N00639.AR.002068
NSA MID SOUTH
5090.3a

LETTER TRANSMITTING CLASS V UNDERGROUND INJECTION WELL APPLICATION AND DYE TRACE REGISTRATION APPLICATION FOR SOLID WASTE MANAGEMENT UNIT 39
MILLINGTON SUPPACT TN
9/17/2004
ENSAFE

ENSAFE

ENSAFE INC. ENVIRONMENTAL AND MANAGEMENT CONSULTANTS

5724 Summer Trees Drive • Memphis, Tennessee 38134 • Telephone 901-372-7962 • Facsimile 901-372-2454 • www.ensafe.com

September 17, 2004

Mr. Bruce Craig
Tennessee Department of Environment and Conservation
Division of Water Supply
401 Church Street, 9th Floor
Nashville, Tennessee 37243-1549

Re: Class V Underground Injection Well Application and Dye Trace Registration Application
SWMU 39
NSA Mid-South, Millington, Tennessee

Dear Mr. Craig,

The Navy has completed a Corrective Measures Study (CMS) to identify and evaluate remedial alternatives to address chlorinated solvent impacted groundwater at SWMU 39 located at NSA Mid-South in Millington, Tennessee. The CMS, approved by the Tennessee Department of Environment and Conservation (TDEC) and the U.S. Environmental Protection Agency (USEPA) Region 4, identified enhanced biodegradation as the preferred remedial alternative. The installation of Class V underground injection wells is necessary to implement the remedy. On behalf of the U.S. Navy, EnSafe has prepared the enclosed application for the proposed installation of six injection wells at the site. In addition, a Dye Trace Registration Application is enclosed for a proposed dye trace study at SWMU 39.

It is our understanding that the application fee is waived as a result of the corrective action work being performed under the direction of the Division of Solid/Hazardous Waste Management. If you have any questions or comments, please contact me at (901) 372-7962.

Sincerely,

EnSafe, Inc.

Corey Coleman

by: Corey Coleman
Environmental Scientist

Attachments - Class V Underground Injection Well Application
- Dye Trace Registration Application

cc: Randy Wilson, NSA Mid-South
James Heide, NSA Mid-South
Bill Hill, NAVFAC EFDSOUTH

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
WATER SUPPLY
9 th Floor, 401 Church Street
Nashville, Tennessee 37243-1549
(615) 532-0191

APPLICATION FOR AUTHORIZATION TO OPERATE A CLASS V UNDERGROUND INJECTION WELL OR STORM WATER DISCHARGE TO THE SUBSURFACE

In accordance with the provisions of Tennessee Code Annotated Section 69-3-105 and Regulations of the Tennessee Water Quality Control Board, application is hereby made to operate:

☒ **Class V Underground Injection Well**
☐ **Discharge of Storm Water into the Subsurface**

Part A - General Information

1. Site or Facility Name Naval Support Activity (NSA) Mid-South – SWMU 39

Street or Highway Address Adjacent to the southeast intersection of Intrepid Street and Kearsarge Avenue

City Millington Zip Code N/A

County Shelby Telephone N/A

2. Describe the activities conducted by the applicant which require it to obtain a Class V permit authorization:

Solid Waste Management Unit (SWMU) 39 is the former site of Building S-74, a facility previously containing a laundry and drycleaning operation and a transformer and transformer oil drum storage area. (Figure 1). A RCRA Facility Investigation conducted at this site determined that chlorinated solvents (e.g. trichloroethene) are present in fluvial groundwater at concentrations exceeding the USEPA Region 9 preliminary remedial goals (PRGs).

Considering site conditions, the NSA Mid-South base cleanup team determined that enhanced in-situ biodegradation would be the best remedial alternative. Enhanced in-situ biodegradation at the site will require the injection of sodium acetate and ammonium phosphate, dissolved in potable water, into the proposed injection wells at SWMU 39.

3. USGS topographic coordinates of the injection well or facility location (if multiple wells are at the same site, then give principal site latitude and longitude, and average elevation):

Quadrangle Name Brunswick

Latitude 35 o 12 ' 02 " North

Longitude 89 o 31 ' 30 " West

Ground elevation at well location: approx. 270' MSL

4. Name and address of owner of injection well or facility:

Individual or Firm Name NSA Mid-South

Street or RFD 5722 Integrity Drive

City Millington State TN

Zip Code 38054-5000 Telephone (901) 874-5462

5. Type of Business: X Federal _____ State _____ Public
_____ Private _____ Other

6. Nature of Business:
NSA Mid-South is an active military installation.

7. List up to four standard industrial codes (SIC) which best reflect the principal products or services provided by the facility:

a. 481219 (NAICS, 1997)
b. 9711
c. 9621
d. _____

8. Name and address of legal contact or person responsible for the operation of the Class V injection well or facility:

Name Mr. Jim Heide

Street or RFD 5722 Integrity Drive

P.O. Box ---

City Millington State TN

Zip Code 38054 Telephone (901) 874-5462

9. Is the facility located on Indian Lands? _____ Yes X No

10. Permit Status: X a. new well or facility
_____b. modification of existing well or facility
_____c. reapplication for previously permitted well or facility

11. List all other permits or construction approvals received or applied for under any of the following programs:

a. Hazardous waste management program under federal or state law
b. UIC program under federal or state law
c. NPDES program under federal or state law
d. Prevention of Significant Deterioration (PSD) program under federal or state law
e. Nonattainment area program under federal or state law
f. National Emission Standards for Hazardous Pollutants (NESHAPS) preconstruction approval under federal or state law
g. Ocean dumping permits under the Marine Protection Research and Sanctuaries Act
h. Dredge and fill permits under Section 404 of the Clean Water Act, 33 U.S.C. 1344
i. Comprehensive Environmental Response, Compensation and Liability Act (Federal Superfund) or Tennessee Hazardous Waste Management Act (Tennessee Superfund)
j. UST program under federal or state law
k. Groundwater Protection permits from Tennessee Division of Ground Water Protection
l. Other relevant environmental permits

Permit No.	Type	Date Issued
TNHW-094	RCRA Part B	
Pending	Memphis and Shelby County Health Department Injection Well	N/A

Part B - Facility Description

1. Nature, type or purpose of injection well:
   The injection wells will be part of an enhanced in-situ biodegradation groundwater treatment system to remediate chlorinated solvent contamination in the fluvial deposits groundwater.

2. Description of injection well or facility, including monitoring wells and other associated structures (attach additional information or diagrams, if necessary):
   Refer to Attachments

3. Depth of injection zone: ≈ 80 to 110 anticipated feet below ground level

4. Operating status of well or facility: __X__ proposed _____ active
_____ inactive _____ abandoned

5. Date injection began (if not in operation, projected date of beginning) 1/12/05
If inactive or abandoned well, approximate date injection ceased _____

6. For previously active facilities, give history of injection or operation:
Enhanced in-situ biodegradation through injection is currently being implemented at AOC A on the former NSA Mid-South Northside. A solution containing 50 pounds of sodium acetate, one half pound of ammonium monophosphate, and 100 gallons of potable water are injected on a monthly basis. This solution serves as a food source stimulating microbial activity and creates an anaerobic environment proven to be effective in trichloroethene (TCE) and tetrachloroethene (PCE) degredation.

7. Mode of operation: _____ continuous __X__ intermittent

8. Volume of injected fluid: __600__ gallons _____ or cubic yards

_____ per day __X__ per month _____ per year

9. Nature of injected fluid, including physical, chemical, biological and/or radiological properties:
The injected fluid will consist of potable water, obtained from the public water supply at NSA Mid-South, amended with sodium acetate salt, ammonium monophosphate, and sodium bromide. The sodium bromide will be used for a groundwater migration study at the site.

10. Origin of injected fluid:
The injected fluid will consist of potable water obtained from the public water supply at NSA Mid-South mixed with the compounds listed above.

11. Description of treatment of fluid prior to injection:
No treatment will be performed other than the physical process of mixing to promote dissolution of the chemical amendments listed in Item 9.

12. Type of injection: __X__ pump _____ gravity _____ other

Description of pump(s):
A pneumatically operated diaphragm pump connected to a chemical feed tank mounted on a flat bed trailer will be used to inject the nutrient water into the wells. The pump will have the ability to pump water at a maximum rate of 15 gpm and maximum pressure of 35 psig

13. Operating parameters of injection well:

a. fluid flow _____ gpm

b. fluid pressure _____ psig

c. fluid temperature ambient temperature Celsius*

d. other significant operating information (attach additional information or diagrams, if necessary):

It is assumed the water in the chemical feed tank will be at ambient temperature.

Part C - Description of Area of Review

The area of review (AOR) for each authorized or permitted Class V injection well shall, unless otherwise specified by the Department, consist of the area lying within and below a one mile radius of the injection well pump site or facility, and shall include, but not be limited to surface geographic features, subsurface geology, and demographic and cultural features within the area. Attach to this part of the application a complete characterization of the AOR, including the following:

1. Description of all past and present uses of groundwater within the AOR, as documented by public record.

2. Description of the groundwater hydrology within the AOR, including characteristics of all subsurface aquifers, presence or absence of solution development features, general direction of groundwater movement, and chemical characteristics of the groundwater in the AOR.

3. Description of the population and cultural development within the AOR, including the number of persons living within one mile of the well or facility, land uses within the AOR, and the existence of any community, state, regional or national parks, wildlife refuges, natural or wilderness areas, recreational or other public-use areas, or any other environmentally sensitive features within the area of review.

4. Identify all sources of publicly-supplied drinking water for persons living or working within the AOR.

5. Identify any single or multi-family residences, churches, schools, businesses or other inhabited structures within the AOR which do not have access to a public drinking water supply system.

6. If groundwater is used for drinking water within the area of review, then identify and locate on Attachment 1, all groundwater withdrawal points within the AOR which supply public or private drinking water systems.

7. Identify any surface water bodies or features within the area of review which may be impacted by groundwater discharge to surface waters.

8. Identify any surface water intake which supplies a public water distribution system and is located within the AOR or within three miles topographically downgradient from the well or facility. If any such intake(s) exist, then locate on Attachment 1.

Part C — Description of Area of Review

1. Before Navy acquisition, the NSA Mid-South area groundwater was used for agriculture or was undeveloped. Potable groundwater wells were established in the Memphis and Fort Pillow aquifers for use across the Naval Base. The nearest public supply well is PW-N5, approximately 400 feet north of SWMU 39. PW-N5 is screened in the Memphis aquifer and is hydraulically separated from the shallow fluvial deposits aquifer by the upper Claiborne confining unit.

2. The aquifer that will receive injection fluid is the fluvial deposits groundwater. The fluvial deposits are a fine to coarse-grained, poorly sorted sand and gravel unit that underlies the loess. The top of the fluvial deposits are encountered at depths between 32′ and 41.5′ at SWMU 39. The base of the fluvial deposits ranges in depths between 78 and 108 feet. The entire thickness of the fluvial deposits at SWMU 39 is saturated. The rounded to sub-angular gravel coarsens downward, with individual cobbles typically ranging from 0.25″ to 1 inch in longest dimension.

