Duke Engineering & Services
A Duke Energy Company

CSX/VAUGHN LANDFILL AND BRAMLETTE ROAD MGP SITES

REMEDIAL ACTION PLAN

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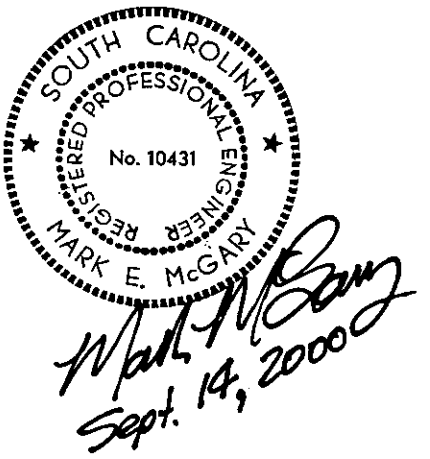

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BRAMLETTE ROAD MGP SITE

REMEDIAL ACTION PLAN

1.0 INTRODUCTION

This remedial action plan describes activities that will be performed to remediate certain impacted soils and free tars located within the site of the former Bramlette Road manufactured gas plant (MGP) and along a drainage pathway leading from the site located north of Bramlette Road. Site cleanup will be managed and performed by Duke Engineering & Services personnel.

2.0 SITE DESCRIPTION

The Bramlette Road MGP site is located in the community of City View in Greenville County, South Carolina as indicated on Figures 1 and 2. The site lies just outside of the Greenville City limits. The site covers 3.69 acres and is located at 400 South Bramlette Road in the western quadrant of the intersection of Bramlette Road and West Washington Street (Figure 4). The site is currently vacant and access is restricted by perimeter fencing. Lockable gates are located near the southern corner of the site along Bramlette Road and along West Washington Street.

The Bramlette Road MGP site is owned by CSX Transportation and has been investigated along with the adjacent CSX/Vaughn Landfill site. The Landfill site covers approximately 7 acres and is located approximately 800 feet west of this intersection across and south of Bramlette Road. Both the Bramlette Road MGP and the CSX/Vaughn Landfill sites are owned by CSX Transportation (CSXT). The two sites are part of more extensive CSXT property holdings in the Bramlette Road area that total approximately 40 acres and contain rail lines and an office for crew transfers and

scheduling activities. The majority of these properties lie within the floodplain of the Reedy River located to the west. Land use immediately east of the MGP and Landfill sites is primarily residential with the exception of the property located in the southern quadrant of the intersection of Bramlette Road and West Washington Street. This property contains a school building and is owned by the Greenville County School District. The property bordering the MGP site to the north is owned by Suburban Propane and is currently used as a propane tank storage facility.

3.0 SITE HISTORY

The Bramlette Road MGP site was originally developed as a manufactured gas plant by Southern Public Utilities in 1917. The Bramlette Road plant was constructed as a replacement for an existing gas plant located at Broad Street in Greenville; and was a larger plant that produced gas using the more economical coal gas process. The site eventually contained a retort house, three gas holders, a water gas plant, tar and ammonia washer tanks, purifiers, a tar extractor and holder, and an underground heating oil tank. Locations of historical site structures are indicated on Figure 3.

Gas plant ownership and operation transferred to Duke Power Company in 1935. Piedmont Natural Gas Company purchased the site in 1951 and subsequently demolished the gas plant sometime in the late 1950s. Site ownership transferred to Piedmont and Northern Railway in 1963. Piedmont and Northern Railway became part of Seaboard Coast Line (CSX) in 1967. The site was used as a trucking facility in the 1970s and 1980s.

The CSX/Vaughn Landfill site is located within the eastern bank floodplain of the Reedy River. The site was developed as an unpermitted landfill by Mr. Robert Vaughn of Vaughn Construction and Demolition Company in Greenville. Mr. Vaughn attempted to purchase approximately 16 acres from CSXT in 1988 for the purpose of constructing a solid waste landfill. Following payment of a deposit, Mr. Vaughn began unpermitted landfilling activities on the property. The property transfer was never finalized, however,

Mr. Vaughn continued to operate the landfill. The South Carolina Department of Health and Environmental Control (SCDHEC) advised Mr. Vaughn in 1993 that his landfilling activities were improper. In February of 1994, the U.S. Army Corps of Engineers (ACE) notified CSXT that the property on which the landfill is located is considered a wetlands, and the landfilling operation was a violation of Section 301 of the Clean Water Act. Following notification by the ACE, CSXT ordered Mr. Vaughn to cease landfilling activities and the site was closed.

4.0 SUMMARY OF SITE INVESTIGATIONS

Three primary investigations of the CSX/Vaughn Landfill and Bramlette Road MGP sites have been performed. A Phase I investigation was conducted in early 1995 at the CSX/Vaughn Landfill site by Applied Engineering and Science (AES) of Atlanta, Georgia. This investigation included soil, sediment, surface water and groundwater sampling across and around the Landfill. The results of this investigation were documented in an AES report entitled "Site investigation; Soil, Sediment, and Groundwater Sampling; Vaughn Landfill, CSX Real Property; March 1995".

A Phase II investigation was conducted by AES in 1996. This investigation included the installation of 8 monitoring wells to assess groundwater quality at both the MGP site and the Landfill site; and soil sampling at the MGP site to assess the extent of coal tar. This investigation also included a biological survey conducted in the wetlands area surrounding the Landfill site, and included a site characterization and contaminant pathway/exposure evaluation. The results of this investigation were documented in an AES report entitled "Site Investigation Phase II, Vaughn Landfill/Duke Power Sites, CSXT Real Properties, Bramlette Road, Greenville, South Carolina, September 1996".

A Phase III investigation was conducted by Duke Power Company in 1999 and documented in the report "CSX/Vaughn Landfill and Bramlette Road MGP Sites, Phase III Investigation and Site Assessment Report, Site Remediation Services Group, Duke Engineering & Services, June 2000". The Phase III investigation included the installation of 18 additional groundwater monitoring wells within both the MGP site and

the Landfill site. The Phase III report summarized the findings of the two previous AES investigations, provided additional characterization of soils and groundwater, and documented the results of additional biological assessments in the wetlands area surrounding the landfill. This report also provided a characterization of risks to human health from potential exposure to soil and groundwater contaminants associated with the MGP site.

Chemical constituents of interest typically associated with MGP residuals include polycyclic aromatic hydrocarbon (PAH) compounds, naphthalene, volatile organic compounds (VOCs), phenols, cyanides, and various other inorganics. The quantity and makeup of these constituents found at a specific MGP site is dependent on several factors including the age of the site, the geologic setting of the site, the gas manufacturing process utilized, the amount of by-product recovered during plant operation, waste disposal practices employed during operation, and the manner in which the site was demolished.

Investigation efforts have verified the presence of typical MGP residuals in soils and groundwater within the MGP site, and along surface migration pathways leading from site.

4.1 Soil

Significant quantities of coal tar contaminated soils and some free tar are present within the MGP site, along a ditch that drains the MGP site (Ditch 1), and in native wetland soils below and around the Landfill. Free tars are present in as many as 3 masonry tar wells located on the MGP site. Contamination within the MGP site originated from day to day operations of the facility, and was made pervasive across the site when the facility was demolished. During operation, coal tar and coal tar laden wastewaters were discharged into Ditch 1 leading from the facility. These constituents settled into ditches, depressions and pools within wetlands south of Bramlette Road. An unpermitted construction and demolition debris landfill has been placed on top of most of the coal tar contaminated soils in the wetlands. The Landfill covers approximately 7 acres of wetlands and ranges in depth from 7 to 14 feet.

Soil samples have been collected and field characterized from 46 locations within the MGP site and along Ditch 1 (Figure 4). Field characterization of samples collected indicated coal tar contaminated soils present in a broad band extending from the southern corner of the MGP site near Bramlette Road to the northern corner of the site along West Washington Street (Figures 5 through 12). Within this band, coal tar residuals were indicated at varying depths from the surface down to 14 feet. The soil samples indicated varying thicknesses of highly disturbed soils intermixed with MGP debris consisting of coal, coal tar, coal ash, coke, brick, wood, and other demolition debris.

From the 46 sampling locations, twelve samples of varying levels of contamination were selected and submitted for laboratory analyses (Tables 1 and 2). The highest levels of contamination within the MGP site were indicated in a sample taken in the southern corner of the site in the vicinity of monitoring wells MW7, MW8 and MW9. The sample was collected from a depth of 5 to 7 feet and indicated a total PAH concentration of 310 ppm. Much higher concentrations of PAHs would be expected in tarry near-surface soils observed in this same area. The maximum total PAH concentration from the laboratory analyses was 23,960 ppm in a near-surface sample taken along Ditch 1approximately 200 feet from the MGP site boundary.

No significant contamination was indicated in soils in the eastern corner of the site. Native soils in the western corner of the site are overlain by approximately 7 feet of a mixture of highly disturbed soils and landfill debris. No MGP related contaminates were indicated in the landfilled debris or in the underlying soil.

Some amount of free product coal tar is present at the MGP site. An undetermined quantity of free tar is contained within as many as 3 intact masonry tar wells at the site. Other minor isolated pockets of free tar have been noticed in various locations around the site.

Beneath the Landfill, coal tars reside at the debris-native soil interface and at the interface between overlying alluvial soils and underlying saprolite.

4.2 Groundwater

Eleven monitoring wells have been installed to-date within the MGP site. Fifteen additional wells have been installed downgradient from the site within the Landfill site and at other locations south of Bramlette Road. Surficial groundwater at the MGP site and beneath the Landfill has been impacted by volatile and semi-volatile organics originating from free tars and coal tar constituents in soils at the MGP site, along Ditch 1, and beneath the Landfill.

Depth to groundwater within the MGP site varies from 3 to 8 feet below the ground surface (Table 3). Groundwater movement at the MGP site is west-southwesterly, eventually turning more southwesterly toward the Landfill. The plume of contamination extends from the MGP site southwesterly into the Landfill site. No groundwater contamination has been indicated in monitoring wells located south and east of the Landfill.

BTEX compounds were detected in 4 wells (MW7, MW8, MW9 and MW17) at the MGP site (Table 4). The maximum total BTEX concentrations were indicated in wells located near the southern corner of the site. Benzene was indicated at concentrations from 6 to 570 ppb in these 4 wells, and was the only BTEX compound indicated at concentrations exceeding the MCL. Various PAH compounds were detected in the same 4 wells discussed above (Table 5). Naphthalene was the predominant PAH indicated, and was detected at a maximum concentration of 6,400 ppb.

Variations in groundwater sulfate and iron concentrations in wells within the MGP site suggests that some degree of biodegradation is occurring, particularly with regard to degradation of the lower molecular weight organics. Other natural attenuation processes such as adsorption are likely occurring as well, however these processes appear to be insufficient to completely retain contaminants within the MGP site boundary in the absence of some degree of source removal. Analytical results also indicate that some degree of natural attenuation is occurring at the Landfill site as well. Additional monitoring wells have been recommended to assess whether or not

groundwater contaminants are discharging into the Reedy River from the Landfill site. Should this assessment indicate that no contaminants are discharging into the river, then the groundwater contaminants are likely stabilized and contained wholly within CSX properties.

4.3 Surface Water

No organics were indicated in any surface water samples obtained from several locations in the wetlands surrounding the Landfill and in drainage pathways leading from the Landfill. No organics were indicated in samples from the Reedy River.

4.4 Biological Assessments

Two separate biological assessments have concluded that coal tar constituents indicated in wetland soils and sediments are not detrimental to plants and animals living in the wetlands environment surrounding the Landfill.

5.0 REMEDIAL ACTION OBJECTIVES AND OVERVIEW

The overall objective of remedial action proposed for the MGP site is to minimize present risks to human health; and to transform the property into an acceptable condition that is suitable for future commercial or industrial development. The specific objectives of remedial actions proposed are to:

a. Cleanup near-surface soils within the MGP site and along Ditch 1 that represent the greatest present risk to human health;

b. Reduce the amount of source material contributing to groundwater contamination;

c. Remove free tars contained within the masonry tar wells on-site.

As discussed in the Phase III Investigation and Site Assessment Report, the greatest present risk associated with contaminants at the MGP site involves ingestion of carcinogenic PAH compounds adsorbed onto near-surface soils. Site trespassers, particularly children, are assumed to be the population at risk. Consequently, remediation activities will be focused primarily on the reduction of this present risk by the risk-based cleanup of these soils within the MGP site and along Ditch 1. Near-surface soils are herein defined as being located within the top 3 feet of the existing ground surface. Considering the proximity of the site to nearby residential properties, cleanup concentrations will be based on exposures to near-surface soils in a residential setting. The determination of risk-based cleanup concentrations is documented in Appendix A. Cleanup will be accomplished by the excavation and treatment of near-surface soils that exceed the specified cleanup concentration. Excavated areas will be backfilled with treated soil meeting the specified cleanup criteria, and/or with virgin clean material obtained from off-site sources. Free tars contained within on-site tar wells will also be removed along with the actual tar well structures.

No remediation is planned at this time for soils located below 3 feet deep. There is no risk associated with exposure to these soils in the current setting, and shallow groundwater at the site renders deeper excavation impractical and of questionable additional benefit as discussed below. Cleanup of specific areas of soils below 3 feet deep will be performed as necessary at such time that the property is developed, excavated, or altered in such a manner that results in potential human exposure to these soils.

This plan does not include remediation of groundwater at the MGP site or at the Landfill site. As discussed in the Phase III Investigation and Site Assessment Report, there is no risk associated with exposure to contaminated groundwater in the vicinity of the MGP site. Drinking water in the area surrounding the site is provided by the local municipal water supply system. There are no known water supply wells in operation in the area immediately surrounding the site. Since municipal water is readily available, there is little likelihood that water supply wells would be constructed in the future.

Groundwater at the MGP site has become contaminated from the percolation of rainwater through contaminated near-surface soils, and from direct contact with deeper contaminated soils. Cleanup of near-surface soils will serve to reduce the source of continuing groundwater contamination. Contaminated soils, sediments and groundwater are pervasive within the CSX/Vaughn Landfill site located downgradient from the MGP site. Efforts to remediate groundwater within the MGP site would be counterproductive as this same groundwater would become recontaminated upon migration into the Landfill site. Excavation and removal of contaminated soils and sediments within the Landfill site would likely result in severe damage, if not complete destruction, to the wetland environment. Biological assessments have indicated that the presence of MGP constituents in soils and sediments within the wetlands has no adverse impact to fauna. Sampling results have suggested that natural attenuation processes may be acting to contain groundwater contaminants within CSX property boundaries.

6.0 CLEANUP CRITERIA

EPA Region III guidelines were used to establish a risk-based cleanup criteria for near-surface soils at the MGP site as documented in Appendix A. Cleanup target concentrations are based on exposure to carcinogenic PAHs adsorbed onto near-surface soils. Direct ingestion of PAH contaminated soil is the primary controlling pathway. Benzo(a)pyrene is assumed to be the most potent carcinogenic PAH and is therefore used as the surrogate carcinogen. The EPA Region III allowable risk-based soil concentration of benzo(a)pyrene based on ingestion of soil in a residential setting is 0.087 mg/kg.

To establish a non-compound specific cleanup concentration, a statistical evaluation was performed on soil samples from the MGP site. The evaluation included only data from samples that indicated PAH contamination above method detection limits. Samples indicating no detectable PAHs were omitted from the evaluation. Total concentrations of PAHs, carcinogenic PAHs, and carcinogenic PAHs as benzo(a)pyrene were calculated. Non-detected compounds were included in total sums at one-half the

method detection limit. A total carcinogenic PAHs as benzo(a)pyrene concentration was calculated by factoring the concentration of each individual carcinogenic PAH compound by it's associated B(a)P equivalent potency factor. Average and upper confidence level ratios of total carcinogenic PAHs as B(a)P to total carcinogenic PAHs were determined. Average and upper confidence level ratios of total carcinogenic PAHs as B(a)P to total PAHs were also determined. Target cleanup concentrations for total carcinogenic PAHs and for total PAHs were determined by factoring the allowable concentration of benzo(a)pyrene (0.087 mg/kg) by the calculated ratios. At a 95% upper confidence level ratio, target cleanup concentrations for near-surface soils within the MGP site are summarized as follows:

Target Cleanup Concentrations [mg/kg]		
Total Carcinogenic PAHs as B(a)P	Total Carcinogenic PAHs	Total PAHs
0.087	0.319	0.9

7.0 REMEDIAL OPTIONS EVALUATION

A limited number of remedial options are available for the cleanup of MGP sites. As part of an MGP site cleanup in 1996, Duke Power, in collaboration with the Electric Power Research Institute (EPRI), conducted a remedial options/feasibility study. The study involved evaluations of several remedial options including various bioremediation technologies, recycling of MGP wastes into asphalt and brick, thermal desorption, and co-burning with coal in utility boilers. Duke has further evaluated various cleanup technologies for MGP sites remediated in 1997 and 1999.

Various bioremediation methods are typically successful at reducing concentrations of volatile organics and some lighter-weight semi-volatiles. Bioremediation, however, has little effect on the heavier-weight carcinogenic PAHs that typically control risks at an MGP site.

Recycling MGP wastes into asphalt was not feasible at the study site due to incompatibilities with the soil chemistry. Recycling MGP wastes into brick involves significant soil screening efforts that are typically uneconomical. Furthermore, the ability of brick kilns to achieve acceptable temperatures and holding times for complete destruction of MGP organics is suspect.

Co-firing with coal in utility boilers is an effective treatment method for MGP wastes. This option, however, involves maintenance risks to coal-pulverizing equipment and expensive retrofits to store, handle and feed the wastes into the coal stream.

Thermal desorption is a timely, effective and economical treatment method for MGP wastes. Both on-site and off-site treatment options are available with this technology. Thermal desorption is recommended as the best available treatment option for wastes at the Bramlette Road MGP site.

8.0 PROPOSED REMEDIAL METHOD

The remedial method proposed for cleanup of the Bramlette Road MGP site is excavation and thermal treatment of near-surface contaminated soils. Both treated soil and clean virgin fill material will be used to backfill excavated areas.

8.1 Soil Excavation and Handling

The quantity of near-surface (surface to 3 feet deep) soil within the MGP site exceeding the proposed risk-based cleanup target is approximately 22,500 tons. The quantity of soil along Ditch 1 exceeding the proposed risk-based cleanup target is estimated to be between 4000 and 5000 tons. Soil will be excavated from the MGP site first, beginning in the northern area of the site. Excavation will proceed south toward the southern (lower) corner of the site. Soil excavation along Ditch 1 will proceed from the MGP site

boundary toward the culvert beneath Bramlette Road. Based on a recent United States Court of Appeals decision, all MGP remediation waste materials are considered non-hazardous.

All excavated soil will be screened on-site to remove demolition and other debris not suitable for thermal treatment. Screening will be performed using a Read Screen-All RD150B with a 6" screen opening.

Material passing the screen will be stockpiled on-site for subsequent thermal treatment. Material rejected by the screen will be stockpiled on-site for transportation to an acceptable landfill facility. All stockpiles of contaminated materials will be covered with polyethylene sheeting when not being worked. Contaminated materials stockpiled in areas not planned for excavation will also be placed on a polyethylene liner.

The rate of excavation, screening, and stockpiling will be controlled by either: a) the capacity of the thermal treatment facility, b) the availability of trucking, or c) the local weather conditions. Buffer quantities of soil will be excavated, screened and stockpiled prior to any transportation of materials to the treatment facility or the landfill. These buffer quantities of ready-to-ship stockpiled materials will be maintained throughout the project. Long-term stockpiling of contaminated materials is not expected.

8.2 Transportation of Site Materials

All contaminated materials leaving the Bramlette Road MGP site will be transported in accordance with DOT regulations. Contaminated soil and debris leaving the site will be loaded onto trucks for transport to a thermal treatment facility (reference Section 8.3), or to a landfill facility, respectively (reference Section 8.4). Weigh scales on the loading equipment and at the thermal treatment facility will be used to document the amount of material shipped. Material manifests will be maintained on every loaded truck leaving the site.

All trucks utilized for hauling will be in good working condition with no holes or perforations in the beds. A washed stone gravel pad will be maintained at the egress point for all trucks leaving the site. Loaded trucks will be inspected and tires cleaned prior to leaving the site to minimize tracking of soil onto county roads. All loaded trucks will be securely covered to prevent spillage and dust en route.

8.3 Soil Treatment

Contaminated soils will be thermally treated by a thermal desorption facility. Both on-site and off-site treatment is under consideration.

Potential off-site treatment facilities under consideration include:

a. Pergo Environmental; Glen Allen, Virginia
b. Southeastern Soil Recovery (SSR); Charleston, South Carolina
c. Philip Services Corporation; Calhoun, Georgia
d. Williams Environmental Services, Inc. Stone Mountain, Georgia

Potential on-site treatment contractors under consideration include:

a. Midwest Soil Remediation, Inc.; Elgin, Illinois
b. Southwest Soil Remediation, Inc.; Tucson, Arizona
c. Thermal Remediation; Bartlette, Illinois
d. Philip Services Corporation; Calhoun, Georgia
e. Williams Environmental Services, Inc. Stone Mountain, Georgia

Should on-site treatment be chosen, the treatment contractor will secure all necessary permits for operation of the unit. If feasible, an on-site treatment unit would be located at the Landfill site to minimize interference with excavation activities at the MGP site.

Thermal treatment providers will be responsible for all verification sampling and testing of treated soil as discussed in Section 8.12.

8.4 Debris Handling

Significant quantities of debris are typically encountered during the remediation of MGP sites. Debris is expected to be found in the form of bricks, broken concrete, wood, rail track, rail ties, rebar, iron pipe, etc. Large debris such as concrete pads, chunks of masonry walls and large pipes will be placed directly on the debris stockpile. Other debris will be collected as screen rejects and stockpiled.

All debris generated at the Bramlette Road MGP site will be disposed of at the Waste Management, Inc. Palmetto Landfill Facility located in Wellford, South Carolina.

8.5 Free Tar Handling and Disposal

Based on a recent United States Court of Appeals decision, all MGP remediation waste materials are considered non-hazardous and thus suitable for treatment by thermal desorption. Free tars at the Bramlette Road MGP site will be mixed with other on-site contaminated soil to a consistency suitable for handling, transport, and thermal treatment.

8.6 Erosion Control and Stormwater Management

An Erosion Control and Stormwater Management Plan will be developed by Duke Engineering & Services and submitted for approval by the appropriate Greenville County regulatory agencies prior to any excavation activities. The plan will include the design of temporary measures to manage and direct stormwater runoff around and away from excavated areas, and to minimize off-site transportation of sediments from the site. The plan will also include specifications for establishing permanent vegetation on all disturbed areas across the MGP site and along Ditch 1.

To minimize the amount of water in the excavations, every effort will be made to maintain excavation depths above the surficial groundwater table. Groundwater or

surface water entering the excavation and coming into contact with contaminated soil will be pumped out by a local waste recovery and disposal contractor.

8.7 Odor and Dust Control

Odors are a significant concern in association with the excavation and handling of typical MGP contaminated soils. Odor levels will be continuously monitored by on-site remediation personnel, and various odor suppression measures will be used to minimize the magnitude of odors emanating from the site. Polyethylene sheeting will be used to cover all contaminated stockpiles when not being worked. Odor suppression foam will be maintained on-site, and will be applied to stockpiles and/or open excavations as necessary. Odor suppression foam is biodegradable, non-toxic, non-hazardous, and non-flammable. The foam forms a flexible membrane over the soil surface resulting in a seal that minimizes volatile emissions. The foam does not inhibit subsequent thermal treatment of the soil, and has been used successfully at several other MGP site cleanups.

Due to their tarry nature and usually high moisture content, coal tar contaminated soils are typically not a significant source of dust emissions from an MGP site. The primary source of fugitive dust from the site will be dry backfill soils (treated soil and/or virgin material) that has been placed in the excavation or has been stockpiled. Water sprays will be used to suppress dust emanating from dry backfilled soils. Polyethylene sheeting will be used to cover stockpiles of backfill material as needed.

8.8 Backfilling of Excavations

All excavated areas will be backfilled to near original grades. Slight changes in grade may be necessary to assure positive drainage of stormwater runoff across the final ground surface.

Material used as backfill will likely be a combination of treated soil returned to the site and clean virgin material obtained locally. A certain quantity of virgin material will be required due to loss of volume from debris removed from the site. Alternatively, virgin material may be used exclusively as backfill should returning treated soil to the site prove uneconomical.

Analytical tests will be performed on all treated soil as discussed in Section 8.12. All treated soil returned to the site will show contaminant concentration levels below cleanup target concentrations.

8.9 Health & Safety Plan

A site-specific Health & Safety Plan has been prepared for remediation activities at the Bramlette Road MGP site and is provided in Appendix B. All Duke Engineering & Services personnel on-site will be HAZWOPER certified. Duke Engineering & Services will maintain a Health & Safety Officer full-time at the site during normal working hours.

8.10 Air Monitoring Program

An air monitoring program will be conducted at the Bramlette Road MGP site to measure concentrations of airborne constituents of interest associated with remediation activities (excavation, screening, truck loading, etc.). The program will consist of both real-time screening and constituent-specific sampling, and will be conducted in addition to, or to supplement, air monitoring requirements stipulated in the site-specific Health and Safety Plan. The air monitoring program will be conducted and/or overseen by the designated on-site health and safety coordinator. Specifics of the air monitoring are provided in Appendix C.

8.11 Site Security and Access Control

Access to the Bramlette Road MGP site will be restricted by perimeter fencing and lockable gates. No unauthorized persons will be allowed access to the site during working hours. Duke Engineering & Services personnel will be on-site at all times during normal working hours.

Site access and egress for vehicles and areas for vehicle decontamination will be carefully controlled. Contaminated areas (open excavations, contaminated stockpiles, screening operations, etc) will be considered exclusion zones and will be clearly designated with high visibility fencing and tape. Designated exclusion zone access/egress locations will be established along with personnel decontamination facilities.

8.12 Confirmation Sampling

Soil samples will be collected from the sidewalls of the excavation and field screened using a RaPID Assay for carcinogenic PAH compounds, and a photo ionization detector (PID) for volatile organics. Samples will be taken every 50 feet of sidewall length and will be collected at a depth of 1 to 2 feet below the ground surface. The excavation depth will generally be limited to 3 feet. A limited number of samples will be collected from the bottom of the excavation for documentation purposes, and as information for future site development decisions.

Laboratory confirmation samples will be collected every 200 feet of sidewall length at a depth of 1 to 2 feet below the ground surface. Laboratory samples will be submitted for analyses of volatile organics and semi-volatile organics by EPA Methods 8260 and 8270, respectively. Laboratory samples will be analyzed by Duke Power Company's Laboratory Services (South Carolina Certification 99005)

Laboratory confirmation samples will be taken of treated soil at the thermal treatment facility. Composite samples of treated soil will be collected no less frequently than 1

sample per every 1000 tons processed. Samples will be submitted for laboratory analyses of volatile organics and semi-volatile organics by EPA Methods 8260 and 8270, respectively.

9.0 WORK SCHEDULE

The schedule for implementation of the proposed scope of work is dependent on SCDHEC review and approval of the work plan. Upon approval, remedial activities are expected to take approximately 6 months to complete.

TABLES

Bramlette Road MGP Site
Soil Data Summary
Volatile Organics by EPA Method 8260

Units in ppm
Detects in bold text, Non-detects in plain text at one-half the detection limit

Sampling Location:	DP1A	DP9	DP14	DP16	DP18	DP21	DP23	DP26	DP28	DP29	NB1	NB8
Sample Depth [ft]:	5-7	?	0-3	0-3	4-6	3-6	6	0-1	0-1	surface	9-12	?
MTBE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isopropyl Ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	0.60	0.0030	0.0035	0.0030	0.0030	0.0035	0.0035	0.0035	**0.007**	0.0040	0.0030	**6.5**
Toluene	0.60	0.0030	0.0035	0.0030	0.0030	0.0035	0.0035	0.0035	0.0035	0.0040	0.0030	**17**
Ethylbenzene	0.60	0.0030	0.0035	0.0030	0.0030	0.0035	0.0035	0.0035	0.0035	0.0040	0.0030	**11**
m-p-Xylene	**1.3**	0.0030	0.0035	0.0030	0.0030	0.0035	0.0035	0.0035	0.0035	0.0040	0.0030	**22**
o-Xylene	0.60	0.0030	0.0035	0.0030	0.0030	0.0035	0.0035	0.0035	0.0035	0.0040	0.0030	**10**
Total BTEX (detected):	**1.3**	ND	ND	ND	ND	ND	ND	ND	**0.007**	ND	ND	**66.5**
Other Compounds Detected:												
Naphthalene	**79**	**0.069**	0.0035	0.0030	0.0030	0.0035	0.0035	0.0035	**0.020**	**0.210**	0.0030	**990**
1,2,4-Trimethylbenzene	0.60	0.0030	0.0035	0.0030	0.0030	0.0035	0.0035	0.0035	0.0035	0.0040	0.0030	**16**
1,3,5-Trimethylbenzene	0.60	0.0030	0.0035	0.0030	0.0030	0.0035	0.0035	0.0035	0.0035	0.0040	0.0030	**5.4**
Styrene	0.60	0.0030	0.0035	0.0030	0.0030	0.0035	0.0035	0.0035	**0.034**	0.0040	0.0030	**4.1**
Trichloroethene	0.60	0.0030	0.0035	0.0030	0.0030	0.0035	0.0035	**0.094**	0.0035	0.0040	0.0030	1.0

NA = Not Analyzed ? Sample depth not stated in Sep 1996 report
ND = Not Detected ^ Estimated depth
* Overall depth probe range at this location; actual sample depth not stated in report

Table 1

Bramlette Road MGP Site

Soil Data Summary

Semi-Volatile Organics by EPA Method 8270

Units in ppm

Detects in bold text, Non-detects in plain text at one-half the detection limit

	Sampling Location:	DP1A	DP9	DP14	DP16	DP18	DP21	DP23	DP26	DP28	DP29	NB1	NB8
	Sample Depth [ft]:	5-7	?	0-3	0-3	4-6	3-6	6	0-1	0-1	surface	9-12	?
PAH Compounds:													
Non-Carcinogenic PAHs	Naphthalene	**48**	3.35	0.22	0.205	0.20	0.225	0.165	0.165	0.165	16.5	0.195	**5,800**
	Acenaphthylene	2.0	**7.9**	0.22	0.205	0.20	0.225	0.165	0.165	0.165	16.5	0.195	330
	Acenaphthene	**20**	3.35	0.22	0.205	0.20	0.225	0.165	0.165	0.165	16.5	0.195	**600**
	Fluorene	**17**	3.35	0.22	0.205	0.20	0.225	0.165	0.165	0.165	16.5	0.195	**1,700**
	Phenanthrene	**44**	**15**	0.22	0.205	0.20	0.225	0.165	0.165	0.165	16.5	**1.8**	**3,800**
	Anthracene	**15**	3.35	0.22	0.205	0.20	0.225	0.165	0.165	0.165	16.5	0.195	**1,400**
	Fluoranthene	**32**	**22**	0.22	0.205	0.20	0.225	0.165	0.165	0.165	16.5	**2**	**2,000**
	Pyrene	**30**	**19**	0.22	0.205	0.20	0.225	0.165	0.165	0.165	16.5	**1.7**	**2,600**
	Benzo(g,h,I)perylene	**7.5**	**15**	0.22	0.205	0.20	0.225	0.165	0.165	0.165	16.5	**0.49**	380
Carcinogenic PAHs	Benzo(a)anthracene	**14**	**12**	0.22	0.205	0.20	0.225	0.165	0.165	0.165	16.5	**0.78**	**1,000**
	Chrysene	**13**	**14**	0.22	0.205	0.20	0.225	0.165	0.165	0.165	**53**	**0.89**	**980**
	Benzo(b)fluoranthene	**9.1**	**14**	0.22	0.205	0.20	0.225	0.165	0.165	0.165	**62**	**0.67**	**460**
	Benzo(k)fluoranthene	**9.6**	**17**	0.22	0.205	0.20	0.225	0.165	0.165	0.165	**72**	**0.63**	**700**
	Benzo(a)pyrene	**12**	**20**	0.22	0.205	0.20	0.225	0.165	0.165	0.165	16.5	**0.60**	**780**
	Indeno(1,2,3-c,d)pyrene	**6.7**	**15**	0.22	0.205	0.20	0.225	0.165	0.165	0.165	16.5	**0.46**	**340**
	Dibenzo(a,h)anthracene	2.0	3.35	0.22	0.205	0.20	0.225	0.165	0.165	0.165	16.5	0.195	330
	Total Carcinogenic PAHs:	**66.4**	**95.4**	1.54	1.44	1.40	1.58	1.16	1.16	1.16	**253.0**	**4.23**	**4,590**
	Total PAHs:	**281.9**	**187.7**	3.52	3.3	3.2	3.6	2.6	2.6	2.6	**401.5**	**11.19**	**23,200**
Other Compounds Detected:													
	2-Methylnaphthalene	**13**	3.350	0.220	0.205	0.20	0.225	0.165	0.165	0.165	16.5	0.195	380
	Dibenzofuran	**15**	3.350	0.220	0.205	0.20	0.225	0.165	0.165	0.165	16.5	0.195	380

? Sample depth not stated in Sep 1996 report

* Overall depth probe range at this location; actual sample depth not stated report

^ Estimated depth

Table 2

Bramlette Road MGP Site

Groundwater Level Summary
June 15-17, 1999

Well ID	Top Casing Elev [ft]	Depth To Free Product [ft]	Depth to Groundwater From Top of Casing [ft]	Depth to Groundwater From Ground Surface [ft]	Adjusted Groundwater Elevation [ft]
MGP Site Wells:					
MW-7	935.74	NA	5.06	2.77	930.68
MW-8	935.99	NA	5.48	3.19	930.51
MW-9	936.03	NA	5.36	3.07	930.67
MW-10	943.39	NA	7.37	5.08	936.02
MW-11	941.81	NA	6.50	4.21	935.31
MW-12	941.89	NA	6.65	4.36	935.24
MW-13	940.48	NA	6.38	4.09	934.10
MW-14	940.18	NA	6.30	4.01	933.88
MW-15	939.07	NA	10.28	7.99	928.79
MW-16	938.75	NA	10.30	8.01	928.45
MW-17	935.22	NA	5.03	2.74	930.19

Water levels and well depths are referenced to top of PVC casing.

Bramlette Road MGP Site
Groundwater Data Summary - June 15-17, 1999
Volatile Organics by EPA Method 8260

Units in ppb
Detects in bold text, Non-detects in plain text at one-half the detection limit

Monitoring Wells:	*MCL*	MW7	MW8	MW9	MW10	MW11	MW12	MW13	MW14	MW15	MW16	MW17
MTBE		15	15	7.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	75
Isopropyl Ether		15	15	7.5	1.5	1.5	1.5	**29**	1.5	1.5	1.5	75
Benzene	*5*	**570**	**340**	7.5	1.5	1.5	1.5	**6**	1.5	1.5	1.5	**120**
Toluene	*1,000*	15	15	7.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	**360**
Ethylbenzene	*700*	**350**	**140**	7.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	**150**
m-p-Xylene	*10000**	**170**	**75**	15	3	3	3	3	3	3	3	**400**
o-Xylene		**140**	**40**	7.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	**180**
Total BTEX (detected):		**1,230**	**595**	ND	ND	ND	ND	**6**	ND	ND	ND	**1,210**
Other Compounds Detected:												
Naphthalene		**1,400**	**1,400**	**120**						**5.9**		**6,400**
1,2,4-Trimethylbenzene		**57**	**24**									
cis-1,2-Dichloroethene									**15**			
Bromochloromethane												
1,2 Dichloroethane	*5*							**3.7**				
Chloroform									**3**			
Trichloroethene									**100**			
Tetrachloroethene									**2.3**			
TICs:												
indane		860	410									
indene		53										920
methyl indane												
methyl naphthalene		51										
benzothiophene												
dimethyl naphthalene												

* Total Xylenes ND = Not Detected

Table 4

Bramlette Road MGP Site
Groundwater Data Summary - June 15-17, 1999
Semi-Volatile Organics by EPA Method 8270

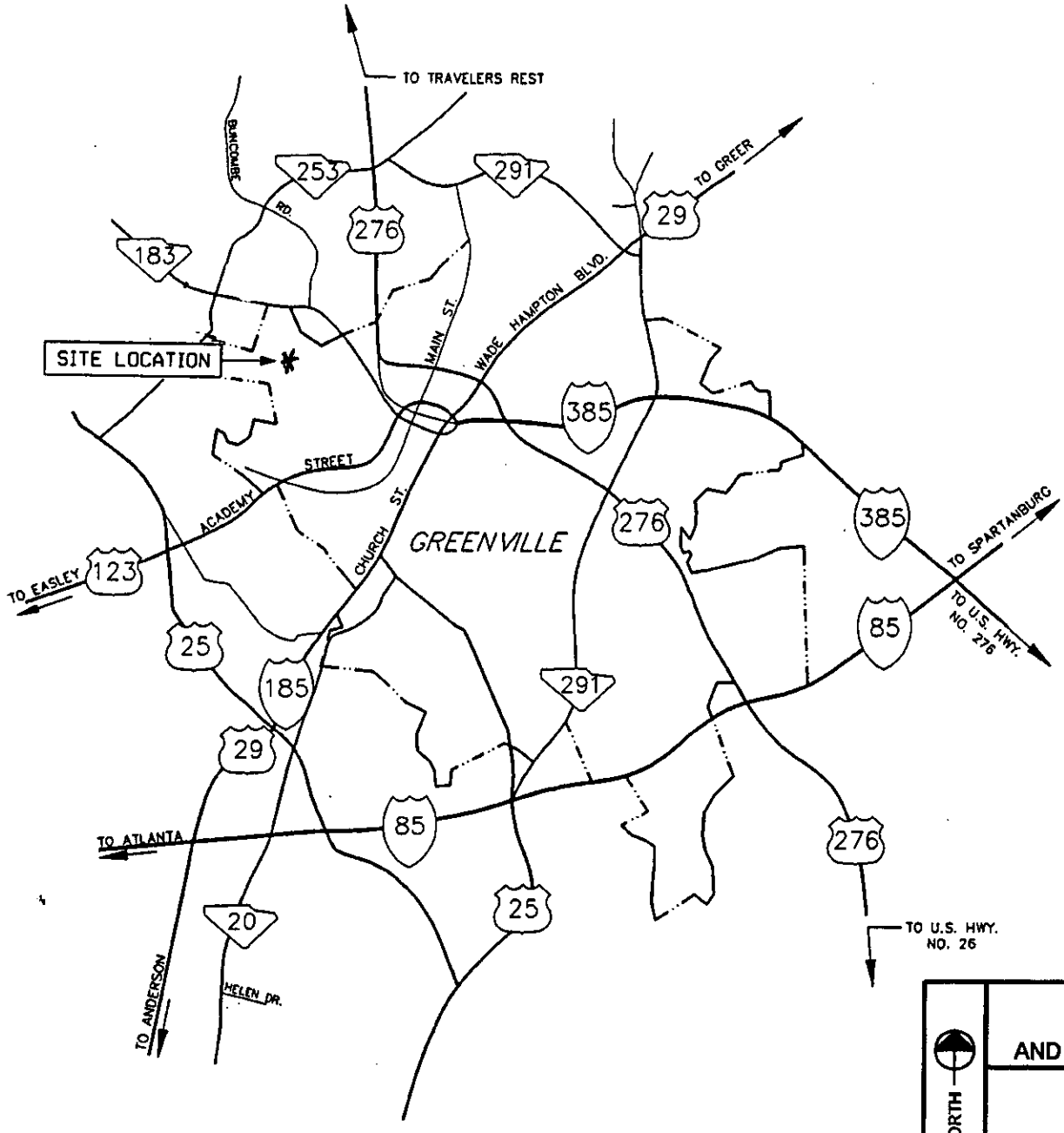
Units in ppb

Detects in bold text, Non-detects in plain text at one-half the detection limit

	Monitoring Wells:	*MCL*	MW7	MW8	MW9	MW10	MW11	MW12	MW13	MW14	MW15	MW16	MW17
PAH Compounds:													
Non-Carcinogenic PAHs	Naphthalene		**470**	**1,900**	**54**	5	5	5	5	5	5	5	500
	Acenaphthylene		**20**	50	5	5	5	5	5	5	5	5	500
	Acenaphthene		**13**	**140**	**18**	5	5	5	5	5	5	5	500
	Fluorene		**15**	50	**14**	5	5	5	5	5	5	5	500
	Phenanthrene		**17**	**110**	**26**	5	5	5	5	5	5	5	500
	Anthracene		5	50	5	5	5	5	5	5	5	5	500
	Fluoranthene		5	50	5	5	5	5	5	5	5	5	500
	Pyrene		5	50	5	5	5	5	5	5	5	5	500
	Benzo(g,h,I)perylene		5	50	5	5	5	5	5	5	5	5	500
Carcinogenic PAHs	Benzo(a)anthracene		5	50	5	5	5	5	5	5	5	5	500
	Chrysene		5	50	5	5	5	5	5	5	5	5	500
	Benzo(b)fluoranthene		5	50	5	5	5	5	5	5	5	5	500
	Benzo(k)fluoranthene		5	50	5	5	5	5	5	5	5	5	500
	Benzo(a)pyrene	*0.2*	5	50	5	5	5	5	5	5	5	5	500
	Indeno(1,2,3-c,d)pyrene		5	50	5	5	5	5	5	5	5	5	500
	Dibenzo(a,h)anthracene		5	50	5	5	5	5	5	5	5	5	500
	Total Carcinogenic PAHs:		35	350	35	35	35	35	35	35	35	35	3,500
	Total PAHs:		**590**	**2,800**	**172**	80	80	80	80	80	80	80	8,000
Other Compounds:													
	2-Methylnaphthalene		**25**	**210**	**17**								**1,000**
	Dibenzofuran		**11**		**14**								
	bis(2-ethylhexyl)phthalate			**310**			**14**	**16**					
	2,4-Dimethylphenol			**110**									
TICs:													
	none												

Table 5

FIGURES



DUKE POWER

CSX/VAUGHN LANDFILL AND BRAMLETTE ROAD MGP SITES

SITE LOCATION

FIGURE: 1

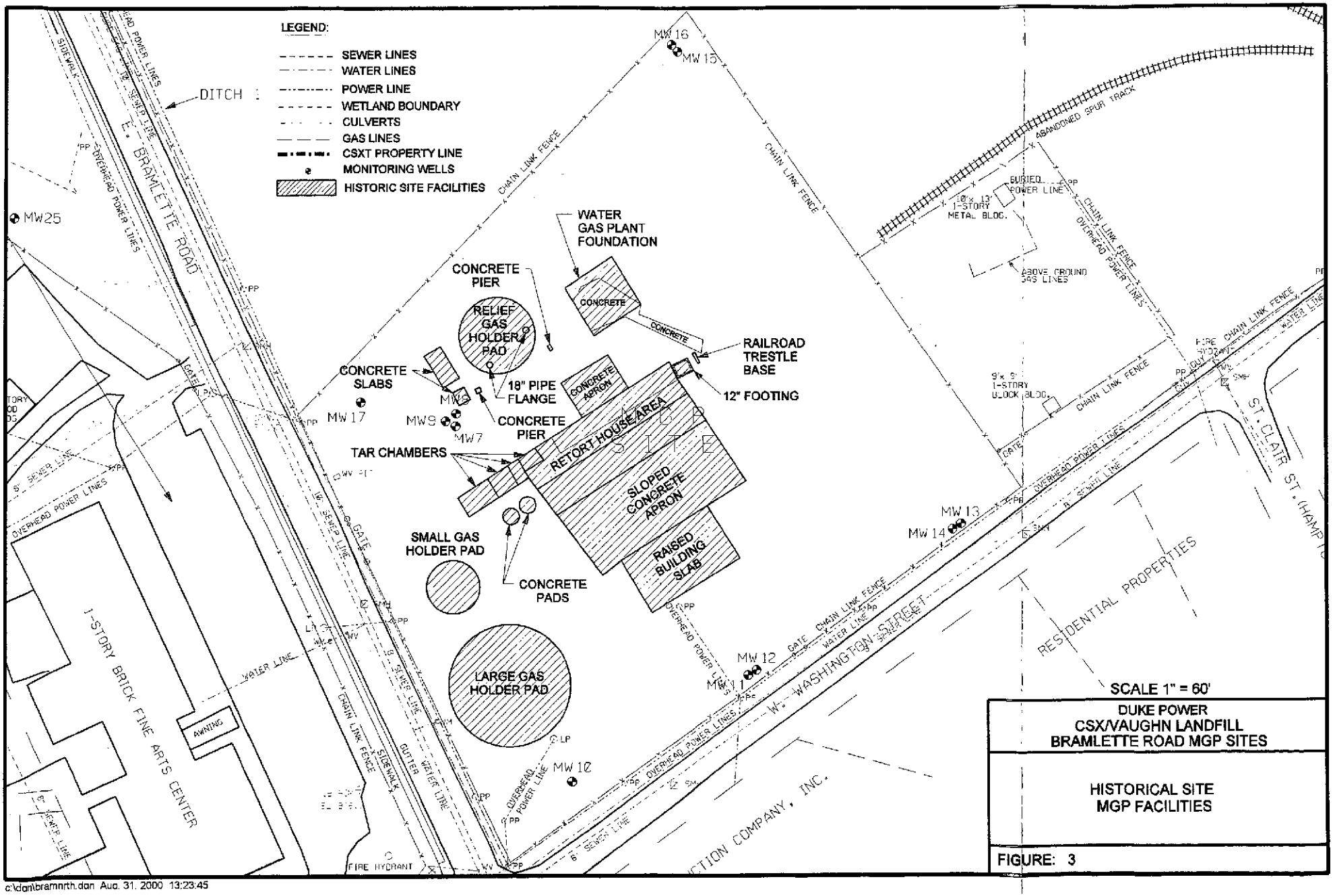
CONTOUR INTERVAL 10 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

NORTH

DUKE POWER
CSX/VAUGHN LANDFILL
AND BRAMLETTE ROAD MGP SITES

SITE LOCATION
USGS TOPO MAP
GREENVILLE, S.C.
1983

FIGURE: 2



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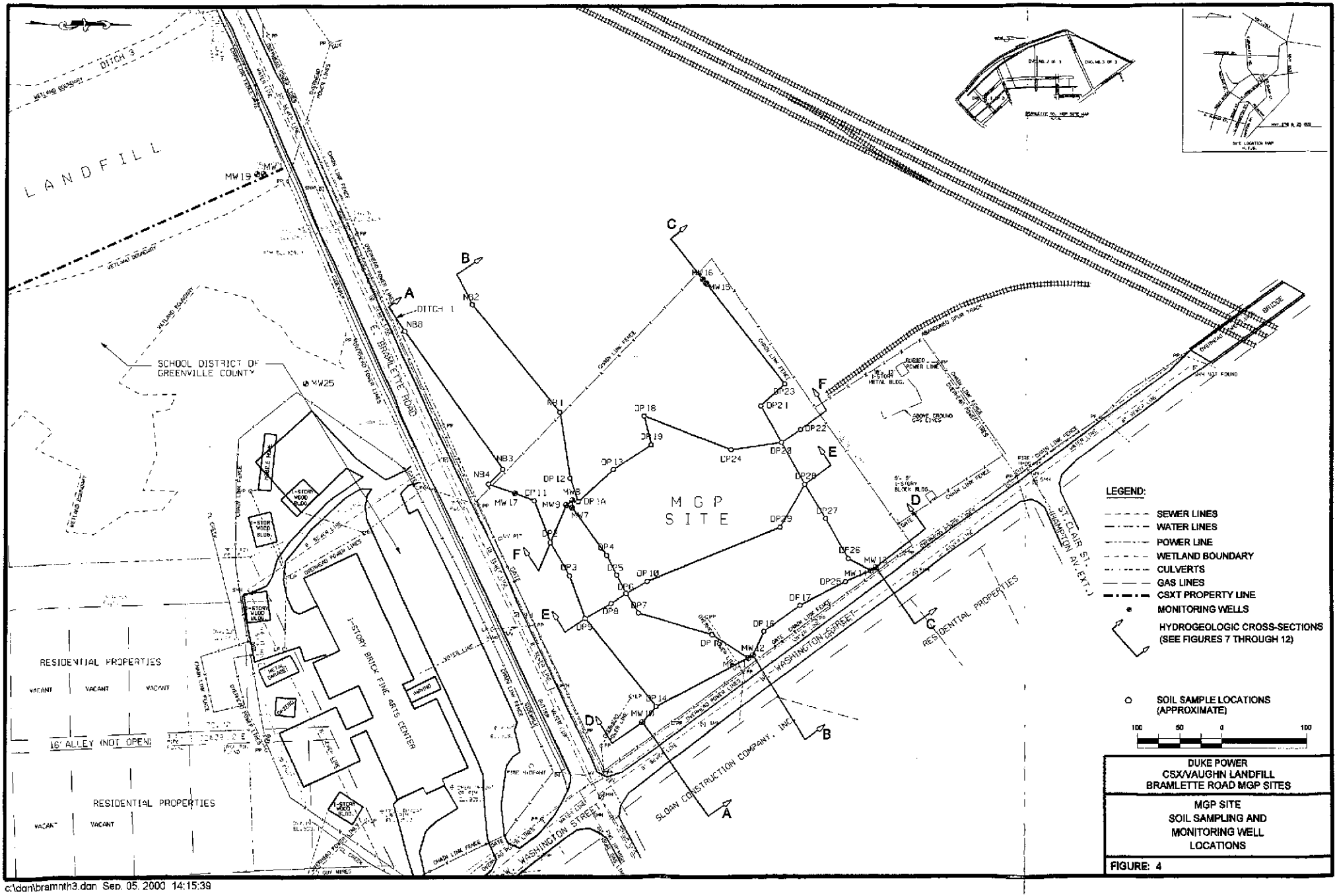

