub>
38.2	10.7	0.15							

MATERIAL DESCRIPTION	USCS	AASHTO
● BLACK SANDY SILT WITH ROCK FRAGMENTS (SLURRY)	ML	A-6(8.6)

Project No.: C00553  
 Project: BIG BRANCH SLURRY IMPOUNDMENT  
 ● Location: DHX-17, DEPTH: 91.6' - 99.0'

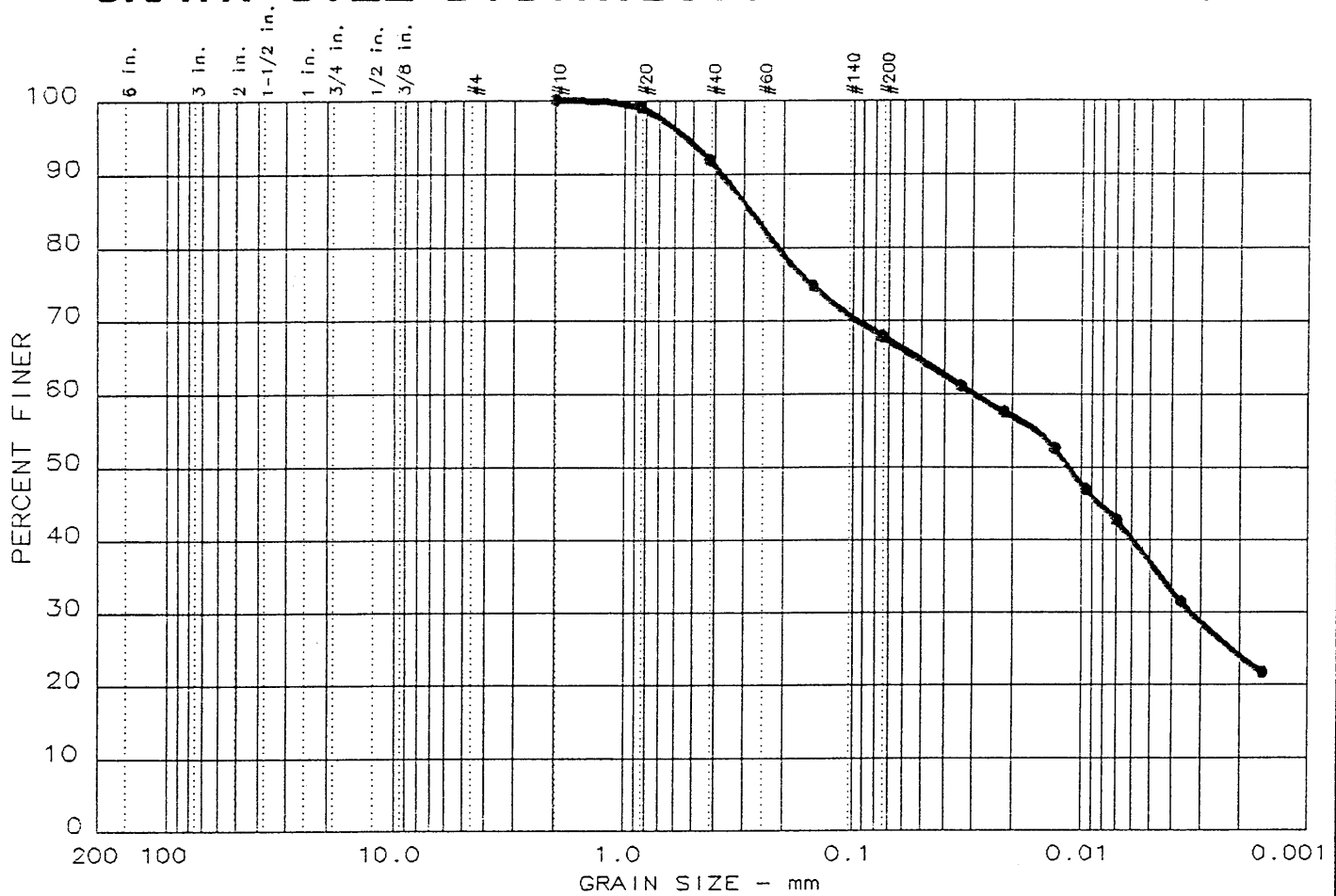
Date: 02/19/2001

Remarks:

Figure No. \_\_\_\_\_



# GRAIN SIZE DISTRIBUTION TEST REPORT



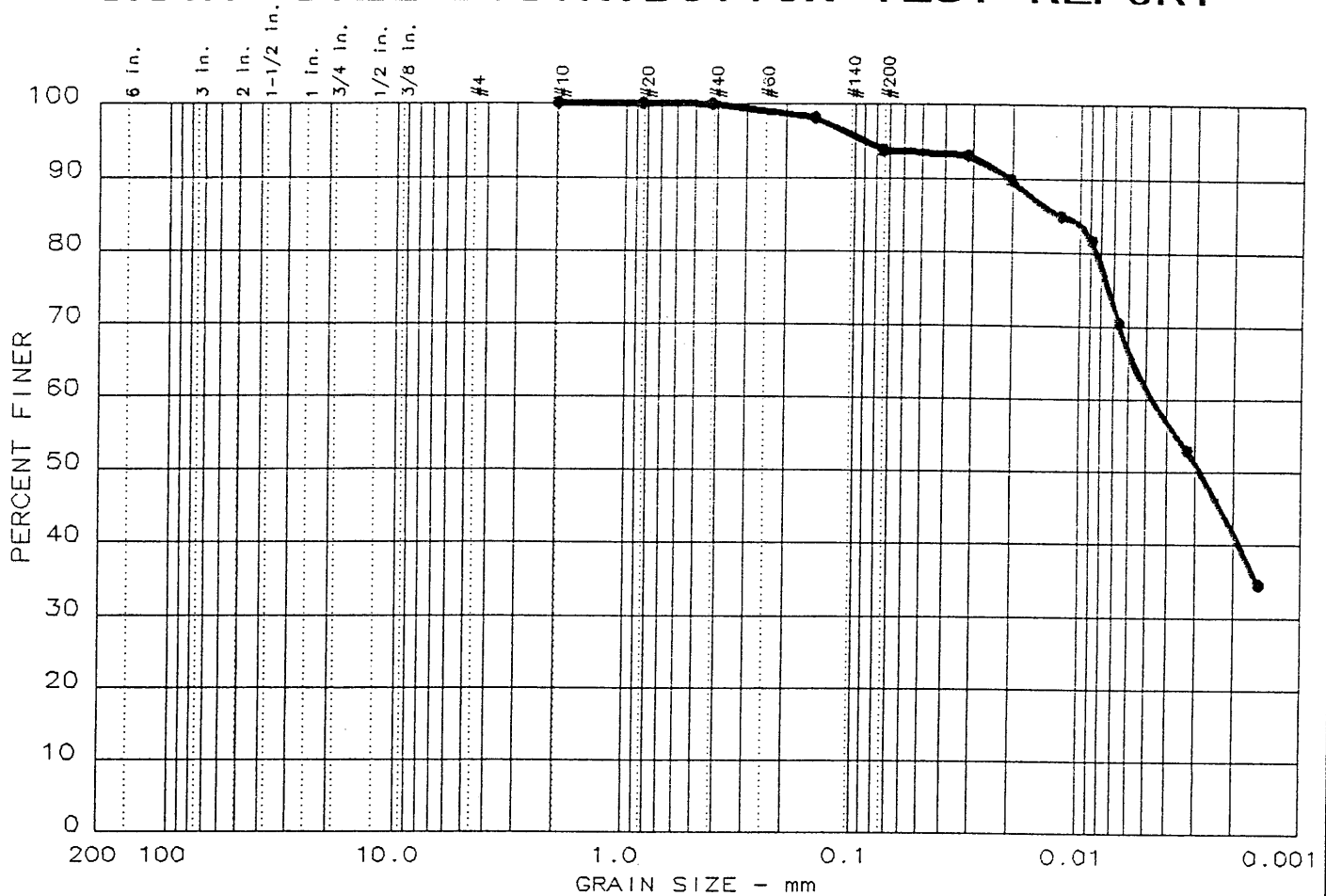
%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	32.2	30.8	37.0

LL	PI	D <sub>85</sub>	D <sub>60</sub>	D <sub>50</sub>	D <sub>30</sub>	D <sub>15</sub>	D <sub>10</sub>	C <sub>c</sub>	C <sub>u</sub>
32.1	8.1	0.28		0.01	0.003				

MATERIAL DESCRIPTION	USCS	AASHTO
● BLACK SANDY SILT (SLURRY)	ML	A-4(4.2)

Project No.: C00553 Project: BIG BRANCH SLURRY IMPOUNDMENT ● Location: SP-2 (BIG BRANCH IMPOUNDMENT)  Date: 02/23/2001	Remarks:  Specific Gravity = 2.07
GRAIN SIZE DISTRIBUTION TEST REPORT <b>TRIAD ENGINEERING, INC.</b>	
Figure No. _____	

# GRAIN SIZE DISTRIBUTION TEST REPORT



	%+75 <sub>mm</sub>	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	0.0	6.3	32.2	61.5

LL	PI	D <sub>85</sub>	D <sub>60</sub>	D <sub>50</sub>	D <sub>30</sub>	D <sub>15</sub>	D <sub>10</sub>	C <sub>c</sub>	C <sub>u</sub>
● 32.1	8.1			0.00					

MATERIAL DESCRIPTION	USCS	AASHTO
● BLACK SANDY SILT (SLURRY)	ML	A-4(7.9)

Project No.: CO0553  
 Project: BIG BRANCH SLURRY IMPOUNDMENT  
 ● Location: SP-3 (BIG BRANCH IMPOUNDMENT)

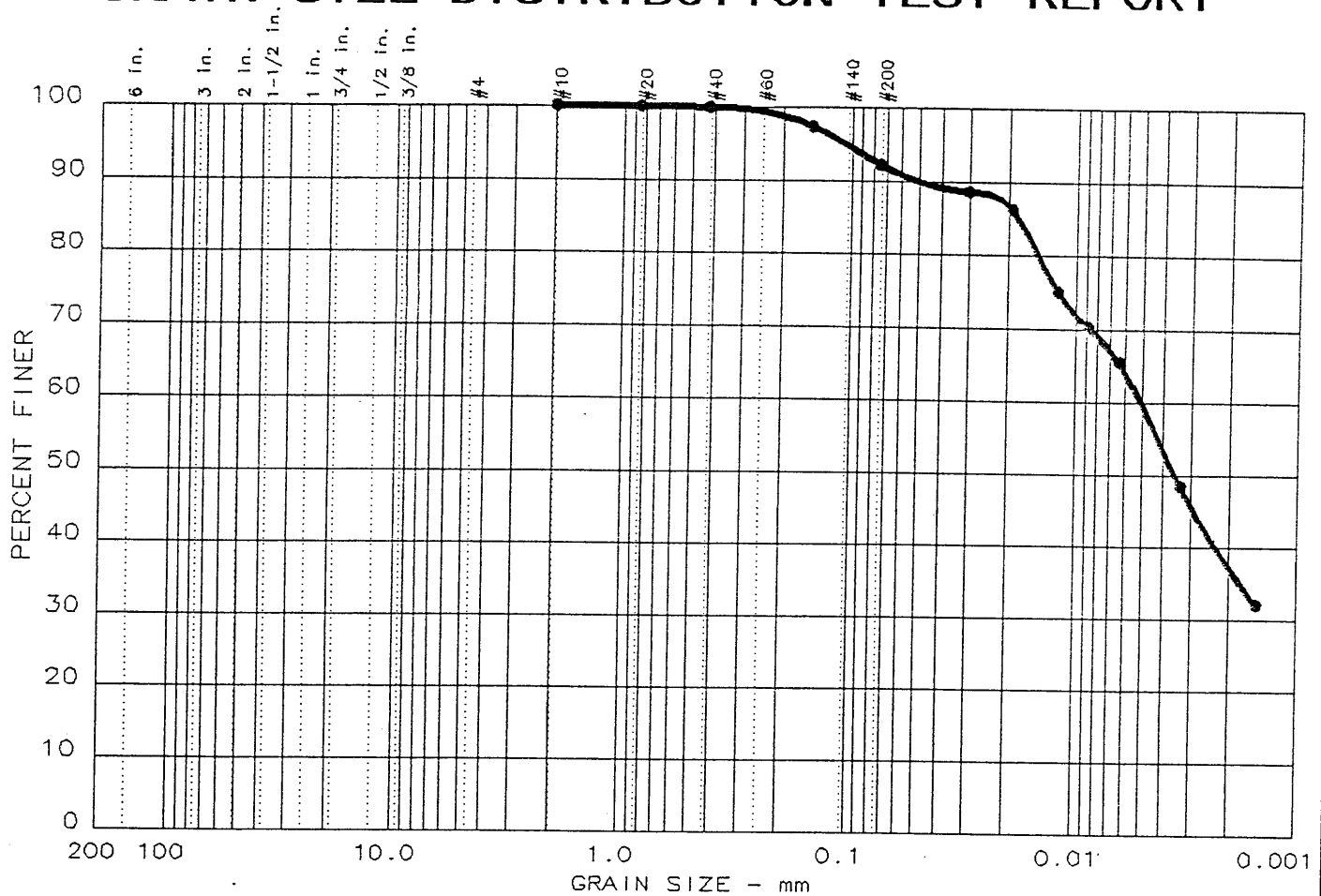
Date: 02/23/2001

Remarks:

Specific Gravity = 2.07

Figure No. \_\_\_\_\_

# GRAIN SIZE DISTRIBUTION TEST REPORT



●	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	0.0	7.8	32.5	59.7

●	LL	PI	D <sub>85</sub>	D <sub>60</sub>	D <sub>50</sub>	D <sub>30</sub>	D <sub>15</sub>	D <sub>10</sub>	C <sub>c</sub>	C <sub>u</sub>
●	40.2	10.1			0.00					

MATERIAL DESCRIPTION	USCS	AASHTO
● BLACK SANDY CLAY (SLURRY)	ML	A-4(11.4)

Project No.: C00553  
 Project: BIG BRANCH SLURRY IMPOUNDMENT  
 ● Location: SP-4 (BIG BRANCH IMPOUNDMENT)

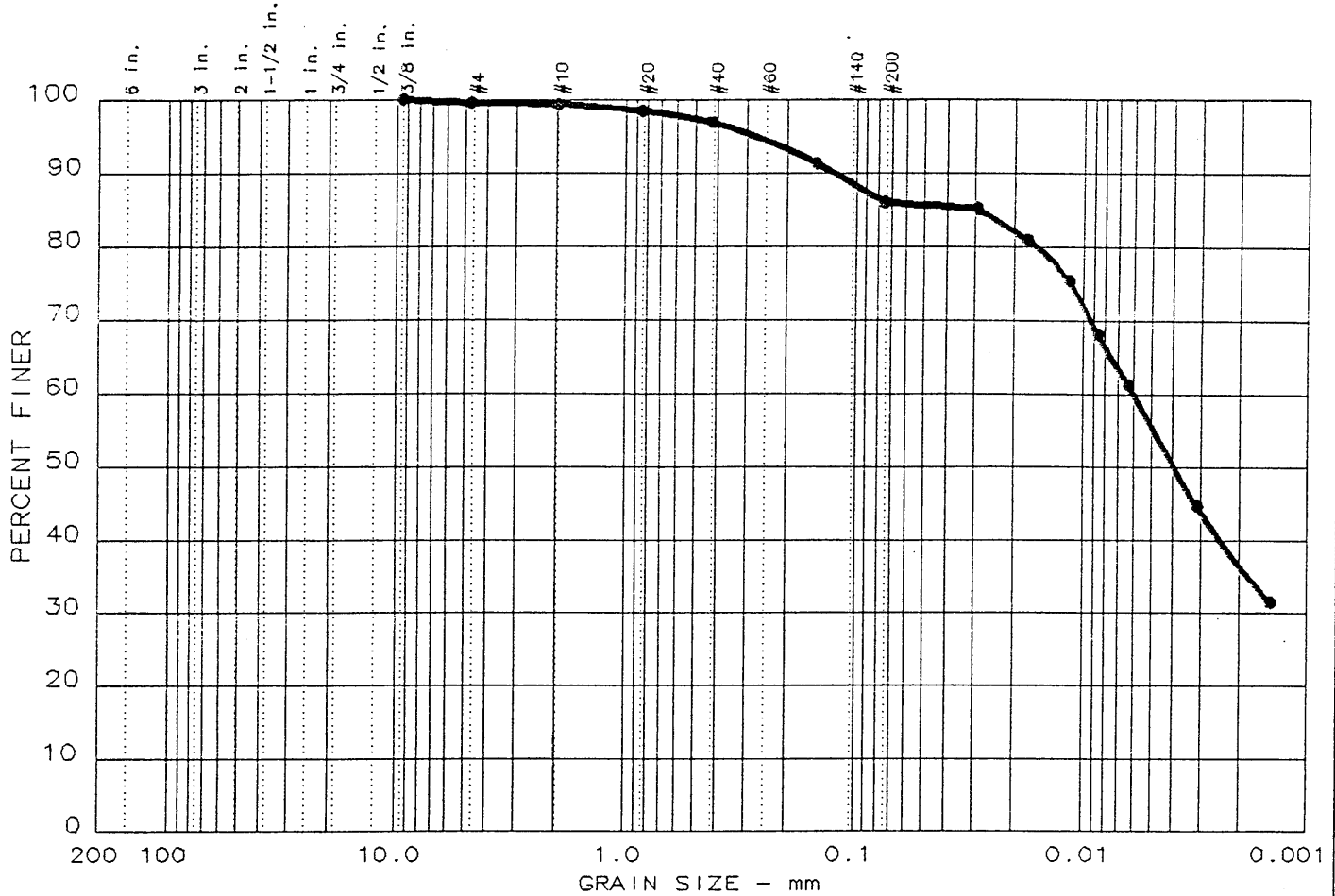
Date: 02/23/2001

Remarks:

Specific Gravity = 2.20

Figure No. \_\_\_\_\_

# GRAIN SIZE DISTRIBUTION TEST REPORT



%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.5	13.6	30.2	55.7

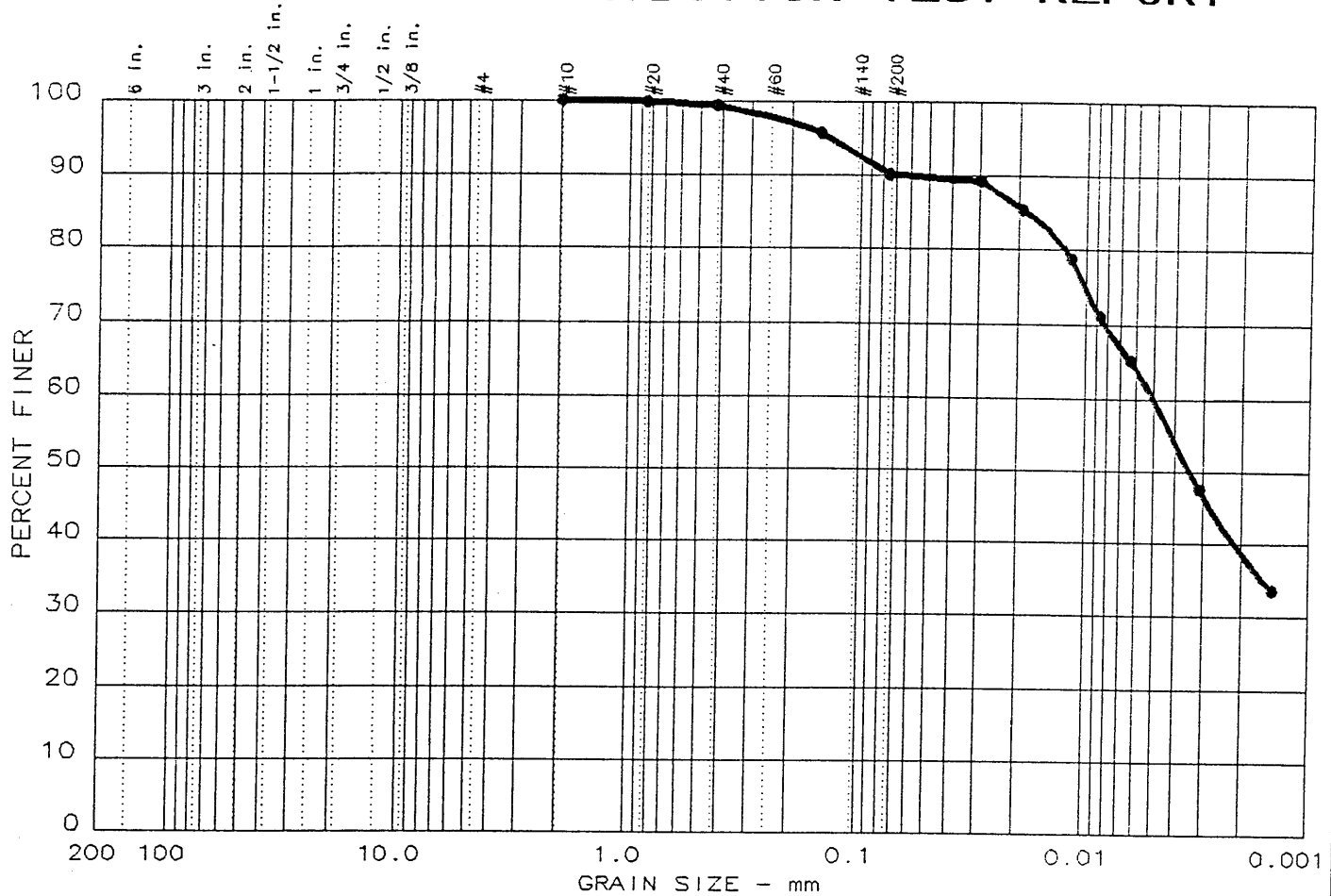
LL	PI	D <sub>85</sub>	D <sub>60</sub>	D <sub>50</sub>	D <sub>30</sub>	D <sub>15</sub>	D <sub>10</sub>	C <sub>c</sub>	C <sub>u</sub>
39.7	9.5			0.00					

MATERIAL DESCRIPTION	USCS	AASHTO
● BLACK SANDY CLAY (SLURRY)	ML	A-4(10.2)

<p>Project No.: C00553                  Project: BIG BRANCH SLURRY IMPOUNDMENT                  ● Location: CW #1 (COLDWATER FORK)</p> <p>Date: 02/23/2001</p> <p style="text-align: center;">GRAIN SIZE DISTRIBUTION TEST REPORT  <b>TRIAD ENGINEERING, INC.</b></p>	<p>Remarks:</p> <p style="text-align: center;">Specific Gravity = 2.18</p> <p>Figure No. _____</p>
-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	----------------------------------------------------------------------------------------------------



# GRAIN SIZE DISTRIBUTION TEST REPORT



	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	0.0	10.0	30.1	59.9

	LL	PI	D <sub>85</sub>	D <sub>60</sub>	D <sub>50</sub>	D <sub>30</sub>	D <sub>15</sub>	D <sub>10</sub>	C <sub>c</sub>	C <sub>u</sub>
●	38.3	9.0			0.00					

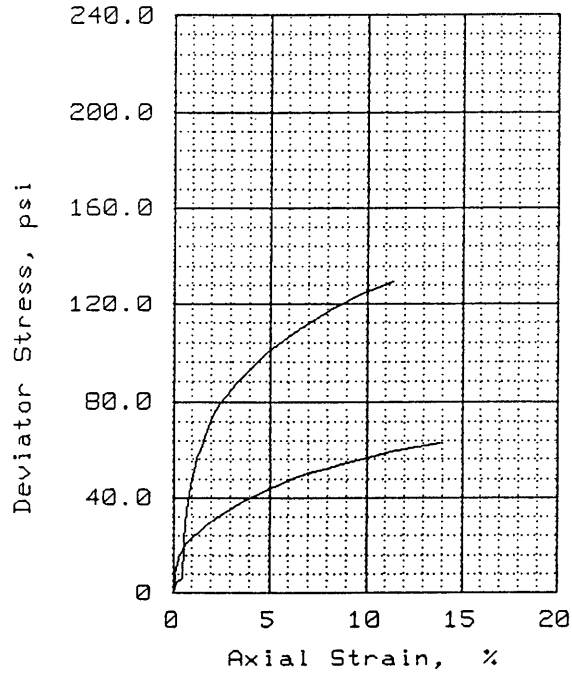
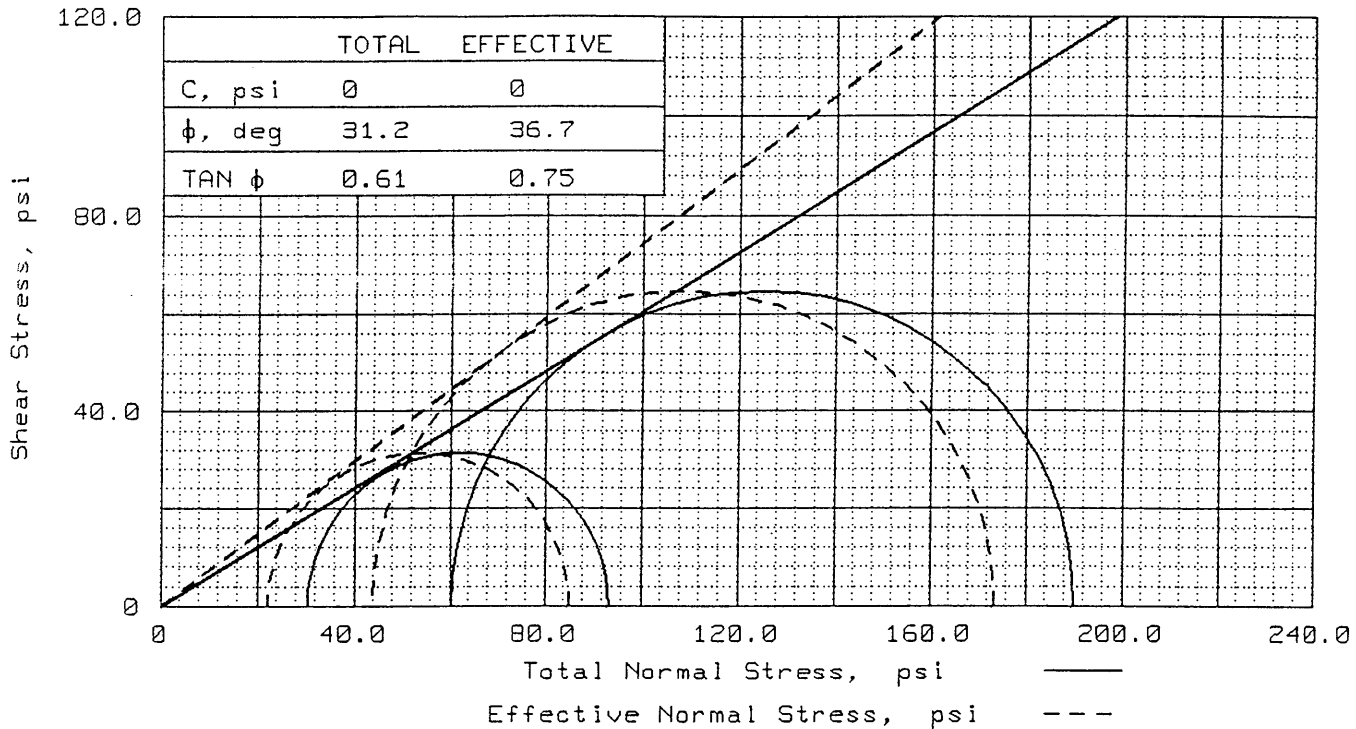
MATERIAL DESCRIPTION	USCS	AASHTO
● BLACK SANDY CLAY (SLURRY)	ML	A-4(9.7)

Project No.: C00553  
 Project: BIG BRANCH SLURRY IMPOUNDMENT  
 ● Location: WOLF CREEK #1  
 Date: 02/23/2001

