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APPENDIX I

REMEDIAL INVESTIGATION AND FEASIBILITY STUDY (RI/FS) WORK PLAN

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Task 1 - Collect and Evaluate Existing Data

Prior to initiating work, it will be necessary to compile archival aerial photos available from the NJDEP Geological Survey Element, the USDA Agricultural Stabilization and Conservation Service (ASCS), the USDA Soil Conservation Service (SCS) and other sources. Reference to these photos may provide information regarding the development of the asbestos hill and the dump within the Great Swamp. The photos will be required in order to plan field reconnaissance and subsurface exploration.

In conjunction with this task, local officials and individuals with knowledge of the history of each of the sites will be interviewed.

Any other data essential to the planning and conduct of the Remedial Investigation (RI), will be obtained and reviewed in this task. Exceptions to this will pertain to information specific to a given task. For example, property records information required for Task 4, Topographic and Boundary Survey, may be acquired as a part of that task, as described below.

Task 2 - Health, Safety and General Site Reconnaissance

Beyond providing an opportunity for field crews to become familiar with the site, goals of the general site reconnaissance are as follows:

- Initial screening of the site to define health and safety requirements for dermal and respiratory protection and to delineate areas of the site requiring specific levels of protection for field crews during the RI.

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- Evaluation of respiratory hazards for the general public as a result of airborne asbestos fibers at the Great Swamp, Pine Valley Tree Service, and White Bridge Road Sites. Should an immediate health hazard exist, action must be expeditiously taken, with the approval of EPA and NJDEP, to mitigate the danger to the public.

- Investigation of surface features, (e.g., irregularities in landforms, locations of buildings, driveways, the perimeter of surface asbestos waste disposal areas) which is necessary for planning subsurface investigations.

The initial surface water and groundwater sampling will be conducted in concert with the general site reconnaissance, or shortly thereafter so that background analytical data will be available as rapidly as possible for planning purposes.

Sampling activities will be discussed in detail in Task 10, Environmental Sampling and Monitoring.

The areas of asbestos waste disposal at the Pine Valley Tree Service and White Bridge Road Sites and along the hiking trail at the Great Swamp Site, must be delineated. The perimeter of each of the driveway and disposal areas will be defined and flagged for later field survey.

Task 3 - Permits, Rights of Entry, and Other Authorizations

Conduct of RI activities at the Millington Site will require right-of-entry, authorization from TIFA. Similarly, investigations at the Great Swamp Site will require right-of-entry authorization from the USF&WS, and activities at the two privately owned sites will require authorization from the owners. Ownership of the latter two properties and their respective boundaries will have been determined in Task 4, Topographic and Boundary Survey, prior to onsite activities anticipated in the Subsurface Investigations (Task 8).

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A utilities search, with field verification during Task 4, will be undertaken in those areas where subsurface disturbance is projected. Any necessary permits or authorizations must be obtained.

Installation of monitoring wells will require permit authorization from the NJDEP, Bureau of Groundwater Management.

In the event that field treatability studies are required during the Feasibility Study (FS), NPDES discharge permits as well as other state, local, and federal permits may be required.

Task 4 - Topographic and Boundary Survey

The most recent topographic mapping at the Millington Site is not suitable for final planning of the Subsurface Investigations (Task 8). In addition it is inadequate for conceptual design purposes in the FS.

A current topographic base map of the asbestos hill and its immediate vicinity will be generated by land survey. The base map will be prepared to a suitable horizontal scale. The contour interval will be 2 feet.

The remaining sites do not require topography for the purposes of the RI/FS. For each of these sites, a plot plan will be prepared. The plan of the Great Swamp Site will include the hiking trail and an adjacent parking area, and will be drawn to a suitable horizontal scale.

Plans of the privately owned sites will be drawn to suitable scales following definition of the extent of asbestos shingle disposal. These plans will include all areas of asbestos shingle disposal, as identified during the general site reconnaissance, and areas in the immediate vicinity to serve as points of reference.

Property records will be researched for the Millington Site and the Pine Valley Tree Service and White Bridge Road Sites. Based upon property descriptions obtained, property boundaries will be surveyed in the field in conjunction with the

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field survey noted above. These property lines will be marked so that they can be easily referenced during subsequent field operations, and will also be transferred to the base mapping for each of the sites.

Permanent monuments will be established at each site to facilitate further survey work anticipated in Task 9.

Task 5 - Site Specific Health and Safety Requirements

A health and safety plan will be developed to protect the health and safety of personnel involved in the remedial investigation. The plan will be consistent with:

- Section III(c) of CERCLA
- EPA Order 1440.1 -- Respiratory Protection
- EPA Order 1440.3 -- Health and Safety Requirements for Employees Engaged in Field Activities
- EPA Occupational Health and Safety Manual
- Other EPA guidance
- State agency and health statutes
- Site conditions

Additionally, it should be consistent with EPA Interim Standard Operating Safety Guide (September 1982) and with applicable OSHA standards.

The plan shall be submitted to EPA for review and approval.

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Task 6 - Site Specific Quality Assurance/Quality Control (QA/QC) Requirements

A Quality Assurance Project Plan for the sampling, analysis, and data handling aspects of the remedial investigation shall be prepared and submitted to EPA for review and approval prior to the start of related activities. The plan shall be consistent with the requirements of EPA's Contract Laboratory Program. The plan shall address the following points:

1. QA Objectives for Measurement Data, in terms of precision, accuracy, completeness, representativeness, and comparability.

2. Sampling procedures.

3. Sample Custody.

4. Calibration Procedures, References, and Frequency.

5. Internal QC Checks and Frequency.

6. QA Performance Audits, System Audits, and Frequency.

7. QA Reports to Management.

8. Preventive Maintenance Procedures and Schedule.

9. Specific Procedures to be used to routinely assess data precision, representativeness, comparability, accuracy, and completeness of specific measurement parameters involved. This section will be required for all QA project plans.

10. Corrective Action.

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Task 7 - Site Operations Plan

A Site Operations Plan will be developed to outline the specific activities required in the completion of each task, or subtask, associated with site activities.

This plan will actually be an assemblage of work plans for the various activities. While it may be initially developed as an overview at the outset of the RI/FS, the specific characterization of each activity will be performed immediately prior to its execution. In this manner, the development of the Plan will remain flexible and responsive to the project requirements and will be based upon the most current data.

The Site Operations Plan will incorporate the applicable health and safety and quality assurance requirements in the development of the individual task work plans. These task work plans will provide the detail necessary to carry out the tasks in the field, and will include detailed health and safety and quality assurance requirements, as well as sampling methodology and complete decontamination procedures.

The Site Operations Plan will specify the organization of the command post for each task and will specify the responsibilties of each individual serving on the field team. It will also address disposal of any hazardous or potentially hazardous materials encountered during site activities.

A copy of the Site Operations Plan will be available to each of the members of the field team for review and comment prior to initiation of each respective site activity task.

Approval of the Site Operations Plan will be required from NJDEP and EPA prior to the initiation of site activities.

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SITE ACTIVITIES (PHASE II)

Task 8 - Subsurface Investigations

The need to evaluate subsurface hydrogeology is indicated in the case of the Millington Site and the Great Swamp Site because the dumps are relatively extensive, and because there is evidence of disposed materials other than asbestos waste or shingles.

Sludges from the settling lagoons in the discharge stream from the asbestos manufacturing process were disposed on all sites.

The White Bridge Road and Pine Valley Tree Service Sites are relatively small. The impact of the sludges is poorly defined, but generally anticipated to be minimal. Therefore the subsurface investigations at these sites will be somewhat reduced in scope, until evidence suggests greater concern for groundwater contamination. These investigations will be carried out in concert with a sampling program designed to evaluate drinking water in the immediate vicinity of the privately-owned sites.

In the event these two sites show more contamination than previously suspected their investigation will be expanded, at EPA's discretion.