DUKE POWER
CSX/VAUGHN LANDFILL
BRAMLETTE ROAD MGP SITES

MGP SITE
SOIL SAMPLING AND
MONITORING WELL
LOCATIONS

FIGURE: 4

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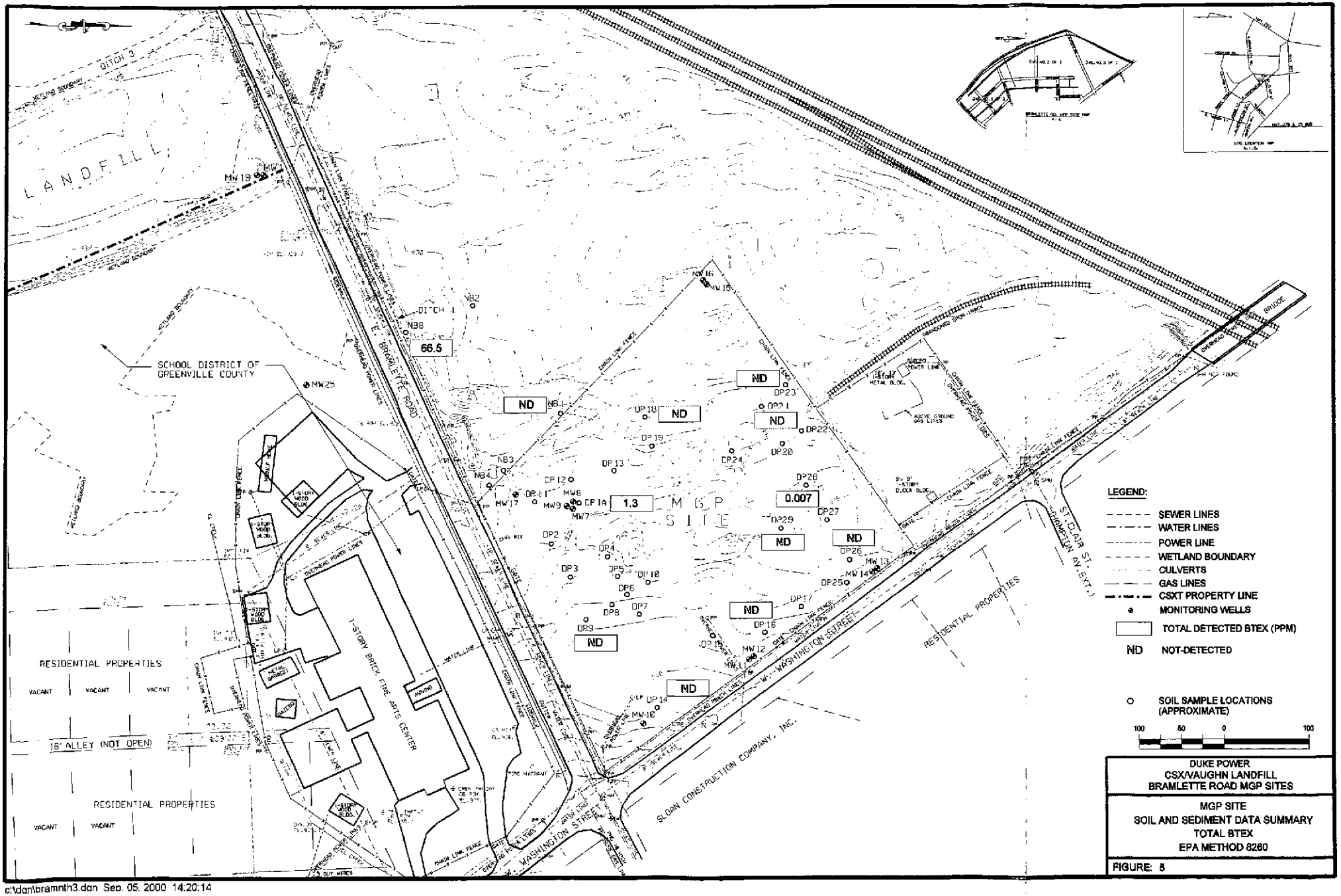

DUKE POWER
CSX/VAUGHN LANDFILL
BRAMLETTE ROAD MGP SITES

MGP SITE
SOIL AND SEDIMENT DATA SUMMARY
TOTAL BTEX
EPA METHOD 8260

FIGURE: 8

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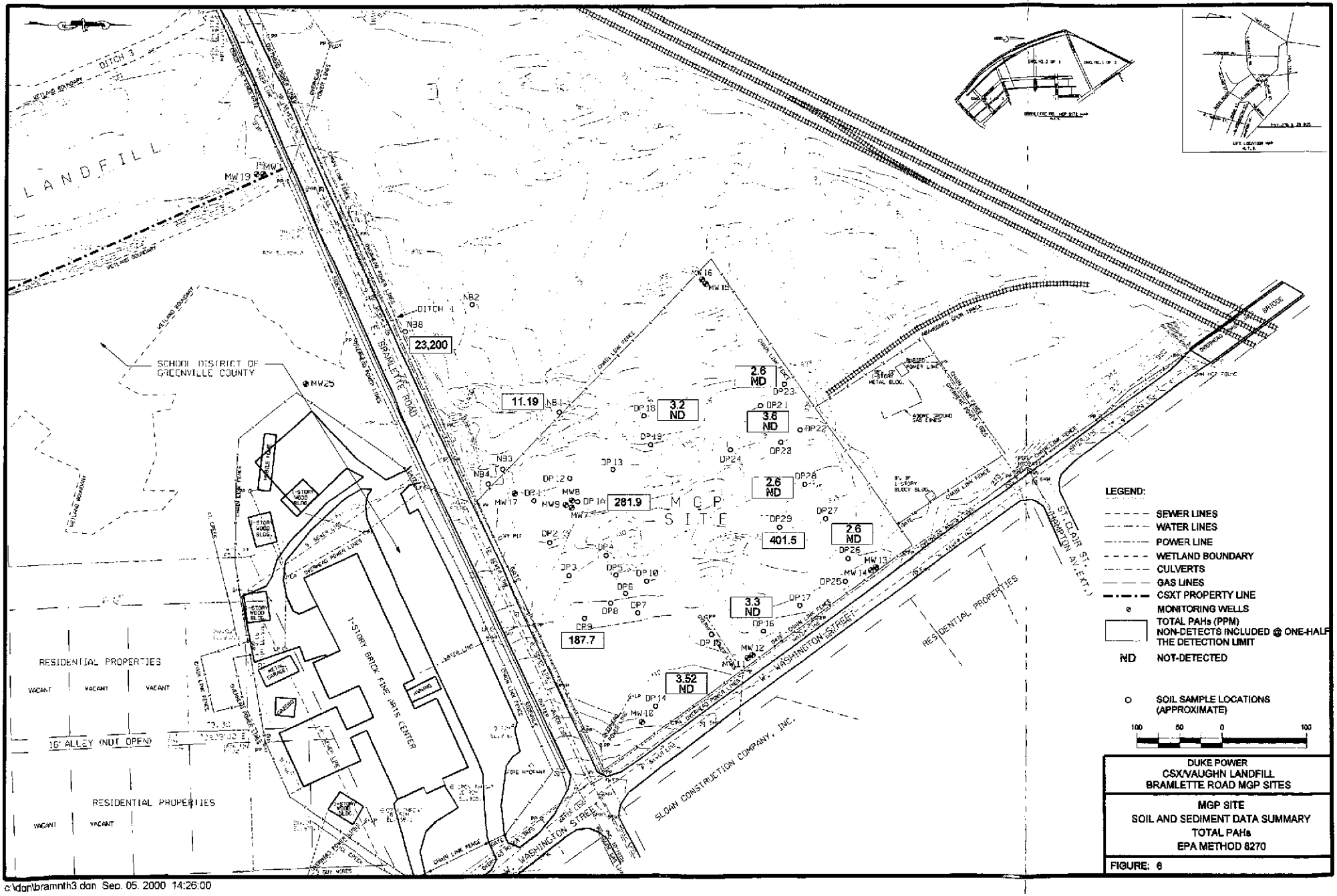

DUKE POWER
CSX/VAUGHN LANDFILL
BRAMLETTE ROAD MGP SITES

MGP SITE
SOIL AND SEDIMENT DATA SUMMARY
TOTAL PAHs
EPA METHOD 8270

FIGURE: 6

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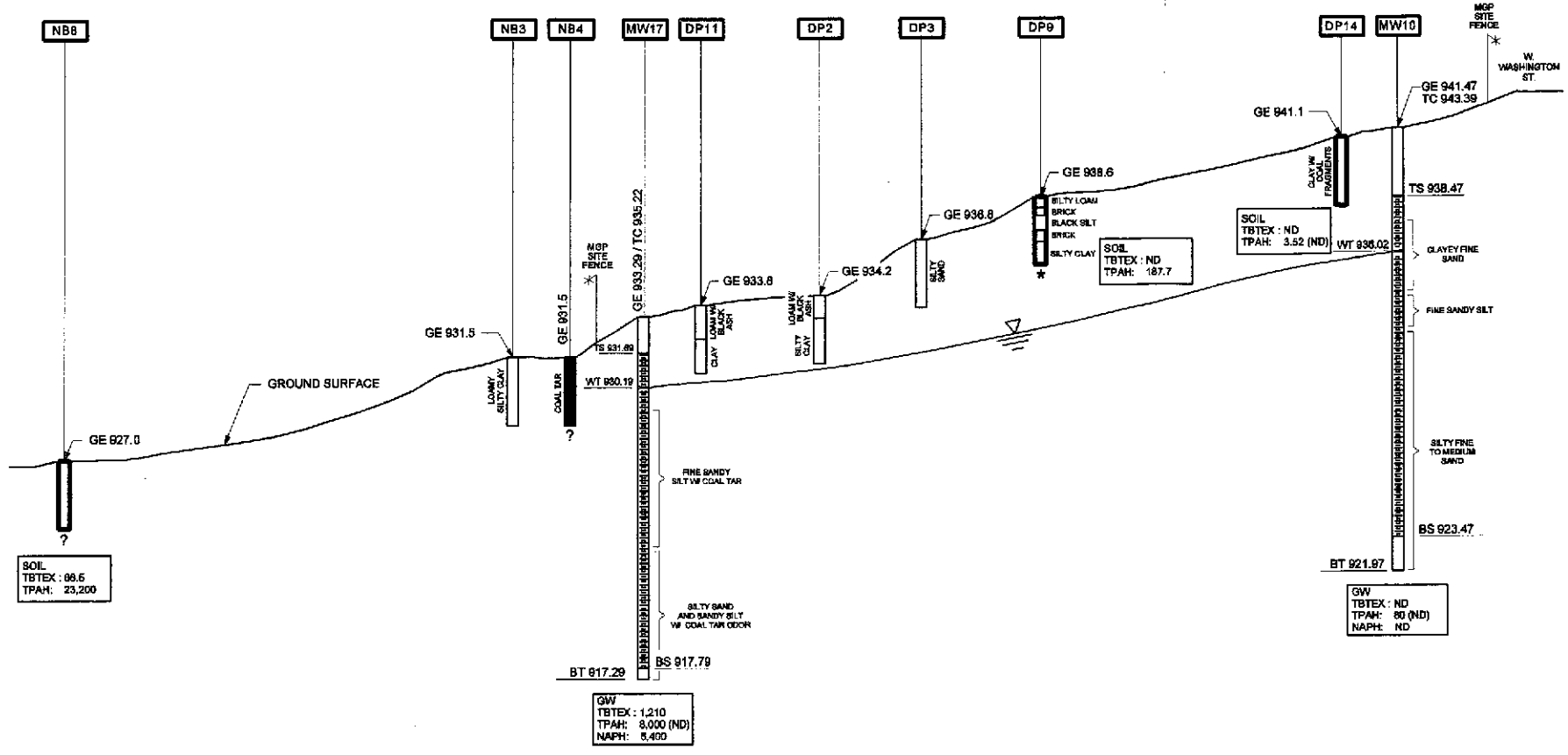

NOTES:

GW LEVELS AND ANALYTICAL RESULTS JUNE 15-17, 1999 UNITS IN PPB

SOIL ANALYTICAL RESULTS IN PPM

PAH NON-DETECTS INDICATED AT ONE-HALF THE DETECTION LIMIT

TBTEX = TOTAL BTEX

TPAH = TOTAL PAHS

NAPH = NAPHTHALENE RESULTS BY METHOD 8260 OR METHOD 8270 WHICHEVER IS GREATER

LEGEND:

TC TOP OF CASING
TS TOP OF SCREEN
BT BORING TERMINATION
WT WATER TABLE
GE GROUND ELEVATION
AR AUGER REFUSAL

GROUNDWATER TABLE JUNE 15-17, 1999

WELL SCREENED INTERVAL

SOIL SAMPLE SUBMITTED FOR LABORATORY ANALYSES

NO ODOR

LITTLE/SLIGHT ODOR

MODERATE ODOR

STRONG ODOR

COAL TAR

? PROBE DEPTH NOT DOCUMENTED

* LAB SAMPLE DEPTH NOT DOCUMENTED

VERTICAL SCALE: 1" = 5'
HORIZONTAL SCALE: 1" = 50'

DUKE POWER COMPANY

CSX/VAUGHN LANDFILL AND BRAMLETTE ROAD MGP SITES

HYDROGEOLOGIC CROSS SECTION A - A

FIGURE: 7

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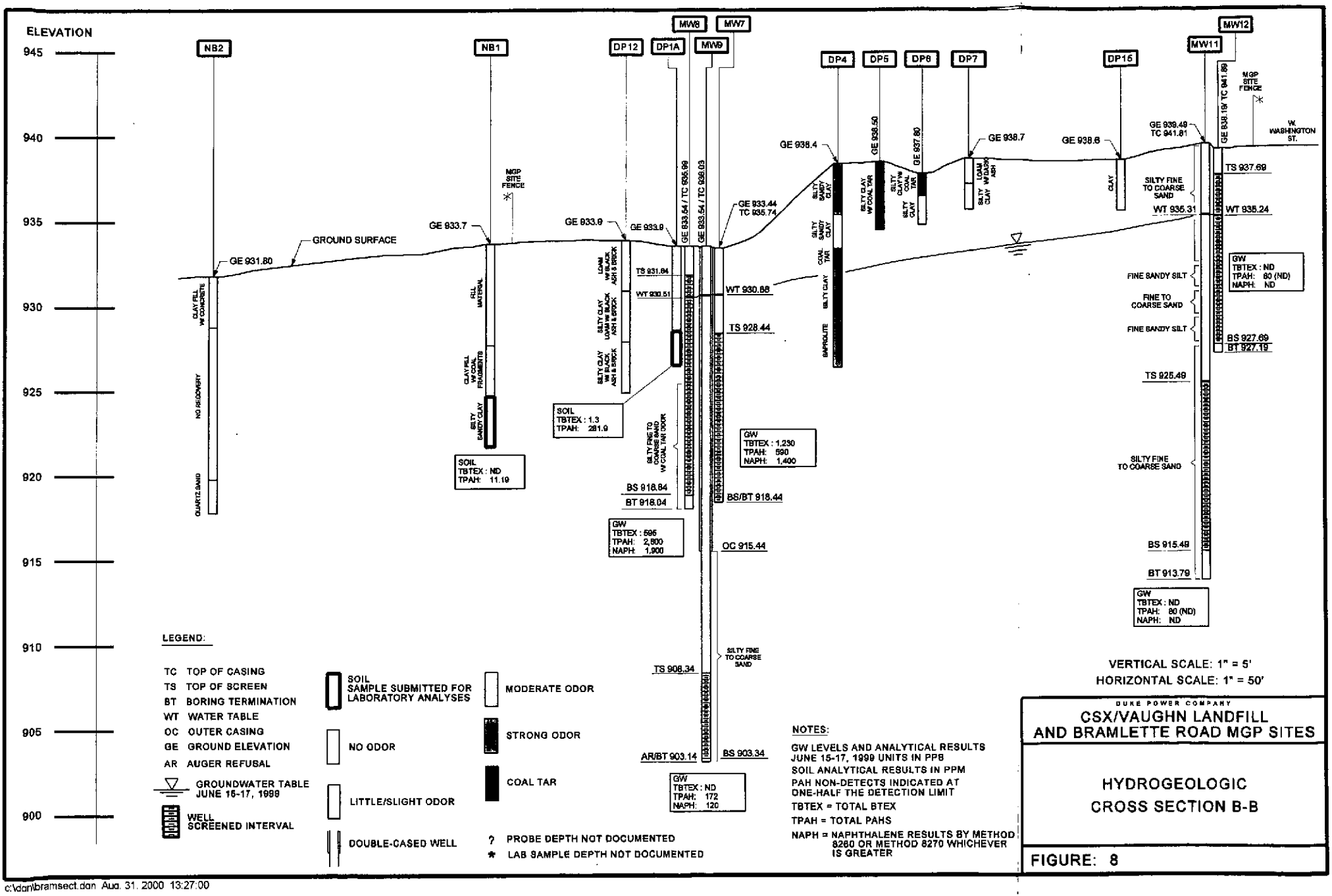

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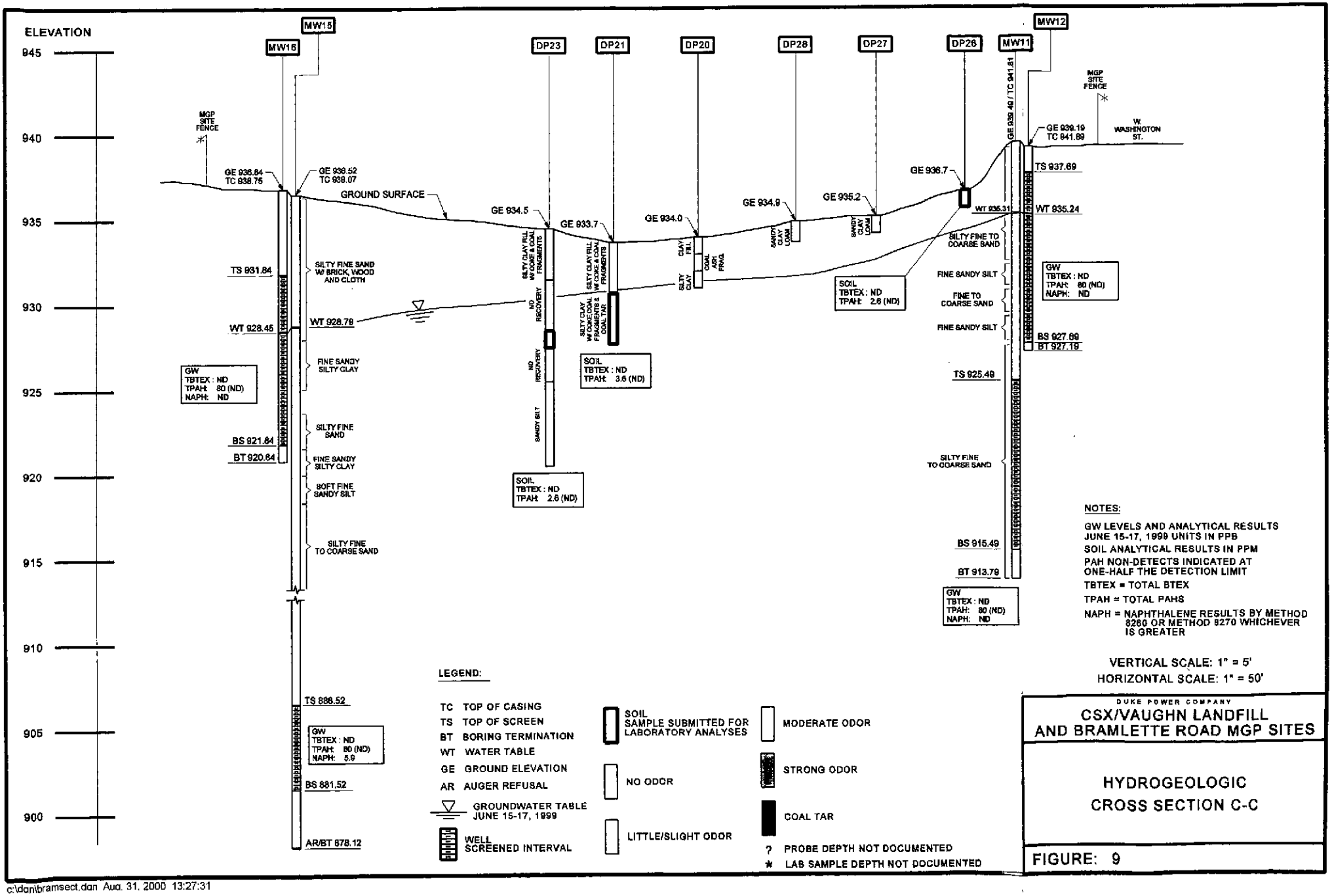

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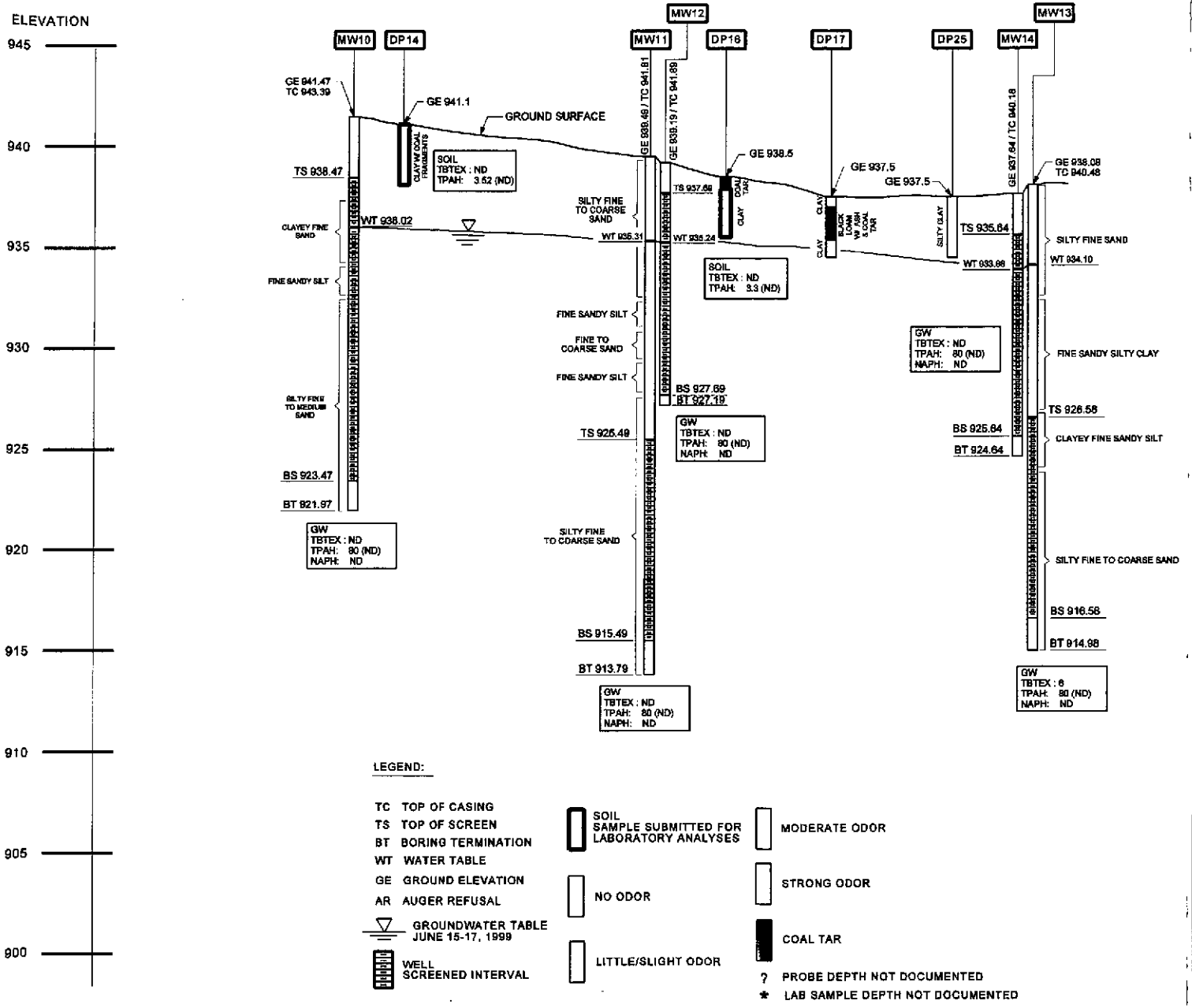

LEGEND:

TC TOP OF CASING
TS TOP OF SCREEN
BT BORING TERMINATION
WT WATER TABLE
GE GROUND ELEVATION
AR AUGER REFUSAL

GROUNDWATER TABLE JUNE 15-17, 1999

WELL SCREENED INTERVAL

SOIL SAMPLE SUBMITTED FOR LABORATORY ANALYSES

NO ODOR

LITTLE/SLIGHT ODOR

MODERATE ODOR

STRONG ODOR

COAL TAR

? PROBE DEPTH NOT DOCUMENTED

* LAB SAMPLE DEPTH NOT DOCUMENTED

NOTES:

GW LEVELS AND ANALYTICAL RESULTS JUNE 15-17, 1999 UNITS IN PPB

SOIL ANALYTICAL RESULTS IN PPM

PAH NON-DETECTS INDICATED AT ONE-HALF THE DETECTION LIMIT

TBTEX = TOTAL BTEX

TPAH = TOTAL PAHS

NAPH = NAPHTHALENE RESULTS BY METHOD 8260 OR METHOD 8270 WHICHEVER IS GREATER

VERTICAL SCALE: 1" = 5'

HORIZONTAL SCALE: 1" = 50'

DUKE POWER COMPANY

CSX/VAUGHN LANDFILL AND BRAMLETTE ROAD MGP SITES

HYDROGEOLOGIC CROSS SECTION D-D

FIGURE: 10

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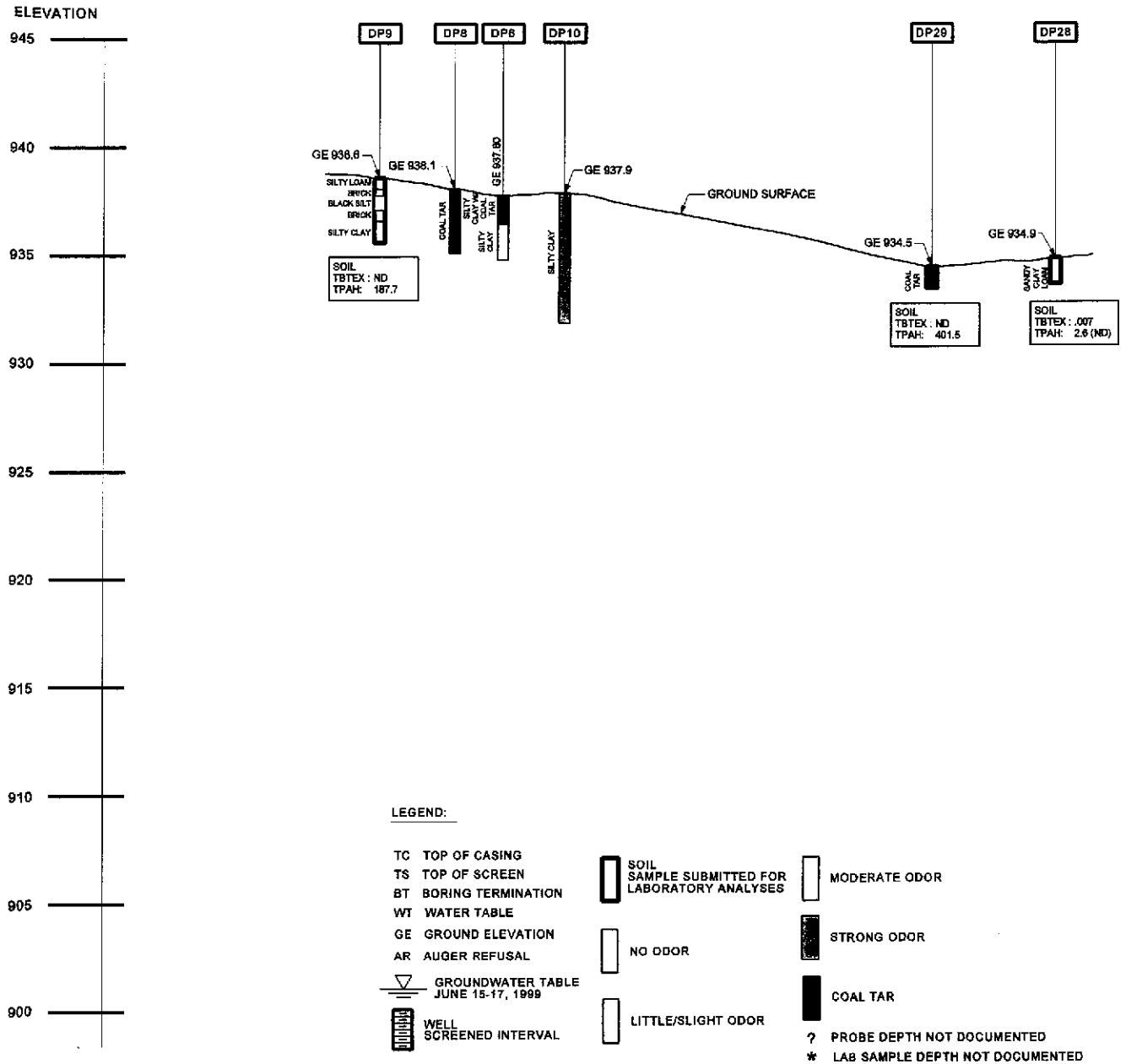

LEGEND:

TC TOP OF CASING
TS TOP OF SCREEN
BT BORING TERMINATION
WT WATER TABLE
GE GROUND ELEVATION
AR AUGER REFUSAL

GROUNDWATER TABLE JUNE 15-17, 1999

WELL SCREENED INTERVAL

SOIL SAMPLE SUBMITTED FOR LABORATORY ANALYSES

NO ODOR

LITTLE/SLIGHT ODOR

MODERATE ODOR

STRONG ODOR

COAL TAR

? PROBE DEPTH NOT DOCUMENTED

* LAB SAMPLE DEPTH NOT DOCUMENTED

NOTES:

GW LEVELS AND ANALYTICAL RESULTS JUNE 15-17, 1999 UNITS IN PPB

SOIL ANALYTICAL RESULTS IN PPM

PAH NON-DETECTS INDICATED AT ONE-HALF THE DETECTION LIMIT

TBTEX = TOTAL BTEX

TPAH = TOTAL PAHS

NAPH = NAPHTHALENE RESULTS BY METHOD 8260 OR METHOD 8270 WHICHEVER IS GREATER

VERTICAL SCALE: 1" = 5'

HORIZONTAL SCALE: 1" = 50'

DUKE POWER COMPANY

CSX/VAUGHN LANDFILL AND BRAMLETTE ROAD MGP SITES

HYDROGEOLOGIC CROSS SECTION E-E

FIGURE: 11

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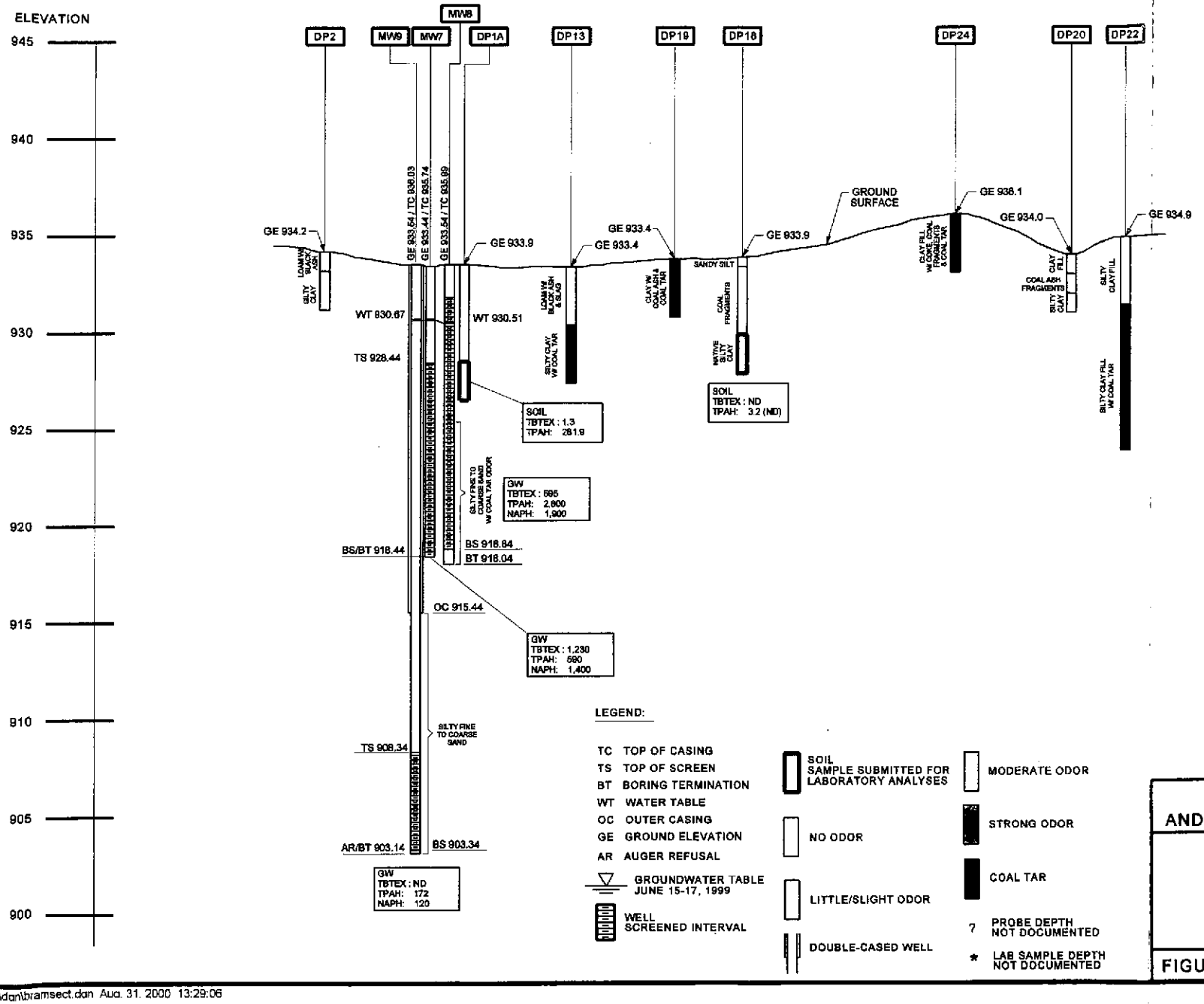

NOTES:

GW LEVELS AND ANALYTICAL RESULTS JUNE 15-17, 1999 UNITS IN PPB

SOIL ANALYTICAL RESULTS IN PPM

PAH NON-DETECTS INDICATED AT ONE-HALF THE DETECTION LIMIT

TBTEX = TOTAL BTEX

TPAH = TOTAL PAHS

NAPH = NAPHTHALENE RESULTS BY METHOD 8260 OR METHOD 8270 WHICHEVER IS GREATER

VERTICAL SCALE: 1" = 5'

HORIZONTAL SCALE: 1" = 50'

DUKE POWER COMPANY

CSX/VAUGHN LANDFILL AND BRAMLETTE ROAD MGP SITES

HYDROGEOLOGIC CROSS SECTION F-F

FIGURE: 12

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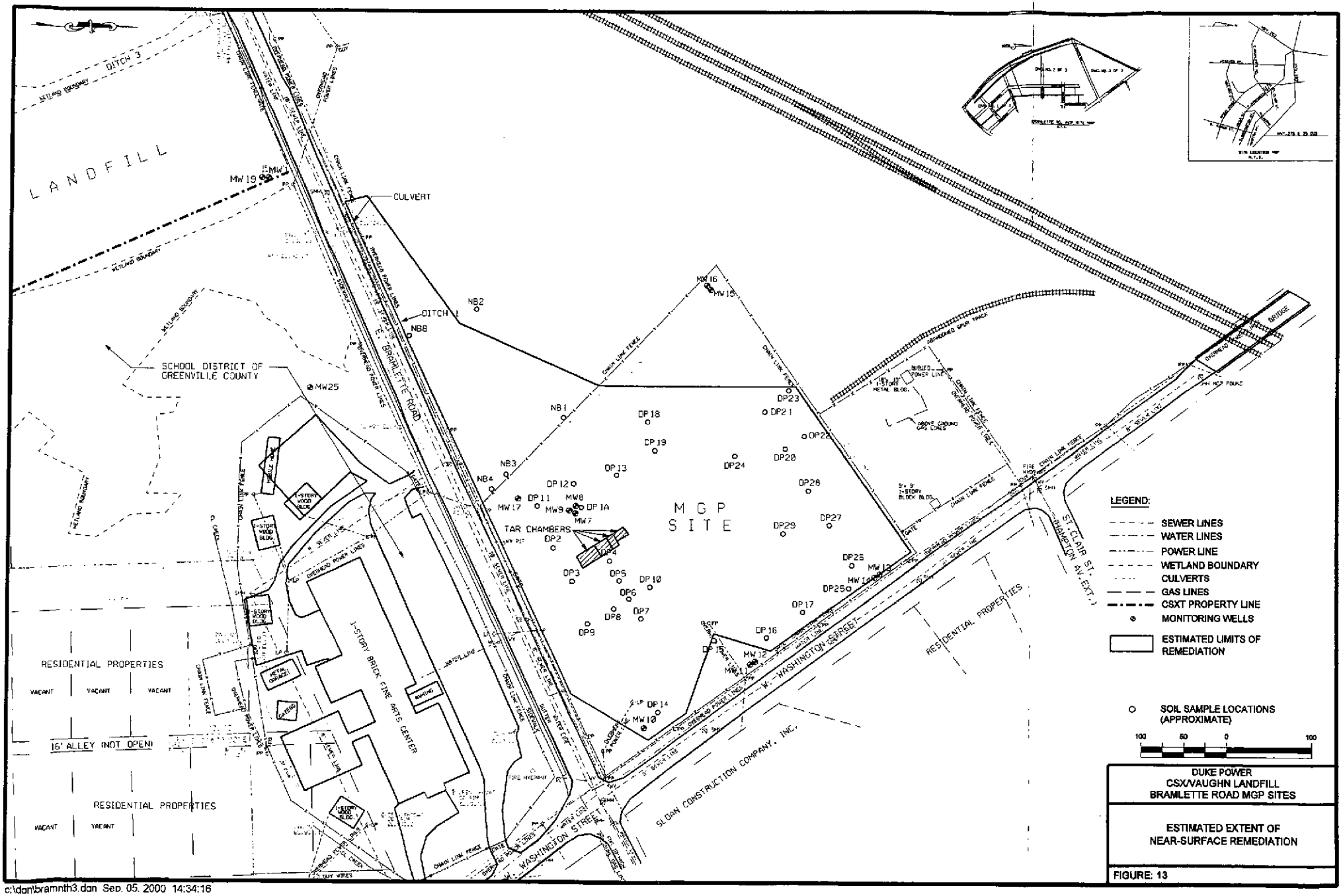

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APPENDIX A

RISK-BASED CLEANUP CRITERIA FOR NEAR-SURFACE SOILS

Statistical Evaluation for Risk-Based Cleanup Criteria of Near-Surface Soils
Semi-Volatile Organics Soil Data by EPA Method 8270

Units in ppm

Detects in bold text, Non-detects in plain text at one-half the detection limit

Sampling Location:		Phase I Data		Phase II Data											Phase III Data
		LF 004	LF 027	DP1A	DP9	DP14	DP16	DP18	DP21	DP23	DP26	DP28	DP29	NB1	NB8	LF 024-2	HA#1
Sample Depth [ft]:		9.5	7.0	5-7	?	0-3	0-3	4-6	3-6	6	0-1	0-1	surface	9-12	?	9^	3-4
NON-CARCINOGENIC PAHs:																	
Acenaphthene		**106**	10	**20**	3.35	0.22	0.205	0.20	0.225	0.165	0.165	0.165	16.5	0.195	**600**	0.22	65
Acenaphthylene		**570**	**30**	2.0	**7.9**	0.22	0.205	0.20	0.225	0.165	0.165	0.165	16.5	0.195	330	0.22	**140**
Anthracene		**219**	**30**	**15**	3.35	0.22	0.205	0.20	0.225	0.165	0.165	0.165	16.5	0.195	**1,400**	0.22	**190**
Benzo(g,h,i)perylene		16.5	**70**	**7.5**	**15**	0.22	0.205	0.20	0.225	0.165	0.165	0.165	16.5	**0.49**	380	0.22	**41**
Dibenzofuran		**74**	10	**15**	3.350	0.220	0.205	0.20	0.225	0.165	0.165	0.165	16.5	0.195	380	0.22	**130**
Fluoranthene		**197**	**180**	**32**	**22**	0.22	0.205	0.20	0.225	0.165	0.165	0.165	16.5	**2**	**2,000**	**0.51**	**340**
Fluorene		16.5	10	**17**	3.35	0.22	0.205	0.20	0.225	0.165	0.165	0.165	16.5	0.195	**1,700**	0.22	**190**
2-Methylnaphthalene		**1,400**	10	**13**	3.350	0.220	0.205	0.20	0.225	0.165	0.165	0.165	16.5	0.195	380	0.22	**240**
Naphthalene		**44**	10	**48**	3.35	0.22	0.205	0.20	0.225	0.165	0.165	0.165	16.5	0.195	**5,800**	0.22	**660**
Phenanthrene		**1,000**	**50**	**44**	**15**	0.22	0.205	0.20	0.225	0.165	0.165	0.165	16.5	**1.8**	**3,800**	**0.47**	**600**
Pyrene		**279**	**170**	**30**	**19**	0.22	0.205	0.20	0.225	0.165	0.165	0.165	16.5	**1.7**	**2,600**	**0.45**	**340**
Total Non-Carcinogenic PAHs:		**3,922**	**680**	**244**	**99**	2.42	2.255	2.20	2.475	1.815	1.815	1.815	181.5	**7.4**	**19,370**	**3.19**	**2,936**
CARCINOGENIC PAHs:																	
Benzo(a)anthracene	0.100	**55**	**80**	**14**	**12**	0.22	0.205	0.20	0.225	0.165	0.165	0.165	16.5	**0.78**	**1,000**	0.22	**140**
Benzo(a)pyrene	1.000	16.5	10	**12**	**20**	0.22	0.205	0.20	0.225	0.165	0.165	0.165	16.5	**0.60**	**780**	0.22	**130**
Benzo(b)fluoranthene	0.100	16.5	**230**	**9.1**	**14**	0.22	0.205	0.20	0.225	0.165	0.165	0.165	**62**	**0.67**	**460**	0.22	65
Benzo(k)fluoranthene	0.010	**84**	**180**	**9.6**	**17**	0.22	0.205	0.20	0.225	0.165	0.165	0.165	**72**	**0.63**	**700**	0.22	**200**
Chrysene	0.001	16.5	**90**	**13**	**14**	0.22	0.205	0.20	0.225	0.165	0.165	0.165	**53**	**0.89**	**980**	0.22	**140**
Dibenzo(a,h)anthracene	1.000	16.5	10	2.0	3.35	0.22	0.205	0.20	0.225	0.165	0.165	0.165	16.5	0.195	330	0.22	65
Indeno(1,2,3-c,d)pyrene	0.100	16.5	**70**	**6.7**	**15**	0.22	0.205	0.20	0.225	0.165	0.165	0.165	16.5	**0.46**	**340**	0.22	**75**
B(a)P Equiv. CPFs																	
Total Carcinogenic PAHs:		**221.5**	**670**	**66.4**	**95.4**	1.54	1.44	1.40	1.58	1.16	1.16	1.16	**253.0**	**4.23**	**4,590**	1.54	**815**
Total Carcinogenic PAHs as B(a)P:		**42.7**	**60**	**17.1**	**27.6**								**43.3**	**1.0**	**1,298**		**225**
Total PAHs:		**4,143.5**	**1,250**	**309.9**	**194.4**	3.96	3.7	3.6	4.1	3.0	3.0	3.0	**434.5**	**11.58**	**23,960**	**4.73**	**3,751**
Ratio: Total Carc PAHs/Total PAHs:		**5.35%**	**53.60%**	**21.43%**	**49.06%**								**58.23%**	**36.49%**	**19.16%**		**21.73%**
Average:		**33.13%**		**85% Confidence Level:**		**42.84%**			**90% Confidence Level:**		**44.22%**				**95% Confidence Level:**		**46.35%**
Ratio: Total Carc PAHs as B(a)P/Total PAHs:		**1.03%**	**4.79%**	**5.51%**	**14.22%**								**9.96%**	**8.58%**	**5.42%**		**6.00%**
Average:		**6.94%**		**85% Confidence Level:**		**8.95%**			**90% Confidence Level:**		**9.24%**				**95% Confidence Level:**		**9.68%**
Ratio: Total Carc PAHs as B(a)P/Total Carc PAHs:		**19.26%**	**8.94%**	**25.74%**	**28.98%**								**17.10%**	**23.51%**	**28.28%**		**27.62%**
Average:		**22.43%**		**85% Confidence Level:**		**25.96%**			**90% Confidence Level:**		**26.46%**				**95% Confidence Level:**		**27.23%**

Bramlette Road MGP Site

Statistical Evaluation
PAH Target Cleanup Concentrations

Units in mg/kg

Exposure Setting:	Residential
*Near Surface Soil Target Cleanup Concentration Based on Exposure to Benzo(a)pyrene (mg/kg):	0.087

Target Cleanup Concentrations for Total Carcinogenic PAHs

Total Carc PAHs as B(a)P / Total Carc PAHs		Residential Cleanup Concentration
Average:	22.43%	0.388
85% Confidence Interval:	25.96%	0.335
90% Confidence Interval:	26.46%	0.329
95% Confidence Interval:	27.23%	0.319

Target Cleanup Concentrations for Total PAHs

Total Carc PAHs as B(a)P / Total PAHs		Residential Cleanup Concentration
Average:	6.94%	1.254
85% Confidence Interval:	8.95%	0.972
90% Confidence Interval:	9.24%	0.942
95% Confidence Interval:	9.68%	0.899

* EPA Region III Risk-Based Concentration Table, revised 4/12/99;
Residential concentration based on combined child and adult ingestion of near-surface (surface to 3 feet) soils in a residential exposure setting.

APPENDIX B

HEALTH & SAFETY PLAN

SITE-SPECIFIC HEALTH AND SAFETY PLAN FOR EXCAVATION, MATERIAL HANDLING, STORING AND TRANSPORTATION OF MGP SITE SOILS AT THE BRAMLETTE ROAD MGP SITE

GREENVILLE, SOUTH CAROLINA

SEPTEMBER, 2000

Developed by: James G. Gartland, CIH, CHMM

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1.0 INTRODUCTION

This document describes the Health & Safety (H&S) protocols developed for the Bramlette Road MGP site located in Greenville, South Carolina. This plan was developed to protect on-site personnel, visitors, and the public from known or suspected health and safety hazards. These procedures and guidelines contained herein are based on the most up-to-date information available at the time of the drafting of this document. Specific sections of this plan will be changed or revised when additional information is received or when conditions at the site change. Any changes or revisions to this plan will be by a written amendment which will become a permanent part of this plan and placed in Appendix A. Where appropriate, specific OSHA or other standards will be cited. In addition, information pertaining to each site may contain individual sections, if necessary.

1.1 Site Safety Plan Acknowledgment & Acceptance

The site manager/safety officer, site engineer, and/or other designated representative shall be responsible for informing all individuals assigned to or visiting the site of the contents of this plan and ensuring that each person signs the Safety Plan Acknowledgment Form in Appendix B. By signing the Safety Plan Acknowledgment Plan, individuals are recognizing the Health & Safety hazards known or suspected on-site, and the protocols required to minimize exposure to such hazards.

1.2 Site Health & Safety Meetings

An initial "Kick-Off" Health & Safety meeting shall be held on the first day of mobilization to the site and prior to the commencement of any work activities. Mandatory attendance is required for all personnel initially assigned to the site. At the conclusion of the "Kick-Off" meeting, personnel are to sign the Safety Plan Acknowledgment Form in Appendix B indicating their attendance and understanding of the Health & Safety protocols. As additional personnel are assigned to the site, it is the responsibility of the project manager/site manager to ensure that the personnel are briefed on health & safety protocols and that they also sign the Safety Plan Acknowledgment Form.

Additional health & safety meetings will be held on a regularly scheduled basis throughout the duration of the project. In no case shall more than one week elapse between health & safety meetings. These meetings shall be scheduled to inform all personnel of changing site conditions, to ensure that personal protective equipment is being used properly and sufficiently stocked, and to address worker health & safety concerns.

1.3 Training Requirements

All personnel assigned to the site must have completed the level of training for hazardous waste site work in accordance with OSHA 29 CFR 1910.120(e)(3) which is commensurate with the work they perform. General workers on site working in areas with exposure or potential exposure to health hazards must receive 40 hrs. Other workers on site with specific limited tasks who are unlikely to be exposed and those who work only in fully characterized areas with no potential for exposure shall receive 24 hrs. or training. If it has been more than 12 months since either of these relevant initial 24 or 40 hr courses, the workers must be current with their 8-hour refresher training in accordance with OSHA 29 CFR 1910.120(e)(8). Documentation of OSHA training is required prior to personnel being permitted to work on-site.

1.4 Medical Monitoring Requirements

All personnel assigned to the site must be enrolled in a medical surveillance program meeting the requirements of OSHA 29 CFR 1910.120(f). Documentation of personnel being enrolled in a medical surveillance program is required prior to personnel being permitted to work on-site.