   Underlying the fluvial deposits at SWMU 39 is the Cockfield Formation. The upper part of the Cockfield Formation consists of a discontinuous sand zone overlying a clayey zone. This upper part consists of very-fine to fine-grained sand. Where present at SWMU 39, the sand thickness ranges from 16.5′ to 28′. Clay horizons in the Cockfield Formation behave as a lower semi confining unit for the fluvial deposits aquifer and, where present at SWMU 39, sandy zones underlying the fluvial deposits in the upper part of the Cockfield Formation. The contact between sands in the upper part of the Cockfield Formation to clays in the upper to middle part of the formation is distinct at SWMU 39. Fine sand was also noted within the clay at some locations at SWMU 39. Based on potentiometric maps, the average hydraulic gradient of SWMU 39 is 0.0036 feet per foot. The hydraulic conductivity is 6.8 ft/day. The effective porosity value for silty sand is 0.25. These values produced a calculated average horizontal groundwater velocity of 0.10 ft/day or 36.5 ft/yr.

   The two principal groundwater units at NSA Mid-South are the alluvial-fluvial deposits aquifer, which is the most prominent surficial aquifer, and the Memphis aquifer, which is the primary drinking water source in the Memphis area. These aquifers are hydraulically separated by the Cockfield and Cook Mountain formations, which individually range from 0 to 185′ and 10′ to 60′ within the AOR. The Cockfield Formation is composed of fine sand and silt with interbedded clay. Water levels in the Cockfield Formation are confined and essentially equal to those in the fluvial deposits. The Cook Mountain Formation, which contains the most aerially extensive clay in the upper part of the Claiborne Group in Shelby County, serves as the lower confining unit for the fluvial deposits and Cockfield Formation groundwater and the upper confining unit for the Memphis aquifer. The Cook Mountain Formation at NSA Mid-South

consists predominately of clay and silt; however, minor lenses of silty fine sand may be present locally. The Memphis Sand, which underlies the Cook Mountain Formation, is a thick layer of fine to medium or medium to coarse sand with various clay lenses. The groundwater from the Memphis Sand is designated the Memphis aquifer. The Memphis Sand/Memphis aquifer is underlain and confined by the Flour Island Formation, which consists predominately of clay and silt. The Flour Island Formation acts as the upper confining unit for the Fort Pillow aquifer of the Fort Pillow Sand. The Fort Pillow Sand/Fort Pillow aquifer is mainly fine to medium sand with minor lenses of clay.

3. According to the Public Affairs Office at NSA Mid-South, as of July 1999, a total of 1,567 people live on the premises. Currently, most of the AOR is only used during daylight hours for work activities. North of SWMU 39 are military offices and warehouses. There are also activity fields that are now open to public use. South of SWMU 39 are woodlands and cultivated farmland. Buildings specified for military use are located east of the SWMU. West of SWMU 39 is a public recreational park containing several activity fields.

4. Five production wells supply potable groundwater to NSA Mid-South. PW-N1 and PW-N2 are screened in the Memphis aquifer. PW-N3, PW-N4, and PW-N5 are screened in the Fort Pillow aquifer. Although the Memphis aquifer and fluvial deposits groundwater are not hydraulically connected, PW-N1 was placed on emergency standby status in 1994 as a precautionary measure because solvent contaminants were identified in the fluvial deposits nearby. Currently, the City of Millington mainly uses groundwater from the Fort Pillow aquifer.

5. No structures within a one mile radius of the injection wells are lacking access to a public drinking water supply system.

6. The active pumping wells that supply water to NSA Mid-South are shown on the attached figure.

7. NSA Mid-South Southside drainage ditches empty into the Big Creek Drainage Canal. The canal is displayed on the attached figure.

8. No surface water intakes are known to exist within three miles down gradient of the AOR.

Attachments

1. USGS topographic quadrangle map showing the location of the Class V injection well or facility and a one-mile radius area surrounding the well or facility.

2. USGS geologic quadrangle or regional geologic map showing the subsurface structure in the area of the well or facility, from the surface to the injection zone.

3. Schematic diagram of the injection well showing construction details and materials of the injection well.

4. Chemical analysis data of injection fluid, if required.

5. Process description of the treatment or other process which is the source of the injection fluid, if required.

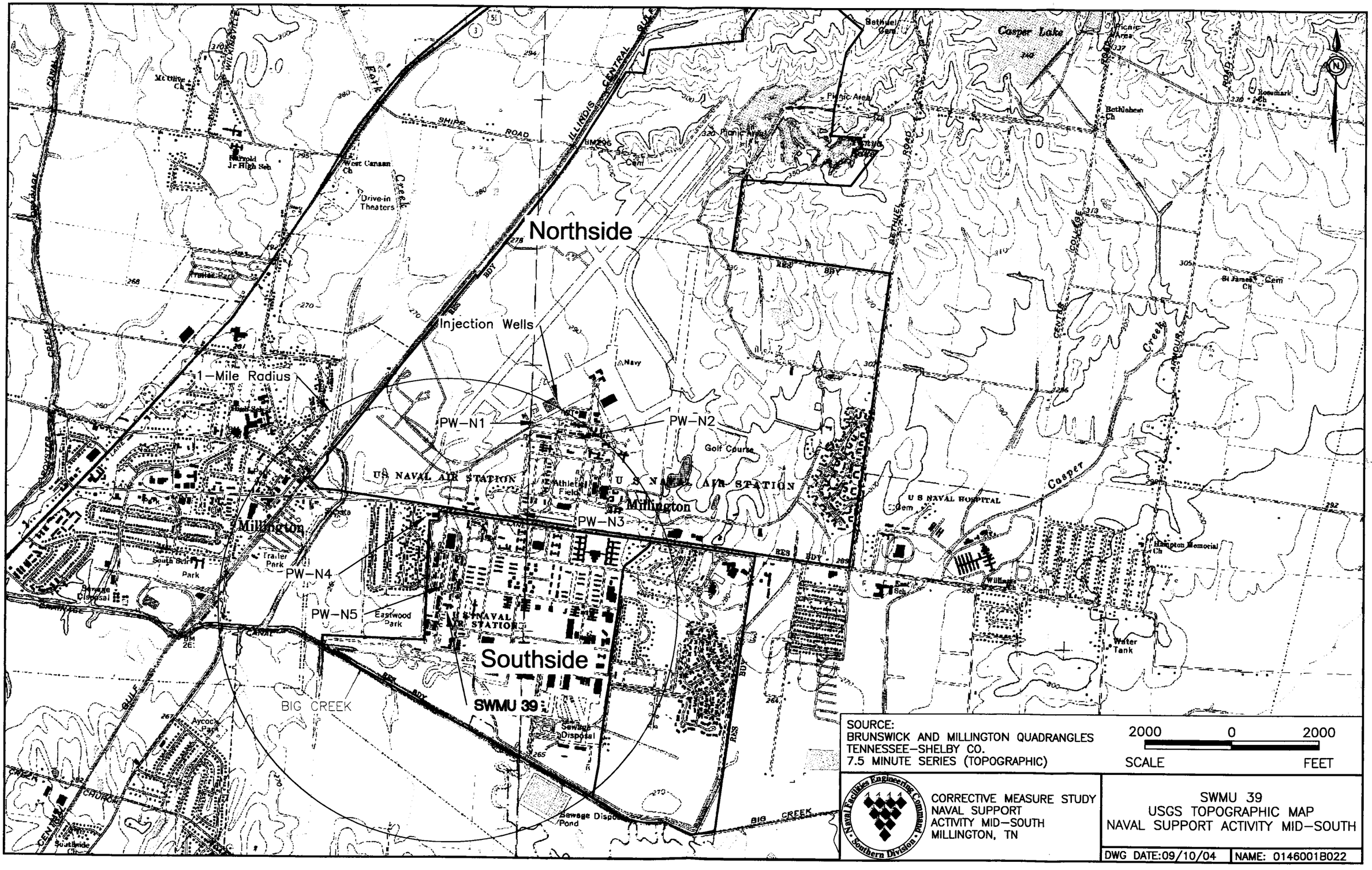
6. Procedure for operation and maintenance of the injection well or facility, if required.

7. Geologic/hydrogeologic information collected during the planning, construction and design phases of the facility and injection well.

8. Blueprints from the facility showing the injection well and portions of the facility which will or may contribute injectate to the injection well, including storm runoff waters.

9. Construction diagrams depicting erosion and sediment controls.

Attachment 1
Topographic Map



SOURCE:
BRUNSWICK AND MILLINGTON QUADRANGLES
TENNESSEE-SHELBY CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)

2000 0 2000
SCALE FEET

Naval Facilities Engineering Command · Southern Division

CORRECTIVE MEASURE STUDY
NAVAL SUPPORT
ACTIVITY MID-SOUTH
MILLINGTON, TN

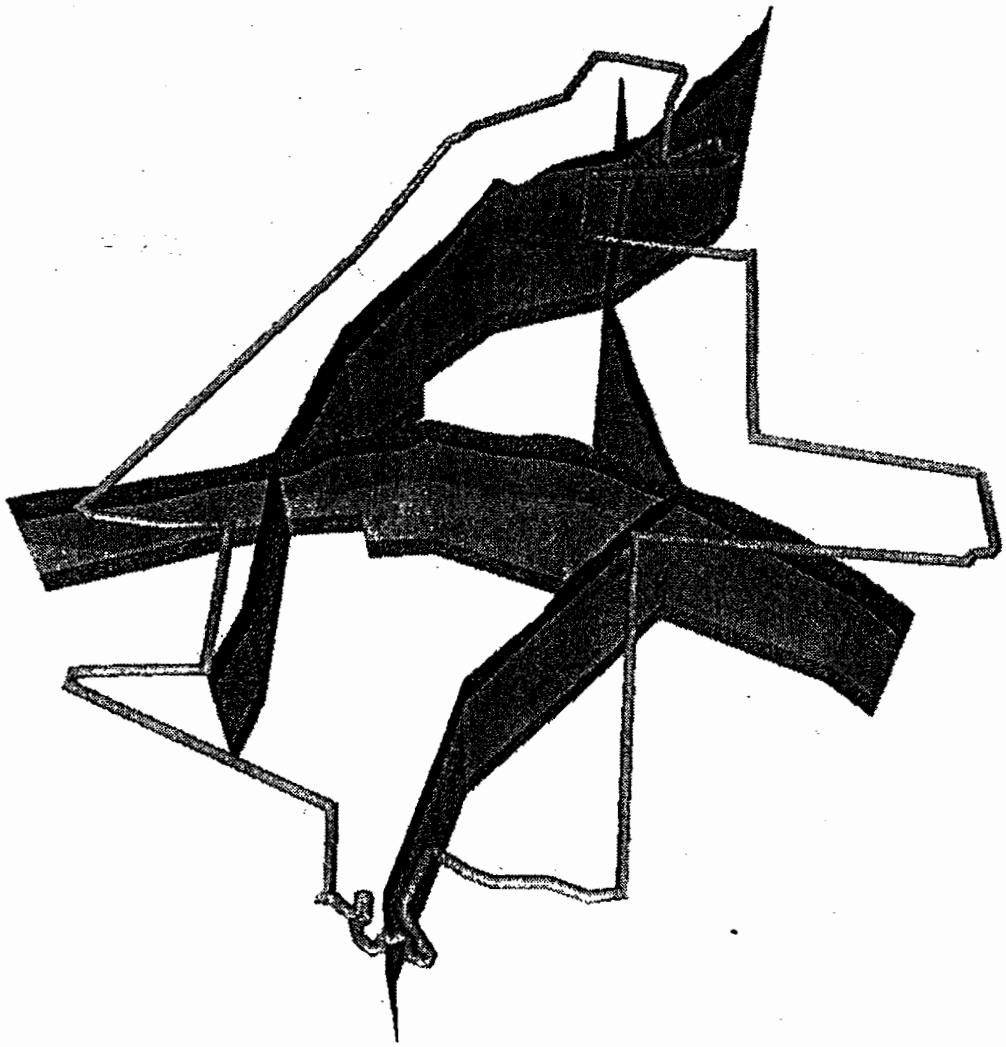
SWMU 39
USGS TOPOGRAPHIC MAP
NAVAL SUPPORT ACTIVITY MID-SOUTH

DWG DATE:09/10/04 | NAME: 0146001B022

Attachment 2
Geologic Map

Hydrogeology and Ground-Water Quality at Naval Support Activity Memphis, Millington, Tennessee