Remarks:  
 Specific Gravity = 2.18  
 Figure No. \_\_\_\_\_

GRAIN SIZE DISTRIBUTION TEST REPORT  
**TRIAD ENGINEERING, INC.**

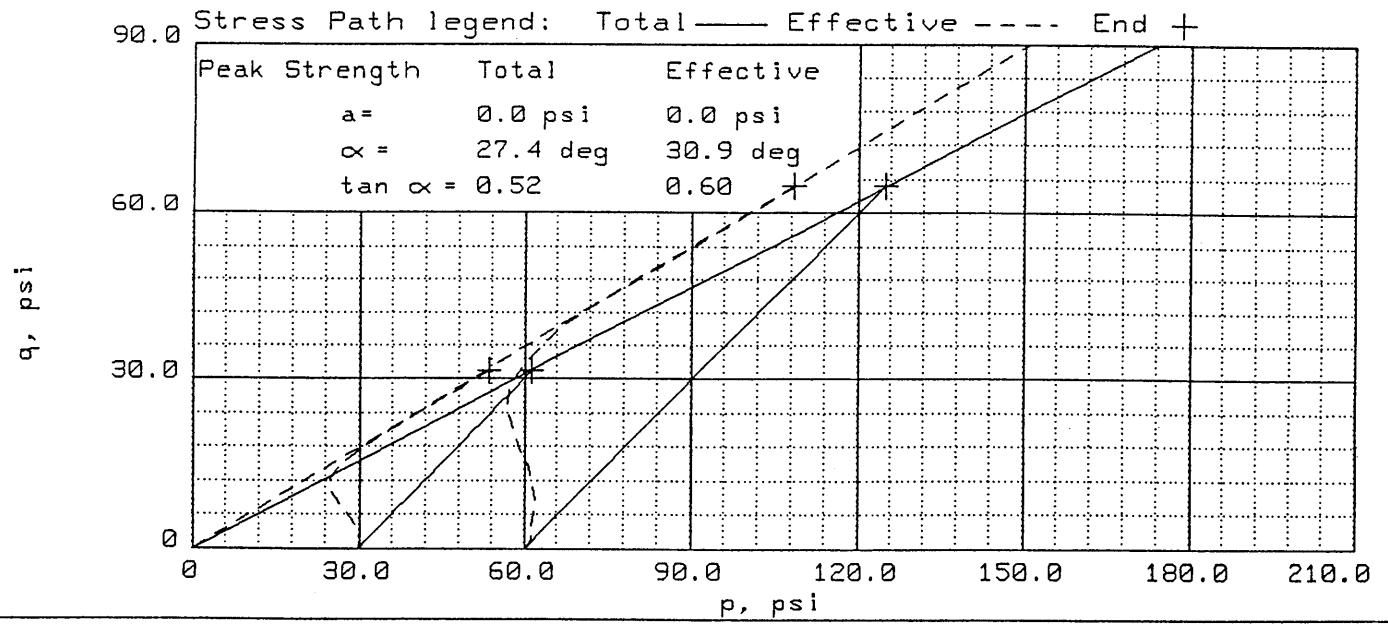
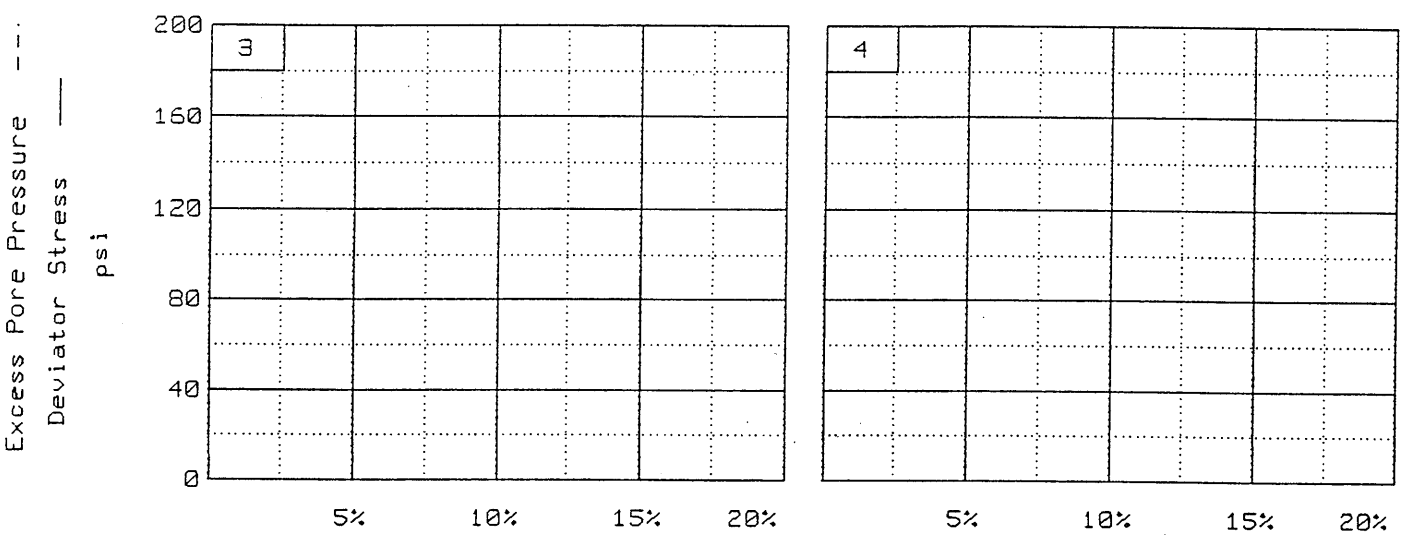
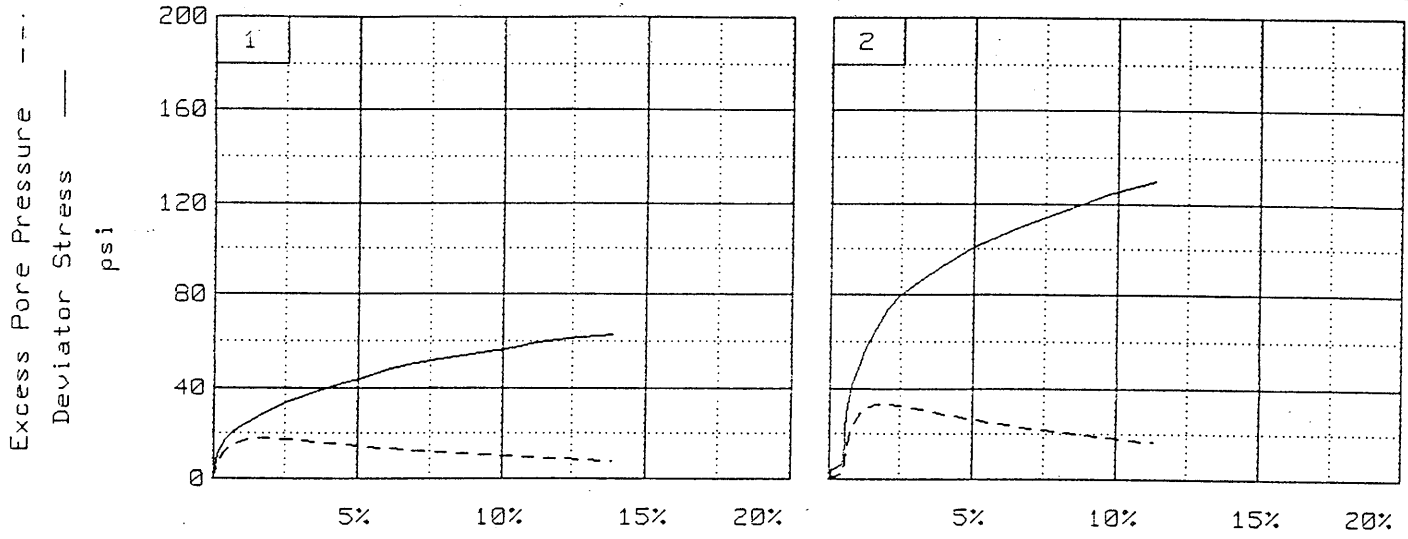
***TRIAXIAL SHEAR STRENGTH***

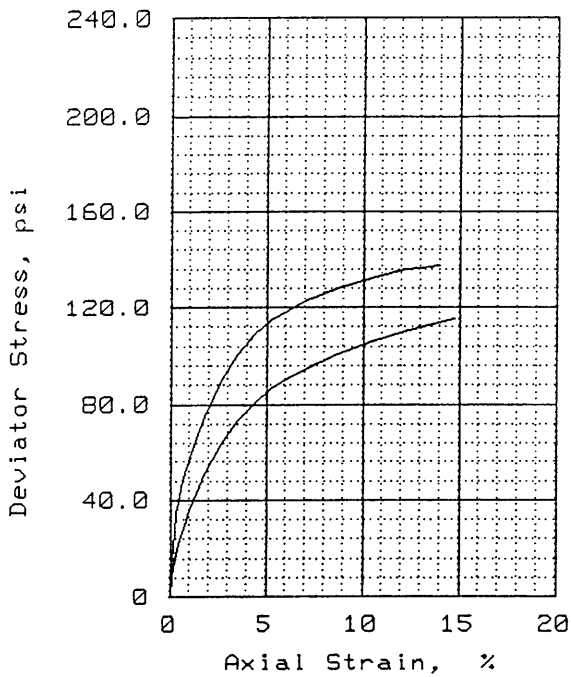
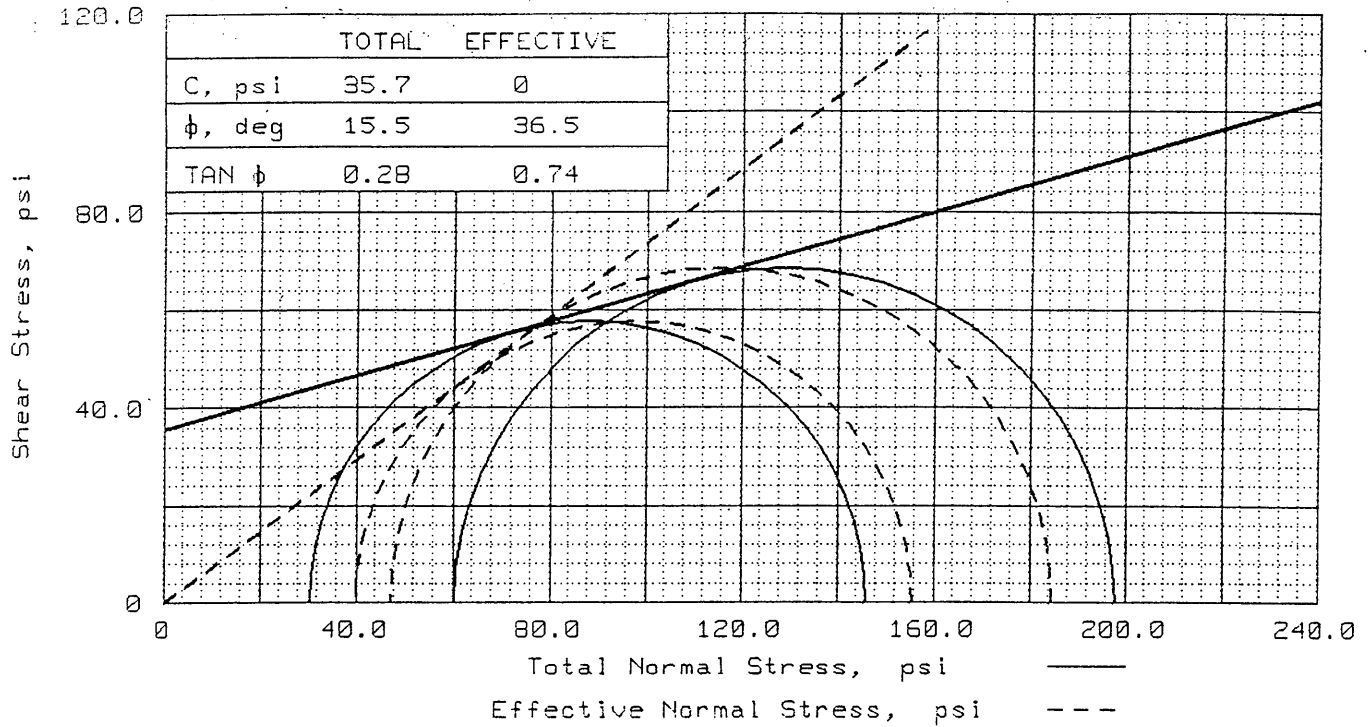


SAMPLE NO.		1	2
INITIAL	WATER CONTENT, %	14.1	11.3
	DRY DENSITY, pcf	122.2	122.4
	SATURATION, %	105.8	85.6
	VOID RATIO	0.354	0.351
	DIAMETER, in	2.80	2.82
	HEIGHT, in	5.85	6.21
AT TEST	WATER CONTENT, %	11.9	12.9
	DRY DENSITY, pcf	125.7	123.3
	SATURATION, %	99.4	99.8
	VOID RATIO	0.316	0.341
	DIAMETER, in	2.77	2.81
	HEIGHT, in	5.80	6.20
Strain rate, %/min		0.015	0.015
BACK PRESSURE, psi		50.0	50.0
CELL PRESSURE, psi		80.0	110.0
FAILURE STRESS, psi		63.0	129.7
PORE PRESSURE, psi		58.2	66.6
ULTIMATE STRESS, psi			
PORE PRESSURE, psi			
$\bar{\sigma}_1$ FAILURE, psi		84.8	173.1
$\bar{\sigma}_3$ FAILURE, psi		21.8	43.4

TYPE OF TEST:  
 CU with pore pressures  
 SAMPLE TYPE: UNDISTURBED  
 DESCRIPTION: LT. BROWN SANDY  
 SILT WITH ROCK FRAGMENTS  
 LL=            PL=            PI=  
 SPECIFIC GRAVITY= 2.65  
 REMARKS:  
 FIG. NO.

CLIENT: US DEPARTMENT OF LABOR  
 PROJECT: BIG BRANCH SLURRY IMPOUNDMENT  
 SAMPLE LOCATION: DH1-6, DEPTH: 40.0'-42.0'  
 PROJ. NO.: C00553                      DATE: 02/27/01  
 TRIAXIAL SHEAR TEST REPORT  
**TRIAD ENGINEERING, INC.**





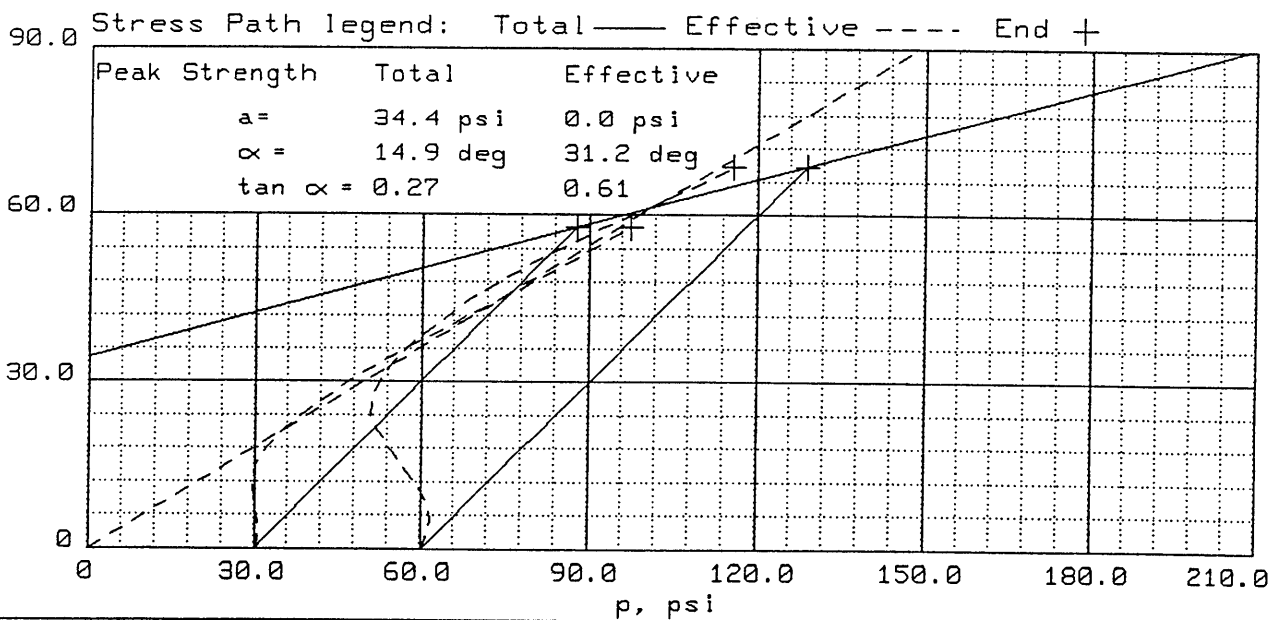
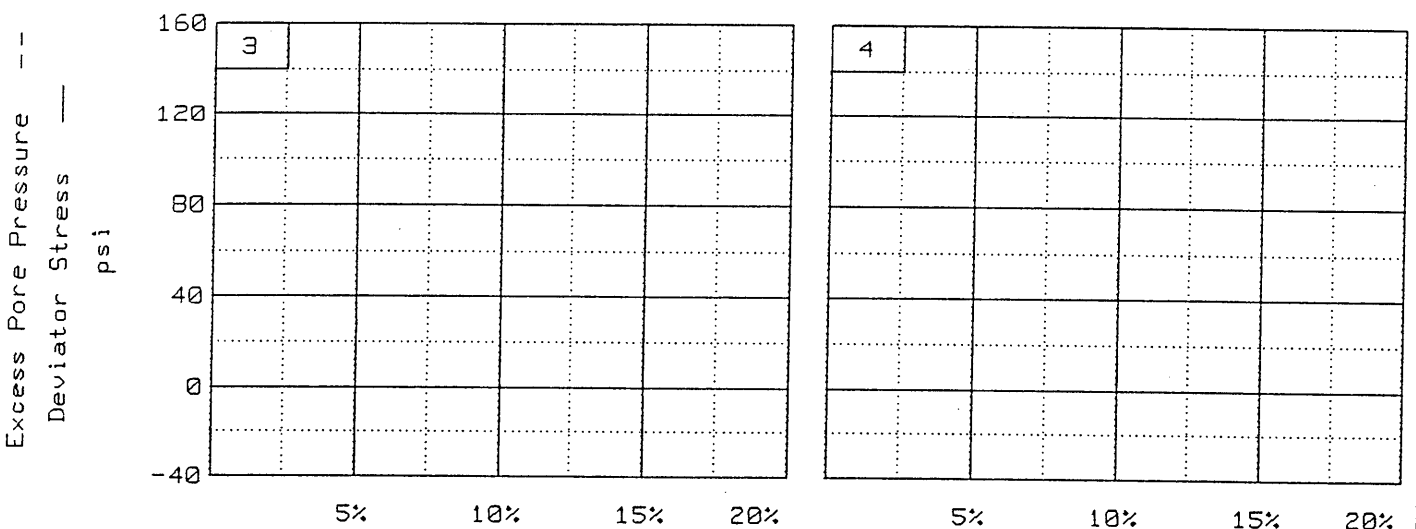
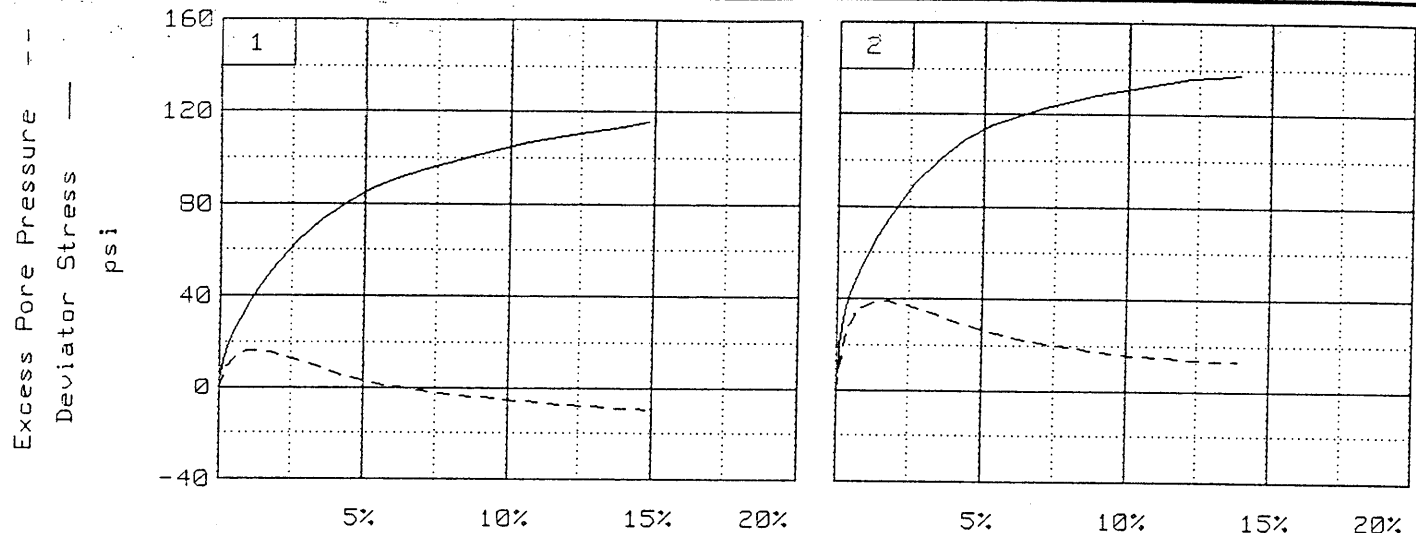
SAMPLE NO.		1	2
INITIAL	WATER CONTENT, %	12.6	12.6
	DRY DENSITY, pcf	125.3	125.0
	SATURATION, %	104.1	103.3
	VOID RATIO	0.321	0.323
	DIAMETER, in	2.85	2.85
	HEIGHT, in	5.79	5.82
AT TEST	WATER CONTENT, %	11.4	11.1
	DRY DENSITY, pcf	126.7	127.8
	SATURATION, %	99.1	99.7
	VOID RATIO	0.306	0.295
	DIAMETER, in	2.84	2.83
	HEIGHT, in	5.77	5.78
Strain rate, %/min		0.015	0.015
BACK PRESSURE, psi		50.0	50.0
CELL PRESSURE, psi		80.0	110.0
FAILURE STRESS, psi		115.6	137.5
PORE PRESSURE, psi		40.5	63.1
ULTIMATE STRESS, psi			
PORE PRESSURE, psi			
$\bar{\sigma}_1$ FAILURE, psi		155.1	184.4
$\bar{\sigma}_3$ FAILURE, psi		39.5	46.9

TYPE OF TEST:  
 CU with pore pressures  
 SAMPLE TYPE: UNDISTURBED  
 DESCRIPTION: LT. BROWN SILTY SAND WITH ROCK FRAGMENTS  
 LL=            PL=            PI=  
 SPECIFIC GRAVITY= 2.65  
 REMARKS:

CLIENT: US DEPARTMENT OF LABOR  
 PROJECT: BIG BRANCH SLURRY IMPOUNDMENT  
 SAMPLE LOCATION: DHX-13  
 DEPTH: 84.0' - 86.0'  
 PROJ. NO.: C00553                      DATE: 03/05/01

TRIAXIAL SHEAR TEST REPORT  
**TRIAD ENGINEERING, INC.**

FIG. NO.



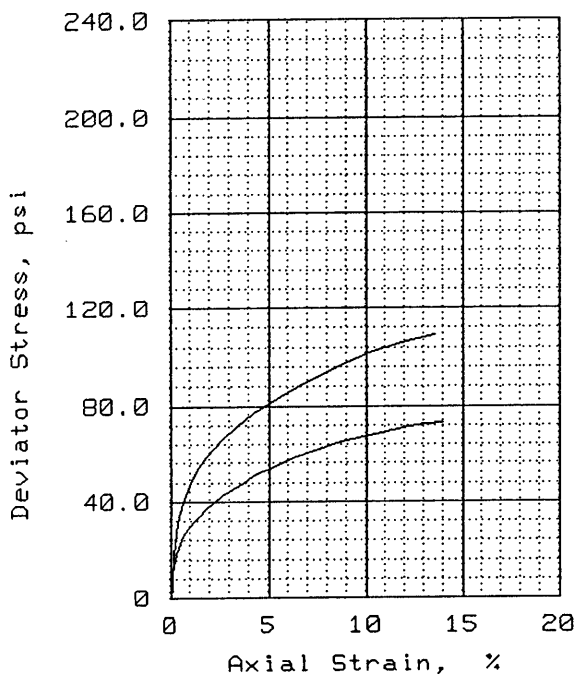
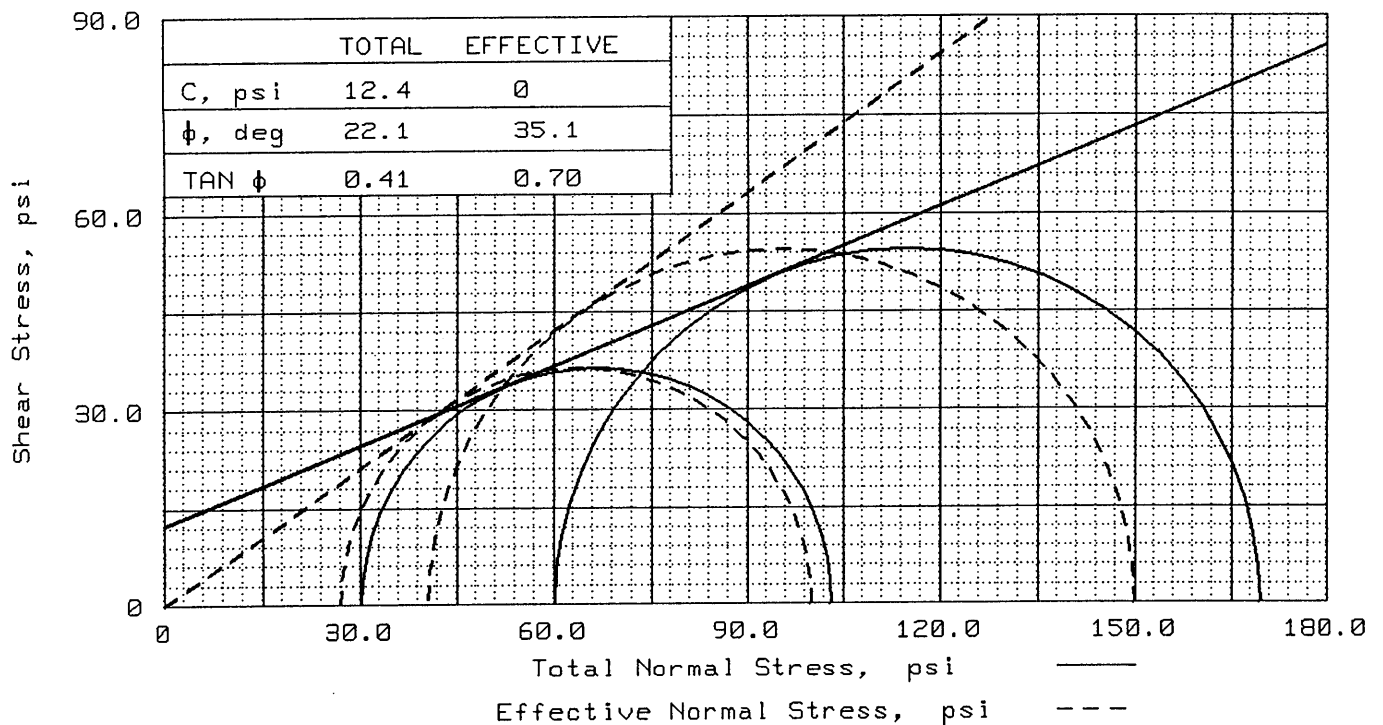
Client: US DEPARTMENT OF LABOR  
 Project: BIG BRANCH SLURRY IMPOUNDMENT  
 Location: DHX-13 DEPTH: 84.0' - 86.0'