1.5 Fit Testing Requirements

If any personnel assigned to the site must wear a respirator, they must have successfully passed a respirator fit test within the past 12 months. Documentation of a successful respirator fit test for the appropriate type of respirator needed for work on this specific site (e.g., half-face or full-face) will be required. The project manager, project site engineer, or site health & safety officer is to ensure the respirator being worn by personnel is the same size, make, and model as that specified on any respirator fit test records from the past twelve month period.

1.6 Responsibilities

The project manager or site manager is responsible for overall project administration and for coordinating health & safety protocols and procedures for all personnel on-site at all times. All U.S. EPA health & safety requirements and all applicable OSHA standards shall be applicable. This health & safety plan covers all personnel on-site, however, each sub-contractor is also responsible for the health & safety of its employees. If there is a dispute with regards to health & safety, the following procedures shall be followed:

1) Site manager shall attempt to resolve the issue with a complete written follow-up to the Health & Safety Officer; or

2) If the issue cannot be resolved, the site manager shall consult the Health & Safety Officer immediately and the specific task operation in dispute shall be discontinued until the issue is resolved.

Any persons who observe health & safety problems or infractions should immediately report the problem or infraction to the appropriate personnel.

1.7 Access to Employee Exposure and Medical Records

The Occupational Safety & Health Act provides employees and their designated representatives a right of access to relevant exposure and medical records (29 CFR 1910.20). The "notification" of access to employee exposure and medical records (Appendix G) is to be posted in a prominent location in the field office.

GENERAL INFORMATION

PROJECT:	**Bramlette Road, Greenville, SC MGP**	**PROJ. NO.:**
SITE NAME:	**Bramlette Road - Former MGP Site**	
SITE LOCATION:	**NW Corner Bramlette Road and Washington St., Greenville SC**	
PURPOSE OF VISIT:	**To remove contaminated soils from site**	
DATES OF FIELD ACTIVITIES:	**Winter, 2000-Spring, 2001**	
PROJECT MANAGER:	**Mark McGary**	
SITE ENGINEER/MANAGER:	**Kenney Ramsey**	
DESIGNATED SITE H&S OFFICER:	**Kenny Cable**	

NAME	GROUP	OSHA TRAINING DATE			PHYSICAL DATE
		40 HR	Super-visor Trng.	8 HR	
Ralph Roberts	GEHS/Env. Eng.	1/94	1/99	3/00	1/00
Richard Baker	GEHS/Env. Eng.	3/96	1/99	3/00	11/99
Kenney Ramsey	DE&S	4/97	2/99	1/00	2/00
Ron Santini	GEHS Env. Chem.	4/94	2/99	3/00	5/00
Tim Hunsucker	GEHS Env. Chem	4/94	2/99	1/00	4/00
Giorgina Franklin	GEHS Env. Chem	4/94	2/99	3/00	3/00
Bob Wolfe	GEHS Env. Chem	4/94	2/99	3/00	3/00
Chuck Campbell	GEHS Env. Chem	4/94	2/99	3/00	1/00
James Gartland	EHS/H&S	4/97	2/99	3/00	5/00
Randy Cardoso	EHS/H&S	4/97	2/99	3/00	2/00
Joel Jones	EHS/H&S	10/99	3/00	3/00	10/99
Dwight Little	DE&S	4/97	2/99	1/00	3/00
John M. Johnson	DE&S	1/94	1/99	1/00	1/00
Mark McGary	DE&S	3/96	1/99	1/00	2/00

SUB-CONTRACTOR PERSONNEL ON-SITE

NAME	SUB-CONTRACTOR	OSHA TRAINING			PHYSICAL DATE
		40 HR	Super-visor Trng.	8 HR	
Kenny Cable					
John Cash	DE&S	3/99	1/00	1/00	2/00
Mike Stephens	DE&S	3/95	1/00	1/00	12/99

BACKGROUND

Greenville, SC

OVERALL HAZARD IS:			
HIGH:	LOW: X	MODERATE:	UNKNOWN:
FACILITY DESCRIPTION: Former MGP facility. Site has been cleared of debris, rubbish and trees.			
STATUS: Abandoned lot surrounded by fence.			
UNUSUAL FEATURES (containers, dikes, buildings, power lines, terrain, etc.): MGP facilities demolished to ground surface.			
SITE HISTORY (worker injury, complaints, regulatory agency action):			
WASTE TYPES:			
LIQUID:	SOLID: X	SLUDGE:	GAS:
CHARACTERISTICS:			
CORROSIVE:	IGNITABLE:	VOLATILE: X	TOXIC:
REACTIVE:	UNKNOWN:	RADIOACTIVE:	
OTHER (name):			
HAZARDS POSED BY SITE ACTIVITIES: Hazards working around equipment, and exposure to Polynuclear Aromatic Hydrocarbons (PNAHs) and benzene. Health hazard exposure potential is expected primarily to occur only via dermal contact. Safety hazards are related to mobile equipment and vehicular hazards.			
UNUSUAL HAZARDS:			

2.0 Health & Safety Risk Analysis

This analysis identifies the general hazards associated with specific site operations and presents an analysis of documented or potential chemical hazards that exist at the site. Every effort must be made to reduce or eliminate these hazards. Those which cannot be eliminated must be guarded against by use of engineering controls and/or personal protective equipment.

2.1 HAZARDS ASSOCIATED WITH WORKING AROUND HEAVY EQUIPMENT

- All equipment must have back-up alarms.
- Personnel must make eye contact with the operator before approaching the equipment.
- Operators must be aware of personnel in the area and use proper hand signals before maneuvering.
- Operators must wear hard hats when operating machines unless equipment has an enclosed cab or cage cover.
- Operators must wear hard hats when going to and from their equipment.
- Operators must be cautious when maneuvering equipment near overhead power lines.
- Use of high visibility reflective (ie. orange or yellow) vests is recommended.

2.2 GENERAL SITE HAZARDS

Lighting

Work areas must have adequate lighting for employees to see to work and identify hazards (5-foot candles minimum, comparable to a single 75-100 watt bulb). Personnel should carry flashlights in all dark areas for use in the event of a power failure. Applicable OSHA standards for lighting 29 CFR 1910.210(m) shall apply.

Electric Power

All electrical power must have a ground fault circuit interrupter as part of the circuit. All equipment must be suitable and approved for the class of hazard. Applicable OSHA standards for electric 29 CFR 1910 Subpart S shall apply.

Lockout/Tagout

Operations where the unexpected energization or start-up of equipment or release of stored energy could cause injury to personnel, will be protected by the implementation of a lockout/tagout program meeting the requirements of 29 CFR 1910.147.

Fall Protection

Fall accidents can result in an injury or fatality. Requirements to help prevent falls will be implemented. Elevated work where a fall potential exists will be performed using appropriate ladders and/or fall protection (i.e., body harness or lifeline). Applicable OSHA standards for fall protection 29 CFR 1910.21 through 29 CFR 1910.32, and 29 CFR 1910.104 through 29 CFR 1910.107 shall apply.

Heat Stress

When the temperature exceeds 70°F, and personnel are wearing personal protective clothing, a heat stress monitoring program shall be implemented. Employees shall have periodic break periods and access to drinking water. Heat stress is discussed in detail in Appendix C.

Eye Wash Protection

All operations involving the potential for eye injury, splash, etc., must have approved eye wash units locally available as per 29 CFR 1910.151 (c).

Hearing Protection

When the noise level of any operation exceeds the 8 hr. TWA of 85 decibels, a hearing protection program meeting the requirements of 29 CFR 1910.95 will be implemented.

Fire Protection/Fire Prevention

Operations involving the potential for fire hazards shall be conducted in a manner as to minimize the risk. Non-sparking tools and fire extinguishers shall be used or available as required. Fire extinguishers are to be used only by those employees trained in their use. Sources of ignition shall be removed. When necessary, explosion-proof instruments and/or bonding and grounding will be used to prevent fire or explosion.

Utilities

Overhead and underground utility hazards shall be identified and/or inspected prior to conducting operations involving potential contact.

Excavation/Trenching

Any excavation/trench greater than four feet in depth in which personnel must enter, will be designed and constructed meeting all applicable requirements of 29 CFR 1926, Subpart P.

Machine Guarding

Moving machine parts can be very dangerous; even smooth, slowly rotating shafts can grip clothing, forcing an arm or hand into a dangerous position. Drilling, milling, and boring machines must be safeguarded in compliance with ANSI B11.8-1983, Safety Requirements For Construction, Care and Use of Drilling, Milling, and Boring Machines.

Confined Space Entry

Any entry into spaces that meet the following criteria shall require implementation of a Confined Space Entry program meeting the requirements to 29 CFR 1910.146:

- Space is large enough for employees to bodily enter and perform work
- Space has limited or restricted means of entry and exit (eg. Tanks, vaults, pits)
- Space is not designated for continuous employee occupancy.

2.3 CHEMICAL HAZARDS

Previous sampling and analytical data or previous site history and investigation have indicated that the following chemical hazards, either documented or suspected, exist at the site. Detailed hazard information for these chemicals is available through MSDS sheets in Appendix E.

CONTAMINANT	SKIN HAZ.	PEL (1)	TLV (2)	REL (3)	STEL (4)	IDLH (5)	ODOR THRES-HOLD	IP (6)
Benzene	Yes	1 ppm	.1 ppm	0.1 ppm	5 ppm	500 ppm CA	34-119 ppm	9.24
Toluene	Yes	200 ppm	50 ppm	100 ppm	150 ppm	500 ppm	4.68 ppm	8.82
Ethylbenzene	No	100 ppm	100 ppm	100 ppm	125 ppm	800 ppm	0.092-0.60 ppm	8.76
Xylene	Yes	100 ppm	100 ppm	100 ppm	150 ppm	900 ppm	20 ppm	8.56
Acetonitrile	No	40 ppm	40 ppm	20 ppm	60 ppm	500 ppm	1160 ppm	12.20
Chloroform	No	50 ppm (C)	10 ppm	2 ppm	2 ppm	500 ppm	133-276 ppm	11.42
1,1,1-Trichloroethane	No	350 ppm	350 ppm	-	350 ppm	700 ppm	390 ppm	11.00
Cyclohexanone	Yes	25 ppm	25 ppm	25 ppm	-	700 ppm	3.5 ppm	9.14
PAHs	No	0.2 mg/m^3	0.2 mg/m^3	0.01 mg/m^3	-	80 mg/m^3	-	N/A
Cadmium	No	0.005 mg/m^3	0.01 mg/m^3	-	-	9 mg/m^3	-	N/A
Arsenic	Yes	0.01 mg/m^3	0.01 mg/m^3	0.002 mg/m^3	-	5 mg/m^3	-	N/A
Lead	No	0.05 mg/m^3	0.05 mg/m^3	0.100 mg/m^3	-	100 mg/m^3	-	N/A
Chromium	Yes	1.0 mg/m^3	0.05 mg/m^3	0.50 mg/m^3	-	25 mg/m^3	-	N/A
Cyanide	No	5.0 mg/m^3	5.0 mg/m^3	-	5.0 mg/m^3	25 mg/m^3	-	N/A
Mercury	Yes	0.1 mg/m^3 (c)	0.025 mg/m^3	0.05 mg/m^3	-	10 mg/m^3	-	N/A

NOTE: (1) OSHA Permissible Exposure Limit (PEL) (2) ACGIH Threshold Limit Value (TLV)
(3) NIOSH Recommended Exposure Limit (REL)

USE LOWEST FIGURE OF THE LIMITS.

(4) Short-Term Exposure Limit (5) Immediately Dangerous to Life & Health
(6) Ionization Potential (c) Ceiling Limit

3.0 PERSONNEL PROTECTIVE EQUIPMENT

The following is a brief description of the personnel protective equipment which may be required during various phases of the project. The U.S. EPA terminology for protective equipment will be used: Levels A, B, C and D. For the purpose of this project, work will not continue at conditions requiring protection greater than level C.

Respiratory protective equipment shall be NIOSH approved and use shall conform to OSHA 29 CFR 1910.134.

There are 3 basic PPE items that must be worn at all time while on site. Sections 3.1 and 3.2 list additional PPE to be worn. The basic items are:

- Substantial work boots
- Hard hat
- Safety glasses

3.1 LEVEL C

Level C protection shall be used when:

- Substance(s) require the same level of skin protection as Level B, but a lesser level of respiratory protection;

- The types of air contaminants have been identified, concentrations measured, and respirator decision logic indicates that APR's are sufficient to remove the contaminants; or

- The substance has adequate warning properties and all criteria for the selection of APR has been met.

- Skin contact potential exists for areas other than just hands.

LEVEL C PPE TO BE UTILIZED: (Check Appropriate PPE)

X	Full-face APR (MSHA/NIOSH Approved) (REQUIRED) NOTE: Can be PAPR.
X	TYPE OF CARTRIDGES TO BE USED: Combination Organic Vapor/HEPA
X	FOR MODERATE SKIN CONTACT RISK Disposable clothing (bag design providing hood and boot covers) (i.e., Tyvek) **FABRIC TYPE:** Tyvek OR FOR SIGNIFICANT SKIN CONTACT RISK Chemical-resistant clothing (one-piece coverall; hooded, two-piece, chemical splash suit, chemical-resistant hood and apron, disposable chemical-resistant coveralls (i.e., Tyvek) **FABRIC TYPE:** Non-Porous Tyvek
X	BOOT PROTECTION • Rain boots (placed over coverall booties)
X	Chemical glove protection (REQUIRED), to include: • Cotton glove liners • Disposable chemical-resistant outer gloves **MATERIAL TYPE:** Teflon or Viton (for long term contact) Nitrile (Only for short, limited contact with materials)
X	Sleeves to be duct-taped over gloves and pants to be duct-taped over boots (REQUIRED)
X	Face shield for hard hat (REQUIRED IF SPLASH POTENTIAL EXISTS)
X	Ear muffs attached to hard hat (REQUIRED if site noise levels are greater than 85 dB based on an 8 hr. TWA.)
	Two-way radio communication (intrinsically safe) (OPTIONAL)
	Modifications:

3.2 LEVEL D

Level D protection will be used when:

- The atmosphere contains no known hazard;
- Work functions preclude splashes, immersions, or the potential for unexpected inhalation of, or contact with, hazardous concentrations of chemicals.
- Atmospheric concentrations of contaminants are less than the TLV.

LEVEL D PPE (Minimum Work Uniform Permitted)

X	Standard work uniform/coveralls (REQUIRED) NOTE: Tyvek disposable coveralls may be worn.

X	Gloves (REQUIRED)
	
	FOR NO HAND CONTAMINATION POTENTIAL
	• Work gloves
	
	FOR HAND CONTAMINATION POTENTIAL (NO OTHER SKIN CONTACT POSSIBLE)
	• Chemical protective gloves (REQUIRED), to include:
	  • Cotton glove liners
	  • Disposable chemical-resistant outer gloves
	MATERIAL TYPE: Teflon or Viton

X	Face shield for hard hat (REQUIRED IF SPLASH POTENTIAL EXISTS)
X	Ear muffs attached to hard hat (REQUIRED if site noise levels are greater than 85 dB based on an 8 hr. TWA.)
X	BOOT PROTECTION (REQUIRED IF MUST WALK THROUGH CONTAMINATED AREAS SUCH AS EXITING OF EXCAVATOR) • Disposable booties (covering work boots) • Rain boots (covering disposables)
	Two-way radio communication (intrinsically safe) (OPTIONAL)
	Modifications:

ACTIVITY VS. LEVEL OF PROTECTION

ACTIVITY	INITIAL LEVEL OF PPE	SPECIAL REQUIREMENTS
Excavation (General)	D	• Upgrade to Level C PPE based on air monitoring results and/or dermal contact.
Sizing/Screening (General)	D	• Upgrade to Level C PPE based on air monitoring results and/or dermal contact.
Truck support	D	• Upgrade to Level C PPE based on air monitoring results and/or dermal contact.
Excavation or Sizing/ Screening in areas with large pockets of tars (ie. Tar wells)	C	• Start at Level C. Downgrade to Level D only after confirming via exposure analysis • Upgrade to Level C PPE based on air monitoring results and/or dermal contact

4.0 EXPOSURE MONITORING

An exposure monitoring program will be conducted using field screening techniques to measure constituents of chemical and physical agents of interest during excavation and screening of material. Chemical constituents of interest for the exposure monitoring program will include total volatile organics (VOCs), benzene, and total suspended particulate matter (TSP). Physical agents that will be monitored include noise and heat stress.

4.1 Monitoring Equipment

Field screening will be conducted using direct reading instruments which are designed to detect contaminants/agents on a real-time basis. Direct reading instruments provide information at the time of sampling. This enables rapid decision making regarding required levels of respiratory protection, hearing protection, etc. The types of direct reading instruments to be used during the exposure monitoring program are described below:

- Organic Vapor Analyzer: Detects the presence of VOCs in part per million by volume (ppmv) concentration. An organic vapor analyzer equipped with a photoionization detector (PID) calibrated to a known concentration of isobutylene, will be used.

  2 types of PID monitors will be used:
  - Personal - Set to provide readings in ppmv of benzene. Worn by personnel with the worst case potential for exposure.
  - Portable area - Readings provided in ppmv of isobutylene. Correction factors will be applied to evaluate benzene and other VOC's. Can also be used to confirm personal PID readings.

- Colorimetric Tubes: Detects individual VOCs in ppmv. A known volume of air is pulled across an indicator tube. The specific contaminant reacts with the indicator producing a stain whose length or color is proportional to its concentration.

- Aerosol Meter: Detects the presence and concentration of TSP matter in milligrams per cubic meter of air (mg/m^3). The meter continuously senses the population of particles present in the atmosphere with an electromagnetic radiation source, near the infrared spectrum.

- Sound Level Meter: Measures sound pressure levels in decibels (dB) The A-weighting scale will be used to survey this project.

- Heat Stress Monitor: Measures several ambient air parameters. These parameter measurements are used to compute a heat stress index. This index is used to predict the amount of heat load on the body.

4.1.1 Action Threshold Levels

Direct reading instruments provide information as to the level of agents in the work place. Section 2.3 previously discussed the regulatory exposure levels for the chemical agents of interest. These exposure levels were used to define action threshold values. Levels measured by the instruments have been associated with action threshold values. Action threshold values are for level of agents in the immediate work area that would warrant PPE. Action threshold values, the type of PPE required, and site monitoring frequency are presented in Table 4-1.

TABLE 4-1

ACTION THRESHOLD VALUES

Constituents	Direct Reading Instrument	Levels	Action	Retest Frequency (Real time monitor)
Volatile Organics	OVA Meter (PID)	< 1 ppmv	None	Minimum of twice daily, increased at discretion of site safety officer
		> 1 ppmv sustained for 5 minutes	Check w/ benzene and toluene detector tubes.	15 minutes
		> 25 ppmv sustained for 5 minutes	• Upgrade to level C with min. HF APR with combination organic/HEPA cartridges • Perform personal monitoring for laboratory analysis using charcoal tubes and sampling pumps for rest of day.	15 minutes
		> 250 ppmv sustained for 5 minutes	• Upgrade to modified level C with min. FF APR with combination organic/HEPA cartridges • Perform personal monitoring for laboratory analysis using charcoal tubes and sampling pumps for rest of day.	hourly
		> 500 ppmv sustained for 5 minutes	Evacuate site and notify H & S Officer	hourly
Volatile Organics (benzene)	Personal PID Monitors / Detector Tubes	< 0.5 ppmv	None	Continuous use of PID.
		0.5-4 ppmv sustained for 5 minutes	• Upgrade to level C with min. HF APR with combination organic/HEPA cartridges • Perform personal monitoring for laboratory analysis using charcoal tubes and sampling pumps for rest of day.	Continuous use of PID. Check with benzene detector tubes every 15 minutes.
		5-50 ppmv sustained for 5 minutes	• Upgrade to modified level C with min. FF APR with combination organic/HEPA cartridges • Perform personal monitoring for laboratory analysis using charcoal tubes and sampling pumps for rest of day.	Continuous use of PID. Check with benzene detector tubes every 15 minutes.
		> 50 ppmv	Evacuate site and notify H & S Officer	hourly

Constituents	Direct Reading Instrument	Levels	Action	Retest Frequency (Real time monitor)
Particulates	Aerosol Meter	<2.5 mg/m^3	None	Minimum of twice daily, increased at discretion of site safety officer
		> 2.5 mg/m^3 sustained for 5 min.	• Upgrade to modified level C with min. FF APR with combination organic/HEPA cartridges. • Perform personal monitoring for laboratory analysis for PAH's using OSHA 58 method (Glass fiber filters) for rest of day.	15 minutes
		> 25 mg/m^3 sustained for 5 min.	Evacuate site and notify H&S Officer	hourly
Noise	Sound Level Meter	< 85 dB(A)	None	once (unless conditions change)
		≥ 85 dB(A)	Hearing protection must be worn by individuals in the affected area.	once (unless conditions change)

5.0 SITE CONTROL

5.1 Work Zones

The primary purpose for site controls is to establish the work zone perimeter, to reduce migration of contaminants into clear areas, and to prevent access or exposure to potentially hazardous materials by unauthorized personnel. At the end of each workday, the site should be secured or guarded to prevent unauthorized entry. Site work zones will include:

- **Clean Zone/Support Zone**. This uncontaminated zone will be the area outside the exclusion and decontamination zone and within the geographic perimeters of the site. This area is used for staging of materials, parking of vehicles, office and laboratory facilities, sanitation facilities, and receipt of deliveries. Personnel entering this zone may include delivery personnel, visitors, security guards, etc., who will not necessarily be permitted in the work zone. All personnel arriving in the support zone will report to the site office and sign a site entry/exit log. There will be only one controlled entry/exit point from the clean zone to the decontamination zone.

- **Decontamination Zone**. The decontamination zone will provide a location for removal of contaminated personnel protective equipment and final decontamination of personnel and equipment. All personnel and equipment should exit via the decon area. A separate decontamination area will be established for heavy equipment.

5.2 General Field Safety and Standard Operating Procedures

- The "Buddy System" will be used at all times by all field personnel in the exclusion zone. No one is to perform field work alone. Maintain visual, voice, or radio communication at all times.

- Whenever possible, avoid contact with contaminated (or potentially contaminated) surfaces. Walk around (not through) puddles and discolored surfaces. Do not kneel or set equipment on the ground.

- Eating, drinking and/or smoking is only permitted in designated areas in the support zone.

- Hands and face must be thoroughly washed upon leaving the decon area.

- If the work zone changes to the point that respirators are required, beards or other facial hair that interferes with respirator fit will preclude admission to the work zone.

- All equipment must be decontaminated or properly discarded upon exit from the work zone as determined by the project manager.

- All personnel exiting the work zone must go through the decontamination procedures as described in this H&S Plan.

- PPE as described in the H&S Plan will be required for all field personnel working on-site.

6.0 DECONTAMINATION

In general, everything that enters the work zone must either be decontaminated or properly discarded upon exit from the work zone. All personnel, including any state or local officials, must enter and exit the work zone through the decon area. Prior to demobilization, contaminated equipment will be decontaminated and inspected by the site manager before it is moved into the clean zone. Any material that is generated by decontamination procedures will be stored in a designated area in the work zone pending disposal approvals and disposition. Detergent and water will be used as a decontamination solution.

6.1 Personnel Decontamination

Personnel may become contaminated in a number of ways including:

- contacting vapors, gases, mists, or particulates in the air;
- walking through puddles of liquids or on contaminated soil;
- handling contaminated materials; or
- using contaminated instruments or equipment.

Even with safeguards, contamination may occur. Harmful materials can be transferred into clear area, exposing unprotected personnel. In removing contaminated clothing, personnel may contact contaminants on clothing or inhale them. To prevent such occurrences, decontamination procedures must be developed and established before anyone enters the site and must continue throughout site operation.

Personnel decontamination procedures will be based on the contaminant associated with the specific site and the level of protection being worn by site personnel.

6.2 Sampling equipment

Sampling devices when used on-site, require special cleaning procedures which are delineated in the chart in Section 6.7.

6.3 Equipment Decontamination

Heavy equipment will be decontaminated by moving the equipment to the designated decon area and brushing off the heavy contamination with a broom, etc. If required, the equipment will be steam cleaned with the decon waters collected for proper disposition. Following the decontamination and prior to exiting the decontamination zone, the project manager/site engineer will inspect the equipment, and if properly decontaminated, make note of the date, time, method, and name of decon personnel in the field notebook.

6.4 Disposal of Contaminated Materials

All materials and equipment used for decontamination must be disposed of properly. Clothing, tools, buckets, brushes, and all other equipment that is contaminated must be properly packaged and stored on-site until disposal arrangements are finalized. Clothing not completely decontaminated on-site should be secured in plastic bags before being removed from the site.

The proper disposal methods for the site are outlined in the chart in Section 6.7.

6.4 Emergency Decontamination

Personnel with medical problems or injuries may also require decontamination. There is the possibility that the decontamination may aggravate or cause more serious health effects. If prompt lifesaving, first aid, and medical treatment is required, decontamination procedures will be omitted. In either case, a member of the site management team will accompany contaminated personnel to the medical facility to advise on matters involving decontamination.

Emergency decontamination procedures for this site are discussed in the chart in Section 6.7.

6.6 Sanitizing of Personnel Protective Equipment

Respirator, reusable protective clothing, and other personnel articles not only must be decontaminated before being reused, but also sanitized. The inside of masks and clothing becomes soiled due to exhalation, body oils, and perspiration. Manufacturer's instructions should be used to sanitize the respirator masks. If practical, reusable protective clothing should be machine washed after a thorough decontamination; otherwise it must be cleaned by hand.

6.7 Decontamination Procedures

	LEVEL A: Segregated equipment drop, boot cover and glove wash, boot cover and glove rinse, tape removal, boot cover removal, outer glove removal, suit/hard hat removal, SCBA removal, inner glove wash, inner glove removal, inner clothing removal, field wash, re-dress. Modifications:
	LEVEL B: Segregated equipment drop, boot cover and glove wash, boot cover and glove rinse, boot cover removal, outer glove removal, suit/safety boot wash, suit/SCBA/boot/glove rinse, (tank change), safety boot removal, splash suite removal, inner glove wash, face piece removal, inner glove removal, inner clothing removal, field wash, re-dress. Modifications:
X	**LEVEL C:** • Segregated equipment drop, • Boot cover and glove dry brush removal of gross contamination, • Outer glove removal and placement for re-use, • Suit/outer boot dry brush removal wash • Outer boot removal and placement for re-use • Disposable suit removal and disposal • Inner glove dry brush • Face piece removal • Inner glove removal Modifications:
X	**LEVEL D:** • Segregated equipment drop • Boot and glove wash dry brush • Boot and glove removal Modifications:
X	**HEAVY EQUIPMENT DECONTAMINATION:** Brush gross contamination from equipment, then steam clean.
X	**DECONTAMINATION DISPOSAL PROCEDURES:** Grossly contaminated PPE to be drummed while awaiting disposal. Waters generated during decontamination will be collected, drummed, and sampled to determine appropriate disposal procedures.
	EMERGENCY DECONTAMINATION EQUIPMENT/PROCEDURES:

7.0 EMERGENCY RESPONSE/CONTINGENCY PLAN

It is essential that site personnel be prepared in the event of an emergency. Emergencies can take many forms: illnesses or injuries, chemical exposure, fires, explosions, spills, leaks, releases of harmful contaminants, or sudden changes in weather. The following outlines the general procedures for emergencies.

7.1 Personnel Responsibilities During Emergencies

The project manager/site engineer, as the site administrator for the project, has primary responsibility for responding to and correcting emergency situations. The on-site project manager/site engineer will:

- Take appropriate measures to protect personnel including withdrawal from the exclusion zone, total evacuation and securing of the site, or upgrading or downgrading the level of protective clothing and respiratory protection.

- Take appropriate measures to protect the public and the environment including isolating and securing the site, preventing run-off to surface waters and ending or controlling the emergency to the extent possible.

- Ensure that the appropriate Federal, State and Local agencies are informed, and emergency response plans are coordinated. In the event of a fire or explosion, the local fire department should be summoned immediately. In the event of an air release of toxic materials, the local authorities should be informed in order to assess the need for evacuation. In the event of a spill, sanitary districts and drinking water systems may need to be alerted.

- Ensure that appropriate decon treatment or testing for exposed or injured personnel is obtained.

- Determine the cause of the incident and make recommendations to prevent recurrence.

- Ensure that all required reports have been prepared.

- If an injury has occurred, depending on the type and severity, notify Medical (General Office).

- Notify the Health & Safety Officer.

7.2 Emergency Contacts/Telephone Numbers

Greenville, SC

FIRE:	911	
POLICE:	911	
AMBULANCE:	911 (Inform EMS if emergency involves contaminated individuals)	
Capable of Transporting Contaminated Personnel?	YES: X	NO:
HOSPITAL: St. Francis Health System	(864)-255-1000	
1 Saint Francis Dr. Greenville, SC 29601		
Chemical Trauma Capabilities?	YES: X	NO:
Decontamination Capabilities?	YES: X	NO:
Directions From Bramlette Ave site. To Sr, Francis Hospital: Turn left onto Washington St and go about 1.5 miles.. Turn RIGHT onto S ACADEMY ST and go about 1.3 miles to St. Francis Hospital on left.		
NOTE: The route to the hospital was verified by: James Gartland Distance from the site to the hospital is: Approximately 2.8 miles.		
CAROLINAS POISON CONTROL CENTER:	(800) 848-6946	
ELECTRIC COMPANY (Duke Power):	(704) 594-9400	
GAS COMPANY: (Piedmont Natural Gas Co.)	(800) 752-7504	
NATIONAL RESPONSE CENTER:	(800) 424-8802	
CENTER FOR DISEASE CONTROL:	1-800-311-3435	
AT&F (explosion information)	1-888-283-2662	
CHEMTREC:	(800) 424-9300	
U.S. EPA REGION NAME: Region IV - Atlanta	Region Number: 1-800-241-1754	
PROJECT HEALTH & SAFETY OFFICER:	Kenny Cable (704)-904-9755	
EHS - SAFETY AND INDUSTRIAL HYGIENE:	Jeff Almond (704) 382-4903	
MEDICAL (Wenwood)	Dianne Norvell (864)-234-4030	
PROJECT MANAGER:	Ralph Roberts (704) 373-7888	

The following individuals are current with their certifications in First Aid/CPR:

NAME	FIRST AID DATE	CPR DATE

EMERGENCY EQUIPMENT AVAILABLE ON-SITE:

COMMUNICATION EQUIPMENT	
X	PUBLIC TELEPHONES
X	PRIVATE TELEPHONES
	CELLULAR TELEPHONES
X	TWO-WAY RADIO (WALKIE-TALKIE)
	EMERGENCY ALARMS/HORNS
MEDICAL EQUIPMENT	
X	FIRST AID KITS
	STRETCHER
X	EYE WASH STATION
	SAFETY SHOWER
	BLANKETS
	OTHER:
FIRE FIGHTING EQUIPMENT	
X	FIRE EXTINGUISHER TYPES: A, B, C, Dry Chemical
	OTHER:
SPILL/LEAK EQUIPMENT	
	ABSORBENT BOOM PADS
	DRY ABSORBENT
ADDITIONAL SAFETY EQUIPMENT:	

- Notify the injured person's supervisor.
- Complete an IIR (Appendix F)

7.3 Medical Emergencies

Any person who becomes ill or injured in the exclusion zone must be decontaminated to the maximum extent possible. If the injury or illness is minor, full decontamination should be completed and, if possible, first aid administered prior to transport. If the patient's condition is serious, at least partial decontamination should be completed (i.e., complete disrobing of the victim and redressing in clean overalls or wrapping in a blanket). First aid should be administered while awaiting an ambulance or paramedics. All injuries and illnesses must be reported to the project manager/site engineer.

Any person transporting an injured/exposed person to a hospital for treatment should take directions to the hospital with them, and information on the chemicals involved.

Any vehicle used to transport contaminated personnel will be cleaned or decontaminated as necessary.

7.4 Fire or Explosion

In the event of a fire or explosion, the local fire department should be summoned immediately. Upon their arrival the project manager/site engineer will advise the fire commander of the location and nature of the fire, and the location and identification of all hazardous materials on-site.

If it is safe to do so, site personnel may use fire fighting equipment available on-site or remove or isolate flammable or other hazardous materials which may contribute to the fire.

7.5 Spill or Leaks

In the event of a spill or leak, site personnel will locate the source of the spillage and stop the flow, if it can be done safely, and begin containment and recovery of the spilled material.

7.6 Evacuation Routes and Resources

Evacuation routes have been established by work area locations for the site. Evacuation should be conducted immediately, without regard for equipment under conditions of extreme emergency.

- Evacuation notification will be a continuous blast on an air horn, vehicle horn, or by verbal communication via radio.
- Once evacuation alarm sounds, all work will stop.
- Keep upwind of smoke, vapors, or spill location.
- Exit through the decontamination corridor if possible.
- If evacuation is not via the decontamination corridor, site personnel should remove contaminated clothing once they are in a location of safety and leave the clothing near the exclusion zone or in a safe place.
- The project manager/site engineer will conduct a head count to insure all personnel have been evacuated safely.
- In the event that a site evacuation is necessary, all personnel are to:
  - ⇒ Escape the emergency situation;
  - ⇒ Decontaminate to the maximum extend practical; and
  - ⇒ Meet at site office or some other pre-arranged location.

8.0 EXCAVATION & TRENCHING

Will this project require any excavations or trenches greater than 4 ft. in depth?

NO:	YES: X

If the excavations or trenches are required and are greater than 4 ft. in depth, will personnel be required to enter the excavations and/or trenches?

NO: X	YES:

If the answer to both of these questions is **NO**, proceed to the next section. If the answer to both of these questions is **YES**, OSHA's Final Rule for Excavation (29 CFR 1926 Subpart P) must be implemented, and personnel must comply with all excavation guidelines.

- Remove all surface encumbrances.
- Locate all underground installations prior to opening excavation.
- Supply means of egress so that no more than 25 feet of lateral travel is required by personnel in the excavation.
- Supply warning vests for personnel exposed to vehicular traffic.
- Utilize barricades, hand signals, or stop logs for equipment operating next to excavations and slope grade away from excavation.
- Check for hazardous atmospheres.
- Protect excavation and personnel from water accumulation.
- Check stability of adjacent structures.
- Protect personnel from loose rock or soil.
- Inspect excavations and record information from the inspection in the field log book.

- Provide for fall protection.

- Describe in detail any protective system used for personnel protection (slopping and benching of sides, support systems or shield systems).

NOTE: SEE THE "TRENCHING GUIDELINES" IN THE DPC SAFETY & INDUSTRIAL HYGIENE COMPLIANCE MANUAL.

9.0 LOCKOUT/TAGOUT

Does this project involve the operation of machines and/or equipment in which the unexpected energization or start up of the machinery or equipment, or release of stored energy, could cause injury to personnel?

NO:	X	YES:

If the answer is **NO**, proceed to the next section. If the answer is **YES**, OSHA regulations for Lockout/Tagout (29 CFR 1910.147) must be implemented and personnel must comply with all Lockout/Tagout procedures.

NOTE: SEE THE "LOCKOUT/TAGOUT" PROGRAM IN THE DPC SAFETY & INDUSTRIAL HYGIENE COMPLIANCE MANUAL.

10.0 FALL PROTECTION

Does this project involve the use of any floors, platforms, and/or runways four feet or more above adjacent flooring or ground level, or the use of ladders, scaffolding, or power platforms?

NO: X	YES:

If the answer is **NO**, proceed to the next section. If the answer is **YES**, OSHA regulations for Fall Protection (29 CFR 1910.21 through 29 CFR 1910.32) must be implemented and appropriate fall protection devices must be utilized.

NOTE: SEE THE "WALKING/WORKING SURFACES AND FALL PROTECTION" PROGRAM IN THE DPC SAFETY & INDUSTRIAL HYGIENE COMPLIANCE MANUAL.

11.0 CONFINED SPACE ENTRY

Does this project involve entry into spaces that meet the following criteria:

- Is large enough for employees to bodily enter and perform work
- Has limited or restricted means of entry and exit (eg. Tanks, vaults, pits)
- Is not designated for continuous employee occupancy?

NO: X	YES:

If the answer is **NO**, proceed to the next section. If the answer is **YES**, OSHA regulations for Confined Space Entry (29 CFR 1910.146) must be implemented and appropriate hazard evaluation, space monitoring, entry and documentation procedures followed.

NOTE: SEE THE "CONFINED SPACE ENTRY" PROGRAM IN THE DPC SAFETY & INDUSTRIAL HYGIENE COMPLIANCE MANUAL.

APPENDIX A

SITE SAFETY PLAN AMENDMENTS

HEALTH & SAFETY PLAN
AMENDMENT RECORD

Project Name:	Bramlette Road Mgp Site Greenville, South Carolina
Project No.:	
Project Manager:	**Mark McGary**
Site Manager:	**Kenney Ramsey**

AMENDMENT NO.	DATE	DESCRIPTION

APPENDIX B

SITE SAFETY PLAN ACKNOWLEDGMENT FORM

SITE SAFETY PLAN
ACKNOWLEDGMENT FORM

I have been informed and understand and will abide by all the procedures and protocols set forth in the Site Health & Safety Plan for the Bramlette Rd., Greenville, SC MGP site.

NAME (PRINT)	SIGNATURE	AFFILIATION	DATE

APPENDIX C

HEAT STRESS

HEAT STRESS AND OTHER PHYSIOLOGICAL FACTORS

Wearing PPE put a hazardous waste worker at considerable risk of developing heat stress. This can result in health effects ranging from transient heat, fatigue to serious illness or death. Heat stress is caused by a number of interacting factors, including environmental conditions, clothing, workload, and the individual characteristic of the worker. Because heat stress is probably one of the most common (and potentially serious) illness at hazardous wastes sites, regular monitoring and other preventative precautions are vital.

Individuals vary in their susceptibility to heat stress. Factors that may predispose someone to heat stress include:

- Lack of physical fitness
- Lack of acclimatization
- Age
- Dehydration
- Obesity
- Alcohol and drug use
- Infection
- Sunburn
- Diarrhea
- Chronic disease

Reduced work tolerance and the increased risk of excessive heat stress is directly influenced by the amount and type of PPE worn. PPE adds weight and bulk, severely reduces the body's access to normal heat exchange mechanisms (evaporation, convection, and radiation), and increases energy expenditure. Therefore, when selecting PPE, each item's benefit should be carefully evaluated in relation to its potential for increase the risk of heat stress. Once PPE is selected, the safe duration of work/rest periods should be determined based on the following:

- Anticipated work rate
- Ambient temperature and other environmental factors
- Type of protective ensemble
- Individual worker characteristics and fitness

Monitoring

Because the incidence of heat stress depends on a variety of actors, all workers, even those not wearing protective equipment, should be monitored.

- For workers wearing permeable clothing (e.g., standard cotton or synthetic work clothes), follow recommendations for monitoring requirements and suggested work/rest schedules in the current American Conference of Governmental Industrial Hygienists' (ACGIH) Threshold Limit Values for Heat Stress [4]. If the actual work clothing differs from the ACGIH standard ensemble in insulation value and/or wind and vapor permeability, change the monitoring requirements and work/rest schedules accordingly [5].

- For workers wearing semipermeable or impermeable[1] encapsulating ensembles, the ACGIH standard cannot be used. For these situations, workers should be monitored when temperature in the work area is above 70°F (21°C) [2].

To monitor the worker, measure the following:

- Heart rate. Count the radial pulse during a 30 second period as early as possible in the rest period.

  If the heart rate exceeds 110 beats per minute at the beginning of the rest period, shorten the next work cycle by one-third and keep the rest period the same.

  If the heart rate still exceeds 110 beats per minute at the next rest period, shorten the following work cycle by one-third [5].

- Oral temperature. Use a clinical thermometer (3 minutes under the tongue) or similar device to measure the oral temperature at the end of the work period (before drinking).

  If oral temperature exceed 99.6°F (37.7°C) at the beginning of the next rest period, shorten the following work cycle by one-third [5].

  Do not permit a worker to wear a semipermeable or impermeable garment when his/her oral temperature exceeds 100.6°F (38.1°C [5].

- Body water loss, if possible. Measure weight on a scale accurate to + 0.25 lb. at the beginning and end of each work day to see if enough fluids are being taken to prevent dehydration. Weights should be taken while the

[1] Although no protective ensembles is "completely" impermeable, for practical purposes an outfit may be considered impermeable when calculating heat stress risk.

employee wears similar clothing. The body water loss should not exceed 1.5 percent total body weight loss in a work day [12].

Initially, the frequency of physiological monitoring depends on the air temperature adjusted for solar radiation and the level of physical work (see Table 1). The length of the work cycle will be governed by the frequency of the required physiological monitoring.

Table 1
Suggested Frequency of Physiological Monitoring for Fit & Acclimatized Workers[2]

Adjusted Temp.[3]	Normal Work Ensemble[4]	Impermeable Ensemble
90°F (32.2°C) or above	After each 45 minutes of work	After each 15 minutes of work
87.5° -87.5°F(30.8°-32.2°C)	After each 60 minutes of work	After each 30 minutes of work
87.5° -87.5°F(28.1°-30.8°C)	After each 90 minutes of work	After each 60 minutes of work
77.5°-82.5°F(25.3°-28.1°C)	After each 120 minutes of work	After each 90 minutes of work
72.5°-77.5°F(22.5°-25.3°C)	After each 150 minutes of work	After each 120 minutes of work

Prevention

Proper training and preventive measures will help avert serious illness and loss of work productivity. Preventing heat stress is particularly important because once someone suffers from heat stroke or heat exhaustion, the person may be predisposed to additional heat injuries. To avoid heat stress, management should take the following steps.

- Adjust work schedules:

  Modify work/rest schedules according to monitoring requirements. Mandate work slowdowns as needed.

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[2] For work levels of 250 Kilocalories/hour.

[3] Calculate the adjusted air temperature (ta adj) using this equation: ta adj = ta° = (13 x % sunshine). Measure air temp. (ta) with a standard thermometer, with the bulb shielded from radiant heat. Estimate percent sunshine by judging what percent time the sun is not covered by clouds that are thick enough to produce a shadow. (100 percent sunshine = no cloud cover and a sharp, distant shadow, 0 percent sunshine = no shadows).

[4] A normal work ensemble consists of cotton coveralls or other cotton clothing with long sleeves and pants.

Rotate personnel: alternate job functions to minimize overstress or overexertion at one task.
Add additional personnel to work team.
Perform work during cooler hours of the day if possible or at night if adequate lighting can be provided.

- Provide shelter (air-conditioned, if possible) or shaded areas to protect personnel during rest periods.

- Maintain workers' body fluids at normal levels. This is necessary to ensure that the cardiovascular system functions adequately. Daily fluid intake must approximately equal the amount of water lost in sweat. The normal thirst mechanism is not sensitive enough to ensure that enough water will be drank to replace lost water [7]. When heavy seating occurs, encourage the worker to drink more. The following strategies may be useful:

Maintain water temperature at 50° to 60°F (10° to 15.6°C.
Provide small disposable cups that hold about 4 ounces (0.1 liter).
Have workers drink 16 ounces (0.5 liters) of fluid (preferably water or dilute drinks) before beginning work.
Urge workers to drink a cup or two every 15 - 20 minutes, or at each monitoring break. A total of 1 to 1.6 gallons (4 to 6 liters) of fluid per day are recommended, but more may be necessary to maintain body weight.
Weight workers before and after work to determine if fluid replacement is adequate.

- Provide cooling devices to aid natural body heat exchange during prolonged work or severe heat exposure. Cooling devices include:

Field showers or hose-down areas to reduce body temperature and/or to cool off protective clothing.
Cooling jackets, vest, or suits.

- Train workers to recognize and treat heat stress. As part of training, identify the signs and symptoms of heat stress.

Other Factors

PPE decreases worker performance as compared to an unequipped individual. The magnitude of this effect varies considerable, depending on both the individual and the PPE ensemble used. This section discusses the demonstrated physiological responses to PPE, the individual human traits that play a factor in these responses, and some of the precautionary and training measures that need to be taken to avoid PPE-induced injury.

The physiological factors may affect worker ability to function using PPE include:

- Physical condition
- Level of acclimatization
- Age
- Gender
- Weight

Physical Condition: Physical fitness is a major factor influencing a person's ability to perform work under heat stress. The more fit someone is, the more work they can safety perform. At a given level of work, a fit person, relative to an unfit person, will have (1,3,8,9):

- Less physiological strain
- A lower heart rate
- A lower body temperature, which indicates less retained body heat (a rise in internal temperature precipitates heat injury)
- A more efficient sweating mechanism
- Slightly lower oxygen consumption
- Slightly lower carbon dioxide production

Level of Acclimatization: The degree to which a worker's body has physiologically adjusted or acclimatized to working under hot conditions affects his or her ability to do work. Acclimatized individuals generally have lower heart rates and body temperatures than unacclimatized individuals (10), and sweat sooner and more profusely. This enables them to maintain lower skin and body temperatures at a given level of environmental heat and work loads than unacclimatized workers (11). Sweat composition also becomes more dilute with acclimatization, which reduces salt loss (3).

Acclimatization can occur after just a few days of exposure to a hot environment (8,9). NIOSH recommends a progressive 6-day acclimatization period for the unacclimatized worker before allowing him/her to do full work on a hot job. Under this regimen, the first day of work on site is begun using only 50 percent of the anticipated workload and exposure time, and 10 period may be shortened 2 or 3 days. However, workers can lose acclimatization in a matter of days, and work regimens should be adjusted to account for this.

When enclosed in an impermeable suit, fit acclimatized individuals sweat more profusely than unfit or unacclimatized individuals and may therefore actually face a greater danger of heat exhaustion due to rapid dehydration. This can be prevented by consuming adequate quantities of water. See previous section of *Prevention* for additional information.

Age: Generally, maximum work capacity declines with increasing age, but this is not always the case. Active, well-conditioned seniors often have performance capabilities equal to or greater than young sedentary individuals. However, there is some evident, indicated by lower sweat rate and higher body core temperatures, that older individuals are less effective in compensating for a given level of environmental heat and work loads (12). At moderate thermal loads, however, the physiological responses of "young" and "old" are similar and performance is not affected (12).

Age should not be the sole criterion for judging whether or not an individual should be subjected to moderate heat stress. Fitness level is a more important factor.

Gender: The literature indicates that females tolerate heat stress at least as well as their male counterparts (13). Generally, a female's work capacity averages 10 to 30 percent less than that of a male (3). The primary reasons for this are the greater oxygen-carrying capacity and the stronger heart in the male (8). However, a similar situation exists as with aging: not all males have greater work capacities than all females.

Weight: The ability of a body to dissipate heat depends on the ratio of its surface area to its mass (surface area/weight). Heat loss (dissipation) is a function of surface area and heat production is dependent on mass. Therefore, heat balance is described by the ratio of the two.

Since overweight individuals (those with a low ratio) produce more heat per units of surface area than thin individuals (those with a high ratio), overweight individuals should be given special consideration in heat stress situations. However, when wearing impermeable clothing, the weight of an individual is not a critical factor in determining the ability to dissipate excess heat.

Signs and Symptoms of Heat Stress

- Heat rash may result from continuous exposure to heat or humid air.

- Heat cramps are caused by heavy sweating with inadequate electrolyte replacement. Signs and symptoms include:

  - muscle spasms
  - pain in the hands, feet and abdomen

- Heat exhaustion occurs from increased stress on various body organs including inadequate blood circulation due to cardiovascular insufficiency or dehydration. Signs and symptoms include:

  - pale, cool, moist skin
  - heavy sweating
  - dizziness
  - nausea
  - fainting

- Heat stroke is the most serious form of heat stress. Temperature regulation fails and the body temperature rises to critical levels. Immediate action must be taken to cool the body before serious injury and death occur. Competent medical health must be obtained. Signs and symptoms are:

  - red, hot, usually dry skin
  - lack of or reduced perspiration
  - nausea
  - dizziness and confusion
  - strong, rapid pulse
  - coma

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APPENDIX D

MSDS's

* * * GENERAL PRODUCT INFORMATION - SECTION 1 * * * MSDS:022265

Trade Product Name	: ACETONITRILE
Manufacturer Name	: Fisher Scientific
Manufacturer's Address	: 1 Reagent Lane
City	: Fairlawn
State	: NJ
ZIP	: 07410
Emergency Phone Number	: 201-796-7100; 800-424-9300 (Chemtrec)
Other calls	: 201-796-7100
Date MSDS was prepared	: 04/03/1996 (Revision Date)
MSDS prepared by	: NOT FOUND ON MSDS

Additional information:

Catalog Numbers:
A21 1, A21 20, A21 4, A21 SS115, A21-1, A21-20, A21-4, A21-500, A21SK-4, A21SS 200, A21SS 30, A21SS 50, A24-4, A996 1, A996 4, A996-1, A996-4, A998 1, A998 4, A998-1, A998-4, A9984LOT002, A998S S115, A998S S30, A998S S50, A998SK 1, A998SK-4, A998SK-1, A998SK-4, A998SS 200, A998SS-11, A998SS-115, A998SS-20, A998SS-200, A998SS-30, A998SS -50, A999 4, A999-4, BP1165 50, BP1165-50, BP1170 4, BP1170 4002, BP1170 4004, BP1170 4005, BP1170 4006, BP1170 4007, BP1170 4008, BP1170 4009, BP1170 4010, BP1170-4, BP1170SS 115, BP1170SS 200, BP1170SS 30, BP1170SS 50, BP1170SS-11, BP1170SS-20, BP1170SS-30, BP1170SS-50, 01034 500, 01034-500, S70092ACS, S70092HPLC

Synonyms:
Cyanomethane, ethanenitrile, ethyl nitrile, methanecarbonitrile, methyl cyanide.