Water-Resources Investigations Report 97-4158



Prepared by the
U.S. GEOLOGICAL SURVEY

in cooperation with the
DEPARTMENT OF THE NAVY,
SOUTHERN DIVISION,
NAVAL FACILITIES ENGINEERING COMMAND

Table 1. Post-Midway Group geologic units underlying Naval Support Activity (NSA) Memphis, Millington, Tennessee, and their hydrologic significance

[Modified from Parks and Carmichael, 1989, 1990c, d; Kingsbury and Parks, 1993; Kingsbury and Carmichael, 1995]

System	Series	Group	Stratigraphic unit (and local name)	Thickness (in feet)	Lithology and hydrologic significance
Quaternary	Holocene and Pleistocene		Alluvium (alluvial deposits)	0-70	Silt, clay, sand, and gravel. Underlies the alluvial plains of Big Creek and tributary streams. A lower sand and gravel is connected to the fluvial deposits and constitutes part of the alluvial-fluvial deposits aquifer.
	Pleistocene		Loess	15-45	Silt, clay, and sand. Predominantly silt with silty clay and silty, fine sand at various horizons. Principal unit at the surface in upland areas. Thinnest on the tops of hills and ridges; thickest on the valley slopes. Generally serves as the upper confining unit for the alluvial-fluvial deposits aquifer. Locally contains perched water tables in the upper part.
Quaternary and Tertiary(?)	Pleistocene and Pliocene(?)		Fluvial deposits (terrace deposits)	5-70	Sand and gravel; minor clay and ferruginous sandstone. Underlies the loess in upland areas. Thickness varies greatly because of erosional surfaces at top and base. Constitutes part of the alluvial-fluvial deposits aquifer. Provides water to some domestic and farm wells in the NSA Memphis area.
Tertiary	Eocene	Claiborne	Cockfield Formation	0-185	Sand, silt, clay, and lignite. Complexly interbedded and interlensed. Thickness of formation is highly variable because of erosional surfaces at top and base. Locally contains sand lenses in which domestic and farm wells are made. Sand lenses are more prevalent in northern and eastern NSA Memphis. Commonly consists predominantly of fine sediments and serves as part of the upper confining unit for the Memphis aquifer.
			Cook Mountain Formation	10-60	Clay, silt, and sand. Generally consists of clay and silt, but locally contains some very fine sand. Locally serves as part of the lower confining unit for the Cockfield aquifer and is the principal upper confining unit for the Memphis aquifer.
			Memphis Sand	865-880	Sand, silt, clay, and minor lignite. Consists of a thick body of sand with clay lenses at various horizons. Sand is fine to medium or medium to coarse. Upper part contains lenses of fine sand and clay. Constitutes the Memphis aquifer—the principal aquifer providing water for most domestic, commercial, industrial, and municipal supplies in the Memphis area. Provides water to two wells at NSA Memphis and three wells at Millington.
	?	Wilcox	Flour Island Formation	225-290	Clay, silt, sand, and lignite. Consists predominantly of clay and silt with lenses of fine sand. Serves as the lower confining unit for the Memphis aquifer and the upper confining unit for the Fort Pillow aquifer.
			Fort Pillow Sand	125-180	Sand, with minor clay. Sand is fine or fine to medium; clay is present as lenses. Constitutes the Fort Pillow aquifer—the second principal aquifer in the Memphis area. Provides water to three wells at NSA Memphis and two wells at Millington.
	Paleocene		Old Breastworks Formation[1]	245-310	Clay, silt, sand, and lignite. Only uppermost part penetrated by test holes at NSA Memphis; thickness range is from two deep test holes drilled in northern Shelby County. Serves as the lower confining unit for the Fort Pillow aquifer, along with the Porters Creek Clay and the Clayton Formation of the underlying Midway Group of Tertiary age and the Owl Creek Formation of Cretaceous age.

[1]Frederiksen and others (1982) tentatively placed the Old Breastworks Formation in the Midway Group, but for the purposes of this report, the Old Breastworks Formation of the Wilcox Group is used as defined by Moore and Brown (1969).

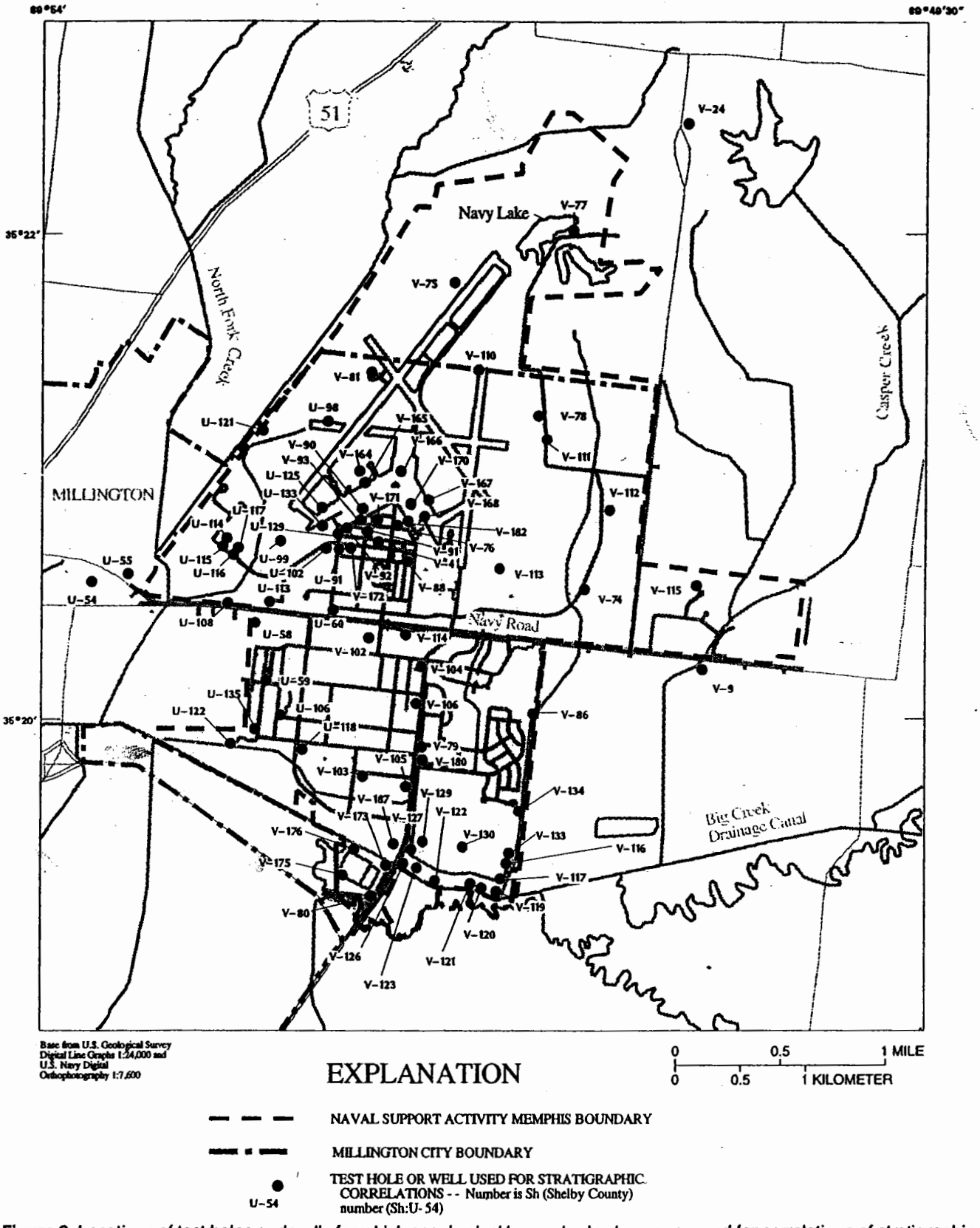


Figure 3. Locations of test holes and wells for which geophysical logs or boring logs were used for correlations of stratigraphic units beneath Naval Support Activity Memphis.