File: C00553-6

Project No.: C00553

Page 2/2

Fig. No. \_\_\_\_\_



SAMPLE NO.		1	2
INITIAL	WATER CONTENT, %	14.4	14.8
	DRY DENSITY, pcf	121.8	120.9
	SATURATION, %	106.5	106.5
	VOID RATIO	0.358	0.368
	DIAMETER, in	2.85	2.85
	HEIGHT, in	5.79	6.01
AT TEST	WATER CONTENT, %	12.5	11.9
	DRY DENSITY, pcf	124.1	125.6
	SATURATION, %	99.7	99.6
	VOID RATIO	0.333	0.317
	DIAMETER, in	2.83	2.81
	HEIGHT, in	5.75	5.93
Strain rate, %/min		0.015	0.015
BACK PRESSURE, psi		50.0	50.0
CELL PRESSURE, psi		80.0	110.0
FAILURE STRESS, psi		73.0	109.3
PORE PRESSURE, psi		53.2	69.6
ULTIMATE STRESS, psi			
PORE PRESSURE, psi			
$\bar{\sigma}_1$ FAILURE, psi		99.8	149.7
$\bar{\sigma}_3$ FAILURE, psi		26.8	40.4

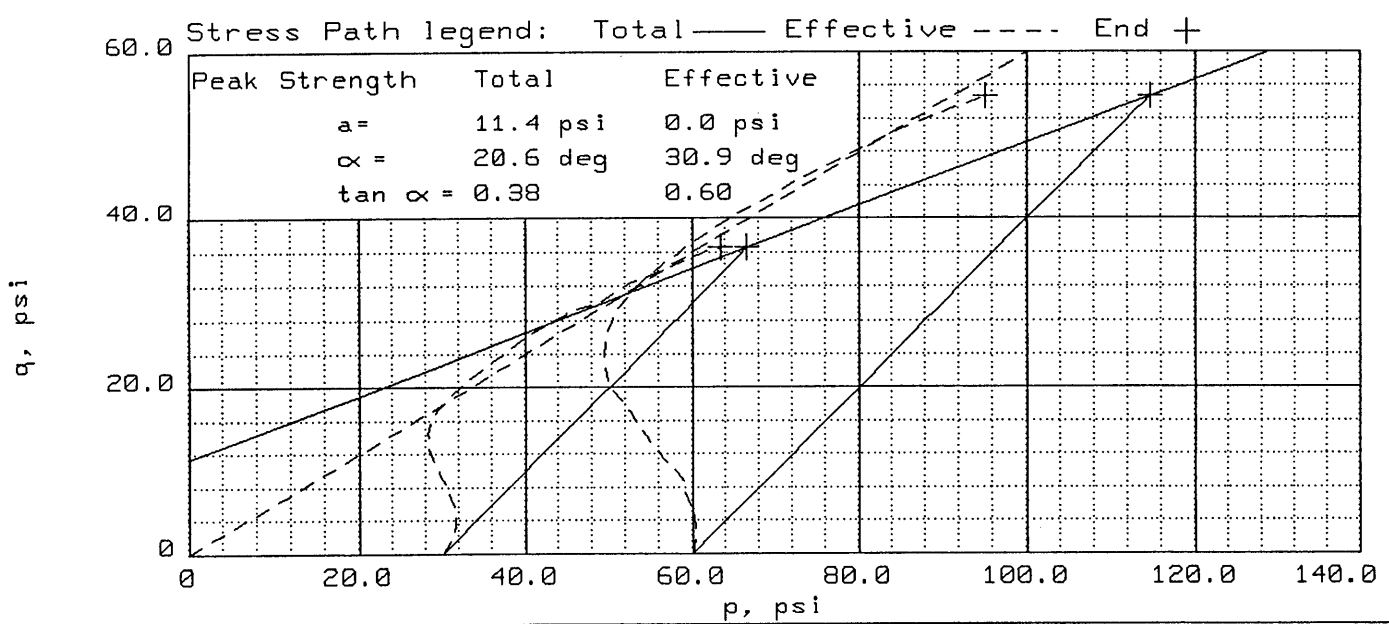
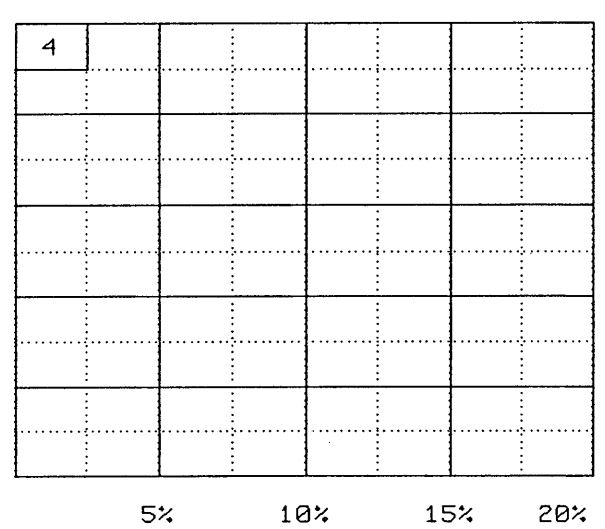
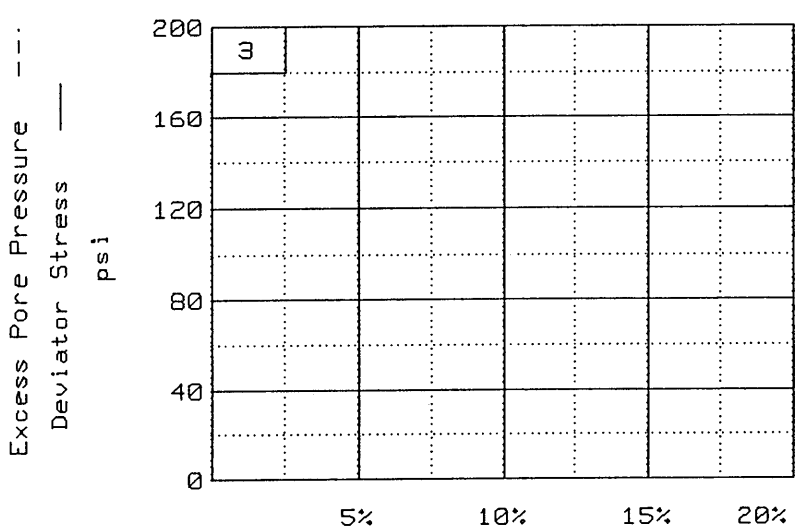
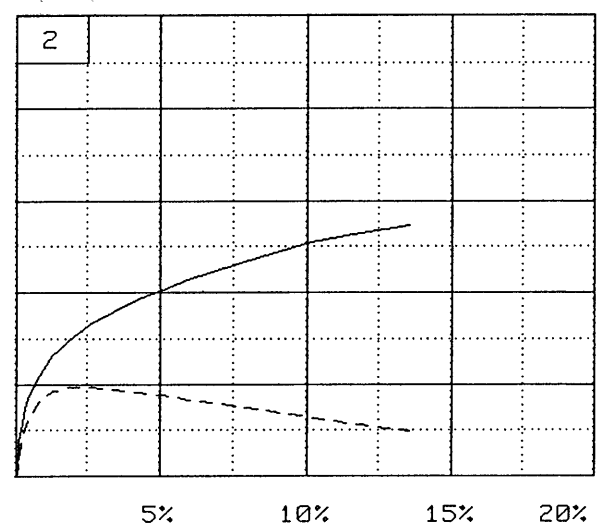
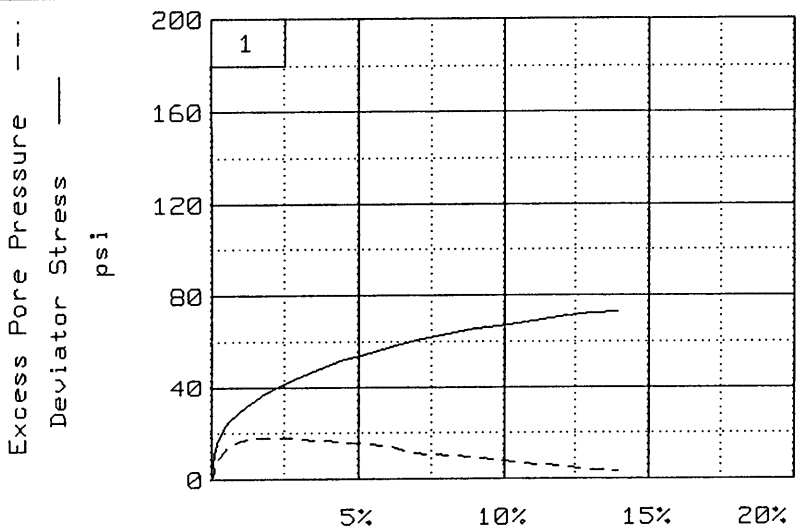
TYPE OF TEST:  
 CU with pore pressures  
 SAMPLE TYPE: UNDISTURBED  
 DESCRIPTION: BROWN SANDY SILT  
 WITH ROCK FRAGMENTS  
 LL=            PL=            PI=  
 SPECIFIC GRAVITY= 2.65  
 REMARKS:

CLIENT: US DEPARTMENT OF LABOR  
 PROJECT: BIG BRANCH SLURRY IMPOUNDMENT  
 SAMPLE LOCATION: DHX-12 & 13  
 DEPTH: 68.0' - 69.0' & 76.0' - 77.3'  
 PROJ. NO.: C00553            DATE: 02/28/01

TRIAxIAL SHEAR TEST REPORT

**TRIAD ENGINEERING, INC.**

FIG. NO.





# ***PERMEABILITY***

# FLEXIBLE WALL PERMEABILITY TEST

(ASTM D5084, METHOD - C)

PROJECT: Big Branch Slurry Impoundment JOB NO.: 000553 DATE: 2/9/01  
 SAMPLE INFO: DH1-6 SAMPLE DESCRIPTION: Brown sandy silt with rock fragments  
 PREPARED BY: MAD TESTED BY: MAD PERMEAMETER NO.: 4

STANDARD PROCTOR ( )      TEST SPECIMEN COMPACTION EFFORT      OTHER ( )  
 MODIFIED PROCTOR ( )      UNDISTURBED (X)

MOISTURE CONTENT	SPECIMEN COMPACTION	PERMEABILITY
CONTAINER NO. <u>MAN</u> WET WT. <u>305.84</u> GMS DRY WT. <u>278.79</u> GMS TARE WT. <u>87.2</u> GMS WT. MOISTURE <u>27.05</u> GMS WT. DRY SOIL <u>191.59</u> GMS MOISTURE CONTENT <u>14.1</u> %	MAX. DRY DENSITY _____ PCF OPTIMUM MOISTURE _____ % WET WT. <u>1318.8</u> GMS HEIGHT <u>5.850</u> IN DIAMETER <u>2.80</u> IN VOLUME <u>0.0208</u> CU. FT. WET UNIT WT. <u>139.8</u> PCF DRY UNIT WT. <u>122.5</u> PCF PERCENT COMPACTION _____ %	$K = -(C/t) \ln(1 - D(T))$ WHERE: MANOMETER CONSTANTS M1 = <u>0.03018</u> M2 = <u>1.04095</u> C = TEST CONSTANT (M1) (L/A) / 12.56 T = TRIAL CONSTANT M2/Z Z = DIFF. IN MERCURY MENISCI AT t=0, CM t = TIME INTERVAL, SEC D = MERCURY DISPLACED OVER TIME t, CM L = SPECIMEN LENGTH, CM A = SPECIMEN AREA, CM <sup>2</sup>

### MANOMETER DATA

(K)	(Z)	(t)	(D)	CALCULATED COEFF. OF PERMEABILITY	DATE	TIME (HRS)	VOLUME OF MERCURY (CM)	DIFFERENCE IN MERCURY MENISCI AT t=0 (CM)	TIME INTERVAL (SEC)	DIFF. IN VOLUME (CM)
				$3.9 \times 10^{-6}$	2/12/01	10:38	24.5	0.8	----	----
						10:48	3.4	23.7	600	21.1
				$4.0 \times 10^{-6}$	2/12/01	1:07	28	0.5	----	----
						1:17	3.4	27.5	600	24.6
				$4.6 \times 10^{-6}$	2/13/01	1:02	28	0.5	----	----
						1:10	3.9	27.5	480	24.1

COEFFICIENT OF PERMEABILITY  
 $K = 4.2 \times 10^{-6}$  CM/SEC  
 AVG. TEMP. 21.7 °C  
 VISCOSITY CORRECTION FOR TEMPERATURE:  
0.9600

REMARKS: CONFINING PRESSURE 10 PSI (CELL PRESSURE 70 PSI, BACK PRESSURE 60 PSI)

$K = \frac{4.0}{20} \times 10^{-6}$  CM/SEC

# FLEXIBLE WALL PERMEABILITY TEST

(ASTM D5084, METHOD - C)

PROJECT: Big Branch Slurry Impoundment      JOB NO.: C00553      DATE: 2/12/01  
 SAMPLE INFO: DHX-13    76.0'-77.3'      SAMPLE DESCRIPTION: Brown sandy silt with rock fragments  
 PREPARED BY: MAD      TESTED BY: MAD      PERMEAMETER NO.: 3

STANDARD PROCTOR ( )      **TEST SPECIMEN COMPACTION EFFORT**      MODIFIED PROCTOR ( )      UNDISTURBED (X)      OTHER ( )

MOISTURE CONTENT	SPECIMEN COMPACTION	PERMEABILITY
CONTAINER NO. <u>LY</u> WET WT. <u>334.12</u> GMS DRY WT. <u>302.24</u> GMS TARE WT. <u>86.7</u> GMS WT. MOISTURE <u>31.88</u> GMS WT. DRY SOIL <u>215.54</u> GMS MOISTURE CONTENT <u>14.8</u> %	MAX. DRY DENSITY _____ PCF OPTIMUM MOISTURE _____ % WET WT. <u>1390.9</u> GMS HEIGHT <u>6.005</u> IN    DIAMETER <u>2.845</u> IN VOLUME <u>0.02208</u> CU. FT. WET UNIT WT. <u>138.9</u> PCF DRY UNIT WT. <u>120.9</u> PCF PERCENT COMPACTION _____ %	$K = -(C/t) \ln(1 - D(T))$ WHERE: MANOMETER CONSTANTS M1= <u>0.03018</u> M2= <u>1.04095</u> C= TEST CONSTANT (M1) (L/A)/12.56 T= TRIAL CONSTANT M2/Z Z= DIFF. IN MERCURY MENISCI AT t=0, CM t= TIME INTERVAL, SEC D= MERCURY DISPLACED OVER TIME t, CM L= SPECIMEN LENGTH, CM A= SPECIMEN AREA, CM <sup>2</sup>

### MANOMETER DATA

(K)	DATE	TIME (HRS)	VOLUME OF MERCURY (CM)	DIFFERENCE IN MERCURY MENISCI AT t=0 (CM)	TIME INTERVAL (SEC)	DIFF. IN VOLUME (CM)
$9.2 \times 10^{-8}$	2/15/01	1:08	29.2	0.5	----	----
		4:38	9.2	28.7	12,600	20
$9.4 \times 10^{-8}$	2/16/01	3:51	28.4	0.6	----	----
		4:39	21.4	27.8	2,880	7
$8.3 \times 10^{-8}$	2/19/01	11:44	28.9	0.6	----	----
		4:54	6.5	28.3	18,600	22.4

COEFFICIENT OF PERMEABILITY  
 $K = 9.0 \times 10^{-8}$  CM/SEC  
 AVG. TEMP. 21.8 °C  
 VISCOSITY CORRECTION FOR TEMPERATURE:  
0.9577

REMARKS:    CONFINING PRESSURE 10 PSI    (CELL PRESSURE 70 PSI, BACK PRESSURE 60 PSI)

$K = \frac{8.6 \times 10^{-8}}{20}$  CM/SEC

# FLEXIBLE WALL PERMEABILITY TEST

(ASTM D5084, METHOD - C)

PROJECT: Big Branch Slurry Impoundment      JOB NO.: 000553      DATE: 2/26/01  
 SAMPLE INFO: DHX-13, Depth: 84.0'-86.0'      SAMPLE DESCRIPTION: Light brown silty sand with rock fragments  
 PREPARED BY: MAD      TESTED BY: MAD      PERMEAMETER NO.: 4

STANDARD PROCTOR ( )      TEST SPECIMEN COMPACTION EFFORT      MODIFIED PROCTOR ( )      UNDISTURBED (X)      OTHER ( )

MOISTURE CONTENT	SPECIMEN COMPACTION	PERMEABILITY
CONTAINER NO. <u>T</u>	MAX. DRY DENSITY _____ PCF	$K = -(C/t) \ln(1 - D(T))$ WHERE: MANOMETER CONSTANTS M1 = <u>0.03013</u> M2 = <u>1.04095</u> C = TEST CONSTANT (ML) (L/A) / 12.56 T = TRIAL CONSTANT M2/2 D = DIFF. IN MERCURY MENISCI AT t=0, CM t = TIME INTERVAL, SEC D = MERCURY DISPLACED OVER TIME t, CM L = SPECIMEN LENGTH, CM A = SPECIMEN AREA, CM <sup>2</sup> COEFFICIENT OF PERMEABILITY $K = 1.4 \times 10^{-7} \text{ CM/SEC}$ AVG. TEMP. <u>22.7</u> °C VISCOSITY CORRECTION FOR TEMPERATURE: <u>0.9377</u>
WET WT. <u>226.19</u> GMS	OPTIMUM MOISTURE _____ %	
DRY WT. <u>215.5</u> GMS	WET WT. <u>1372.0</u> GMS	
TARE WT. <u>130.6</u> GMS	HEIGHT <u>5.820</u> IN      DIAMETER <u>2.850</u> IN	
WT. MOISTURE <u>10.69</u> GMS	VOLUME <u>0.0215</u> CU. FT.	
WT. DRY SOIL <u>84.9</u> GMS	WET UNIT WT. <u>140.7</u> PCF	
MOISTURE CONTENT <u>12.6</u> %	DRY UNIT WT. <u>124.9</u> PCF	
	PERCENT COMPACTION _____ %	

### MANOMETER DATA

(K)	DATE	TIME (HRS)	VOLUME OF MERCURY (CM)	DIFFERENCE IN MERCURY MENISCI AT t=0 (CM)	TIME INTERVAL (SEC)	DIFF. IN VOLUME (CM)
$1.4 \times 10^{-7}$	2/27/01	12:58	28.5	0.5	----	----
		3:34	20.6	28	2,160	7.9
$1.4 \times 10^{-7}$	2/28/01	8:09	27.7	0.6	----	----
		11:18	5.8	27.1	11,340	21.9
$1.3 \times 10^{-7}$	2/28/01	3:37	28.9	0.5	----	----
		4:59	14.6	28.4	4,920	14.3

REMARKS:      CONFINING PRESSURE 10 PSI      (CELL PRESSURE 70 PSI, BACK PRESSURE 60 PSI)

$K = 1.3 \times 10^{-7} \text{ CM/SEC}$   
20

TRIAD ENGINEERING, INC.  
 ST. ALBANS, WILKINSON & MORGANTOWN, WEST VIRGINIA  
 WINCHESTER & HARRISONBURG, VIRGINIA  
 GREENSBURG, PENNSYLVANIA

***UNIAXIAL COMPRESSIVE STRENGTH***

TRIAD ENGINEERING, INC.  
4980 TEAYS VALLEY ROAD  
P.O. BOX 1435  
ST. ALBANS, WV 25177  
PHONE No. (304) 755-0721  
FAX. No. (304) 755-1880



ST. ALBANS, LOGAN & MORGANTOWN, WEST VIRGINIA  
WINCHESTER & HARRISONBURG, VIRGINIA  
GREENSBURG, PENNSYLVANIA

## ROCK CORE COMPRESSIVE STRENGTH WORKSHEET

PROJECT No. C00553 DATE: 2/15/01

PROJECT NAME: Big Branch Slurry Impoundment

CORE No. DH1-3 (83.9'-84.2') TYPE OF CURE \_\_\_\_\_

LENGTH (AFTER CAP) #1: 3.960 in.

#2: 3.965 in. AVERAGE: 3.963 in.

#3: 3.960 in.

DIAMETER #1: 1.980 in.

#2: 1.980 in. AVERAGE: 1.980 in.

#3: 1.980 in.

LENGTH TO DIAMETER RATIO (L/D) 2.00

AREA: 3.08 in.<sup>2</sup> CORRECTION FACTOR: 1

LOAD: 18,800 lbs PSI: 6,100

CORRECTED PSI: 6,100

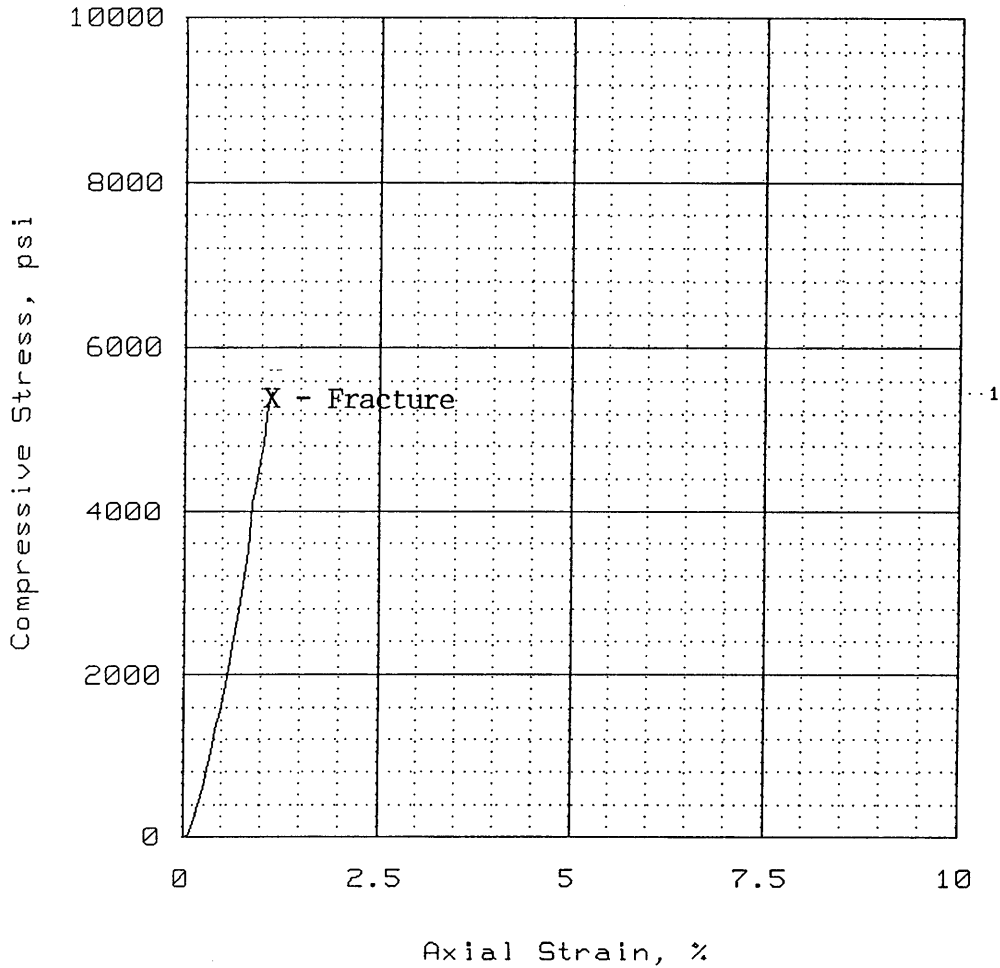
REMARKS: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

TESTED BY: J.M. Sayre CHECKED BY: M. Ali Dastgheib

## UNCONFINED COMPRESSION TEST



Sample number:	1			
Unconfined strength, psi	5464			
Undrained shear strength, psi	2732			
Strain rate, %/min				
Water content, %	0.0			
Void ratio	535.7343			
Saturation, %	0.0			
Dry density, pcf	0.3			
Specimen diameter, in	1.99			
Specimen height, in	3.92			

Description: LT. GRAY MED. GRAINED SANDSTONE

LL =	PL =	PI =	GS = 2.7	Type: ROCK
------	------	------	----------	------------

Project No.: C00553  
 Date: 03/01/01  
 Remarks:

Client: US DEPARTMENT OF LABOR  
 Project: BIG BRANCH SLURRY IMPOUNDMENT  
 Location: DH1-3  
 DEPTH: 85.0' - 85.4'

UNCONFINED COMPRESSION TEST  
**TRIAD ENGINEERING, INC.**

Fig No.

TRIAD ENGINEERING, INC.  
4980 TEAYS VALLEY ROAD  
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FAX. No. (304) 755-1880



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WINCHESTER & HARRISONBURG, VIRGINIA  
GREENSBURG, PENNSYLVANIA

## ROCK CORE COMPRESSIVE STRENGTH WORKSHEET

PROJECT No. C00553 DATE: 2/15/01

PROJECT NAME: Big Branch Slurry Impoundment

CORE No. DH1-4 (78.9'-79.3') TYPE OF CURE \_\_\_\_\_

LENGTH (AFTER CAP) #1: 3.715 in.

#2: 3.720 in. AVERAGE: 3.717 in.

#3: 3.720 in.

DIAMETER #1: 1.975 in.

#2: 1.975 in. AVERAGE: 1.975 in.

#3: 1.975 in.

LENGTH TO DIAMETER RATIO (L/D) 1.88

AREA: 3.06 in.<sup>2</sup> CORRECTION FACTOR: 0.994

LOAD: 15,250 lbs PSI: 4,980

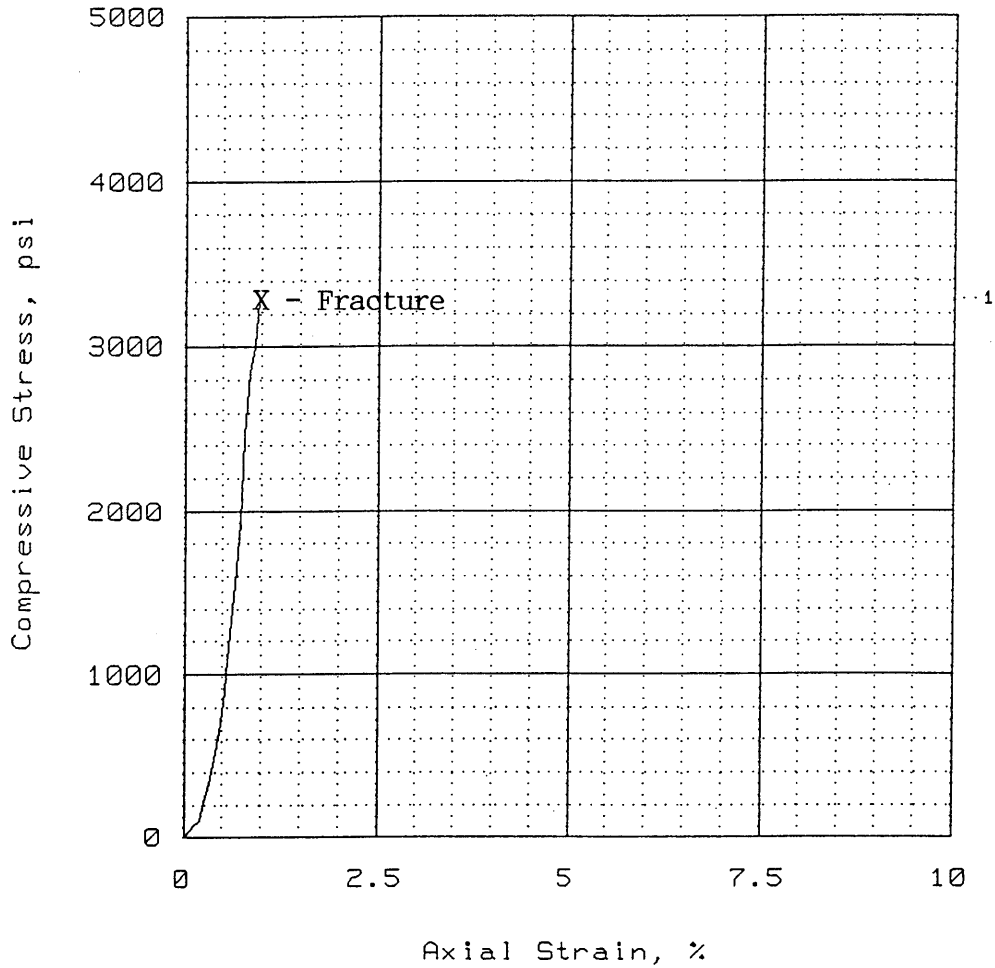
CORRECTED PSI: 4,950

REMARKS: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

TESTED BY: J.M. Sayre CHECKED BY: M. Ali Dastgheib



# UNCONFINED COMPRESSION TEST



Sample number:	1			
Unconfined strength, psi	3291			
Undrained shear strength, psi	1645			
Strain rate, %/min				
Water content, %	0.0			
Void ratio				
Saturation, %	0.0			
Dry density, pcf				
Specimen diameter, in	1.98			
Specimen height, in	3.88			

Description: LT. BROWN MED. GRAINED SANDSTONE

LL =      PL =      PI =      GS = 2.7      Type: ROCK

Project No.: C00553

Date: 03/01/01

Remarks:

Client: US DEPARTMENT OF LABOR

Project: BIG BRANCH SLURRY IMPOUNDMENT

Location: DH1-4

DEPTH: 83.2' -83.8'

UNCONFINED COMPRESSION TEST

**TRIAD ENGINEERING, INC.**

Fig No.