* * * INGREDIENTS INFORMATION - Section 2 * * *

** EXPOSURE LIMITS **

INGREDIENT NAME	PEL	TLV	OTHER
ACETONITRILE	40 ppm TWA; 70 mg/m3 TWA;	40 ppm TWA; 67 mg/m3; 60 ppm STEL 101 mg/m3 STEL	20 ppm TWA; 34 mg/m3 TWA

** PERCENTAGES **

	HIGH %	LOW %
ACETONITRILE	> 99.00	

** CAS NUMBERS **

	CAS NUMBER	
ACETONITRILE	75-05-8	NOT VERIFIED

Additional information:

EINECS#: Unlisted

* * * HAZARDS IDENTIFICATION - Section 3 * * *

*** EMERGENCY OVERVIEW ***

Appearance: Clear, colorless. Flash Point: 42F
WARNINGÜ FLAMMABLE LIQUID. MAY CAUSE CENTRAL NERVOUS SYSTEM DEPRESSION. MAY CAUSE FETAL EFFECTS BASED UPON ANIMAL STUDIES. MAY CAUSE REPRODUCTIVE EFFECTS BASED UPON ANIMAL STUDIES. MAY CAUSE EYE AND

SKIN IRRITATION. MAY CAUSE RESPIRATORY AND DIGESTIVE TRACT IRRITATION. MAY CAUSE CARDIAC DISTURBANCES. MAY CAUSE LIVER AND KIDNEY DAMAGE. MAY CAUSE PULMONARY EDEMA.
Target Organs: Kidneys, heart, central nervous system, liver, red blood cells.

Routes of Entry : This section not found on MSDS. Refer to sections below.

Signs of Acute Overexposure : EYE:
May cause moderate eye irritation. Vapors may cause eye irritation.

SKIN:
May cause skin irritation. May be absorbed through the skin in harmful amounts.

INGESTION:
May cause central nervous system depression, kidney damage, and liver damage. May cause gastrointestinal irritation with nausea, vomiting and diarrhea. May cause muscle tremor and impaired motor function. May cause cardiac disturbances.

INHALATION:
Effects may be delayed. May cause respiratory tract irritation. May cause effects similar to those described for ingestion. May cause pulmonary edema and severe respiratory disturbances.

Signs of Chronic Overexposure : Chronic inhalation and ingestion may cause effects similar to those of acute inhalation and ingestion. Animal studies indicate that fetal effects/abnormalities and reproductive effects may occur when material toxicity is seen. Liver damage may occur.

Medical Conditions Aggravated by Exposure : NOT FOUND ON MSDS

Is chemical listed as a carcinogen or potential carcinogen by:

National Toxicology Program	IARC Monographs	OSHA
NOT LISTED	NOT LISTED	NOT LISTED

Carcinogenicity:

* * * FIRST AID - Section 4 * * *

Emergency phone number: 201-796-7100

Note to Physicians : Exposure should be treated as cyanide poisoning. Effects may be delayed. May be partially metabolized to cyanide in the body. Have a Cyanide Antidote Kit available; however, the determination for its usage

should be made by qualified personnel.

Inhalation	:	Get medical aid immediately. Remove from exposure to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.
Eye Contact	:	Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower lids. Get medical aid immediately.
Skin Contact	:	Get medical aid immediately. Flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes.
Ingestion	:	If victim is conscious and alert, give 2-4 cupfuls of milk or water. Get medical aid immediately.

Additional Information:

* * * FIRE AND EXPLOSION HAZARD - Section 5 * * *

Flash Point	: 42F (5.56C)
Flash Point Method	: NOT FOUND ON MSDS
Upper Explosive Limit	: 16.0
Lower Explosive Limit	: 3.0
Autoignition Temperature	: 975F (523.89C)
Extinguisher Media	: Use foam, dry chemical, or carbon dioxide. Water may spread fire.
Special Fire Fighting Procedures	: Containers can build up pressure if exposed to heat and/or fire. As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear.
Unusual Fire and Explosion Hazards	: Vapors can travel to a source of ignition and flash back. Combustion generates toxic fumes. Use water spray to keep fire-exposed containers cool.
Additional Information	:

NFPA Hazard Ratings

Health	:
Fire	:
Reactivity	:
Special Hazards	:

* * * ACCIDENTAL RELEASE MEASURES - Section 6 * * *

Steps to be taken in case material is released or spilled:
Scoop up with a non-sparking tool, then place into a suitable container for disposal. Remove all sources of ignition. Absorb spill using an absorbent, non-combustible material such as earth, sand, or vermiculite.

* * * HANDLING & STORAGE - Section 7 * * *

Precautions to be taken in handling and storage : STORAGE:
Keep away from sources of ignition.
Do not store in direct sunlight.
Store in a cool, dry, well-ventilated area away from incompatible substances.

Other Precautions : HANDLING:
Wash thoroughly after handling.
Remove contaminated clothing and wash before reuse. Use with adequate ventilation. Use spark-proof tools and explosion proof equipment.
Empty containers retain product residue, (liquid and/or vapor), and can be dangerous.
Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, sparks or open flames.
Do not get on skin or in eyes.
Do not ingest or inhale.

* * * CONTROL MEASURES - Section 8 * * *

*** Personal Protective Equipment (PPE) ***

Respiratory Protection :

Protective Gloves : Wear appropriate protective gloves to prevent skin exposure.

Eye Protection : Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133.

Other protective clothing or equipment : Wear appropriate protective clothing to prevent skin exposure.

Work Practices : See "HANDLING & STORAGE" Section.

Personal Hygienic Procedures : Wash thoroughly after handling.

*** Engineering / Ventilation Requirements ***

Local Exhaust : Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Mechanical (General) :

Special Requirements :

Other Requirements :

Additional Information:

* * * PHYSICAL/CHEMICAL CHARACTERISTICS - Section 9 * * *

Boiling Point	:	180F
Melting Point	:	-49F
Specific Gravity(H2O = 1)	:	0.783
Vapor Pressure	:	73 mmhg
Percent Volatile	:	NOT FOUND ON MSDS
Vapor Density (Air=1)	:	1.42
Evaporation Rate	:	5.79
Compared To	:	Butyl Acetate
Water Solubility	:	Soluble in water.
Appearance	:	Clear, colorless liquid; sweet, aromatic odor.
WT/Gal (LB)	:	
% Solid by WT	:	
pH	:	Not available
Viscosity	:	Not available
Decomposition Temp.	:	Not available
Molecular Formula	:	CH3CN
Molecular Weight	:	41.0277

Additional Information:

* * * REACTIVITY DATA - Section 10 * * *

Water reactivity?	: NOT FOUND ON MSDS
Is this chemical stable under normal conditions of handling and storage?	: Stable under normal temperatures and pressures.
Conditions to Avoid	: Incompatible materials, ignition sources.
Incompatibility (materials to avoid)	: Strong oxidizers, chlorosulfonic acid, erbium perchlorate, fuming sulfuric acid, and sulfuric acid.
Hazardous Decomposition or Byproducts	: Hydrogen cyanide, nitrogen oxides, carbon monoxide, carbon dioxide.
Is Hazardous Polymerization Possible?	: Has not been reported.
Conditions to avoid regarding polymerization	: NOT FOUND ON MSDS

Additional Information :

* * * TOXICOLOGICAL INFORMATION - Section 11 * * *

H M I S Classification

Health	:
Fire	:
Reactivity	:
Special hazard	:

Immediate (acute) effects: LD50/LC50:
CAS# 75-05-8

Ihl (mouse) LC50: 2695 ppm/1H
Ihl (rabbit) LC50: 2828 ppm/4H
Ihl (rat) LC50: 7551 ppm/8H
Orl (mouse) LD50: 269 mg/kg
Orl (rabbit) LD50: 50 mg/kg
Orl (rat) LD50: 2730 mg/kg
Skn (rabbit) LD50: 1250 mg/kg

Delayed (subchronic & chronic) effects :

Other data : RTECS#
CAS# 75-05-8: AL7700000

Epidemiology: No information available
Teratogenicity:
Embryo or Fetus:
Stunted fetus, Ihl-Hamster TCLo = 8000 ppm/1H
Specific Developmental Abnormalities:
Musculoskeletal, Orl-Hamster TCLo = 300 mg/kg

Reproductive Effects:
Fertility: Post-implantation mortality, orl-hamster TDLo = 400 mg/kg and Ihl-hamster TCLo = 5000 ppm/1H

Neurotoxicity:
No information available.

Mutagenicity:
Sex Chromosome Loss/Non-dysjunction:
S. cerevisiae 47600 ppm.

Other Studies: None.

Exposure guidelines :

Target organ data : Kidneys, heart, central nervous system, liver, red blood cells.

* * * ECOLOGICAL INFORMATION - Section 12 * * *

Degradability (BOD & COD) : Ecotoxicity:
Fathead minnow (hard water) Tlm = 1150 ppm/24H.

Octanol/ Water Partition Coefficient :

Soil Mobility :

Reference to data in other sections : Environmental Fate:
No information reported.

Physical/Chemical:
No information available.

Other: None

* * *DISPOSAL CONSIDERATIONS - Section 13 * * *

Waste Disposal Methods : Dispose of in a manner consistent with federal, state, and local regulations.

RCRA : RCRA D-SERIES Max. Concentration of Contaminants: NOT LISTED
RCRA D-SERIES Chronic Toxicity Reference Levels: NOT LISTED
RCRA F-SERIES: NOT LISTED
RCRA P-Series: NOT LISTED
RCRA U-Series:
Waste number U003 (Ignitable waste; Toxic waste)
This material is banned from land disposal according to RCRA.

Additional Information:

* * * TRANSPORT INFORMATION - Section 14 * * *

DOT, IMO, ICAO, Transport Canada
Hazard class : DOT/IMO/IATA/RID/ADR:
No information available.

CANADIAN TDG: 3 (6.1)

Proper shipping name : Canadian TDG: ACETONITRILE

U N number : Canadian TDG: UN1648

Label :

Packing group :

Placard :

NFPA
Health :
Fire :
Reactivity :
Special :

* * * REGULATORY INFORMATION - Section 15 * * *

U. S. Federal Regulations

OSHA : None of the chemicals in this product are considered highly hazardous by OSHA.

TSCA : CAS# 75-05-8 is listed on this inventory.

Health & Safety Reporting List:
CAS# 75-05-8 Effective Date: 10/4/1982

Chemical Test Rules:
None of the chemicals in this product are under a Chemical Test Rule.

Section 12b:

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule:
None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substance (40 CFR 302) : Section 302 RQ:
None of the chemicals in this material have an RQ.

Section 302 TPQ:
None of the chemicals in this product have a TPQ.

SARA Codes:
CAS# 75-05-8: Acute, Chronic, Flammable

SARA Title III :

Section 313 Supplier Notification : This chemical is not at a high enough concentration to be reportable under this section.
No chemicals are reportable under this section.

Clean Air Act : CAS# 75-05-8 is listed as a hazardous air pollutant (HAP).
This material does not contain any Class 1 or Class 2 Ozone depletors.

Clean Water Act : None of the chemicals in this product are listed as Hazardous Substances under the CWA.
None of the chemicals in this product are listed as Priority Pollutants or as Toxic Pollutants under the CWA.

SARA Hazard Categories

Chemical Substance	CAS no.	Concentration %	Regulations

State Regulations:
Acetonitrile can be found on the following state right-to-know Lists:
California, New Jersey, Florida, Pennsylvania, Minnesota, Massachusetts

California No Significant Risk Level:
None of the chemicals in this product are listed.

INTERNATIONAL:
Canada
CAS# 75-05-8 is listed on Canada's DSL/NDSL List.
CAS# 75-05-8 is listed on Canada's Ingredient Disclosure List.

European Labeling in Accordance with EC Directives:

Hazard Symbols: Not available

* * * ADDITIONAL INFORMATION - Section 16 * * *

Disclaimer	:	The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no way shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequentila or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.
Abbreviations/terms	:	
Preparation and Revision information	:	Revision Date: 04/03/1996 Creation Date: 1/04/1995

* * * GENERAL PRODUCT INFORMATION - SECTION 1 * * * MSDS:020132

TRADE PRODUCT NAME	:ARSENIC (V) OXIDE P/C 14668
MANUFACTURER'S NAME	:JOHNSON MATTHEY/ALFA AESAR
MANUFACTURER'S ADDRESS	:30 BOND STREET
CITY	:WARD HILL
STATE	:MA
ZIP	:01835-0747
EMERGENCY PHONE NUMBER	:508-521-6300
OTHER CALLS	:CHEMTREC 800-424-9300
DATE MSDS WAS PREPARED	:07/06/1994 (REVISION DATE)
MSDS PREPARED BY	:NOT FOUND ON MSDS

ADDITIONAL INFORMATION

PRODUCT CODE: 14668
SYNONYMS: ARSENIC ACID, ARSENIC ANHYDRIDE, ARSENIC PENTOXIDE, DIARSENIC PENTOXIDE, ARSENIC OXIDE.
CHEMICAL FAMILY: INORGANIC ARSENIC COMPOUND
MOLECULAR FORMULA: As2O5

* * * INGREDIENTS INFORMATION - SECTION 2 * * *

** EXPOSURE LIMITS **

INGREDIENT NAME	PEL	TLV
ARSENIC (V) OXIDE	0.01 mg As/m3	0.01 mg As/m3

** PERCENTAGES **

	HIGH %	LOW %
ARSENIC (V) OXIDE	100%	

** CAS NUMBERS **

	CAS ON MSDS	CIMS VERIFIED CAS
ARSENIC (V) OXIDE	1303-28-2	NOT VERIFIED

* * * HAZARDS IDENTIFICATION - SECTION 3 * * *

Routes of Entry :MOST LIKELY ROUTE-- INGESTION.

Signs of Acute Overexposure :INGESTION: HIGHLY TOXIC. MAY CAUSE BURNING IN ESPHAGUS, VOMITING AND BLOODY DIARRHEA. SYMPTOMS OF COLD AND CLAMMY SKIN, LOW BLOOD PRESSURE, WEAKNESS, HEADACHE, CRAMPS, CONVULSIONS AND COMA MAY FOLLOW. DEATH MAY OCCUR FROM CIRCULATORY FAILURE.
SKIN CONTACT: MAY CAUSE IRRITATION, WITH REDNESS AND PAIN.
EYE CONTACT: MAY CAUSE IRRITATION AND CONJUNCTIVA DAMAGE.
INHALATION: MAY CAUSE INFLAMMATION OF MUCOUS MEMBRANES WITH COUGH AND FOAMY SPUTUM, RESTLESSNESS, DYSPNEA, CYANOSIS AND RALES. SYMPTOMS LIKE THOSE FROM INGESTION EXPOSURE MAY FOLLOW. MAY CAUSE PULMONARY EDEMA.

Signs of Chronic Overexposure :INGESTION: HAIR AND WEIGHT LOSS, CENTRAL NERVOUS SYSTEM DAMAGE, HEPATITIS AND CARDIOVASCULAR,

KIDNEY AND LIVER DAMAGE.
SKIN CONTACT: REPEATED OR PROLONGED CONTACT MAY CAUSE BRONZING, EDEMA, DERMATITIS, LESIONS AND SKIN CANCER.
EYE CONTACT: NONE KNOWN.
INHALATION: LUNG CANCER, DAMAGE TO NASAL SEPTUM AND SAME EFFECTS AS CHRONIC INGESTION.
**OTHER: INORGANIC ARSENIC COMPOUNDS ARE CONSIDERED CARCINOGENIC BY OSHA, NTP, IARC.

Medical Conditions Aggravated by Exposure :NONE KNOWN.

Other Health Hazards: NONE KNOWN.

Is chemical listed as a carcinogen or potential carcinogen by:

National Toxicology Program	IARC Monographs	OSHA

<------ **SEE STATEMENT ABOVE UNDER "CHRONIC OVEREXPOSURE" ------>
ALSO SEE WARNINGS APPEARING IN SECT. VII, "PRECAUTIONS FOR SAFE HANDLING & USE: OTHER PRECAUTIONS".

* * * FIRST AID - SECTION 4 * * *

Emergency phone number: 508-521-6300

Inhalation :NO SPECIFIC INFORMATION AVAILABLE; ONE SHOULD OBTAIN MEDICAL ATTENTION.

Eye Contact :IMMEDIATELY FLUSH EYES, INCLUDING UNDER EYELIDS, WITH LARGE AMOUNTS OF WATER FOR AT LEAST 15 MINUTES. CALL A PHYSICIAN.

Skin Contact :REMOVE CONTAMINATED CLOTHING, FLOOD SKIN WITH LARGE AMOUNTS OF WATER. IF IRRITATION PERSISTS SEEK MEDICAL ATTENTION.

Ingestion :IF SWALLOWED INDUCE VOMITING IMMEDIATELY BY GIVING TWO GLASSES OF WATER AND STICKING FINGERS DOWN THROAT. NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON. CALL A PHYSICIAN IMMEDIATELY

Additional Information:

OSHA (PEL): 0.01 mg/m3 as As
ACGIH (TLV): 0.01 mg/m3 as As

ANIMAL TOXICITY:

LD50: ORAL-RAT: 8 mg/kg;
ORAL-MOUSE: 55 mg/kg
LC50: NO DATA.
OTHER: NO DATA.

* * * FIRE AND EXPLOSION HAZARD - SECTION 5 * * *

Flash Point :NOT APPLICABLE
Flash Point Method :NOT FOUND ON MSDS
Upper Explosive Limit :NOT APPLICABLE
Lower Explosive Limit :NOT APPLICABLE

Autoignition Temperature	:NO DATA
Extinguisher Media	:USE WATER, CARBON DIOXIDE, DRY CHEMICAL EXTINGUISHING AGENTS, OR DRY GROUND DOLOMITE.
Special Fire Fighting Procedures	:NO SPECIAL FIREFIGHTING PROCEDURES NEEDED, USE NORMAL PROCEDURES WHICH INCLUDE WEARING NIOSH/MSHA APPROVED SELF-CONTAINED BREATHING APPARATUS, FLAME AND CHEMICAL RESISTANT CLOTHING; HATS, BOOTS AND GLOVES. IF WITHOUT RISK, REMOVE MATERIAL FROM FIRE AREA. COOL CONTAINER WITH WATER FROM MAXIMUM DISTANCE.
Unusual Fire and Explosion Hazards	:NOT FOUND ON MSDS

* * * ACCIDENTAL RELEASE MEASURES - SECTION 6 * * *

Steps to be taken in case material is released or spilled:
WEARING FULL PROTECTIVE EQUIPMENT, COVER SPILL WITH DRY SAND OR VERMICULITE. MIX WELL AND CAREFULLY TRANSFER TO A CONTAINER.

* * * HANDLING & STORAGE - SECTION 7 * * *

Precautions to be taken in handling and storage:
KEEP CONTAINER TIGHTLY CLOSED. STORE IN A COOL, DRY, WELL-VENTILATED AREA. WASH THOROUGHLY AFTER USE.

Other Precautions:
LAB COAT AND APRON, FLAME AND CHEMICAL RESISTANT COVERALLS, EYEWASH CAPABLE OF SUSTAINED FLUSHING, SAFETY DRENCH SHOWER AND HYGIENIC FACILITIES FOR WASHING.

DANGER: POISON, CAUSES SKIN AND LUNG CANCER.
------ REFER TO 29 CFR 1910.1018 FOR REGULATIONS CONCERNING INORGANIC ARSENIC COMPOUNDS.

WARNING: THIS PRODUCT CONTAINS A CHEMICAL KNOWN TO THE STATE OF CALI-
------- FORNIA TO CAUSE CANCER.

THIS PRODUCT CONTAINS AN ARSENIC COMPOUND WHICH IS SUBJECT TO THE REPORTING REQUIREMENTS OF SECTION 313 OF THE EMERGENCY PLANNING AND COMMUNITY RIGHT-TO-KNOW ACT OF 1986 AND 40CFR 372.

* * * CONTROL MEASURES - SECTION 8 * * *

*** Personal Protective Equipment ***

Respiratory Protection	:HIGH EFFICIENCY PARTICLE RESPIRATOR. SEE SECTION VII, "PRECAUTIONS".
Protective Gloves	:RUBBER.
Eye/Face Protection	:ANSI APPROVED SAFETY GOGGLES AND/OR FACE SHIELD.
Other protective clothing or equipment	:LAB COAT AND APRON, FLAME AND CHEMICAL RESISTANT COVERALLS, EYEWASH CAPABLE OF SUSTAINED FLUSHING, SAFETY DRENCH SHOWER AND HYGIENIC FACILITIES FOR WASHING.
Work/Hygienic Practices	:WASH THOROUGHLY AFTER USE.

*** Ventilation Requirements ***

Local Exhaust	:LABORATORY FUME HOOD. SEE SECTION VII, "PRECAUTIONS".
Mechanical (General)	:SEE "LOCAL EXHAUST" ABOVE.
Special Requirements	:NOT FOUND ON MSDS
Other Requirements	:NOT FOUND ON MSDS

* * * PHYSICAL/CHEMICAL CHARACTERISTICS - SECTION 9 * * *

Boiling Point	:DECOMPOSES
Freezing/Melting Point	:DECOMPOSES § 800C
Specific Gravity (H2O = 1)	:4.32
Vapor Pressure	:ESSENTIALLY 0
Percent Volatiles	:0
Vapor Density (Air=1)	:NOT APPLICABLE
Evaporation Rate	:0
Compared To	:BUTYL ACETATE = 1
Water Solubility	:SOLUBLE
Appearance	:WHITE POWDER, ODORLESS.

Additional Information:

OTHER: NO DATA

* * * REACTIVITY DATA - SECTION 10 * * *

Water reactivity	:SEE "INCOMPATIBILITY".
Is this chemical stable under normal conditions of handling and storage?	:STABLE.
Conditions to Avoid	:INCOMPATIBLES, THERMAL DECOMPOSITION.
Incompatibility (materials to avoid)	:Rb2Cl2, ACIDS, Zn, Al AND WATER SOLUTIONS OF ACTIVE METALS.
Hazardous Decomposition or Byproducts:	PRODUCES HIGHLY TOXIC ARSENIC CONTAINING FUMES UPON DECOMPOSITION.
Is Hazardous Polymerization Possible?:	WILL NOT OCCUR.
Conditions to avoid regarding polymerization	:NOT FOUND ON MSDS

* * * DISPOSAL CONSIDERATIONS - SECTION 13 * * *

Waste Disposal Methods:
CONSULT STATE, LOCAL OR FEDERAL EPA REGULATIONS FOR PROPER DISPOSAL.

Additional Information:

RCRA CODE: P012
TSCA REGISTERED: YES

TRANSPORTATION INFORMATION--U.S. D.O.T.:
PER 49CFR 172.101 (HM181)
NAME AND DESCRIPTION: ARSENIC PENTOXIDE

HAZARD CLASS: 6.1
PACKING GROUP: II
IDENTIFICATION NUMBER: UN1559
LABELS REQUIRED: POISON, DOT-E8249
ERG#: 53

* * * ADDITIONAL INFORMATION - SECTION 16 * * *

THIS MSDS PREPARED BY :NOT FOUND ON MSDS
DATE OF PREPARATION FOR THIS MSDS :7/6/94 (REVISION DATE)

EMPLOYERS SHOULD USE THIS INFORMATION ONLY AS A SUPPLEMENT TO OTHER INFORMATION GATHERED BY THEM, AND SHOULD MAKE INDEPENDENT JUDGEMENT OF SUITABILITY OF THIS INFORMATION TO ENSURE PROPER USE AND PROTECT THE HEALTH AND SAFETY OF EMPLOYEES. THIS INFORMATION IS FURNISHED WITHOUT WARRANTY, AND ANY USE OF THE PRODUCT NOT IN CONFORMANCE WITH THIS MATERIAL SAFETY DATA SHEET, OR IN COMBINATION WITH ANY OTHER PRODUCT OR PROCESS, IS THE RESPONSIBILITY OF THE USER.

10313

Material Safety Data Sheet

Benzene, p.a.

ACC# 95487

Section 1 - Chemical Product and Company Identification

MSDS Name: Benzene, p.a.
Catalog Numbers: AC295330000, AC295330010, AC295330025, AC295330250
Synonyms: Benzol, coal naphtha, cyclohexatriene, phenyl hydride, pyrobenzol.
Company Identification:
Acros Organics N.V.
One Reagent Lane
Fairlawn, NJ 07410
For information in North America, call: 800-ACROS-01
For information in Europe, call: 0032(0) 14575211
For emergencies in the US, call CHEMTREC: 800-424-9300
For emergencies outside the US, call: 0032(0) 14575299

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
71-43-2	Benzene	100	200-753-7

Hazard Symbols: T F
Risk Phrases: 11 45 48/23/24/25

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: colourless. Flash Point: 12 deg F. **Danger! Extremely flammableliquid.** May be harmful if swallowed. May cause centralnervous system depression. Aspiration hazard. May cause centralnervous system effects. May cause respiratory and digestive tractirritation. Causes eye and skin irritation. May cause reproductiveand fetal effects. Cancer hazard. May cause cancer in

humans. Maycause blood abnormalities.
Target Organs: Blood, central nervous system,bone marrow, immune system.

Potential Health Effects

Eye: Produces irritation, characterized by a burning sensation, redness, tearing, inflammation, and possible corneal injury.
Skin: Causes skin irritation. Chronic exposure has been associated with an increased incidence of leukemia and multiple myelomas. Immunodepressive effects have been reported. Animal studies have reported fetotoxicity (growth retardation) and teratogenicity (exencephaly, angulated ribs, dilated brain ventricles).
Ingestion: Aspiration hazard. May cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness, and nausea. Advanced stages may cause collapse, unconsciousness, coma and possible death due to respiratory failure. May cause effects similar to those for inhalation exposure. Aspiration of material into the lungs may cause chemical pneumonitis, which may be fatal. May be harmful if swallowed.
Inhalation: Dust is irritating to the respiratory tract. May cause respiratory tract irritation. May cause adverse central nervous system effects including headache, convulsions, and possible death. May cause drowsiness, unconsciousness, and central nervous system depression. Central nervous system effects may include confusion, ataxia, vertigo, tinnitus, weakness, disorientation, lethargy, drowsiness, and finally coma. Exposure may lead to irreversible bone marrow injury.
Chronic: Possible cancer hazard based on tests with laboratory animals. Prolonged or repeated exposure may cause adverse reproductive effects. May cause bone marrow abnormalities with damage to blood forming tissues. Chronic exposure has been associated with an increased incidence of leukemia and multiple myelomas. Immunodepressive effects have been reported. Animal studies have reported fetotoxicity (growth retardation) and teratogenicity (exencephaly, angulated ribs, dilated brain ventricles).

Section 4 - First Aid Measures

Eyes: Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower lids. Get medical aid immediately.
Skin: Get medical aid. Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes.
Ingestion: Do NOT induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Possible aspiration hazard. Get medical aid immediately.
Inhalation: Get medical aid immediately. Remove from exposure to fresh air immediately. If breathing is difficult, give oxygen. DO NOT use mouth-to-mouth respiration. If breathing has ceased apply artificial respiration using oxygen and a suitable mechanical device such as a bag and a mask.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Firefighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Water runoff can cause environmental damage. Dike and collect water used to fight fire. Vapors can travel to a source of ignition and flash back. Will burn if involved in a fire. Use water spray to keep fire-exposed containers cool. Extremely flammable liquid. Vapors may be heavier than air. They can spread along the ground and collect in low or confined areas. Will be easily ignited by heat, sparks or flame. Vapors may form an explosive mixture with air. Containers may explode when heated.
Extinguishing Media: Use water spray to cool fire-exposed containers. Do NOT use straight streams of water. For small fires, use dry chemical, carbon dioxide, water spray or regular foam. Cool containers with flooding quantities of water until

well after fire is out. For large fires, use water spray, fog or regular foam.
Autoignition Temperature: 928 deg F (497.78 deg C)
Flash Point: 12 deg F (-11.11 deg C)
NFPA Rating: health-2; flammability-3; reactivity-0 Explosion Limits, Lower: 1.3% Upper: 7.1%

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Remove all sources of ignition. Absorb spill using an absorbent, non-combustible material such as earth, sand, or vermiculite. Provide ventilation. A vapor suppressing foam may be used to reduce vapors. Water spray may reduce vapor but may not prevent ignition in closed spaces.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Ground and bond containers when transferring material. Use spark-proof tools and explosion proof equipment. Avoid contact with eyes, skin, and clothing. Do not get in eyes, on skin, or on clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep container tightly closed. Avoid contact with heat, sparks and flame. Avoid ingestion and inhalation. Do not ingest or inhale. Use only in a chemical fume hood. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames.
Storage: Keep away from heat, sparks, and flame. Keep away from sources of ignition. Store in a tightly closed container. Keep from contact with oxidizing materials. Store in a cool, dry, well-ventilated area away from incompatible substances.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Benzene	0.5 ppm ; 1.6 mg/m3; 2.5 ppm STEL; 8 mg/m3 STEL; skin - potential for cutaneous absorption	0.1 ppm TWA; NIOSH Potential Occupational Carcinogen - see Appendix A Potential NIOSH carcinogen.	10 ppm TWA (apply only to exempt industry segments); 1

OSHA Vacated PELs: Benzene: 10 ppm TWA (unless specified in 1910.1028)
Personal Protective Equipment
Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: Follow the OSHA respirator regulations found in 29CFR 1910.134 or European Standard EN 149. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: colourless
Odor: Sweet, aromatic.
pH: Not available.
Vapor Pressure: 100 mm Hg
Vapor Density: 2.7 (Air=1)
Evaporation Rate:
Viscosity: 0.647mPa at 20C
Boiling Point: 176 deg F
Freezing/Melting Point:42 deg F
Decomposition Temperature: Not available.
Solubility: 0.18g/100g water at 25C.
Specific Gravity/Density:0.88
Molecular Formula:C6H6
Molecular Weight:

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Mechanical shock, incompatible materials, ignition sources, excess heat.
Incompatibilities with Other Materials: Benzene is incompatible with arsenic pentafluoride + potassium methoxide, diborane, hydrogen + raney nickel, interhalogens, oxidants, uranium hexafluoride, bromine pentafluoride, chlorine, chlorine trifluoride, chromic anhydride, nitryl perchlorate, oxygen, ozone, perchlorates, perchloryl fluoride + aluminum chloride, permanganates + sulfuric acid, potassium peroxide and silver perchlorate.
Hazardous Decomposition Products: Carbon monoxide, irritating and toxic fumes and gases, carbon dioxide.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 71-43-2: CY1400000
LD50/LC50:
CAS# 71-43-2:
Inhalation, mouse: LC50 =9980 ppm;
Inhalation, rat: LC50 =10000 ppm/7H;
Oral, mouse: LD50 = 4700 mg/kg;
Oral, rat: LD50 = 930 mg/kg;
Skin, rabbit: LD50 = >9400 mg/kg;
Carcinogenicity:
CAS# 71-43-2:
ACGIH: A1-confirmed human carcinogen
California: carcinogen - initial date 2/27/87
NIOSH: occupational carcinogen
NTP: Known carcinogen
OSHA: Select carcinogen
IARC: Group 1 carcinogen
Epidemiology: No data available.
Teratogenicity: No data available.
Reproductive Effects: No data available.
Neurotoxicity: No data available.
Mutagenicity: No data available.

Other Studies: Please refer to RTECS CY1400000 for additional data.

Section 12 - Ecological Information

Ecotoxicity: Minnow (distilled water) lethal, 5 ppm/6H. Sunfish (tap water) TLM=20 ppm/24H. Striped bass TLm96=100-10 ppm.
Environmental Fate: No information reported.
Physical/Chemical: No information available.
Other: None.

Section 13 - Disposal Considerations

Dispose of in a manner consistent with federal, state, and local regulations.
RCRA D-Series Maximum Concentration ofContaminants: CAS# 71-43-2: waste number D018;regulatory level = 0.5 mg/L.
RCRA D-Series Chronic Toxicity ReferenceLevels: CAS# 71-43-2: chronic toxicity referencelevel = 0.005 mg/L.
RCRA F-Series: None listed.
RCRA P-Series: None listed.
RCRA U-Series: CAS# 71-43-2: waste numberU019 (Ignitable waste; Toxic waste).

Section 14 - Transport Information

	US DOT	IATA	RID/ADR	IMO	Canada TDG
Shipping Name:	BENZENE	BENZENE	BENZENE	BENZENE	BENZENE
Hazard Class:	3	3	3(3B)	3.2	3(9.2)
UN Number:	UN1114	UN1114	UN1114	UN1114	UN1114
Packing Group:	II	II		II	II
Additional Info:					FLASHPOINT -11 C

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 71-43-2 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
SARA

Section 302 (RQ)
CAS# 71-43-2: final RQ = 10 pounds (4.54 kg); receives an adjustable RQ of 10 pounds base
Section 302 (TPQ)
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 71-43-2: acute, chronic, flammable.

Section 313
This material contains Benzene (CAS# 71-43-2, 100%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.
Clean Air Act:
CAS# 71-43-2 is listed as a hazardous air pollutant (HAP). This material does not contain any Class 1 Ozone depletors. This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
CAS# 71-43-2 is listed as a Hazardous Substance under the CWA. CAS# 71-43-2 is listed as a Priority Pollutant under the Clean Water Act. CAS# 71-43-2 is listed as a Toxic Pollutant under the Clean Water Act.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
CAS# 71-43-2 can be found on the following state right to know lists: California, New Jersey, Florida, Pennsylvania, Minnesota, Massachusetts.
The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act: WARNING: This product contains Benzene, a chemical known to the state of California to cause cancer. WARNING: This product contains Benzene, a chemical known to the state of California to cause birth defects or other reproductive harm. California No Significant Risk Level: CAS# 71-43-2: no significant risk level = 7 ug/day

European/International Regulations

European Labeling in Accordance with EC Directives
Hazard Symbols:
T F
Risk Phrases:
R 11 Highly flammable. R 45 May cause cancer. R 48/23/24/25 Toxic : danger of serious damage to health by prolonged exposure through inhalation, contact with skin and if swallowed.
Safety Phrases:
S 16 Keep away from sources of ignition - No smoking. S 29 Do not empty into drains. S 45 In case of accident of if you feel unwell, seek medical advice immediately (show the label where possible). S 53 Avoid exposure - obtain special instructions before use.
WGK (Water Danger/Protection)
CAS# 71-43-2: 3
Canada
CAS# 71-43-2 is listed on Canada's DSL/NDSL List.
This product does not have a WHMIS classification.
CAS# 71-43-2 is not listed on Canada's Ingredient Disclosure List.
Exposure Limits
CAS# 71-43-2: OEL-AUSTRALIA:TWA 5 ppm (16 mg/m3);Carcinogen OEL-BELGIUM:TWA 10 ppm (32 mg/m3);Carcinogen JAN9 OEL-CZECHOSLOVAKIA:TWA 10 mg/m3;STEL 20 mg/m3 OEL-DENMARK:TWA 5 ppm (16 mg/m3);Skin;Carcinogen OEL-FINLAND:TWA 5 ppm (15 mg/m3);STEL 10 ppm (30 mg/m3);Skin;CAR OEL -FRANCE:TWA 5 ppm (16 mg/m3);Carcinogen OEL-GERMANY;Skin;Carcinogen OEL-HUNGARY:STEL 5 mg/m3;Skin;Carcinogen OEL-INDIA:TWA 10 ppm (30 mg/m3);Carcinogen OEL-JAPAN:TWA 10 ppm (32 mg/m3);STEL 25 ppm (80 mg/m3) ;CAR OEL-THE NETHERLANDS:TWA 10 ppm (30 mg/m3);Skin OEL-THE PHILIPPINES:TWA 25 ppm (80 mg/m3);Skin OEL-POLAND:TWA 30 mg/m3;Skin OEL-RUSSIA:TWA 10 ppm (5 mg/m3);STEL 25 ppm (15 mg/m3);Skin;CAR OEL-SWEDEN:TWA 1 ppm (3 mg/m3);STEL 5 ppm (16 mg/m3);Skin;CAR OEL-SWITZERLAND:TWA 5 ppm (16 mg/m3);Skin;Carcinogen OEL-THAILAND:TWA 10 ppm (30 mg/m3);STEL 25 ppm (7 mg/m3) OEL-TURKEY:TWA 20 ppm (64 mg/m3);Skin OEL-UNITED KINGDOM:TWA 10 ppm (30 mg/m3) OEL IN BULGARIA, COLOMBIA, JORDAN, KO

REA check ACGIH TLV OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGI
TLV

Section 16 - Additional Information

MSDS Creation Date: 2/12/1996
Revision #6 Date: 3/11/1998

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no way shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

Need help with a product? Send email to Fisher's customer service or call us at 1-800-766-7000.

18578

CADMIUM
CADMIUM
CADMIUM

MATERIAL SAFETY DATA SHEET

FISHER SCIENTIFIC
CHEMICAL DIVISION
1 REAGENT LANE
FAIR LAWN NJ 07410
(201) 796-7100

EMERGENCY NUMBER: (201) 796-7100
CHEMTREC ASSISTANCE: (800) 424-9300

SUBSTANCE IDENTIFICATION

CAS-NUMBER 7440-43-9

SUBSTANCE: **CADMIUM**

TRADE NAMES/SYNONYMS:
CADMIUM, GRANULAR; C.I. NO. 77180; C3; CD;

CHEMICAL FAMILY:
METAL

MOLECULAR FORMULA: CD

MOLECULAR WEIGHT: 112.41

CERCLA RATINGS (SCALE 0-3): HEALTH=3 FIRE=3 REACTIVITY=2 PERSISTENCE=3
NFPA RATINGS (SCALE 0-4): HEALTH=4 FIRE=3 REACTIVITY=2

COMPONENTS AND CONTAMINANTS

COMPONENT: CADMIUM PERCENT: >100.0
CAS# 7440-43-9

OTHER CONTAMINANTS: ZINC, COPPER, LEAD, TIN, SILVER, ANTIMONY, ARSENIC, THALLIUM

EXPOSURE LIMITS:
CADMIUM (AS CD):
0.005 MG/M3 OSHA TWA; 0.0025 MG/M3 OSHA ACTION LEVEL
0.01 MG/M3 ACGIH TWA (TOTAL DUST); 0.002 MG/M3 ACGIH TWA (RESPIRABLE DUST)
ACGIH A2-SUSPECTED HUMAN CARCINOGEN.
0.05 MG/M3 ACGIH CEILING LIMIT (CADMIUM OXIDE FUME)
(NOTICE OF INTENDED CHANGES 1990-91)
LOWEST FEASIBLE LIMIT NIOSH RECOMMENDED EXPOSURE CRITERIA

MEASUREMENT METHOD: PARTICULATE FILTER; ACID; ATOMIC ABSORPTION SPECTROMETRY; (NIOSH VOL. III # 7048).

SUBJECT TO SARA SECTION 313 ANNUAL TOXIC CHEMICAL RELEASE REPORTING [illegible] SUBJECT TO CALIFORNIA PROPOSITION 65 CANCER AND/OR REPRODUCTIVE TOXICITY

CADMIUM:
10 POUNDS CERCLA SECTION 103 REPORTABLE QUANTITY

PHYSICAL DATA

DESCRIPTION: SOFT, DUCTILE, MALLEABLE SILVER-WHITE, BLUE-TINGED, LUSTROUS METAL OR GRAYISH-WHITE POWDER BOILING POINT: 1409 F (765 C)

MELTING POINT: 610 F (321 C) SPECIFIC GRAVITY: 8.64

VAPOR PRESSURE: 1 MMHG @ 394 C SOLUBILITY IN WATER: INSOLUBLE

SOLVENT SOLUBILITY: ACIDS, AMMONIUM NITRATE SOLUTION, HOT SULFURIC ACID

FIRE AND EXPLOSION DATA

FIRE AND EXPLOSION HAZARD:
THE FINELY DIVIDED METAL IS PYROPHORIC; THE DUST IS A SEVERE FIRE HAZARD AND MODERATE EXPLOSION HAZARD WHEN EXPOSED TO HEAT OR FLAME. THE SUBSTANCE REACTS VIOLENTLY WITH EXTINGUISHING AGENTS SUCH AS WATER, FOAM, CARBON DIOXIDE AND HALONS.

FLASH POINT: FLAMMABLE (DUST)

FIREFIGHTING MEDIA:
USE DRY SAND, DOLOMITE, GRAPHITE, SODIUM CHLORIDE, SODA ASH, OR APPROPRIATE METAL-EXTINGUISHING POWDER. DO NOT APPLY WATER TO BURNING MATERIAL (NFPA FIRE PROTECTION HANDBOOK, 16TH EDITION).

FIREFIGHTING:
MOVE CONTAINER FROM FIRE AREA IF YOU CAN DO IT WITHOUT RISK. DO NOT SCATTER SPILLED MATERIAL WITH HIGH-PRESSURE WATER STREAMS. DIKE FIRE-CONTROL WATER FOR LATER DISPOSAL (1990 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.5, GUIDE PAGE 31).

USE AGENTS SUITABLE FOR TYPE OF SURROUNDING FIRE. AVOID BREATHING HAZARDOUS VAPORS, KEEP UPWIND.

TOXICITY

CADMIUM:
TOXICITY DATA: 88 UG/M3/8.6 YEARS INHALATION-MAN TCLO; 39 MG/M3/20 MINUTES INHALATION-HUMAN LCLO; 25 MG/M3/30 MINUTES INHALATION-RAT LC50; 170 MG/M3 INHALATION-MOUSE LCLO; 225 MG/KG ORAL-RAT LD50; 70 MG/KG ORAL-RABBIT LDLO; 890 MG/KG ORAL-MOUSE LD50; 9 MG/KG SUBCUTANEOUS-RAT LD50; 6 MG/KG SUBCUTANEOUS-RABBIT LDLO; 1800 UG/KG INTRAVENOUS-RAT LD50; 5 MG/KG INTRAVENOUS-RABBIT LDLO; 4 MG/KG INTRAPERITONEAL-RAT LD50; 5700 UG/KG INTRAPERITONEAL-MOUSE LD50; 15 MG/KG UNREPORTED-MAN LDLO; 1140 MG/KG UNREPORTED-RAT LD50; 890 MG/KG UNREPORTED-MOUSE LD50; MUTAGENIC DATA (RTECS); REPRODUCTIVE EFFECTS DATA (RTECS); TUMORIGENIC DATA (RTECS).
CARCINOGEN STATUS: ANTICIPATED HUMAN CARCINOGEN (NTP); HUMAN LIMITED EVIDENCE, ANIMAL SUFFICIENT EVIDENCE (IARC GROUP-2A). CADMIUM HAS PRODUCED LOCAL SARCOMAS IN RATS FOLLOWING INTRAMUSCULAR ADMINISTRATION. EXPOSURE TO

CADMIUM, PRIMARILY AS THE OXIDE, HAS BEEN ASSOCIATED WITH INCREASED RISKS OF PROSTATIC AND RESPIRATORY CANCERS.
LOCAL EFFECTS: IRRITANT- INHALATION.
ACUTE TOXICITY LEVEL: HIGHLY TOXIC BY INHALATION; TOXIC BY INGESTION.
TARGET EFFECTS: NEPHROTOXIN. POISONING MAY AFFECT THE LIVER, BONE, BLOOD, LUNGS, AND THE NERVOUS SYSTEM.
AT-INCREASED RISK FROM EXPOSURE: PERSONS WITH KIDNEY OR RESPIRATORY DISORDERS.
ADDITIONAL DATA: DEFICIENCIES IN IRON, CALCIUM, ZINC, PROTEIN AND VITAMINS C AND D MAY ENHANCE THE TOXIC EFFECTS. ALTERATIONS OF DRUG METABOLIZING ACTIVITY HAVE BEEN INDUCED IN ANIMALS. SMOKING MAY RESULT IN HIGHER BLOOD CADMIUM LEVELS.

HEALTH EFFECTS AND FIRST AID

INHALATION:
CADMIUM:
IRRITANT/NEPHROTOXIN/HIGHLY TOXIC.

ACUTE EXPOSURE- THE AVERAGE CONCENTRATION OF FUME RESPONSIBLE FOR FATALITIES IS 40-50 MG/M3 FOR 1 HOUR OR 9 MG/M3 FOR 5 HOURS. EARLY SYMPTOMS MAY INCLUDE MILD IRRITATION OF THE UPPER RESPIRATORY TRACT, RHINITIS, VERTIGO, A SENSATION OF CONSTRICTION OF THE THROAT, A METALLIC TASTE IN THE MOUTH AND COUGH. A LATENT PERIOD FROM 1-10 HOURS MAY PRECEDE THE ONSET OF RAPIDLY-PROGRESSING DYSPNEA, CYANOSIS, SUBSTERNAL OR PRECORDIAL CHEST PAIN, AND A FLU-LIKE SYNDROME WITH WEAKNESS, MALAISE, NAUSEA, VOMITING, HEADACHE, FEVER, CHILLS, SHIVERING, PROFUSE SWEATING, AND MUSCULAR PAINS IN THE BACK AND LIMBS. COUGH WITH FOAMY OR BLOODY SPUTUM AND PULMONARY RALES MARK THE ONSET OF ACUTE PULMONARY EDEMA WHICH USUALLY DEVELOPS WITHIN 24 HOURS AND REACHES A MAXIMUM BY 3 DAYS. IF DEATH FROM ASPHYXIA DOES NOT OCCUR, AND EXPOSURE WAS MILD, SYMPTOMS MAY RESOLVE WITHIN A WEEK. IN MORE SEVERE EXPOSURES, ALL SYMPTOMS INCLUDING PROLIFERATIVE INTERSTITIAL PNEUMONITIS MAY PERSIST FROM 3-10 DAYS. PERMANENT PULMONARY FIBROSIS AND HYPERTROPHY OF BRONCHIAL VESSELS MAY OCCUR. THE FATALITY RATE HAS BEEN ESTIMATED TO BE BETWEEN 15-20%. ACUTE RENAL NECROSIS AND/OR LIVER DAMAGE MAY DEVELOP FOLLOWING MASSIVE ACUTE EXPOSURE. SEQUELAE FROM NON-FATAL EXPOSURE MAY INCLUDE MICROCYTIC, HYPOCHROMIC ANEMIA, TESTICULAR ATROPHY, CARDIOVASCULAR EFFECTS, EMPHYSEMA, ANEMIA AND OSTEOMALACIA.

CHRONIC EXPOSURE- CADMIUM IS HIGHLY CUMULATIVE. REPEATED OR PROLONGED EXPOSURE MAY CAUSE IRREVERSIBLE LUNG INJURY OF THE EMPHYSEMATOUS TYPE WITH COUGH AND SHORTNESS OF BREATH, ABNORMAL LUNG FUNCTION, AIRWAYS OBSTRUCTION AND POSSIBLY PULMONARY FIBROSIS. ULCERATION OF THE NASAL SEPTUM AND YELLOW DISCOLORATION OF THE TEETH MAY OCCUR. CADMIUM INDUCED KIDNEY DAMAGE IS IRREVERSIBLE AND MAY PROGRESS AFTER EXPOSURE CEASES. PROTEINURIA MAY BE THE FIRST SIGN OF DAMAGE AND MAY BE ASSOCIATED WITH GLUCOSURIA, AMINOACIDURIA, IMPAIRED EXCRETION, DECREASED CONCENTRATING CAPACITY, INCREASED EXCRETION OF CALCIUM AND PHOSPHORUS, AND INCREASED PLASMA CREATININE. CALCIURIA MAY FAVOR THE DEVELOPMENT OF KIDNEY STONES. SOME CASES OF KIDNEY FAILURE HAVE BEEN REPORTED. OSTEOMALACIA, OSTEOPOROSIS, AND SPONTANEOUS FRACTURES MAY OCCUR AND MAY BE MANIFESTED AS BACK PAIN, PAIN IN THE EXTREMITIES; DIFFICULTY IN WALKING, AND PAIN ON BONE PRESSURE. OTHER SYMPTOMS MAY INCLUDE DAMAGE TO THE OLFACTORY NERVE AND ANOSMIA, HEMOLYTIC AND IRON-DEFICIENCY ANEMIA, WEIGHT LOSS, AND IRRITABILITY. SOME STUDIES SUGGEST A RELATIONSHIP BETWEEN CADMIUM LEVELS IN AIR AND HUMAN CARDIOVASCULAR DISEASE AND HYPERTENSION, BUT CAUSAL ASSOCIATION HAS NOT BEEN PROVEN. LONG-TERM SEQUELAE MAY INCLUDE RENAL TUBULAR NECROSIS, CARDIOVASCULAR EFFECTS, AND LIVER DAMAGE. OCCUPATIONAL EXPOSURE TO CADMIUM IS IMPLICATED IN A SIGNIFICANT INCREASE IN THE INCIDENCE OF PROSTATIC AND RESPIRATORY CANCERS. ONE STUDY ALSO

REPORTS A SIGNIFICANT INCREASE IN RENAL CANCERS IN THOSE WITH INFERRED OCCUPATIONAL EXPOSURE TO CADMIUM. THERE IS ALSO LIMITED INFORMATION SUGGESTING THAT CADMIUM MAY INTERFERE WITH SPERM PRODUCTION IN HUMANS.

FIRST AID- REMOVE FROM EXPOSURE AREA TO FRESH AIR IMMEDIATELY. IF BREATHING HAS STOPPED, GIVE ARTIFICIAL RESPIRATION. MAINTAIN AIRWAY AND BLOOD PRESSURE AND ADMINISTER OXYGEN IF AVAILABLE. KEEP AFFECTED PERSON WARM AND AT REST. TREAT SYMPTOMATICALLY AND SUPPORTIVELY. ADMINISTRATION OF OXYGEN SHOULD BE PERFORMED BY QUALIFIED PERSONNEL. GET MEDICAL ATTENTION IMMEDIATELY.