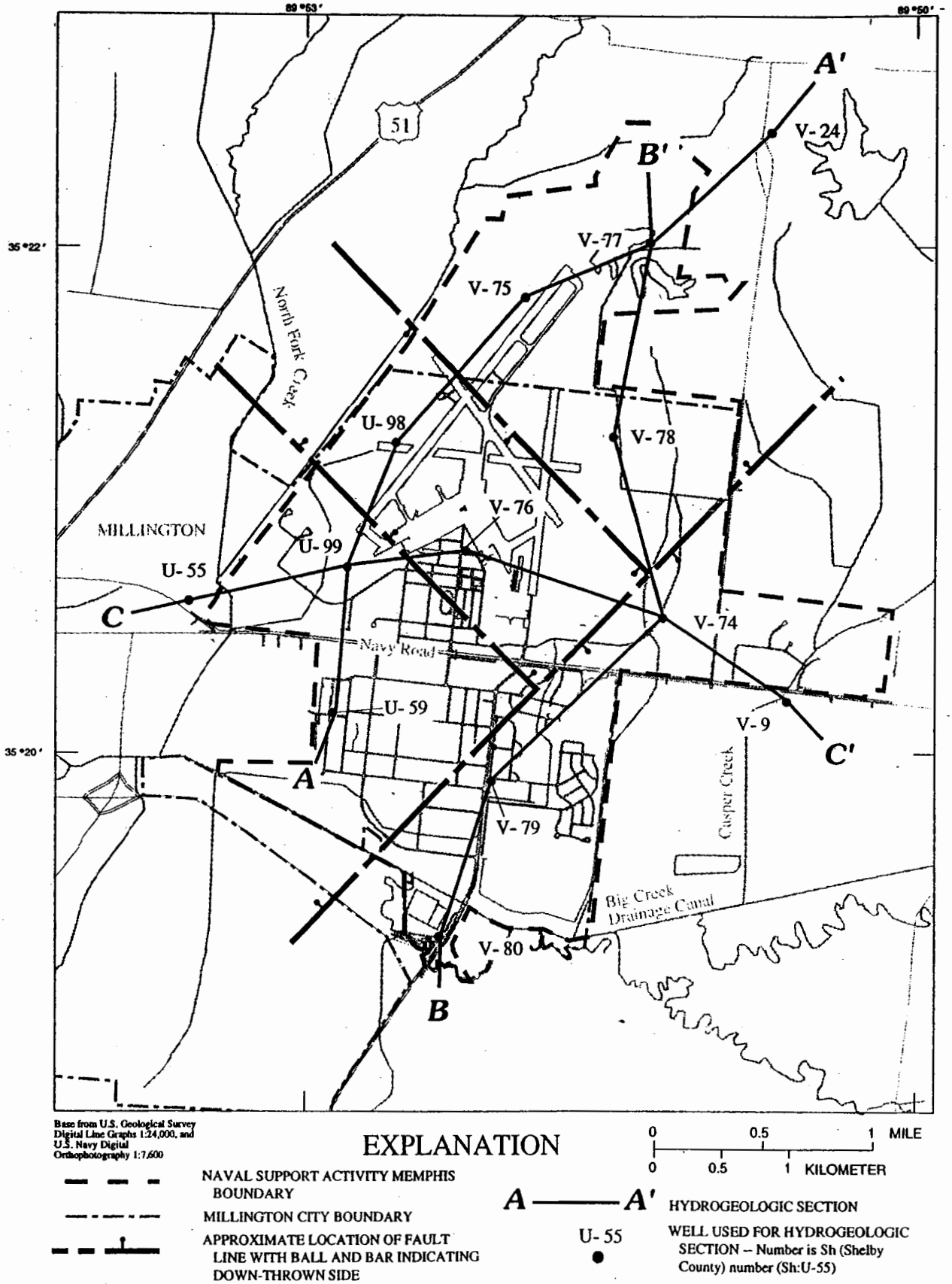
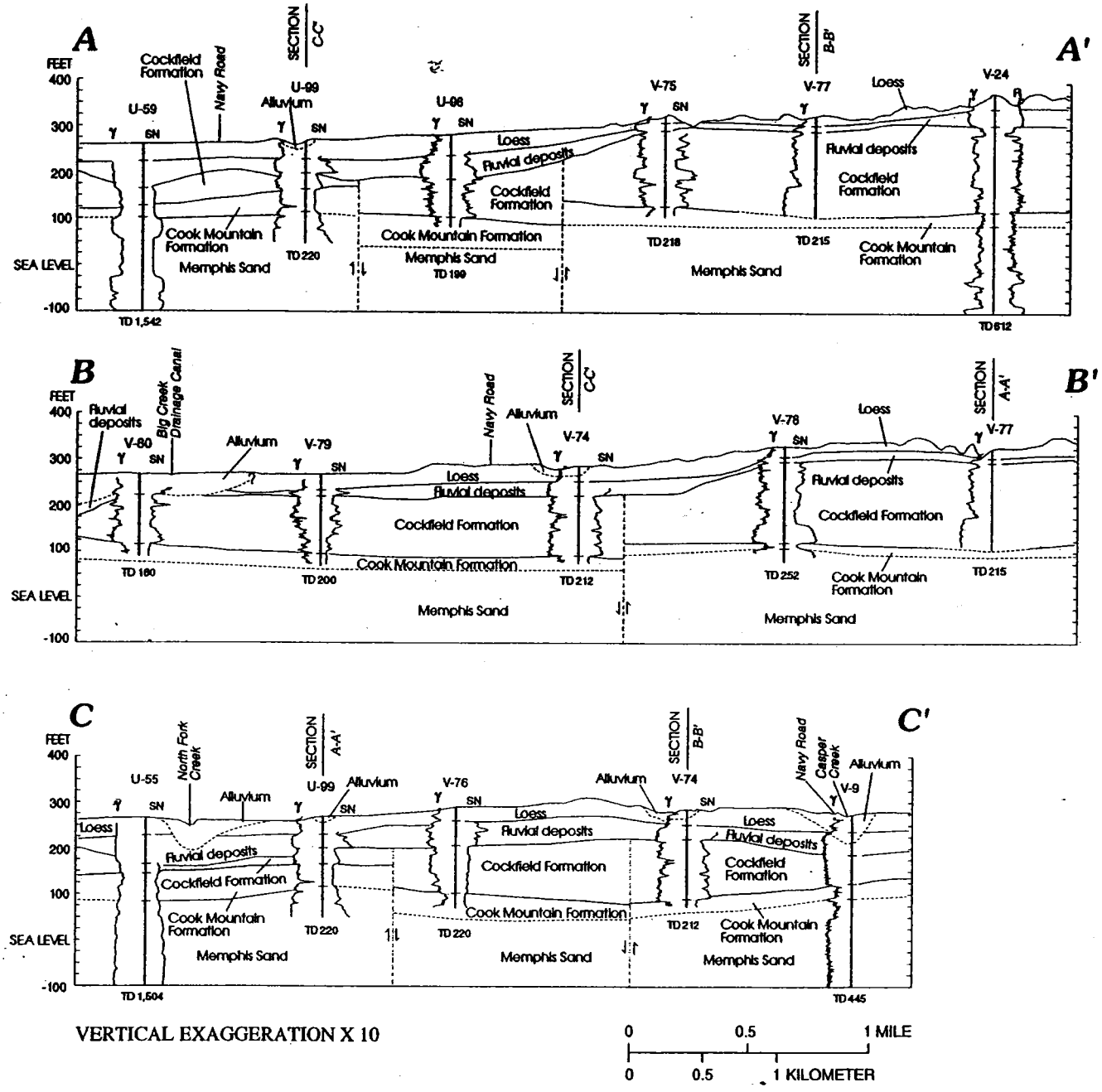


Figure 4a. Locations of hydrogeologic sections *A–A'*, *B–B'*, and *C–C'*, and faults that displace the Cockfield Formation, Cook Mountain Formation, and Memphis Sand at Naval Support Activity Memphis.



EXPLANATION

A——A' HYDROGEOLOGIC SECTION

FORMATION CONTACT. DASHED WHERE APPROXIMATE

APPROXIMATE LOCATION OF FAULT, AND RELATIVE DIRECTION OF DISPLACEMENT

V-79 TEST HOLE OR WELL -- Number is Sh (Shelby County) number (Sh:V-79). Tick marks indicate formation contacts

TD200 TOTAL DEPTH OF WELL OR TEST HOLE

GEOPHYSICAL LOGS

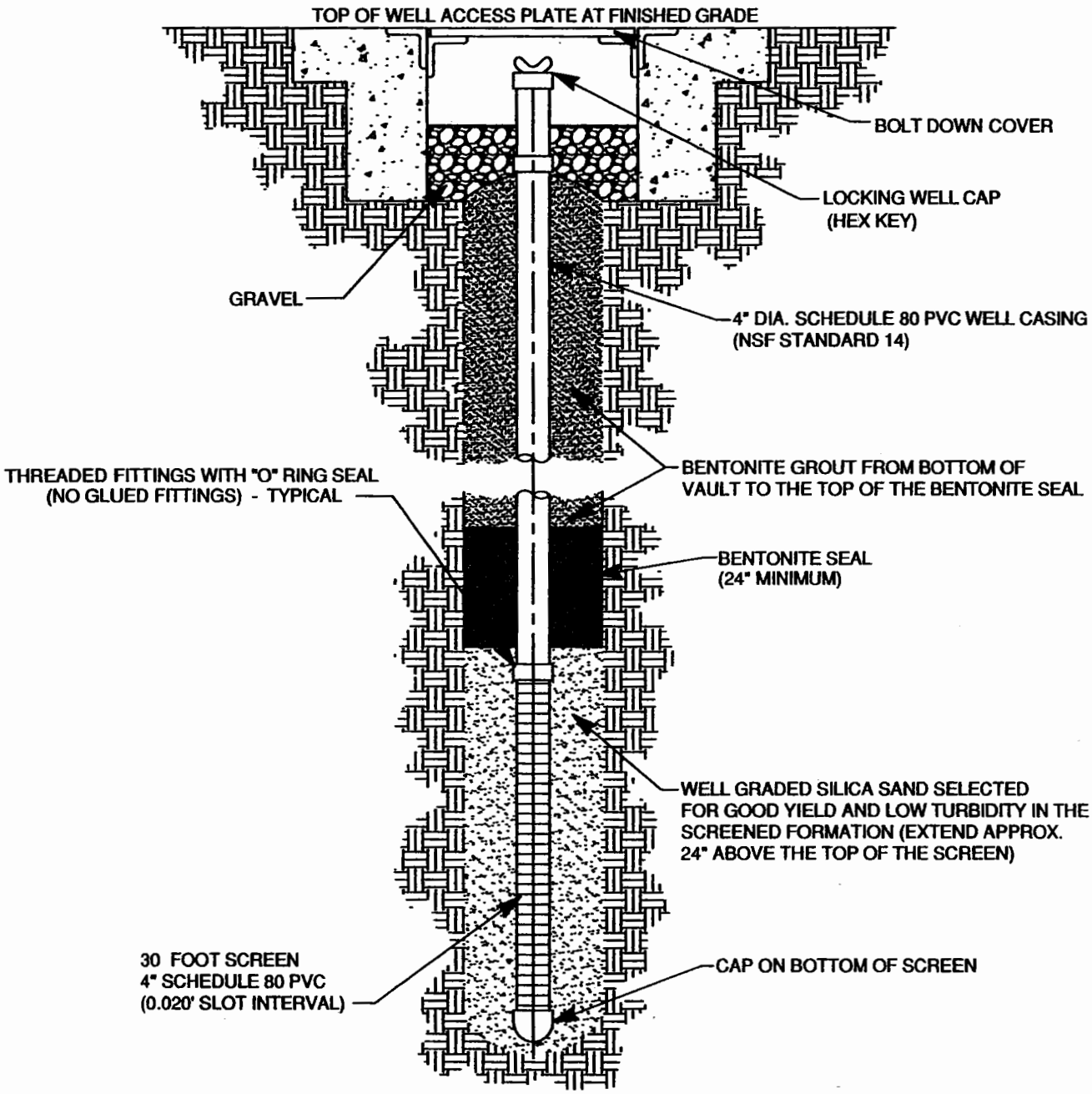
Y GAMMA-RAY LOG

SN SHORT-NORMAL RESISTIVITY LOG

R RESISTANCE LOG

Figure 4b. Hydrogeologic sections *A–A'*, *B–B'*, and *C–C'*, and geophysical logs of test holes or wells in the area of Naval Support Activity Memphis.