Geologic/Hydrogeologic Investigation

Millington Site

A subsurface investigation is proposed to provide a detailed analysis of geologic and hydrologic conditions, site stratigraphy, and groundwater regimes. In order to define shallow groundwater flow, a series of seven monitoring wells (nos. 901 to 907) is proposed for the site. One well (901) will be placed into bedrock to determine background water quality data. The remaining wells will be placed in locations of possible areas of contamination. Figure 1 shows tentative placement

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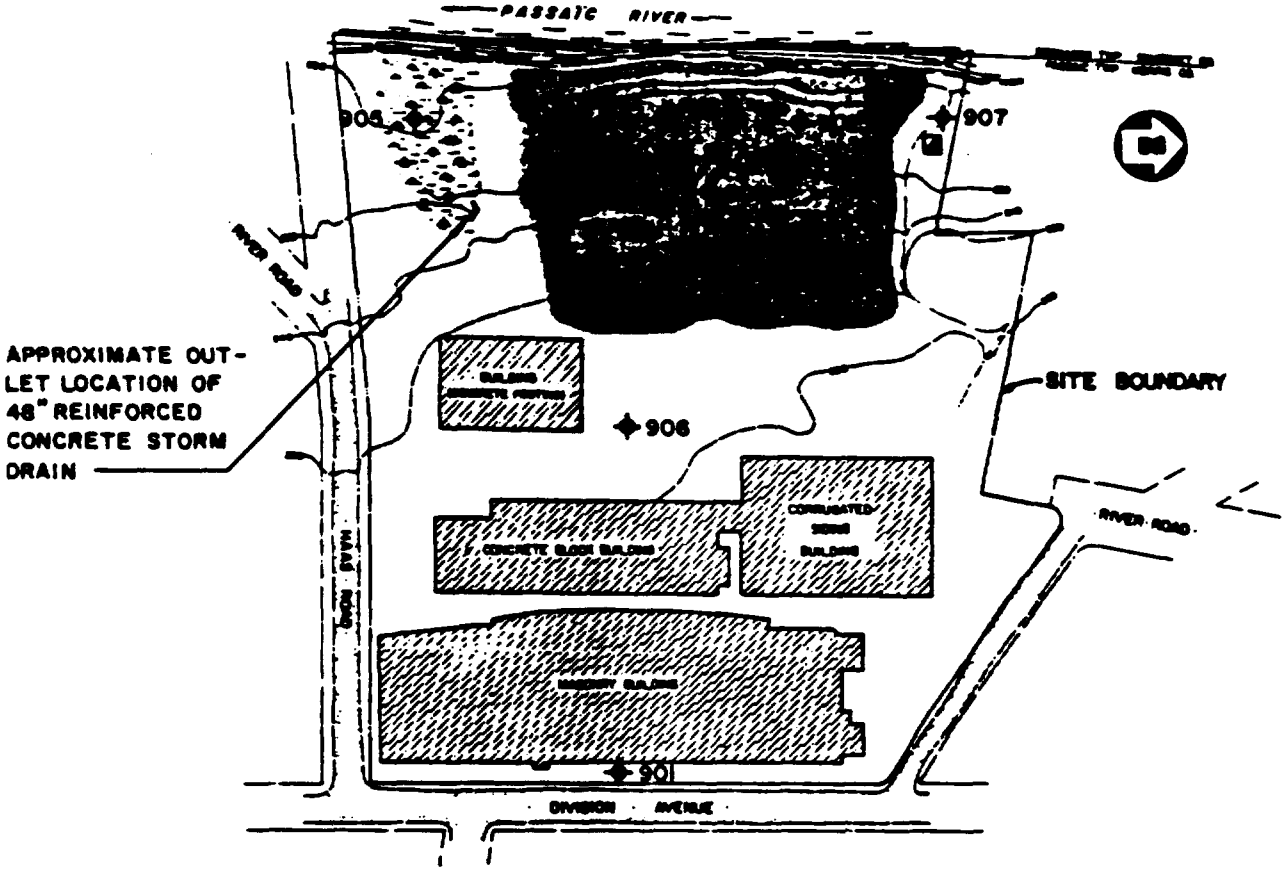
Figure 1



SOURCE: TAKEN FROM DRAWING Nº 6657; AUGUST 17, 1977; YANNACONE ASSOCIATES, INC. BERNARDSVILLE, NJ

BUILDINGS: TIFA, LTD. OFFICE COMPLEX.

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LEGEND

- ✦ PROPOSED MONITORING WELL LOCATION
- ◪ PROPOSED TEST PIT LOCATIONS
- APPROXIMATE LIMIT OF ASBESTOS HILL
- SWAMPLAND

PROPOSED SUBSURFACE INVESTIGATION
MILLINGTON SITE
ASBESTOS DUMP, MILLINGTON, NJ

SCALE 1" = 200'

FIGURE 1

NUS CORPORATION
A Halliburton Company

of seven monitoring wells. Each successive well will be located in the field based upon historic aerial photos of the site and results from the previous wells.

Borings will be advanced to bedrock using 10-inch (or larger) diameter hollow-stem augers. Split-spoon samples will be taken at 2-1/2 foot intervals and in addition, within changes in strata, and zones exhibiting obvious contamination. Thin-wall tube samples may be collected, as deemed necessary by the site geologist, and will be collected from the fill material. Continuous split-spoon samples will be taken at wells 903, 905, 906.

It is presumed that groundwater flow at the Millington Site is in accordance with topography, so that groundwater moves westward to the Passaic River, with some water also possibly discharging to the small wetland south of the asbestos fill. On the basis of this assumption, Well 901 (Figure 1) is proposed as an upgradient monitoring well. Well 906 will monitor flow in the vicinity of the former waste paint lagoon. Wells 902, 903, and 904 will monitor groundwater beneath the asbestos fill. Well 905 will monitor any groundwater discharging to the wetland. If preliminary investigations show that the fill will not support a drill rig, then the wells will be placed immediately next to the fill, 904 to the south, 902 to the north and 903 to the east.

At boring 901, a monitoring well will be constructed in accordance with "New Jersey Department of Environmental Protection Rock Monitor Well Specifications" (Figure 2). Six-inch inside diameter (ID) steel casing will be set to competent rock and sealed in place with a bentonite slurry. The hole will then be advanced 10 feet into the bedrock, should the water table be located in unconsolidated material, or should the water table be located in bedrock, to a depth of 10 feet below the water table, by coring, using compressed air as a drilling fluid. A protective, steel locking cap will be added to the top of the well, and securely grouted in place.

At the remaining borings, wells will be constructed in the same fashion as Well 901, if the water table occurs in bedrock. If the water table occurs in unconsolidated material, wells will be constructed in accordance with "New Jersey Department of Environmental Protection Unconsolidated Monitor Well Specification" (Figure 3).

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Figure 2

New Jersey Department of Environmental Protectio
Rock Monitor Well Specifications*

ite Name: Millington Asbestos Dump

Location: _____

Date: 3/84

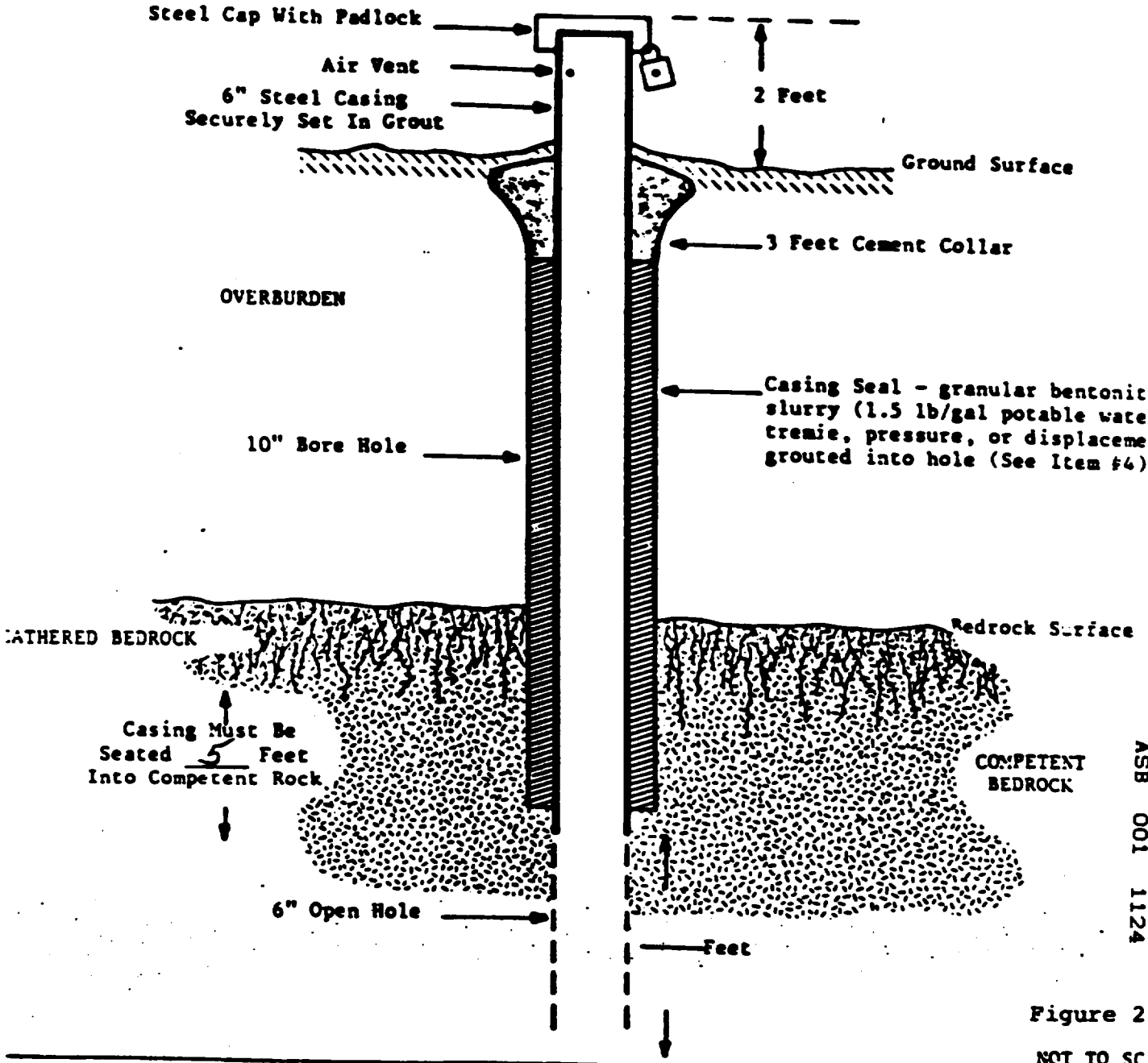

Figure 2

NOT TO SC

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REQUIREMENTS:

OVER PLEASE

1. Notification to the NJDEP is required two (2) weeks prior to drilling.
2. State well permits are required for each monitor well constructed by the driller. Report "use of well" on well permit application. Permit number must be permanently affixed to each monitor well. NOTE: Well driller must be licensed in the State of New Jersey.

3. Oversize borehole, minimum four (4) inches greater than casing diameter drilled through overburden and casing sealed ten (10) feet into competent rock unless shown otherwise above.
4. Approved high grade sodium base, well sealant type, granular bentonite must be used to seal casing. Casing sealant and drilling fluids must be mixed with potable water.
5. Well must be developed upon completion for a minimum of one (1) hour or to yield a turbid-free discharge.
6. The driller must maintain an accurate written log of all materials encountered in each hole, record all construction details for each well, and record the depth of major water bearing fracture zones. This information must be submitted to the Office of Water Allocation as required by N.J.S.A. 58:4A.
7. Cement collar must be installed a minimum of one (1) hour after casing seal has been emplaced.
8. Locking caps must be provided to secure each well.
9. Top of each well casing (excluding cap) must be surveyed to the nearest hundreth foot (0.01) by a licensed surveyor. The casing must be permanently marked at the point surveyed. The well should be numbered clearly on the casing. A detailed site map with well locations and casing elevations must be submitted to _____ _____.

10. NOTICE IS HEREBY GIVEN OF THE FOLLOWING:

    a. Review by the Department of well locations and depths is limited solely to review for compliance with the law and Department rules;
    b. The Department does not review well locations or depths to ascertain the presence of, nor the potential for, damage to any pipeline, cable or other structures;
    c. The permittee (applicant) is solely responsible for safety and adequacy of the design and construction of well required to be constructed by the Department;
    d. The permittee (applicant) is solely responsible for any harm or damage to person or property which results from the construction or maintenance of any well; this provision is not intended to relieve third parties of any liabilities or responsibilities which are legally theirs.

ADDITIONAL REQUIREMENTS (IF CHECKED):

☒ 1. Split Spoon Samples (In Overburden) Every 2.5 feet (except where specifi continuous), at strata changes, & zones of contam

☐ 2. Rock Core Samples _____

☐ 3. Dedicated Bailer (Sampler) in Well(s) _____

☐ 4. Borehole Geophysical Log(s) _____

☐ 5. Other _____

_____

* OTHER DRILLING METHODS, MATERIALS, DESIGNS AND CASING DIAMETERS MAY BE USED WITH PRIOR APPROVAL BY NJDEP.

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Figure 3

New Jersey Department of Environmental Protection
Unconsolidated Monitor Well Specifications*

Site Name: Millington Asbestos Dump

Location: _____

Date: 3/84

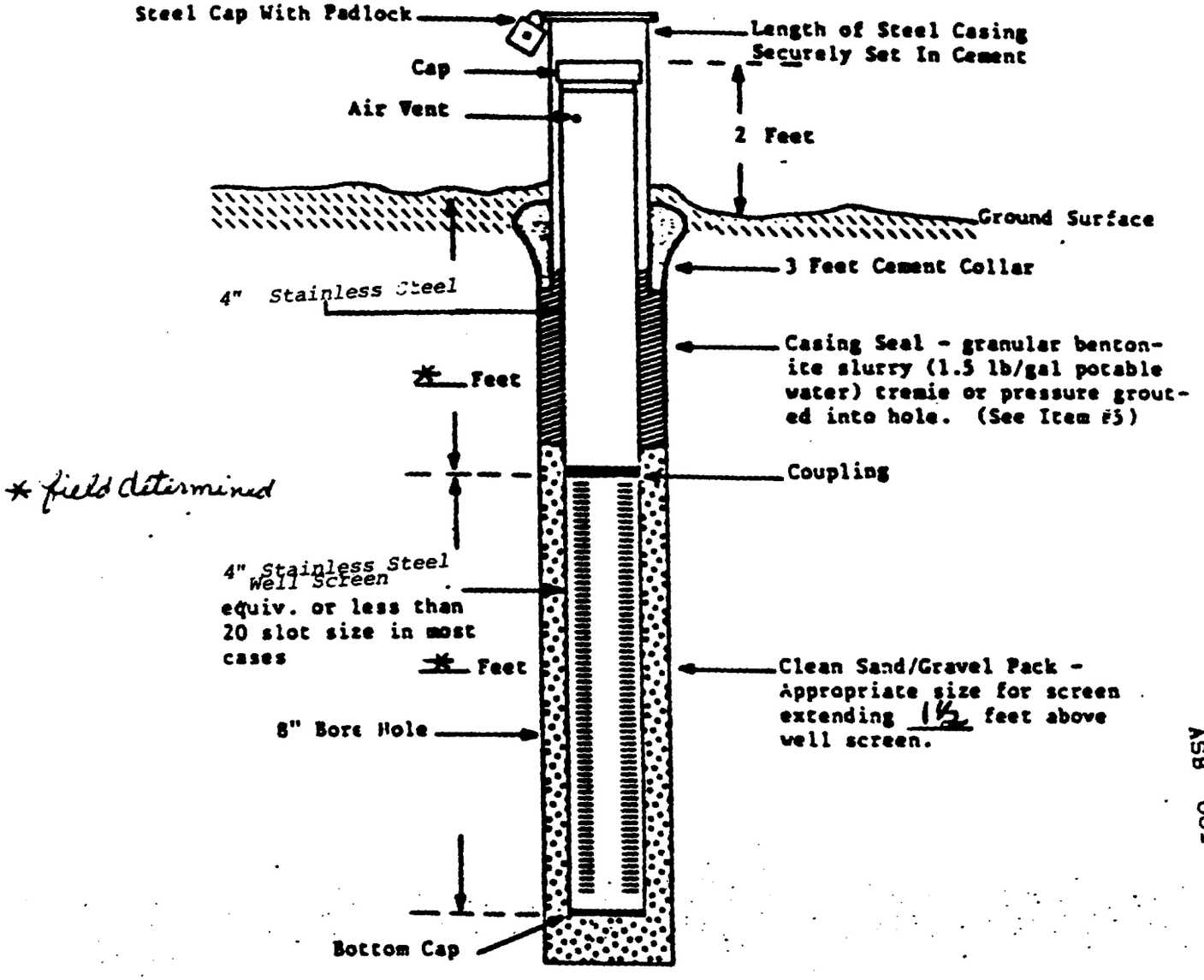

Figure 3
NOT TO SCALE

REQUIREMENTS:

1. Notification to the NJDEP is required two (2) weeks prior to drilling.
2. State well permits are required for each monitor well constructed by the driller. Report "use of well" on well permit application. Permit number must be permanently affixed to each monitor well. NOTE: Well driller must be licensed in the State of New Jersey.

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3. The borehole must be a minimum of four (4) inches greater than the casing diameter.
4. Wells must be gravel packed unless noted otherwise in Additional Requirement #8.
5. Approved high grade sodium base, well sealant type, granular bentonite must be used to seal casing. Casing sealant and drilling fluids must be mixed with potable water.
6. All wells must be developed upon completion for a minimum of one (1) hour or to yield a turbid-free discharge.
7. The driller must maintain an accurate written log of all materials encountered in each hole, record all construction details for each well, the static water levels, and any tidal fluctuations (when applicable). This information must be submitted to the Office of Water Allocation as required by N.J.S.A. 58:4A.

8. A length of steel casing with a locking cap must be securely set in cement a minimum of three (3) feet below ground surface.
9. Top of casing (excluding cap) must be surveyed to the nearest hundreth foot (0.01) by a licensed surveyor. The casing must be permanently marked at the point surveyed. The well(s) should be numbered clearly on the casing. A detailed site map with the well locations and casing elevations must be submitted to _____ _____.