TRIAD ENGINEERING, INC.  
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GREENSBURG, PENNSYLVANIA

## ROCK CORE COMPRESSIVE STRENGTH WORKSHEET

PROJECT No. C00553 DATE: 2/15/01

PROJECT NAME: Big Branch Slurry Impoundment

CORE No. DH1-5 (83.2'-83.7') TYPE OF CURE \_\_\_\_\_

LENGTH (AFTER CAP) #1: 3.855 in.

#2: 3.870 in. AVERAGE: 3.862 in.

#3: 3.860 in.

DIAMETER #1: 1.970 in.

#2: 1.970 in. AVERAGE: 1.970 in.

#3: 1.970 in.

LENGTH TO DIAMETER RATIO (L/D) 1.96

AREA: 3.05 in.<sup>2</sup> CORRECTION FACTOR: 1

LOAD: 18,050 lbs PSI: 5,920

CORRECTED PSI: 5,920

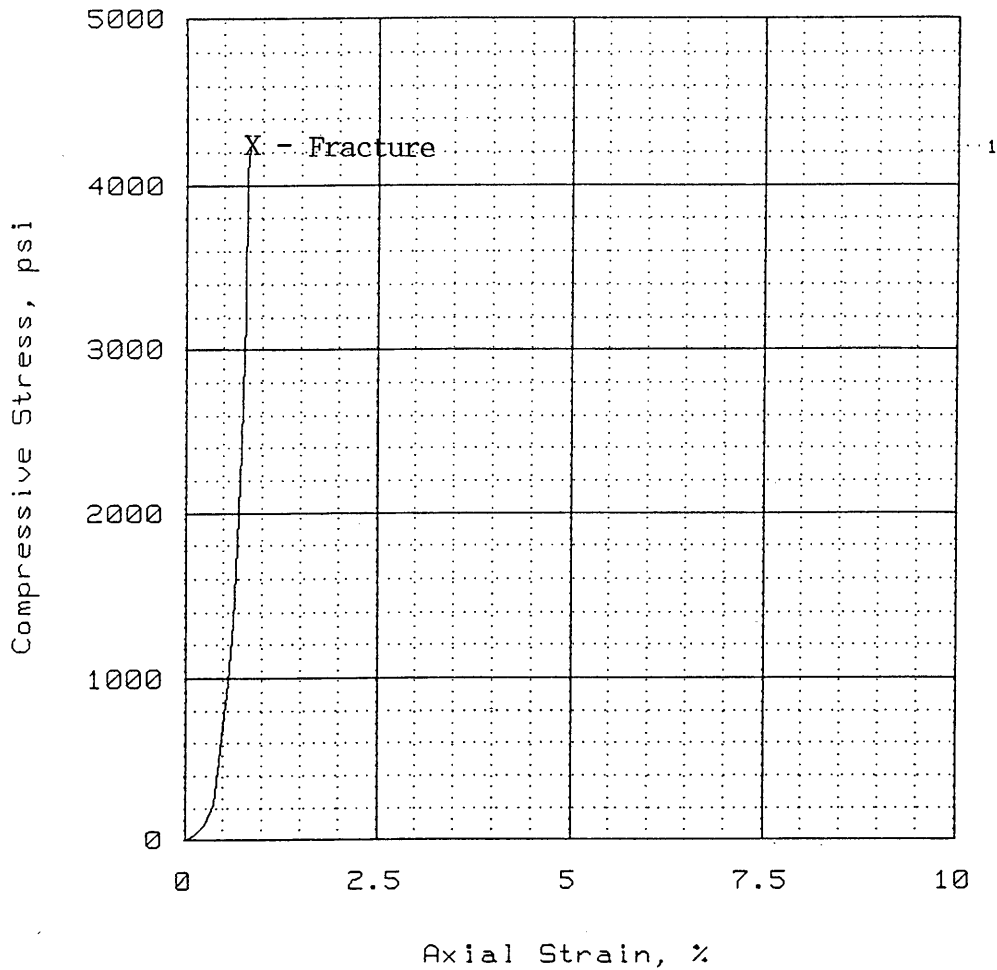
REMARKS: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

TESTED BY: J.M. Sayre CHECKED BY: M.Ali Dastgheib

# UNCONFINED COMPRESSION TEST



Sample number:	1			
Unconfined strength, psi	4230			
Undrained shear strength, psi	2115			
Strain rate, %/min				
Water content, %	0.0			
Void ratio				
Saturation, %	0.0			
Dry density, pcf				
Specimen diameter, in	1.97			
Specimen height, in	4.07			

Description: LT. GRAY MED. GRAINED SANDSTONE

LL =      PL =      PI =      GS = 2.7      Type: ROCK

Project No.: C00553  
 Date: 03/01/01  
 Remarks:  
  
 Fig No.

Client: US DEPARTMENT OF LABOR  
  
 Project: BIG BRANCH SLURRY IMPOUNDMENT  
  
 Location: DH1-5  
 DEPTH: 84.6' -85.1'  
  
 UNCONFINED COMPRESSION TEST  
**TRIAD ENGINEERING, INC.**

TRIAD ENGINEERING, INC.  
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WINCHESTER & HARRISONBURG, VIRGINIA  
GREENSBURG, PENNSYLVANIA

## ROCK CORE COMPRESSIVE STRENGTH WORKSHEET

PROJECT No. C00553 DATE: 2/15/01

PROJECT NAME: Big Branch Slurry Impoundment

CORE No. DH1-8 (81.2'-81.7') TYPE OF CURE \_\_\_\_\_

LENGTH (AFTER CAP) #1: 3.900 in.

#2: 3.900 in. AVERAGE: 3.903 in.

#3: 3.905 in.

DIAMETER #1: 1.985 in.

#2: 1.980 in. AVERAGE: 1.983 in.

#3: 1.985 in.

LENGTH TO DIAMETER RATIO (L/D) 1.97

AREA: 3.09 in.<sup>2</sup> CORRECTION FACTOR: 1

LOAD: 17,600 lbs PSI: 5,700

CORRECTED PSI: 5,700

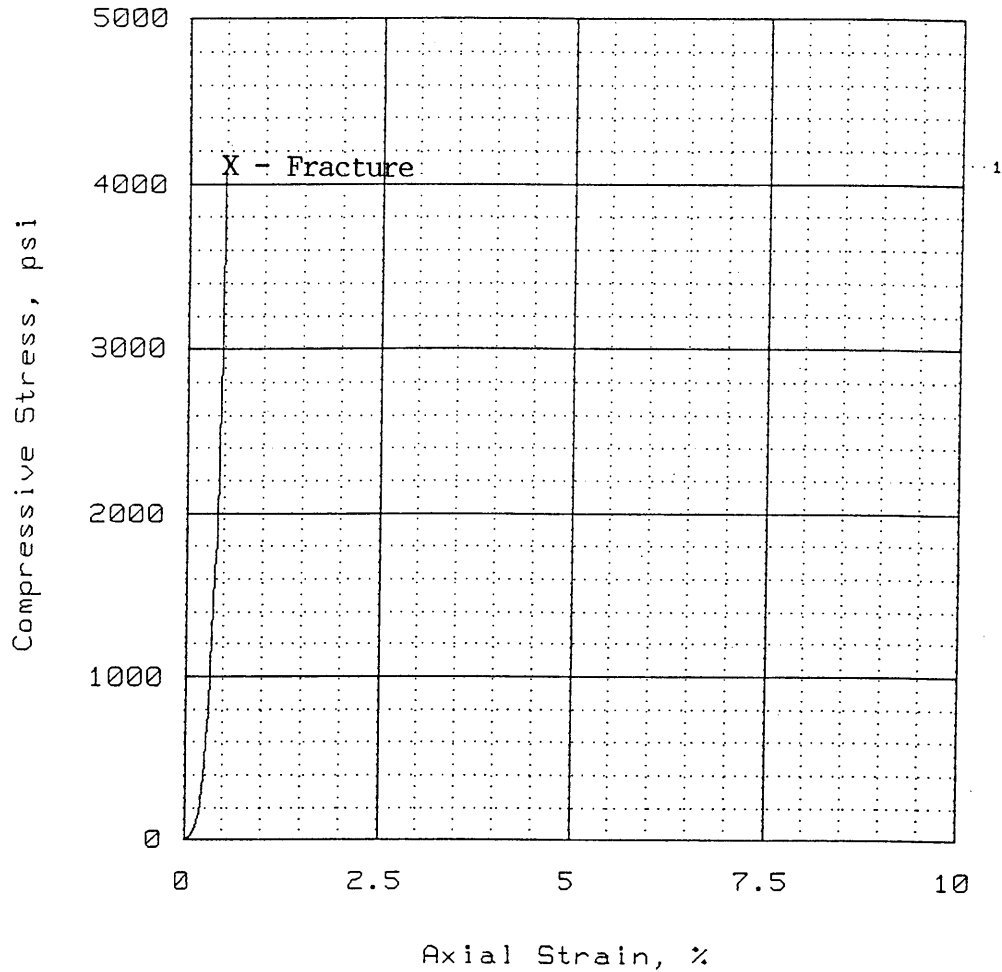
REMARKS: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

TESTED BY: M. Ali Dastgheib CHECKED BY: M. Ali Dastgheib

# UNCONFINED COMPRESSION TEST



Sample number:	1			
Unconfined strength, psi	4125			
Undrained shear strength, psi	2063			
Strain rate, %/min				
Water content, %	0.0			
Void ratio				
Saturation, %	0.0			
Dry density, pcf				
Specimen diameter, in	1.98			
Specimen height, in	4.09			

Description: LT. GRAY MED. GRAINED SANDSTONE

LL =	PL =	PI =	GS = 2.75	Type: ROCK
------	------	------	-----------	------------

Project No.: C00553  
 Date: 03/01/01  
 Remarks:

Fig No.

Client: US DEPARTMENT OF LABOR

Project: BIG BRANCH SLURRY IMPOUNDMENT

Location: DH1-B  
 DEPTH: 82.6' - 83.0'

UNCONFINED COMPRESSION TEST

**TRIAD ENGINEERING, INC.**

TRIAD ENGINEERING, INC.  
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WINCHESTER & HARRISONBURG, VIRGINIA  
GREENSBURG, PENNSYLVANIA

## ROCK CORE COMPRESSIVE STRENGTH WORKSHEET

PROJECT No. C00553 DATE: 2/16/01

PROJECT NAME: Big Branch Slurry Impoundment

CORE No. DH2-1 (91.5'-91.7') TYPE OF CURE \_\_\_\_\_

LENGTH (AFTER CAP) #1: 3.150 in.

#2: 3.155 in. AVERAGE: 3.153 in.

#3: 3.155 in.

DIAMETER #1: 1.980 in.

#2: 1.955 in. AVERAGE: 1.970 in.

#3: 1.975 in.

LENGTH TO DIAMETER RATIO (L/D) 1.60

AREA: 3.05 in.<sup>2</sup> CORRECTION FACTOR: 0.968

LOAD: 4,050 lbs PSI: 1,330

CORRECTED PSI: 1,290

REMARKS: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

TESTED BY: M. Ali Dastgheib CHECKED BY: M. Ali Dastgheib

TRIAD ENGINEERING, INC.  
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WINCHESTER & HARRISONBURG, VIRGINIA  
GREENSBURG, PENNSYLVANIA

## ROCK CORE COMPRESSIVE STRENGTH WORKSHEET

PROJECT No. C00553 DATE: 2/16/01

PROJECT NAME: Big Branch Slurry Impoundment

CORE No. DH2-1 (95.0'-95.3') TYPE OF CURE \_\_\_\_\_

LENGTH (AFTER CAP) #1: 3.290 in.

#2: 3.295 in. AVERAGE: 3.293 in.

#3: 3.295 in.

DIAMETER #1: 1.980 in.

#2: 1.985 in. AVERAGE: 1.985 in.

#3: 1.990 in.

LENGTH TO DIAMETER RATIO (L/D) 1.65

AREA: 3.09 in.<sup>2</sup> CORRECTION FACTOR: 0.972

LOAD: 11,750 lbs PSI: 3,800

CORRECTED PSI: 3,690

REMARKS: \_\_\_\_\_

TESTED BY: M. Ali Dastgheib CHECKED BY: M. Ali Dastgheib

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WINCHESTER & HARRISONBURG, VIRGINIA  
GREENSBURG, PENNSYLVANIA

## ROCK CORE COMPRESSIVE STRENGTH WORKSHEET

PROJECT No. C00553 DATE: 2/16/01

PROJECT NAME: Big Branch Slurry Impoundment

CORE No. DH3-3 (93.0'-93.3') TYPE OF CURE \_\_\_\_\_

LENGTH (AFTER CAP) #1: 2.975 in.  
#2: 2.985 in. AVERAGE: 2.978 in.

#3: 2.975 in.

DIAMETER #1: 1.975 in.

#2: 1.980 in. AVERAGE: 1.977 in.

#3: 1.975 in.

LENGTH TO DIAMETER RATIO (L/D) 1.51

AREA: 3.07 in.<sup>2</sup> CORRECTION FACTOR: 0.961

LOAD: 11,500 lbs PSI: 3,750

CORRECTED PSI: 3,600

REMARKS: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

TESTED BY: M. Ali Dastgheib CHECKED BY: M. Ali Dastgheib



TRIAD ENGINEERING, INC.  
4980 TEAYS VALLEY ROAD  
P.O. BOX 1435  
ST. ALBANS, WV 25177  
PHONE No. (304) 755-0721  
FAX. No. (304) 755-1880



ST. ALBANS, LOGAN & MORGANTOWN, WEST VIRGINIA  
WINCHESTER & HARRISONBURG, VIRGINIA  
GREENSBURG, PENNSYLVANIA

## ROCK CORE COMPRESSIVE STRENGTH WORKSHEET

PROJECT No. C00553 DATE: 2/16/01

PROJECT NAME: Big Branch Slurry Impoundment

CORE No. DH3-3 (95.5'-95.8') TYPE OF CURE \_\_\_\_\_

LENGTH (AFTER CAP) #1: 3.400 in.

#2: 3.400 in. AVERAGE: 3.403 in.

#3: 3.405 in.

DIAMETER #1: 1.980 in.

#2: 1.995 in. AVERAGE: 1.988 in.

#3: 1.990 in.

LENGTH TO DIAMETER RATIO (L/D) 1.71

AREA: 3.10 in.<sup>2</sup> CORRECTION FACTOR: 0.977

LOAD: 12,000 lbs PSI: 3,870

CORRECTED PSI: 3,780

REMARKS: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

TESTED BY: M. Ali Dastgheib CHECKED BY: M. Ali Dastgheib

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WINCHESTER & HARRISONBURG, VIRGINIA  
GREENSBURG, PENNSYLVANIA

## ROCK CORE COMPRESSIVE STRENGTH WORKSHEET

PROJECT No. C00553 DATE: 2/16/01

PROJECT NAME: Big Branch Slurry Impoundment

CORE No. DHP-1 (91.3'-91.5') TYPE OF CURE \_\_\_\_\_

LENGTH (AFTER CAP) #1: 2.730 in.

#2: 2.735 in. AVERAGE: 2.728 in.

#3: 2.720 in.

DIAMETER #1: 1.990 in.

#2: 1.985 in. AVERAGE: 1.987 in.

#3: 1.985 in.

LENGTH TO DIAMETER RATIO (L/D) 1.37

AREA: 3.10 in.<sup>2</sup> CORRECTION FACTOR: 0.944

LOAD: 13,050 lbs PSI: 4,210

CORRECTED PSI: 3,970

REMARKS: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

TESTED BY: M. Ali Dastgheib CHECKED BY: M. Ali Dastgheib

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GREENSBURG, PENNSYLVANIA

## ROCK CORE COMPRESSIVE STRENGTH WORKSHEET

PROJECT No. C00553 DATE: 2/16/01

PROJECT NAME: Big Branch Slurry Impoundment

CORE No. DHP-1 (96.6'-96.9') TYPE OF CURE \_\_\_\_\_

LENGTH (AFTER CAP) #1: 3.075 in.

#2: 3.082 in. AVERAGE: 3.077 in.

#3: 3.075 in.

DIAMETER #1: 2.000 in.

#2: 1.990 in. AVERAGE: 1.993 in.

#3: 1.990 in.

LENGTH TO DIAMETER RATIO (L/D) 1.54

AREA: 3.11 in.<sup>2</sup> CORRECTION FACTOR: 0.963

LOAD: 13,050 lbs PSI: 4,196

CORRECTED PSI: 4,040

REMARKS: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

TESTED BY: M. Ali Dastgheib CHECKED BY: M. Ali Dastgheib

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WINCHESTER & HARRISONBURG, VIRGINIA  
GREENSBURG, PENNSYLVANIA

## ROCK CORE COMPRESSIVE STRENGTH WORKSHEET

PROJECT No. C00553 DATE: 2/16/01

PROJECT NAME: Big Branch Slurry Impoundment

CORE No. DHP-1 (97.5'-97.8') TYPE OF CURE \_\_\_\_\_

LENGTH (AFTER CAP) #1: 3.790 in.

#2: 3.800 in. AVERAGE: 3.797 in.

#3: 3.800 in.

DIAMETER #1: 2.000 in.

#2: 2.005 in. AVERAGE: 1.998 in.

#3: 1.990 in.

LENGTH TO DIAMETER RATIO (L/D) 1.900

AREA: 3.13 in.<sup>2</sup> CORRECTION FACTOR: 0.996

LOAD: 9,250 lbs PSI: 2,955

CORRECTED PSI: 2,940

REMARKS: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

TESTED BY: M. Ali Dastgheib CHECKED BY: M. Ali Dastgheib

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WINCHESTER & HARRISONBURG, VIRGINIA  
GREENSBURG, PENNSYLVANIA

## ROCK CORE COMPRESSIVE STRENGTH WORKSHEET

PROJECT No. C00553 DATE: 2/16/01

PROJECT NAME: Big Branch Slurry Impoundment

CORE No. DHX-3 (89.5'-89.8') TYPE OF CURE \_\_\_\_\_

LENGTH (AFTER CAP) #1: 3.450 in.

#2: 3.455 in. AVERAGE: 3.456 in.

#3: 3.457 in.

DIAMETER #1: 1.980 in.

#2: 1.980 in. AVERAGE: 1.980 in.

#3: 1.980 in.

LENGTH TO DIAMETER RATIO (L/D) 1.74

AREA: 3.08 in.<sup>2</sup> CORRECTION FACTOR: 0.979

LOAD: 15,000 lbs PSI: 4,870

CORRECTED PSI: 4,770

REMARKS: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

TESTED BY: M. Ali Dastgheib CHECKED BY: M. Ali Dastgheib

TRIAD ENGINEERING, INC.  
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WINCHESTER & HARRISONBURG, VIRGINIA  
GREENSBURG, PENNSYLVANIA

## ROCK CORE COMPRESSIVE STRENGTH WORKSHEET

PROJECT No. C00553 DATE: 2/16/01

PROJECT NAME: Big Branch Slurry Impoundment

CORE No. DHX-3 (91.6'-91.9') TYPE OF CURE \_\_\_\_\_

LENGTH (AFTER CAP) #1: 4.500 in.

#2: 4.510 in. AVERAGE: 4.502 in.

#3: 4.497 in.

DIAMETER #1: 1.985 in.

#2: 1.950 in. AVERAGE: 1.974 in.

#3: 1.987 in.

LENGTH TO DIAMETER RATIO (L/D) 2.28

AREA: 3.06 in.<sup>2</sup> CORRECTION FACTOR: 1

LOAD: 9,500 lbs PSI: 3,100

CORRECTED PSI: 3,100

REMARKS: \_\_\_\_\_

TESTED BY: M. Ali Dastgheib CHECKED BY: M. Ali Dastgheib

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WINCHESTER & HARRISONBURG, VIRGINIA  
GREENSBURG, PENNSYLVANIA

## ROCK CORE COMPRESSIVE STRENGTH WORKSHEET

PROJECT No. C00553 DATE: \_\_\_\_\_

PROJECT NAME: Big Branch Slurry Impoundment

CORE No. DHX-3 (93.5'-93.8') TYPE OF CURE \_\_\_\_\_

LENGTH (AFTER CAP) #1: 3.950 in.

#2: 3.965 in. AVERAGE: 3.957 in.

#3: 3.955 in.

DIAMETER #1: 1.975 in.

#2: 1.975 in. AVERAGE: 1.975 in.

#3: 1.995 in.

LENGTH TO DIAMETER RATIO (L/D) 2.00

AREA: 3.06 in.<sup>2</sup> CORRECTION FACTOR: 1

LOAD: 10,000 lbs PSI: 3,270

CORRECTED PSI: 3,270

REMARKS: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

TESTED BY: M. Ali Dastgheib CHECKED BY: M. Ali Dastgheib

***MODULUS OF RUPTURE***



TRIAD ENGINEERING, INC.  
MODULUS OF RUPTURE ( $R_o$ )  
3-POINT

PROJECT NO.: C00553 PROJECT NAME: Big Branch Slurry Impoundment

BORING NO.: DH1-3 DEPTH: 84.2'-85.0'

DESCRIPTION: Brown sandstone, medium grained

DATE: 2/14/01 TESTED BY: M.A. Dastgheib

$$R_o = \frac{8F_c L}{\pi D^3}$$

LOAD ( $F_c$ ) = 350 lbs

LENGTH (L) = 4.190 in.

DIAMETER (D) = 1.975 in

MODULUS OF RUPTURE = 485 (PSI)

TRIAD ENGINEERING, INC.  
MODULUS OF RUPTURE ( $R_o$ )  
3-POINT

PROJECT NO.: C00553 PROJECT NAME: Big Branch Slurry Impoundment

BORING NO.: DH1-3 DEPTH: 85.4'-86.0'

DESCRIPTION: Brown and gray sandstone, medium grained

DATE: 2/14/01 TESTED BY: M.A. Dastgheib

$$R_o = \frac{8F_c L}{\pi D^3}$$

LOAD ( $F_c$ ) = 250 lbs

LENGTH (L) = 4.190 in.

DIAMETER (D) = 1.975 in

MODULUS OF RUPTURE = 346 (PSI)

**TRIAD ENGINEERING, INC.**  
**MODULUS OF RUPTURE (R<sub>o</sub>)**  
**3-POINT**

PROJECT NO.: C00553 PROJECT NAME: Big Branch Slurry Impoundment

BORING NO.: DH1-4 DEPTH: 78.0'-78.7'

DESCRIPTION: Brown and gray sandstone, medium grained

DATE: 2/14/01 TESTED BY: M.A. Dastgheib

$$R_o = \frac{8F_c L}{\pi D^3}$$

LOAD (F<sub>c</sub>) = 200 lbs

LENGTH (L) = 4.190 in.

DIAMETER (D) = 1.965 in

MODULUS OF RUPTURE = 280 (PSI)

**TRIAD ENGINEERING, INC.**  
**MODULUS OF RUPTURE (R<sub>o</sub>)**  
**3-POINT**

PROJECT NO.: C00553 PROJECT NAME: Big Branch Slurry Impoundment

BORING NO.: DH1-4 DEPTH: 84.0'-84.5'

DESCRIPTION: Brown sandstone, medium grained

DATE: 2/14/01 TESTED BY: M.A. Dastgheib

$$R_o = \frac{8F_c L}{\pi D^3}$$

LOAD (F<sub>c</sub>) = 280 lbs

LENGTH (L) = 4.190 in.

DIAMETER (D) = 1.975 in

MODULUS OF RUPTURE = 388 (PSI)

TRIAD ENGINEERING, INC.  
MODULUS OF RUPTURE (R<sub>o</sub>)  
3-POINT

PROJECT NO.: C00553 PROJECT NAME: Big Branch Slurry Impoundment

BORING NO.: DH1-5 DEPTH: 82.0'-82.5'

DESCRIPTION: Brown sandstone, medium grained

DATE: 2/14/01 TESTED BY: M.A. Dastgheib

$$R_o = \frac{8F_c L}{\pi D^3}$$

LOAD (F<sub>c</sub>) = 250 lbs

LENGTH (L) = 4.190 in.

DIAMETER (D) = 1.970 in

MODULUS OF RUPTURE = 249 (PSI)

TRIAD ENGINEERING, INC.  
MODULUS OF RUPTURE (R<sub>o</sub>)  
3-POINT

PROJECT NO.: C00553 PROJECT NAME: Big Branch Slurry Impoundment

BORING NO.: DH1-5 DEPTH: 84.0'-84.6'

DESCRIPTION: Gray sandstone, medium grained

DATE: 2/14/01 TESTED BY: M.A. Dastgheib

$$R_o = \frac{8F_c L}{\pi D^3}$$

LOAD (F<sub>c</sub>) = 200 lbs

LENGTH (L) = 4.190 in.

DIAMETER (D) = 1.980 in

MODULUS OF RUPTURE = 275 (PSI)

**TRIAD ENGINEERING, INC.**  
**MODULUS OF RUPTURE (R<sub>o</sub>)**  
**3-POINT**

PROJECT NO.: C00553 PROJECT NAME: Big Branch Slurry Impoundment

BORING NO.: DH1-8 DEPTH: 79.5'-80.1'

DESCRIPTION: Gray sandstone, medium grained

DATE: 2/14/01 TESTED BY: M.A. Dastgheib

$$R_o = \frac{8F_c L}{\pi D^3}$$

LOAD (F<sub>c</sub>) = 250 lbs

LENGTH (L) = 4.190 in.

DIAMETER (D) = 1.980 in

MODULUS OF RUPTURE = 344 (PSI)

**TRIAD ENGINEERING, INC.**  
**MODULUS OF RUPTURE (R<sub>o</sub>)**  
**3-POINT**

PROJECT NO.: C00553 PROJECT NAME: Big Branch Slurry Impoundment

BORING NO.: DH1-8 DEPTH: 83.0'-83.8'

DESCRIPTION: Gray sandstone, medium grained

DATE: 2/14/01 TESTED BY: M.A. Dastgheib

$$R_o = \frac{8F_c L}{\pi D^3}$$

LOAD (F<sub>c</sub>) = 290 lbs

LENGTH (L) = 4.190 in.