Attachment 3
Injection Well Schematic



TYPICAL ILLUSTRATION OF
INJECTION WELL CONSTRUCTION
IN CONFINED AQUIFER
NOT TO SCALE

NAVFAC Naval Facilities Engineering Command SOUTHERN DIVISION	INTERIM MEASURES SWMU 39 NSA MID-SOUTH MILLINGTON, TENNESSEE	TYPICAL INJECTION WELL
		Date: 08/17/04 | DWG Name:0148001B020

Attachment 4
Chemical Analysis of Injection Fluid

(Attached are the Material Safety Data Sheets for the compounds to be mixed with potable water)

MSDS Number: **S2666** * * * * * *Effective Date:* ***05/14/03*** * * * * * *Supercedes:* ***09/24/01***

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS | J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

SODIUM ACETATE

1. Product Identification

Synonyms: Sodium acetate trihydrate; Acetic acid, sodium salt trihydrate
CAS No.: 127-09-3 (Anhydrous); 6131-90-4 (Trihydrate)
Molecular Weight: 136.08
Chemical Formula: CH3COONa 3H2O
Product Codes:
J.T. Baker: 3460, 3461, 3462, 4009
Mallinckrodt: 7356, 7364, 7690, 7768

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Sodium Acetate	127-09-3	99 - 100%	Yes

3. Hazards Identification

Emergency Overview

CAUTION! MAY CAUSE IRRITATION TO SKIN, EYES, AND RESPIRATORY TRACT.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 1 - Slight
Flammability Rating: 0 - None
Reactivity Rating: 0 - None
Contact Rating: 1 - Slight
Lab Protective Equip: GOGGLES; LAB COAT
Storage Color Code: Orange (General Storage)

Potential Health Effects

Inhalation:
May cause irritation to the respiratory tract. Symptoms may include coughing, sore throat, labored breathing, and chest pain.
Ingestion:
Large doses may produce abdominal pain, nausea, and vomiting.
Skin Contact:
May cause irritation with redness and pain.
Eye Contact:
Contact may cause irritation, redness, and pain.
Chronic Exposure:
No information found.
Aggravation of Pre-existing Conditions:
No information found.

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4. First Aid Measures

Inhalation:
Remove to fresh air. Get medical attention for any breathing difficulty.
Ingestion:
Give several glasses of water to drink to dilute. If large amounts were swallowed, get medical advice.
Skin Contact:
Immediately flush skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention if irritation develops.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting upper and lower eyelids occasionally. Get medical attention if irritation persists.

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5. Fire Fighting Measures

Fire:
Autoignition temperature: 611C (1132F)
As with most organic solids, fire is possible at elevated temperatures or by contact with an ignition source. Listed fire data is for the Anhydrous Material.
Explosion:
Fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard.
Fire Extinguishing Media:
Water spray, dry chemical, alcohol foam, or carbon dioxide.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

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6. Accidental Release Measures

Remove all sources of ignition. Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Clean up spills in a manner that does not disperse dust into the air. Use non-sparking tools and equipment. Reduce airborne dust and prevent scattering by moistening with water. Pick up spill for recovery or disposal and place in a closed container. Small amounts of residue may be flushed to sewer with plenty of water.

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7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from any source of heat or ignition. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

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8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
None established.
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
For conditions of use where exposure to dust or mist is apparent and engineering controls

are not feasible, a particulate respirator (NIOSH type N95 or better filters) may be worn. If oil particles (e.g. lubricants, cutting fluids, glycerine, etc.) are present, use a NIOSH type R or P filter. For emergencies or instances where the exposure levels are not known, use a full-face positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:
Wear protective gloves and clean body-covering clothing.

Eye Protection:
Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

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9. Physical and Chemical Properties

Appearance:
Colorless crystals.

Odor:
Slight acetic acid odor.

Solubility:
76 gm/100mls water @ 0C

Density:
1.45

pH:
8.9

% Volatiles by volume @ 21C (70F):
0

Boiling Point:
Not applicable.

Melting Point:
Loses water @ 120C (248F); decomposes @ 324C (615.2F)

Vapor Density (Air=1):
No information found.

Vapor Pressure (mm Hg):
No information found.

Evaporation Rate (BuAc=1):
No information found.

---

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products:
Emits fumes of acetic acid upon heating and on contact with strong acids.

Hazardous Polymerization:
Will not occur.

Incompatibilities:
Nitric acid, fluoride, potassium nitrate, strong oxidizers and diketene.

Conditions to Avoid:
Incompatibles.

---

11. Toxicological Information

Hydrate: Investigated as a mutagen. Anhydrous: Oral rat LD50: 3530 mg/kg; inhalation rat LC50: > 30 gm/m3; skin rabbit LD50: > 10 mg/kg; Irritation Data, standard Draize: Skin rabbit 500 mg/24H, mild; standard Draize, Eye rabbit 10 mg, mild. Investigated as a mutagen.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Sodium Acetate (127-09-3)	No	No	None

---

12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
No information found.

---

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

---

14. Transport Information

Not regulated.

---

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\----------

Ingredient	TSCA	EC	Japan	Australia
Sodium Acetate (127-09-3)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\----------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Sodium Acetate (127-09-3)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Sodium Acetate (127-09-3)	No	No	No	No

--------\Federal, State & International Regulations - Part 2\----------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Sodium Acetate (127-09-3)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: No Fire: No Pressure: No
Reactivity: No (Pure / Solid)

Australian Hazchem Code: None allocated.
Poison Schedule: None allocated.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

---

16. Other Information

NFPA Ratings: Health: **1** Flammability: **1** Reactivity: **0**
Label Hazard Warning:
CAUTION! MAY CAUSE IRRITATION TO SKIN, EYES, AND RESPIRATORY TRACT.
Label Precautions:
Avoid contact with eyes, skin and clothing.
Avoid breathing dust.
Use with adequate ventilation.
Wash thoroughly after handling.
Keep container closed.
Label First Aid:
If inhaled, remove to fresh air. Get medical attention for any breathing difficulty. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Get medical attention if irritation develops or persists.
Product Use:

Laboratory Reagent.
Revision Information:
MSDS Section(s) changed since last revision of document include: 8.
Disclaimer:
****

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****

Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

ASTRO PRODUCT CODE # 7032

Rhodia

MONOAMMONIUM PHOSPHATE

Material Safety Data Sheet **Date Prepared:** **2/23/01 Supersedes Date:** **9/03/96**

1. PRODUCT AND COMPANY DESCRIPTION

RHODIA INC.
RHODIA PHOSPHATE PRODUCTS
CN 7500
259 Prospect Plains Road
Cranbury NJ 08512-7500

Emergency Phone Numbers:
FOR EMERGENCIES INVOLVING A SPILL, LEAK, FIRE, EXPOSURE OR ACCIDENT CONTACT: CHEMTREC (800-424-9300 within the United States or 703-527-3887 for international collect calls) or Rhodia CAERS (Communication and Emergency Response System) at 800-916-3232.

For Product Information:
(800) 243-5052

Chemical Name or Synonym:
AMMONIUM PHOSPHATE, PRIMARY; AMMONIUM PHOSPHATE, MONOBASIC

Molecular Formula:
$NH_4H_2PO_4$

2. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS Reg Number	OSHA Hazard	Percentage
MONOAMMONIUM PHOSPHATE	7722-76-1	Y	100

3. HAZARDS IDENTIFICATION

A. EMERGENCY OVERVIEW:

Physical Appearance and Odor:
white powder solid, odorless.

Warning Statements:
CAUTION! MAY CAUSE SKIN AND RESPIRATORY TRACT IRRITATION.

 Continued on Next Page

3. HAZARDS IDENTIFICATION (Continued)

B. POTENTIAL HEALTH EFFECTS:

Acute Eye:
May cause irritation.

Acute Skin:
Slightly irritating.

Acute Inhalation:
Dusts may cause upper respiratory tract irritation.

Acute Ingestion:
May cause abdominal cramps, nausea, vomiting, diarrhea.

Chronic Effects:
This product does not contain any ingredient designated by IARC, NTP, ACGIH or OSHA as probable or suspected human carcinogens.

4. FIRST AID MEASURES

FIRST AID MEASURES FOR ACCIDENTAL:
Eye Exposure:
Hold eyelids open and flush with a steady, gentle stream of water for at least 15 minutes. Seek medical attention if irritation develops or persists or if visual changes occur.

Skin Exposure:
In case of contact, wash with plenty of soap and water. Seek medical attention if irritation develops or persists.

Inhalation:
If respiratory irritation or distress occurs remove victim to fresh air. Seek medical attention if respiratory irritation or distress continues.

Ingestion:
If victim is conscious and alert, give 2-3 glasses of water to drink and do not induce vomiting. Seek immediate medical attention. Do not leave victim unattended. To prevent aspiration of swallowed product, lay victim on side with head lower than waist. Vomiting may occur spontaneously. If vomiting occurs and the victim is conscious, give water to further dilute the chemical.

4. FIRST AID MEASURES (Continued)

MEDICAL CONDITIONS POSSIBLY AGGRAVATED BY EXPOSURE:
Inhalation of product may aggravate existing chronic respiratory problems such as asthma, emphysema or bronchitis. Skin contact may aggravate existing skin disease.

NOTES TO PHYSICIAN:
All treatments should be based on observed signs and symptoms of distress in the patient. Consideration should be given to the possibility that overexposure to materials other than this product may have occurred.

Ingestion of large quantities of phosphate salts (over 1.0 grams for an adult) may cause an osmotic catharsis resulting in diarrhea and probable abdominal cramps. Larger doses such as 4-8 grams will almost certainly cause these effects in everyone. In healthy individuals most of the ingested salt will be excreted in the feces with the diarrhea and, thus, not cause any systemic toxicity. Doses greater than 10 grams hypothetically may cause systemic toxicity. Treatment should take into consideration both anionic and cation portion of the molecule. The following treatments should be considered for the specific group(s) of phosphate salts found in this product:

--All phosphate salts, except calcium salts, have a hypothetical risk of hypocalcemia, so calcium levels should be monitored.

--Ammonium salts have a hypothetical risk of ammonia toxicity. In addition to calcium levels, ammonia and phosphate levels should be monitored.

--Potassium salts have a hypothetical risk of hyperkalemia which can cause cardiac arrhythmia. In addition to calcium levels, potassium and phosphate levels should be monitored. Also consider continuous EKG monitoring to detect hyperkalemia.

--Sodium salts have a hypothetical risk of hypernatremia. In addition to calcium levels, sodium and phosphate levels should be monitored.

5. FIRE FIGHTING MEASURES

FIRE HAZARD DATA:

5. FIRE FIGHTING MEASURES (Continued)

Flash Point:
Not Applicable

Extinguishing Media:
Not combustible. Use extinguishing method suitable for surrounding fire.

Special Fire Fighting Procedures:
Firefighters should wear NIOSH/MSHA approved self-contained breathing apparatus and full protective clothing. Dike area to prevent runoff and contamination of water sources. Dispose of fire control water later.

Unusual Fire and Explosion Hazards:
Hazardous Decomposition Materials (Under Fire Conditions):
oxides of nitrogen
oxides of phosphorus

6. ACCIDENTAL RELEASE MEASURES

Evacuation Procedures and Safety:
Wear appropriate protective gear for the situation. See Personal Protection information in Section 8.

Containment of Spill:
Dike or retain dilution water or water from firefighting for later disposal. Follow procedure described below under Cleanup and Disposal of Spill.

Cleanup and Disposal of Spill:
Sweep or vacuum up and place in an appropriate closed container (see Section 7: Handling and Storage). Clean up residual material by washing area with water and detergent. DO NOT RETURN MATERIAL TO ITS ORIGINAL CONTAINER.

Environmental and Regulatory Reporting:
Prevent material from entering public sewer system or any waterways.

7. HANDLING AND STORAGE

7. HANDLING AND STORAGE (Continued)

Minimum/Maximum Storage Temperatures:
Not Available

Handling:
Avoid direct or prolonged contact with skin and eyes.