SKIN CONTACT:
CADMIUM:
ACUTE EXPOSURE- DIRECT CONTACT MAY RESULT IN IRRITATION.
CHRONIC EXPOSURE- REPEATED OR PROLONGED EXPOSURE MAY RESULT IN DERMATITIS.

FIRST AID- REMOVE CONTAMINATED CLOTHING AND SHOES IMMEDIATELY. WASH AFFECTED AREA WITH SOAP OR MILD DETERGENT AND LARGE AMOUNTS OF WATER UNTIL NO EVIDENCE OF CHEMICAL REMAINS (APPROXIMATELY 15-20 MINUTES). GET MEDICAL ATTENTION IMMEDIATELY.

EYE CONTACT:
CADMIUM:
ACUTE EXPOSURE- DIRECT CONTACT MAY CAUSE IRRITATION, REDNESS, PAIN AND SMARTING, BUT NO INJURY HAS BEEN REPORTED.
CHRONIC EXPOSURE- REPEATED OR PROLONGED EXPOSURE MAY CAUSE CONJUNCTIVITIS.

FIRST AID- WASH EYES IMMEDIATELY WITH LARGE AMOUNTS OF WATER OR NORMAL SALINE, OCCASIONALLY LIFTING UPPER AND LOWER LIDS, UNTIL NO EVIDENCE OF CHEMICAL REMAINS (APPROXIMATELY 15-20 MINUTES). GET MEDICAL ATTENTION IMMEDIATELY.

INGESTION:
CADMIUM:
NEPHROTOXIN/TOXIC.
ACUTE EXPOSURE- CADMIUM IS A POWERFUL EMETIC WHICH INDUCES VOMITING SO THAT LESS IS RETAINED AND ABSORBED. IF SUFFICIENT AMOUNTS ARE ABSORBED SYSTEMIC TOXICITY MAY OCCUR. SYMPTOMS, WHICH MAY BEGIN WITHIN 1-60 MINUTES AFTER INGESTION, ARE SALIVATION, CHOKING, SEVERE NAUSEA, PERSISTENT VOMITING, DIARRHEA, TENESMUS, ABDOMINAL PAIN, BLURRED VISION, DIZZINESS, VERTIGO, HEADACHE, MUSCULAR CRAMPS AND RARELY, CONVULSIONS, EXHAUSTION, COLLAPSE, SHOCK AND UNCONSCIOUSNESS. IF DEATH OCCURS, IT IS USUALLY WITHIN 24 HOURS FROM SHOCK DUE TO FLUID LOSS, OR, IT MAY BE DELAYED 7-14 DAYS AND RESULT FROM ACUTE RENAL FAILURE OR CARDIOPULMONARY DEPRESSION. IF VICTIM SURVIVES, DELAYED LIVER AND/OR KIDNEY DAMAGE MAY OCCUR. A DOSE EXCEEDING 300 MG MAY BE FATAL.
CHRONIC EXPOSURE- CADMIUM IS HIGHLY CUMULATIVE. PROLONGED LOW LEVEL EXPOSURE MAY CAUSE IRREVERSIBLE RENAL TUBULAR DYSFUNCTION AS DESCRIBED IN CHRONIC INHALATION. ANIMAL EXPERIMENTS INDICATE ANTAGONISTIC ACTIVITY BETWEEN CADMIUM AND ZINC SUCH THAT ABNORMAL ZINC METABOLISM WAS FOUND TO CONTRIBUTE SIGNIFICANTLY TO THE TOXIC SYNDROME FOLLOWING PROLONGED INGESTION OF CADMIUM. FUNCTIONAL CHANGES IN THE LIVER, PANCREAS AND ADRENAL GLANDS WHICH ALTER GLUCOSE METABOLISM MAY OCCUR. ALTHOUGH INCONCLUSIVE, SOME STUDIES SUGGEST A RELATIONSHIP BETWEEN PROLONGED EXPOSURE TO CADMIUM AND HUMAN CARDIOVASCULAR DISEASE AND HYPERTENSION. A STUDY WHICH SUPPORTS THIS THEORY WAS REPORTED WHERE FEMALE RATS EXHIBITED HYPERTENSION AFTER CHRONICALLY INGESTING CADMIUM THROUGH THEIR DRINKING WATER. REPRODUCTIVE EFFECTS SUCH AS CONGENITAL ABNORMALITIES, INCREASED MORTALITY, AND REDUCED RATES OF GROWTH HAVE BEEN

FOUND IN ANIMALS AFTER PROLONGED INGESTION OF CADMIUM.

FIRST AID- GIVE MILK OR BEATEN EGGS EVERY 4 HOURS TO RELIEVE GASTROINTESTINAL IRRITATION. REMOVE UNABSORBED CADMIUM BY CATHARSIS WITH FLEET'S PHOSPHO-SODA, 30-60 ML DILUTED 1:4 IN WATER (DREISBACH, HANDBOOK OF POISONING, 12TH ED.). TREATMENT MUST BE ADMINISTERED MEDICAL PERSONNEL.

ANTIDOTE:
THE FOLLOWING ANTIDOTE HAS BEEN RECOMMENDED. HOWEVER, THE DECISION AS TO WHETHER THE SEVERITY OF POISONING REQUIRES ADMINISTRATION OF ANY ANTIDOTE AND ACTUAL DOSE REQUIRED SHOULD BE MADE BY QUALIFIED MEDICAL PERSONNEL.

CADMIUM POISONING:
DO NOT GIVE DIMERCAPROL (BAL). IF SYMPTOMS PERSIST, THE ADMINISTRATION OF CALCIUM DISODIUM EDETATE IS RECOMMENDED. GIVE 15-25 MG/KG (0.08-0.125 ML OF 20% SOLUTION PER KILOGRAM OF BODY WEIGHT) IN 250-500 ML OF 5% DEXTROSE INTRAVENOUSLY OVER A 1 TO 2 HOUR PERIOD, TWICE DAILY. THE MAXIMUM DOSE SHOULD NOT EXCEED 50 MG/KG/DAY. THE DRUG SHOULD BE GIVEN IN 5-DAY COURSES WITH A REST PERIOD OF AT LEAST 2 DAYS BETWEEN COURSES. AFTER THE FIRST COURSE, SUBSEQUENT COURSES SHOULD NOT EXCEED 50 MG/KG/DAY. DAILY URINALYSES SHOULD BE DONE DURING THE TREATMENT PERIOD. THE DOSAGE SHOULD BE REDUCED IF ANY UNUSUAL URINARY FINDINGS APPEAR.
FOR INTRAMUSCULAR ADMINISTRATION, GIVE 20% SOLUTION (200 MG/ML), 12.5 MG/KG BODY WEIGHT EVERY 4-6 HOURS. DILUTE EACH DOSE WITH AN EQUAL VOLUME OF 1% PROCAINE. DOSE LIMITATION IS THE SAME AS THAT GIVEN ABOVE (DREISBACH, HANDBOOK OF POISONING; 12TH ED.). ANTIDOTE SHOULD BE ADMINISTERED BY QUALIFIED MEDICAL PERSONNEL.

REACTIVITY

REACTIVITY:
CADMIUM:
STABLE WHEN KEPT IN SEALED CONTAINERS UNDER NORMAL TEMPERATURES AND PRESSURES, BUT DUST MAY IGNITE UPON CONTACT WITH AIR. METAL TARNISHES IN MOIST AIR. REACTS VIOLENTLY WITH WATER.

INCOMPATIBILITIES:
CADMIUM:
AMMONIUM NITRATE (FUSED): VIOLENT OR EXPLOSIVE REACTION.
HYDRAZOIC ACID: MAY EXPLODE VIOLENTLY.
NITRYL FLUORIDE: INCANDESCENT REACTION WHEN HEATED SLIGHTLY.
OXIDIZERS (STRONG): FIRE AND EXPLOSION HAZARD.
SELENIUM: EXOTHERMIC REACTION.
SULFUR: FIRE AND EXPLOSION HAZARD.
TELLURIUM: INCANDESCENT REACTION IN HYDROGEN ATMOSPHERE.
ZINC: INTENSE EXOTHERMIC REACTION.

DECOMPOSITION:
CADMIUM:
THE HEATED METAL RAPIDLY FORMS HIGHLY TOXIC, BROWNISH FUMES OF OXIDES OF CADMIUM.

POLYMERIZATION:
HAZARDOUS POLYMERIZATION HAS NOT BEEN REPORTED TO OCCUR UNDER NORMAL TEMPERATURES AND PRESSURES.

STORAGE AND DISPOSAL

OBSERVE ALL FEDERAL, STATE AND LOCAL REGULATIONS WHEN STORING OR DISPOSING OF THIS SUBSTANCE.

DISPOSAL

CADMIUM - REGULATORY LEVEL: 1.0 MG/L (TCLP-40 CFR 261 APPENDIX II)
MATERIALS WHICH CONTAIN THE ABOVE SUBSTANCE AT OR ABOVE THE TCLP REGULATORY LEVEL MEET THE EPA TOXICITY CHARACTERISTIC, AND MUST BE DISPOSED OF IN ACCORDANCE WITH 40 CFR PART 262. EPA HAZARDOUS WASTE NUMBER D006.

****

CONDITIONS TO AVOID

MAY IGNITE ITSELF IF EXPOSED TO AIR AND MAY RE-IGNITE AFTER FIRE IS EXTINGUISHED. MAY BURN RAPIDLY WITH FLARE-BURNING EFFECT. RUNOFF TO SEWER MAY CREATE FIRE OR EXPLOSION HAZARD.

****

SPILL AND LEAK PROCEDURES

OCCUPATIONAL SPILL:
DO NOT TOUCH SPILLED MATERIAL. STOP LEAK IF YOU CAN DO IT WITHOUT RISK. DO NOT GET WATER INSIDE CONTAINER. FOR SMALL SPILLS, FLUSH AREA WITH FLOODING AMOUNTS OF WATER. FOR LARGER SPILLS, DIKE SPILL FOR LATER DISPOSAL. KEEP UNNECESSARY PEOPLE AWAY. ISOLATE HAZARD AREA AND DENY ENTRY.

REPORTABLE QUANTITY (RQ): 1 POUND
THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA) SECTION 304 REQUIRES THAT A RELEASE EQUAL TO OR GREATER THAN THE REPORTABLE QUANTITY FOR THIS SUBSTANCE BE IMMEDIATELY REPORTED TO THE LOCAL EMERGENCY PLANNING COMMITTEE AND THE STATE EMERGENCY RESPONSE COMMISSION (40 CFR 355.40). IF THE RELEASE OF THIS SUBSTANCE IS REPORTABLE UNDER CERCLA SECTION 103, THE NATIONAL RESPONSE CENTER MUST BE NOTIFIED IMMEDIATELY AT (800) 424-8802 OR (202) 426-2675 IN THE METROPOLITAN WASHINGTON, D.C. AREA (40 CFR 302.6).

PROTECTIVE EQUIPMENT

VENTILATION:
PROCESS ENCLOSURE VENTILATION RECOMMENDED TO MEET PUBLISHED EXPOSURE LIMITS. VENTILATION EQUIPMENT MUST BE EXPLOSION-PROOF.

CADMIUM:
VENTILATION SHOULD MEET THE REQUIREMENTS OF 29 CFR 1910.1027(F).

RESPIRATOR:
THE FOLLOWING RESPIRATORS ARE THE MINIMUM LEGAL REQUIREMENTS AS SET FORTH BY THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION FOUND IN 29 CFR 1910, SUBPART Z.

CADMIUM:

LESS THAN OR EQUAL TO 10X PEL-	A HALF MASK, AIR-PURIFYING RESPIRATOR EQUIPPED WITH A HIGH-EFFICIENCY PARTICULATE FILTER.

LESS THAN OR EQUAL TO 25X PEL-	A POWERED AIR-PURIFYING RESPIRATOR WITH A LOOSE-FITTING HOOD OR HELMET EQUIPPED WITH A HIGH-EFFICIENCY PARTICULATE FILTER. A SUPPLIED-AIR RESPIRATOR WITH A LOOSE-FITTING HOOD OR HELMET FACEPIECE OPERATED IN THE CONTINUOUS FLOW MODE.
LESS THAN OR EQUAL TO 50X PEL-	A FULL FACEPIECE AIR-PURIFYING RESPIRATOR EQUIPPED WITH A HIGH-EFFICIENCY PARTICULATE FILTER. A POWERED AIR-PURIFYING RESPIRATOR WITH A TIGHT-FITTING HALF MASK EQUIPPED WITH A HIGH-EFFICIENCY PARTICULATE FILTER. A SUPPLIED-AIR RESPIRATOR WITH A TIGHT-FITTING HALF MASK OPERATED IN THE CONTINUOUS FLOW MODE.
LESS THAN OR EQUAL TO 250X PEL-	A POWERED AIR-PURIFYING RESPIRATOR WITH A TIGHT-FITTING FULL FACEPIECE EQUIPPED WITH A HIGH-EFFICIENCY PARTICULATE FILTER. A SUPPLIED-AIR RESPIRATOR WITH A TIGHT-FITTING FULL FACEPIECE OPERATED IN THE CONTINUOUS FLOW MODE.
LESS THAN OR EQUAL TO 1000X PEL-	A SUPPLIED-AIR RESPIRATOR WITH HALF MASK OR FULL FACEPIECE OPERATED IN THE PRESSURE DEMAND OR OTHER POSITIVE PRESSURE MODE.
GREATER THAN 1000X PEL OR UNKNOWN CONCENTRATIONS-	A SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACEPIECE OPERATED IN THE PRESSURE DEMAND OR OTHER POSITIVE PRESSURE MODE. A SUPPLIED-AIR RESPIRATOR WITH A FULL FACEPIECE OPERATED IN THE PRESSURE DEMAND OR OTHER POSITIVE PRESSURE MODE AND EQUIPPED WITH AN AUXILIARY ESCAPE TYPE SELF CONTAINED BREATHING APPARATUS OPERATED IN THE PRESSURE DEMAND MODE.

* - A FULL FACEPIECE RESPIRATOR IS REQUIRED WHEN EYE IRRITATION IS EXPERIENCED.

THE FOLLOWING RESPIRATORS AND MAXIMUM USE CONCENTRATIONS ARE RECOMMENDATIONS BY THE U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, NIOSH POCKET GUIDE TO CHEMICAL HAZARDS OR NIOSH CRITERIA DOCUMENTS.
THE SPECIFIC RESPIRATOR SELECTED MUST BE BASED ON CONTAMINATION LEVELS FOUND IN THE WORK PLACE AND BE JOINTLY APPROVED BY THE NATIONAL INSTITUTE OF OCCUPATIONAL SAFETY AND HEALTH AND THE MINE SAFETY AND HEALTH ADMINISTRATION.

CADMIUM DUST AND FUME (AS CD):
AT ANY DETECTABLE CONCENTRATION:

ANY SELF-CONTAINED BREATHING APPARATUS THAT HAS A FULL FACEPIECE AND IS OPERATED IN A PRESSURE-DEMAND OR OTHER POSITIVE-PRESSURE MODE.
ANY SUPPLIED-AIR RESPIRATOR THAT HAS A FULL FACEPIECE AND IS OPERATED IN A PRESSURE-DEMAND OR OTHER POSITIVE-PRESSURE MODE IN COMBINATION WITH AN AUXILIARY SELF-CONTAINED BREATHING APPARATUS OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.

ESCAPE- ANY AIR-PURIFYING, FULL-FACEPIECE RESPIRATOR WITH HIGH-EFFICIENCY PARTICULATE FILTER.
ANY APPROPRIATE ESCAPE-TYPE, SELF-CONTAINED BREATHING APPARATUS.

FOR FIREFIGHTING AND OTHER IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONDITIONS:

ANY SELF-CONTAINED BREATHING APPARATUS THAT HAS A FULL FACEPIECE AND IS OPERATED IN A PRESSURE-DEMAND OR OTHER POSITIVE-PRESSURE MODE.

ANY SUPPLIED-AIR RESPIRATOR THAT HAS A FULL FACEPIECE AND IS OPERATED IN A PRESSURE-DEMAND OR OTHER POSITIVE-PRESSURE MODE IN COMBINATION WITH AN AUXILIARY SELF-CONTAINED BREATHING APPARATUS OPERATED IN PRESSURE DEMAND OR OTHER POSITIVE-PRESSURE MODE.

CLOTHING:
EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE (IMPERVIOUS) CLOTHING AND EQUIPMENT TO PREVENT REPEATED OR PROLONGED SKIN CONTACT WITH THIS SUBSTANCE.

CADMIUM:
PROTECTIVE CLOTHING SHOULD MEET THE REQUIREMENTS FOR PROTECTIVE WORK CLOTHING AND EQUIPMENT IN 29 CFR 1910.1027(I).

GLOVES:
EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE GLOVES TO PREVENT CONTACT WITH THIS SUBSTANCE.

CADMIUM:
PROTECTIVE GLOVES SHOULD MEET THE REQUIREMENTS FOR PROTECTIVE WORK CLOTHING AND EQUIPMENT IN 29 CFR 1910.1027(I).

EYE PROTECTION:
EMPLOYEE MUST WEAR SPLASH-PROOF OR DUST-RESISTANT SAFETY GOGGLES TO PREVENT EYE CONTACT WITH THIS SUBSTANCE.

EMERGENCY EYE WASH: WHERE THERE IS ANY POSSIBILITY THAT AN EMPLOYEE'S EYES MAY BE EXPOSED TO THIS SUBSTANCE, THE EMPLOYER SHOULD PROVIDE AN EYE WASH FOUNTAIN WITHIN THE IMMEDIATE WORK AREA FOR EMERGENCY USE.

CADMIUM:
PROTECTIVE EYE EQUIPMENT SHOULD MEET THE REQUIREMENTS FOR PROTECTIVE WORK CLOTHING AND EQUIPMENT IN 29 CFR 1910.1027(I).

AUTHORIZED - FISHER SCIENTIFIC, INC.
CREATION DATE: 12/03/84 REVISION DATE: 07/20/93

-ADDITIONAL INFORMATION-

* * * GENERAL PRODUCT INFORMATION - SECTION 1 * * * MSDS:012796

Trade Product Name	:CHLOROFORM
Manufacturer Name	:MALLINCKRODT Performance and Laboratory Chemical Div.
Manufacturer's Address	:P.O. BOX 800
City	:PARIS
State	:KY
ZIP	:40362
Emergency Phone Number	:314-539-1600
Other calls	:Same as above
Date MSDS was prepared	:04/19/1995 (Effective Date)
MSDS prepared by	:NOT FOUND ON MSDS

Additional information:

Synonyms: Trichloromethane
Formula CAS No. 67-66-3
Molecular Weight: 119.38
Chemical Formula: CHCL3
Hazardous Ingredients: Chloroform

* * * INGREDIENTS INFORMATION - SECTION 2 * * *

** EXPOSURE LIMITS **

INGREDIENT NAME	PEL	TLV
Chloroform	NOT FOUND	NOT FOUND

** PERCENTAGES **

	HIGH %	LOW %

** CAS NUMBERS **

	CAS ON MSDS	CIMS VERIFIED CAS
Chloroform	67-66-3	Not verified

* * * HAZARDS IDENTIFICATION - SECTION 3 * * *

Routes of entry :This section not found on MSDS. Refer to sections below.

Signs of exposure :INHALATION:
Acts as a relatively potent anesthetic. Irritates respiratory tract and causes central nervous system effects, including headache, drowsiness, dizziness. Higher and unconsciousness. Prolonged exposure may lead to death due to irregular heart beat and kidney and liver disorders.

INGESTION:
Causes severe burning in mouth and throat, pain in the chest and vomiting. Large quantities may cause symptoms similar to inhalation.

SKIN CONTACT:
Causes skin irritation resulting in redness and pain. Removes natural oils. May be absorbed through skin.

EYE CONTACT:
Vapors cause pain and irritation to eyes. Splashes may cause severe irritation and possible eye damage.

Symptoms of over exposure :CHRONIC EXPOSURE:
Prolonged or repeated exposure to vapors may cause damage to liver and kidneys. Contact with liquid has defatting effect and may cause chronic irritation of skin with cracking and drying, and corresponding dermatitis. Chloroform is a suspected human carcinogen.

Medical conditions aggravated :PERSONS WITH PRE-EXISTING SKIN DISORDERS OE EYE PROBLEMS, OR IMPAIRED LIVER, KIDNEY OR RESPIRATORY FUNCTION MAY BE MORE SUSCEPTIBLE TO THE EFFECTS OF THE SUBSTANCE.

Is chemical listed as a carcinogen or potential carcinogen?

National Toxicology Program	IARC Monographs	OSHA
Listed Carcinogen	Group 2B	NOT FOUND

* * * FIRST AID - SECTION 4 * * *

Emergency phone number: 314-539-1600

Inhalation: REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN. CALL A PHYSICIAN.

Eye contact: EYE EXPOSURE: WASH EYES WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES, LIFTING LOWER AND UPPER EYELIDS OCCASIONALLY. GET MEDICAL ATTENTION IMMEDIATELY.

Skin contact: SKIN EXPOSURE: IN CASE OF CONTACT, IMMEDIATELY FLUSH SKIN WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES WHILE REMOVING CONTAMINATED CLOTHING AND SHOES. WASH CLOTHING BEFORE REUSE. CALL A PHYSICIAN IMMEDIATELY.

Ingestion: Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person.

Additional information:

* * * FIRE AND EXPLOSION HAZARD - SECTION 5 * * *

Flash Point	:Not given on the original MSDS
Flash Point Method	:Not given on the original MSDS
Upper Explosive Limit	:Not given on the original MSDS
Lower Explosive Limit	:Not given on the original MSDS
Autoignition Temperature	:Not given on the original MSDS
Extinguisher Media	:USE ANY MEANS SUITABLE FOR EXTINGUISHING SURROUNDING°FIRE.

Special Fire Fighting

Procedures	: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 PRESURE DEMAND OR OTHER POSITIVE PRESSURE MODE.
Unusual Fire and Explosion Hazards	:FIRE: SLIGHT FIRE HAZARD WHEN EXPOSED TO HIGH HEAT; OTHERWISE, PRACTICALLY NOT FLAMMABLE.

* * * ACCIDENTAL RELEASE MEASURES - SECTION 6 * * *

Steps to be taken in case material is released or spilled:
VENTILATE AREA OF LEAK OR SPILL. REMOVE ALL SOURCES OF IGNITION. CLEAN-UP PERSONNEL REQUIRE PROTECTIVE CLOTHING AND RESPIRATORY PROTECTION FROM VAPORS. CONTAIN AND RECOVER LIQUID WHEN POSSIBLE. COLLECT AS HAZARDOUS WASTE AND ATOMIZE IN A SUITABLE RCRA APPROVED COMBUSTIBLE CHAMBER, OR ABSORB WITH VERMICULITE, DRY SAND, EARTH OR SIMILAR MATERIAL FOR DISPOSAL AS HAZARDOUS WASTE IN A RCRA APPROVED FACILITY. DO NOT FLUSH TO SEWERÜ

* * * HANDLING & STORAGE - SECTION 7 * * *

Precautions to be taken in handling and storage:
KEEP IN A TIGHTLY CLOSED CONTAINER. PROTECT FROM PHYSICAL DAMAGE. STORE IN A COOL, VENTILATED AREA AWAY FROM SOURCES OF HEAT, MOISTURE AND INCOMPATIBILITIES. Wear special protective equipment ("Control Measures" section) for maintenance breake-in or where exposures may exceed established exposure levels. Wash hands, face, forearms and neck when exiting restricted areas. Shower, dispose of outer clothing, change to clean garments at the end of the day. Avoid cross-contamination of street clothes. Wash hands before eating and do not eat, drink, or smoke in workplace. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid), observe all warnings and precautions listed for the product. Odor threshold 250 mg/m3. The odor threshold only serves as a warning of exposure, not smelling it does not mean you are not being exposed.

Other precautions:

PRECAUTIONARY MEASURES

DANGERÜ MAY BE FATAL IF SWALLOWED.
INHALED OR ABSORBED THROUGH SKIN. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. MAY EFFECT CENTRAL NERVOUS SYSTEM, CARDIOVASCULAR SYSTEM, LIVER AND KIDNEYS. SUSPECT CANCER HAZARD. MAY CAUSE CANCER.
Risk of cancer depends on duration and level of exposure.

Do not breathe vapor.
Do not get in eyes, on skin, or on clothing.
Keep container closed.
Use with adequate ventilation.
Wash thoroughly after handling.

* * * CONTROL MEASURES - SECTION 8 * * *

Respiratory protection	:If the TLV is exceeded, wear a supplied-air, full facepiece respirator, airlined hood, or self-contained breathing apparatus.

Protective gloves	:WEAR IMPERVIOUS GLOVES to prevent skin contact.
Eye protection	:USE CHEMICAL SAFETY GOGGLES AND/OR A FULL FACE SHIELD WHERE SPLASHING IS POSSIBLE. CONTACT LENSES SHOULD NOT BE WORN WHEN WORKING WITH THIS MATERIAL. MAINTAIN EYE WASH FOUNTAIN AND QUICK-DRENCH FACILITIES IN WORK AREA.
Other protective clothing or equipment	:SKIN PROTECTION: WEAR IMPERVIOUS PROTECTIVE CLOTHING, INCLUDING BOOTS, GLOVES, LAB COAT, APRON OR COVERALLS TO PREVENT SKIN CONTACT.
Work hygenic practices	:Wash thoroughly after handling.
Ventilation requirements	:A SYSTEM OF LOCAL AND/OR GENERAL EXHAUST IS RECOMMENDED TO KEEP EMPLOYEE EXPOSURES BELOW THE AIRBORNE EXPOSURE LIMITS. 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 EDITIONS, FOR DETAILS.
Local exhaust recommended	:See "Ventilation Requirements" above.
Mechanical	:See "Ventilation Requirements" above.
Special requirements	:Not given on the original MSDS
Other requirements	:Not given on the original MSDS

Additional information:

* * * PHYSICAL/CHEMICAL CHARACTERISTICS - SECTION 9 * * *

Boiling point	:61.3C/142F
Melting point	:-63.5C/-82F
Specific gravity	:1.49
Vapor pressure	:100 § 10.4C/51F
Percent volatiles	:Not given on the original MSDS
Vapor density (Air=1)	:4.1
Evaporation rate	:11.6
Compared to	:BUAC
Water solubility	:0.8G/100G§ 20C
Appearance	:CLEAR COLORLESS LIQUID. CHARACTERISTIC, ETHEREAL ODOR

* * * REACTIVITY DATA - SECTION 10 * * *

Water reactivity	:Not given on the original MSDS
Is this chemical stable under normal conditions of handling and storage?	:Stable under ordinary conditions of use and storage.

Conditions to avoid :Not given on the original MSDS

Incompatibility (materials to avoid) :Strong caustics and chemically active metals such as aluminum, magnesium powder, sodium, or potassium, acetone, fluorine, methanol, sodium methoxide, dinitrogen tetroxide, tert-butoxide, trisopropylphosphine.

Hazardous decomposition products :TOXIC GASES AND VAPORS SUCH AS HYDROGEN CHLORIDE, CHLORINE, PHOSGENE, AND CARBON MONOXIDE MAY BE RELEASED UPON HEATING TO DECOMPOSITION.

Is hazardous polymerization possible?:WILL NOT OCCUR

Conditions to avoid regarding polymerization :Not given on the original MSDS

* * * TOXICOLOGICAL INFORMATION - Section 11 * * *

H M I S Classification
Health : 2
Fire : 0
Reactivity : 0
Special hazard :

Immediate (acute) effects: Oral rat LD50: 908 mg/kg, skin rabbit LD50 > 20 gm/kg; inhalation rat LC50: 47702 mg/m3/4H; irritation data: skin rabbit 10 mg/24H open mild; eye rabbit: 20 mg/24H moderate; investigated as a tumorigen, mutagen, reproductive effector;

Delayed (subchronic & chronic) effects :

Other data : Cancer Status: IARC Category 2B, NTP Listed Carcinogen.

Exposure guidelines :

Target organ data :

* * * ECOLOGICAL INFORMATION - Section 12 * * *

Degradability (BOD & COD) :

Octanol/ Water Partition Coefficient :

Soil Mobility :

Reference to data in other sections :

* * * DISPOSAL CONSIDERATIONS - SECTION 13 * * *

Waste Disposal methods:
Ensure compliance with local, state, and federal regulations.

RCRA:
Chloroform (67-66-3) - U044
(Commercial chemical product wastes designated as acute hazards or toxic under 40 CFR 261.33)

* * * TRANSPORT INFORMATION - Section 14 * * *

DOT, IMO, ICAO, Transport Canada

Hazard class	:
Proper shipping name	:
U N number	:
Label	:
Packing group	:
Placard	:

NFPA

Health	:
Fire	:
Reactivity	:
Special	:

* * * REGULATORY INFORMATION - Section 15 * * *

U. S. Federal Regulations

OSHA	:	
TSCA	:	Chloroform is listed on the TSCA inventory.
CERCLA Hazardous Substance (40 CFR 302)	:	CERCLA Sec. 103 RQ (lbs.): 10 Listed at 40 CFR 302.4. SARA EHS Sec. 302 (TPQ - lbs.): 10,000
SARA Title III	:	Hazard Categories for SARA Sect. 311/312 Acute: Yes Chronic: Yes
Section 313 Supplier Notification	:	SARA Section 313 Chemicals: Yes (Toxic substances subject to annual release reporting requirements listed at 40 CFR 372.65.

SARA Hazard Categories

Chemical Substance	CAS no.	Concentration %	Regulations

State Regulations:

PROPOSITION 65 WARNING:
This product contains a chemical known to the state of California to cause cancer.

* * * ADDITIONAL INFORMATION - SECTION 16 * * *

This MSDS prepared by :NOT FOUND ON MSDS
Date of preparation for this MSDS :04/19/95
Supersedes: 11/27/89

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* * * GENERAL PRODUCT INFORMATION - SECTION 1 * * * MSDS:018244

Trade Product Name	:CHROMIUM: 1,000 UG/ML & 10,000 UG/ML
Manufacturer's Name	:INORGANIC VENTURES INC.
Manufacturer's Address	:1555 ROUTE 37 WEST, SUITE 9
City	:TOMS RIVER
State	:NJ
ZIP	:08753
Emergency Phone Number	:201-240-6700 (INORGANIC VENTURES); 800-424-9300 (CHEMTREC); 800-424-8802 (NATIONAL RESPONSE CENTER)
Other Calls	:201-240-6700
Date MSDS was Prepared	:03/01/88 (ISSUE DATE)
MSDS Prepared By	:NOT FOUND ON MSDS

Additional Information:

TELEX: 9102408855
EFFECTIVE DATE: 03/01/88
PRODUCT NAME: CHROMIUM 1000 UG/ML (0.1% V/V)
10,000 UG/ML (1.0% V/V)
FORMULA: CR IN DILUTE HNO3
FORM. WT.: 52.00
COMMON NAMES: N/A
NIOSH/RTECS #: N/A

* * * INGREDIENTS INFORMATION - SECTION 2 * * *

** EXPOSURE LIMITS **

INGREDIENT NAME	PEL	TLV
AMMONIUM DICHROMATE	NOT FOUND	0.5 MG/M3
NITRIC ACID	NOT FOUND	NOT FOUND

** PERCENTAGES **

	HIGH %	LOW %
AMMONIUM DICHROMATE	1	0
NITRIC ACID	5	0

** CAS NUMBERS **

	CAS ON MSDS	CIMS VERIFIED CAS
AMMONIUM DICHROMATE	7789-09-5	NOT VERIFIED
NITRIC ACID	7697-37-2	NOT VERIFIED

ADDITIONAL INFORMATION:

COMPONENT

AMMONIUM DICHROMATE STEL: SUSPECTED CARCINOGEN
PEL: 0. 5 MG/M3
TOXICITY: LD50 (ORL-RAT) 1870 MG/KG

* * * HAZARDS IDENTIFICATION - SECTION 3 * * *

Routes of Entry	:INHALATION, INGESTION, EYE CONTACT, SKIN CONTACT
Signs of Acute Overexposure	:BURNS, IRRITATION, COUGHING, DIFFICULT BREATHING.
Signs of Chronic Overexposure	:NOT FOUND ON MSDS

Medical Conditions

Aggravated by Exposure :LIQUID MAY CAUSE BURNS TO SKIN AND EYES. VAPORS MAY BE IRRITATING TO EYES, NOSE & THROAT. INHALATION OF VAPORS MAY CAUSE COUGHING AND DIFFICULT BREATHING. CARCINOGEN OF LUNGS, STOMACH AND LARYNX.

Is chemical listed as a carcinogen or potential carcinogen by:

National Toxicology Program	IARC Monographs	OSHA
YES	YES	YES

* * * FIRST AID - SECTION 4 * * *

Emergency phone number:201-240-6700 (INORGANIC VENTURES); 800-424-9300 (CHEMTREC); 800-424-8802 (NATIONAL RESPONSE CTR)

Inhalation :NOT FOUND ON MSDS

Eye Contact :IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES...WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES...

Skin Contact :IN CASE OF CONTACT, IMMEDIATELY FLUSH...SKIN WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES WHILE REMOVING CONTAMINATED CLOTHING AND SHOES. WASH CLOTHING BEFORE REUSE.

Ingestion :IF SWALLOWED, DO N O T INDUCE VOMITING. IF CONSCIOUS, GIVE WATER, MILK OR MILK OF MAGNESIA.

Additional Information:

* * * FIRE AND EXPLOSION HAZARD - SECTION 5 * * *

Flash Point	:N/A
Flash Point Method	:NOT FOUND ON MSDS
Upper Explosive Limit	:NOT FOUND ON MSDS
Lower Explosive Limit	:NOT FOUND ON MSDS
Autoignition Temperature	:NOT FOUND ON MSDS
Extinguisher Media	:USE APPROPRIATE MEDIA.
Special Fire Fighting Procedures	:FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN POSITIVE PRESSURE MODE.
Unusual Fire and Explosion Hazards	:N/A

Additional Information:

TOXIC GASES PRODUCED: NITROGEN OXIDES
N F P A RATINGS: N/A

* * * ACCIDENTAL RELEASE MEASURES - SECTION 6 * * *

Steps to be taken in case material is released or spilled:
WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING. STOP LEAK IF YOU CAN DO SO WITHOUT RISK. USE WATER SPRAY TO REDUCE VAPORS. TAKE UP WITH SAND OR OTHER NON-COMBUSTIBLE ABSORBENT MATERIAL AND PLACE INTO CONTAINER FOR LATER DISPOSAL. FLUSH SPILL AREA WITH WATER.

* * * HANDLING & STORAGE - SECTION 7 * * *

Precautions to be taken in handling and storage:
SPECIAL PRECAUTIONS: KEEP CONTAINER TIGHTLY CLOSED.
STORE IN CORROSION-PROOF AREA.

Other Precautions:
E P A HAZARDOUS WASTE #: D002 (CORROSIVE WASTE)

* * * CONTROL MEASURES - SECTION 8 * * *

*** Personal Protective Equipment ***

Respiratory Protection	:NIOSH APPROVED RESPIRATOR.
Protective Gloves	:PROPER GLOVES.
Eye Protection	:SAFETY GLASSES WITH SIDE SHIELDS.
Other protective clothing or equipment	:LAB COAT/APRON; VENT HOOD.
Work/Hygenic Practices	:NOT FOUND ON MSDS

*** Ventilation Requirements ***

Local Exhaust	:RECOMMENDED
Mechanical (General)	:NOT FOUND ON MSDS
Special Requirements	:NOT FOUND ON MSDS
Other Requirements	:NOT FOUND ON MSDS

Additional Information:

* * * PHYSICAL/CHEMICAL CHARACTERISTICS - SECTION 9 * * *

Boiling Point	:100C (212F)
Melting Point	:N/A
Specific Gravity (H2O = 1)	:1
Vapor Pressure	:N/A
Percent Volatiles	:NOT FOUND ON MSDS
Vapor Density (Air=1)	:N/A
Evaporation Rate	:NOT FOUND ON MSDS
Compared To	:NOT FOUND ON MSDS
Water Solubility	:COMPLETE
Appearance	:PALE YELLOW, CLEAR SOLUTION WITH NO ODOR.

Additional Information:

* * * REACTIVITY DATA - SECTION 10 * * *

WATER REACTIVITY?	:NOT FOUND ON MSDS
Is this chemical stable under normal conditions of handling and storage?	:STABLE
Conditions to Avoid	:N/A
Incompatibility (materials to avoid)	:ORGANIC MATERIALS, STRONG REDUCING AGENTS.
Hazardous Decomposition or Byproducts	:OXIDES OF NITROGEN

Is Hazardous Polymerization Possible?:NOT FOUND ON MSDS

Conditions to avoid regarding
polymerization :NOT FOUND ON MSDS

Additional Information:

* * * DISPOSAL CONSIDERATIONS - SECTION 13 * * *
Waste Disposal Methods:
DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL ENVIRONMENTAL REGULATIONS.

Additional Information:

* * * ADDITIONAL INFORMATION - SECTION 16 * * *

THIS MSDS PREPARED BY :NOT FOUND ON MSDS
DATE OF PREPARATION FOR THIS MSDS :03/01/88

NOTICE:
THE ABOVE INFORMATION IS BELIEVED TO BE ACCURATE AND REPRESENTS THE BEST INFORMATION CURRENTLY AVAILABLE TO US. IT HAS BEEN COMPILED FROM THE DATA PRESENTED IN VARIOUS TECHNICAL PUBLICATIONS & OUR EXPERIENCE. IT IS THE USER'S RESPONSIBILITY TO DETERMINE THE SUITABILITY OF THIS INFORMATION FOR THEIR PARTICULAR PURPOSES. WE ASSUME THAT ONLY QUALIFIED INDIVIDUALS, TRAINED AND FAMILIAR WITH PROCEDURES SUITABLE TO THIS PRODUCT WILL HANDLE THIS MATERIAL.

DACCO Chemicals

MATERIAL SAFETY DATA SHEET

DISTRIBUTED BY:
DEL AMO CHEMICAL COMPANY
535 West 152nd Street
Gardena, California 90248
(213) 532-9214

18267
NO IND

No. 301

CYCLOHEXANONE
(Revision C)
Issued: August 1979
Revised: April 1989

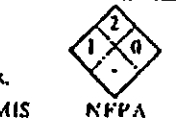
SECTION 1 - MATERIAL IDENTIFICATION

Material: CYCLOHEXANONE CY0200-(ZTN SEALER)

Description (Origin/Uses): Obtained by catalytic dehydrogenation of cyclohexanol or by oxidation of cyclohexane. Used in the production of adipic acid for nylon and as a solvent for DDT, cellulose acetate, nitrocellulose, natural resins, vinyl resins, crude rubber, waxes, and shellacs.

Other Designations: Cyclohexyl Ketone; Ketohexamethylene; Pimelic Ketone; Pimelin Ketone; $C_6H_{10}O$; CAS No. 0108-94-1

Manufacturer: Contact your supplier or distributor. Consult the latest edition of *Chemicalweek Buyers' Guide* (Genium ref. 73) for a list of suppliers.



	HMIS	NFPA
H	1	
F	2	R 1
R	0	I 3
PPG*		S 2
*See sect. 8		K 2

SECTION 2 - INGREDIENTS AND OCCUPATIONAL EXPOSURE LIMITS

Cyclohexanone, ca 100%

OSHA PEL (Skin*)
8-hr TWA: 25 ppm, 100 mg/m³

ACGIH TLV (Skin*), 1988-89
TLV-TWA: 25 ppm, 100 mg/m³

NIOSH REL, 1978
10-hr TWA: 25 ppm, 100 mg/m³
Toxicity Data†
Human, Inhalation, TC_{Lo}: 75 ppm

*This material can be absorbed through intact skin, which contributes to overall exposure.
†See NIOSH, *RTECS* (GW1050000), for additional data.

SECTION 3 - PHYSICAL DATA

Boiling Point: 314 °F (156 °C)
Melting Point: -26 °F (-32 °C)
Vapor Density (Air = 1): 3.4
Vapor Pressure: 2 Torr at 68 °F (20 °C)

% Volatile by Volume: ca 100
Molecular Weight: 98 g/mol
Specific Gravity (H_2O = 1): 0.9478 at 68 °F (20 °C)
Solubility in Water (%): Slight

Appearance and Odor: A clear, water white to slightly yellow oily liquid; characteristic acetone or peppermint odor. The unfatigued threshold of recognition (100% of the test panel) is 0.24 ppm.

SECTION 4 - FIRE AND EXPLOSION DATA

Flash Point: 147 °F (63 °C) CC	Autoignition Temperature: 788 °F (420 °C)	LEL: 1.1% v/v	UEL: 8.1% v/v

Extinguishing Media: Use water spray, dry chemical, carbon dioxide (CO_2), or "alcohol" foam to extinguish cyclohexanone fires. Use water spray to cool fire-exposed containers, to flush spills away from sensitive exposures, to disperse the vapor, to dilute spilled cyclohexanone to nonflammable mixtures, and to protect personnel attempting to stop or seal the source of the leaking material.

Unusual Fire or Explosion Hazards: Cyclohexanone is a moderate fire and explosion hazard. Its heavier-than-air vapor can flow along surfaces; collect in low-lying, confined areas; reach a distant source of ignition; and flash back to its source.

Special Fire-fighting Procedures: Wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode. Use care in selecting equipment (see sect. 5, Conditions to Avoid).

SECTION 5 - REACTIVITY DATA

Stability/Polymerization: Cyclohexanone is stable in closed containers during routine operations at room temperature. Hazardous polymerization cannot occur.

Chemical Incompatibilities: Cyclohexanone can react dangerously with oxidizing agents and nitric acid.

Conditions to Avoid: Prevent exposure to sources of ignition such as heat, sparks, open flame, uninsulated heaters, and lighted tobacco products. Cyclohexanone can soften or dissolve some plastics, resins, and rubbers; this may affect personal protective equipment (see sect 4, Special Fire-fighting Procedures).

Hazardous Products of Decomposition: Thermal oxidative degradation of cyclohexanone during fires can produce toxic gases such as carbon monoxide.

SECTION 6. HEALTH HAZARD INFORMATION

Carcinogenicity: Cyclohexanone is not listed as a carcinogen by the NTP, IARC, or OSHA.
Summary of Risks: Cyclohexanone vapor irritates the eyes, nose, throat, and respiratory system at relatively low levels (ca 50 ppm). Prolonged or repeated skin contact with this material causes defatting, rashes, and chemical burns. Inhalation exposure causes headache, dizziness, weakness, drowsiness, unconsciousness, and possible death. Cyclohexanone depresses the central nervous system (CNS); this condition is enhanced by skin absorption (e.g., prolonged wearing of contaminated clothing).
Medical Conditions Aggravated by Long-Term Exposure: None reported.
Target Organs: Skin, eyes, nose, throat, respiratory system, CNS.
Primary Entry: Inhalation, skin contact/absorption.
Acute Effects: Irritation of the eyes, skin, mucous membranes, and possible narcosis from depression of the CNS.
Chronic Effects: None reported.

FIRST AID
Eyes: Immediately flush eyes, including under the eyelids, gently but thoroughly with flooding amounts of running water for at least 15 minutes.
Skin: Remove contaminated clothing immediately and place it into an appropriate container. Rinse the affected area with flooding amounts of water; wash it with soap and water.
Inhalation: Remove the exposed person to fresh air; restore and/or support his or her breathing as needed. Have qualified medical personnel administer oxygen as required. Keep him or her warm and at rest until medical help is available.
Ingestion: Unlikely. Should accidental ingestion occur, give the exposed person 1 to 2 glasses of water to drink.
Get in-plant, paramedic, or community medical help for all exposures. Seek prompt medical assistance for further treatment, observation, and support after first aid.

SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

Spill/Leak: Notify safety personnel, remove sources of ignition, and provide adequate explosion-proof ventilation in response to a cyclohexanone spill. Use nonsparking tools. Cleanup personnel should avoid skin contact with this material and inhalation of its vapor. Contain the spilled cyclohexanone, absorb it with vermiculite, and place it into appropriate containers for disposal.
Waste Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow Federal, state, and local regulations.

OSHA Designations
Listed as an Air Contaminant (29 CFR 1910.1000 Subpart Z)
EPA Designations
Listed as RCRA Hazardous Waste No. U057 (40 CFR 261.33)
Listed as a CERCLA Hazardous Substance* (40 CFR 302.4) Reportable Quantity (RQ): 5000 lb (2270 kg), [*per the RCRA, § 3001]
SARA Extremely Hazardous Substance (40 CFR 355): Not Listed
SARA Toxic Chemical* (40 CFR 372.65): Not Listed

SECTION 8. SPECIAL PROTECTION INFORMATION

Goggles: Always wear protective eyeglasses or chemical safety goggles. Where splashing of cyclohexanone is possible, wear a full face shield. Follow OSHA eye- and face-protection regulations (29 CFR 1910.133). **Respirator:** Wear a NIOSH-approved respirator per Genium reference 88 for the maximum-use concentrations and/or the exposure limits cited in section 2. Follow OSHA respirator regulations (29 CFR 1910.134). For emergency or nonroutine operations (leaks or cleaning reactor vessels and storage tanks), wear an SCBA. **Warning:** Air-purifying respirators will *not* protect workers in oxygen-deficient atmospheres. Use care in selecting equipment (see sect. 5, Conditions to Avoid). **Other:** Wear impervious gloves, boots, aprons, and gauntlets to prevent prolonged or repeated skin contact with cyclohexanone. **Ventilation:** Install and operate general and local maximum explosion-proof ventilation systems powerful enough to maintain airborne concentrations of this material below the OSHA PEL standard cited in section 2. Local exhaust ventilation is preferred because it prevents dispersion of the contaminant into the general work area by eliminating it at its source. Consult the latest edition of Genium reference 103 for detailed recommendations. **Safety Stations:** Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work areas. **Contaminated Equipment:** Contact lenses pose a special hazard; soft lenses may absorb irritants, and all lenses concentrate them. Do *not* wear contact lenses in any work area. Remove and launder contaminated clothing before wearing it again; clean this material from your shoes and equipment. **Comments:** Practice good personal hygiene; always wash thoroughly after using this material and before eating, drinking, smoking, using the toilet, or applying cosmetics. Keep it off your clothing and equipment. Avoid transferring it from your hands to your mouth while eating, drinking, or smoking. Do *not* eat, drink, or smoke in work areas. Do not inhale cyclohexanone vapor.

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

Storage/Segregation: Store cyclohexanone in closed containers in a cool, dry, well-ventilated area away from oxidizing agents and sources of ignition.
Engineering Controls: Electrically ground and bond all containers used in shipping, receiving, transferring, producing, and sampling operations to prevent static sparks.

Hazardous Materials Table (40 CFR 172.101): Not Listed

Optional Hazardous Materials Table (49 CFR 172.102)

IMO Shipping Name: Cyclohexanone
IMO Hazard Class: 3.3
IMO ID No.: UN1915
IMO Label: Flammable Liquid
IMDG Packaging Group: III

References: 1, 6, 26, 38, 84-94, 100, 116, 118, 119, 122

Prepared by: PJ Igoe, BS; **Industrial Hygiene Review:** DJ Wilson, CIH; **Medical Review:** W Silverman, MD

* * * GENERAL PRODUCT INFORMATION - SECTION 1 * * * MSDS:022648

Trade Product Name	:ETHYLBENZENE, C/N F38
Manufacturer Name	:CHEM SERVICE, INC.
Manufacturer Address	:P.O. Box 3108
City	:WEST CHESTER
State	:PA
ZIP	:19381
Emergency Phone Number	:610/692-3026
Other calls	:610/692-3026
Date MSDS was prepared	:01/25/1995 (Last Revised)
MSDS prepared by	:NOT FOUND ON MSDS

Additional information :

OTHER NAME: Phenylethane

* * * INGREDIENTS INFORMATION - Section 2 * * *

** EXPOSURE LIMITS **

INGREDIENT NAME	PEL	TLV	OTHER
Ethyl-benzene	100 ppm (435 mg/m3)	100 ppm (434 mg/m3)	

** PERCENTAGES **

	HIGH %	LOW %
Ethyl-benzene	NOT FOUND	

** CAS NUMBERS **

	CAS NUMBER	
Ethyl-benzene	100-41-4	NOT VERIFIED

Additional information:

* * * HAZARDS IDENTIFICATION - Section 3 * * *

*** EMERGENCY OVERVIEW ***

Routes of Entry : This section not found on MSDS. Refer to sections below.

Signs of Acute Overexposure : All chemicals should be considered hazardous - Avoid direct physical contactÜ
Can cause skin irritation. Can cause eye irritation. May be harmful if absorbed through the skin. May be harmful if inhaled. May be harmful if swallowed. Can be irritating to mucous membranes.
Can cause nervous system injury. Dust and/or vapors can cause irritation to respiratory tract.

Signs of Chronic Overexposure : Prolonged exposure may cause

nausea/headache/dizziness and/or eye damage.

Medical Conditions
Aggravated by
Exposure : NOT FOUND ON MSDS

Is chemical listed as a carcinogen or potential carcinogen by:

National Toxicology Program	IARC Monographs	OSHA
NOT FOUND	NOT FOUND	NOT FOUND

Carcinogenicity:

* * * FIRST AID - Section 4 * * *

Emergency phone number: 610-692-3026

AN ANTIDOTE IS A SUBSTANCE INTENDED TO COUNTERACT THE EFFECT OF A POISON. IT SHOULD BE ADMINISTERED ONLY BY A PHYSICIAN OR TRAINED EMERGENCY PERSONNEL. MEDICAL ADVICE CAN BE OBTAINED FROM A POISON CONTROL CENTER.

Inhalation : If inhaled, remove patient to fresh air. Administer oxygen if patient is having difficulty breathing. If patient has stopped breathing administer artificial respirations. If patient is in cardiac arrest administer CPR. Continue life supporting measures until medical assistance has arrived.