1. NOTICE IS HEREBY GIVEN OF THE FOLLOWING:

   a. Review by the Department of well locations and depths is limited solely to review for compliance with the law and Department rules;
   b. The Department does not review well locations or depths to ascertain the presence of, nor the potential for, damage to any pipeline, cable or other structure;
   c. The permittee (applicant) is solely responsible for safety and adequacy of the design and construction of wells required to be constructed by the Department;
   d. The permittee (applicant) is solely responsible for any harm or damage to person or property which results from the construction or maintenance of any well; this provision is not intended to relieve third parties of any liabilities or responsibilities which are legally theirs.

ADDITIONAL REQUIREMENTS (IF CHECKED):

xx Top of screen set 3-5 feet above/below water table.

xx Split Spoon Samples EVERY 2.5 feet (EXCEPT WHERE SPECIFIED CONTINUOUS), AT CHANGES IN STRATA, AND ZONE OF CONTAMINATION.

13. Dedicated Bailer (Sampler) In Well(s) _____

xx Threaded or Press Joints _____

15. Five (5) Foot Casing Tailpiece Below Screen _____

16. Centralizers On Screen _____

17. Borehole Geophysical Log(s) _____

18. Other _____

_____

* OTHER MATERIALS, DESIGNS AND CASING DIAMETERS MAY BE USED WITH PRIOR APPROVAL BY THE NJDEP.

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If the well is to be shallower than the test boring, then the hole will be backfilled to the selected depth with a bentonite slurry. A well, constructed of four-inch diameter, stainless steel pipe and a five-foot-long, slotted, stainless steel screen will be placed in the boring. A gravel pack will be emplaced over the chosen monitoring interval. A bentonite slurry will be used for the remainder of the backfilling. A protective, steel locking cap will be installed and grouted securely in place.

Great Swamp Site

Logs of water wells in the Great Swamp indicate that 80 to 90 feet of glacial and lacustrine sands, silts, and clays underlie areas near the sites. A series of 15 to 20 hollow-stem auger borings are proposed for the Great Swamp Site. The aim of this investigation is to determine the depth and extent of the asbestos waste fill, shallow stratigraphy, and water table configuration. At least 10 wells must be installed in the series of 15-20, hollow-stem auger borings. If hydrogeology appears complex, more of the test borings may be finished as monitoring wells.

Test borings and monitoring wells will be constructed in the same fashion as those at the Millington Site, except that borings will not be advanced to bedrock. Wells will be finished approximately five feet below the water table. Because no site map is currently available, a map of the proposed monitoring well locations cannot be given. It is anticipated that the borings will be installed on a 200-foot square grid covering the site, although individual boring locations may be altered on the basis of field observations, at the discretion fo the site geologist. The wells will be spaced relatively uniformly across the site. Borings not completed as wells will be grouted shut. Locations of wells and soil borings are subject to EPA approval.

White Bridge Road and Pine Valley Tree Service Sites

In order to define the extent of wastes, shallow subsurface conditions, and depth of water table at these two sites, shallow test borings and monitoring wells will be installed. At each of the sites, three borings will be performed, spaced evenly around the wastes. The borings will be advanced with 10-inch hollow-stem auger

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and split-spoon sampling at 2.5-foot intervals. The borings will be terminated approximately 10 feet below the water table.

Should the initial subsurface investigation indicate a more serious problem than anticipated, the Geologic/Hydrogeologic investigation will be expanded at EPA's direction. Stainless steel monitoring wells will be installed in the same manner as at the Millington Site. A detailed log of all materials encountered and of groundwater conditions will be kept by the site geologist.

Aquifer Interpretation

At each of the sites, all wells will be developed by purging. Timelag permeability tests will be performed on selected wells. The data will be integrated using the Hvorslev method.

Extent and nature of the hydrogeologic units will be determined from data gathered during drilling. Cross sections will be prepared and stratigraphy will be compared to permeabilities. Any aquifers present will thereby be delineated.

Water levels will be measured both in boreholes (during drilling) and in finished wells (before sampling). These measurements, in conjunction with ground surveying, will allow for plotting of a water-table contour map and flow nets.

Engineering Investigation

An engineering/subsurface investigation program will be undertaken in the study areas in conjunction with the geologic/hydrogeologic investigation. This program will produce data to determine and/or define the following:

- The soil types and stratification
- The physical characteristics and properties of the materials at the sites
- The interface characteristics between fill materials and in-situ materials

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- The internal structure/condition of the fills

- The extent of materials placed at the sites

- The existence of any lagoon structures at the Millington Dump Site

The drilling program will involve the use of hollow stem augers at all study areas. Sampling will occur on a site-specific basis, as detailed below. The sampling methods must include split barrel samples, Shelby tubes or other thin wall samplers for undisturbed sampling, and test pits. The approved Quality Assurance/Quality Control Plan, as well as specific guidance provided in the Site Operations Plan, will govern sample collection and handling activities at all times. The samples will be described in the field using the Unified Soil Classification System (USCS).

Millington Site

Fourteen Shelby tube samples will be taken from within the Millington Site asbestos hill. At the discretion of the site engineer, additional Shelby tube and split barrel samples may be taken and/or continuous sampling may be required. All samples will be stored in air-tight containers.

The Standard Penetration Test (SPT) will be performed and the samples taken will be monitored with an Organic Vapor Analyzer (OVA) and a Photo Ionization Detector (PID). Results will be recorded in the field log and used in conjunction with an evaluation of physical appearance. Samples showing positive results will be submitted for laboratory analysis.

It is recommended that boring numbers 903 and 906 be drilled first to obtain information about the asbestos pile, and paint wash lime lagoon, respectively. Based on this information relative to the stability of the soils and asbestos wastes, as well as reference to archival aerial photos, the locations of borings 902 and 904

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can be adjusted. In all cases, boreholes should not be located near, and equipment should avoid the proximity of the crest of the slopes, to minimize the chances of slope failures.

In addition, test pits will be used to detail the spoil and in-situ materials at the site. At present, two test pits are planned, one on the pile and one near the upstream side slope in the in-situ soil. The pit into the in-situ soils will be to the top of rock (assumed to be approximately five feet, based upon the November 2, 1983 site visit), and will be constructed in a safe manner for personnel, not causing instability within the pile. The exact depth and location of the test pit into the asbestos pile will be determined by the site engineer and project manager.

Both test pits will be constructed in a safe and proper manner in accordance with the site operations plan and the site health and safety plan.

The horizontal and vertical extent of waste materials will be estimated from field reconnaissance and the samples taken during drilling.

Great Swamp Site

As was the case with the Millington Site, the shallow hollow-stem auger borings and split-barrel samples specified under the Geologic/Hydrogeologic Investigation will be utilized in an Engineering Investigation. The standard penetration test will be conducted, and the use of Shelby tubes and continuous sampling will be at the discretion of the site engineer and the EPA on site coordinator.

Pine Valley Tree Service and White Bridge Road Sites

Based on the limited information available at these sites, engineering investigations do not appear to be required in these areas. However, if the site reconnaissance activities or future information warrant such studies, this work plan will be modified to reflect such a change and will be subject to EPA approval.

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Laboratory Analysis - Engineering Properties

Laboratory testing will be required to determine the engineering properties of the spoil material and in-situ soil at the Millington Site, in order to permit an evaluation of the mass stability of the asbestos hill. The following tests are recommended for parameter determination at the Millington Site only:

- Atterberg limits
- Particle size analysis
- Specific gravity
- Moisture content
- Unit weight
- Triaxial compression strength testing

The basic tests (the first five listed above) will be required to classify the spoil materials and in-situ soils. Tests will be performed on samples selected by the engineer.

Triaxial compression strength testing will be performed on the asbestos spoil material and in-situ soils. The strength parameters that are determined from these tests will be used in the analysis of the stability of the pile and the design of a recontoured and/or benched slope. At present, the materials are assumed to be homogeneous, and only two sets of triaxial strength tests are planned. Additional testing may be required if the materials are found not to be relatively homogeneous.

Future Borrow Material

Surface capping is a potential remedial technique at these sites. This technique may require extensive use of borrow material. At present, no sources have been identified. Evaluation of borrow material has not been included in the present work plan since the extent of the asbestos shingle disposal areas, and thus the quantity of borrow required, have not yet been determined. If this technology is considered as a remedial alternative, sources must be located, sampled, and tested

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in the laboratory for engineering properties. This may be undertaken via a modification in the work plan scope and attendant costs.

Decontamination Procedures

Decontamination procedures for drilling and sampling equipment will be specified in detail in the site operations plan. In general, however, equipment will be steam-cleaned prior to site entry, between drilling of each hole, and prior to exiting the site. Decontamination wash will be collected and characterized regarding hazardous characteristics prior to disposal.