DIAMETER (D) = 1.980 in

MODULUS OF RUPTURE = 398 (PSI)



***APPENDIX B***

***CHEMICAL ANALYSIS OF  
SELECTED SLURRY SAMPLES***

CT&E Environmental Services Inc.  
Laboratory Division: Charleston Laboratory

John Meeks  
TRIAD ENGINEERING INC

Laboratory Number TA1-CO-P271-006

Page 1

CW #1  
2000' UPSTREAM OF CONF. AT STRAIGHT FORK

COC  
Date Sampled 01/06/01 00:00  
Date Received 02/13/01 11:00

Type F Matrix WATER  
Sampled by CLIENT

% Solids 71

032001 1358 Ver. 4.0.187

ANALYSIS FOR REQUESTED PARAMETERS

Analyzed Parameter	CAS No.	Result	Flg	RLimit	Units	S Method	Date/Time/Anl	DilF
ACRYLAMIDE	79-06-1	ND	U	0.26	mg/L	Y SW8316	03/19/01 23:26 ra	1.0



# CT&E Environmental Services Inc.

Laboratory Division

## Laboratory Analysis Report

TRIAD ENGINEERING INC

MCCC BIG BRANCH IMPOUNDMENT

CT&E Laboratory Delivery Group Number: TA1-B0-P338

Page 1

DATE: 03/15/01

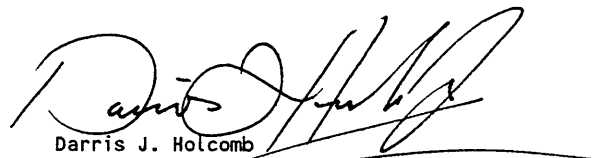
COC:

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed in an attached case narrative. Release of the data contained in the hard copy data package has been authorized by the Laboratory Manager or designee, as verified by the following signature.

A case narrative is not required.

<u>Reference</u>	<u>Sample Description</u>	<u>Sampled</u>	<u>Laboratory Number</u>
DH 1-11 SLURRY SAMPLE 1-ME	SLURRY SAMPLE 1 96.1-97.1 FEET	12/14/2000	TA1-B0-P338-001
DH 2-9 SLURRY SAMPLE 5-ME	SLURRY BAG SAMPLE 5 97.8-100.1 FEET	01/18/2001	TA1-B0-P338-002
WOLF CREEK #1	1.7 MILES DOWNSTREAM OF BIG ANDY CULVERT	01/06/2001	TA1-B0-P338-003
DH 2-9 SLURRY SAMPLE 2-ME	SLURRY BAG SAMPLE 2 91.8-93.8 FEET	01/18/2001	TA1-B0-P338-004
SP #5	100' UPSTREAM OF DRILL PAD 20' FROM SHORE	01/06/2001	TA1-B0-P338-005
CW #1	2000' UPSTREAM OF CONF. AT STRAIGHT FORK	01/06/2001	TA1-B0-P338-006

Submitted by,



Darris J. Holcomb  
Project Manager

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5712 Erdman Ave., Baltimore, MD 21205-3598 – Tel: (410) 483-2200 Fax: (410) 483-2206

4440 Glen Este-Withamsville Road, Suite 900, Cincinnati, OH 45245-1331 – Tel: (513) 752-9696 Fax: (513) 752-2614

CT&E Environmental Services Inc.  
 Laboratory Division: Charleston Laboratory

John Meeks  
 TRIAD ENGINEERING INC

Laboratory Number TA1-B0-P338-001

Page 1

DH 1-11 SLURRY SAMPLE 1-ME  
 SLURRY SAMPLE 1 96.1-97.1 FEET

COC  
 Date Sampled 12/14/00 00:00  
 Date Received 02/13/01 11:00

Type F Matrix SLUDGE  
 Sampled by CLIENT

% Solids 77

031501 1145 Ver. 4.0.187

ANALYSIS FOR REQUESTED PARAMETERS

Analyzed Parameter	CAS No.	Result	Flg	RLimit	Units	S Method	Date/Time/Anl	DILF
ALUMINUM	7429-90-5	2700		19	mg/Kg	Y SW6010B	02/21/01 02:23 JWJ	1.0
ANTIMONY	7440-36-0	ND	U	0.97	mg/Kg	Y SW6010B	02/21/01 02:23 JWJ	1.0
ARSENIC	7440-38-2	2.6		0.97	mg/Kg	Y SW6010B	02/21/01 02:23 JWJ	1.0
BARIUM	7440-39-3	34		0.19	mg/Kg	Y SW6010B	02/21/01 02:23 JWJ	1.0
BERYLLIUM	7440-41-7	0.65		0.19	mg/Kg	Y SW6010B	02/21/01 02:23 JWJ	1.0
BORON	7440-42-8	ND	U	19	mg/Kg	Y SW6010B	02/21/01 02:23 JWJ	1.0
CADMIUM	7440-43-9	ND	U	0.19	mg/Kg	Y SW6010B	02/21/01 02:23 JWJ	1.0
CALCIUM	7440-70-2	640		9.7	mg/Kg	Y SW6010B	02/21/01 02:23 JWJ	1.0
MIUM	7440-47-3	5.8		0.97	mg/Kg	Y SW6010B	02/21/01 02:23 JWJ	1.0
OSALT	7440-48-4	5.8		0.97	mg/Kg	Y SW6010B	02/21/01 02:23 JWJ	1.0
COPPER	7440-50-8	11		0.97	mg/Kg	Y SW6010B	02/21/01 02:23 JWJ	1.0
IRON	7439-89-6	16000		9.7	mg/Kg	Y SW6010B	02/21/01 02:23 JWJ	1.0
LEAD	7439-92-1	6.1		0.97	mg/Kg	Y SW6010B	02/21/01 02:23 JWJ	1.0
MAGNESIUM	7439-95-4	1200		9.7	mg/Kg	Y SW6010B	02/21/01 02:23 JWJ	1.0
MANGANESE	7439-96-5	230		1.9	mg/Kg	Y SW6010B	02/21/01 02:23 JWJ	1.0
MOLYBDENUM	7439-98-7	ND	U	0.97	mg/Kg	Y SW6010B	02/21/01 02:23 JWJ	1.0
NICKEL	7440-02-0	9.0		0.97	mg/Kg	Y SW6010B	02/21/01 02:23 JWJ	1.0
POTASSIUM	7440-09-7	650		190	mg/Kg	Y SW6010B	02/21/01 02:23 JWJ	1.0
SELENIUM	7782-49-2	ND	U	0.97	mg/Kg	Y SW6010B	02/21/01 02:23 JWJ	1.0
SILICON	7440-21-3	1100		19	mg/Kg	Y SW6010B	02/21/01 02:23 JWJ	1.0
SILVER	7440-22-4	ND	U	0.97	mg/Kg	Y SW6010B	02/21/01 02:23 JWJ	1.0
SODIUM	7440-23-5	ND	U	190	mg/Kg	Y SW6010B	02/21/01 02:23 JWJ	1.0
THALLIUM	7440-28-0	ND	U	0.97	mg/Kg	Y SW6010B	02/21/01 02:23 JWJ	1.0
TITANIUM	7440-32-6	45		0.19	mg/Kg	Y SW6010B	02/21/01 02:23 JWJ	1.0
VANADIUM	7440-62-2	7.7		0.97	mg/Kg	Y SW6010B	02/21/01 02:23 JWJ	1.0
ZINC	7440-66-6	27		3.9	mg/Kg	Y SW6010B	02/21/01 02:23 JWJ	1.0
Total Solids (Percent)		77		0.010	%	EPA160.3	02/15/01 15:30 MHS	1.0
Acidity (Soluble)		1800		260	mg/Kg	Y	02/20/01 14:44 TF	100
Alkalinity (Soluble)		640		260	mg/Kg	Y	02/20/01 14:44 TF	100
LIBRARY SEARCH		ND	U			SW8270C	02/26/01 12:12 tjh	1.0
PHENOL	108-95-2	ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
BIS(2-CHLOROETHYL)ETHER	111-44-4	ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0

CT&E Environmental Services Inc.  
 Laboratory Division: Charleston Laboratory

John Meeks  
 TRIAD ENGINEERING INC

Laboratory Number TA1-B0-P338-001

Page 2

DH 1-11 SLURRY SAMPLE 1-ME  
 SLURRY SAMPLE 1 96.1-97.1 FEET

COC  
 Date Sampled 12/14/00 00:00  
 Date Received 02/13/01 11:00

Type F Matrix SLUDGE  
 Sampled by CLIENT

% Solids 77

031501 1145 Ver. 4.0.187

ANALYSIS FOR REQUESTED PARAMETERS

Analyzed Parameter	CAS No.	Result	Flg	RLimit	Units	S Method	Date/Time/Anl	DILF
2-CHLOROPHENOL	95-57-8	ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
1,3-DICHLOROBENZENE	541-73-1	ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
1,4-DICHLOROBENZENE	106-46-7	ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
1,2-DICHLOROBENZENE	95-50-1	ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
2-METHYLPHENOL	95-48-7	ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
3- & 4-METHYLPHENOL		ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
N-NITROSODI-N-PROPYLAMINE	621-64-7	ND	U	4900	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
HEXACHLOROETHANE	67-72-1	ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
BENZENE	98-95-3	ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
ISOPHORONE	78-59-1	ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
2-NITROPHENOL	88-75-5	ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
2,4-DIMETHYLPHENOL	105-67-9	ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
BIS(2-CHLOROETHOXY) METHANE	111-91-1	ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
2,4-DICHLOROPHENOL	120-83-2	ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
1,2,4-TRICHLOROBENZENE	120-82-1	ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
NAPHTHALENE	91-20-3	ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
4-CHLOROANILINE	106-47-8	ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
HEXACHLOROBUTADIENE	87-68-3	ND	U	4900	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
4-CHLORO-3-METHYLPHENOL	59-50-7	ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
2-METHYLNAPHTHALENE	91-57-6	ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
HEXACHLOROCYCLOPENTADIENE	77-47-4	ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
2,4,6-TRICHLOROPHENOL	88-06-2	ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
2,4,5-TRICHLOROPHENOL	95-95-4	ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
2-CHLORONAPHTHALENE	91-58-7	ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
2-NITROANILINE	88-74-4	ND	U	12000	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
DIMETHYLPHTHALATE	131-11-3	ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
ACENAPHTHYLENE	208-96-8	ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
2,6-DINITROTOLUENE	606-20-2	ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
3-NITROANILINE	99-09-2	ND	U	12000	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
ACENAPHTHENE	83-32-9	ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
2,4-DINITROPHENOL	51-28-5	ND	U	12000	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
4-NITROPHENOL	100-02-7	ND	U	12000	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
DIBENZOFURAN	132-64-9	ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
2-DINITROTOLUENE	121-14-2	ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
DIMETHYLPHTHALATE	84-66-2	ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
4-CHLORODIPHENYLETHER	7005-72-3	ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
FLUORENE	86-73-7	ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0

CT&E Environmental Services Inc.  
 Laboratory Division: Charleston Laboratory

John Meeks  
 TRIAD ENGINEERING INC

Laboratory Number TA1-B0-P338-001

Page 3

DH 1-11 SLURRY SAMPLE 1-ME  
 SLURRY SAMPLE 1 96.1-97.1 FEET

COC  
 Date Sampled 12/14/00 00:00  
 Date Received 02/13/01 11:00

Type F Matrix SLUDGE  
 Sampled by CLIENT

% Solids 77

031501 1145 Ver. 4.0.187

ANALYSIS FOR REQUESTED PARAMETERS

Analyzed Parameter	CAS No.	Result	Flg	RLimit	Units	S Method	Date/Time/Anl	DilF
4-NITROANILINE	100-01-6	ND	U	12000	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
4,6-DINITRO-2-METHYLPHENOL	534-52-1	ND	U	12000	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
N-NITROSODIPHENYLAMINE	86-30-6	ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
4-BROMOPHENYL PHENYL ETHER	101-55-3	ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
HEXACHLOROBENZENE	118-74-1	ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
PENTACHLOROPHENOL	87-86-5	ND	U	12000	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
PHENANTHRENE	85-01-8	ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
ANTHRACENE	120-12-7	ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
1-BUTYLPHTHALATE	84-74-2	ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
FLUORANTHENE	206-44-0	ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
PYRENE	129-00-0	ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
BUTYL BENZYL PHTHALATE	85-68-7	ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
3,3-DICHLOROBENZIDINE	91-94-1	ND	U	4900	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
BENZO(A)ANTHRACENE	56-55-3	ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
CHRYSENE	218-01-9	ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
DI-N-OCTYLPHTHALATE	117-84-0	ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
BENZO(B)FLUORANTHENE	205-99-2	ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
BENZO(K)FLUORANTHENE	207-08-9	ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
BENZO(A)PYRENE	50-32-8	ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
INDENO(1,2,3-CD)PYRENE	193-39-5	ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
DIBENZO(A,H)ANTHRACENE	53-70-3	ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
BENZO(G,H,I)PERYLENE	191-24-2	ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
BENZYL ALCOHOL	100-51-6	ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
BENZOIC ACID	65-85-0	ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
BIS(2-CHLOROISOPROPYL)ETHER	108-60-1	ND	U	2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
SURROGATE RESULTS								
NITROBENZENE-D5	4165-60-0	6200		2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
NITROBENZENE-D5	4165-60-0	25			% REC	Y SW8270C	02/26/01 12:12 tjh	1.0
2-FLUOROBIPHENYL	321-60-8	13000		2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
2-FLUOROBIPHENYL	321-60-8	55			% REC	Y SW8270C	02/26/01 12:12 tjh	1.0
TERPHENYL-D14	1718-51-0	15000		2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
TERPHENYL-D14	1718-51-0	62			% REC	Y SW8270C	02/26/01 12:12 tjh	1.0
NOL-D5	4165-62-2	13000		2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
NOL-D5	4165-62-2	54			% REC	Y SW8270C	02/26/01 12:12 tjh	1.0
2-FLUOROPHENOL	367-12-4	13000		2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
2-FLUOROPHENOL	367-12-4	55			% REC	Y SW8270C	02/26/01 12:12 tjh	1.0

CT&E Environmental Services Inc.  
Laboratory Division: Charleston Laboratory

John Meeks  
TRIAD ENGINEERING INC

Laboratory Number TA1-B0-P338-001

Page 4

DH 1-11 SLURRY SAMPLE 1-ME  
SLURRY SAMPLE 1 96.1-97.1 FEET

COC  
Date Sampled 12/14/00 00:00  
Date Received 02/13/01 11:00

Type F Matrix SLUDGE  
Sampled by CLIENT

% Solids 77

031501 1145 Ver. 4.0.187

ANALYSIS FOR REQUESTED PARAMETERS

Analyzed Parameter	CAS No.	Result	Flg	RLimit	Units	S Method	Date/Time/Anl	DilF
2,4,6-TRIBROMOPHENOL	118-79-6	7700		2400	ug/Kg	Y SW8270C	02/26/01 12:12 tjh	1.0
2,4,6-TRIBROMOPHENOL	118-79-6	32			% REC	Y SW8270C	02/26/01 12:12 tjh	1.0

CT&E Environmental Services Inc.  
Laboratory Division: Charleston Laboratory

John Meeks  
TRIAD ENGINEERING INC

Laboratory Number TA1-C0-P271-001

Page 1

DH 1-11 SLURRY SAMPLE 1-ME  
SLURRY SAMPLE 1 96.1-97.1 FEET

COC  
Date Sampled 12/14/00 00:00  
Date Received 02/13/01 11:00

Type F Matrix SLUDGE  
Sampled by CLIENT

% Solids 77

032001 1358 Ver. 4.0.187

ANALYSIS FOR REQUESTED PARAMETERS

Analyzed Parameter	CAS No.	Result	Flg	RLimit	Units	S Method	Date/Time/Anl	DilF
ACRYLAMIDE	79-06-1	ND	U	0.23	mg/L	Y SW8316	03/19/01 21:58 ra	1.0



CT&E Environmental Services Inc.  
 Laboratory Division: Charleston Laboratory

John Meeks  
 TRIAD ENGINEERING INC

Laboratory Number TA1-B0-P338-002

Page 1

DH 2-9 SLURRY SAMPLE 5-ME  
 SLURRY BAG SAMPLE 5 97.8-100.1 FEET

COC  
 Date Sampled 01/18/01 00:00  
 Date Received 02/13/01 11:00

Type F Matrix SLUDGE  
 Sampled by CLIENT

% Solids 78

031501 1145 Ver. 4.0.187

ANALYSIS FOR REQUESTED PARAMETERS

Analyzed Parameter	CAS No.	Result	Flg	RLimit	Units	S Method	Date/Time/Anl	DilF
ALUMINUM	7429-90-5	2800		19	mg/Kg	Y SW6010B	02/21/01 02:31 JWJ	1.0
ANTIMONY	7440-36-0	ND	U	0.95	mg/Kg	Y SW6010B	02/21/01 02:31 JWJ	1.0
ARSENIC	7440-38-2	2.9		0.95	mg/Kg	Y SW6010B	02/21/01 02:31 JWJ	1.0
BARIIUM	7440-39-3	58		0.19	mg/Kg	Y SW6010B	02/21/01 02:31 JWJ	1.0
BERYLLIUM	7440-41-7	0.62		0.19	mg/Kg	Y SW6010B	02/21/01 02:31 JWJ	1.0
BORON	7440-42-8	ND	U	19	mg/Kg	Y SW6010B	02/21/01 02:31 JWJ	1.0
CADMIUM	7440-43-9	ND	U	0.19	mg/Kg	Y SW6010B	02/21/01 02:31 JWJ	1.0
CALCIUM	7440-70-2	780		9.5	mg/Kg	Y SW6010B	02/21/01 02:31 JWJ	1.0
CELESIUM	7440-47-3	5.1		0.95	mg/Kg	Y SW6010B	02/21/01 02:31 JWJ	1.0
COBALT	7440-48-4	5.6		0.95	mg/Kg	Y SW6010B	02/21/01 02:31 JWJ	1.0
COPPER	7440-50-8	12		0.95	mg/Kg	Y SW6010B	02/21/01 02:31 JWJ	1.0
IRON	7439-89-6	10000		9.5	mg/Kg	Y SW6010B	02/21/01 02:31 JWJ	1.0
LEAD	7439-92-1	7.6		0.95	mg/Kg	Y SW6010B	02/21/01 02:31 JWJ	1.0
MAGNESIUM	7439-95-4	1300		9.5	mg/Kg	Y SW6010B	02/21/01 02:31 JWJ	1.0
MANGANESE	7439-96-5	190		1.9	mg/Kg	Y SW6010B	02/21/01 02:31 JWJ	1.0
MOLYBDENUM	7439-98-7	ND	U	0.95	mg/Kg	Y SW6010B	02/21/01 02:31 JWJ	1.0
NICKEL	7440-02-0	8.9		0.95	mg/Kg	Y SW6010B	02/21/01 02:31 JWJ	1.0
POTASSIUM	7440-09-7	830		190	mg/Kg	Y SW6010B	02/21/01 02:31 JWJ	1.0
SELENIUM	7782-49-2	1.0		0.95	mg/Kg	Y SW6010B	02/21/01 02:31 JWJ	1.0
SILICON	7440-21-3	1200		19	mg/Kg	Y SW6010B	02/21/01 02:31 JWJ	1.0
SILVER	7440-22-4	ND	U	0.95	mg/Kg	Y SW6010B	02/21/01 02:31 JWJ	1.0
SODIUM	7440-23-5	ND	U	190	mg/Kg	Y SW6010B	02/21/01 02:31 JWJ	1.0
THALLIUM	7440-28-0	ND	U	0.95	mg/Kg	Y SW6010B	02/21/01 02:31 JWJ	1.0
TITANIUM	7440-32-6	50		0.19	mg/Kg	Y SW6010B	02/21/01 02:31 JWJ	1.0
VANADIUM	7440-62-2	8.0		0.95	mg/Kg	Y SW6010B	02/21/01 02:31 JWJ	1.0
ZINC	7440-66-6	28		3.8	mg/Kg	Y SW6010B	02/21/01 02:31 JWJ	1.0
Total Solids (Percent)		78		0.010	%	EPA160.3	02/15/01 15:30 MHS	1.0
Acidity (Soluble)		3600		250	mg/Kg	Y	02/20/01 14:44 TF	100
Alkalinity (Soluble)		890		250	mg/Kg	Y	02/20/01 14:44 TF	100
LIBRARY SEARCH		ND	U			SW8270C	02/26/01 13:06 tjh	1.0
PHENOL	108-95-2	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
BIS(2-CHLOROETHYL)ETHER	111-44-4	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0

CT&E Environmental Services Inc.  
 Laboratory Division: Charleston Laboratory

John Meeks  
 TRIAD ENGINEERING INC

Laboratory Number TA1-B0-P338-002

Page 2

DH 2-9 SLURRY SAMPLE 5-ME  
 SLURRY BAG SAMPLE 5 97.8-100.1 FEET

COC  
 Date Sampled 01/18/01 00:00  
 Date Received 02/13/01 11:00

Type F Matrix SLUDGE  
 Sampled by CLIENT

% Solids 78

031501 1145 Ver. 4.0.187

ANALYSIS FOR REQUESTED PARAMETERS

Analyzed Parameter	CAS No.	Result	Flg	RLimit	Units	S Method	Date/Time/Anl	DilF
2-CHLOROPHENOL	95-57-8	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
1,3-DICHLOROENZENE	541-73-1	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
1,4-DICHLOROENZENE	106-46-7	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
1,2-DICHLOROENZENE	95-50-1	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
2-METHYLPHENOL	95-48-7	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
3- & 4-METHYLPHENOL		ND	U	2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
N-NITROSODI-N-PROPYLAMINE	621-64-7	ND	U	4600	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
HEXACHLOROETHANE	67-72-1	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
BENZENE	98-95-3	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
ISOPHORONE	78-59-1	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
2-NITROPHENOL	88-75-5	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
2,4-DIMETHYLPHENOL	105-67-9	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
BIS(2-CHLOROETHOXY) METHANE	111-91-1	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
2,4-DICHLOROPHENOL	120-83-2	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
1,2,4-TRICHLOROENZENE	120-82-1	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
NAPHTHALENE	91-20-3	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
4-CHLOROANILINE	106-47-8	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
HEXACHLOROBUTADIENE	87-68-3	ND	U	4600	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
4-CHLORO-3-METHYLPHENOL	59-50-7	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
2-METHYLNAPHTHALENE	91-57-6	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
HEXACHLOROCYCLOPENTADIENE	77-47-4	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
2,4,6-TRICHLOROPHENOL	88-06-2	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
2,4,5-TRICHLOROPHENOL	95-95-4	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
2-CHLORONAPHTHALENE	91-58-7	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
2-NITROANILINE	88-74-4	ND	U	12000	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
DIMETHYLPHTHALATE	131-11-3	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
ACENAPHTHYLENE	208-96-8	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
2,6-DINITROTOLUENE	606-20-2	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
3-NITROANILINE	99-09-2	ND	U	12000	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
ACENAPHTHENE	83-32-9	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
2,4-DINITROPHENOL	51-28-5	ND	U	12000	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
4-NITROPHENOL	100-02-7	ND	U	12000	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
DIBENZOFURAN	132-64-9	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
DINITROTOLUENE	121-14-2	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
PHTHALATE	84-66-2	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
4-CHLORODIPHENYLETHER	7005-72-3	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
FLUORENE	86-73-7	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0

CT&E Environmental Services Inc.  
 Laboratory Division: Charleston Laboratory

John Meeks  
 TRIAD ENGINEERING INC

Laboratory Number TA1-B0-P338-002

Page 3

DH 2-9 SLURRY SAMPLE 5-ME  
 SLURRY BAG SAMPLE 5 97.8-100.1 FEET

COC  
 Date Sampled 01/18/01 00:00  
 Date Received 02/13/01 11:00

Type F Matrix SLUDGE  
 Sampled by CLIENT

% Solids 78

031501 1145 Ver. 4.0.187

ANALYSIS FOR REQUESTED PARAMETERS

Analyzed Parameter	CAS No.	Result	Flg	RLimit	Units	S Method	Date/Time/Anl	DilF
4-NITROANILINE	100-01-6	ND	U	12000	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
4,6-DINITRO-2-METHYLPHENOL	534-52-1	ND	U	12000	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
N-NITROSODIPHENYLAMINE	86-30-6	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
4-BROMOPHENYL PHENYL ETHER	101-55-3	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
HEXACHLOROBENZENE	118-74-1	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
PENTACHLOROPHENOL	87-86-5	ND	U	12000	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
PHENANTHRENE	85-01-8	3300		2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
ANTHRACENE	120-12-7	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
-BUTYLPHTHALATE	84-74-2	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
FLUORANTHENE	206-44-0	6300		2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
PYRENE	129-00-0	5100		2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
BUTYL BENZYL PHTHALATE	85-68-7	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
3,3-DICHLOROBENZIDINE	91-94-1	ND	U	4600	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
BENZO(A)ANTHRACENE	56-55-3	3100		2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
CHRYSENE	218-01-9	3200		2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
DI-N-OCTYLPHTHALATE	117-84-0	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
BENZO(B)FLUORANTHENE	205-99-2	2900		2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
BENZO(K)FLUORANTHENE	207-08-9	2700		2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
BENZO(A)PYRENE	50-32-8	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
INDENO(1,2,3-CD)PYRENE	193-39-5	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
DIBENZO(A,H)ANTHRACENE	53-70-3	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
BENZO(G,H,I)PERYLENE	191-24-2	2500		2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
BENZYL ALCOHOL	100-51-6	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
BENZOIC ACID	65-85-0	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
BIS(2-CHLOROISOPROPYL)ETHER	108-60-1	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
SURROGATE RESULTS								
NITROBENZENE-D5	4165-60-0	5400		2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
NITROBENZENE-D5	4165-60-0	23			% REC	Y SW8270C	02/26/01 13:06 tjh	1.0
2-FLUOROBIPHENYL	321-60-8	14000		2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
2-FLUOROBIPHENYL	321-60-8	62			% REC	Y SW8270C	02/26/01 13:06 tjh	1.0
TERPHENYL-D14	1718-51-0	16000		2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
TERPHENYL-D14	1718-51-0	68			% REC	Y SW8270C	02/26/01 13:06 tjh	1.0
F OL-D5	4165-62-2	15000		2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
F OL-D5	4165-62-2	65			% REC	Y SW8270C	02/26/01 13:06 tjh	1.0
2-FLUOROPHENOL	367-12-4	15000		2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
2-FLUOROPHENOL	367-12-4	64			% REC	Y SW8270C	02/26/01 13:06 tjh	1.0

CT&E Environmental Services Inc.  
Laboratory Division: Charleston Laboratory

John Meeks  
TRIAD ENGINEERING INC

Laboratory Number TA1-B0-P338-002

Page 4

DH 2-9 SLURRY SAMPLE 5-ME  
SLURRY BAG SAMPLE 5 97.8-100.1 FEET

COC  
Date Sampled 01/18/01 00:00  
Date Received 02/13/01 11:00

Type F Matrix SLUDGE  
Sampled by CLIENT

% Solids 78

031501 1145 Ver. 4.0.187

ANALYSIS FOR REQUESTED PARAMETERS

Analyzed Parameter	CAS No.	Result	Flg	RLimit	Units	S Method	Date/Time/Anl	DilF
2,4,6-TRIBROMOPHENOL	118-79-6	11000		2300	ug/Kg	Y SW8270C	02/26/01 13:06 tjh	1.0
2,4,6-TRIBROMOPHENOL	118-79-6	48			% REC	Y SW8270C	02/26/01 13:06 tjh	1.0

CT&E Environmental Services Inc.  
Laboratory Division: Charleston Laboratory

John Meeks  
TRIAD ENGINEERING INC

Laboratory Number TA1-C0-P271-002

Page 1

DH 2-9 SLURRY SAMPLE 5-ME  
SLURRY BAG SAMPLE 5 97.8-100.1 FEET

COC  
Date Sampled 01/18/01 00:00  
Date Received 02/13/01 11:00

Type F Matrix SLUDGE  
Sampled by CLIENT

% Solids 78

032001 1358 Ver. 4.0.187

ANALYSIS FOR REQUESTED PARAMETERS

Analyzed Parameter	CAS No.	Result	Flg	RLimit	Units	S Method	Date/Time/Anl	DilF
ACRYLAMIDE	79-06-1	ND	U	0.25	mg/L	Y SW8316	03/19/01 22:36 ra	1.0