Eye Contact : In case of contact, Flush eyes continuously with water for 15-20 minutes.

Skin Contact : Flush skin with water for 15-20 minutes. If no burns have occurred-use soap and water to cleanse skin. Remove and wash contaminated clothing. If patient is exhibiting signs of shock - Keep warm and quiet.

Ingestion : Contact Poison Control Center immediately if necessary. Do not administer liquids or induce vomiting to an unconscious or convulsing person. If patient is vomiting - watch closely to make sure airway does not become obstructed by vomit. Get medical attention if necessary.

Additional Information:

* * * FIRE AND EXPLOSION HAZARD - Section 5 * * *

Flash Point : 18C (This is a flammable chemical)
Flash Point Method : NOT FOUND ON MSDS
Upper Explosive Limit : 6.7%
Lower Explosive Limit : 0.8%
Autoignition Temperature : NOT FOUND ON MSDS
Extinguisher Media : Carbon dioxide or dry chemical powder. DO NOT USE WATER

Special Fire Fighting Procedures : NOT FOUND ON MSDS

Unusual Fire and Explosion Hazards : Flammable

Additional Information :

NFPA Hazard Ratings
Health : 2
Fire : 3
Reactivity : 0
Special Hazards :

* * * ACCIDENTAL RELEASE MEASURES - Section 6 * * *

Steps to be taken in case material is released or spilled:
Evacuate area. Wear appropriate OSHA regulated equipment. Ventilate area. Absorb on vermiculite or similar material. Sweep up and place in an appropriate container. Hold for disposal. Wash contaminated surfaces to remove any residues.

* * * HANDLING & STORAGE - Section 7 * * *

Precautions to be taken in handling and storage : This chemical should be handled only in a hood. Eye shields should be worn. Use appropriate OSHA/MSHA approved safety equipment. Avoid contact with skin, eyes and clothing. Do not breathe vapors. Keep tightly closed.

Other Precautions : Store in a cool, dry place. Store only with compatible chemicals.

* * * CONTROL MEASURES - Section 8 * * *

*** Personal Protective Equipment (PPE) ***

Respiratory Protection : Use appropriate OSHA/MSHA approved safety equipment.

Protective Gloves : NOT FOUND ON MSDS

Eye Protection : Eye shields should be worn. Contact lenses should not be worn in the laboratory.

Other protective clothing or equipment : NOT FOUND ON MSDS

Work Practices : Avoid contact with skin, eyes and clothing.

Personal Hygienic Procedures : Do not breathe vapors.

*** Engineering / Ventilation Requirements ***

Local Exhaust : NOT FOUND ON MSDS

Mechanical (General) : NOT FOUND ON MSDS

Special Requirements : This chemical should be handled only in a hood.

Other Requirements : NOT FOUND ON MSDS

Additional Information:

* * * PHYSICAL/CHEMICAL CHARACTERISTICS - Section 9 * * *

Boiling Point	:	136.25C
Melting Point	:	-95C
Specific Gravity(H2O = 1)	:	0.866
Vapor Pressure	:	7 mmHg § 20C
Percent Volatile	:	NOT FOUND ON MSDS
Vapor Density (Air=1)	:	Not Available
Evaporation Rate	:	Not Available
Compared To	:	Butyl Acetate
Water Solubility	:	Insoluble (not miscible)
Appearance	:	Aromatic colorless liquid
WT/Gal (LB)	:	
% Solid by WT	:	
pH	:	

Additional Information:

* * * REACTIVITY DATA - Section 10 * * *

Water reactivity? : NOT FOUND ON MSDS

Is this chemical stable under normal conditions of handling and storage? : See below.

Conditions to Avoid : See below.

Incompatibility (materials to avoid) : Incompatible with strong oxidizing agents.

Hazardous Decomposition or Byproducts : Emits toxic fumes and fire conditions.

Is Hazardous Polymerization Possible? : NOT FOUND ON MSDS

Conditions to avoid regarding polymerization : NOT FOUND ON MSDS

Additional Information :

* * * TOXICOLOGICAL INFORMATION - Section 11 * * *

H M I S Classification

Health	:
Fire	:
Reactivity	:
Special hazard	:

Immediate (acute) effects: Ethyl-benzene:
Oral Rat or Mouse LD50 = 3500 mg/kg

This compound is considered to be slightly toxic. This statement is based upon OSHA s assessment of the LD50.

Delayed (subchronic & chronic) effects :

Other data : Ethyl-benzene:
RTECS #DA0700000

Exposure guidelines :

Target organ data :

* * * ECOLOGICAL INFORMATION - Section 12 * * *

Degradability (BOD & COD) :

Octanol/ Water Partition Coefficient :

Soil Mobility :

Reference to data in other sections :

* * *DISPOSAL CONSIDERATIONS - Section 13 * * *

Waste Disposal Methods : Burn in a chemical incinerator equipped with an after-burner and scrubber.

RCRA : NOT FOUND ON MSDS

Additional Information:

* * * TRANSPORT INFORMATION - Section 14 * * *

DOT, IMO, ICAO, Transport Canada
Hazard class :

Proper shipping name :

U N number :

Label :

Packing group :

Placard :

NFPA
Health :
Fire :
Reactivity :
Special :

* * * REGULATORY INFORMATION - Section 15 * * *

U. S. Federal Regulations

OSHA	:
TSCA	:
CERCLA Hazardous Substance (40 CFR 302)	:
SARA Title III	:
Section 313 Supplier Notification	:

SARA Hazard Categories

Chemical Substance	CAS no.	Concentration %	Regulations

State Regulations:

* * * ADDITIONAL INFORMATION - Section 16 * * *

Disclaimer : THE ABOVE INFORMATION IS BELIEVED TO BE CORRECT ON THE DATE IT IS PUBLISHED AND MUST NOT BE CONSIDERED ALL INCLUSIVE. THE INFORMATION HAS BEEN OBTAINED ONLY BY A SEARCH OF AVAILABLE LITERATURE AND IS ONLY A GUIDE FOR HANDLING THE CHEMICALS. OSHA REGULATIONS REQUIRE THAT IF OTHER HAZARDS BECOME EVIDENT, AN UPGRADED MSDS MUST BE MADE AVAILABLE TO THE EMPLOYEE WITHIN 3 MONTHS. RESPONSIBILITY FOR UPDATES LIES WITH THE EMPLOYER AND NOT WITH CHEM SERVICE INC. PERSONS NOT SPECIFICALLY AND PROPERLY TRAINED SHOULD NOT HANDLE THIS CHEMICAL OR ITS CONTAINER. THIS MSDS IS PROVIDED WITHOUT ANY WARRANTY EXPRESSED OR IMPLIED, INCLUDING MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE.

THIS PRODUCT IS FURNISHED FOR LABORATORY USE ONLYÜ OUR PRODUCTS MAY NOT BE USED AS DRUGS, COSMETICS, AGRICULTURAL OR PESTICIDAL PRODUCTS, FOOD ADDITIVES OR AS HOUSEHOLD CHEMICALS.

Abbreviations/terms :

Preparation and Revision information : January 25, 1995 (Last Revised)

Please Note: This MSDS is a courtesy MSDS. No order accompanied this MSDS.

* * * GENERAL PRODUCT INFORMATION - SECTION 1 * * * MSDS:002809

Trade Product Name	:LEAD
Synonyms	:WHITE LEAD, C.I. PIGMENT METAL 4, C.I. 77575, LEAD FLAKE, KS-4, LEAD S2, SI, SO, PLUMBUM, L-18, L-24, L-29, L-27, T-134, ACC12510
Manufacturer Name	:FISHER SCIENTIFIC
Manufacturer's Address	:CHEMICAL DIVISION/1 REAGENT LANE
City	:FAIR LAWN
State	:NJ
ZIP	:07410
Emergency Phone Number	:201-796-7100
Other calls	:201-796-7100
Date MSDS was prepared	:06/12/1987
MSDS prepared by	:GASTON L. PILLORI, EMERGENCY CONTACT

Additional information:

AUTHORIZED - FISHER SCIENTIFIC GROUP, INC.

CREATION DATE: 02/08/85
REVISION DATE: 09/27/85

DATE: 06/12/87
PO NBR: N/A
ACCT: 218820-01
INDEX: N/A
CAT NO: L246

CHEMICAL FAMILY: METAL
MOLECULAR FORMULA: PB
MOL WT: 207.19

CERCLA RATINGS (SCALE 0-3): HEALTH=3 FIRE=0 REACTIVITY=2
PERSISTENCE=3

* * * INGREDIENTS INFORMATION - SECTION 2 * * *

** EXPOSURE LIMITS **

INGREDIENT NAME	PEL	TLV*
LEAD	0.05 MG/M3	0.15 MG/M3

** PERCENTAGES **

	HIGH %	LOW %
LEAD	99.8	

** CAS NUMBERS **

	CAS ON MSDS	CIMS VERIFIED CAS
LEAD	7439-92-1	7439-92-1

ADDITIONAL INFORMATION:

* OTHER CONTAMINANTS: BISMUTH, COPPER, ARSENIC, ANTIMONY, TIN, IRON, SILVER, ZINC

EXPOSURE LIMITS:
0.10 MG(PB)/M3 NIOSH RECOMMENDED CEILING
0.45 MG(PB)/M3 ACGIH STEL (NOTICE OF INTENDED CHANGE 1984-1985).

* * * HAZARDS IDENTIFICATION - SECTION 3 * * *

Routes of Entry :INHALATION, SKIN, EYES, INGESTION

Signs of Acute Overexposure :INHALATION: NEUROTOXIN/NEPHROTOXIN/TERATOGEN.
ACUTE EXPOSURE - INHALATION & SUBSEQUENT ABSORPTION OF LARGE AMOUNTS OF LEAD MAY CAUSE THIRST, A METALLIC TASTE, A BURNING SENSATION IN THE MOUTH & THROAT, EXCESSIVE SALIVATION, ABDOMINAL PAIN WITH SEVERE COLIC, VOMITING, DIARRHEA OF BLACK OR BLOODY STOOLS, CONSTIPATION, FATIGUE, SLEEP DISTURBANCES, DULLNESS, RESTLESSNESS, IRRITABILITY, MEMORY LOSS, LOSS OF CONCENTRATION, DELIRIUM, OLIGURIA OFTEN WITH HEMATURIA & ALBUMINURIA, ENCEPHALOPATHY WITH VISUAL FAILURE, PARESTHESIAS, MUSCLE PAIN AND WEAKNESS, CONVULSIONS, AND PARALYSIS. DEATH MAY RESULT FROM CARDIORESPIRATORY ARREST, COMA, OR DEHYDRATION FROM FLUID LOSS & SHOCK WHICH MAY BE DELAYED FOR 1-2 DAYS. SURVIVAL FROM ACUTE EXPOSURE MAY RESULT IN THE ONSET OF CHRONIC INTOXICATION. LIVER DAMAGE MAY INCLUDE ENLARGEMENT AND TENDERNESS, ICTERUS, AND JAUNDICE. THE APPROXIMATE FATAL DOSE OF ABSORBED LEAD IS APPROXIMATELY 0.5 GRAMS. PATHOLOGIC FINDINGS FROM ACUTE POISONING INCLUDE GASTROINTESTINAL INFLAMMATION AND RENAL TUBULAR DEGENERATION.
SKIN CONTACT:
ACUTE EXPOSURE- CONTACT WITH LEAD POWDERS OR DUST MAY BE IRRITATING. LEAD IS NOT ABSORBED THROUGH THE SKIN, BUT MAY BE TRANSFERRED TO THE MOUTH INADVERTENTLY BY CIGARETTES, CHEWING TOBACCO, FOOD, OR MAKE-UP.
EYE CONTACT:
ACUTE EXPOSURE - LEAD DUST OR POWDERS MAY BE IRRITATING. METALLIC LEAD PARTICLES MAY CAUSE AN INFLAMMATORY FOREIGN BODY REACTION & INJURY IS GENERALLY THOUGHT TO BE MECHANICAL AND NOT TOXIC.
INGESTION: NEUROTOXIN.
ACUTE EXPOSURE - INGESTION OF LEAD MAY PRODUCE HEADACHE, NAUSEA, VOMITING, CONSTIPATION, ABDOMINAL SPASMS, METALLIC TASTE IN MOUTH, BLACK STOOLS, EXCESSIVE URINATION, HYPOTENSION, COLLAPSE AND COMA.

Signs of Chronic Overexposure :INHALATION: NEUROTOXIN/NEPHROTOXIN/TERATOGEN.
CHRONIC EXPOSURE - PROLONGED OR REPEATED EXPOSURE TO LOW LEVELS OF LEAD MAY RESULT IN AN ACCUMULATION IN BODY TISSUES AND EXERT ADVERSE EFFECTS ON THE BLOOD, NERVOUS SYSTEMS, HEART, ENDOCRINE AND IMMUNE SYSTEMS, KIDNEYS, AND REPRODUCTION. EARLY STAGES OF LEAD POISONING, "PLUMBISM", MAY BE EVIDENCED BY ANOREXIA, WEIGHT LOSS, CONSTIPATION, APATHY OR IRRITABILITY, OCCASIONAL VOMITING, FATIGUE, HEADACHE WEAKNESS, METALLIC TASTE IN THE MOUTH, GINGIVAL LEAD IN PERSONS WITH POOR DENTAL HYGIENE, AND ANEMIA. LOSS OF RECENTLY DEVELOPED MOTOR SKILLS IS GENERALLY OBSERVED ONLY IN CHILDREN. MORE ADVANCED STAGES OF POISONING MAY BE CHARACTERIZED BY INTERMITTENT VOMITING, IRRITABILITY AND NERVOUSNESS, MYALGIA OF THE ARMS AND LEGS WITH WRIST AND/OR FOOT DROP. DISTURBANCES OF MENSTRUAL CYCLES AND SPONTANEOUS ABORTIONS MAY OCCUR IN WOMEN. SEVERE "PLUBISM" MAY RESULT IN PERSISTENT VOMITING, ATAXIA, PERIODS OF STUPOR OR LETHARGY, ENCEPHALOPATHY WITH VISUAL DISTURBANCES WHICH MAY PROGRESS TO OPTIC NEURITIS AND ATROPHY, HYPERTENSION, PAPILLEDEMA, CRANIAL NERVE PARALYSIS,

DELIRIUM, CONVULSIONS, AND COMA. NEUROLOGIC SEQUELAE MAY INCLUDE MENTAL RETARDATION, SEIZURES, CEREBRAL PALSY, AND DYSTONIA MUSCULORUM DEFORMANS. IRREVERSIBLE KIDNEY DAMAGE HAS BEEN ASSOCIATED WITH INDUSTRIAL EXPOSURE. REPRODUCTIVE EFFECTS HAVE BEEN EXHIBITED IN BOTH MALES AND FEMALES. PATERNAL EFFECTS MAY INCLUDE DECREASED SEX DRIVE, IMPOTENCE, STERILITY & ADVERSE EFFECTS ON THE SPERM WHICH MAY INCREASE THE RISK OF BIRTH DEFECTS. MATERNAL EFFECTS MAY INCLUDE MISCARRIAGE AND STILLBIRTHS IN EXPOSED WOMEN OR WOMEN WHOSE HUSBANDS WERE EXPOSED, ABORTION, STERILITY OR DECREASED FERTILITY, AND ABNORMAL MENSTRUAL CYCLES. LEAD CROSSES THE PLACENTA AND MAY AFFECT THE FETUS CAUSING BIRTH DEFECTS, MENTAL RETARDATION, BEHAVIORAL DISORDERS, AND DEATH DURING THE FIRST YEAR OF CHILDHOOD. ANIMAL STUDIES INDICATE THAT REPRODUCTIVE EFFECTS MAY BE ADDITIVE IF BOTH PARENTS ARE EXPOSED TO LEAD.
SKIN CONTACT:
CHRONIC EXPOSURE - PROLONGED OR REPEATED EXPOSURE TO THE POWDER OR DUST MAY RESULT IN DERMATITIS. SYSTEMATIC TOXICITY MAY DEVELOP IF LEAD IS TRANSFERRED TO THE MOUTH BY CIGARETTES, CHEWING TOBACCO, FOOD, OR MAKE-UP.
EYE CONTACT:
CHRONIC EXPOSURE - PROLONGED EXPOSURE MAY CAUSE CONJUNCTIVITIS.
INGESTION: NEUROTOXIN.
CHRONIC EXPOSURE - NOT GIVEN ON THE ORIGINAL MSDS.

Medical Conditions Aggravated by Exposure :NOT GIVEN ON THE ORIGINAL MSDS

Is chemical listed as a carcinogen or potential carcinogen by:

National Toxicology Program	IARC Monographs	OSHA
N	N	N

* * * FIRST AID - SECTION 4 * * *

Emergency phone number:201-796-7100

Inhalation :REMOVE FROM EXPOSURE AREA TO FRESH AIR IMMEDIATELY. IF BREATHING HAS STOPPED, GIVE ARTIFICIAL RESPIRATION. MAINTAIN AIRWAY AND BLOOD PRESSURE AND ADMINISTER OXYGEN IF AVAILABLE. KEEP AFFECTED PERSON WARM AND AT REST. GET MEDICAL ATTENTION. (DREISBACH, HANDBOOK OF POISONING, 11TH ED.)

Eye Contact :WASH EYES IMMEDIATELY WITH LARGE AMOUNTS OF WATER OCCASIONALLY LIFTING UPPER AND LOWER LIDS, UNTIL NO EVIDENCE OF CHEMICAL REMAINS (APPROXIMATELY 15 TO 20 MINUTES). GET MEDICAL ATTENTION.

Skin Contact :REMOVE CONTAMINATED CLOTHING AND SHOES IMMEDIATELY. WASH AFFECTED AREA WITH SOAP OR MILD DETERGENT AND LARGE AMOUNTS OF WATER (APPROXIMATELY 15 TO 20 MINUTES) UNTIL NO EVIDENCE OF CHEMICAL REMAINS.

Ingestion :DO NOT INDUCE VOMITING. GET IMMEDIATE MEDICAL ATTENTION.

Additional Information:

TOXICITY

450 MG/KG/6 YEAR ORAL-WOMAN TDLO; 1000 MG/KG INTRAPERITONEAL-RAT LDLO; 160 MG/KG ORAL-PIGEON LDLO; MUTAGENIC DATA (RTEC); CARCINOGEN STATUS: NONE.

LEAD IS A CUMULATIVE NEUROTOXIN. POISONING AFFECTS THE CENTRAL NERVOUS SYSTEM, GASTROINTESTINAL TRACT, BLOOD, AND KIDNEYS.

* * * FIRE AND EXPLOSION HAZARD - SECTION 5 * * *

Flash Point	:NON-FLAMMABLE
Flash Point Method	:Not given on the original MSDS
Upper Explosive Limit	:Not given on the original MSDS
Lower Explosive Limit	:Not given on the original MSDS
Autoignition Temperature	:Not given on the original MSDS
Extinguisher Media	:DRY CHEMICAL, CARBON DIOXIDE, WATER SPRAY OR FOAM (1984 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.3). FOR LARGER FIRES, USE WATER SPRAY, FOG OR ALCOHOL FOAM (1984 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.3)
Special Fire Fighting Procedures	:MOVE CONTAINERS FROM FIRE AREA IF POSSIBLE (1984 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.3, GUIDE PAGE 53). EXTINGUISH USING AGENT INDICATED. USE FLOODING AMOUNTS OF WATER AS A FOG. AVOID BREATHING DUSTS AND FUMES FROM BURNING MATERIAL; KEEP UPWIND. (BUREAU OF EXPLOSIVE, EMERGENCY HANDLING OF HAZARDOUS MATERIALS IN SURFACE TRANSPORTATION, 1981). FOR FIREFIGHTING RESPIRATOR TYPE RECOMMENDED, SEE SECTION VIII, RESPIRATORY PROTECTION.
Unusual Fire and Explosion Hazards	:MODERATE HAZARD IN DUST FORM WHEN EXPOSED TO HEAT OR FLAME.

Additional information:

* * * ACCIDENTAL RELEASE MEASURES - SECTION 6 * * *

Steps to be taken in case material is released or spilled:
OCCUPATIONAL SPILL: DO NOT TOUCH SPILLED MATERIAL. STOP LEAK IF YOU CAN DO IT WITHOUT RISK. FOR SMALL SPILLS, TAKE UP WITH SAND OR OTHER ABSORBENT MATERIAL AND PLACE INTO CONTAINERS FOR LATER DISPOSAL. FOR SMALL DRY SPILLS, WITH CLEAN SHOVEL PLACE MATERIAL INTO CLEAN, DRY CONTAINER AND COVER. MOVE CONTAINERS FROM SPILL AREA. FOR LARGER SPILLS, DIKE FAR AHEAD OF SPILL FOR LATER DISPOSAL. KEEP UNNECESSARY PEOPLE AWAY. ISOLATE HAZARD AREA AND DENY ENTRY.

* * * HANDLING & STORAGE - SECTION 7 * * *

Precautions to be taken in handling and storage:
Not given on the original MSDS

Other precautions:
Not given on the original MSDS

* * * CONTROL MEASURES - SECTION 8 * * *

Respiratory protection	:RESPIRATOR: 0.5 MG(PB)/M3 - HIGH EFFICIENCY PARTICULATE RESPIRATOR. 2.5 MG(PB)/M3 - HIGH EFFICIENCY PARTICULATE RESPIRATOR WITH A FULL FACEPIECE. 50 MG(PB)/M3 - TYPE "C" SUPPLIED-AIR RESPIRATOR OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE-PRESSURE OR CONTINUOUS-FLOW MODE. 100 MG9PB)/M3 - TYPE "C" SUPPLIED-AIR RESPIRATOR WITH A FULL FACEPIECE OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE-PRESSURE MODE OR WITH A FULL FACEPIECE, HELMET OR HOOD OPERATED IN CONTINUOUS FLOW MODE.
FIREFIGHTING:	SELF CONTAINED BREATHING APPARATUS WITH A FULL FACEPIECE OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE-PRESSURE MODE.
Protective gloves	:EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE GLOVES TO PREVENT CONTACT WITH THIS SUBSTANCE.
Eye protection	:EMPLOYEE MUST WEAR SPLASH-PROOF OR DUST-RESISTANT SAFETY GOGGLES TO PREVENT EYE CONTACT WITH THIS SUBSTANCE.
Other protective clothing or equipment	:EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE (IMPERVIOUS) CLOTHING AND EQUIPMENT TO PREVENT ANY POSSIBILITY OF SKIN CONTACT WITH THIS SUBSTANCE.
Work hygenic practices	:Not given on the original MSDS
Ventilation requirements	:PROVIDE LOCAL EXHAUST VENTILATION SYSTEM TO MEET PUBLISHED EXPOSURE LIMITS.
Local exhaust recommended	:SEE VENTILATION REQUIREMENTS.
Mechanical	:Not given on the original MSDS
Special requirements	:Not given on the original MSDS
Other requirements	:Not given on the original MSDS

* * * PHYSICAL/CHEMICAL CHARACTERISTICS - SECTION 9 * * *

Boiling point	:3164F/1740C
Melting point	:622F/328C
Specific gravity	:11.3
Vapor pressure (MMHG)	:1.3 § 970C
Percent volatiles	:Not given on the original MSDS
Vapor density (Air=1)	:Not given on the original MSDS
Evaporation rate	:Not given on the original MSDS
Compared to	:Not given on the original MSDS
Water solubility	:INSOLUBLE
Appearance	:BULISH-WHITE, SILVERY GRAY METAL

Additional information:

SOLVENT SOLUBILITY	:HNO3, HOT CONC H2SO4

* * * REACTIVITY DATA - SECTION 10 * * *

Water reactivity :Not given on the original MSDS

Is this chemical stable under normal conditions of handling and storage? :NOT GIVEN ON THE ORIGINAL MSDS*

Conditions to avoid :MAY BURN BUT DOES NOT IGNITE READILY.

Incompatibility (materials to avoid) :LEAD: AMMONIUM NITRATE: EXPLOSIVE REACTION. CHLORINE TRIFLUORIDE: VIOLENT REACTION. DISODIUM ACETYLIDE: TRITURATION IN MORTAR MAY BE VIOLENT AND LIBERATE CARBON. HYDROGEN PEROXIDE, 60% TRIOXANE SOLUTION: SPONTANEOUSLY DETONABLE. NITRIC ACID: LEAD-CONTAINING RUBBER MAY IGNITE. SODIUM AZIDE: FORMS LEAD AZIDE IN COPPER PIPE. SODIUM CARBIDE: VIGOROUS REACTION. SULFURIC ACID (HOT): REACTS. ZIRCONIUM-LEAD ALLOYS: IGNITION ON IMPACT.

Hazardous decomposition products :THERMAL DECOMPOSITION PRODUCTS ARE TOXIC OXIDES OF LEAD.

Is hazardous polymerization possible?:NONE KNOWN

Conditions to avoid regarding polymerization :Not given on the original MSDS

Additional information:

* REACTIVITY: REACTS WITH STRONG OXIDIZERS, HYDROGEN PEROXIDE, CHLORINE TRIFLUORIDE AND ACTIVE METALS. THE FINELY DIVIDED LEAD PRODUCED BY REDUCTION OF OXIDE WITH FURFURAL VAPOR AT 290C IS PHROPHORIC AND CHEMICALLY REACTIVE, THIS IS ASCRIBED TO OXIDE FORMATION ON EXPOSURE TO AIR. UPON SOLDERING, MELTING AND LEAD COATING LEAD FUME IS FORMED W HICH CAN BE INHALED.

* * * DISPOSAL CONSIDERATIONS - SECTION 13 * * *
Waste disposal methods:
Not given on the original MSDS
* * * ADDITIONAL INFORMATION - SECTION 16 * * *

This MSDS prepared by :GASTON L. PILLORI, EMERGENCY CONTACT

Date of preparation for this MSDS :09/27/1985

REVISION DATE: 09/27/85

THE INFORMATION ABOVE IS BELIEVED TO BE ACCURATE AND REPRESENTS THE BEST INFORMATION CURRENTLY AVAILABLE TO US. HOWEVER, WE MAKE NO WARRANTY OF MERCHANTABILITY OR ANY OTHER WARRANTY, EXPRESS OR IMPLIED, WITH RESPECT TO SUCH INFORMATION, AND WE ASSUME NO LIABILITY RESULTING FROM ITS USE. USERS SHOULD MAKE THEIR OWN INVESTIGATIONS TO DETERMINE THE SUITABILITY OF THE INFORMATION FOR THEIR PARTICULAR PURPOSES.

AUTHORIZED - FISHER SCIENTIFIC GROUP, INC.

CREATION DATE: 02/08/85
REVISION DATE: 09/27/85

DATE: 06/12/87
PO NBR: N/A
ACCT: 218820-01
INDEX: N/A
CAT NO: L246

CHEMICAL FAMILY: METAL
MOLECULAR FORMULA: PB
MOL WT: 207.19

* * * GENERAL PRODUCT INFORMATION - SECTION 1 * * * MSDS:010538

Trade Product Name	:MERCURY
Manufacturer Name	:D. F. GOLDSMITH CHEMICAL & METAL CORPORATION
Manufacturer's Address	:909 PITNER AVENUE
City	:EVANSTON
State	:IL
ZIP	:60202
Emergency Phone Number	:800-424-9300
Other calls	:708-869-7800
Date MSDS was prepared	:05/01/1994
MSDS prepared by	:NOT FOUND ON MSDS

Additional information:

WHMIS : D2B.E
HMIS : 3-0-0
POISON UN : 2809
CORROSIVE : 8

* * * INGREDIENTS INFORMATION - SECTION 2 * * *

** EXPOSURE LIMITS **

INGREDIENT NAME	PEL	TLV
MERCURY (METALLIC MERCURY-QUICKSILVER)	0.5 MG/M3	0.05 M/M3

** PERCENTAGES **

	HIGH %	LOW %
MERCURY (METALLIC MERCURY-QUICKSILVER)	100	

** CAS NUMBERS **

	CAS ON MSDS	CIMS VERIFIED CAS
MERCURY (METALLIC MERCURY-QUICKSILVER)	7439-97-6	7439-97-6

* * * HAZARDS IDENTIFICATION - SECTION 3 * * *

Routes of entry :SKIN, EYES, INGESTION, INHALATION

Signs of exposure :SKIN CONTACT:
IRRITANT/SENSITIZER/NEUROTOXIN/NEPHROTOXIN.
ACUTE EXPOSURE: MAY CAUSE REDNESS AND IRRITATION.
SENSITIZATION DERMITITIS MAY OCCUR IN PREVIOUSLY
EXPOSED WORKERS. SUBSTANCE MAY BE ABSORBED
THROUGH INTACT SKIN CAUSING ANURIA.

EYE CONTACT:
IRRITANT. ACUTE EXPOSURE.
CONTACT MAY CAUSE IRRITATION. SOLUTIONS ARE
CORROSIVE AND MAY CAUSE CORNEAL INJURY OR BURNS.

INGESTION:

NEUROTOXIC/NEPHROTOXIC.
ACUTE EXPOSURE: WHEN INGESTED, NECROSIS BEGINS IMMEDIATELY IN THE MOUTH, THROAT, ESOPHAGUS, AND STOMACH. WITHIN A FEW MINUTES, VIOLENT PAIN, PROFUSE VOMITING, AND SEVERE PURGING MAY OCCUR. PATIENT MAY DIE WITHIN A FEW MINUTES FROM FLUID/ELECTROLYTE LOSSES AND PERIPHERAL VASCULAR COLLAPSE, BUT DEATH (FROM UREMIA) IS USUALLY DELAYED 5 TO 12 DAYS.

INHALATION:
IRRITANT/SENSITIZER/NEUROTOXIN.
28 MG/M3 IMMIDIATELY DANGEROUS TO LIFE OR HEALTH. ACUTE EXPOSURE: INHALATION OF A HIGH CONCENTRATIONS OR MERCURY VAPOR CAN CAUSE ALMOST IMMEDIATE DYSPNEA, COUGH, FEVER, NAUSEA AND VOMITING, DIARRHEA, STOMATITIS, SALIVATION AND METALLIC TASTE. SYMPTOMS MAY RESOLVE OR MAY PROGRESS TO NECROTIZING BRONCHIOLITIS, PNEUMONITIS, PULMONARY EDEMA, AND PNEUMOTHORAX. THIS SYNDROME IS OFTEN FATAL IN CHILDREN. ACIDOSIS AND RENAL DAMAGE WITH RENAL FAILURE MAY OCCUR. INHALING VOLATILE ORGANIC MERCURIALS IN HIGH CONCENTRATIONS CAUSES METALLIC TASTE, DIZZINESS, CLUMSINESS, SLURRED SPEECH, DIARRHEA, AND SOMETIMES, FATAL CONVULSIONS.

Symptoms of over exposure :EYE CONTACT: MERCURY MAY BE DEPOSITED IN THE LENS OF THE EYE, CAUSING VISUAL DISTURBANCES.

INHALATION:
OF MERCURY VAPOR, DUSTS, OVER A LONG PERIOD CAUSES MERCURIALISM. FINDINGS EXTREMELY VARIABLE AND INCLUDE TREMORS, SALIVATION, STOMATITIS, LOOSENING OF TEETH, BLUE LINES ON GUMS, PAIN AND NUMBNESS IN EXTREMITIES, NEPHTRITIS, DIARRHEA, ANXIETY, HEADACHE, WEIGHT LOSS, ANOREXIA, MENTAL DEPRESSION, INSOMNIA, IRRITABILITY AND INSTABILITY, HALLUCINATIONS & EVIDENCE OF MENTAL DETERIORATION.

Medical conditions aggravated :NOT FOUND ON MSDS.

Is chemical listed as a carcinogen or potential carcinogen?

National Toxicology Program	IARC Monographs	OSHA
Not stated	Not stated	Not stated

* * * FIRST AID - SECTION 4 * * *

EMERGENCY PHONE NUMBER: 800-424-9300

Inhalation: REMOVE TO FRESH AIR. RESTORE AND/OR SUPPORT BREATHING AS NEEDED. ADMINISTER O2 FOR CHEM. PNEUMONITIS.
Eye contact: FLUSH WITH RUNNING WATER FOR 15 MIN. INCLUDING UNDER THE EYELIDS.
Skin contact: REMOVE CONTAMINATED CLOTHING. WASH AFFECTED AREA WITH SOAP AND WATER.
Ingestion: GASTRIC LAVAGE WITH 5% SOLUTION OF SODIUM FORMALDEHYDE SULFOXYLATE, FOLLOWED BY 2% NaHCO3, AND FINALLY

LEAVE 250 cc OF THE SODIUM FORMAHLDEHYDE SULFOXYLATE IN THE STOMACH. SEEK MEDICAL ASSISTANCE FOR FURTHER TREATMENT, OBSERVATION AND SUPPORT.

Additional information:
ELEMENTAL Hg, LIQUID AND VAPOR, IS TOXIC DUE TO ITS LIQUID SOLUBILITY, LACK OF CHARGE, AND MEMBRANE PERMEABILITY. INHALED VAPORS (80%) RAPIDLY THROUGH ALVEOLAR MEMBRANES INTO THE BLOOD AND ARE SYSTEMICALLY TRANSPORTED TO THE BODY TISSUES, INCLUDING THE BRAIN. EXPOSURE TO HIGH CONC. (>1.2 MG/M3) OF VAPORS FOR BRIEF PERIODS CAN CAUSE PNEUMONITIS. Hg CAN BE ABSORBED SLOWLY THROUGH THE SKIN. CHRONIC SYMPTOMS INVOLVE THE CNS WITH TREMORS AND VARIOUS NEUROPSYCHIATRIC DISTURBANCES. THE TLV WOULD BE EXCEEDED IF THE CONTENTS OF A SMALL Hg CLINICAL THERMOMETER WERE DISPERSED IN A CLOSED 100' X 100' X 15' ROOM. GI UPTAKE OF Hg IS LOW (<5%).

* * * FIRE AND EXPLOSION HAZARD - SECTION 5 * * *

Flash Point	:N/A
Flash Point Method	:N/A
Upper Explosive Limit	:N/A
Lower Explosive Limit	:N/A
Autoignition Temperature	:N/A
Extinguisher Media	:DRY CHEMICAL, CARBON DIOXIDE, WATER SPRAY OR FOAM. (1984 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.3).
Special Fire Fighting Procedures	:FOR LARGER FIRES, USE WATER SPRAY, FOG OR ALCOHOL FOAM (1984 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.3). FIREFIGHTING: MOVE CONTAINERS FROM AREA IF POSSIBLE. COOL CONTAINERS EXPOSED TO FLAMES WITH WATER FROM SIDE UNTIL WELL AFTER FIRE IS OUT. (1984 EMERGENCY RESPONSE GUIDEBOOK, DOT P5800.3) USE AGENTS SUITABLE FOR TYPE OF FIRE.
Unusual Fire and Explosion Hazards	:FOR TYPE OF FIRE; USE WATER IN FLOODING AMOUNTS AS A FOG. AVOID BREATHING CORROSIVE AND POISONOUS VAPORS. KEEP UPWIND.

* * * ACCIDENTAL RELEASE MEASURES - SECTION 6 * * *
Steps to be taken in case material is released or spilled:
MERCURY EVAPORATES VERY SLOWLY. SPILLED Hg FORMS MAY TINY GLOBULES THAT WILL EVAPORATE FASTER THAN A SINGLE POOL AND CAN DEVELOP A SIGNIFICANT CONCENTRATION OF VAPORS IN AN UNVENTILATED AREA. SUCH VAPORS CAN BE POISONOUS, ESPECIALLY IF BREATHED OVER A LONG PERIOD OF TIME. HEATED Hg EVOLVES HIGH LEVELS OF TOXIC VAPORS. DO NOT TOUCH SPILLED MATERIAL. STOP LEAK IF YOU CAN DO IT WITHOUT RISK. FOR SMALL SPILLS, TAKE UP WITH SAND OR OTHER ABSORBENT MATERIAL AND PLACE INTO CONTAINERS FOR LATER DISPOSAL. A MERCURY SPILL KIT MAY ALSO BE USED FOR SMALL SPILLS IN THE WORKPLACE. FOR LARGER SPILLS, DIKE FAR AHAED OF SPILL FOR LATER DISPOSAL. KEEP UNNECESSARY PEOPLE AWAY. ISOLATE HAZARD AREA AND DENY ENTRY.

* * * HANDLING & STORAGE - SECTION 7 * * *

Precautions to be taken in handling and storage:
STORE IN CLOSED UNBREAKABLE CONTAINERS (POLYETHYLENE) IN A COOL,

DRY, WELL-VENTILATED AREA AWAY FROM SOURCES OF HEAT. PROTECT CONTAINERS FROM PHYSICAL DAMAGE.

Other precautions:
NOT FOUND ON MSDS.

* * * CONTROL MEASURES - SECTION 8 * * *

Respiratory protection	:SELF-CONTAINED BREATHING APPARATUS CAN BE USED UP TO 5 MG/M3 WITH A FULL FACEPIECE ABOVE 1 MG/M3. POSITIVE PRESSURE-TYPE AIR SUPPLIED BREATHING EQUIPMENT HAS BEEN RECOMMENDED ABOVE 5 MG/M3.
Protective gloves	:WEAR RUBBER GLOVES.
Eye protection	:AVOID EYE CONTACT BY USE OF CHEMICAL SAFETY GLASSES.
Other protective clothing or equipment	:WEAR PROTECTIVE CLOTHING APPROPRIATE FOR THE WORK SITUATION. SEPARATE WORK AND STREET CLOTHING. STORE WORK CLOTHING IN SPECIAL LOCKERS. SHOWERS TO BE TAKEN BEFORE CHANGING TO STREET CLOTHES. PROVIDE PREPLACEMENT AND PERIODIC MEDICAL EXAMS FOR THOSE REGULARLY EXPOSED TO Hg, WITH EMPHASIS DIRECTED TO CNS, SKIN, LUNGS, LIVER, KIDNEYS, AND G.I. TRACT.
Work hygenic practices	:NOT FOUND ON MSDS.
Ventilation requirements	:PROVIDE ADEQUATE EXHAUST VENTILATION TO MEET TLV REQUIREMENTS IN THE WORKPLACE. OPERATIONS REQUIRING AN EXPOSED Hg SURFACE SHOULD REDUCE THE TEMP. OF Hg TO LIMIT VAPORIZATION AND MINIMIZE VAPOR EXPOSURE BY USING A LOCAL EXHAUST.
Local exhaust recommended	:NOT FOUND ON MSDS.
Mechanical	:NOT FOUND ON MSDS.
Special requirements	:NOT FOUND ON MSDS.
Other requirements	:NOT FOUND ON MSDS.

* * * PHYSICAL/CHEMICAL CHARACTERISTICS - SECTION 9 * * *

Boiling point	:675F/357C
Melting point	:-38F/-39C
Specific gravity	:13.6
Vapor pressure	:0.0012 mm Hg § 20C
Percent volatiles	:NOT FOUND ON MSDS.
Vapor density (Air=1)	:7.0
Evaporation rate	:NOT FOUND ON MSDS.
Compared to	:NOT FOUND ON MSDS.
Water solubility	:INSOLUBLE
Appearance	:SILVER-WHITE, HEAVY MOBILE, LIQUID METAL.

* * * REACTIVITY DATA - SECTION 10 * * *

Water reactivity :N/A

Is this chemical stable under normal conditions of handling and storage? :NOT FOUND ON MSDS.

Conditions to avoid :DOES NO IGNITE READILY. FLAMMABLE, POISONOUS GASES MAY ACCUMULATE IN TANKS AND HOPPER CARS. MAY IGNITE COMBUSTIBLES (WOOD, PAPER, OIL).

Incompatibility (materials to avoid):VIOLENT REACTION: ACETYLINIC COMPOUNDS; AMMONIA; BORON; DIIODOPHOSPHIDE; ETHYLENE OXIDE; METALS (ALUMINUM; POTASSIUM; LITHIUM; SODIUM; RUBIDIUM); METHYL AZIDE; METHYLSILANE; OXYGEN; OXIDANTS (BROMINE; PEROXYFORMIC ACID; CHLORINE DIOXIDE; NITRIC ACID; TETRACARBONYLNICKEL; NITROMETHANE; SILVER PERCHLORATE.

Hazardous decomposition products :THERMAL DECOMPOSITION PRODUCTS INCLUDE TOXIC MERCURY VAPORS AND OXYGEN.

IS HAZARDOUS POLYMERIZATION POSSIBLE?:NOT FOUND ON MSDS.

Conditions to avoid regarding polymerization :NONE KNOWN

* * * DISPOSAL CONSIDERATIONS - SECTION 13 * * *

Waste disposal methods:
NOT FOUND ON MSDS.

* * * ADDITIONAL INFORMATION - SECTION 16 * * *

This MSDS prepared by :NOT FOUND ON MSDS.

Date of preparation for this MSDS :05/01/1994

* * * GENERAL PRODUCT INFORMATION - SECTION 1 * * * MSDS:017397

Trade Product Name	:SUPELPREME-HC KIT TLC POLYNUCLEAR AROMATIC HYDROCARBONS MIX 48909
Manufacturer's Name	:SUPELCO, INC.
Manufacturer's Address	:SUPELCO PARK
City	:BELLEFONTE
State	:PA
ZIP	:16823-0048
Emergency Phone Number	:NOT FOUND ON MSDS
Other Calls	:814-359-3441
Date MSDS was Prepared	:03/06/1998 (LAST REVISED)
MSDS Prepared By	:NOT FOUND ON MSDS

Additional Information:

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FAX 814-359-3044
CUSTOMER P.O. NO.:NOT FOUND
DATE: 08/17/1998
CATALOG NO. 48909
DATA SHEET NO. I489050
SYNONYM: ANALYTICAL STD IN METHYLENE CHLORIDE: BENZENE (1:1)

* * * INGREDIENTS INFORMATION - SECTION 2 * * *

** EXPOSURE LIMITS **

INGREDIENT NAME	PEL	TLV
ANTHRACENE	N/A	N/A
FLUORANTHENE	N/A	N/A
NAPHTHALENE	10 PPM	10 PPM
ACENAPHTHYLENE, 1,2-DIHYDRO-/ACENAPHTHENE	N/A	N/A
BENZäAüANTHRACENE	N/A	N/A
BENZäAüPYRENE	N/A	N/A
BENZO(B)FLUORANTHENE	N/A	N/A
BENZOäKüFLUORANTHENE	N/A	N/A
CHRYSENE	N/A	N/A
ACENAPHTHYLENE	N/A	N/A
PYRENE	8 MG/M3	N/A
BENZOäGHIüPERYLENE	N/A	N/A
9H-FLUORENE/FLUORENE	N/A	N/A
PHENANTHRENE	N/A	N/A
DIBENZäA,HüANTHRACENE	N/A	N/A
INDENOä1,2,3-CDüPYRENE	N/A	N/A
BENZENE	1 PPM	10 PPM
METHANE,DICHLORO-/METHYLENE CHLORIDE	500 PPM	50 PPM

** PERCENTAGES **

	HIGH %	LOW %
ANTHRACENE	0.2	
FLUORANTHENE	0.2	
NAPHTHALENE	0.2	
ACENAPHTHYLENE, 1,2-DIHYDRO-ACENAPHTHENE	0.2	
BENZäAüANTHRACENE	0.2	
BENZOäAüPYRENE	0.2	
BENZO(B)PYRENE	0.2	
BENZO(B)FLUORANTHENE	0.2	
BENZOäKüFLUORANTHENE	0.2	
CHRYSENE	0.2	
ACENAPHTHYLENE	0.2	
PYRENE	0.2	

BENZOäGHIüPERYLENE	0.2
9H-FLUORENE	0.2
PHENANTHRENE	0.2
DIBENZO(A,H)ANTHRACENE	0.2
INDENOä1,2,3-CDüPYRENE	0.2
BENZENE	48
METHYLENE CHLORIDE	48

** CAS NUMBERS **

	CAS ON MSDS	CIMS VERIFIED CAS
ANTHRACENE	120-12-7	NOT VERIFIED
FLUORANTHENE	206-44-0	NOT VERIFIED
NAPHTHALENE	91-20-3	NOT VERIFIED
ACENAPHTHYLENE, 1,2-DIHYDRO-ACENAPHTHENE	83-32-9	NOT VERIFIED
BENZO(A)ANTHRACENE	56-55-3	NOT VERIFIED
BENZO(A)PYRENE	50-32-8	NOT VERIFIED
BENZO(B)FLUORANTHENE	205-99-2	NOT VERIFIED
BENZOäKüFLUORANTHENE	207-08-9	NOT VERIFIED
CHRYSENE	218-01-9	NOT VERIFIED
ACENAPHTHYLENE	208-96-8	NOT VERIFIED
PYRENE	129-00-0	NOT VERIFIED
BENZO(GHI)PERYLENE	191-24-2	NOT VERIFIED
9H-FLUORENE	86-73-7	NOT VERIFIED
PHENANTHRENE	85-01-8	NOT VERIFIED
DIBENZO(A,H)ANTHRACENE	53-70-3	NOT VERIFIED
INDENO(1,2,3-CD)PYRENE	193-39-5	NOT VERIFIED
BENZENE	71-43-2	NOT VERIFIED
METHYLENE CHLORIDE	75-09-2	NOT VERIFIED

ADDITIONAL INFORMATION:

INGREDIENTS	OTHER EXPOSURE INFORMATION		
ANTHRACENE	430 MG/KG	INTRAPERITONEAL RAT	(4,6)
FLUORANTHENE	2000 MG/KG	ORAL RAT	(4)
NAPHTHALENE	490 MG/KG	ORAL RAT	(6)
ACENAPHTHYLENE, 1,2-DIHYDRO-ACENAPHTHENE	600 MG/KG	ORAL RAT	
BENZO(A)ANTHRACENE	200 MG/KG	ORAL RAT	(2,8)
BENZO(A)PYRENE	50 MG/KG	SUBCUTANEOUS RAT	(2,8)
BENZO(B)FLUORANTHENE	NOT FOUND ON MSDS		(3,8,9)
BENZOäKüFLUORANTHENE	NOT FOUND ON MSDS		(3,8,9)
CHRYSENE	NOT FOUND ON MSDS		(4)
ACENAPHTHYLENE	NOT FOUND ON MSDS		
PYRENE	2700 MG/KG	ORAL RAT	(4)
BENZO(GHI)PERYLENE	NOT FOUND ON MSDS		(4,9)
FLUORENE	NOT FOUND ON MSDS		(4)
PHENANTHRENE	700 MG/KG	ORAL MOUSE	(4)
DIBENZO(A,H)ANTHRACENE	NOT FOUND ON MSDS		(2,8)
INDENO(1,2,3-CD)PYRENE	NOT FOUND ON MSDS		(3,8)
BENZENE	4894 MG/KG	ORAL RAT	(1,5,6,7)
METHYLENE CHLORIDE	2524 MG/KG	ORAL RAT	(3,6,8)

FOOTNOTES

1 - CLASSIFIED BY I A R C AS A CLASS 1 CARCINOGEN.
2 - CLASSIFIED BY I A R C AS A CLASS 2A CARCINOGEN.
3 - CLASSIFIED BY I A R C AS A CLASS 2B CARCINOGEN.
4 - CLASSIFIED BY I A R C AS A CLASS 3 CARCINOGEN.
5 - OSHA REGULATED CARCINOGEN, 29 CFR 1910.
6 - SUBJECT TO THE REPORTING REQUIREMENTS OF S A R A TITLE III, SECTION 313.
7 - CLASSIFIED BY N T P AS A GROUP A CARCINOGEN.
8 - CLASSIFIED BY N T P AS A GROUP B CARCINOGEN.

9 - THIS MATERIAL IS NOT LISTED ON THE T S C A (TOXIC SUBSTANCES CONTROL ACT) INVENTORY. THIS MATERIAL IS INTENDED FOR R&D USE ONLY AND MAY NOT BE USED FOR DRUG, HOUSEHOLD, OR OTHER PURPOSES. IT IS SUBJECT TO T S C A REGULATIONS AT CFR 40 PART 720.36 WHICH DEAL WITH THE EXEMPTION OF CHEMICALS USED IN RESEARCH AND DEVELOPMENT FROM PMN (PREMANUFACTURE NOTIFICATION) REQUIREMENTS. IN ADDITION, THE BURDEN OF SAFE USE OF THE MATERIAL RESTS WITH YOU AND, THEREFORE, IT SHOULD BE HANDLED ONLY BY QUALIFIED PERSONS TRAINED IN LABORATORY PROCEDURES AND GOOD SAFETY PRACTICES

* * * HAZARDS IDENTIFICATION - SECTION 3 * * *

Routes of Entry :THIS SECTION NOT FOUND ON MSDS. REFER TO SECTIONS BELOW.

Signs of Acute Overexposure :MAY IRRITATE EYES AND/OR SKIN IRRITATES RESPIRATORY TRACT. MAY BE FATAL IF INHALED. HARMFUL IN INHALED. HARMFUL IF SWALLOWED. CONTAINS MATERIAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER. DERMATITIS. BREATHING DIFFICULTY. PULMONARY EDEMA. HEADACHE. BLURRED VISION. DIZZINESS. GASTROINTESTINAL DISTBANCES.

DEPRESSES CENTRAL NERVOUS SYSTEM. REPORTED HUMAN CARCINOGEN. CARCINIGENICITY - INDEFINITE IN ANIMALS. LEUKEMIA. REVERSIBLE CORNEAL EFFECTS MAY OCCUR.

Signs of Chronic Overexposure :NOT FOUND ON MSDS

Medical Conditions Aggravated by Exposure :NOT FOUND ON MSDS

Is chemical listed as a carcinogen or potential carcinogen by:

National Toxicology Program	IARC Monographs	OSHA
SEE ABOVE	SEE ABOVE	SEE ABOVE

* * * FIRST AID - SECTION 4 * * *

Emergency phone number:NOT FOUND ON MSDS

Inhalation :IMMEDIATELY MOVE TO FRESH AIR. GIVE OXYGEN IF BREATHING IS LABORED. IF BREATHING STOPS, GIVE ARTIFICIAL RESPIRATION. CONTACT A PHYSICIAN.