Task 9 - Field Survey

Following completion of monitoring well installation in Task 8, horizontal and vertical coordinates of all wells will be obtained.

The location of all wells will then be plotted on the base mapping prepared during Task 4, Topographic and Boundary Survey.

Permanent benchmarks constructed in Task 4 will facilitate location of the wells during this task.

Any other features noted during site activities requiring preservation on the base mapping will be surveyed at this time.

Task 10 - Environmental Sampling and Monitoring

For ease in summary and presentation in this work plan, all environmental sampling requiring laboratory analysis has been consolidated into Task 10. In practice, however, actual field sample collection will occur as follows:

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Ambient Air	Task 8	Subsurface Investigations
Surface Water and Sediment	Task 2	Health, Safety, and General Site Reconnaissance
Subsurface Soil/Waste	Task 8	Subsurface Investigations
Groundwater	Task 8	Subsurface Investigations
Groundwater (monitoring)	Task 10	Environmental Sampling and Monitoring
Surface (monitoring)	Task 10	Environmental Sampling and Monitoring
Potable Water Supplies	Task 10	Environmental Sampling and Monitoring
Benthic Macroinvertebrates	Task 11	Aquatic Impact Assessment

A Sampling and Analysis Plan will be prepared in conjunction with Task 7, Site Operations Plan and will comply with Task 6, Site Specific Quality Assurance/Quality Control (QA/QC) Requirements.

Ambient Air

Approximately 20 samples will be taken during Task 8, Subsurface Investigations, for simple asbestos fiber counts, in order to evaluate exposure of the RI/FS field team to airborne concentrations generated during drilling. These samples will be collected using personal air samplers or by using stationary samplers placed at strategic locations within the area in which drilling will occur. The latter samplers would employ pumps calibrated to draw air through a methyl cellulose filter at a known rate. A site-specific sampling plan will be developed within the Sampling and Analysis Plan to address levels of airborne asbestos fibers as a result of surface

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disturbance during RI activities, such as drilling. This information will be valuable in defining potential public health risk as a result of specific proposed remedial actions to be evaluated in the FS.

Surface Water and Sediment

Surface water and sediment samples will be collected to define the extent of contamination in the Passaic River and its tributaries, Great Brook, and Black Brook. Background sampling stations have been selected to represent conditions in Great Brook, Black Brook, an ~~unnamed tributary to Black Brook~~ Middle Brook, upstream of the Great Swamp and White Bridge Road Sites, and ~~New Vernon Road~~ Pine Brook Site respectively. Background stations have also been identified in the Passaic River upstream of the Millington Site. Results from these locations will be compared to samples collected immediately downstream of each of these four sites.

Asbestos fiber counts in the April 4, 1978 NJDEP sampling were higher upriver of the Millington Site (783 fibers per ml) than downriver (590 fibers per ml). While this may be interpreted to indicate that upstream areas are contributing greater quantities of fibers than the Millington Site, itself, the single existing sample is obviously not conclusive. Sample locations have been defined within Great Brook and within the reach of the Passaic River downstream of its confluence with Great Brook to "track" the asbestos fiber counts in an effort to evaluate whether the Great Swamp Site may be responsible for elevated Passaic River asbestos levels in the Millington Site vicinity.

Sediment samples will be collected from the soft bottoms of Great Brook, Black Brook, and unnamed tributaries to Black Brook, both at background points upstream and at a point immediately downstream of the dump sites. If possible, sediment samples will be taken from the Passaic River at White Bridge Road and immediately upstream and downstream of the Millington Site. The bed of the Passaic River exhibited little or no siltation in the Millington Site vicinity during a recent site reconnaissance, and sediment samples may be difficult to obtain.

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Sediment samples will be obtained using either a coring tool or a dredge type sampler, such as the Ekman or Ponar units designed for sampling soft sediments.

Preliminary sample numbers and locations have been summarized below and shown on Figure 4. Surface water and combined surface water/sediment sampling stations have been differentiated.

Passaic River

- Above confluence with Great Brook (2)
- Intersection with Lord Stirling Road (1)*
- Intersection with Maple Avenue (1)
- Immediately upstream of Millington Site (1)*
- Intersection with Haas Road (1)*
- Commonwealth Water Company intake (1)

Great Brook

- Upstream of dump site (2)*
- Immediately downstream of dump site (1)*
- Intersection with Pleasant Plains Road (1)
- Above confluence with Passaic River (1)

Black Brook

- Upstream of White Bridge Road Site (2)*
- Immediately downstream of site (1)*
- Intersection with White Bridge Road (1)
- Above confluence with Passaic River (1)

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*Indicates sediment sample collection in addition to water sample.

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Figure 4

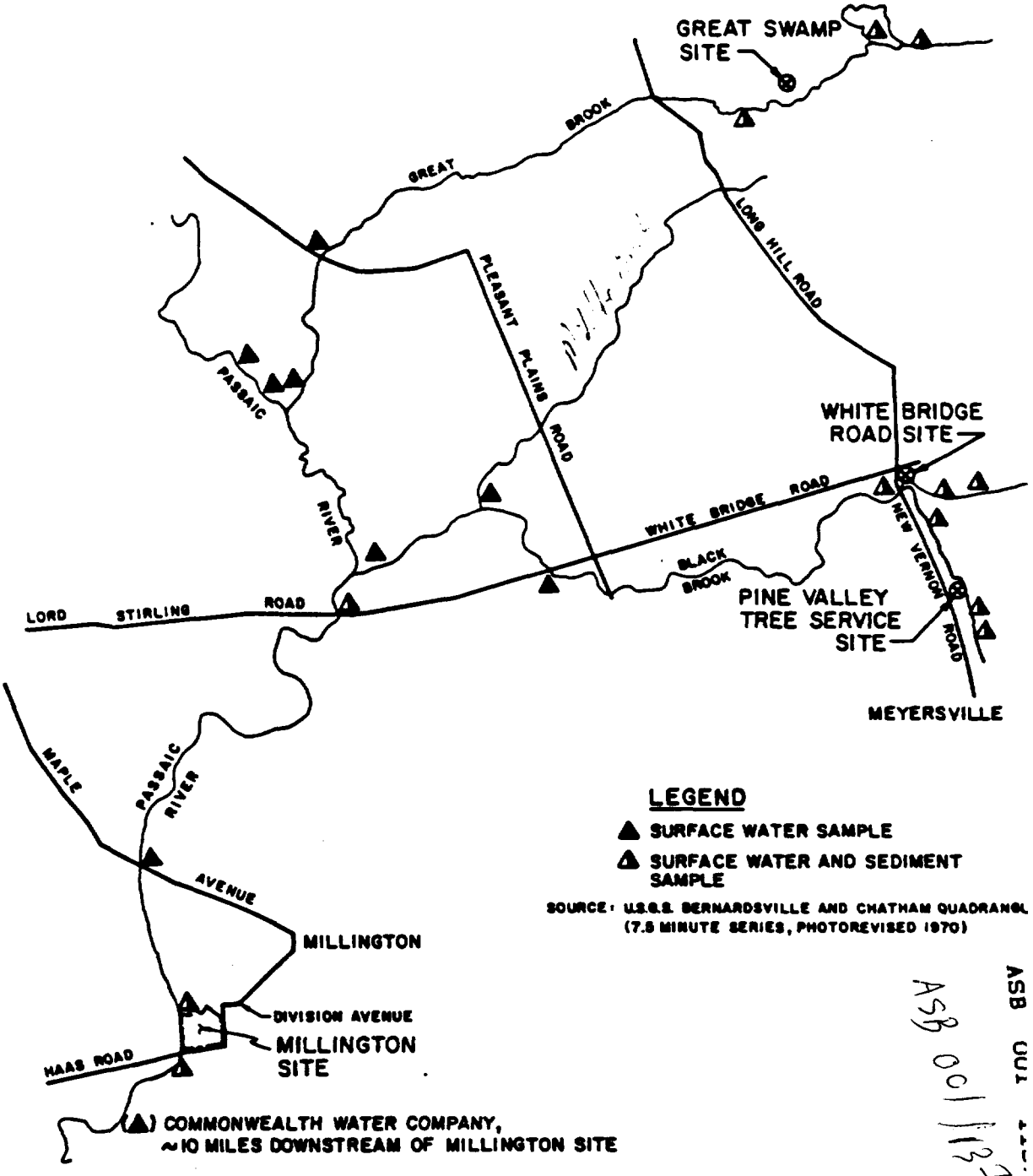

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FIGURE 4

PROPOSED SURFACE WATER/ SEDIMENT SAMPLE LOCATIONS
ASBESTOS DUMP SITE, MILLINGTON, NJ
SCALE 1" = 6,000'

NUS CORPORATIO
A Halliburton Compa

Unnamed Tributary to Black Brook from New Vernon Road Area

Pine Valley Tree Service

- Upstream of the ~~New Vernon Road~~ Site (2)*
- Immediately downstream of the New Vernon Road Site(1)*

Unnamed Tributary to Black Brook from Long Hill Road Area

- Above confluence with Black Brook (1)

An attempt will also be made to sample the storm drain at the Millington Site during a rainfall event. The total number of surface water sampling points is therefore 21. Of these, 12 will include sediment sampling. Aqueous samples will be analyzed in the field for pH, specific conductivity, and temperature and will be submitted to an approved laboratory for Priority Pollutant (PP) analyses and asbestos fiber count. Sediment samples will be analyzed for asbestos fiber count, as well as the (PP). All priority pollutant analyses will consist of the priority pollutant plus forty analysis. This analysis will tentatively identify the 15 highest purgeable organic fraction, 10 highest acid extractable organic fraction and the 15 highest base/neutral organic fractions, along with their estimated concentrations, using a forward search of the EPA/NIH/NBS Mass Spectral Library.