CT&E Environmental Services Inc.  
 Laboratory Division: Charleston Laboratory

John Meeks  
 TRIAD ENGINEERING INC

Laboratory Number TA1-B0-P338-003

Page 1

WOLF CREEK #1  
 1.7 MILES DOWNSTREAM OF BIG ANDY CULVERT

COC  
 Date Sampled 01/06/01 00:00  
 Date Received 02/13/01 11:00

Type F Matrix SLUDGE  
 Sampled by CLIENT

% Solids 68

031501 1145 Ver. 4.0.187

ANALYSIS FOR REQUESTED PARAMETERS

Analyzed Parameter	CAS No.	Result	Flg	RLimit	Units	S Method	Date/Time/Anl	DilF
ALUMINUM	7429-90-5	4800		22	mg/Kg	Y SW6010B	02/21/01 02:38 JWJ	1.0
ANTIMONY	7440-36-0	ND	U	1.1	mg/Kg	Y SW6010B	02/21/01 02:38 JWJ	1.0
ARSENIC	7440-38-2	4.6		1.1	mg/Kg	Y SW6010B	02/21/01 02:38 JWJ	1.0
BARIUM	7440-39-3	170		0.22	mg/Kg	Y SW6010B	02/21/01 02:38 JWJ	1.0
BERYLLIUM	7440-41-7	1.2		0.22	mg/Kg	Y SW6010B	02/21/01 02:38 JWJ	1.0
BORON	7440-42-8	ND	U	22	mg/Kg	Y SW6010B	02/21/01 02:38 JWJ	1.0
CADMIUM	7440-43-9	ND	U	0.22	mg/Kg	Y SW6010B	02/21/01 02:38 JWJ	1.0
CALCIUM	7440-70-2	1400		11	mg/Kg	Y SW6010B	02/21/01 02:38 JWJ	1.0
CERIUM	7440-47-3	9.1		1.1	mg/Kg	Y SW6010B	02/21/01 02:38 JWJ	1.0
COBALT	7440-48-4	7.5		1.1	mg/Kg	Y SW6010B	02/21/01 02:38 JWJ	1.0
COPPER	7440-50-8	28		1.1	mg/Kg	Y SW6010B	02/21/01 02:38 JWJ	1.0
IRON	7439-89-6	10000		11	mg/Kg	Y SW6010B	02/21/01 02:38 JWJ	1.0
LEAD	7439-92-1	14		1.1	mg/Kg	Y SW6010B	02/21/01 02:38 JWJ	1.0
MAGNESIUM	7439-95-4	2100		11	mg/Kg	Y SW6010B	02/21/01 02:38 JWJ	1.0
MANGANESE	7439-96-5	92		2.2	mg/Kg	Y SW6010B	02/21/01 02:38 JWJ	1.0
MOLYBDENUM	7439-98-7	ND	U	1.1	mg/Kg	Y SW6010B	02/21/01 02:38 JWJ	1.0
NICKEL	7440-02-0	16		1.1	mg/Kg	Y SW6010B	02/21/01 02:38 JWJ	1.0
POTASSIUM	7440-09-7	1700		220	mg/Kg	Y SW6010B	02/21/01 02:38 JWJ	1.0
SELENIUM	7782-49-2	3.1		1.1	mg/Kg	Y SW6010B	02/21/01 02:38 JWJ	1.0
SILICON	7440-21-3	1400		22	mg/Kg	Y SW6010B	02/21/01 02:38 JWJ	1.0
SILVER	7440-22-4	ND	U	1.1	mg/Kg	Y SW6010B	02/21/01 02:38 JWJ	1.0
SODIUM	7440-23-5	ND	U	220	mg/Kg	Y SW6010B	02/21/01 02:38 JWJ	1.0
THALLIUM	7440-28-0	ND	U	1.1	mg/Kg	Y SW6010B	02/21/01 02:38 JWJ	1.0
TITANIUM	7440-32-6	130		0.22	mg/Kg	Y SW6010B	02/21/01 02:38 JWJ	1.0
VANADIUM	7440-62-2	16		1.1	mg/Kg	Y SW6010B	02/21/01 02:38 JWJ	1.0
ZINC	7440-66-6	35		4.4	mg/Kg	Y SW6010B	02/21/01 02:38 JWJ	1.0
Total Solids (Percent)		68		0.010	%	EPA160.3	02/15/01 15:30 MHS	1.0
Acidity (Soluble)		7600		300	mg/Kg	Y	02/20/01 14:44 TF	100
Alkalinity (Soluble)		1600		300	mg/Kg	Y	02/20/01 14:44 TF	100
Undecane	629-59-4	1900	J		ug/Kg	SW8270C	02/26/01 14:00 tjh	1.0
Naphthalene, 1-hexyl-	2876-53-1	2100	J		ug/Kg	SW8270C	02/26/01 14:00 tjh	1.0
Naphthalene, 1,6-dimethyl-	575-43-9	1900	J		ug/Kg	SW8270C	02/26/01 14:00 tjh	1.0
Heptane, 2,6-dimethyl-	1072-05-5	2000	J		ug/Kg	SW8270C	02/26/01 14:00 tjh	1.0

CT&E Environmental Services Inc.  
 Laboratory Division: Charleston Laboratory

John Meeks  
 TRIAD ENGINEERING INC

Laboratory Number TA1-B0-P338-003

Page 2

WOLF CREEK #1  
 1.7 MILES DOWNSTREAM OF BIG ANDY CULVERT

COC  
 Date Sampled 01/06/01 00:00  
 Date Received 02/13/01 11:00

Type F Matrix SLUDGE  
 Sampled by CLIENT

% Solids 68

031501 1145 Ver. 4.0.187

ANALYSIS FOR REQUESTED PARAMETERS

Analyzed Parameter	CAS No.	Result	Flg	RLimit	Units	S Method	Date/Time/Anl	DilF
PHENOL	108-95-2	ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
BIS(2-CHLOROETHYL)ETHER	111-44-4	ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
2-CHLOROPHENOL	95-57-8	ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
1,3-DICHLOROBENZENE	541-73-1	ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
1,4-DICHLOROBENZENE	106-46-7	ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
1,2-DICHLOROBENZENE	95-50-1	ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
2-METHYLPHENOL	95-48-7	ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
2- & 4-METHYLPHENOL		ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
DITROSODI-N-PROPYLAMINE	621-64-7	ND	U	5400	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
HEXACHLOROETHANE	67-72-1	ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
NITROBENZENE	98-95-3	ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
ISOPHORONE	78-59-1	ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
2-NITROPHENOL	88-75-5	ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
2,4-DIMETHYLPHENOL	105-67-9	ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
BIS(2-CHLOROETHOXY) METHANE	111-91-1	ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
2,4-DICHLOROPHENOL	120-83-2	ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
1,2,4-TRICHLOROBENZENE	120-82-1	ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
NAPHTHALENE	91-20-3	ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
4-CHLOROANILINE	106-47-8	ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
HEXACHLOROBUTADIENE	87-68-3	ND	U	5400	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
4-CHLORO-3-METHYLPHENOL	59-50-7	ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
2-METHYLNAPHTHALENE	91-57-6	ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
HEXACHLOROCYCLOPENTADIENE	77-47-4	ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
2,4,6-TRICHLOROPHENOL	88-06-2	ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
2,4,5-TRICHLOROPHENOL	95-95-4	ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
2-CHLORONAPHTHALENE	91-58-7	ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
2-NITROANILINE	88-74-4	ND	U	13000	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
DIMETHYLPHTHALATE	131-11-3	ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
ACENAPHTHYLENE	208-96-8	ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
2,6-DINITROTOLUENE	606-20-2	ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
3-NITROANILINE	99-09-2	ND	U	13000	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
ACENAPHTHENE	83-32-9	ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
2,4-DINITROPHENOL	51-28-5	ND	U	13000	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
1-NITROPHENOL	100-02-7	ND	U	13000	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
BENZOFURAN	132-64-9	ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
2,4-DINITROTOLUENE	121-14-2	ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
DIETHYLPHTHALATE	84-66-2	ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0

CT&E Environmental Services Inc.  
 Laboratory Division: Charleston Laboratory

John Meeks  
 TRIAD ENGINEERING INC

Laboratory Number TA1-B0-P338-003

Page 3

WOLF CREEK #1  
 1.7 MILES DOWNSTREAM OF BIG ANDY CULVERT

COC  
 Date Sampled 01/06/01 00:00  
 Date Received 02/13/01 11:00

Type F Matrix SLUDGE  
 Sampled by CLIENT

% Solids 68

031501 1145 Ver. 4.0.187

ANALYSIS FOR REQUESTED PARAMETERS

Analyzed Parameter	CAS No.	Result	Flg	RLimit	Units	S Method	Date/Time/Anl	DilF
4-CHLORODIPHENYLETHER	7005-72-3	ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
FLUORENE	86-73-7	ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
4-NITROANILINE	100-01-6	ND	U	13000	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
4,6-DINITRO-2-METHYLPHENOL	534-52-1	ND	U	13000	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
N-NITROSODIPHENYLAMINE	86-30-6	ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
4-BROMOPHENYL PHENYL ETHER	101-55-3	ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
HEXACHLOROBENZENE	118-74-1	ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
PENTACHLOROPHENOL	87-86-5	ND	U	13000	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
ANTHRENE	85-01-8	ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
ANTHRACENE	120-12-7	ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
DI-N-BUTYLPHTHALATE	84-74-2	ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
FLUORANTHENE	206-44-0	ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
PYRENE	129-00-0	ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
BUTYL BENZYL PHTHALATE	85-68-7	ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
3,3-DICHLOROENZIDINE	91-94-1	ND	U	5400	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
BENZO(A)ANTHRACENE	56-55-3	ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
CHRYSENE	218-01-9	ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
DI-N-OCTYLPHTHALATE	117-84-0	ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
BENZO(B)FLUORANTHENE	205-99-2	ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
BENZO(K)FLUORANTHENE	207-08-9	ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
BENZO(A)PYRENE	50-32-8	ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
INDENO(1,2,3-CD)PYRENE	193-39-5	ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
DIBENZO(A,H)ANTHRACENE	53-70-3	ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
BENZO(G,H,I)PERYLENE	191-24-2	ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
BENZYL ALCOHOL	100-51-6	ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
BENZOIC ACID	65-85-0	ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
BIS(2-CHLOROISOPROPYL)ETHER	108-60-1	ND	U	2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
SURROGATE RESULTS								
NITROBENZENE-D5	4165-60-0	6300		2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
NITROBENZENE-D5	4165-60-0	24			% REC	Y SW8270C	02/26/01 14:00 tjh	1.0
2-FLUOROBIPHENYL	321-60-8	9500		2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
2-FLUOROBIPHENYL	321-60-8	35			% REC	Y SW8270C	02/26/01 14:00 tjh	1.0
PHENYL-D14	1718-51-0	10000		2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
PHENYL-D14	1718-51-0	38			% REC	Y SW8270C	02/26/01 14:00 tjh	1.0
PHENOL-D5	4165-62-2	11000		2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
PHENOL-D5	4165-62-2	40			% REC	Y SW8270C	02/26/01 14:00 tjh	1.0



CT&E Environmental Services Inc.  
Laboratory Division: Charleston Laboratory

John Meeks  
TRIAD ENGINEERING INC

Laboratory Number TA1-B0-P338-003

Page 4

WOLF CREEK #1  
1.7 MILES DOWNSTREAM OF BIG ANDY CULVERT

COC  
Date Sampled 01/06/01 00:00  
Date Received 02/13/01 11:00

Type F Matrix SLUDGE  
Sampled by CLIENT

% Solids 68

031501 1145 Ver. 4.0.187

ANALYSIS FOR REQUESTED PARAMETERS

Analyzed Parameter	CAS No.	Result	Flg	RLimit	Units	S Method	Date/Time/Anl	DilF
2-FLUOROPHENOL	367-12-4	10000		2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
2-FLUOROPHENOL	367-12-4	38			% REC	Y SW8270C	02/26/01 14:00 tjh	1.0
2,4,6-TRIBROMOPHENOL	118-79-6	6500		2700	ug/Kg	Y SW8270C	02/26/01 14:00 tjh	1.0
2,4,6-TRIBROMOPHENOL	118-79-6	24			% REC	Y SW8270C	02/26/01 14:00 tjh	1.0

CT&E Environmental Services Inc.  
Laboratory Division: Charleston Laboratory

John Meeks  
TRIAD ENGINEERING INC

Laboratory Number TA1-C0-P271-003

Page 1

WOLF CREEK #1  
1.7 MILES DOWNSTREAM OF BIG ANDY CULVERT

COC  
Date Sampled 01/06/01 00:00  
Date Received 02/13/01 11:00

Type F Matrix SLUDGE  
Sampled by CLIENT

% Solids 68

032001 1358 Ver. 4.0.187

ANALYSIS FOR REQUESTED PARAMETERS

Analyzed Parameter	CAS No.	Result	Flg	RLimit	Units	S Method	Date/Time/Anl	DilF
ACRYLAMIDE	79-06-1	ND	U	0.26	mg/L	Y SW8316	03/19/01 22:48 ra	1.0

CT&E Environmental Services Inc.  
 Laboratory Division: Charleston Laboratory

John Meeks  
 TRIAD ENGINEERING INC

Laboratory Number TA1-B0-P338-004

Page 1

DH 2-9 SLURRY SAMPLE 2-ME  
 SLURRY BAG SAMPLE 2 91.8-93.8 FEET

COC  
 Date Sampled 01/18/01 00:00  
 Date Received 02/13/01 11:00

Type F Matrix SLUDGE  
 Sampled by CLIENT

% Solids 74

031501 1145 Ver. 4.0.187

ANALYSIS FOR REQUESTED PARAMETERS

Analyzed Parameter	CAS No.	Result	Flg	RLimit	Units	S Method	Date/Time/Anl	DilF
ALUMINUM	7429-90-5	3600		20	mg/Kg	Y SW6010B	02/21/01 03:08 JWW	1.0
ANTIMONY	7440-36-0	ND	U	1.0	mg/Kg	Y SW6010B	02/21/01 03:08 JWW	1.0
ARSENIC	7440-38-2	5.0		1.0	mg/Kg	Y SW6010B	02/21/01 03:08 JWW	1.0
BARIUM	7440-39-3	140		0.20	mg/Kg	Y SW6010B	02/21/01 03:08 JWW	1.0
BERYLLIUM	7440-41-7	1.1		0.20	mg/Kg	Y SW6010B	02/21/01 03:08 JWW	1.0
BORON	7440-42-8	ND	U	20	mg/Kg	Y SW6010B	02/21/01 03:08 JWW	1.0
CADMIUM	7440-43-9	ND	U	0.20	mg/Kg	Y SW6010B	02/21/01 03:08 JWW	1.0
CALCIUM	7440-70-2	1200		10	mg/Kg	Y SW6010B	02/21/01 03:08 JWW	1.0
CHLORINE	7440-47-3	11		1.0	mg/Kg	Y SW6010B	02/21/01 03:08 JWW	1.0
COBALT	7440-48-4	7.3		1.0	mg/Kg	Y SW6010B	02/21/01 03:08 JWW	1.0
COPPER	7440-50-8	26		1.0	mg/Kg	Y SW6010B	02/21/01 03:08 JWW	1.0
IRON	7439-89-6	9100		10	mg/Kg	Y SW6010B	02/21/01 03:08 JWW	1.0
LEAD	7439-92-1	13		1.0	mg/Kg	Y SW6010B	02/21/01 03:08 JWW	1.0
MAGNESIUM	7439-95-4	1400		10	mg/Kg	Y SW6010B	02/21/01 03:08 JWW	1.0
MANGANESE	7439-96-5	68		2.0	mg/Kg	Y SW6010B	02/21/01 03:08 JWW	1.0
MOLYBDENUM	7439-98-7	ND	U	1.0	mg/Kg	Y SW6010B	02/21/01 03:08 JWW	1.0
NICKEL	7440-02-0	15		1.0	mg/Kg	Y SW6010B	02/21/01 03:08 JWW	1.0
POTASSIUM	7440-09-7	1300		200	mg/Kg	Y SW6010B	02/21/01 03:08 JWW	1.0
SELENIUM	7782-49-2	4.5		1.0	mg/Kg	Y SW6010B	02/21/01 03:08 JWW	1.0
SILICON	7440-21-3	1300		20	mg/Kg	Y SW6010B	02/21/01 03:08 JWW	1.0
SILVER	7440-22-4	ND	U	1.0	mg/Kg	Y SW6010B	02/21/01 03:08 JWW	1.0
SODIUM	7440-23-5	ND	U	200	mg/Kg	Y SW6010B	02/21/01 03:08 JWW	1.0
THALLIUM	7440-28-0	ND	U	1.0	mg/Kg	Y SW6010B	02/21/01 03:08 JWW	1.0
TITANIUM	7440-32-6	170		0.20	mg/Kg	Y SW6010B	02/21/01 03:08 JWW	1.0
VANADIUM	7440-62-2	26		1.0	mg/Kg	Y SW6010B	02/21/01 03:08 JWW	1.0
ZINC	7440-66-6	29		4.1	mg/Kg	Y SW6010B	02/21/01 03:08 JWW	1.0
Total Solids (Percent)		74		0.010	%	EPA160.3	02/15/01 15:30 MHS	1.0
Acidity (Soluble)		7200		270	mg/Kg	Y	02/20/01 14:44 TF	100
Alkalinity (Soluble)		1000		270	mg/Kg	Y	02/20/01 14:44 TF	100
Naphthalene, 1,3-dimethyl-	575-41-7	2200	J		ug/Kg	SW8270C	02/26/01 14:53 tjh	1.0
Naphthalene, 1,5-dimethyl-	571-61-9	4000	J		ug/Kg	SW8270C	02/26/01 14:53 tjh	1.0
Octadecane, 2,6-dimethyl-	75163-97-2	6900	J		ug/Kg	SW8270C	02/26/01 14:53 tjh	1.0
Naphthalene, 1-methyl-7-(1-methylethyl)-	490-65-3	4400	J		ug/Kg	SW8270C	02/26/01 14:53 tjh	1.0

CT&E Environmental Services Inc.  
 Laboratory Division: Charleston Laboratory

John Meeks  
 TRIAD ENGINEERING INC

Laboratory Number TA1-B0-P338-004

Page 2

DH 2-9 SLURRY SAMPLE 2-ME  
 SLURRY BAG SAMPLE 2 91.8-93.8 FEET

COC  
 Date Sampled 01/18/01 00:00  
 Date Received 02/13/01 11:00

Type F Matrix SLUDGE  
 Sampled by CLIENT

% Solids 74

031501 1145 Ver. 4.0.187

ANALYSIS FOR REQUESTED PARAMETERS

Analyzed Parameter	CAS No.	Result	Flg	RLimit	Units	S Method	Date/Time/Anl	DilF
Eicosane	112-95-8	2300	J		ug/Kg	SW8270C	02/26/01 14:53 tjh	1.0
Heptadecane, 4-methyl-	26429-11-8	2200	J		ug/Kg	SW8270C	02/26/01 14:53 tjh	1.0
Tetracosane	646-31-1	27000	J		ug/Kg	SW8270C	02/26/01 14:53 tjh	1.0
PHENOL	108-95-2	ND	U	2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
BIS(2-CHLOROETHYL)ETHER	111-44-4	ND	U	2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
2-CHLOROPHENOL	95-57-8	ND	U	2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
1,3-DICHLOROBENZENE	541-73-1	ND	U	2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
1,4-DICHLOROBENZENE	106-46-7	ND	U	2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
1,2-DICHLOROBENZENE	95-50-1	ND	U	2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
2-METHYLPHENOL	95-48-7	ND	U	2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
3- & 4-METHYLPHENOL		ND	U	2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
N-NITROSODI-N-PROPYLAMINE	621-64-7	ND	U	4000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
HEXACHLOROETHANE	67-72-1	ND	U	2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
NITROBENZENE	98-95-3	ND	U	2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
ISOPHORONE	78-59-1	ND	U	2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
2-NITROPHENOL	88-75-5	ND	U	2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
2,4-DIMETHYLPHENOL	105-67-9	ND	U	2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
BIS(2-CHLOROETHOXY) METHANE	111-91-1	ND	U	2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
2,4-DICHLOROPHENOL	120-83-2	ND	U	2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
1,2,4-TRICHLOROBENZENE	120-82-1	ND	U	2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
NAPHTHALENE	91-20-3	4100		2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
4-CHLOROANILINE	106-47-8	3800		2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
HEXACHLOROBUTADIENE	87-68-3	ND	U	4000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
4-CHLORO-3-METHYLPHENOL	59-50-7	ND	U	2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
2-METHYLNAPHTHALENE	91-57-6	5900		2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
HEXACHLOROCYCLOPENTADIENE	77-47-4	ND	U	2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
2,4,6-TRICHLOROPHENOL	88-06-2	ND	U	2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
2,4,5-TRICHLOROPHENOL	95-95-4	ND	U	2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
2-CHLORONAPHTHALENE	91-58-7	ND	U	2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
2-NITROANILINE	88-74-4	ND	U	10000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
DIMETHYLPHTHALATE	131-11-3	ND	U	2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
ACENAPHTHYLENE	208-96-8	ND	U	2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
2,4-DINITROTOLUENE	606-20-2	ND	U	2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
3,4-DICHLOROANILINE	99-09-2	ND	U	10000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
ACENAPHTHENE	83-32-9	ND	U	2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
2,4-DINITROPHENOL	51-28-5	ND	U	10000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0

CT&E Environmental Services Inc.  
 Laboratory Division: Charleston Laboratory

John Meeks  
 TRIAD ENGINEERING INC

Laboratory Number TA1-B0-P338-004

Page 3

DH 2-9 SLURRY SAMPLE 2-ME  
 SLURRY BAG SAMPLE 2 91.8-93.8 FEET

COC  
 Date Sampled 01/18/01 00:00  
 Date Received 02/13/01 11:00

Type F Matrix SLUDGE  
 Sampled by CLIENT

% Solids 74

031501 1145 Ver. 4.0.187

ANALYSIS FOR REQUESTED PARAMETERS

Analyzed Parameter	CAS No.	Result	Flg	RLimit	Units	S Method	Date/Time/Anl	DilF
4-NITROPHENOL	100-02-7	ND	U	10000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
DIBENZOFURAN	132-64-9	ND	U	2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
2,4-DINITROTOLUENE	121-14-2	ND	U	2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
DIETHYLPHTHALATE	84-66-2	ND	U	2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
4-CHLORODIPHENYLETHER	7005-72-3	ND	U	2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
FLUORENE	86-73-7	ND	U	2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
4-NITROANILINE	100-01-6	ND	U	10000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
4 6-DINITRO-2-METHYLPHENOL	534-52-1	ND	U	10000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
TROSODIPHENYLAMINE	86-30-6	ND	U	2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
4-BROMOPHENYL PHENYL ETHER	101-55-3	ND	U	2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
HEXACHLOROBENZENE	118-74-1	ND	U	2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
PENTACHLOROPHENOL	87-86-5	ND	U	10000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
PHENANTHRENE	85-01-8	2800		2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
ANTHRACENE	120-12-7	ND	U	2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
DI-N-BUTYLPHTHALATE	84-74-2	ND	U	2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
FLUORANTHENE	206-44-0	ND	U	2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
PYRENE	129-00-0	ND	U	2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
BUTYL BENZYL PHTHALATE	85-68-7	ND	U	2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
3,3-DICHLOROBENZIDINE	91-94-1	ND	U	4000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
BENZO(A)ANTHRACENE	56-55-3	ND	U	2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
CHRYSENE	218-01-9	ND	U	2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ND	U	2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
DI-N-OCTYLPHTHALATE	117-84-0	ND	U	2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
BENZO(B)FLUORANTHENE	205-99-2	ND	U	2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
BENZO(K)FLUORANTHENE	207-08-9	ND	U	2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
BENZO(A)PYRENE	50-32-8	ND	U	2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
INDENO(1,2,3-CD)PYRENE	193-39-5	ND	U	2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
DIBENZO(A,H)ANTHRACENE	53-70-3	ND	U	2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
BENZO(G,H,I)PERYLENE	191-24-2	ND	U	2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
BENZYL ALCOHOL	100-51-6	ND	U	2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
BENZOIC ACID	65-85-0	ND	U	2200	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
BIS(2-CHLOROISOPROPYL)ETHER	108-60-1	ND	U	2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
SURROGATE RESULTS								
M OBOBENZENE-D5	4165-60-0	8200		2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
BOBENZENE-D5	4165-60-0	40			% REC	Y SW8270C	02/26/01 14:53 tjh	1.0
2-FLUOROBIPHENYL	321-60-8	13000		2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
2-FLUOROBIPHENYL	321-60-8	65			% REC	Y SW8270C	02/26/01 14:53 tjh	1.0

CT&E Environmental Services Inc.  
 Laboratory Division: Charleston Laboratory

John Meeks  
 TRIAD ENGINEERING INC

Laboratory Number TA1-B0-P338-004

Page 4

DH 2-9 SLURRY SAMPLE 2-ME  
 SLURRY BAG SAMPLE 2 91.8-93.8 FEET

COC  
 Date Sampled 01/18/01 00:00  
 Date Received 02/13/01 11:00

Type F Matrix SLUDGE  
 Sampled by CLIENT

% Solids 74

031501 1145 Ver. 4.0.187

ANALYSIS FOR REQUESTED PARAMETERS

Analyzed Parameter	CAS No.	Result	Flg	RLimit	Units	S Method	Date/Time/Anl	DilF
TERPHENYL-D14	1718-51-0	16000		2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
TERPHENYL-D14	1718-51-0	78			% REC	Y SW8270C	02/26/01 14:53 tjh	1.0
PHENOL-D5	4165-62-2	16000		2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
PHENOL-D5	4165-62-2	79			% REC	Y SW8270C	02/26/01 14:53 tjh	1.0
2-FLUOROPHENOL	367-12-4	15000		2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
2-FLUOROPHENOL	367-12-4	74			% REC	Y SW8270C	02/26/01 14:53 tjh	1.0
2,4,6-TRIBROMOPHENOL	118-79-6	11000		2000	ug/Kg	Y SW8270C	02/26/01 14:53 tjh	1.0
2,4,6-TRIBROMOPHENOL	118-79-6	55			% REC	Y SW8270C	02/26/01 14:53 tjh	1.0

CT&E Environmental Services Inc.  
Laboratory Division: Charleston Laboratory

John Meeks  
TRIAD ENGINEERING INC

Laboratory Number TA1-C0-P271-004

Page 1

DH 2-9 SLURRY SAMPLE 2-ME  
SLURRY BAG SAMPLE 2 91.8-93.8 FEET

COC  
Date Sampled 01/18/01 00:00  
Date Received 02/13/01 11:00

Type F Matrix SLUDGE  
Sampled by CLIENT

% Solids 74

032001 1358 Ver. 4.0.187

ANALYSIS FOR REQUESTED PARAMETERS

Analyzed Parameter	CAS No.	Result	Flg	RLimit	Units	S Method	Date/Time/Anl	DilF
ACRYLAMIDE	79-06-1	ND	U	1.0	mg/L	Y SW8316	03/19/01 23:01 ra	1.0