Eye Contact :FLUSH EYES WITH WATER FOR A5 MINUTES.

Skin Contact :PROMPTLY WASH SKIN WITH MILD SOAP AND LARGE VOLUMES OF WATER. REMOVE CONTAMINATED CLOTHING.

Ingestion :NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON. NEVER TRY TO MAKE AN UNCONSCIOUS PERSON VOMIT. DO NOT INDUCE VOMITING. GIVE LARGE AMOUNTS OF WATER. GIVE LARGE AMOUNTS OF MILK.

Additional Information:

LD50 - 4894 MG/KG ORAL RAT TLV - 10 PPM
PEL - 1 PPM

* * * FIRE AND EXPLOSION HAZARD - SECTION 5 * * *

Flash Point	:12F
Flash Point Method	:CLOSED CUP
Upper FLAMMABLE Limit	:8.0
Lower FLAMMABLE Limit	:1.3
Autoignition Temperature	:NOT FOUND ON MSDS
Extinguisher Media	:CO2,FOAM, DRY CHEMICAL. WATER MAY BE INEFFECTIVE.
Special Fire Fighting Procedures	:WEAR SELF-CONTAINED BREATHING APPARATUS WHEN FIGHTING A CHEMICAL FIRE.
Unusual Fire and Explosion Hazards	:VAPORS FORM EXPLOSIVE MIXTURES WITH AIR. MAY REACT WITH OXIDIZING MATERIALS. CONTAINERS MAY EXPLODE UNDER FIRE CONDITIONS. FLASHBACK ALONG VAPOR TRAIL MAY OCCUR.

* * * ACCIDENTAL RELEASE MEASURES - SECTION 6 * * *

Steps to be taken in case material is released or spilled:
TAKE UP WITH ABSORBENT MATERIAL. VENTILATE AREA. ELIMINATE ALL IGNITION SOURCES.

* * * HANDLING & STORAGE - SECTION 7 * * *

Precautions to be taken in handling and storage:
STORAGE AND HANDLING:REFRIGERATE IN SEALED CONTAINER. KEEP AWAY FROM HEAT. KEEP AWAY FROM OXIDIZERS. KEEP AWAY FROM IGNITION SOURCES.

Other Precautions:
REPORTED CANCER HAZARD. AVOID EYE OR SKIN CONTACT. AVOID BREATHING VAPORS.

* * * CONTROL MEASURES - SECTION 8 * * *

*** Personal Protective Equipment ***

Respiratory Protection	:WEAR FACE MASK WITH ORGANIC VAPOR CANISTER.
Protective Gloves	:WEAR PLASTIC GLOVES
Eye Protection	:WEAR PROTECTIVE GLASSES
Other protective clothing or equipment	:N/A
Work/Hygenic Practices	:NOT FOUND ON MSDS
VENTILATION REQUIREMENTS	:USE ONLY IN EXHAUST HOOD.
Local Exhaust	:NOT FOUND ON MSDS
Mechanical (General)	:NOT FOUND ON MSDS
Special Requirements	:N/A
Other Requirements	:NOT FOUND ON MSDS

Additional Information:

* * * PHYSICAL/CHEMICAL CHARACTERISTICS - SECTION 9 * * *

Boiling Point	:80.1C
Melting Point	:5C
Specific Gravity (H2O = 1)	:.8790
Vapor Pressure	:75 mm Hg §68C
Percent Volatiles	:100 VOL
Vapor Density (Air=1)	:N/A
Evaporation Rate	:N/A
Compared To	:NOT FOUND ON MSDS
Water Solubility	:.18
Appearance	:CLEAR COLORLESS LIQUID; GASOLINE-LIKE ODOR

Additional Information:

* * * REACTIVITY DATA - SECTION 10 * * *

WATER REACTIVITY? :NOT FOUND ON MSDS

Is this chemical stable under normal conditions of handling and storage? :STABLE

Conditions to Avoid :N/A

Incompatibility (materials to avoid) :STRONG ACIDS, OXIDIZING AGENTS, FLUORINE, CHLORINE AND BROMINE

Hazardous Decomposition or Byproducts:N/A

Is Hazardous Polymerization Possible?:WILL NOT OCCUR

Conditions to avoid regarding polymerization :N/A

Additional Information:

* * * DISPOSAL CONSIDERATIONS - SECTION 13 * * *

Waste Disposal Methods:
COMPLY WITH ALL APPLICABLE FEDERAL, STATE, OR LOCAL REGULATIONS.

Additional Information:

* * * ADDITIONAL INFORMATION - SECTION 16 * * *

THIS MSDS PREPARED BY	:NOT FOUND ON MSDS
DATE OF PREPARATION FOR THIS MSDS	:03/06/1998 (LAST REVISED)

WHILE THE INFORMATION AND RECOMMENDATIONS SET FORTH HEREIN ARE BELIEVED TO BE ACCURATE AS OF THE DATE HEREOF, SUPELCO, INC. MAKED NO WARRANTY WITH RESPECT THERETO AND DISCLAIMS ALL LIABILITY FROM RELIANCE THEREON.

* * * GENERAL PRODUCT INFORMATION - SECTION 1 * * * MSDS:010715

Trade Product Name	:POTASSIUM CYANIDE
Manufacturer Name	:FISHER SCIENTIFIC
Manufacturer's Address	:1 REAGENT LANE
City	:FAIR LAWN
State	:NJ
ZIP	:07410
Emergency Phone Number	:201-796-7100 GASTON L. PILLORI
Other calls	:201-796-7100
Date MSDS was prepared	:09/05/1985
MSDS prepared by	:Not given on the original MSDS

Additional information:
AUTHORIZED - FISHER SCIENTIFIC GROUP, INC.
CREATION DATE: 01/11/85
REVISION DATE: 09/05/85

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SUBSTANCE: POTASSIUM CYANIDE

TRADE NAMES/SYNONYMS:
HYDROCYANIC ACID, POTASSIUM SALT; CYANIDE OF POTASSIUM; P-225; P-226

CHEMICAL FALMILY: INORGANIC SALT

MOLECULAR FORMULA: K-C-N
MOL WT: 65.12

CERCLA RATINGS (SCALE 0-3):

HEALTH	3
FIRE	0
REACTIVITY	0
PERSISTENCE	0

DATE: 12/25/85
PO NBR: M62446-74
ACCT: 539255-01
INDEX: 14-8534-40371
CAT NO: P226T100

* * * INGREDIENTS INFORMATION - SECTION 2 * * *

** EXPOSURE LIMITS **

INGREDIENT NAME	PEL	TLV
POTASSIUM CYANIDE	5 MG/M3	5 MG/M3

** PERCENTAGES **

	HIGH %	LOW %
POTASSIUM CYANIDE		95

** CAS NUMBERS **

CAS ON MSDS CIMS VERIFIED CAS

POTASSIUM CYANIDE 151-50-8 Not verified

Additional information:
EXPOSURE LIMITS:
5 MG(CN)/M3 OSHA TWA (SKIN)
5 MG(CN)/M3 ACGIH TWA (SKIN)
5 MG(CN)/M3/10 MIN NIOSH RECOMMENDED CEILING

* * * HAZARDS IDENTIFICATION - SECTION 3 * * *

Routes of entry :INHALATION, INGESTION, SKIN, EYES

Signs of exposure :INHALATION: ASPHYXIANT. 50 MG(CN)/M3 IMMEDIATELY DANGEROUS TO LIFE OR HEALTH. LETHAL AMOUNTS OF CYANIDE CAUSE IMMEDIATE HYPOTENSION, BRIGHT PINK SKIN COLOR, SWEATING, COLLAPSE, UNCONSCIOUSNESS AND DEATH FROM RESPIRATORY FAILURE. NASAL IRRITATION MAY OCCUR, BUT THE ODOR OF CYANIDE IS NOT EASILY DETECTED BY ALL INDIVIDUALS. NON-FATAL EXPOSURE MAY CAUSE DIZZINESS, FLUSHING OF THE SKIN, ANXIETY, CONFUSION, DROWSINESS, AND POSSIBLY NAUSEA AND VOMITING, WITH INVOLUNTARY DEFECATION AND URINATION. RESPIRATION MAY BE RAPID AT FIRST, THEN BECOME SLOW AND GASPING. CYANOSIS, PULMONARY EDEMA, COMA AND CONVULSIONS MAY OCCUR. SKIN CONTACT: IRRITANT/ASPHYXIANT. MAY CAUSE IRRITATION. SOLUTIONS ARE CORROSIVE, CONTACT MAY PRODUCE SERIOUS BURNS. MAY BE ABSORBED, CAUSING ASPHYXIA, HYPOTENSION, UNCONSCIOUSNESS, CONVULSIONS AND DEATH. EYE CONTACT: CORROSIVE. MAY CAUSE IRRITANTION. SOLUTIONS ARE CORROSIVE, AND DIRECT EYE CONTACT MAY RESULT IN SERIOUS CORNEAL BURNS AND BLURRED VISION. INGESTION: CORROSIVE/ASPHYXIANT. INGESTION MAY CAUSE SORE THROAT, DYSPHAGIA, AND ABDOMINAL PAIN FROM CORROSIVE ACTION ON THE MUCOUS MEMBRANES. TOXIC AMOUNTS WILL CAUSE RAPID RESPIRATION, HYPOTENSION, CONVULSION, COMA AND DEATH IN 1-15 MINUTES.

Symptoms of over exposure :INHALATION: CYANIDES MAY CAUSE DIZZINESS, WEAKNESS, PULMONARY EDEMA, SORE THROAT, CONJUNCTIVITIS, ANOREXIA, WEIGHT LOSS AND MENTAL DETERIORATION. SKIN CONTACT: REPEATED CONTACT MAY RESULT IN DERMATITIS. EYE CONTACT:; REPEATED OR PROLONGED VAPOR CONTACT MAY PRODUCE CONJUNCTIVITIS.

Medical conditions aggravated :Not given on the original MSDS

Is chemical listed as a carcinogen or potential carcinogen?

National Toxicology Program	IARC Monographs	OSHA
N	N	N

* * * FIRST AID - SECTION 4 * * *

Emergency phone number: 201-796-7100

Inhalation: ADMINISTER ANTIDOTE IMMEDIATELYÜ REMOVE FROM EXPOSURE AREA TO FRESH AIR IMMEDIATELY. IF BREATHING HAS STOPPED, GIVE ARTIFICIAL RESPIRATION. MAINTAIN AIRWAY AND ADMINISTER OXYGEN IF AVAILABLE. KEEP AFFECTED PERSON WARM AND AT REST. GET MEDICAL ATTENTION IMMEDIATELY. (DREISBACH, HANDBOOK OF POISONING, 11TH ED.)

Eye contact: WASH EYES IMMEDIATELY WITH LARGE AMOUNTS OF WATER (APPROXIMATELY 15-20 MINUTES) UNTIL NO EVIDENCE OF CHEMICAL REMAINS. IN PRESENCE OF BURNS, APPLY STERILE BANDAGES WITHOUT MEDICATION. GET MEDICAL ATTENTION IMMEDIATELY.

Skin contact: ADMINISTER ANTIDOTE IMMEDIATELYÜ REMOVE CONTAMINATED CLOTHING AND SHOES IMMEDIATELY. WASH AFFECTED AREA WITH SOAP OR MILD DETERGENT AND LARGE AMOUNTS OF WATER UNTIL NO EVIDENCE OF CHEMICAL REMAINS. IN CASE OF CHEMICAL BURNS, COVER AFFECTED AREA WITH STERILE, DRY DRESSING. BANDAGE SECURELY, BUT NOT TOO TIGHTLY. GET MEDICAL ATTENTION. (DRIESBACH, HANDBOOK OF POISONING, 11TH ED.).

Ingestion: IMMEDIATELY SEND FOR ANTIDOTE (AMYL NITRITE PEARLS), IF BREATHING HAS STOPPED, PERFORM ARTIFICIAL RESPIRATION AND IMMEDIATELY ADMINISTER THE ANTIDOTE BY BREAKING THE AMYL NITRITE PEARL IN A PIECE OF CLOTH AND HOLD LIGHTLY UNDER NOSE FOR 15 SECONDS. REPEAT ABOUT 5TIMES AT ABOUT 15 SECOND INTERVALS. KEEP PERSON WARM AND AT REST. GET MEDICAL ATTENTION AS SOON AS POSSIBLE.

Additional information:
TOXICITY:

2.9 MG/KG ORAL-HUMAN LDLO; 10 MG/KG ORAL-RAT LD50; POSITIVE MUTAGEN (RTECS); CARCINOGEN STATUS: NONE.

POTASSIUM CYANIDE IS A SKIN IRRITANT AND HIGHLY TOXIC, RAPIDLY ACTING CHEMICAL ASPHYXIANT BY ALL ROUTES OF EXPOSURE. MEDICAL CONTROL SHOULD EMPHASIZE THE CARDIOVASCULAR SYSTEM, UPPER RESPIRATORY TRACT, AND SKIN.

* * * FIRE AND EXPLOSION HAZARD - SECTION 5 * * *

Flash Point	:NONCOMBUSTIBLE
Flash Point Method	:Not given on the original MSDS
Upper Explosive Limit	:Not given on the original MSDS
Lower Explosive Limit	:Not given on the original MSDS
Autoignition Temperature	:Not given on the original MSDS
Extinguisher Media	:DRY CHEMICAL, WATER SPRAY OR FOAM (1984 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.3). FOR LARGER FIRES, USE WATER SPRAY, FOG OR ALCOHOL FOAM (1984 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.3).
Special Fire Fighting Procedures	:MOVE CONTAINER FROM FIRE AREA IF POSSIBLE. FIGHT FIRE FROM MAXIMUM DISTANCE. DIKE FIRE CONTROL WATER FOR LATER DISPOSAL. DO NOT SCATTER MATERIAL (1984 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.3). EXTINGUISH USING AGENT INDICATED. USE FLOODING

AMOUNS OF WATER AS A FOG. AVAOID BREATHING DUSTS AND FUMES FROM BURNING MATERIAL; KEEP UPWIND. (BURAU OF EXPLOSIVE, EMERGENCY HANDLING OF HAZARDOUS MATERIALS IN SURFACE TRANSPORTATION, 1981).

Unusual Fire and Explosion Hazards :NONCOMBUSTIBLE, BUT REACTS WITH ACIDS TO READILY RELEASE HIGHLY TOXIC AND HIGHLY FLAMMABLE HYDROGEN CYANIDE GAS.

* * * ACCIDENTAL RELEASE MEASURES - SECTION 6 * * *

Steps to be taken in case material is released or spilled:
SOIL SPILL: DIG A HOLDING AREA SUCH AS PIT, POND OR LAGOON TO CONTAIN LIQUID OR SOLID MATERIAL. COVER SOLIDS WITH A PLASTIC SHEET TO PREVENT DISSOLVING IN RAIN OR FIREFIGHTING WATER. AIR SPILL: AAPPLY WATER SPRAY TO KNOCK DOWN AND REDUCE VAPORS. KNOCK-DOWN WATER IS CORROSIVE AND TOXIC AND SHOULD BE DIKED FOR CONTAINMENT. WATER SPILL: NEUTRALIZE WITH CAUSTIC SODA. ADD CALCIUM HYPOCHLORITE TO SPILL. ADD SUITABLE AGENT TO NEUTRALIZE SPILLED MATERIAL TO pH-7. OCCUPATIONAL SPILL: DO NOT TOUCH-. SPILLED MATERIAL. STOP LEAK IF YOU CAN DO IT WITHOUT RISK. USE WATER SPRAY TO REDUCE VAPORS. FOR SMALL SPILLS, TAKE UP WITH SAND OR OTHER ABSORBENT MATERIAL AND PLACE INTO CONTAINERS FOR LATER DISPOSAL. FOR SMALL DRY SPILLS, WITH A CLEAN SHOVEL PLACE MATERIAL INTO CLEAN, DRY CONTAINERS AND COVER. MOVE CONTAINERS FROM SPILL AREA. FOR LARGER SPILLS, DIKE FAR AHEAD OF SPILL FOR LATER DISPOSAL. KEEP UNNECESSARY PEOPLE AWAY. ISOLATE HAZARD AREA AND DENY ENTRY. VENTILATE CLOSED SPACES BEFORE ENTERING.

* * * HANDLING & STORAGE - SECTION 7 * * *

Precautions to be taken in handling and storage:
MAY BURN BUT DOES NOT IGNITE READILY. CONTAINERS MAY EXPLODE IN HEAT OF FIRE.

Other precautions:
Not given on the original MSDS

* * * CONTROL MEASURES - SECTION 8 * * *

Respiratory protection :SEE SEC X

Protective gloves :EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE GLOVES TO PREVENT CONTACT WITH THIS SUBSTANCE.

Eye protection :EMPLOYEE MUST WEAR SPLASH-PROOF OR DUST-RESISTANT SAFETY GOGGLES TO PREVENT EYE CONTACT WITH THIS SUBSTANCE. WHERE THERE IS ANY POSSIBILITY THAT AN EMPLOYEE'S EYES MAY BE EXPOSED TO THIS SUBSTANCE, THE EMPLOYER SHALL PROVIDE AN EYE-WASH FOUNTAIN WITHIN THE IMMEDIATE WORK AREA FOR EMERGENCY USE.

Other protective clothing or equipment :EMPLOYEE MUST WEAR APPROPRIATE CLOTHING AND EQUIPMENT TO PREVENT ANY POSSIBILITY OF SKIN CONTACT WITH THIS SUBSTANCE.

Work hygenic practices :Not given on the original MSDS

Ventilation requirements :PROVIDE LOCAL EXHAUST VENTILATION OR PROCESS ENCLOSURE TO MEET PERMISSIBLE EXPOSURE LIMITS.

Local exhaust recommended:Not given on the original MSDS

Mechanical :Not given on the original MSDS

Special requirements :Not given on the original MSDS

Other requirements :Not given on the original MSDS

* * * PHYSICAL/CHEMICAL CHARACTERISTICS - SECTION 9 * * *

Boiling point	:2957F/1625C
Melting point	:1175F/635C
Specific gravity	:1.5
Vapor pressure	:Not given on the original MSDS
Percent volatiles	:Not given on the original MSDS
Vapor density (Air=1)	:Not given on the original MSDS
Evaporation rate	:Not given on the original MSDS
Compared to	:Not given on the original MSDS
Water solubility	:72%
Appearance	:WHITE LUMPS OR CRYSTALS WITH A FAINT ODOR OF BITTER ALMONDS WHEN MOIST.

Additional information:
pH: BASIC IN SOLUTION

SOLVENT SOLUBILITY: ALCOHOL, METHYL ALCOHOL, GLYCEROL

* * * REACTIVITY DATA - SECTION 10 * * *

Water reactivity :Not given on the original MSDS

Is this chemical stable under normal conditions of handling and storage? :Y

Conditions to avoid :STABLE UNDER NORMAL CONDITIONS. VIOLENT OR EXPLOSIVE REACTION WITH OXIDIZERS. CONCENTRATED SOLUTIONS ARE STRONGLY BASIC, AND REACT VIOLENTLY WITH ACIDS.

Incompatibility (materials to avoid) :EXPLOSIVE WITH NITROGEN TRICHLORIDE. EXPLODES ON HEATING WITH SODIUM NITRITE, PERCHLORATES, OR PERCHLORYL FLUORIDE § 100-300C. FORMS EXPLOSIVE MIXTURE WITH NITRITES.

Hazardous decomposition products :DECOMPOSES READILY IN ACIDS, EVOLVING HIGHLY TOXIC AND HIGHLY FLAMMABLE HYDROGEN CYANIDE AND TOXIC OXIDES OF NITROGEN.

Is hazardous polymerization possible?:Not specified on MSDS

Conditions to avoid regarding polymerization :REACTS WITH ACIDS TO EVOLVE HYDROGEN CYANIDE, WHICH MAY POLYMERIZE EXPLOSIVELY AT 184 C, ESPECIALLY IN THE PRESENCE OF WATER OR ALKALI.

* * * DISPOSAL CONSIDERATIONS - SECTION 13 * * *

Waste disposal methods:
Not given on the original MSDS

* * * ADDITIONAL INFORMATION - SECTION 16 * * *

This MSDS prepared by :Not given on the original MSDS
Date of preparation for this MSDS :12/25/1985

REVISION DATE: 09/05/85

Additional information:

PROTECTIVE EQUIPMENT

50 PPM: SUPPLIED-AIR RESPIRATOR.
SELF-CONTAINED BREATHING APPARATUS.

ESCAPE: GAS MASK WITH AN ORGANIC VAPOR CANISTER PROVIDING PROTECTION AGAINST CYANIDE (CHIN-STY;E OR FRON- OR BACK-MOUNTED CANISTER).
SELF-CONTAINED BREATHING APPARATUS.

FIREFIGHTING: SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.

N/A = Not applicable
N/E = Not established
N/D = Not determined

Additional information:
AUTHORIZED - FISHER SCIENTIFIC GROUP, INC.

CREATION DATE: 01/11/85
REVISION DATE: 09/05/85

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SUBSTANCE: POTASSIUM CYANIDE

TRADE NAMES/SYNONYMS:
HYDROCYANIC ACID, POTASSIUM SALT; CYANIDE OF POTASSIUM; P-225; P-226

CHEMICAL FALMILY: INORGANIC SALT

MOLECULAR FORMULA: K-C-N
MOL WT: 65.12

CERCLA RATINGS (SCALE 0-3):

HEALTH	3
FIRE	0
REACTIVITY	0
PERSISTENCE	0

DUKE MSDS NUMBER:2545

START_MSDS:

MATERIAL SAFETY DATA SHEET

TOLUENE
23590

SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MSDS NAME: TOLUENE

CATALOG NUMBERS:
S80229, S80229-1, S80229-2, S80229HPLC, S80229SPEC, BPT290RS-115, BPT290RS-200,BPT290RS-28, BPT290RS-50, BW1671006, NC9475555, S802292MF, T289-4, T290 1,T2904, T290-1, T290-4, T2901, T2904, T290J4, T290RS115, T290RS200, T290RS28,T290RS50, T290SK 1, T290SK 4, T290SK-1, T290SK-4, T290SK1, T290SK4,T290SS115,T291 4, T291-4, T2914, T2914LC, T2914LOT009, T2914LOT010, T291J4, T313 4,T313-4, T3134, T313SK 4, T313SK-4, T313SK4, T323 20, T323 4, T323-20, T323-4,T32320, T3234, T324 1, T324 20, T324 200, T324 4, T324 500, T324-1, T324-20, T324-200,T324-4, T324-500, T3241, T32420, T32420 001, T324200, T32420001, T3244,T324500,T324FB115, T324FB19 T324FB200, T324FB50, T324J4, T324RB115, T324RB19,T324RB200,T324RB50, T324RS115, T324RS200, T324RS28, T324RS50, T324S 4, T324S-4,T324S4,T324SK 4, T324SK-4, T324SK4, T324SK4LC, T324SS115, T324SS200, T324SS28,T324SS50, T326S20, T330 4, T330-4, T3304

SYNONYMS: METHACIDE, METHYLBENZENE, METHYLBENZOL, PHENYLMETHANE, TOLUOL.

COMPANY IDENTIFICATION: FISHER SCIENTIFIC
1 REAGENT LANE
FAIRLAWN, NJ 07410

FOR INFORMATION, CALL: 201-796-7100
EMERGENCY NUMBER: 201-796-7100
FOR CHEMTREC ASSISTANCE, CALL: 800-424-9300
FOR INTERNATIONAL CHEMTREC ASSISTANCE, CALL: 703-527-3887

SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS

CAS#	CHEMICAL NAME	%	EINECS#
108-88-3	BENZENE, METHYL-	>99	203-625-9

HAZARD SYMBOLS: XN F
RISK PHRASES: 11 20

SECTION 3 - HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

APPEARANCE: COLOURLESS. FLASH POINT: 40 DEG F.

DANGER! FLAMMABLE LIQUID. MAY CAUSE SKIN IRRITATION. HARMFUL IF INHALED. THIS SUBSTANCE HAS CAUSED ADVERSE REPRODUCTIVE AND FETAL EFFECTS IN ANIMALS. MAY CAUSE CENTRAL NERVOUS SYSTEM DEPRESSION. ASPIRATION HAZARD. MAY BE ABSORBED THROUGH THE SKIN. POISON! MAY CAUSE LIVER AND KIDNEY DAMAGE. CAUSES DIGESTIVE AND RESPIRATORY TRACT IRRITATION. HARMFUL OR FATAL IF SWALLOWED. CAUSES EYE IRRITATION AND POSSIBLE TRANSIENT INJURY.

TARGET ORGANS:

KIDNEYS, CENTRAL NERVOUS SYSTEM, LIVER.

POTENTIAL HEALTH EFFECTS

EYE:
CAUSES EYE IRRITATION. MAY RESULT IN CORNEAL INJURY. VAPORS MAY CAUSE EYE IRRITATION.

SKIN:
MAY CAUSE SKIN IRRITATION. PROLONGED AND/OR REPEATED CONTACT MAY CAUSE IRRITATION AND/OR DERMATITIS. MAY BE ABSORBED THROUGH THE SKIN.

INGESTION:
ASPIRATION HAZARD. MAY CAUSE IRRITATION OF THE DIGESTIVE TRACT. MAY CAUSE EFFECTS SIMILAR TO THOSE FOR INHALATION EXPOSURE. ASPIRATION OF MATERIAL INTO THE LUNGS MAY CAUSE CHEMICAL PNEUMONITIS, WHICH MAY BE FATAL.

INHALATION:
INHALATION OF HIGH CONCENTRATIONS MAY CAUSE CENTRAL NERVOUS SYSTEM EFFECTS CHARACTERIZED BY HEADACHE, DIZZINESS, UNCONSCIOUSNESS AND

COMA. INHALATION OF VAPOR MAY CAUSE RESPIRATORY TRACT IRRITATION. MAY CAUSE LIVER AND KIDNEY DAMAGE. VAPORS MAY CAUSE DIZZINESS OR SUFFOCATION. OVEREXPOSURE MAY CAUSE DIZZINESS, TREMORS, RESTLESSNESS, RAPID HEART BEAT, INCREASED BLOOD PRESSURE, HALLUCINATIONS, ACIDOSIS, KIDNEY FAILURE,

CHRONIC:
PROLONGED OR REPEATED SKIN CONTACT MAY CAUSE DERMATITIS. MAY CAUSE CARDIAC SENSITIZATION AND SEVERE HEART ABNORMALITIES. MAY CAUSE LIVER AND KIDNEY DAMAGE.

SECTION 4 - FIRST AID MEASURES

EYES:
FLUSH EYES WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES, OCCASIONALLY LIFTING THE UPPER AND LOWER LIDS. GET MEDICAL AID IMMEDIATELY.

SKIN:
FLUSH SKIN WITH PLENTY OF SOAP AND WATER FOR AT LEAST 15 MINUTES WHILE REMOVING CONTAMINATED CLOTHING AND SHOES. GET MEDICAL AID IF IRRITATION DEVELOPS OR PERSISTS.

INGESTION:
DO NOT INDUCE VOMITING. IF VICTIM IS CONSCIOUS AND ALERT, GIVE 2-4 CUPFULS OF MILK OR WATER. NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON. POSSIBLE ASPIRATION HAZARD. GET MEDICAL AID IMMEDIATELY.

INHALATION:
GET MEDICAL AID IMMEDIATELY. REMOVE FROM EXPOSURE TO FRESH AIR IMMEDIATELY. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.

NOTES TO PHYSICIAN:
CAUSES CARDIAC SENSITIZATION TO ENDOGENOUS CATELCHOLAMINES WHICH MAY LEAD TO CARDIAC ARRHYTHMIAS. DO NOT USE ADRENERGIC AGENTS SUCH AS EPINEPHRINE OR PSEUDOEPINEPHRINE.

SECTION 5 - FIRE FIGHTING MEASURES

GENERAL INFORMATION:
CONTAINERS CAN BUILD UP PRESSURE IF EXPOSED TO HEAT AND/OR FIRE. AS IN ANY FIRE, WEAR A SELF-CONTAINED BREATHING APPARATUS IN PRESSURE-DEMAND, MSHA/NIOSH (APPROVED OR EQUIVALENT), AND FULL PROTECTIVE GEAR. WATER RUNOFF CAN CAUSE ENVIRONMENTAL DAMAGE. DIKE AND COLLECT WATER

USED TO FIGHT FIRE. VAPORS MAY FORM AN EXPLOSIVE MIXTURE WITH AIR. VAPORS CAN TRAVEL TO A SOURCE OF IGNITION AND FLASH BACK. FLAMMABLE LIQUID. CAN RELEASE VAPORS THAT FORM EXPLOSIVE MIXTURES AT TEMPERATURES ABOVE THE FLASHPOINT. USE WATER SPRAY TO KEEP FIRE-EXPOSED CONTAINERS COOL. WATER MAY BE INEFFECTIVE. MATERIAL IS LIGHTER THAN WATER AND A FIRE MAY BE SPREAD BY THE USE OF WATER. VAPORS MAY BE HEAVIER THAN AIR. THEY CAN SPREAD ALONG THE GROUND AND COLLECT IN LOW OR CONFINED AREAS. CONTAINERS MAY EXPLODE WHEN HEATED.

EXTINGUISHING MEDIA:
USE WATER SPRAY TO COOL FIRE-EXPOSED CONTAINERS. WATER MAY BE INEFFECTIVE. DO NOT USE STRAIGHT STREAMS OF WATER. FOR SMALL FIRES, USE DRY CHEMICAL, CARBON DIOXIDE, WATER SPRAY OR REGULAR FOAM. COOL CONTAINERS WITH FLOODING QUANTITIES OF WATER UNTIL WELL AFTER FIRE IS OUT. FOR LARGE FIRES, USE WATER SPRAY, FOG OR REGULAR FOAM.

AUTOIGNITION TEMPERATURE: 896 DEG F (480.00 DEG C)

FLASH POINT: 40 DEG F (4.44 DEG C)

NFPA RATING: HEALTH-2; FLAMMABILITY-3; REACTIVITY-0

EXPLOSION LIMITS, LOWER: 1.1
UPPER: 7.1

SECTION 6 - ACCIDENTAL RELEASE MEASURES

GENERAL INFORMATION:
USE PROPER PERSONAL PROTECTIVE EQUIPMENT AS INDICATED IN SECTION 8.

SPILLS/LEAKS:
AVOID RUNOFF INTO STORM SEWERS AND DITCHES WHICH LEAD TO WATERWAYS. REMOVE ALL SOURCES OF IGNITION. ABSORB SPILL USING AN ABSORBENT, NON-COMBUSTIBLE MATERIAL SUCH AS EARTH, SAND, OR VERMICULITE. A VAPOR SUPPRESSING FOAM MAY BE USED TO REDUCE VAPORS. WATER SPRAY MAY REDUCE VAPOR BUT MAY NOT PREVENT IGNITION IN CLOSED SPACES.

SECTION 7 - HANDLING AND STORAGE

HANDLING:
WASH THOROUGHLY AFTER HANDLING. USE WITH ADEQUATE VENTILATION. GROUND AND BOND CONTAINERS WHEN TRANSFERRING MATERIAL. AVOID CONTACT WITH EYES, SKIN, AND CLOTHING. EMPTY CONTAINERS RETAIN PRODUCT RESIDUE, (LIQUID AND/OR VAPOR), AND CAN BE DANGEROUS. KEEP CONTAINER TIGHTLY CLOSED. AVOID CONTACT WITH HEAT, SPARKS AND FLAME. AVOID INGESTION AND

INHALATION. DO NOT PRESSURIZE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE EMPTY CONTAINERS TO HEAT, SPARKS OR OPEN FLAMES.

STORAGE:
KEEP AWAY FROM HEAT, SPARKS, AND FLAME. KEEP AWAY FROM SOURCES OF IGNITION. STORE IN A TIGHTLY CLOSED CONTAINER. STORE IN A COOL, DRY, WELL-VENTILATED AREA AWAY FROM INCOMPATIBLE SUBSTANCES.

SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION

ENGINEERING CONTROLS:
USE ADEQUATE GENERAL OR LOCAL EXHAUST VENTILATION TO KEEP AIRBORNE CONCENTRATIONS BELOW THE PERMISSIBLE EXPOSURE LIMITS.

EXPOSURE LIMITS

CHEMICAL NAME	ACGIH FINAL	NIOSH	OSHA - PELS
BENZENE, METHYL-	50 PPM ; 188 MG/M3	100 PPM TWA; 375 MG/M3 TWA 500 PPM IDLH	200 PPM TWA; C 300 PPM; C 300 PPM

OSHA VACATED PELS: BENZENE, METHYL-: 100 PPM TWA; 375 MG/M3 TWA

PERSONAL PROTECTIVE EQUIPMENT

EYES:
WEAR APPROPRIATE PROTECTIVE EYEGLASSES OR CHEMICAL SAFETY GOGGLES AS DESCRIBED BY OSHA'S EYE AND FACE PROTECTION REGULATIONS IN 29 CFR 1910.133.

SKIN:
WEAR APPROPRIATE PROTECTIVE GLOVES TO PREVENT SKIN EXPOSURE.

CLOTHING:
WEAR APPROPRIATE PROTECTIVE CLOTHING TO PREVENT SKIN EXPOSURE.

RESPIRATORS:
FOLLOW THE OSHA RESPIRATOR REGULATIONS FOUND IN 29CFR 1910.134. ALWAYS USE A NIOSH-APPROVED RESPIRATOR WHEN NECESSARY.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE:	LIQUID
APPEARANCE:	COLOURLESS
ODOR:	SWEETISH ODOR - PLEASANT ODOR
PH:	NOT AVAILABLE.
VAPOR PRESSURE:	10 MM HG
VAPOR DENSITY:	3.1 (AIR=1)
EVAPORATION RATE:	2.4 (BUTYL ACETATE=1)
VISCOSITY:	0.59 CP AT 68F.
BOILING POINT:	232 DEG F
FREEZING/MELTING POINT:	-139 DEG F
DECOMPOSITION TEMPERATURE:	NOT AVAILABLE.
SOLUBILITY:	0.6 MG/L H2O AT 68F.
SPECIFIC GRAVITY/DENSITY:	0.9 (WATER=1)
MOLECULAR FORMULA:	C6H5CH3
MOLECULAR WEIGHT:	92.056

SECTION 10 - STABILITY AND REACTIVITY

CHEMICAL STABILITY: STABLE UNDER NORMAL TEMPERATURES AND PRESSURES.

CONDITIONS TO AVOID: INCOMPATIBLE MATERIALS, IGNITION SOURCES, EXCESS HEAT.

INCOMPATIBILITIES WITH OTHER MATERIALS:

NITROGEN TETRAOXIDE, NITRIC ACID + SULFURIC ACID, SILVER PERCHLORATE, STRONG OXIDIZERS, SODIUM DIFLUORIDE, .

HAZARDOUS DECOMPOSITION PRODUCTS: CARBON MONOXIDE, CARBON DIOXIDE.

HAZARDOUS POLYMERIZATION: HAS NOT BEEN REPORTED.

SECTION 11 - TOXICOLOGICAL INFORMATION

RTECS#: CAS# 108-88-3: XS5250000

LD50/LC50:
CAS# 108-88-3: INHALATION, MOUSE: LC50 =400 PPM/24H; INHALATION, RAT: LC50 =49 GM/M3/4H; ORAL, RAT: LD50 = 636 MG/KG; SKIN, RABBIT: LD50 = 12124 MG/KG.

CARCINOGENICITY:
BENZENE, METHYL- -
ACGIH: A4 - NOT CLASSIFIABLE AS A HUMAN CARCINOGEN
IARC: GROUP 3 CARCINOGEN

EPIDEMIOLOGY: NO INFORMATION AVAILABLE.

TERATOGENICITY:
SPECIFIC DEVELOPMENTAL ABNORMALITIES INCLUDED CRANIOFACIAL EFFECTS INVOLVING THE NOSE AND TONGUE, MUSCULOSKELETAL EFFECTS, UROGENITAL AND METABOLIC EFFECTS IN STUDIES ON MICE AND RATS BY THE INHALATION AND ORAL ROUTES OF EXPOSURE. SOME EVIDENCE OF FETOTOXICITY WITH REDUCED FETAL WEIGHT AND RETARDED SKELETAL DEVELOPMENT HAS BEEN REPORTED IN MICE AND RATS.

REPRODUCTIVE EFFECTS: EFFECTS ON FERTILITY SUCH AS ABORTION WERE REPORTED IN RABBITS BY INHALATION. PATERNAL EFFECTS WERE NOTED IN RATS BY INHALATION. THESE EFFECTS INVOLVED THE TESTES, SPERM DUCT AND EPIDIDYMIS.

NEUROTOXICITY:
NO INFORMATION AVAILABLE.

MUTAGENICITY:
NO INFORMATION AVAILABLE.

OTHER STUDIES:
NONE.

SECTION 12 - ECOLOGICAL INFORMATION

ECOTOXICITY:
BLUEGILL LC50=17 MG/L/24H SHRIMP LC50=4.3 PPM/96H FATHEAD MINNOW LC50=36.2
MG/L/96H SUNFISH (FRESH WATER) TLM=1180 MG/L/96H

ENVIRONMENTAL FATE:
FROM SOIL, SUBSTANCE EVAPORATES AND IS MICROBIALLY BIODEGRADED. IN WATER, SUBSTANCE VOLATILIZES AND BIODEGRADES.

PHYSICAL/CHEMICAL:
PHOTOCHEMICALLY PRODUCED HYDROXYL RADICALS DEGRADE SUBSTANCE.

OTHER: NONE.

SECTION 13 - DISPOSAL CONSIDERATIONS

DISPOSE OF IN A MANNER CONSISTENT WITH FEDERAL, STATE, AND LOCAL REGULATIONS. RCRA D-SERIES MAXIMUM CONCENTRATION OF CONTAMINANTS: NONE LISTED. RCRA D-SERIES CHRONIC TOXICITY REFERENCE LEVELS: NONE LISTED. RCRA F-SERIES: NONE LISTED. RCRA P-SERIES: NONE LISTED. RCRA U-SERIES: CAS# 108-88-3: WASTE NUMBER U220. CAS# 108-88-3 IS BANNED FROM LAND DISPOSAL ACCORDING TO RCRA.

SECTION 14 - TRANSPORT INFORMATION

US DOT
SHIPPING NAME: TOLUENE
HAZARD CLASS: 3
UN NUMBER: UN1294
PACKING GROUP: II

IMO
NO INFORMATION AVAILABLE.

IATA
NO INFORMATION AVAILABLE.

RID/ADR
NO INFORMATION AVAILABLE.

CANADIAN TDG
SHIPPING NAME: TOLUENE
HAZARD CLASS: 3(9.2)

UN NUMBER: UN1294
OTHER INFORMATION: FLASHPOINT 4 C

SECTION 15 - REGULATORY INFORMATION

US FEDERAL

TSCA
CAS# 108-88-3 IS LISTED ON THE TSCA INVENTORY.

HEALTH & SAFETY REPORTING LIST
CAS# 108-88-3: EFFECTIVE DATE: OCTOBER 4, 1982; SUNSET DATE: OCTOBER 4

CHEMICAL TEST RULES
NONE OF THE CHEMICALS IN THIS PRODUCT ARE UNDER A CHEMICAL TEST RULE.

SECTION 12B
NONE OF THE CHEMICALS ARE LISTED UNDER TSCA SECTION 12B.

TSCA SIGNIFICANT NEW USE RULE
NONE OF THE CHEMICALS IN THIS MATERIAL HAVE A SNUR UNDER TSCA.

SARA

SECTION 302 (RQ)
FINAL RQ = 1000 POUNDS (454 KG)

SECTION 302 (TPQ)
NONE OF THE CHEMICALS IN THIS PRODUCT HAVE A TPQ.

SARA CODES
CAS # 108-88-3: ACUTE, FLAMMABLE.

SECTION 313
THIS MATERIAL CONTAINS BENZENE, METHYL- (CAS# 108-88-3, >99%),WHICH IS SUBJECT TO THE REPORTING REQUIREMENTS OF SECTION 313 OF SARA TITLE III AND 40 CFR PART 373.

CLEAN AIR ACT:

CAS# 108-88-3 IS LISTED AS A HAZARDOUS AIR POLLUTANT (HAP).
THIS MATERIAL DOES NOT CONTAIN ANY CLASS 1 OZONE DEPLETORS.
THIS MATERIAL DOES NOT CONTAIN ANY CLASS 2 OZONE DEPLETORS.

CLEAN WATER ACT:

CAS# 108-88-3 IS LISTED AS A HAZARDOUS SUBSTANCE UNDER THE CWA. CAS# 108-88-3 IS LISTED AS A PRIORITY POLLUTANT UNDER THE CLEAN WATER ACT. CAS# 108-88-3 IS LISTED AS A TOXIC POLLUTANT UNDER THE CLEAN WATER ACT.

OSHA:
NONE OF THE CHEMICALS IN THIS PRODUCT ARE CONSIDERED HIGHLY HAZARDOUS BY OSHA.

STATE
BENZENE, METHYL- CAN BE FOUND ON THE FOLLOWING STATE RIGHT TO KNOW LISTS:
CALIFORNIA, NEW JERSEY, FLORIDA, PENNSYLVANIA, MINNESOTA, MASSACHUSETTS.

WARNING:
THIS PRODUCT CONTAINS BENZENE, METHYL-, A CHEMICAL KNOWN TO THE STATE OF CALIFORNIA TO CAUSE BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM.

CALIFORNIA NO SIGNIFICANT RISK LEVEL:
NONE OF THE CHEMICALS IN THIS PRODUCT ARE LISTED.

EUROPEAN/INTERNATIONAL REGULATIONS
EUROPEAN LABELING IN ACCORDANCE WITH EC DIRECTIVES
HAZARD SYMBOLS: XN F

RISK PHRASES:
R 11 HIGHLY FLAMMABLE.
R 20 HARMFUL BY INHALATION.

SAFETY PHRASES:
S 16 KEEP AWAY FROM SOURCES OF IGNITION - NO SMOKING.
S 25 AVOID CONTACT WITH EYES.
S 29 DO NOT EMPTY INTO DRAINS.
S 33 TAKE PRECAUTIONARY MEASURES AGAINST STATIC DISCHARGES.

WGK (WATER DANGER/PROTECTION) CAS# 108-88-3: 2

CANADA
CAS# 108-88-3 IS LISTED ON CANADA'S DSL/NDSL LIST.
THIS PRODUCT HAS A WHMIS CLASSIFICATION OF B2, D2B.
CAS# 108-88-3 IS NOT LISTED ON CANADA'S INGREDIENT DISCLOSURE LIST.

EXPOSURE LIMITS

CAS# 108-88-3:.
OEL-AUSTRALIA:TWA 100 PPM (375 MG/M3);STEL 150 PPM (560 MG/M3).
OEL-BELGIUM:TWA 100 PPM (377 MG/M3);STEL 150 PPM (565 MG/M3).
OEL-CZECHOSLOVAKIA:TWA 200 MG/M3;STEL 1000 MG/M3.
OEL-DENMARK:TWA 50 PPM (190 MG/M3);SKIN.
OEL-FINLAND:TWA 100 PPM (375 MG/M3);STEL 150 PPM;SKIN.
OEL-FRANCE:TWA 100 PPM (375 MG/M3);STEL 150 PPM (560 MG/M3).
OEL-GERMANY:TWA 100 PPM (380 MG/M3).
OEL-HUNGARY:TWA 100 MG/M3;STEL 300 MG/M3;SKIN.
OEL-JAPAN:TWA 100 PPM (380 MG/M3).
OEL-THE NETHERLANDS:TWA 100 PPM (375 MG/M3);SKIN.
OEL-THE PHILIPPINES:TWA 100 PPM (375 MG/M3).
OEL-POLAND:TWA 100 MG/M3.
OEL-RUSSIA:TWA 100 PPM;STEL 50 MG/M3
OEL-SWEDEN:TWA 50 PPM (200 MG/M3);STEL 100 PPM (400 MG/M3);SKIN.
OEL-SWITZERLAND:TWA 100 PPM (380 MG/M3);STEL 500 PPM.
OEL-THAILAND:TWA 200 PPM;STEL 300 PPM.
OEL-TURKEY:TWA 200 PPM (750 MG/M3).
OEL-UNITED KINGDOM:TWA 100 PPM (375 MG/M3);STEL 150 PPM;SKIN.
OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA CHECK ACGIH TLV.
OEL IN NEW ZEALAND, SINGAPORE, VIETNAM CHECK ACGIH TLV.

SECTION 16 - ADDITIONAL INFORMATION

MSDS CREATION DATE: 1/04/1995 REVISION #24 DATE: 12/12/1997

THE INFORMATION ABOVE IS BELIEVED TO BE ACCURATE AND REPRESENTS THE BEST INFORMATION CURRENTLY AVAILABLE TO US. HOWEVER, WE MAKE NO WARRANTY OF MERCHANTABILITY OR ANY OTHER WARRANTY, EXPRESS OR IMPLIED, WITH RESPECT TO SUCH INFORMATION, AND WE ASSUME NO LIABILITY RESULTING FROM ITS USE. USERS SHOULD MAKE THEIR OWN INVESTIGATIONS TO DETERMINE THE SUITABILITY OF THE INFORMATION FOR THEIR PARTICULAR PURPOSES. IN NO WAY SHALL FISHER BE LIABLE FOR ANY CLAIMS, LOSSES, OR DAMAGES OF ANY THIRD PARTY OR FOR LOST PROFITS OR ANY SPECIAL, INDIRECT, INCIDENTAL, CONSEQUENTIAL OR EXEMPLARY DAMAGES, HOWSOEVER ARISING, EVEN IF FISHER HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

* * * GENERAL PRODUCT INFORMATION - SECTION 1 * * * MSDS:010933

Trade Product Name	:1,1,1-TRICHLOROETHANE
Synonyms	:ALPHA-TRICHLOROETHANE; CHLOROTHENE; AEROTHENE TT; ETHYLIDINE CHLORIDE; METHYL-TRICHLOROMETHANE; METHYLCHLOROFORM; TRICHLOROMETHYL-METHANE; TRICHLOROETHANE; STCC 4941176; RCRA U226; UN 2831; T-391; T-398; C2H3CL3; ACC14370
Manufacturer Name	:FISHER SCIENTIFIC
Manufacturer's Address	:1 REAGENT LANE/CHEMICAL DIVISION
City	:FAIR LAWN
State	:NJ
ZIP	:07410
Emergency Phone Number	:201-796-7100; 800-424-9300 (CHEMTREC)
Other calls	:201-796-7100
Date MSDS was prepared	:10/10/90 (REVISION DATE)
MSDS PREPARED BY	:AUTHORIZED - FISHER SCIENTIFIC, INC.

Additional information:

CREATION DATE: 10/25/1984

DATE: 11/20/90 ACCT: 539255-01
INDEX: N/A CAT NO: 73911 PO NBR: N/A
CHEMICAL FAMILY: HALOGEN COMPOUND, ALIPHATIC
MOLECULAR FORMULA: C2-H3-CL3
MOLECULAR WEIGHT: 133.40
CERCLA RATINGS (SCALE 0- 3):
HEALTH - 3, FIRE - 1, REACTIVITY - 0, PERSISTENCE - 3
N F P A RATINGS (SCALE 0-4):
HEALTH - 3, FIRE - 1, REACTIVITY - 0

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* * * INGREDIENTS INFORMATION - SECTION 2 * * *

** EXPOSURE LIMITS **

INGREDIENT NAME	PEL	TLV
1,1,1-TRICHLOROETHANE	See Below	See Below
1,4 DIOXANE	See Below	See Below
1,2-BUTYLENE OXIDE	NOT FOUND	NOT FOUND
NITROMETHANE	NOT FOUND	NOT FOUND

** PERCENTAGES **

	HIGH %	LOW %
1,1,1-TRICHLOROETHANE	96.50	
1,4 DIOXANE	2.5	
1,2-BUTYLENE OXIDE	0.47	
NITROMETHANE	0.34	

** CAS NUMBERS **

	CAS ON MSDS	CIMS VERIFIED CAS
1,1,1-TRICHLOROETHANE	71-55-6	Not verified
1,4 DIOXANE	123-91-1	Not verified

1,2-BUTYLENE OXIDE	106-88-7	Not verified
NITROMETHANE	75-52-5	Not verified

Additional information:

OTHER CONTAMINANTS: NONE

EXPOSURE LIMITS:
METHYL CHLOROFORM (1,1,1-TRICHLOROMETHANE):
350 PPM (1900 MG/M3) OSHA TWA; 450 PPM (2450 MG/M3) OSHA STEL
350 PPM (1900 MG/M3) ACGIH TWA; 450 PPM (2450 MG/M3) ACGIH STEL
350 PPM NIOSH RECOMMENDED 15 MINUTE CEILING

1000 POUNDS CERCLA SECTION 103 REPORTABLE QUANTITY
SUBJECT TO SARA SECTION 313 ANNUAL TOXIC CHEMICAL RELEASE REPORTING

1,4-DIOXANE:
25 PPM (90 MG/M3) OSHA TWA (SKIN)
25 PPM (90 MG/M3) ACGIH TWA (SKIN)
1 PPM NIOSH RECOMMENDED 30 MINUTE CEILING

100 POUND CERCLA SECTION 103 REPORTABLE QUANTITY
SUBJECT TO SARA SECTION 313 ANNUAL TOXIC CHEMICAL RELEASE REPORTING
SUBJECT TO CALIFORNIA PROPOSITION 65 CANCER AND/OR REPRODUCTIVE TOXICITY WARNING & RELEASE REQUIREMENTS - (JANUARY 1, 1988)

THIS SUBSTANCE IS SUBJECT TO CALIFORNIA PROPOSITION 65 CANCER AND/OR REPRODUCTIVE TOXICITY WARNING AND RELEASE REQUIREMENTS.