Subsurface Soil/Asbestos Waste Sampling

Subsurface soils and/or asbestos waste materials will be sampled during the Subsurface Investigations at both the Millington and Great Swamp Sites. The sample collection procedure and rationale for submission of samples for analysis, utilizing field monitoring and physical characteristics, has been discussed in Task 8.

Approximately 20 subsurface soil samples per site are anticipated to require analysis for priority pollutant plus forty analysis.

*Indicates sediment sample collection in addition to water sample.

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In addition, at least 16 thin wall tube samples will require analysis for engineering properties.

Groundwater

Seven monitoring wells will be installed at the Millington Site, and 15 to 20 shallow wells will be installed within the Great Swamp Dump Site. Three shallow wells will be installed at each of the two privately owned dump sites.

The initial sampling tour will occur immediately after installation of the wells and will involve the collection of approximately 22 samples for priority pollutant plus forty analysis and asbestos fiber counts.

Surface and Groundwater Monitoring

Following the initial surface and groundwater sampling and analyses, parameters indicative of the contaminants present may be identified.

Two subsequent sampling tours are projected in order to provide a suitable data base to define the presence or absence of onsite groundwater contamination at the Millington and Great Swamp Sites and to identify offsite surface water contamination.

At the present time, it is anticipated that the sample locations noted in Task 10 will be replicated in each of the subsequent tours. Analysis will be for indicator parameters only, based upon previous analytical results, with field measurement of pH, conductivity, temperature, and flow, where applicable.

In total, a collection of approximately 44 groundwater and 42 surface water samples is projected.

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Potable Water Supplies

The residences near White Bridge Road Site and the New Vernon Road Site are not served by municipal water supplies. Because the degree of groundwater contamination, if any, as a result of disposal of sludges on these sites is unknown, sampling of the nearby domestic wells must be undertaken.

In addition, sampling of water at the Commonwealth Water Company (CWC) intake on the Passaic River, as well as the filtered water entering the distribution system, must be undertaken.

Analyses of all of the potable water supply samples will be for priority pollutant analysis and for asbestos fiber count. The need for subsequent analysis of potable water supplies will be determined by EPA based upon the initial sample results and for the results of the hydrogeologic investigations.

Task 11 - Aquatic Impact Assessment

Because of potential chemical contamination via leaching of components from sludges and physical contamination via deposition of asbestos fibers within the watercourses, a brief (approximately two field days) survey of the receiving streams is recommended. This activity will coincide with the initial surface water and sediment sample collection. The evaluation will be limited to field examination of benthic samples, for the most part, with follow-up examination of the more critical samples.

The benthic community lies at the base of the aquatic food web. The organisms are relatively immobile, and some nymphal forms such as mayflies (Ephemeroptera) are highly susceptible to pollution.

The presence or absence of pollution-intolerant species within the benthic community reflects long-term trends in water quality in a much better manner than periodic grab samples of water or sediment.

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The benthic macroinvertebrate community will be examined at selected locations within Great Brook, Black Brook, and the Passaic River, in order to investigate potential impacts from the dump sites.

Samples will be taken at each of the sediment sampling stations noted in Task 10. Where stream conditions permit, a stream bottom sampler, such as the Surber sampler, will be used. In the case of soft bottoms, or where the Surber sampler is otherwise impractical, a bottom-sampling dredge may be used to collect a unit volume of sediment. In the event that the latter sampler is required, benthic macroinvertebrates will be extracted from the sediment with the aid of a benthos screen. In either case, the samples collected will be preserved and returned to the office, where specific samples will be subjected to further study.

Sampling in the Passaic River may be further augmented by sweep netting. This approach involves positioning a fine mesh net in a downstream location and collecting aquatic forms dislodged from the substrate for a short distance upstream of the net. This technique may prove useful where the river stage exceeds the operating limit of the Surber sampler.

The species found at each of the benthic sample stations will be reviewed to determine whether substrates are being differentially colonized by specific types of organisms. Life histories of the species will be consulted to assist in explaining any differential colonization noted. Special emphasis will be placed upon the identification of pollution-tolerance with respect to the range of physical and chemical contamination found at each station.

Evaluation of the resident benthic population at various points within the drainage system will provide the necessary data upon which to evaluate chronic impacts to the aquatic environment as a result of site activities.

<u>Task 12 - Data Reduction and Evaluation</u>

Following completion of RI tasks, data generated during the investigation will be used in the production of a report to be submitted following the completion of all

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RI tasks. A thorough analysis and summary of all site investigations will be prepared so that a complete, coherent, and comprehensive understanding of site conditions is achieved to support the FS.

The data from previous investigations will be re-evaluated within the context of the new data obtained during the RI to characterize the groundwater, surface water, and engineering properties of the in situ soils and the asbestos processing spoil materials. The results of the evaluation will be used to determine the stability of the Millington Dump Site and the extent of contamination of the soils, surface waters, and groundwaters in the vicinity of all the sites.

The significant contaminant pathways will be identified, and an assessment of exposure, as it relates to public health and the environment, will be made. The degree to which either source control or offsite actions are required to mitigate any threat to public health, welfare or the environment will be identified. The assessment will be sufficiently detailed to allow a decision regarding further remedial response to be made at this point.

Task 13 - Identify Preliminary Remedial Technologies

Establish Objectives and Criteria

The results of the RI will clarify the extent of contamination and other hazards associated with the sites. To identify preliminary remedial technologies, the goals and objectives of site remediation must be clearly defined. Then, based on the extent of contamination and safety factors, the objectives must be established.

These objectives will be developed in conjunction with the EPA and the State and may include the prevention of contaminant input into the environment and the mitigation of existing contamination. All objectives for site remediation will be consistent with the regulations set forth in the National Contingency Plan (NCP).

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Criteria to be used in the evaluation of alternatives, such as technical, environmental, and economic factors, must also be identified. The criteria for the evaluation of alternatives are expected to include

- Reliability
- Implementability
- Environmental Concerns
- Safety Requirements
- Cost-Effectiveness

Factors implicit in the evaluation of remedial measures include: availability and cost of materials required for final construction, physical site limitations for construction activities, applicability of treatment technologies to the waste materials, long-term effectiveness of the remedial measure, long-term Operation and Maintenance (O&M) requirements, transportation requirements, and additional exposure hazards to the environment and public created by implementing a given remedial measure. All onsite and offsite remedial alternatives will be evaluated in comparison to a risk assessment associated with a no-action alternative.

Based on site-specific conditions, some evaluation criteria may be weighted more heavily than others. These criteria will be identified during the RI. The evaluation criteria will be subject to approval by EPA.

Identify Remedial Technologies

Appropriate remedial technologies will be identified based on the established site objectives. These technologies will be evaluated singly and in combinations to determine how well they meet the established project objective. Appropriate remedial technologies may be grouped as required to constitute the remedial measure.

The identification process for remedial technologies will take into account the type of media contamination, the site-specific conditions (soils, geology, etc.), public health and safety concerns, and existing EPA and NJDEP Hazardous Waste and

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related guidance and regulations. Preliminary data indicate that contamination at the Great Swamp, Pine Valley Tree Service, and White Bridge Road Sites consists primarily of asbestos shingles, while additional forms of contamination may exist at the Millington and Great Swamp Sites.

The remedial measures listed below represent a preliminary list of options based on the existing site information. The Millington Site will be examined with all of these options in mind, while the Great Swamp, White Bridge Road, and Pine Valley Tree Service Sites will be examined based on selected options (See Table 1). Additional options will be examined for the latter sites, if additional contamination is found during the RI. The list will be reduced or expanded, depending on the results of the site investigation. For example, if surface and groundwater monitoring do not indicate chemical contamination on site or off site, groundwater collection and treatment will not be required. The final list of remedial measures to be considered for all sites will be subject to approval by EPA.