CT&E Environmental Services Inc.  
 Laboratory Division: Charleston Laboratory

John Meeks  
 TRIAD ENGINEERING INC

Laboratory Number TA1-80-P338-005

Page 1

SP #5  
 100' UPSTREAM OF DRILL PAD 20' FROM SHORE

COC  
 Date Sampled 01/06/01 00:00  
 Date Received 02/13/01 11:00

Type F Matrix SLUDGE  
 Sampled by CLIENT

% Solids 69

031501 1145 Ver. 4.0.187

ANALYSIS FOR REQUESTED PARAMETERS

Analyzed Parameter	CAS No.	Result	Flg	RLimit	Units	S Method	Date/Time/Anl	DilF
ALUMINUM	7429-90-5	5900		22	mg/Kg	Y SW6010B	02/21/01 03:15 JWJ	1.0
ANTIMONY	7440-36-0	ND	U	1.1	mg/Kg	Y SW6010B	02/21/01 03:15 JWJ	1.0
ARSENIC	7440-38-2	5.1		1.1	mg/Kg	Y SW6010B	02/21/01 03:15 JWJ	1.0
BARIUM	7440-39-3	150		0.22	mg/Kg	Y SW6010B	02/21/01 03:15 JWJ	1.0
BERYLLIUM	7440-41-7	0.91		0.22	mg/Kg	Y SW6010B	02/21/01 03:15 JWJ	1.0
BORON	7440-42-8	ND	U	22	mg/Kg	Y SW6010B	02/21/01 03:15 JWJ	1.0
CADMIUM	7440-43-9	ND	U	0.22	mg/Kg	Y SW6010B	02/21/01 03:15 JWJ	1.0
CALCIUM	7440-70-2	1200		11	mg/Kg	Y SW6010B	02/21/01 03:15 JWJ	1.0
CHROMIUM	7440-47-3	10		1.1	mg/Kg	Y SW6010B	02/21/01 03:15 JWJ	1.0
COBALT	7440-48-4	8.1		1.1	mg/Kg	Y SW6010B	02/21/01 03:15 JWJ	1.0
COPPER	7440-50-8	30		1.1	mg/Kg	Y SW6010B	02/21/01 03:15 JWJ	1.0
IRON	7439-89-6	12000		11	mg/Kg	Y SW6010B	02/21/01 03:15 JWJ	1.0
LEAD	7439-92-1	13		1.1	mg/Kg	Y SW6010B	02/21/01 03:15 JWJ	1.0
MAGNESIUM	7439-95-4	2600		11	mg/Kg	Y SW6010B	02/21/01 03:15 JWJ	1.0
MANGANESE	7439-96-5	97		2.2	mg/Kg	Y SW6010B	02/21/01 03:15 JWJ	1.0
MOLYBDENUM	7439-98-7	ND	U	1.1	mg/Kg	Y SW6010B	02/21/01 03:15 JWJ	1.0
NICKEL	7440-02-0	18		1.1	mg/Kg	Y SW6010B	02/21/01 03:15 JWJ	1.0
POTASSIUM	7440-09-7	1500		220	mg/Kg	Y SW6010B	02/21/01 03:15 JWJ	1.0
SELENIUM	7782-49-2	2.9		1.1	mg/Kg	Y SW6010B	02/21/01 03:15 JWJ	1.0
SILICON	7440-21-3	1800		22	mg/Kg	Y SW6010B	02/21/01 03:15 JWJ	1.0
SILVER	7440-22-4	ND	U	1.1	mg/Kg	Y SW6010B	02/21/01 03:15 JWJ	1.0
SODIUM	7440-23-5	ND	U	220	mg/Kg	Y SW6010B	02/21/01 03:15 JWJ	1.0
THALLIUM	7440-28-0	ND	U	1.1	mg/Kg	Y SW6010B	02/21/01 03:15 JWJ	1.0
TITANIUM	7440-32-6	120		0.22	mg/Kg	Y SW6010B	02/21/01 03:15 JWJ	1.0
VANADIUM	7440-62-2	17		1.1	mg/Kg	Y SW6010B	02/21/01 03:15 JWJ	1.0
ZINC	7440-66-6	43		4.3	mg/Kg	Y SW6010B	02/21/01 03:15 JWJ	1.0
Total Solids (Percent)		69		0.010	%	EPA160.3	02/15/01 15:30 MHS	1.0
Acidity (Soluble)		11000		290	mg/Kg	Y	02/20/01 14:44 TF	100
Alkalinity (Soluble)		1100		290	mg/Kg	Y	02/20/01 14:44 TF	100
Fluorene	112-40-3	2000	J		ug/Kg	SW8270C	02/26/01 15:47 tjh	1.0
Naphthalene, 1-methyl-	90-12-0	2000	J		ug/Kg	SW8270C	02/26/01 15:47 tjh	1.0
Naphthalene, 2,3-dimethyl-	581-40-8	2300	J		ug/Kg	SW8270C	02/26/01 15:47 tjh	1.0
Dodecane, 2-methyl-8-propyl-	55045-07-3	2600	J		ug/Kg	SW8270C	02/26/01 15:47 tjh	1.0



CT&E Environmental Services Inc.  
 Laboratory Division: Charleston Laboratory

John Meeks  
 TRIAD ENGINEERING INC

Laboratory Number TA1-B0-P338-005

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SP #5  
 100' UPSTREAM OF DRILL PAD 20' FROM SHORE

COC  
 Date Sampled 01/06/01 00:00  
 Date Received 02/13/01 11:00

Type F Matrix SLUDGE  
 Sampled by CLIENT

% Solids 69

031501 1145 Ver. 4.0.187

ANALYSIS FOR REQUESTED PARAMETERS

Analyzed Parameter	CAS No.	Result	Flg	RLimit	Units	S Method	Date/Time/Anl	DilF
Octadecane	593-45-3	4900	J		ug/Kg	SW8270C	02/26/01 15:47 tjh	1.0
PHENOL	108-95-2	ND	U	2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
BIS(2-CHLOROETHYL)ETHER	111-44-4	ND	U	2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
2-CHLOROPHENOL	95-57-8	ND	U	2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
1,3-DICHLOROBENZENE	541-73-1	ND	U	2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
1,4-DICHLOROBENZENE	106-46-7	ND	U	2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
1,2-DICHLOROBENZENE	95-50-1	ND	U	2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
2-METHYLPHENOL	95-48-7	ND	U	2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
3- & 4-METHYLPHENOL		ND	U	2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
N-NITROSODI-N-PROPYLAMINE	621-64-7	ND	U	5200	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
HEXACHLOROETHANE	67-72-1	ND	U	2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
NITROBENZENE	98-95-3	ND	U	2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
ISOPHORONE	78-59-1	ND	U	2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
2-NITROPHENOL	88-75-5	ND	U	2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
2,4-DIMETHYLPHENOL	105-67-9	ND	U	2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
BIS(2-CHLOROETHOXY) METHANE	111-91-1	ND	U	2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
2,4-DICHLOROPHENOL	120-83-2	ND	U	2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
1,2,4-TRICHLOROBENZENE	120-82-1	ND	U	2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
NAPHTHALENE	91-20-3	ND	U	2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
4-CHLOROANILINE	106-47-8	2600		2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
HEXACHLOROBUTADIENE	87-68-3	ND	U	5200	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
4-CHLORO-3-METHYLPHENOL	59-50-7	ND	U	2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
2-METHYLNAPHTHALENE	91-57-6	3000		2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
HEXACHLOROCYCLOPENTADIENE	77-47-4	ND	U	2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
2,4,6-TRICHLOROPHENOL	88-06-2	ND	U	2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
2,4,5-TRICHLOROPHENOL	95-95-4	ND	U	2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
2-CHLORONAPHTHALENE	91-58-7	ND	U	2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
2-NITROANILINE	88-74-4	ND	U	13000	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
DIMETHYLPHTHALATE	131-11-3	ND	U	2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
ACENAPHTHYLENE	208-96-8	ND	U	2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
2,6-DINITROTOLUENE	606-20-2	ND	U	2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
3-NITROANILINE	99-09-2	ND	U	13000	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
1-NAPHTHENE	83-32-9	ND	U	2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
2,4-DINITROPHENOL	51-28-5	ND	U	13000	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
4-NITROPHENOL	100-02-7	ND	U	13000	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
DIBENZOFURAN	132-64-9	ND	U	2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0

CT&E Environmental Services Inc.  
 Laboratory Division: Charleston Laboratory

John Meeks  
 TRIAD ENGINEERING INC

Laboratory Number TA1-B0-P338-005

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SP #5  
 100' UPSTREAM OF DRILL PAD 20' FROM SHORE

COC  
 Date Sampled 01/06/01 00:00  
 Date Received 02/13/01 11:00

Type F Matrix SLUDGE  
 Sampled by CLIENT

% Solids 69

031501 1145 Ver. 4.0.187

ANALYSIS FOR REQUESTED PARAMETERS

Analyzed Parameter	CAS No.	Result	Flg	RLimit	Units	S Method	Date/Time/Anl	DilF
2,4-DINITROTOLUENE	121-14-2	ND	U	2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
DIETHYLPHthalate	84-66-2	ND	U	2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
4-CHLORODIPHENYLEther	7005-72-3	ND	U	2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
FLUORENE	86-73-7	ND	U	2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
4-NITROANILINE	100-01-6	ND	U	13000	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
4,6-DINITRO-2-METHYLPHENOL	534-52-1	ND	U	13000	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
N-NITROSODIPHENYLAMINE	86-30-6	ND	U	2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
4-BROMOPHENYL PHENYL ETHER	101-55-3	ND	U	2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
CHLOROBenzene	118-74-1	ND	U	2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
PENTACHLOROPHENOL	87-86-5	ND	U	13000	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
PHENANTHRENE	85-01-8	ND	U	2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
ANTHRACENE	120-12-7	ND	U	2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
DI-N-BUTYLPHthalate	84-74-2	ND	U	2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
FLUORANTHENE	206-44-0	ND	U	2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
PYRENE	129-00-0	ND	U	2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
BUTYL BENZYL PHthalate	85-68-7	ND	U	2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
3,3-DICHLOROBENZIDINE	91-94-1	ND	U	5200	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
BENZO(A)ANTHRACENE	56-55-3	ND	U	2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
CHRYSENE	218-01-9	ND	U	2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
BIS(2-ETHYLHEXYL) PHthalate	117-81-7	ND	U	2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
DI-N-OCTYLPHthalate	117-84-0	ND	U	2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
BENZO(B)FLUORANTHENE	205-99-2	ND	U	2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
BENZO(K)FLUORANTHENE	207-08-9	ND	U	2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
BENZO(A)PYRENE	50-32-8	ND	U	2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
INDENO(1,2,3-CD)PYRENE	193-39-5	ND	U	2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
DIBENZO(A,H)ANTHRACENE	53-70-3	ND	U	2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
BENZO(G,H,I)PERYLENE	191-24-2	ND	U	2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
BENZYL ALCOHOL	100-51-6	ND	U	2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
BENZOIC ACID	65-85-0	ND	U	2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
BIS(2-CHLOROISOPROPYL)ETHER	108-60-1	ND	U	2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
SURROGATE RESULTS								
NITROBENZENE-D5	4165-60-0	7000		2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
NITROBENZENE-D5	4165-60-0	27			% REC	Y SW8270C	02/26/01 15:47 tjh	1.0
UOROBIPHENYL	321-60-8	14000		2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
UOROBIPHENYL	321-60-8	53			% REC	Y SW8270C	02/26/01 15:47 tjh	1.0
TERPHENYL-D14	1718-51-0	15000		2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
TERPHENYL-D14	1718-51-0	57			% REC	Y SW8270C	02/26/01 15:47 tjh	1.0

CT&E Environmental Services Inc.  
 Laboratory Division: Charleston Laboratory

John Meeks  
 TRIAD ENGINEERING INC

Laboratory Number TA1-B0-P338-005

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SP #5  
 100' UPSTREAM OF DRILL PAD 20' FROM SHORE

COC  
 Date Sampled 01/06/01 00:00  
 Date Received 02/13/01 11:00

Type F Matrix SLUDGE  
 Sampled by CLIENT

% Solids 69

031501 1145 Ver. 4.0.187

ANALYSIS FOR REQUESTED PARAMETERS

Analyzed Parameter	CAS No.	Result	Flg	RLimit	Units	S Method	Date/Time/Anl	DilF
PHENOL-D5	4165-62-2	18000		2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
PHENOL-D5	4165-62-2	70			% REC	Y SW8270C	02/26/01 15:47 tjh	1.0
2-FLUOROPHENOL	367-12-4	14000		2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
2-FLUOROPHENOL	367-12-4	54			% REC	Y SW8270C	02/26/01 15:47 tjh	1.0
2,4,6-TRIBROMOPHENOL	118-79-6	12000		2600	ug/Kg	Y SW8270C	02/26/01 15:47 tjh	1.0
2,4,6-TRIBROMOPHENOL	118-79-6	48			% REC	Y SW8270C	02/26/01 15:47 tjh	1.0

CT&E Environmental Services Inc.  
Laboratory Division: Charleston Laboratory

John Meeks  
TRIAD ENGINEERING INC

Laboratory Number TA1-C0-P271-005

Page 1

SP #5  
100' UPSTREAM OF DRILL PAD 20' FROM SHORE

COC  
Date Sampled 01/06/01 00:00  
Date Received 02/13/01 11:00

Type F Matrix SLUDGE  
Sampled by CLIENT

% Solids 69

032001 1358 Ver. 4.0.187

ANALYSIS FOR REQUESTED PARAMETERS

Analyzed Parameter	CAS No.	Result	Flg	RLimit	Units	S Method	Date/Time/Anl	DilF
ACRYLAMIDE	79-06-1	ND	U	1.0	mg/L	Y SW8316	03/19/01 23:14 ra	1.0

CT&E Environmental Services Inc.  
 Laboratory Division: Charleston Laboratory

John Meeks  
 TRIAD ENGINEERING INC

Laboratory Number TA1-80-P338-006

Page 1

CW #1  
 2000' UPSTREAM OF CONF. AT STRAIGHT FORK

COC  
 Date Sampled 01/06/01 00:00  
 Date Received 02/13/01 11:00

Type F Matrix SLUDGE  
 Sampled by CLIENT

% Solids 71

031501 1145 Ver. 4.0.187

ANALYSIS FOR REQUESTED PARAMETERS

Analyzed Parameter	CAS No.	Result	Flg	RLimit	Units	S Method	Date/Time/Anl	DilF
ALUMINUM	7429-90-5	4800		21	mg/Kg	Y SW6010B	02/21/01 03:23 JWJ	1.0
ANTIMONY	7440-36-0	ND	U	1.0	mg/Kg	Y SW6010B	02/21/01 03:23 JWJ	1.0
ARSENIC	7440-38-2	4.5		1.0	mg/Kg	Y SW6010B	02/21/01 03:23 JWJ	1.0
BARIUM	7440-39-3	170		0.21	mg/Kg	Y SW6010B	02/21/01 03:23 JWJ	1.0
BERYLLIUM	7440-41-7	1.2		0.21	mg/Kg	Y SW6010B	02/21/01 03:23 JWJ	1.0
BORON	7440-42-8	ND	U	21	mg/Kg	Y SW6010B	02/21/01 03:23 JWJ	1.0
CADMIUM	7440-43-9	ND	U	0.21	mg/Kg	Y SW6010B	02/21/01 03:23 JWJ	1.0
CAESIUM	7440-70-2	1400		10	mg/Kg	Y SW6010B	02/21/01 03:23 JWJ	1.0
CERIUM	7440-47-3	8.4		1.0	mg/Kg	Y SW6010B	02/21/01 03:23 JWJ	1.0
COBALT	7440-48-4	7.3		1.0	mg/Kg	Y SW6010B	02/21/01 03:23 JWJ	1.0
COPPER	7440-50-8	28		1.0	mg/Kg	Y SW6010B	02/21/01 03:23 JWJ	1.0
IRON	7439-89-6	9800		10	mg/Kg	Y SW6010B	02/21/01 03:23 JWJ	1.0
LEAD	7439-92-1	13		1.0	mg/Kg	Y SW6010B	02/21/01 03:23 JWJ	1.0
MAGNESIUM	7439-95-4	2000		10	mg/Kg	Y SW6010B	02/21/01 03:23 JWJ	1.0
MANGANESE	7439-96-5	100		2.1	mg/Kg	Y SW6010B	02/21/01 03:23 JWJ	1.0
MOLYBDENUM	7439-98-7	ND	U	1.0	mg/Kg	Y SW6010B	02/21/01 03:23 JWJ	1.0
NICKEL	7440-02-0	15		1.0	mg/Kg	Y SW6010B	02/21/01 03:23 JWJ	1.0
POTASSIUM	7440-09-7	1700		210	mg/Kg	Y SW6010B	02/21/01 03:23 JWJ	1.0
SELENIUM	7782-49-2	3.3		1.0	mg/Kg	Y SW6010B	02/21/01 03:23 JWJ	1.0
SILICON	7440-21-3	2300		21	mg/Kg	Y SW6010B	02/21/01 03:23 JWJ	1.0
SILVER	7440-22-4	ND	U	1.0	mg/Kg	Y SW6010B	02/21/01 03:23 JWJ	1.0
SODIUM	7440-23-5	ND	U	210	mg/Kg	Y SW6010B	02/21/01 03:23 JWJ	1.0
THALLIUM	7440-28-0	ND	U	1.0	mg/Kg	Y SW6010B	02/21/01 03:23 JWJ	1.0
TITANIUM	7440-32-6	100		0.21	mg/Kg	Y SW6010B	02/21/01 03:23 JWJ	1.0
VANADIUM	7440-62-2	15		1.0	mg/Kg	Y SW6010B	02/21/01 03:23 JWJ	1.0
ZINC	7440-66-6	37		4.2	mg/Kg	Y SW6010B	02/21/01 03:23 JWJ	1.0
Total Solids (Percent)		71		0.010	%	EPA160.3	02/15/01 15:30 MHS	1.0
Acidity (Soluble)		6200		280	mg/Kg	Y	02/20/01 14:44 TF	100
Alkalinity (Soluble)		1600		280	mg/Kg	Y	02/20/01 14:44 TF	100
Decane, 2,6,10,14-tetramethyl-	1921-70-6	2000	J		ug/Kg	SW8270C	02/26/01 16:40 tjh	1.0
PHENOL	108-95-2	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
BIS(2-CHLOROETHYL)ETHER	111-44-4	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0

CT&E Environmental Services Inc.  
 Laboratory Division: Charleston Laboratory

John Meeks  
 TRIAD ENGINEERING INC

Laboratory Number TA1-B0-P338-006

Page 2

CW #1  
 2000' UPSTREAM OF CONF. AT STRAIGHT FORK

COC  
 Date Sampled 01/06/01 00:00  
 Date Received 02/13/01 11:00

Type F Matrix SLUDGE  
 Sampled by CLIENT

% Solids 71

031501 1145 Ver. 4.0.187

ANALYSIS FOR REQUESTED PARAMETERS

Analyzed Parameter	CAS No.	Result	Flg	RLimit	Units	S Method	Date/Time/Anl	DilF
2-CHLOROPHENOL	95-57-8	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
1,3-DICHLOROBENZENE	541-73-1	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
1,4-DICHLOROBENZENE	106-46-7	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
1,2-DICHLOROBENZENE	95-50-1	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
2-METHYLPHENOL	95-48-7	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
3- & 4-METHYLPHENOL		ND	U	2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
N-NITROSODI-N-PROPYLAMINE	621-64-7	ND	U	4700	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
HEXACHLOROETHANE	67-72-1	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
1,2,4-TRICHLOROBENZENE	98-95-3	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
ISOPHORONE	78-59-1	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
2-NITROPHENOL	88-75-5	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
2,4-DIMETHYLPHENOL	105-67-9	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
BIS(2-CHLOROETHOXY) METHANE	111-91-1	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
2,4-DICHLOROPHENOL	120-83-2	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
1,2,4-TRICHLOROBENZENE	120-82-1	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
NAPHTHALENE	91-20-3	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
4-CHLOROANILINE	106-47-8	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
HEXACHLOROBUTADIENE	87-68-3	ND	U	4700	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
4-CHLORO-3-METHYLPHENOL	59-50-7	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
2-METHYLNAPHTHALENE	91-57-6	2400		2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
HEXACHLOROCYCLOPENTADIENE	77-47-4	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
2,4,6-TRICHLOROPHENOL	88-06-2	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
2,4,5-TRICHLOROPHENOL	95-95-4	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
2-CHLORONAPHTHALENE	91-58-7	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
2-NITROANILINE	88-74-4	ND	U	12000	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
DIMETHYLPHTHALATE	131-11-3	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
ACENAPHTHYLENE	208-96-8	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
2,6-DINITROTOLUENE	606-20-2	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
3-NITROANILINE	99-09-2	ND	U	12000	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
ACENAPHTHENE	83-32-9	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
2,4-DINITROPHENOL	51-28-5	ND	U	12000	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
4-NITROPHENOL	100-02-7	ND	U	12000	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
DIBENZOFURAN	132-64-9	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
1,2-DINITROTOLUENE	121-14-2	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
DIMETHYLPHTHALATE	84-66-2	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
4-CHLORODIPHENYLETHER	7005-72-3	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
FLUORENE	86-73-7	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0

CT&E Environmental Services Inc.  
 Laboratory Division: Charleston Laboratory

John Meeks  
 TRIAD ENGINEERING INC

Laboratory Number TA1-B0-P338-006

Page 3

CW #1  
 2000' UPSTREAM OF CONF. AT STRAIGHT FORK

COC  
 Date Sampled 01/06/01 00:00  
 Date Received 02/13/01 11:00

Type F Matrix SLUDGE  
 Sampled by CLIENT

% Solids 71

031501 1145 Ver. 4.0.187

ANALYSIS FOR REQUESTED PARAMETERS

Analyzed Parameter	CAS No.	Result	Flg	RLimit	Units	S Method	Date/Time/Anl	DilF
4-NITROANILINE	100-01-6	ND	U	12000	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
4,6-DINITRO-2-METHYLPHENOL	534-52-1	ND	U	12000	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
N-NITROSODIPHENYLAMINE	86-30-6	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
4-BROMOPHENYL PHENYL ETHER	101-55-3	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
HEXACHLOROBENZENE	118-74-1	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
PENTACHLOROPHENOL	87-86-5	ND	U	12000	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
PHENANTHRENE	85-01-8	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
ANTHRACENE	120-12-7	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
4-TERT-BUTYLPHTHALATE	84-74-2	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
FLUORANTHENE	206-44-0	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
PYRENE	129-00-0	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
BUTYL BENZYL PHTHALATE	85-68-7	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
3,3-DICHLOROBENZIDINE	91-94-1	ND	U	4700	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
BENZO(A)ANTHRACENE	56-55-3	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
CHRYSENE	218-01-9	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
DI-N-OCTYLPHTHALATE	117-84-0	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
BENZO(B)FLUORANTHENE	205-99-2	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
BENZO(K)FLUORANTHENE	207-08-9	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
BENZO(A)PYRENE	50-32-8	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
INDENO(1,2,3-CD)PYRENE	193-39-5	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
DIBENZO(A,H)ANTHRACENE	53-70-3	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
BENZO(G,H,I)PERYLENE	191-24-2	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
BENZYL ALCOHOL	100-51-6	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
BENZOIC ACID	65-85-0	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
BIS(2-CHLOROISOPROPYL)ETHER	108-60-1	ND	U	2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
SURROGATE RESULTS								
NITROBENZENE-D5	4165-60-0	9600		2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
NITROBENZENE-D5	4165-60-0	41			% REC	Y SW8270C	02/26/01 16:40 tjh	1.0
2-FLUOROBIPHENYL	321-60-8	10000		2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
2-FLUOROBIPHENYL	321-60-8	42			% REC	Y SW8270C	02/26/01 16:40 tjh	1.0
TERPHENYL-D14	1718-51-0	12000		2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
TERPHENYL-D14	1718-51-0	52			% REC	Y SW8270C	02/26/01 16:40 tjh	1.0
P L-D5	4165-62-2	15000		2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
PHENOL-D5	4165-62-2	64			% REC	Y SW8270C	02/26/01 16:40 tjh	1.0
2-FLUOROPHENOL	367-12-4	12000		2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
2-FLUOROPHENOL	367-12-4	53			% REC	Y SW8270C	02/26/01 16:40 tjh	1.0

CT&E Environmental Services Inc.  
 Laboratory Division: Charleston Laboratory

John Meeks  
 TRIAD ENGINEERING INC

Laboratory Number TA1-B0-P338-006

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CW #1  
 2000' UPSTREAM OF CONF. AT STRAIGHT FORK

COC  
 Date Sampled 01/06/01 00:00  
 Date Received 02/13/01 11:00

Type F Matrix SLUDGE  
 Sampled by CLIENT

% Solids 71

031501 1145 Ver. 4.0.187

ANALYSIS FOR REQUESTED PARAMETERS

Analyzed Parameter	CAS No.	Result	Flg	RLimit	Units	S Method	Date/Time/Anl	DilF
2,4,6-TRIBROMOPHENOL	118-79-6	8700		2300	ug/Kg	Y SW8270C	02/26/01 16:40 tjh	1.0
2,4,6-TRIBROMOPHENOL	118-79-6	37			% REC	Y SW8270C	02/26/01 16:40 tjh	1.0



CT&E Environmental Services Inc.  
Laboratory Division: Charleston Laboratory

John Meeks  
TRIAD ENGINEERING INC

Laboratory Number TA1-C0-P271-006

Page 1

CW #1  
2000' UPSTREAM OF CONF. AT STRAIGHT FORK

COC  
Date Sampled 01/06/01 00:00  
Date Received 02/13/01 11:00

Type F Matrix WATER  
Sampled by CLIENT

% Solids 71

032001 1358 Ver. 4.0.187

ANALYSIS FOR REQUESTED PARAMETERS

Analyzed Parameter	CAS No.	Result	Flg	RLimit	Units	S Method	Date/Time/Anl	DilF
ACRYLAMIDE	79-06-1	ND	U	0.26	mg/L	Y SW8316	03/19/01 23:26 ra	1.0

***APPENDIX C***

***GEOPHYSICAL INVESTIGATION***



**Final Report  
Geophysical Survey  
Big Branch Slurry Impoundment  
Martin County Coal Corporation  
Martin County, KY  
Enviroscan Reference Number 120015**

**Prepared For: Triad Engineering, Inc.  
Prepared By: Enviroscan, Inc.  
January 23, 2001**



January 23, 2001

Mr. John Nottingham  
**Triad Engineering, Inc.**  
4980 Teays Valley Road  
Scott Depot, WV 25560

RE: Geophysical Survey  
Big Branch Slurry Impoundment  
Martin County Coal Corporation  
Martin County, KY  
Enviroscan Reference Number 120015

Dear Mr. Nottingham:

Pursuant to our proposal, dated December 11, 2000, Enviroscan, Inc. completed a geophysical survey of the above-referenced site between December 18 through 20, 2000. The methods and results of the survey are described in the following text and figures.

## **Survey Purpose**

The geophysical survey area lies in a dammed valley that has been used by the Martin County Coal Corporation as a coal washing slurry impoundment. According to information provided by Triad Engineering, Inc. (Triad) and the Mine Safety and Health Administration (MSHA), the impoundment bottom failed, releasing semi-liquid coal slurry into nearby mine workings. The purpose of the geophysical survey was to determine whether there is geophysical evidence to constrain the location of the presumed conduit or breakthrough from the impoundment into the mine workings. The survey area consists of a recently constructed earthen drilling pad extending out into the slurry impoundment. The locations of selected recent boreholes (by others) within the survey area are depicted on Figure 1.

Mr. Nottingham  
January 23, 2001  
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## Survey Method

Based on the site conditions and survey purpose, Enviroscan performed a mise-a-la-masse electrical profiling survey. The mise-a-la-masse method is commonly used in the mining industry to map the extent of conductive ore bodies. The principles of the mise-a-la-masse method are depicted in Appendix A, and are described in detail in e.g. Telford, W.M., Geldart, L.P., and Sheriff, R.E., 1990, Applied Geophysics, Cambridge University Press. The method is based on the idea that an electrically conductive subsurface body (in this case the slurry-filled mine working and conduit/breakthrough area) will radiate the signal from an inserted current electrode. Concentrations of current flow at the ground surface are expected to mimic the footprint of the conductive body.

In this case, mine workings containing electrically conductive slurry were energized by a current source electrode inserted through borehole DH1-11. A current sink electrode was placed on the far western shore of the impoundment – at a distance of over 1500 feet representing essentially electrical infinity. The approximate footprint of the slurry-filled mine workings, and the possible breakthrough zone were then delineated by mapping the current flow from the energized mine workings. Current flow was mapped as voltage using a pair of voltage electrodes (with a constant 20-foot spacing) attached to a high-impedance microvolt meter. The voltage electrodes were walked along linear profiles radiating from the current electrode borehole, with the voltage electrodes arranged collinearly with the borehole. For each measurement, the midpoint of the voltage electrodes was measured using a backpack-mounted Trimble Pathfinder global positioning system (GPS) receiver in contact with 6 to 8 position-fixing satellites. Real-time communication with OmniStar resulted in differential GPS (DGPS) positioning with an accuracy of plus or minus approximately two feet. The applied signal was generated by an Advanced GeoSciences Sting R1-IP earth resistivity meter. The voltage measurements were also collected and digitally recorded by the Sting R1-IP.

The field survey was conducted on the nights of December 19 and 20, 2000. Nighttime work was necessitated by the contemporary drilling efforts on the site. In order to minimize “leakage” of electrical current from the mine workings, drilling steel was removed from any active holes prior to commencement of the electrical survey, and readings were spread across two nights, to allow avoidance of the drill rigs themselves. Note that a drill rod is reportedly stuck in borehole DHX-2 (see Figure 1), but it extends no closer than approximately 10 feet to the top of the coal seam.