Storage:
Store in an area that is cool, dry, well-ventilated, Store in closed containers.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Introductory Remarks:
These recommendations provide general guidance for handling this product. Because specific work environments and material handling practices vary, safety procedures should be developed for each intended application. While developing safe handling procedures, do not overlook the need to clean equipment and piping systems for maintenance and repairs. Waste resulting from these procedures should be handled in accordance with Section 13: Disposal Considerations.

Assistance with selection, use and maintenance of worker protection equipment is generally available from equipment manufacturers.

Exposure Guidelines:
Exposure limits represent regulated or recommended worker breathing zone concentrations measured by validated sampling and analytical methods, meeting the regulatory requirements. The following limits apply to this material, where, if indicated, S=skin and C=ceiling limit:

PARTICULATES NOT OTHERWISE REGULATED RESPIRABLE FRACTION

	Notes	TWA	STEL
OSHA		5 mg/cu m	

PARTICULATES NOT OTHERWISE REGULATED TOTAL DUST

	Notes	TWA	STEL

 Continued on Next Page

8. EXPOSURE CONTROLS/PERSONAL PROTECTION (Continued)

OSHA 15 mg/cu m

Engineering Controls:
Where engineering controls are indicated by use conditions or a potential for excessive exposure exists, the following traditional exposure control techniques may be used to effectively minimize employee exposures.

Respiratory Protection:
When respirators are required, select NIOSH/MSHA approved equipment based on actual or potential airborne concentrations and in accordance with the appropriate regulatory standards and/or industrial recommendations.

Eye/Face Protection:
Skin Protection:
Work Practice Controls:
Personal hygiene is an important work practice exposure control measure and the following general measures should be taken when working with or handling this material:

(1) Do not store, use, and/or consume foods, beverages, tobacco products, or cosmetics in areas where this material is stored.
(2) Wash hands and face carefully before eating, drinking, using tobacco, applying cosmetics, or using the toilet.
(3) Wash exposed skin promptly to remove accidental splashes or contact with this material.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical and Chemical properties here represent typical properties of this product. Contact the business area using the Product Information phone number in Section 1 for its exact specifications.

Physical Appearance:
white powder solid.

Odor:
odorless.

 Continued on Next Page

9. PHYSICAL AND CHEMICAL PROPERTIES (Continued)

pH:
4.4 to 4.9 at 1 wt/wt%.

Specific Gravity:
1.8 at 25 C (77 F).

Water Solubility:
soluble
29.4 Wt/Wt% at 25 C (77 F).

Melting Point Range:
Not Available

Boiling Point Range:
Not Available

Vapor Pressure:
Not Available

Vapor Density:
Not Available

Molecular Weight:
115.03

10. STABILITY AND REACTIVITY

Chemical Stability:
This material is stable under normal handling and storage conditions described in Section 7.

Conditions To Be Avoided:
extreme heat
water

Materials/Chemicals To Be Avoided:
strong bases
sodium hypochlorite

Decomposition Temperature Range:
170 C (338 F)

10. STABILITY AND REACTIVITY (Continued)

The Following Hazardous Decomposition Products Might Be Expected:
Decomposition Type: thermal

ammonia
phosphoric acid
oxides of nitrogen
oxides of phosphorus

Hazardous Polymerization Will Not Occur.
Avoid The Following To Inhibit Hazardous Polymerization:

not applicable

11. TOXICOLOGICAL INFORMATION

Acute Eye Irritation:

No test data found for product.

Acute Skin Irritation:
Toxicological Information and Interpretation

skin - skin irritation, 500 mg, rabbit.
Mildly irritating.

Acute Dermal Toxicity:

No test data found for product.

Acute Respiratory Irritation:

No test data found for product.

Acute Inhalation Toxicity:

No test data found for product.

Acute Oral Toxicity:
Toxicological Information and Interpretation

LD50 - lethal dose 50% of test species, > 1000 mg/kg, rat.

Chronic Toxicity:

This product does not contain any substances that are considered by OSHA, NTP, IARC or ACGIH to be "probable" or "suspected" human carcinogens.

 Continued on Next Page

12. ECOLOGICAL INFORMATION

Ecotoxicological Information:
No data found for product.

Chemical Fate Information:
No data found for product.

13. DISPOSAL CONSIDERATIONS

Waste Disposal Method:
Chemical additions, processing or otherwise altering this material may make the waste management information presented in this MSDS incomplete, inaccurate or otherwise inappropriate. Please be advised that state and local requirements for waste disposal may be more restrictive or otherwise different from federal laws and regulations. Consult state and local regulations regarding the proper disposal of this material.

EPA Hazardous Waste - NO

14. TRANSPORTATION INFORMATION

Transportation Status: IMPORTANT! Statements below provide additional data on listed DOT classification.
The listed Transportation Classification does not address regulatory variations due to changes in package size, mode of shipment or other regulatory descriptors.

US Department of Transportation
Shipping Name:
NOT REGULATED

15. REGULATORY INFORMATION

ASTRO PRODUCT CODE # 7032

Rhodia

MONOAMMONIUM PHOSPHATE

Material Safety Data Sheet **Date Prepared:** **2/23/01 Supersedes Date:** **9/03/96**

15. REGULATORY INFORMATION (Continued)

Inventory Status

Inventory	**Status**
UNITED STATES (TSCA)	Y
CANADA (DSL)	Y
EUROPE (EINECS/ELINCS)	Y
AUSTRALIA (AICS)	Y
JAPAN (MITI)	Y
SOUTH KOREA (KECL)	Y

Y = All ingredients are on the inventory.
E = All ingredients are on the inventory or exempt from listing.
P = One or more ingredients fall under the polymer exemption or are on the no longer polymer list. All other ingredients are on the inventory or exempt from listing.
N = Not determined or one or more ingredients are not on the inventory and are not exempt from listing.

FEDERAL REGULATIONS

Inventory Issues:
All functional components of this product are listed on the TSCA Inventory.

SARA Title III Hazard Classes:
Fire Hazard - NO
Reactive Hazard - NO
Release of Pressure - NO
Acute Health Hazard - NO
Chronic Health Hazard - NO

OTHER FEDERAL REGULATIONS:
FDA Status:
This product meets the compositional requirements of:

21 CFR 184.1141A AMMONIUM PHOSPHATE, MONOBASIC

STATE REGULATIONS:
This product does not contain any components that are regulated under California Proposition 65.

16. OTHER INFORMATION

 Continued on Next Page

Rhodia

MONOAMMONIUM PHOSPHATE

Material Safety Data Sheet **Date Prepared:** **2/23/01 Supersedes Date:** **9/03/96**

16. OTHER INFORMATION (Continued)

National Fire Protection Association Hazard Ratings--NFPA(R):

1 Health Hazard Rating--Slight
0 Flammability Rating--Minimal
0 Instability Rating--Minimal

National Paint & Coating Hazardous Materials Identification System--HMIS(R):

1 Health Hazard Rating--Slight
0 Flammability Rating--Minimal
0 Reactivity Rating--Minimal

Reason for Revisions:

Change and/or addition made to Section 2, Warning Statements in Section 3, HMIS Ratings in Section 16, NFPA Ratings in Section 16.

Key Legend Information:

ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
TLV - Threshold Limit Value
PEL - Permissable Exposure Limit
TWA - Time Weighted Average
STEL - Short Term Exposure Limit
NTP - National Toxicology Program
IARC - International Agency for Research on Cancer
ND - Not determined
RPI - Rhodia Established Exposure Limits

Disclaimer:

The information herein is given in good faith but no warranty, expressed or implied, is made.

/MSDS/HMIS/082/CKBNG.HTM (15 hits)

<<SODIUM>> <<BROMIDE>>, PRODUCT NO C4627R

MSDS Safety Information

TOP

FSC: 0 **NIIN:** 00-000-0000 **MSDS Date:** 12/27/1994 **MSDS Num:** CKBNG

Submitter: D DG **Tech Review:** 02/08/2000 **Status CD:** A

Product ID: **<<SODIUM>> <<BROMIDE>>, PRODUCT NO C4627R** **MFN:** 01

Article: N **Kit Part:** N

Responsible Party **Cage:** TO505

Name: SARGENT WELCH VWR SCIENTIFIC

Address: 911 COMMERCE COURT

City: BUFFALO GROVE **State:** IL **Zip:** 60089-2375

Country: US

Info Phone Number: 800-727-4368

Emergency Phone Number: 800-727-4368

Resp. Party Other MSDS No.: WLC4627R

Preparer's Name: STEVEN C. QUANDT **Chemtrec IND/Phone:** (800)424-9300

Proprietary Ind: N **Review Ind:** Y

Published: Y **Special Project CD:**

Contractor Summary

TOP

Cage:TO505 **Name:SARGENT WELCH VWR SCIENTIFIC**

Address:911 COMMERCE COURT
City:BUFFALO GROVE **State:**IL **Zip:**60089-2375

Country:US **Phone:**800-727-4368

Cage:63759 **Name:WARDS NATURAL SCIENCE ESTABLISHMENT INC**

Address:5100 W HENRIETTA RD
City:ROCHESTER **State:**NY **Zip:**14692

Country:US **Phone:**(716) 359-2502 OR 800-962-2660
Contract Number:MDA414-99A-0024-0023

Ingredients TOP

Cas: 7647-15-6 **Code:** T **RTECS #:** VZ3150000 **Code:** T

Name: <<SODIUM>> <<BROMIDE>> (NABR)

= Wt: 99.9 **Code:** M

Environmental Wt:
Other REC Limits: N/P

OSHA PEL: N/P	**Code:**	**OSHA STEL:** N/P	**Code:**
ACGIH TLV: N/P	**Code:**	**ACGIH STEL:** N/P	**Code:**
EPA Rpt Qty:		**DOT Rpt Qty:**	

Ozone Depleting Chemical: N

Health Hazards Data TOP

LD50 LC50 MixtureN/P

Route Of Entry Inds - Inhalation:N/P **Skin:**N/P **Ingestion:**N/P
Carcinogenicity Inds - NTP:N/P **IARC:**N/P **OSHA:**N/P

Health Hazards Acute And Chronic

MAY CAUSE MILD IRRITATION TO SKIN, EYES AND RESPIRATORY SYSTEM. INGESTION OF LARGE DOSES OF <<BROMIDE>> CAUSE NAUSEA, VOMITING, ABDOMINAL PAIN, COMA AND PARALYSIS. PROLONGED EXPOSURE TO DUST MAY CAUSE BRONCHITIS

Explanation Of Carcinogenicity

NOT PROVIDED

Signs And Symptions Of Overexposure

SEE HEALTH EFFECTS SECTION

Medical Cond Aggravated By Exposure

NOT PROVIDED

First Aid Information TOP

CALL A PHYSICIAN. EYES AND SKIN: IMMEDIATELY FLUSH WITH PLANTY OF WATER FOR AT LEAST 15 MINUTES. INHALATION: REMOVE TO FRESH AIR. INGESTION: GIVE TWO GLASSES OF WATER AND INDUCE VOMITING IF CONSCIOUS

Spill Release Procedures TOP

WEAR APPROPRIATE SAFETY EQUIPMENT. SWEEP UP AND CONTAINERIZE FOR DISPOSAL. FLUSH RESIDUE WITH LARGE AMOUNTS OF WATER.