The remedial alternatives identified at this time include the following.

- Removal and Proper Disposal of Contaminated Soil

  Excavating and disposing of the contaminated soil is one way to prevent additional leaching of contaminants into the groundwater and surface water. The extent of contamination and, therefore, the amount of soil to be removed will be determined in the RI. The soil removed from the site will have to be transported and disposed properly. Once the contaminated soil is removed, clean fill material will be placed in the excavated areas. The site will then be graded and revegetated.

- Surface Capping

  Surface capping is a remedial measure used to prevent surface water infiltration, control erosion, and isolate and contain contaminated wastes and volatiles. Natural materials, such as clay or silt, or synthetic liners constructed of materials, such as PVC, butyl, or hypalon, may be used.

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TABLE 1

PRELIMINARY REMEDIAL TECHNOLOGIES
ASBESTOS DUMP SITE, MILLINGTON, NEW JERSEY

Remedial Technology		Sites			
Category	Type	Millington Dump	Great Swamp	White Bridge Road	Pine Valley Tree Service
	Removal and proper disposal of contaminated soil and fill.	X	X	X	X
Engineering	Surface capping.	X(1)	X	X	X
	Surface grading and revegetation.	X	X	X	X
	Erosion protection	X			
	Surface and slope recontouring and benching	X			
	Retaining Structures	X			
	Leachate collection and treatment.	X			
Treatment	Groundwater collection and treatment.	X			
	Construction of groundwater barriers.	X			
	Surface water collection and treatment.	X			
Other	No action	X	X	X	X

(1) Surface capping will not be considered appropriate by itself as a remedial measure at the Millington Site. It will be considered in conjunction with or in addition to recontouring or benching the outslopes.

(2) Potential for treatment at secondary dump sites will be contingent upon whether toxics are found in the groundwater during the RI.

Source: Prepared by NUS Corporation

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The choice of sealing material and method of application is dictated by site-specific factors such as local availability and costs of cover material, the nature of the wastes being covered, local climate and hydrogeology, and projected future use of the site.

The subject of location and types of borrow material required and available to implement this option are not addressed in this work plan. If this option is selected for further consideration, a modification must be made to the work plan to accommodate the locating, sampling and laboratory testing of suitable borrow material.

Due to the nature and location of the asbestos hill at the Millington Site, this option will not be considered adequate without moderation of the existing outslopes.

- Surface Grading and Revegetation

Surface grading is used to reshape the surface of covered landfills in order to manage surface water infiltration and erosion. The choice of specific grading techniques for a given waste disposal site will depend on site conditions. A graded surface indirectly controls groundwater contamination by promoting surface runoff and reducing infiltration, therefore minimizing leachate generation. Revegetation is used to dry surface layers of land disposal areas through root uptake/ evapotranspiration, reducing the volume of leachate generated and, thereby, indirectly controlling groundwater contamination.

- Erosion Control

At present, the riprap at the toe of the slope at the Millington Site is insufficient to protect the asbestos pile from erosion and sloughing during a medium-to-high flood.

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Erosion control systems will be examined in an effort to protect the slope from damage. Additional riprap, geotextiles, concrete mats, and other systems will be considered to prevent erosion, scouring, and undercutting of the slope. The system will be designed after a review of projected flooding in the Passaic River.

- Surface and Slope Recontouring and Benching

  This remedial action would provide a method to stabilize the embankment by reducing the overall angle of the slope. The slope would be designed based upon the engineering properties of the pile and the in-situ soils.

- Retaining Structures

  This alternative would provide stability to the pile through the application of a structure resistant to the movements of the slope. Concrete retaining walls, crib walls, gabions, and other methods will be examined as buttressing alternatives for the pile.

- Leachate Collection and Treatment

  Leachate collection systems consist of a series of drains that intercept contaminated liquid discharged from the site and channel it to a treatment facility or discharge point. Leachate treatment will be highly variable depending on the composition and strength of the leachate.

- Groundwater Collection and Treatment

  Groundwater collection and treatment is achieved by installing recovery wells that pump groundwater from the contaminated aquifers, treating the water and returning it to the aquifer or discharging to surface waters. As with all methods that affect groundwater conditions, extensive investigation is necessary to determine the appropriate implementation

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procedures. Surface water discharge permits must also be obtained if necessary.

- Construction of Groundwater Barriers

  Groundwater barriers, constructed of bentonite slurries, cement or chemical grout, or sheet piling, can be installed vertically to (1) prevent groundwater from migrating away from the site or (2) divert groundwater so that contact with waste materials is prevented. The installation of an impermeable barrier to control groundwater flow may cause an increase in the upgradient hydraulic head, which would affect the rate of movement of groundwater. These effects must be investigated before recommendation of a groundwater barrier.

- Surface Water Collection and Treatment

  Surface water collection and treatment involves collecting surface waters originating from the site and treating them onsite or at a municipal treatment facility. Treatability studies must precede implementation of any surface water treatment scheme.

- No Action

  In all cases, as dictated by the NCP, the "no action" alternative must be considered in cost-effective analysis. The analysis must address both the environmental and financial consequences of such an alternative.

Task 14 - Prepare Remedial Investigation Report

Remedial Investigation Report

After completion of the field investigations, all pertinent field and laboratory data will be assembled into a detailed RI report. This report will include detailed descriptions of the following items:

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- Objectives of the RI.

- A description of the study areas, including soil types and depths, and the results of the laboratory testing.

- Geologic framework and subsurface geologic conditions in the vicinity of the sites.

- Hydrogeologic conditions at and in the immediate vicinity of the sites, including the depth of the aquifers and the rates and directions of groundwater flow.

- Groundwater and surface water quality in the study areas.

- Ambient air quality to determine public health risk.

- Transport of the wastes by surface water in the vicinity of the sites.

- Extent of contaminated groundwater plumes with estimates of the flow time from the source to the aquifer (if possible), if such plumes are found during the RI at the Millington or Great Swamp Sites or the other sites.

- The stability of the asbestos byproducts and spoil pile at the Millington Site.

- Supporting data, such as chemical analysis reports, logs, and monitoring well water level readings.

- Conclusions and recommendations of the study.

Maps, figures, and tables will be prepared to support the text.

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Feasibility Study (Phase III)

The purpose of the FS is to identify and evaluate appropriate remedial measures and prepare a conceptual design of the selected alternative. The FS will be based on existing site information and information obtained during the RI.

Task 15 - Revise FS Work Plan

The FS portion of this Work Plan will be revised in accordance with the data and information developed in the RI. The revised FS Work Plan will present a detailed schedule for the activities to be undertaken, and will be subject to EPA approval. The major tasks of the FS are as follows:

- Identification and development of alternatives
- Initial screening of alternatives
- Laboratory and field treatability studies
- Remedial alternatives evaluation and preliminary FS report
- Conceptual design of the selected alternative
- Final report

Task 16 - Development of Alternatives

Subsequent to the evaluation of information obtained from the RI and the preliminary identification of remedial technologies (as described in Tasks 13 and 14), all appropriate remedial alternatives will be identified for the determined site objectives. Additional Remedial Alternatives will be considered for the Great Swamp, Pine Valley Tree Service, and White Bridge Road Sites, if appropriate. New alternatives may be identified and examined for each of the sites. Each of these identified alternatives will undergo preliminary development. This preliminary development will be used in the initial screening task.

The selection of objectives for Identification and Development of Remedial Measures must be based on public health protection and site-specific conditions. The selection of objectives and criteria will consider

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- Nature and extent of waste migration and type of media contamination (air, water, soil)

- Local land use and protection of investigative teams and construction crews

- EPA and NJDEP Hazardous Waste Regulations, including NCP, Subpart F

- Other local, state, and federal regulations

Specific objectives will be determined after completion of the RI. However, based upon available information, the following preliminary objectives have been established:

- Public Health and Safety Assurance

  This includes protection of local residents, field crews, and future land users from the waste toxicity and physical damage hazards, which include inhalation, oral and dermal toxicities, and explosion and fire potentials. Both short and long-term hazards are considered.

- Surface Water Protection - Control

  The migration of wastes, caused by surface water flow, leachate runoff, erosion, and flooding must be controlled.

- Ground Water Protection

  The migration of waste into the ground water must be controlled.

- Effectiveness

  This will address the degree to which the remedial measure will reduce long-term environmental impact including air, surface, and groundwater

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contamination; biological degradation; and impacts upon human health. The reliability of post-closure monitoring systems will be included.

The ranking of relative effectiveness will depend largely on past performance of similar remedial measures. Best engineering judgment based on thorough knowledge of site conditions will be used where past experience is deficient.

- Costs

  This will include all capital expenditures and annual operating and maintenance costs associated with the remedial measure. Annual cost comparisons for each method will be performed by amortizing capital over a selected time period to determine equivalent annual costs. Present-worth costs will be used.