Mr. Nottingham  
January 23, 2001  
Page 3

The field voltages from the survey stations depicted in Figure 1 were subjected to removal of a geometric factor derived from standard equations for a gradient array (see e.g. Telford et al., 1990). The corrected voltages were contoured using the statistical kriging algorithm in SURFER by Golden Software, and are depicted in Figure 2. Note that Figures 1, 2 and 3 also depict a depression that was GPS-surveyed by Enviroscan in the field, and which the drillers reported was suffering active subsidence during the drilling operations.

The main feature of Figure 2 is a zone of high voltage that mimics the reported westward extent of mine workings near the surficial depression. This high voltage zone presumably mimics the footprint of a subsurface electrically conductive zone in contact with the electrode inserted through DH1-11. A portion of the mine workings containing slurry (or other wet and therefore electrically conductive earth materials) would produce such a zone. The footprint of this zone is shown in gray on Figure 3. Note that it presumably extends some distance eastward (beyond the geophysical survey data coverage).

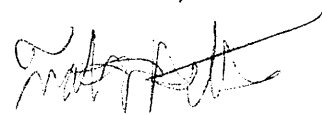
Superimposed on the overall high voltage anomaly are two distinct peaks (and a third subtle peak). The footprints of the two main peaks are highlighted on Figure 3. These peaks should represent areas where a portion of the electrically conductive target extends closer to the ground surface – e.g. areas of current leakage from the electrified mine workings. Such current leakage would certainly occur through the breakthrough/conduit from the slurry impoundment, and could also occur along natural mineralized or oxidized near-vertical joints or fractures intersecting the mine workings. Note that none of the three anomaly peaks coincide with contemporary drilling operations or features, and are therefore interpreted as representing actual subsurface conditions rather than artifacts or interference.

ENVIROSCAN, INC.

Mr. Nottingham  
January 23, 2001  
Page 4

We have appreciated this opportunity to work with you. If you have any questions, please do not hesitate to contact me.

Sincerely,  
**Enviroscan, Inc.**



Timothy D. Bechtel, Ph.D., P.G.  
Principal Geophysicist

enc.: Figure 1: Geophysical Survey Data Coverage  
Figure 2: Mise a la Masse Survey Data  
Figure 3: Mise a la Masse Survey Interpretation  
Appendix A: Mise-a-la-Masse Method Schematic



**Legend:**

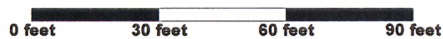
- + Mise a la Masse Survey Station
- x Drill Hole (by others)

**Notes:**

Coordinates in KY North State Plane Grid, NAD-83 geodetic datum.

Survey stations and drill hole locations from DGPS survey by Enviroscan, Inc.

Mine plan and coal outcrop lines digitized from portions of "MSHA Drilling Program" map provided by MSHA.



**Figure 1**

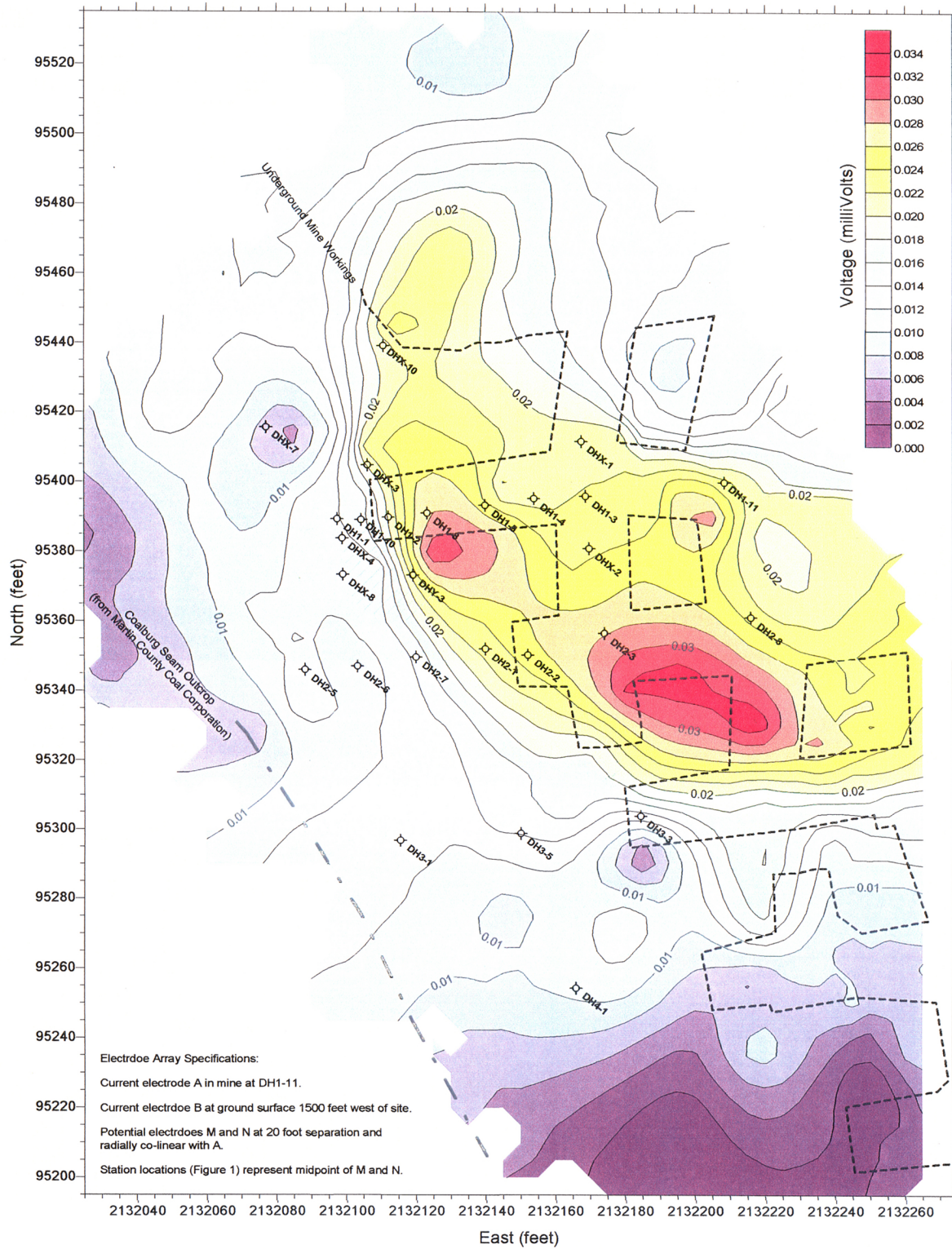
**Geophysical Survey Data Coverage**

**Big Branch Slurry Impoundment  
Martin County Coal Corporation  
Martin Co., KY**

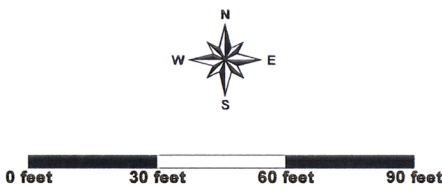
**Enviroscan, Inc.  
Project No. 120016  
Rev. 01/03/01**







Electrode Array Specifications:  
 Current electrode A in mine at DH1-11.  
 Current electrode B at ground surface 1500 feet west of site.  
 Potential electrodes M and N at 20 foot separation and radially co-linear with A.  
 Station locations (Figure 1) represent midpoint of M and N.



Legend:  
 + Mise a la Masse Survey Station  
 ⊕ Drill Hole (by others)

Notes:  
 Coordinates in KY North State Plane Grid, NAD-83 geodetic datum.  
 Survey stations and drill hole locations from DGPS survey by Enviroscan, Inc.  
 Mine plan and coal outcrop lines digitized from portions of "MSHA Drilling Program" map provided by MSHA.

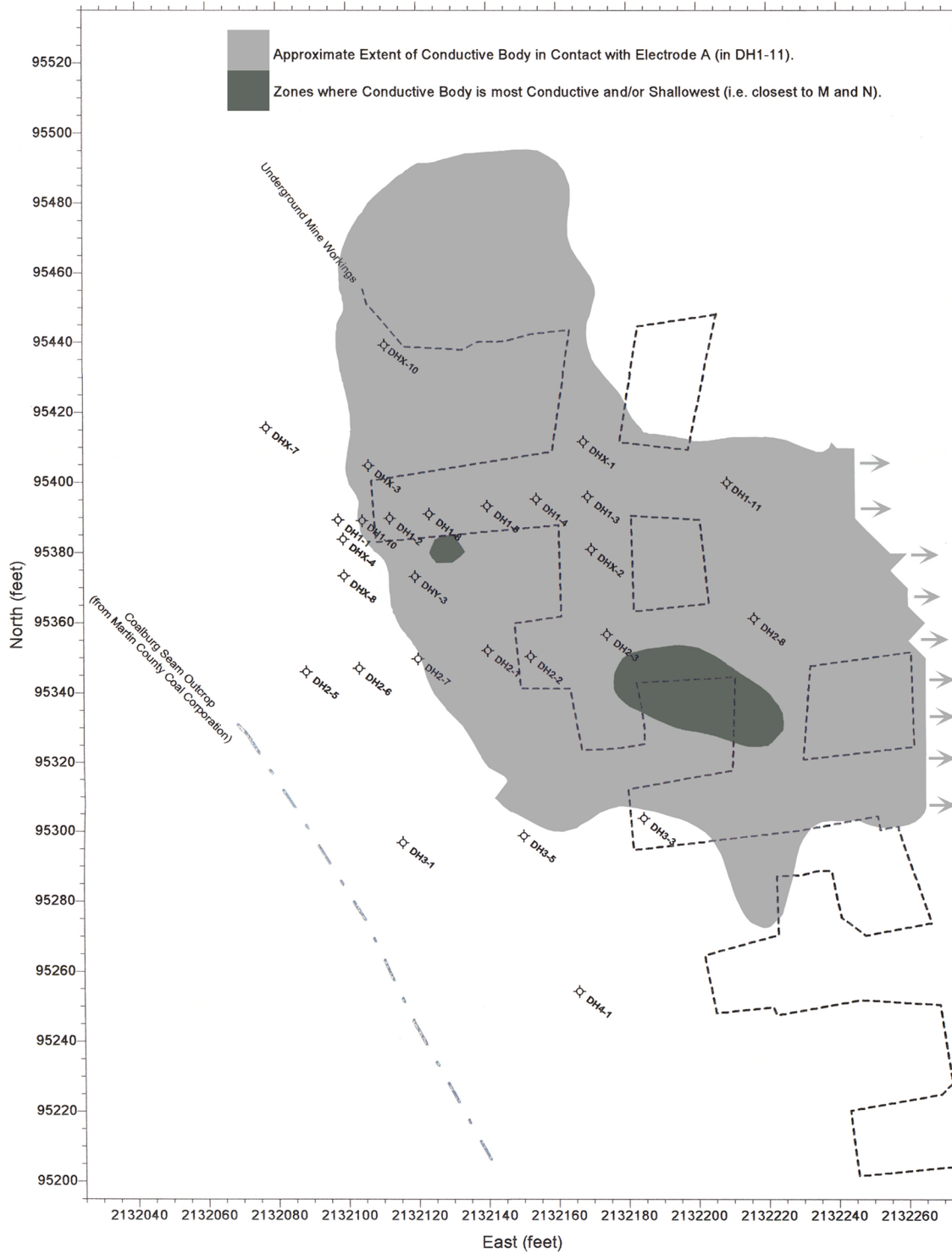
Figure 2

Mise a la Masse Survey Data

Big Branch Slurry Impoundment  
 Martin County Coal Corporation  
 Martin Co., KY

Enviroscan, Inc.  
 Project No. 120016  
 Rev. 01/03/01





0 feet 30 feet 60 feet 90 feet

**Legend:**

- + Mise a la Masse Survey Station
- ◇ Drill Hole (by others)

**Notes:**

Coordinates in KY North State Plane Grid, NAD-83 geodetic datum.  
 Survey stations and drill hole locations from DGPS survey by Enviroscan, Inc.  
 Mine plan and coal outcrop lines digitized from portions of "MSHA Drilling Program" map provided by MSHA.

**Figure 3**

**Mise a la Masse  
 Survey Interpretation**

**Big Branch Slurry Impoundment  
 Martin County Coal Corporation  
 Martin Co., KY**

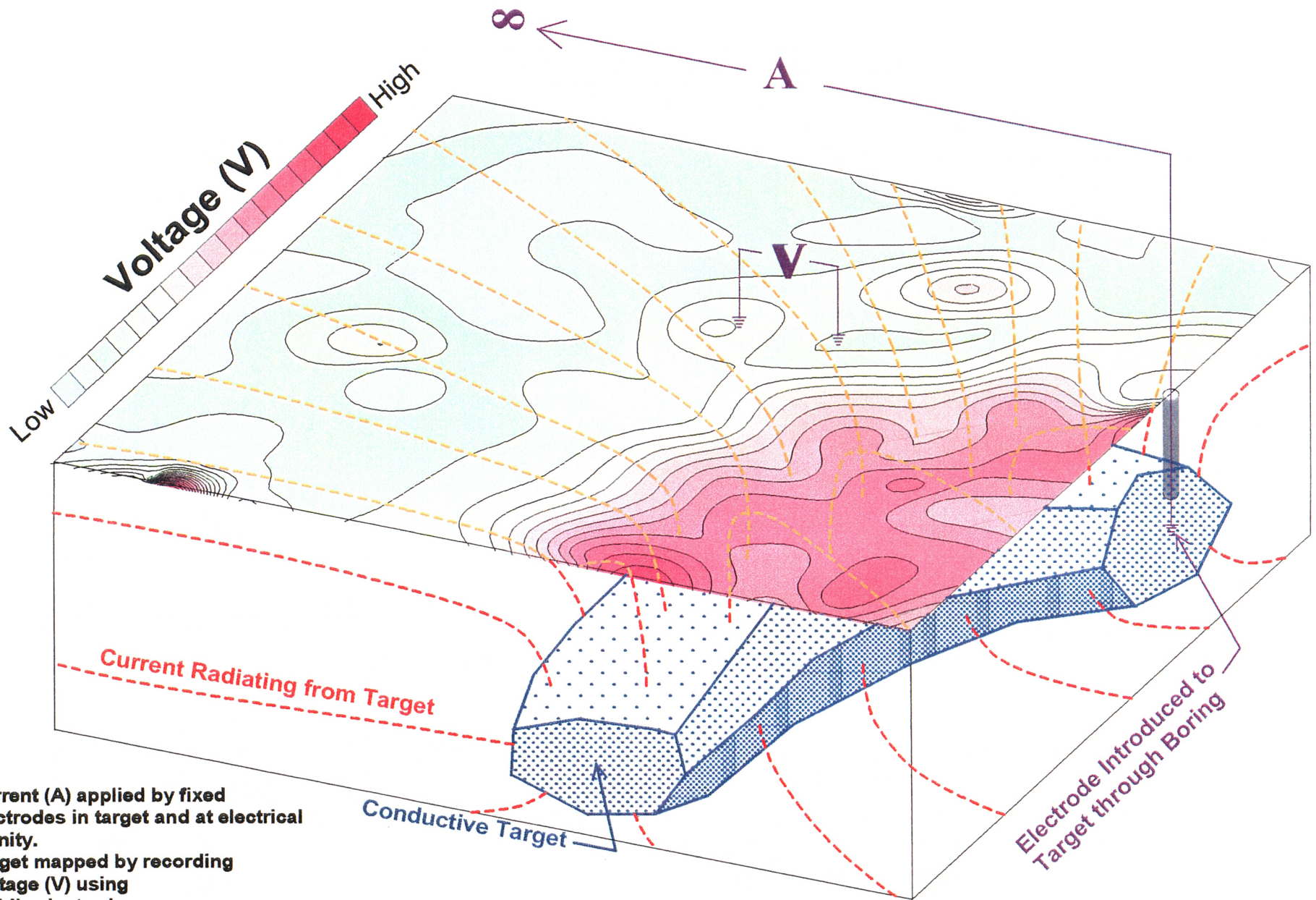
**Enviroscan, Inc.  
 Project No. 120015  
 Rev. 01/05/01**



ENVIROSCAN, INC.

## **Appendix A**

### **Mise-a-la-Masse Method Schematic**



Current (A) applied by fixed electrodes in target and at electrical infinity.  
 Target mapped by recording Voltage (V) using mobile electrodes.

## Mise a la Masse Method Schematic

Rev. 01/2001

***DRAWINGS***



MINE WORKINGS  
IN COALBURG SEAM

COAL PILLARS  
(TYPICAL)

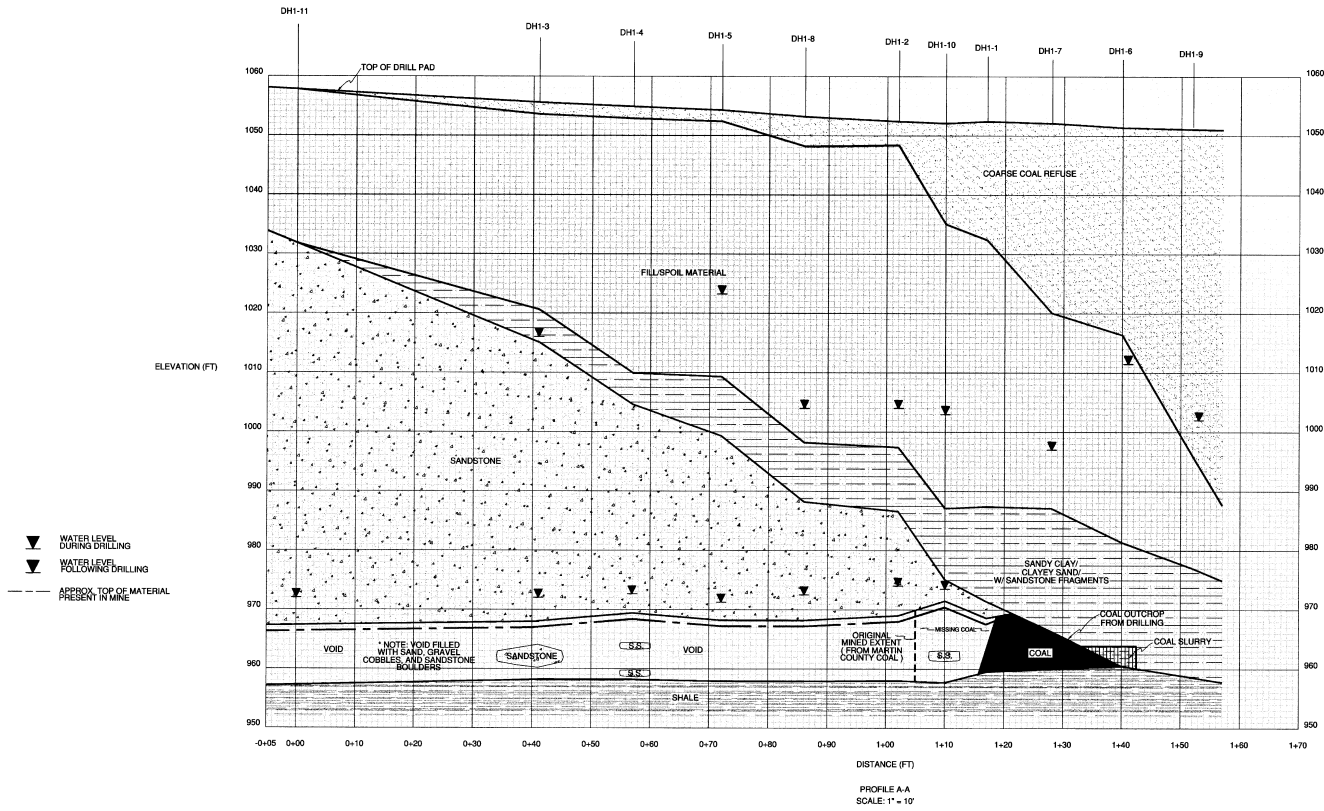
APPROXIMATE  
COALBURG OUTCROP  
(FROM DRILLING)


COALBURG OUTCROP  
(FROM MARTIN COUNTY COAL)

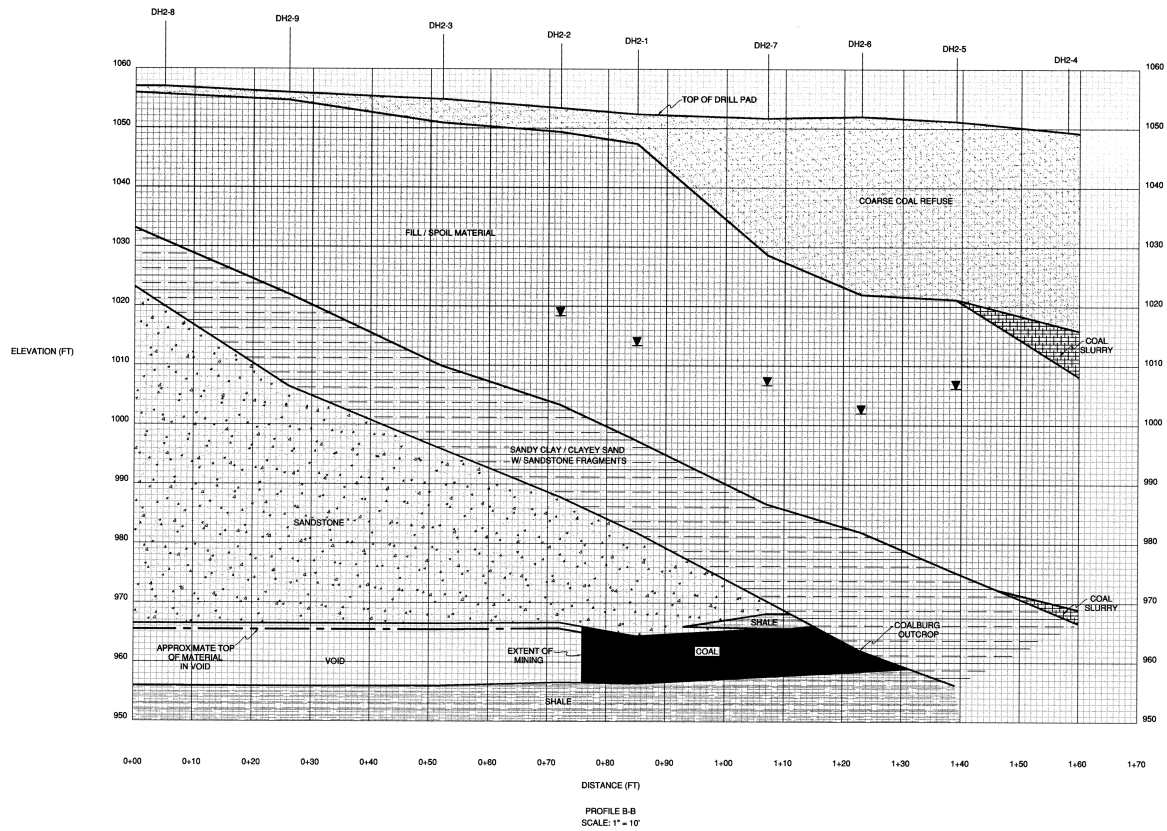
FULL THICKNESS  
OF COALBURG


FORMER SLURRY LINE  
(BEFORE BREAK)

REV.	DATE	ITEM		
CADFILE: C00553_BORINGS.DWG				
<b>BIG BRANCH SLURRY IMPOUNDMENT INVESTIGATION BORING LOCATION PLAN</b>				
Drawing No.	DRAWN	MDM	SCALE	1" = 20'
C00553-1	CHECKED	CEM	DATE	02/08/01
		TRIAD ENGINEERING, INC. 57 BANK LOUIS & MORGENTHAU, WEST VIRGINIA PROJECTS & INVESTIGATIONS, PITTSBURGH GREENSBORO, PENNSYLVANIA		

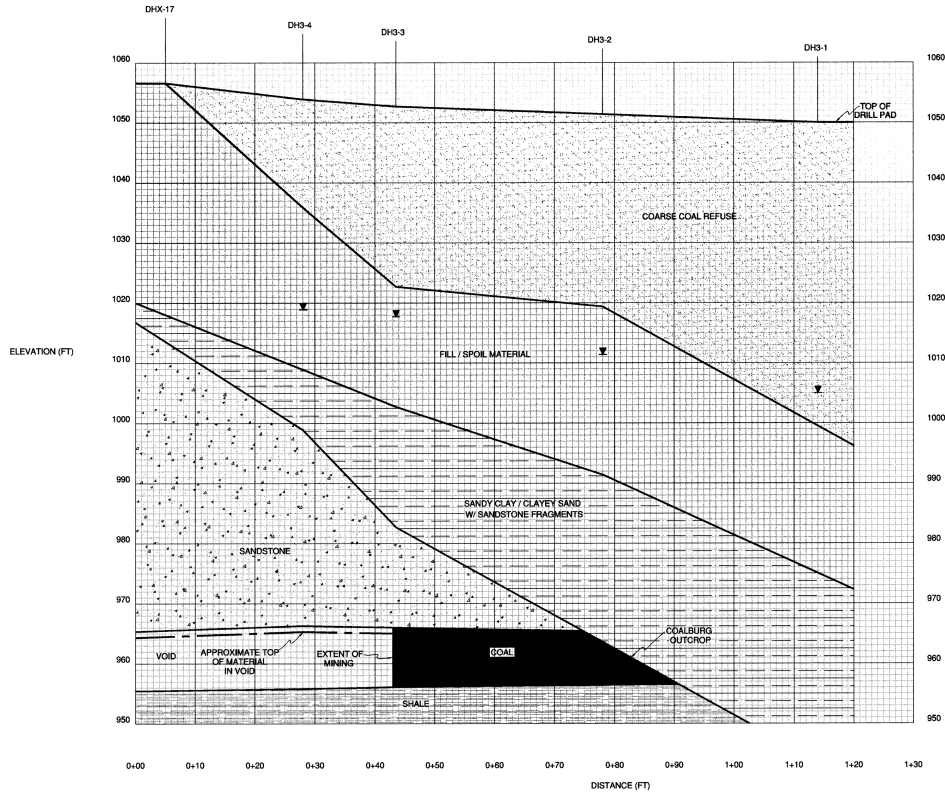


1	01/22/01	
REV.	DATE	ITEM
CADFILE: A-A.DWG		
PROFILE A-A SIXES BRANCH SLURRY IMPOUNDMENT INVESTIGATION MARTIN COUNTY, KENTUCKY		
Drawing No.	DRAWN	SCALE
C00553-2	MDM	1" = 10'
	CHECKED	DATE
	GEM	01/22/01
 TRIAD ENGINEERING, INC. <small>87 ALBING DRIVE • WINDY HOLLOW, WEST VIRGINIA          WINCHESTER • WYOMING, WYOMING          GREENSBORO, NORTH CAROLINA</small>		



REV.	DATE	ITEM
CADFILE: B-B.DWG		
PROFILE B-B BIG BRANCH SLURRY IMPOUNDMENT INVESTIGATION MARTIN COUNTY, KENTUCKY		
Drawing No. C00853-3	DRAWN MDM	SCALE 1" = 10'
	CHECKED GEM	DATE 02/01/01
 TRIAD ENGINEERING, INC. <small>31 ANNEKE LODGE &amp; MEMORIAL DRIVE, SUITE 100            WINCHESTER, KENTUCKY 40391            (606) 755-1100</small>		





WATER LEVEL DURING DRILLING  
 APPROX. TOP OF MATERIAL PRESENT IN MINE

PROFILE C-C  
SCALE: 1" = 10'

REV.	DATE	ITEM
CADFILE: C-C.DWG		
PROFILE C-C BIG BRANCH SLURRY IMPOUNDMENT INVESTIGATION MARTIN COUNTY, KENTUCKY		
Drawing No.	DRAWN MDM	SCALE 1" = 10'
C00553-4	CHECKED CEM	DATE 02/01/01
		TRIAD ENGINEERING, INC. 87 ALABAMA COAL & WOODWORKING WREST VENEZIA WINCHESTER & HARRISBURG, VIRGINIA GREENSBORO, NORTH CAROLINA