Neutralizing Agent

NOT PROVIDED

Waste Disposal Methods TOP

DISCHARGE, TREATMENT OR DISPOSAL MAY BE SUBJECT TO FEDERAL, STATE OR LOCAL LAWS. THESE DISPOSAL GUIDELINES ARE INTENDED FOR THE DISPOSAL OF CATALOG-SIZE QUANTITIES ONLY.

Handling and Storage Precautions TOP

KEEP CONTAINER CLOSED WHEN NOT IN USE. AVOID BREATHING DUST. WASH THOROUGHLY AFTER HANDLING.

Other Precautions

READ LABEL ON CONTAINER BEFORE USING. DO NOT WEARCONTACT LENSES WHEN WORKING WITH CHEMICALS. PRODUCT WILL CAKE ON EXPOSURETO EXCESS MOISTURE. DOES NOT AFFECT MATERIAL IN A HAZARDOUS MANNER.

Fire and Explosion Hazard Information TOP

Flash Point Method:

Flash Point: **Flash Point Text:** NONE

Autoignition Temp: **Autoignition Temp Text:** N/P

Lower Limits: N/A **Upper Limits:** N/A

Extinguishing Media

USE MEANS SUITABLE TO EXTINGUISH THE SUPPORTING FLAME

Fire Fighting Procedures

WEAR SELF-CONTAINED BREATING APPARATUS

Unusual Fire/Explosion Hazard

NONE

Control Measures TOP

Respiratory Protection

NIOSH APPROVED DUST RESPIRATOR IF NEEDED

Ventilation

LOCAL EXHAUSE RECOMMENDED

Protective Gloves

RUBBER GLOVES

Eye Protection

SAFETY GOGGLES

Other Protective Equipment

LAB COAT OR APRON

Work Hygienic Practices

NOT PROVIDED

Supplemental Safety and Health

NOT RELEVANT

Physical/Chemical Properties TOP

HCC: N1 **NRC/State LIC No:**

Net Prop WT For Ammo:

Boiling Point: =1390.C, 2534.F **B.P. Text:**

Melt/Freeze Pt: =747.C, ######F **M.P/F.P Text:**

Decomp Temp: **Decomp Text:** N/P

Vapor Pres: N/A **Vapor Density:** N/A

Volatile Org Content %: **Spec Gravity:** 3.21

VOC Pounds/Gallon: **PH:** N/P

VOC Grams/Liter: **Viscosity:** N/P

Evaporation Rate & Reference: N/A

Solubility in Water: 116% BY WEIGHT @ 50C

Appearance and Odor: WHITE CRYSTALLINE SOLID, ODORLESS

Percent Volatiles by Volume: 0 **Corrosion Rate:** N/P

---

dtSearch 6.22 (6366)

Reactivity Data

TOP

Stability Indicator: YES

Stability Condition To Avoid: NOT APPLICABLE
Materials To Avoid: STRONG OXIDIZING AGENTS; ACIDS CAN PRODUCE HYDROGEN <<BROMIDE>>, ALKALOIDIAL AND HEAVY METAL SALTS
Hazardous Decomposition Products: NONE

Hazardous Polymerization Indicator: NO
Conditions To Avoid Polymerization: NOT APPLICABLE

Toxicological Information

TOP

Toxicological Information: NOT PROVIDED

Ecological Information

TOP

Ecological: NOT PROVIDED

MSDS Transport Information

TOP

Transport Information: SEE TRANSPORTATION DATA.

Regulatory Information

TOP

Sara Title III Information: NOT PROVIDED

Federal Regulatory Information: NOT PROVIDED
State Regulatory Information: NOT PROVIDED

Other Information

TOP

Other Information: NOT RELEVANT

HMIS Transportation Information

TOP

Responsible Party Cage: TO505 **Trans ID NO:** 151391

Product ID: <<SODIUM>> <<BROMIDE>>, PRODUCT NO C4627R
MSDS Prepared Date: 12/27/1994 **Review Date:** 02/08/2000

MFN: 1
Submitter: D DG **Status CD:** A

Article W/O MSDS: N
Radioactivity:

Tech Entry NOS Shipping Nm:
Form:

Net Explosive Weight:
Coast Guard AMMO Code:

Magnetism:

Net Unit Weight:
DOD Exemption NUM: N/A

AF MMAC Code:
Limited Quantity IND: N

Multiple KIT Number: 0
Kit Part IND: N

Kit IND: N
Review IND: N

Unit Of Issue: NK
Type Of Container: UNKNOWN
Additional Data:

Container QTY: UNKNOWN.

Detail DOT Information TOP

DOT PSN Code: ZZZ

Symbols: N/R

DOT Proper Shipping Name: NOT REGULATED BY THIS MODE OF TRANSPORTATION
DOT PSN Modifier:

Hazard Class: N/R
DOT Packaging Group: N/R

UN ID Num: N/R

Label: N/R
Special Provision: N/R
Packaging Exception: N/R

Non Bulk Pack: N/R
Max Qty Pass: N/R

Bulk Pack: N/R
Max Qty N/R
Cargo:

Vessel Stow Req: N/R
Water/Ship/Other Req: N/R

Detail IMO Information TOP

IMO PSN Code: ZZZ

IMO Proper Shipping Name: NOT REGULATED FOR THIS MODE OF TRANSPORTATION
IMO PSN Modifier:

IMDG Page Number: N/R
UN Hazard Class: N/R

UN Number: N/R
IMO Packaging Group: N/R

Subsidiary Risk Label: N/R
EMS Number: N/R

MED First Aid Guide NUM: N/R

Detail IATA Information TOP

IATA PSN Code: ZZZ **IATA UN ID NUM:** N/R

IATA Proper Shipping Name: NOT REGULATED BY THIS MODE OF TRANSPORTATION
IATA PSN Modifier:
IATA UN Class: N/R **Subsidiary Risk Class:** N/R

IATA Label: N/R
UN Packing Group: N/R **Packing Note Passenger:** N/R

Max Quant Pass: N/R **Max Quant Cargo:** N/R
Packaging Note Cargo: N/R **Exceptions:** N/R

Detail AFI Information TOP

AFI PSN Code: ZZZ **AFI Symbols:**

AFI Proper Shipping Name: NOT REGULATED BY THIS MODE OF TRANSPORTATION
AFI PSN Modifier:

AFI Hazard Class: N/R **AFI UN ID NUM:** N/R
AFI Packing Group: N/R

AFI Label: N/R
Special Provisions: N/A **Back Pack Reference:** N/A

HMIS HAZCOM Label TOP

Product ID: <<SODIUM>> <<BROMIDE>>, PRODUCT NO C4627R

Cage: TO505 **Assigned IND:** Y

Company Name: SARGENT WELCH VWR SCIENTIFIC
Street: 911 COMMERCE COURT **PO Box:**

City: BUFFALO GROVE **State:** IL **Zipcode:** 60089-2375
Country: US

Health Emergency Phone: 800-727-4368

Label Required IND: Y **Date Of Label Review:** 02/08/2000
Status Code: A **MFG Label NO:**
Label Date: **Year Procured:** N/K

Origination Code: F **Chronic Hazard IND:** N/P

Eye Protection IND: YES

Skin Protection IND: YES

Signal Word: CAUTION

Respiratory Protection IND: YES

Health Hazard: Slight
Contact Hazard: Slight

Fire Hazard: None
Reactivity Hazard: None

Hazard And Precautions

MAY CAUSE MILD IRRITATION TO SKIN, EYES AND RESPIRATORY SYSTEM. INGESTION OF LARGE DOSES OF <<BROMIDE>> CAUSE NAUSEA, VOMITING, ABDOMINAL PAIN, COMA AND PARALYSIS. PROLONGED EXPOSURE TO DUST MAY CAUSE BRONCHITIS

Attachment 5
Remedial Process Description

Technology Description

Enhanced in situ bioremediation is the engineered augmentation of the subsurface to accelerate biodegradation of organic contamination. In the case of chlorinated solvent contamination, augmentation consists of adding simple carbohydrates (e.g., fructose or acetate) and micro-nutrients into the groundwater. The carbohydrates provide a food source that stimulates microbial activity, manipulates groundwater redox conditions, and creates an anaerobic zone that is necessary for trichloroethene (TCE) and tetrachloroethene (PCE) degradation. TCE that is intercepted in the anaerobic zone breaks down fairly early to lesser chlorinated compounds such as 1,2-dichloroethene (DCE) or vinyl chloride (VC), which are subsequently degraded to innocuous end products by natural or engineered means.

Pilot Study Findings

A pilot study conducted at a selected location within Area of Concern A (AOC A) on the Northside of Naval Support Activity (NSA) Mid-South proved that enhanced biodegradation was feasible and effective at treating TCE-contaminated groundwater in the fluvial deposits aquifer. An organic food source was added during the study to create an anaerobic environment, which supported the reductive dechlorination of TCE. Reducing conditions (low dissolved oxygen concentrations) were created and a 50% reduction in TCE mass in the area was achieved during the pilot study. Enhanced biodegradation is now being implemented at AOC A. Due to the pilot study success, enhanced bioremediation coupled with MNA is an effective remedial approach at Solid Waste Management Unit (SWMU) 39.

Full Scale System Layout and Design

Injection wells will be strategically installed to introduce a carbohydrate and nutrient solution in the area of highest TCE concentrations. The carbon source would be delivered to the injection points via a mobile application unit (e.g., a truck with a large storage vessel and a pump). As shown in the attached figure, a total of six injection points would be strategically located throughout TCE plume. One row containing two wells will be placed upgradient of 039G04LF, the location with the highest TCE concentration. These injection wells will be spaced approximately 40 feet apart within the row, which would be approximately 15 to 25 feet upgradient of monitoring well 039G04LF and perpendicular to the direction of groundwater flow. A third injection well will be installed approximately 20 feet upgradient of 039G03LF, which shows the second highest TCE concentration. Three additional wells will be strategically located throughout the TCE plume in an effort to impact the entire contaminated area. The fourth and fifth injection wells will be located approximately 50 and 75 ft upgradient of 039G04LF. The sixth injection well will be placed immediately east of Building S-203. Using this approach, additional injection points could be easily added if effectiveness monitoring indicates that a portion of the plume was not being adequately affected by the amendments.

The amendment solution would be injected quarterly in 100-gallon amendments during the treatment period. Every 100 gallons of amended solution will contain approximately 50 pounds (lbs) of sodium acetate and 0.5 lbs of ammonium monophosphate. Sodium acetate is a breakdown product of sugar and is continually created in living systems in similar form as a breakdown product of sugars. Therefore, it is not considered to be a toxic substance. It is also non-hazardous and safe to use and handle. Ammonium monophosphate is a micro-nutrient for microorganisms in groundwater. It will be entirely consumed by microorganisms, so there will not be a footprint in the water when remediation is completed. It is also non-hazardous and safe to use and handle.

Based on the concentration of 200 parts per billion for TCE at well 04LF and the biodegradation rate developed for the AOC A pilot study, the time frame for enhanced biodegradation is expected to be one or two years.

In addition to the bioremediation system, a dye tracer study will also be performed at SWMU 39 to confirm groundwater velocity and dispersive characteristics that have been used to locate and space substrate injection wells. As part of this study, approximately 25 lbs of sodium bromide will be injected into a single injection well. Sodium bromide does not have any toxicity issues at proposed level of injection and the expected final concentration.