Task 17 - Initial Screening of Alternatives

The alternatives developed in Task 16 will be screened to eliminate alternatives that are clearly not feasible or appropriate prior to undertaking detailed evaluations of the remaining alternatives. This screening will be carried out in close coordination with the EPA and the NJDEP.

Three broad considerations will be used as a basis for the initial screening: cost, effects of the alternative, and acceptable engineering practices. More specifically, the following factors will be considered.

- Cost: An alternative whose cost far exceeds that of other alternatives will usually be eliminated from further consideration. Total cost will include the cost of implementing the alternative and the cost of operation and maintenance.

- Environmental effects: Alternatives posing significant adverse environmental effects will be excluded.

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- Environmental protection: Only alternatives that satisfy the response objectives and contribute substantially to the protection of public health, welfare, or the environment will be considered further.

- Implementability and reliability: Alternatives that may prove extremely difficult to implement, that will not achieve the remedial objectives in a reasonable time period, or that rely on unproven technology will be eliminated.

As with the selection of objectives, the site investigation findings will be used to develop an evaluation criteria weighting. Additional criteria are not anticipated; however, each of the criteria can be weighted to reflect the requirements of site-specific conditions.

Decisions on remedial action objectives and the weighting of evaluation criteria can be made after the site investigations have been completed and evaluated. Review meetings with the EPA and the NJDEP will serve to develop the final objectives and criteria.

Task 18 - Laboratory and Field Studies

After the RI field work has been completed and the remedial actions have been identified, it may be necessary to conduct pilot or bench-scale treatability studies to evaluate some of the recommended actions. This work would include any studies required to evaluate the effectiveness of remedial actions and to establish engineering criteria necessary for design and implementation. These treatability studies will be used to evaluate remedial actions applicable to the potentially contaminated media at the site, including soils, groundwater, and surface water. Potential remedial technologies that may be investigated through pilot or bench-scale studies may include groundwater or surface water treatment and sorption and desorption properties of soils. Literature review of treatment technologies will be used where possible.

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Sorption and desorption reactions of local soils to contaminants will be studied for evaluation of the no action alternative. Two types of tests are proposed, adsorption isotherms and contaminant breakthroughs. The experimentation is proposed to evaluate the renovation/attenuation potential of the contaminated soil and the soils separating the contaminants from the receiving groundwater aquifer. The proposed studies will be based on the groundwater contamination results and the physical properties of the soils. Soil samples will be collected via Shelby tube sampling as discussed in Task 10.

Because these laboratory studies are linked directly to the prior performance of other FS tasks, a separate Work Plan for any proposed laboratory studies will be submitted to the EPA for approval, if such studies are warranted.

Task 19 - Remedial Alternatives Evaluation and Preliminary Feasibility Report

The remedial alternatives that pass the initial screening will be further developed and evaluated so that the most cost-effective alternative(s) can be recommended to EPA and the NJDEP. A preliminary report will be submitted to EPA and the NJDEP for approval and final selection of a remedial action.

The following is a breakdown of the subtasks involved in this phase of the FS:

Detailed Development of Alternatives

Alternatives which pass the initial screening step will be developed in greater detail. This development will include the following:

- Description of appropriate treatment and disposal technologies
- Evaluation of the ability of each alternative to mitigate site hazards.
- Special engineering considerations required to implement the alternative (e.g., pilot treatment facility, additional studies needed to proceed with final remedial design.)

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- Environmental impacts and proposed methods for mitigating any adverse effects.

- Operation, maintenance, and monitoring requirements of the remedy.

- Offsite disposal needs and transportation plans.

- Temporary storage requirements.

- Safety requirements for remedial implementation (including both onsite and offsite health and safety considerations).

- A description of how the alternative could be phased into individual operable units. The description should include a discussion of how various operable units of the total remedy could be implemented individually or in groups resulting in a significant improvement to the environment or savings in costs.

- A description of how the alternative could be segmented into areas to allow implementation of differing phases of the alternative.

- A review of any offsite storage or disposal facilities to ensure compliance with applicable RCRA requirements, both current and proposed.

Environmental Assessment

An Environmental Assessment (EA) will be performed for each alternative. The EA is an evaluation of each alternative's environmental effects, physical or legal constraints, and regulatory requirements. In addition, the EA will include an analysis of measures to mitigate any adverse effects associated with an alternative.

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Cost Evaluation

A cost evaluation will be developed for all feasible remedial alternatives (and for each phase or segment of the alternatives). The cost will be presented as a present-worth cost and will include the total cost of implementing the alternative and the annual operating and maintenance cost. Both monetary costs and associated non-monetary costs will be included.

Alternatives Evaluation and Final Recommendation

Alternatives will be evaluated using technical, environmental, and economic criteria. At a minimum, the following areas will be used to evaluate the cost-effectiveness of alternatives.

- Reliability: Alternatives that minimize or eliminate the potential for release of wastes into the environment will be considered more reliable than other alternatives. Institutional concerns, such as management requirements, can also be considered as reliability factors.

- Implementability: The requirements of implementing the alternatives will be considered, including phasing alternatives into operable units and segmenting alternatives into project areas on the site. The requirements for permits, zoning restrictions, right of ways, and public acceptance are also examples of factors to be considered.

- Operation and Maintenance Requirements: Preference will be given to projects with lower O & M requirements, other factors being equal.

- Safety Requirements: Onsite and offsite safety requirements during implementation of the alternatives will be considered. Alternatives with lower safety impact and cost will be favored.

- Cost: The remedial alternative with the lowest total present-worth cost will be favored. Total present-worth cost will include the capital cost of

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implementing the alternative and the cost of operation and maintenance of the proposed alternative.

Based on the above criteria and evaluations, an alternative(s) will be recommended. The recommendation will be justified by stating the relative advantages over other alternatives considered. Evaluative considerations shall be applied uniformaly to each alternative. The lowest-cost alternative that is technologically feasible and reliable and that adequately protects (or mitigates damage to) public health, welfare, or the environment will be considered the most cost-effective alternative.

Preliminary Report

A preliminary FS report will be prepared presenting the results of Task 16 through 18 and identifying the recommended remedial alternative(s). The report will be submitted to EPA and the State for approval and final selection of a remedial alternative(s).

All information specific to the remedial measure evaluation will be summarized and presented in a separate remedial evaluation report. That report, together with the above noted RI report, will be the basis for the conceptual design of the selected remedial measure.

Information to be included in the remedial evaluation report will include the following.

- Supporting references on the feasibility of the remedial measures chosen for evaluation.
- Specific procedures and supporting data used to rank each remedial measure for the evaluation criteria.
- The expected environmental effects of the remedial measure alternatives.
- Design calculations used in evaluating each remedial measure.

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- Preliminary design drawings and sketches used to evaluate each remedial measure.

- Acceptable engineering practices related to the design and implementation of the remedial measures chosen for evaluation.

- The cost estimates for each remedial measure with appropriate references provided.

The report will be prepared in a format acceptable to EPA. All documents collected in the remedial measure evaluation will be organized in a project file and will be available for later reference.

All data developed during the FS needed to support the recommendation of specific remedial measures will be presented in the draft report. A risk assessment necessary to confirm or dispute a no-action alternative will be provided.

Task 20 - Conceptual Design

A conceptual design of the selected remedial measure will be prepared for use in development of detailed construction plans. The design will be based on the findings of the RI and the remedial measures evaluation.

The conceptual design plan will include general arrangement drawings and specifications. The site investigation reports will be companion documents with the conceptual design plan. These reports will contain site information needed for construction design, such as test boring logs, borehole testing data, groundwater conditions, and soil, waste, and rock sample descriptions and analysis.

The conceptual design plan will include the following:

- The selected engineering approach with implementation schedule
- Any special implementation requirements
- Applicable design criteria

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- Preliminary site layouts
- Budget cost estimates including operation and maintenance cost figures
- Operation and maintenance requirements
- Monitoring requirements
- Safety plan including costs
- Equipment and construction functional specifications

Any additional information required as the basis for the completion of the final remedial design will also be included.

Task 21 - Final Report

A final report will be prepared for submission to the EPA and NJDEP. The report will include the results of Tasks 15 through 19 and will include additional appended information.

Appended information may include, but will not be limited to

- Summary of assessment of on and offsite contamination
- Summary of remedial measure evaluation
- Supporting data for chosen remedial measure(s)
- Detailed data analysis
- Site topographic map with ground control data
- General arrangement drawings of remedial measure
- Typical geologic and design cross-sections
- Typical design details

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- Design report with supporting calculations
- Erosion and sedimentation control plans
- Preliminary construction health and safety plan
- Preliminary construction schedule
- Conceptual design drawings (Process and Instrumentation Diagrams and general arrangements)
- Preliminary cost estimates

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