System Monitoring

Monitoring and sampling will be conducted to measure or estimate the effectiveness of the system. Onsite effectiveness monitoring will include chemical and geochemical sampling in wells located in the targeted area, upgradient and downgradient, as well as background wells. Samples will be analyzed for volatile organic compounds, hydrogen, methane, ethane, ethene, nitrate, total organic carbon, metabolic fatty acids, and major cations. Geochemical samples will be analyzed for ferrous iron, sulfate and sulfide, dissolved oxygen, oxidation-reduction potential, pH, temperature, alkalinity, chlorides, and phosphorus and ammonia-nitrogen. All samples will be collected quarterly. EnSafe would like to provide semi-annual updates on the progress of the bioremediation system.

Attachment 6
Operation and Maintenance Procedures

Because this is a passive system, no operation and maintenance procedures are necessary beyond what is required by the Memphis and Shelby County Well Construction Code. The following is an excerpt from the well regulations.

Section 6.06 — Maintenance of Wells

A. Wells shall be maintained in an operative condition at all times in order for water samples to be collected for analytical purposes and shall have at least one (l) keyed lock to prevent tampering. Because of the potential for surface runoff to enter the below grade protective structure and/or well, installation of a removable cover with a flexible o-ring or gasket attached at the point where the cover fits over the protective structure and/or well will be necessary to prevent surface runoff from entering the well.

B. All wells shall be maintained in a condition whereby they are not a hazard to health or environment nor a source of contamination to the groundwater aquifers.

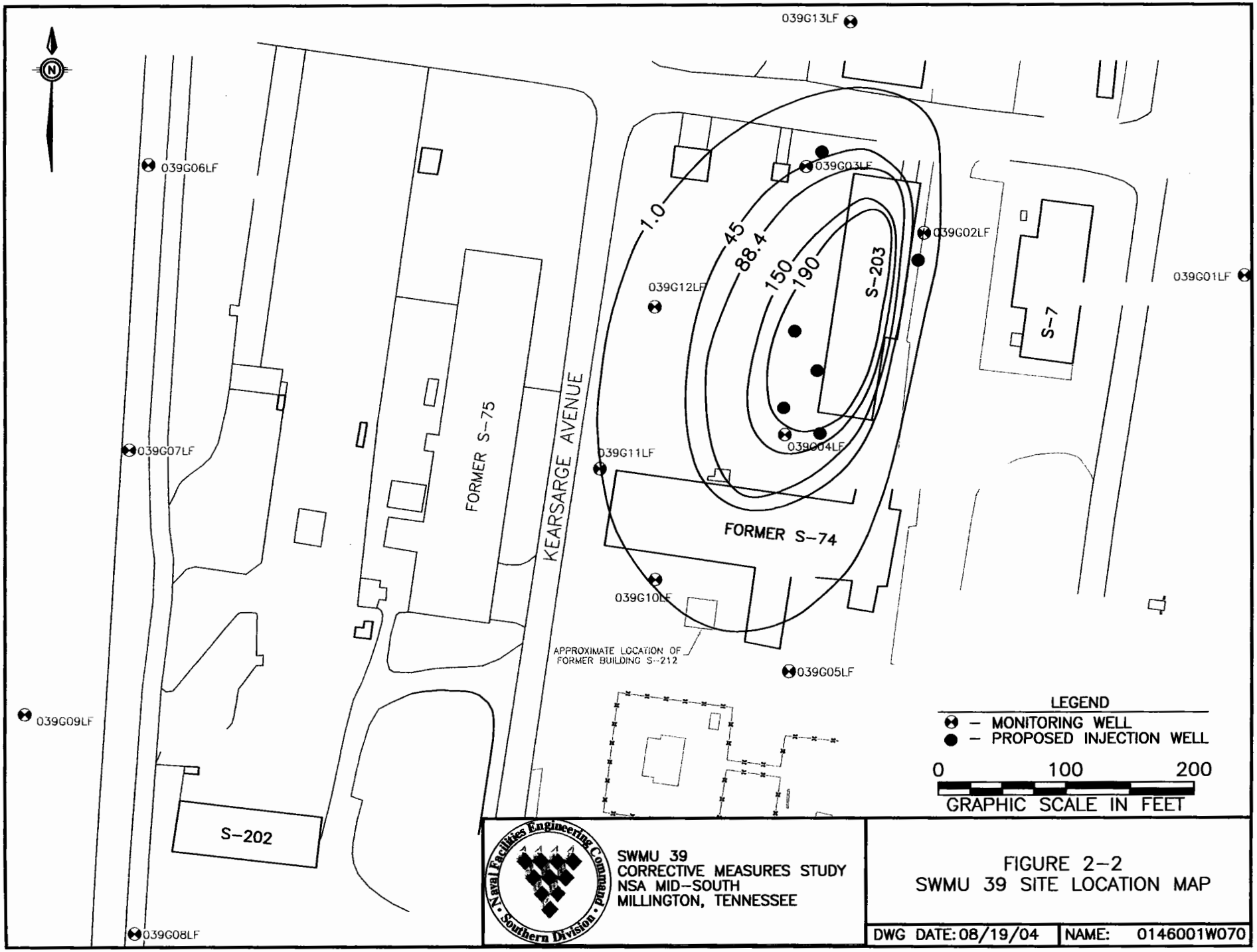
C. When a well is determined to be abandoned, as defined by these rules and regulations, the owner shall be ordered to seal the well in accordance with the requirements of Section 9 of the regulations.

Attachment 7
Geologic/Hydrogeologic Information

Refer to Part C.2. for a geology/hydrogeology excerpt.

Attachment 2 of this permit application contains additional information pertaining to the hydrogeology beneath the AOR.

Attachment 8
Proposed System Layout Diagram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039G08LF
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45
88.4
150
190
S-203
S-7
FORMER S-75
KEARSARGE AVENUE
FORMER S-74
APPROXIMATE LOCATION OF FORMER BUILDING S-212
S-202
LEGEND
– MONITORING WELL
– PROPOSED INJECTION WELL
0
100
200
GRAPHIC SCALE IN FEET
Naval Facilities Engineering Command
Southern Division
SWMU 39
CORRECTIVE MEASURES STUDY
NSA MID-SOUTH
MILLINGTON, TENNESSEE
FIGURE 2-2
SWMU 39 SITE LOCATION MAP
DWG DATE: 08/19/04
NAME: 0146001W070

Attachment 9
Erosion and Sediment Controls Diagram

The injection wells will be installed within a grassy area at SWMU 39. Care will be taken during the injections to ensure that the amended water is not spilled onto the ground.

Part D - Signature and Certification

This application should be signed by a person having responsibility for the operation of the injection well or facility as follows:

1. For a corporation, by a responsible corporate officer (i.e., president, secretary, treasurer, vice-president, or equivalent person) who performs policy or decision making functions; or

2. The manager of one or more manufacturing, production, or operating facilities employing more than 250 persons or having gross annual sales or expenditures exceeding $25 million if authority to sign documents has been assigned or delegated to the manager in accordance with operating procedures; or

3. For a partnership, by a general partner or the proprietor; or

4. By a duly authorized representative (a duly authorized representative may be either a named individual or any individual occupying a named position) only if:

   a. The authorization is made in writing by a person described in (1), (2), or (3) above;

   b. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, operator of a well or well field, superintendent, or position of equivalent responsibility, or

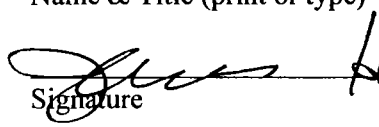
   c. For municipality, state, federal, or other public agency by either a principal executive officer or ranking elected official.

5. The owner of the property or facility on which the injection well is located.

I certify under penalty of law I have personally examined and am familiar with the information submitted in the attached document; and based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the submitted information is true, accurate, and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine or imprisonment.

James Heide Supv Env Eng
Name & Title (print or type)

License No.


Signature

17 Sep 04
Date

Name & Title (print or type)

License No.

Signature

Date

Tennessee Department of Environment & Conservation
Dye Trace Registration

Owner/Operator of Facility Necessitating Trace:

Name: Naval Support Activity (NSA) Mid-South

Mailing Address: 5722 Integrity Drive

City, State, Zip Code: Millington, Tennessee 38054-5000

Phone: (901) 874-5462

Person/Company Performing Trace:

Name: EnSafe, Inc.

Mailing Address: 5724 Summer Trees Drive

City, State, Zip Code: Memphis, Tennessee 38134

Phone: (901) 372-7962

Property Owner at Injection Site:

Name: Naval Support Activity (NSA) Mid-South

Mailing Address: 5722 Integrity Drive

City, State, Zip Code: Millington, Tennessee 38054-5000

Reason for Trace: The objective of the dye trace is to obtain data regarding dispersion and direction of groundwater flow in the fluvial deposits beneath NSA Mid-South. The work is proposed as part of the scope of the enhanced in-situ bioremediation groundwater treatment system at solid waste management unit (SWMU) 39.

If State or Federal Agency Oversight, Give Agency: TDEC Division of Solid and Hazardous Waste Management (Roger Donovan) and USEPA Region 4.

Dyes to be Used with Approximate Amounts and Respective Injection Locations:

Approximately 25 pounds of sodium bromide will be mixed with water and injected into one of the proposed injection wells.

CN-1112 RDA 2474

(continued on reverse)

Type Receptors or Visual: Groundwater samples will be collected and analyzed at a laboratory for bromide.

Background Test: A background sample will be collected from each well in the study area prior to the sodium bromide injection.

Describe Injection Point(s) and Include Photocopy of Topographic Map with Locations:

The proposed injection point is a 4" diameter PVC well (a Class V injection well application has been submitted in addition to a variance request to the Memphis and Shelby County Health Department) that will be equipped with a 30 foot screen and installed to a maximum depth of 110 feet below ground surface.

Anticipated Injection Date: January 2005

Public Water Systems: List Surface Water Intakes, Wells or Springs within 2 Miles of the Injection Point(s):

Five potable water production wells that supply water to NSA Mid-South (see Attachment 1-Topographic map) are within a 2 mile radius of the injection point. All of the wells are screened in either the Fort Pillow or Memphis Sand aquifers that are not hydraulically connected to the fluvial deposits in which the dye trace is proposed.

Is the Area Served by a Public Water System? Yes

Estimate Percentage of Private Well/Spring Use Versus Public Water Use:

100% of the water is provided by the public water system.

Submitted by: Corey Coleman, EnSafe on behalf of NSA Mid-South

Phone: (901) 372-7962

Date: September 17, 2004

Mail or Fax the Completed Form to:

Tennessee Division of Water Supply
Ground Water Management Section
Attn: Scotty Sorrells
6th Floor, L & C Tower
401 Church Street
Nashville, Tennessee 37243-1549
Phone: (615) 532-0191; Fax: (615) 532-0503

There are currently no regulations requiring dye trace registration in Tennessee, unless there is the potential to impact a public water system. This registry is designed to avoid cross contamination and re-performing the same or similar trace. The dye tracing registry allows the Department to make informed responses to water pollution inquiries so that dye traces are not mistakenly identified as pollution to waters of the state.