* * * HAZARDS IDENTIFICATION - SECTION 3 * * *

Routes of entry :THIS SECTION NOT FOUND ON MSDS. REFER TO SECTIONS BELOW.

Signs of exposure :INHALATION:
METHYL CHLOROFORM (1,1,1-TRICHLOROETHANE):
IRRITANT/NARCOTIC 1000 PPM IMMEDIATELY DANGEROUS TO LIFE OR HEALTH.
ACUTE EXPOSURE - EXPOSURE TO 500 PPM FOR 60 MINUTES SHOULD CAUSE NO EFFECT EXCEPT FOR A DISTINCTIVE ODOR WHILE 900-1000 PPM FOR 20 MINUTES MAY CAUSE MILD RESPIRATORY TRACT IRRITATION AND PROMPT BUT MINIMAL IMPAIRMENT OF EQUILIBRIUM WHICH MAY BE ACCOMPOUNIED BY HEADACHE, LASSITUDE AND ATAXIA. IMPAIRED PERFORMANCE OF BEHAVIORAL TESTS WAS ALSO REPORTED AT 1000 PPM. HIGHER LEVELS OF 2000 - 5000 PPM MAY CAUSE INCOORDINATION, ANESTHESIA, LOSS OF CONSCIOUSNESS, COMA & DEATH. EXCESSIVE CONCENTRATIONS OF 10,000 PPM MAY CAUSE DEATH DUE TO RESPIRATORY OR CARDIAC FAILURE. CARDIAC SENSITIZATION MAY BE A CONTRIBUTING FACTOR. OTHER EFFECTS MAY INCLUDE NAUSEA VOMITING, DROWSINESS, CONVULSIONS, FALL OF BLOOD PRESSURE, LIVER AND KIDNEY DAMAGE, BRADYCARDIA AND BLOOD CLOTTING CHANGES.
1,4-DIOXANE:
IRRITANT/NARCOTIC/HEPATOTOXIN/NEPHROTOXIN.
ACUTE EXPOSURE - MAY BE IRRITATING TO THE NOSE, THROAT & RESPIRATORY TRACT AT 220 PPM. THIS COMPOUND HAS POOR WARNING PROPERTIES & CAN BE INHALED IN AMOUNTS THAT MAY CAUSE SERIOUS SYSTEMIC INJURY. SYMPTOMS OF SYSTEMIC TOXICITY MAY INCLUDE HEADACHE, VERTIGO, DROWSINESS, DYSPNEA, NAUSEA, & VOMITING. INHALATION CAUSED INCREASED

SALIVATION, LACRIMATION, NARCOSIS, BEHAVIORAL CHANGES, & DEATH IN ANIMALS. AUTOPSY REVEALED LUNG, LIVER & KIDNEY DAMAGE, CONGESTION & EDEMA OF THE LUNGS, AND INCREASED BLOOD COUNTS.

SKIN CONTACT:
METHYL CHLOROFORM (1,1,1-TRICHLOROETHANE):
IRRITANT.
ACUTE EXPOSURE - DIRECT CONTACT MAY CAUSE IRRITATION AND REDNESS. VAPORS ARE POORLY ABSORBED BUT THE LIQUID, ESPECIALLY IF CONFINED UNDER AN IMPERMEABLE BARRIER MAY BE ABSORBED TO SOME EXTENT. THIS ALONE IS UNLIKELY TO RESULT IN TOXIC EFFECTS, BUT MAY ADD TO THE EFFECTS OF INHALATION EXPOSURE.
1,4-DIOXANE:
IRRITANT/NARCOTIC/HEPATOTOXIN/NEPHROTOXIN.
ACUTE EXPOSURE - MAY CAUSE IRRITATION WITH REDNESS & PAIN. ALLERGIC CONTACT DERMATITIS HAS BEEN REPORTED. SKIN ABSORPTION MAY OCCUR & CAUSE HEAD ACHE, NAUSEA & VOMITING. SKIN ABSORPTION PRODUCED SIGNS OF UNSTEADINESS, INCOORDINATION, NARCISOS, ERYTHEMA, AND LIVER & KIDNEY DAMAGE IN ANIMALS.

EYE CONTACT:
METHYL CHLOROFORM (1,1,1-TRICHLOROETHANE):
IRRITANT.
ACUTE EXPOSURE - EXPOSURE TO 500 PPM MAY CAUSE IRRITATION & REDNESS. DIRECT CONTACT WITH THE LIQUID MAY CAUSE TEMPORARY INJURY WITH COMPLETE RECOVERY EXPECTED IN 48 HRS. DIRECT APPLICATION TO THE EYES OF RABBITS HAS CAUSED CONJUNCTIVAL IRRITATION, BUT NO CORNEAL DAMAGE.
1,4-DIOXANE:
IRRITANT.
ACUTE EXPOSURE - VAPORS MAY CAUSE IRRITATION AT CONCENTRATIONS ABOVE 220 PPM. APPLICATION TO RABBIT EYES CAUSED TRANSIENT CORNEAL INJURY.

INGESTION:
METHYL CHLOROFORM (1,1,1-TRICHLOROETHANE):
NARCOTIC.
ACUTE EXPOSURE - MAY CAUSE NAUSEA, VOMITING, DIARRHEA, GASTROINTESTINAL DISTURBANCES & ABDOMINAL PAIN FOLLOWED BY CENTRAL NERVOUS SYSTEM DEPRESSION & UNCONSCIOUSNESS. DEATH MAY OCCUR FROM CHRONIC RESPIRATORY FAILURE. OTHER SYMPTOMS AS DESCRIBED IN ACUTE INHALATION MAY ALSO OCCUR. MYOCARDIAL SENSITIZATION TO EPINEPHRINE AND SUBSEQUENT DEATH DUE TO CARDIAC ARREST MAY OCCUR. ASPIRATION MAY RESULT IN PULMONARY EDEMA OR CHEMICAL PNEUMONITIS.
1,4-DIOXANE:
NARCOTIC/HEPATOTOXIN/NEPHROTOXIN/CARCINOGEN.
ACUTE EXPOSURE - MAY CAUSE LIGHT BURNING SENSATION ON CONTACT WITH ORAL MUCOUS MEMBRANES. LARGE DOSES RESULTED IN WEAKNESS, INCOORDINATION, DEPRESSION, COMA & DEATH IN ANIMALS. AUTOPSY REVEALED HEMORHAGIC AREAS IN THE PYLORIC REGION OF THE STOMACH, BLADDERS DISTENDED WITH URINE, SLIGHT PROTEINURIA & ENLARGED KIDNEYS. ASPIRATION MAY RESULT IN PNEUMONIA.

Symptoms of over exposure

:INHALATION:
METHYL CHLOROFORM (1,1,1-TRICHLOROETHANE):
CHRONIC EXPOSURE - NO ADVERSE EFFECTS RELATED TO EXPOSURE WHERE REPORTED IN VOLUNTEERS EXPOSED TO 500 PPM FOR 7 HRS A DAY FOR 5 DAYS, OR IN WORKERS EXPOSED TO 200 PPM FOR SEVERAL MONTHS TO 6 YEARS. EXPOSURE OF ANIMALS FOR 3 MONTHS AT CONCENTRATIONS FROM 1000 TO 10,000 PPM CAUSED SYMPTOMS OF CENTRAL NERVOUS SYSTEM DEPRESSION & SOME PATHOLOGICAL CHANGES IN THE LIVERS & LUNGS OF SOME SPECIES. REPRODUCTIVE EFFECTS HAVE BEEN REPORTED IN ANIMALS.
1,4-DIOXANE:
CHRONIC EXPOSURE - REPEATED EXPOSURE CAUSED MUCOUS MEMBRANE IRRITATION, DYSPNEA, HEADACHE, VERTIGO, LOSS OF APPETITE, NAUSEA & VOMITING, PAIN & TENDERNESS IN THE ABDOMEN & LUMBAR REGION DROWSINESS, MALAISE, LIVER ENLARGEMENT & DAMAGE, OLIGURIA, ANURIA, COMA, & DEATH FROM ACUTE RENAL FAILURE. AUTOPSIES REVEALED LUNG & BRAIN CONGESTION. CENTRAL NERVOUS SYSTEM DAMAGE, LIVER NECROSIS, LEUKOCYTOSIS, & BRONCHOPNEUMONIA.

SKIN CONTACT:
METHYL CHLOROFORM (1,1,1-TRICHLOROETHANE):
CHRONIC EXPOSURE - REPEATED SKIN CONTACT MAY PRODUCE A DRY, SCALY, FISSURED DERMATITIS DUE TO THE REPORTING PROPERTIES OF THE LIQUID, AND POSSIBLY BURNS.
1,4-DIOXANE:
CHRONIC EXPOSURE - PROLONGED OR REPEATED CONTACT MAY CAUSE DRYING & CRACKING OF THE SKIN, DERMATITIS, & ECZEMA. SKIN ABSORPTION MAY HAVE CONTRIBUTED TO THE DEATH OF A WORKER FOLLOWING SKIN AND INHALATION EXPOSURE FOR ONE WEEK. ANIMAL STUDIES INCIDATE REPEATED SKIN APPLICATION MAY RESULT IN LIVER & KIDNEY DAMAGE. TUMOR PROMOTER ACTIVITY HAS BEEN REPORTED IN MICE.

EYE CONTACT;
METHYL CHLOROFORM (1,1,1-TRICHLOROETHANE):
CHRONIC EXPOSURE - REPEATED OR PROLONGED CONTACT MAY CAUSE CONJUNCTIVITIS.
1,4-DIOXANE:
CHRONIC EXPOSURE - REPEATED OR PROLONGED EXPOSURE MAY RESULT IN CONJUNCTIVITIS.

INGESTION:
METHYL CHLOROFORM (1,1,1-TRICHLOROETHANE):
CHRONIC EXPOSURE - REPRODUCTIVE EFFECTS HAVE BEEN REPORTED IN ANIMALS.
1,4-DIOXANE:
CHONIC EXPOSURE - IN ANIMAL FEEDING STUDIES, THIS COMPOUND PRODUCED LIVER & KIDNEY DEGENERATION & NECROSIS. ULCERATION OF THE STOMACH, HEPATOMAS, CARCINOMA OF THE NASAL CAVITY, CARCINOMA OF THE KIDNEY PELVIS, LEUKEMIA, LYMPHOSARCOMA, CHOLANGIOMAS, GALL BLADDER CARCINOMAS, AND TUMORS OF THE LUNG. REPRODUCTIVE EFFECTS HAVE BEEN REPORTED IN ANIMALS.

Medical conditions aggravated

:AT INCREASED RISK FROM EXPOSURE: PERSONS WITH

PRE-EXISTING SKIN DISORDERS.
AT INCREASED RISK FROM EXPOSURE: PERSONS WITH PRE-EXISTING LIVER, KIDNEY, PULMONARY OR SKIN DISORDERS.

Is chemical listed as a carcinogen or potential carcinogen?

National Toxicology Program	IARC Monographs	OSHA
SEE BELOW *	SEE BELOW *	SEE BELOW *

* * * FIRST AID - SECTION 4 * * *

Emergency phone number: 201-796-7100; 800-424-9300 (CHEMTREC)

Inhalation: REMOVE FROM EXPOSURE AREA TO FRESH AIR IMMEDIATELY. IF BREATHING HAS STOPPED, PERFORM ARTIFICIAL RESPIRATION. KEEP PERSON WARM AND AT REST. DO NOT GIVE EPINEPHRINE OR OTHER STIMULANTS THAT MAY CAUSE VENTRICULAR ARRHYTHMIAS. (DREISBACH, HANDBOOK OF POISONING, 11TH ED.). GET MEDICAL ATTENTION IMMEDIATELY.

Eye contact: WASH EYES IMMEDIATELY WITH LARGE AMOUNTS OF WATER OR NORMAL SALINE, OCCASIONALLY LIFTING UPPER AND LOWER LIDS, UNTIL NO EVIDENCE OF CHEMICAL REMAINS (APPROXIMATELY 15-20 MINUTES). GET MEDICAL ATTENTION IMMEDIATELY.

Skin contact: REMOVE CONTAMINATED CLOTHING AND SHOES IMMEDIATELY. WASH AFFECTED AREA WITH SOAP OR MILD DETERGENT AND LARGE AMOUNTS OF WATER UNTIL NO EVIDENCE OF CHEMICAL REMAINS (APPROXIMATELY 15-20 MINUTES). GET MEDICAL ATTENTION IMMEDIATELY.

Ingestion: TREAT SYMPTOMATICALLY AND SUPPORTIVELY. GET MEDICAL ATTENTION AND ADVICE ON WHETHER TO USE GASTRIC LAVAGE. EXTREME CARE MUST BE TAKEN TO PREVENT ASPIRATION. A CUFFED ENDOTRACHEAL TUBE USED BY QUALIFIED MEDICAL PERSONNEL MIGHT BE ADVISABLE. KEEP HEAD LOWER THAN HIPS TO PREVENT ASPIRATION SHOULD VOMITING OCCUR.

Additional information:

TOXICITY

METHYL CHLOROFORM (1,1,1-TRICHLOROETHANE):
IRRITATION DATA: 450 PPM/8 HOURS EYE-MAN; 5 GM/12 DAYS INTERMITTENT SKIN-RABBIT MILD; 20 MG/24 HOURS SKIN-RABBIT MODERATE; 100 MG EYE-RABBIT MILD; 2 MG/24 HOURS EYE-RABBIT SEVERE.
TOXICITY DATA: 27 GM/M3/10 MINUTES INHALATION-MAN LCLO; 350 PPM INHALATION-MAN TCLO; 200 PPM/4 HOURS INHALATION-MAN TCLO; 920 PPM/70 MINUTES INHALATION-HUMAN TCLO; 18000 PPM/4 HOURS INHALATION-RAT LC50; 3911 PPM/2 HOURS INHALATION-MOUSE LC50; 24400 MG/M3 INHALATION-CAT LC50; 1 GM/KG SKIN-RABBIT LDLO; 670 MG/KG ORAL-HUMAN TDLO; 10300 MG/KG ORAL-RAT LD50; 11240 MG/KG ORAL-MOUSE LD50; 5660 MG/KG ORAL-RABBIT LD50; 9470 MG/KG ORAL-GUINEA PIG LD50; 750 MG/KG ORAL-DOG LD50; 16 GM/KG SUBCUTANEOUS-MOUSE LD50; 500 MG/KG SUBCUTANEOUS-RABBIT LDLO; 95 MG/KG INTRAVENOUS-DOG LDLO; 3593 MG/KG INTRAPERITONEAL-RAT LD50; 3636 MG/KG INTRAPERITONEAL-MOUSE LD50; 3100 MG/KG INTRAPERITONEAL-DOG LD50; 15800 MG/KG SKIN-RABBIT LD50 (EPA-600/8-82-003F, 1984); MUTAGENIC DATA (RTECS); REPRODUCTIVE EFFECTS DATA (RTECS).
* CARCINOGEN STATUS: ANIMAL INADEQUATE EVIDENCE (IARC GROUP-3)

LOCAL EFFECTS: IRRITANT - INHALATION, SKIN, EYE.
ACUTE TOXICITY LEVEL: SLIGHTLY TOXIC BY INHALATION, DERMAL ABSORPTION AND INGESTION.
TARGET EFFECTS: CENTRAL NERVOUS SYSTEM DEPRESSANT. POISONING MAY ALSO AFFECT THE HEART AND POSSIBLY LIVER AND KIDNEYS.
AT INCREASED RISK FROM EXPOSURE: PERSONS WITH PRE-EXISTING SKIN DISORDERS. LIVER DISEASE OR CARDIOVASCULAR DISEASE.
ADDITIONAL DATA: ALCOHOL MAY POTENTIATE BOTH CARDIAC AND HEPATIC TOXICITY. EPINEPHRINE OR OTHER STIMULANTS MAY INDUCE VENTRICLULAR ARRHYTHMIAS.

1,4-DIOXANE:
IRRITATION DATA: 515 MG OPEN SKIN-RABBIT MILD; 300 PPM/15 MINUTES EYE-HUMAN; 21 MG EYE-RABBIT; 100 MG/24 HOURS EYE-RABBIT MODERATE; 10 UG EYE-GUINEA PIG MODERATE.
TOXICITY DATA: 470 PPM INHALATION-HUMAN TCLO; 5500 PPM/1 MINUTE INHALATION-HUMAN TCLO; 470 PPM/3 DAYS INHALATION-HUMAN LCLO; 46 GM/M3/2 HOURS INHALATION-RAT LC50; 37 GM/M3/2 HOURS INHALATION-MOUSE LC50; 44 GM/M3/7 HOURS INHALATION-CAT LCLO; 20500 MG/M3 INHALATION-MAMMAL LC50; 7600 MG/KG SKIN-RABBIT LD50; 2000 MG/KG ORAL-RABBIT LD50; 5700 MG/KG ORAL-MOUSE LD50; 2000 MG/KG ORAL-CAT LD50; 3150 MG/KG ORAL-GUINEA PIG LD50; 1500 MG/KG INTRAVENOUS-RABBIT LDLO; 799 INTRAPERITONEAL-RAT LD50; MUTAGENIC DATA (RTECS); REPRODUCTIVE EFFECTS DATA (RTECS); TUMORIGENIC DATA (RTECS).
* CARCINOGEN STATUS: ANTICIPATED HUMAN CARCINOGEN (NTP); HUMAN INADEQUATE EVIDENCE, ANIMAL SUFFICIENT EVIDENCE (IARC CLASS-2B). ORAL ADMINISTRATION PRODUCED ADENOMAS & CARCINOMAS IN THE LIVER & CARCINOMAS OF THE NASAL CAVITY IN RATS & HEPATOMAS & CARCINOMAS OF THE GALL BLADDER IN GUINEA PIGS.
LOCAL EFFECTS: IRRITATION - INHALATION, SKIN, EYES.
ACUTE TOXICITY LEVEL: TOXIC BY INHALATION; SLIGHTLY TOXIC BY SKIN CONTACT AND INGESTION.
TARGET EFFECTS: HEPATOTOXIN; CENTRAL NERVOUS SYSTEM DEPRESSANT; NEPROTOXIN. POISONING MAY AFFECT THE BRAIN.
AT INCREASED RISK FROM EXPOSURE: PERSONS WITH PRE-EXISTING LIVER, KIDNEY, PULMONARY OR SKIN DISORDERS.
ADDITIONAL DATA: ALCOHOL MAY ENHANCE THE TOXIC EFFECTS.

ANTIDOTE:
NO SPECIFIC ANTIDOTE. TREAT SYMPTOMATICALLY AND SUPPORTIVELY.

* * * FIRE AND EXPLOSION HAZARD - SECTION 5 * * *

Flash Point	:NONE
Flash Point Method	:NOT FOUND ON MSDS
Upper Explosive Limit	:12.5
Lower Explosive Limit	:7.5
Autoignition Temperature	:998F/537C
Extinguisher Media	:DRY CHEMICAL, OR CARBON DIOXIDE (1990 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.5) FOR LARGER FIRES, USE WATER SPRAY, FOG OR REGULAR FOAM (1990 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.5)
Special Fire Fighting Procedures	:APPLY COOLING WATER TO SIDES OF CONTAINERS THAT ARE EXPOSED TO FLAMES UNTIL WELL AFTER FIRE IS OUT. STAY AWAY FROM ENDS OF TANKS. ISOLATE FOR 1/2 MILE IN ALL DIRECTIONS IF TANK, RAIL CAR OR TANK TRUCK IS INVOLVED IN FIRE (1990 EMERGENCY RESPONSE GUIDEBOOK DOT P 5800.5, GUIDE PAGE 74).

USE AGENTS SUITABLE FOR TYPE OF SURROUNDING FIRE. AVOID BREATHING HAZARDOUS VAPORS; KEEP UPWIND.

Unusual Fire and Explosion Hazards :SLIGHT FIRE HAZARD WHEN EXPOSED TO HEAT OR FLAME.
THIS MATERIAL IS NEARLY NON-FLAMMABLE. HIGH ENERGY, SUCH AS AN ELECTRIC ARC, IS NEEDED FOR IGNITION, AND THE FLAME TENDS TO GO OUT WHEN THE IGNITION SOURCE IS REMOVED.

Additional information:

* * * ACCIDENTAL RELEASE MEASURES - SECTION 6 * * *

Steps to be taken in case material is released or spilled:

SOIL SPILL:

DIG A PIT, POND, LAGOON OR HOLDING AREA TO CONTAIN LIQUID OR SOLID MATERIAL. DIKE SURFACE FLOW USING SOIL, SANDBAGS, FOAMED POLYURETHANE OR FOAMED CONCRETE. ABSORB BULK LIQUID WITH FLY ASH OR CEMENT POWDER.

WATER SPILL:

NATURAL BARRIERS OR OIL SPILL CONTROL. BOONS SHOULD BE USED TO LIMIT SPILL TRAVEL.
NATURAL DEEP WATER POCKETS, EXCAVATED LAGOONS, OR SAND BAG BARRIERS SHOULD BE USED TO TRAP MATERIAL AT BOTTOM.
SUCTION HOSES SHOULD BE USED TO REMOVE TRAPPED MATERIAL.

THE CALIFORNIA SAFE DRINKING WATER & TOXIC ENFORCEMENT ACT OF 1986 (PROPOSITION 65) PROHIBITS CONTAMINATING ANY KNOWN SOURCE OF DRINKING WATER WITH SUBSTANCES KNOWN TO CAUSE CANCER AND/OR REPRODUCTIVE TOXICITY.

OCCUPATIONAL SPILL:

SHUT OFF IGNITION SOURCES. STOP LEAK IF YOU CAN DO IT WITHOUT RISK. FOR SMALL LIQUID SPILLS, TAKE UP WITH SAND, EARTH OR OTHER ABSORBENT MATERIAL. FOR LARGER SPILLS, DIKE FAR AHEAD OF SPILL FOR LATER DISPOSAL. NO SMOKING, FLAMES OR FLARES IN HAZARD AREAÜ KEEP UNNECESSARY PEOPLE AWAY.

* * * HANDLING & STORAGE - SECTION 7 * * *

Precautions to be taken in handling and storage:

STORE IN A COOL, DRY, WELL-VENTILATED LOCATION, AWAY FROM ANY AREA WHERE THE FIRE HAZARD MAY BE ACUTE (NFPA 49, HAZARDOUS CHEMICALS DATA, 1975). STORE AWAY FROM INCOMPATIBLE SUBSTANCES.

Other precautions:

NOT FOUND ON MSDS

* * * CONTROL MEASURES - SECTION 8 * * *

Respiratory protection :RESPIRATOR:

THE FOLLOWING RESPIRATORS AND MAXIMUM USE CONCENTRATIONS ARE RECOMMENDATINOS BY THE U.S. DEPARTMENT OF HEALTH & HUMAN SERVICES, NIOSH POCKET GUIDE TO CHEMICAL HAZARDS; NIOSH CRITERIA DOCUMENTS OR BY THE U.S. DEPARTMENT OF LABOR, 29 CFR 1910, SUBPART Z.

THE SPECIFIC RESPIRATOR SELECTED MUST BE BASED ON CONTAMINATION LEVELS FOUND IN THE WORKPLACE, MUST NOT EXCEED THE WORKING LIMITS OF THE RESPIRATOR AND BE JOINTLY APPROVED BY THE NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY & HEALTH & THE MINE SAFETY & HEALTH ADMINISTRATION (NIOSH/MSHA).

METHYL CHLOROFORM (1,1,1-TRICHLOROETHANE):

1000 PPM - ANY SUPPLIED-AIR RESPIRATOR WITH FULL FACEPIECE.
ANY SELF-CONTAINED BREATHING APPARATUS WITH FULL FACE-

PIECE.

ESCAPE - ANY AIR-PURIFYING FULL FACEPIECE RESPIRATOR (GAS MASK) WITH A CHIN-STYLE OR FRONT OR BACK-MOUNTED ORGANIC VAPOR CANISTER.
ANY APPROPRIATE ESCAPE-TYPE SELF-CONTAINED BREATHING APPARATUS.

FOR FIREFIGHTING & OTHER IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONDITIONS:

SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.

SUPPLIED-AIR RESPIRATOR WITH FULL FACEPIECE & OPERATED IN PRESSURE DEMAND OR OTHER POSITIVE PRESSURE MODE IN COMBINATION WITH AN AUXILIARY SELF-CONTAINED BREATHING APPARATUS OPERATED IN PRESSURE DEMAND OR OTHER POSITIVE PRESSURE MODE.

Protective gloves	:EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE GLOVES TO PREVENT CONTACT WITH THIS SUBSTANCE.
Eye protection	:EMPLOYEE MUST WEAR SPLASH-PROOF OR DUST-RESISTANT SAFETY GOGGLES & A FACESHIELD TO PREVENT CONTACT WITH THIS SUBSTANCE.
Other protective clothing or equipment	:EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE (IMPERVIOUS) CLOTHING AND EQUIPMENT TO PREVENT ANY POSSIBILITY OF SKIN CONTACT WITH THIS SUBSTANCE.
Work hygenic practices	:EMERGENCY WASH FACILITIES: WHERE THERE IS ANY POSSIBILITY THAT AN EMPLOYEE'S EYES AND/OR SKIN MAY BE EXPOSED TO THIS SUBSTANCE. THE EMPLOYER SHOULD PROVIDE AN EYE-WASH FOUNTAIN & QUICK DRENCH SHOWER WITHIN THE IMMEDIATE WORK AREA FOR EMERGENCY USE.
Ventilation requirements	:PROVIDE LOCAL EXHAUST OR PROCESS ENCLOSURE VENTILATION TO MEET PUBLISHED EXPOSURE LIMITS.
Local exhaust recommended	:SEE "VENTILATION REQUIREMENTS" ABOVE
Mechanical	:NOT FOUND ON MSDS
Special requirements	:NOT FOUND ON MSDS
Other requirements	:NOT FOUND ON MSDS

Additional information:
* * * PHYSICAL/CHEMICAL CHARACTERISTICS - SECTION 9 * * *

Boiling point	:165F/74C
Melting point	:-36F/-32C
Specific gravity	:1.32
Vapor pressure	:100 mm Hg § 20 C
Percent volatiles	:NOT FOUND ON MSDS
Vapor density (Air=1)	:4.55
Evaporation rate	:1
Compared to	:CARBON TETRACHLORIDE

Water solubility :0.09%
Appearance :COLORLESS LIQUID WITH A MILD CHLOROFORM-LIKE ODOR.

Additional information:

ODOR THRESHOLD; 100 PPM

SOLVENT SOLUBILITY: ACETONE, BENZENE, METHANOL, ETHER, CARBON TETRACHLORIDE CARBON DISULFIDE, N-HEPTANE, ETHANOL, CHLOROFORM

* * * REACTIVITY DATA - SECTION 10 * * *

Water reactivity :SLOWLY DECOMPOSES OVER TIME YIELDING HYDROGEN CHLORIDE. AN INHIBITOR MAY BE ADDED TO SCAVENGE THE ACID THAT IS FORMED & PREVENT CORROSION TO METALS. WATER MAY REACT WITH THE INHIBITOR & ALLOW THE NATURAL DECOMPOSITION TO OCCUR

Is this chemical stable under normal conditions of handling and storage? :SEE "WATER REACTIVITY" ABOVE.

Conditions to avoid :MAY BURN BUT DOES NOT IGNITE READILY. CONTAINER MAY EXPLODE IN HEAT OF FIRE.

Incompatibility (materials to avoid) :METHYL CHLOROFORM
METHYL CHLOROFORM (1,1,1-TRICHLOROETHANE):
ACETONE: EXOTHERMIC REACTION.
ALKALI (STRONG): POSSIBLY VIOLENT REACTION.
ALUMINUM AND ALLOYS: MAY DECOMPOSE VIOLENTLY.
BARIUM: FIRE AND EXPLOSION HAZARD.
MAGNESIUM: VIOLENT DECOMPOSITION WITH EVOLUTION OF HYDROGEN CHLORIDE.
METALS (POWDERED): FIRE AND EXPLOSION HAZARD.
NITROGEN TETROXIDE: FORMS EXPLOSIVE MIXTURE.
OXIDIZERS (STRONG): POSSIBLE VIOLENT REACTION.
OXYGEN (GAS): POSSIBLE EXPLOSION WHEN HEATED AT 100C.
OXYGEN (LIQUID): POSSIBLE VIOLENT EXPLOSION.
POTASH: FORMS FLAMMABLE OR EXPLOSIVE PRODUCT.
POTASSIUM AND ALLOYS: FORMS SHOCK-SENSITIVE MIXTURE.
POTASSIUM HYDROXIDE: FORMATION OF SPONTANEOUSLY FLAMMABLE PRODUCT.
RUBBER, PLASTICS, COATINGS: MAY BE ATTACKED
SODIUM AND ALLOYS: FIRE AND EXPLOSION HAZARD.
SODIUM HYDROXIDE: FORMS SPONTANEOUSLY FLAMMABLE PRODUCT.
SODIUM-POTASSIUM ALLOY: POSSIBLE EXPLOSION.
TIN AND ALLOYS: INCOMPATIBLE.
ZINC AND ALLOYS: INCOMPATIBLE.

1,4-DIOXANE:
DECABORANE: FORMS SHOCK-SENSITIVE MIXTURE.
NICKEL (RANEY CATALYST): POSSIBLE EXPLOSIVE REACTION ABOVE 210C.
NITRIC ACID + PERCHLORIC ACID: POSSIBLE EXPLOSIVE REACTION.
OXIDIZERS (STRONG): FIRE AND EXPLOSION HAZARD.
SILVER PERCHLORATE: MAY FORM EXPLOSIVE COMPOUND.
SULFUR TRIOXIDE: VIOLENT DECOMPOSITION ON STORAGE.
TRIETHYNLALUMINUN: MAY EXPLODE WHEN HEATED.
SEE ALSO "ETHERS" BELOW.

ETHERS:
BORON TRIODIDE: VIGOROUS REACTION.

Hazardous decomposition products :THERMAL DECOMPOSITION PRODUCTS MAY INCLUDE TOXIC & CORROSIVE FUMES OF CHLORIDES. TOXIC FUMES OF PHOSGENE & CHLOROACETYLENES, & OXIDES OF CARBON.

Is hazardous polymerization possible?:HAZARDOUS POLYMERIZATION HAS NOT BEEN REPORTED TO OCCUR UNDER NORMAL TEMPERATURES & PRESSURES.

Conditions to avoid regarding polymerization :NOT FOUND ON MSDS

* * * DISPOSAL CONSIDERATIONS - SECTION 13 * * *

Waste disposal methods:
DISPOSAL MUST BE IN ACCORDANCE WITH STANDARDS APPLICABLE TO GENERATORS OF HAZARDOUS WASTE, 40CFR 262. EPA HAZARDOUS WASTE NUMBER U226.

Additional information:

REPORTABLE QUANTITY (RQ): 1000 POUNDS
THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA) SECTION 304 REQUIRES THAT A RELEASE EQUAL TO OR GREATER THAN THE REPORTABLE QUANTITY FOR THIS SUBSTANCE BE IMMEDIATELY REPORTED TO THE LOCAL EMERGENCY PLANNING COMMITTEE & THE STATE EMERGENCY RESPONSE COMMISSION (40 CFR 355.40). IF THE RELEASE OF THIS SUBSTANCE IS REPORTABLE UNDER CERCLA SECTION 103, THE NATIONAL RESPONSE CENTER MUST BE NOTIFIED IMMEDIATELY AT 800-424-8802 OR 202-426-2675 IN THE METROPOLITAN WASHINGTON, D.C. AREA (40 CFR 302.6).

* * * ADDITIONAL INFORMATION - SECTION 16 * * *

This MSDS prepared by :AUTHORIZED - FISHER SCIENTIFIC INC
Date of preparation for this MSDS :10/10/90 (REVISION DATE)
CREATION DATE: 10/25/84

THIS INFORMATION IS BELIEVED TO BE ACCURATE AND REPRESENTS THE BEST INFORMATION CURRRENTLY AVAILABLE TO US. HOWEVER, WE MAKE NO WARRANTY OF MERCHANTABILITY OR ANY OTHER WARRANTY, EXPRESS OR IMPLIED, WITH RESPECT TO SUCH INFORMATION, AND WE ASSUME NO LIABILITY RESULTING FROM ITS USE. USERS SHOULD MAKE THEIR OWN INVESTIGATIONS TO DETERMINE THE SUITABILITY OF THE INFORMATION FOR THEIR PARTICULAR PURPOSES.

* * * GENERAL PRODUCT INFORMATION - SECTION 1 * * * MSDS:002281

Trade Product Name :XYLENE
Synonyms :XYLENE

Manufacturer Name :CHARTER INTERNATIONAL OIL COMPANY
Manufacturer's Address :P.O. BOX 5008
City :HOUSTON
State :TX
ZIP :77012
Emergency Phone Number :CHARTER AC 713-923-6641
Other calls :CHEMTREC AC 800-424-9300
Date MSDS was prepared :00/00/1900
MSDS prepared by :Not given on the original MSDS

Additional information:
CHEMICAL NAME AND SYNONYMS: XYLENES, XYLOLS
CAS #: 1330-20-7
CHEMICAL FAMILY: AROMATIC HYDROCARBONS
FORMULA: C6H4 (CH3) 2

* * * INGREDIENTS INFORMATION - SECTION 2 * * *

** EXPOSURE LIMITS **

INGREDIENT NAME	PEL	TLV
SOLVENTS	Not on MSDS	100 PPM

** PERCENTAGES **

	HIGH %	LOW %
SOLVENTS	100	

** CAS NUMBERS **

	CAS ON MSDS	CIMS VERIFIED CAS
SOLVENTS	Not on MSDS	Not verified

* * * HAZARDS IDENTIFICATION - SECTION 3 * * *

Routes of entry :INHALATION, SKIN, EYES, INGESTION

Signs of exposure :INHALATION: OVEREXPOSURE TO VAPORS MIGHT DAMAGE CENTRAL NERVOUS SYSTEM AND CAUSE RESPIRATORY IRRITATION, MUSCULAR WEAKNESS, CONFUSION, IMPAIRED COORDINATION, HEADACHE AND NAUSEA. (LIVER AND KIDNEY DAMAGE).

Symptoms of over exposure :Not given on the original MSDS

Medical conditions aggravated :Not given on the original MSDS

Is chemical listed as a carcinogen or potential carcinogen?

National Toxicology Program	IARC Monographs	OSHA
Not stated	Not stated	Not stated

* * * FIRST AID - SECTION 4 * * *

Emergency phone number: CHARTER AC 713-923-6641

Inhalation: REMOVE FORM EXPOSURE. PROVIDE FRESH AIR AND REST. USE ARTIFICIAL RESPIRATION IF NEEDED.
Eye contact: WASH IMMEDIATELY WITH PLENTY OF WATER FOR 15 MINUTES.

Skin contact: WASH IMMEDIATELY WITH SOAP AND WATER.
Ingestion: DO NOT INDUCE VOMITING. CALL A PHYSICIAN IMMEDIATELY.

Additional information:
THRESHOLD LIMIT VALUE: 100 PPM

* * * FIRE AND EXPLOSION HAZARD - SECTION 5 * * *

Flash Point	:80F
Flash Point Method	:TCC
Upper Explosive Limit	:6.0
Lower Explosive Limit	:1.0
Autoignition Temperature	:Not given on the original MSDS
Extinguisher Media	:MECHANICAL FOAM, DRY CHEMICAL, WATER FOG, CO2
Special Fire Fighting Procedures	:A STRAIGHT WATER STREAM SHOULD SPREAD HYDROCARBON FIRES. AVOID BREATHING VAPORS. USE FRESH AIR RESPIRATORS.
Unusual Fire and Explosion Hazards	:A VAPOR ACCUMULATION WOULD FLASH AND/OR EXPLODE IF IGNITED. FLAMMABLE LIQIUD.

* * * ACCIDENTAL RELEASE MEASURES - SECTION 6 * * *
Steps to be taken in case material is released or spilled:
REMOVE ALL POSSIBLE IGNITION SOURCES. AVOID BREATHING VAPORS.
PROVIDE ADEQUATE VENTILATION. INCASE OF SPILLAGE, ABSORB AND
DISPOSE OF IN ACCORDANE WITH LOCAL APPLICABLE REGULATIONS.
CALL EMERGENCY NUMBER IF SPILLAGE POSES THREAT TO MAN OR ENVIRONMENT.

* * * HANDLING & STORAGE - SECTION 7 * * *

Precautions to be taken in handling and storage:
KEEP CLOSURES TIGHT AND UPRIGHT TO PREVENT LEAKAGE. KEEP CLOSED
WHEN NOT IN USE. DO NOT TRANSFER TO UNMARKED CONTAINER. READ
ALL WARNING LABELS. STORE IN COOL, WELL VENTILATED AREA. GROUND
CONTAINERS WHEN FILLING OR EMPTYING.

Other precautions:
Not given on the original MSDS

* * * CONTROL MEASURES - SECTION 8 * * *

Respiratory protection	:IF TLV IS EXCEEDED, USE SELF-CONTAINED BREATHING APPARATUS.
Protective gloves	:USE CHEMICAL RESISTANT.
Eye protection	:USE SAFETY GOGGLES.
Other protective clothing or equipment	:AS REQUIRED TO AVOID SKIN CONTACT OR BREATHING VAPORS.
Work hygenic practices	:Not given on the original MSDS
Ventilation requirements	:Not given on the original MSDS
Local exhaust recommended	:TO A DANGER SAFE AREA.
Mechanical	:USE EXPLOSION-PROOF EQUIPMENT.
Special requirements	:USE ONLY WITH ADEQUATE VENTILATION.

ADEQUATE MEANS EQUIVALENT TO OUTDOORS VENTILATION.

Other requirements :AVOID POTENTIAL IGNITION SOURCES.

* * * PHYSICAL/CHEMICAL CHARACTERISTICS - SECTION 9 * * *

Boiling point	:279/291
Melting point	:Not given on the original MSDS
Specific gravity	:0.87
Vapor pressure	:§60F/100F 5/18
Percent volatiles	:100%
Vapor density (Air=1)	:3.665
Evaporation rate	:0.61
Compared to	:N-BUAC
Water solubility	:NEGLIBLE
Appearance	:WHITE WATER LIQUID-TYPICAL AROMATIC HYDROCARBON.

Additional information:

* * * REACTIVITY DATA - SECTION 10 * * *

Water reactivity	:Not given on the original MSDS
Is this chemical stable under normal conditions of handling and storage?	:Y
Conditions to avoid	:AVOID HEAT, SPARKS, FLAME AND OTHER SOURCES OF IGNITION.
Incompatibility (materials to avoid)	:AVOID STRONG OXIDIZING AGENTS.
Hazardous decomposition products	:CARBON MONOXIDE IF BURNED WITH INSUFFICIENT AIR.
Is hazardous polymerization possible?	:N
Conditions to avoid regarding polymerization	:Not given on the original MSDS

* * * DISPOSAL CONSIDERATIONS - SECTION 13 * * *

Waste disposal methods:
DISPOSE IN ACCORDANCE WITH LOCAL, STATE AND FEDERAL REGULATIONS. USE QUALIFIED DISPOSAL COMPANY TO INCINERATE, OR OTHERWISE DISCARD, AT AN APPROVED FACILITY. DO NOT INCINERATE CLOSED CONTAINERS.

* * * ADDITIONAL INFORMATION - SECTION 16 * * *

This MSDS prepared by	:Not given on the original MSDS
Date of preparation for this MSDS	:00/00/1900

Additional information:
N/A=NOT APPLICABLE

REVISED 12/78

Additional information:
CHEMICAL NAME AND SYNONYMS: XYLENES, XYLOLS
CAS #: 1330-20-7
CHEMICAL FAMILY: AROMATIC HYDROCARBONS
FORMULA: C6H4 (CH3) 2

APPENDIX E

RECORD OF HAZARDOUS WASTE ACTIVITY

RECORD OF HAZARDOUS WASTE ACTIVITY

CLIENT;			PROJ. NO.:		
LOCATION:			DATE:		
PROJ. MGR.:			SITE ENG.:		
SITE HEALTH & SAFETY OFFICER:					
		DAYS AT THE SITE IN:			
NAME	TOTAL DAYS ON-SITE	LEVEL A/B	LEVEL C	LEVEL D	JOB FUNCTIO N

APPENDIX F

INCIDENT INVESTIGATION REPORT

INCIDENT INVESTIGATION REPORT

Form 00892

Instructions for Completing the Incident Investigation Report

Form 00892

PURPOSE

The purpose of this form is to document an injury or non-injury incident and to help in the Company's continuous improvement efforts to prevent injuries.

INSTRUCTIONS

- **For Employee Incidents (full or part time)**

  The first 5 Sections must be completed for any work-related incident involving a Duke Power employee during work. (A separate form must be completed for each employee injured in a multiple-injury incident.) Depending on the injury's severity, Section 6 may also have to be completed for Risk Management to appropriately file for worker's compensation benefits. Answer all questions as completely and specifically as possible. If no answer is available or the question does not apply, indicate so on the form. Attach supplementary pages for additional details, drawings, and sketches as needed. Send copies of the completed form, with any attachments, to the appropriate SIMS data enterer and worker's compensation coordinator. If an injury/illness results in a doctor visit, emergency room visit or other outside expense, send a copy of the completed form to Risk Management Department, PB05A.

  If the employee is hospitalized or fatally injured, do not complete sections 3, 4, 5, or 6. Contact Risk Management immediately at 382-8296 or 382-8287 (Fax: 382-1241).

- **For Suppliers**

  The first 5 Sections of this report should be completed, and entered on the SIMS system OR contractor should complete modified IIR and mail to the appropriate Duke contact person as directed by contractor management.

  Do not complete Section 6.

  Do not contact Risk Management for this type incident unless it involves a contractor/vendor being admitted to the hospital or if a fatality occurs.

  In either of these situations, follow the directions for public incident. Do not complete any other sections of this report.

- **For Public Incidents Occurring On Duke Premises Or Jobsites**

  Only Duke Power personnel should fill out the following portions of the IIR.

  Section 1 — 1, 3, 5, 6, 8, 13, 15, 18, 19, 20, 21, 23, 24, 25, 26

  Section 2 — 28, 29, 30, 31, 32, 33, 34

  STOP! Do not fill out any other lines on the IIR. Contact Risk Management and follow their direction.

EXPLANATIONS:

Date of Incident: For an injury, near-misses, flashes, etc., the Date of Incident should be the date the incident occurred. For illnesses, the Date of Incident should be the date of diagnosis of the condition. Diagnosis does not necessarily have to be made by a physician. For STS cases, the Date of Incident is the date of the annual audiogram, not the retest date to verify the STS.

BLS CODE: Classify the injury according to the OSHA classification system (Bureau of Labor Statistics) listed below. If you have questions about this classification system, contact your safety professional.

F(1) FOR RECORD ONLY — Usually used for standard threshold shifts that turn out not to be shifts and other cases where a work relationship cannot be established.

N(2) NON-RECORDABLE — Injury requiring some care, but under the guidelines is not significant enough to be classified as a recordable incident. Normally, the injured person receives care from a medical professional; however, the care is more for diagnostic procedures (e.g., x-ray), for the reduction of pain (e.g., single dose of pain medication), or for the relief of discomfort (e.g., single dose of Benadryl or Cortisone after an insect bite or sting). Tetanus shots are also classified as non-recordable care, since they are not actual treatment but rather preventive.

R(3) RECORDABLE — Significant injury requiring professional medical attention (e.g., treatment of second or third degree burns, application of sutures, administration of prescription medication other than a single dose, admission to a hospital for treatment, not just observation). All work-related illnesses are recordable regardless of medical treatment.

L LOST TIME-RESTRICTED ACTIVITY — Employee is able to return to work, but the injury or illness prevents complete fulfillment of job requirements beyond the day of the incident (e.g., a Line Technician is treated for a knee injury, is released by the doctor to return to work, but cannot climb poles (part of the normal job assignment) for a specific period of time because of the injury).

LWCDAW(5) LOST WORKDAY CASE DAYS AWAY FROM WORK — Injury or illness is so serious that the employee cannot report to work on the next scheduled workday after the day of the incident. (This does not include the day of the incident.) The case must be classified as LWCDAW if:

- One day is missed.
- The employee is injured to such an extent that he/she can return but cannot perform productive work.

Fatality(6) If employee dies

First aid case(7) Employee not sent to doctor or outside medical facilities

Near miss incident(8) A "near-miss," also called a "close call," is any work-related incident that did not result in any bodily injury but had the potential of bodily injury if circumstances such as worker positioning, timing, etc. had been different. The supervisor of the employee involved must complete an Incident Investigation Report (IIR).

Electrical flash with no injury(9) Had an electrical flash, but no injury occurred.

STS Code: After an annual audiogram, if a Standard Threshold Shift (STS) is indicated, it must be entered into the Safety Information Management System (SIMS) as a pending (P) case. OSHA allows employers a maximum of 30 calendar days to retest the individual to verify the STS. If after retest the STS still exists, then the record must be updated to confirmed (C). If after retest no hearing loss is indicated, then the record must be updated to (N) for "no STS." Pending (P) and Confirmed (C) STS cases must carry a BLS Code of R(3). "No STS" (N) cases must be updated to F(1). The retest date must be entered into the STS Retest Date field.

SECTION 1

1-6. Self-explanatory

7. Best estimate

8-9. Self-explanatory

10. Job title (e.g., personnel assistant, distribution line tech., control room operator). Job class code is the same as the employee's OCC code.

11. If the injured was working out of his/her normal job assignment, list that job code.

12. Best estimate or defined period from doctor (See the definition of restricted activity under BLS class guidelines.)

13. Self-explanatory

14. Total number of months in the classification involved in the incident.

15. This is a 4-digit responsibility number that does not begin with a zero and comes from the Responsibility Reporting Rollup Table. The approval numbers are in BookManager for each site.

16. This is a 4-digit responsibility number that does not begin with a zero and comes from the Responsibility Reporting Rollup Table.

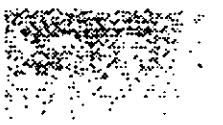
17. Full department name

Normally used in nuclear facilities

Three-digit code normally used by PG locations

19b. Indicate whether the incident occurred during an outage situation. For Customer Operations or Power Delivery, outage means storm duty or other abnormal conditions.

20. Be as specific as possible (e.g., Duke Power Building, 422 South Church Street, Charlotte, NC, 4th floor, room 416; Dan River Steam Station, Transfer House, 3rd level, adjacent to belt #2; 230 KV Transmission tower #8 between Riverbend and Marshall Stations; McGuire Nuclear Station, #1 turbine building, column line BB-21, west side of column).



21. If there is any known or possible connection, be as specific as possible. If incident occurred indoors, specify. If outdoors, list temperature, humidity (if known), wind conditions, rain, fog, etc. Estimate if not known.

22. All recordable incidents in the injured's working career with Duke Power.

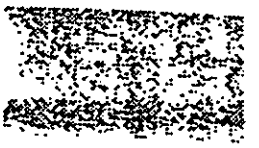
23. Were you seen by a doctor or other medical professional for this injury? If yes, list doctor's name, address, and phone number.

24. Were you ADMITTED to the hospital (not just visiting the emergency room)? If yes, hospital's name and address.

25-26. Self-explanatory

SECTION 2

LINES 27-35 ARE TO BE HANDWRITTEN BY INJURED EMPLOYEE, IF POSSIBLE.



27. In the injured employee's own words, describe what happened as completely and specifically as possible. What were you doing at the time of the incident? What relevant events immediately preceded the incident? What objects, substances, or equipment were involved? List anything else potentially relevant.

28. Injured employee relates the first time he/she knew there was an on-the-job injury.

29. In the injured employee's own words, describe exactly the kind of injury (e.g., laceration to right hand, broken lower left leg, strained lower back). It's important to use "right," "left," "big toe," "little toe," etc. here.

30-31. Self-explanatory

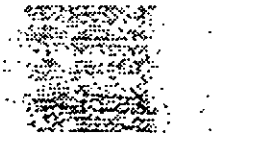
32. What was done immediately for the injury (e.g., wrapped injured hand in clean cloth, applied antiseptic)?

33. Exactly when did you tell your supervisor about this injury? Give best estimate if you can't remember exactly.

34. Check the body part(s) injured. Check a maximum of 6 as applicable, and list any part not listed on the "other" line.
Note: Back strains, sprains, etc. should be marked as [16] Back Strain. All other cuts, burns, etc. to the back should be marked as [32] Back (other).

35-36. Self-explanatory

SECTION 3



37-40. Self-explanatory

41. Ergonomics: Ergonomic incidents are identified by a combination of certain triggers in Body Part Injured (Line 34), Type of Injury (Line 39) and Incident Type (Line 41). These triggers are identified by **bold-face** type in these sections of the IIR. Item 33 - Ergonomics in the Incident Type section (Line 41) must be checked whenever a **bold-faced** item is checked in <u>all three</u> sections (Body Part Injured, Type of Injury, Incident Type). If all three sections do not have a bold-faced item checked, then the incident is not ergonomically related and Item 33 should not be checked.

42. List the sequence of events leading to the incident. Example: A bursting steam line burns an employee's hand. Events preceding this event may have contributed to the incident. These events may be things that did not happen that should have happened. In the steam line bursting example, preceding events may have been excess pressure in the line. The pressure relief valve may have corroded shut, preventing the safe release of excess pressure. The corrosion may not have been discovered and corrected because a regular valve inspection and test was not carried out. The investigator should ask whether the occurrence or non-occurrence of any event permitted the incident to occur, regardless of whether it actually caused the incident.

43-45. Self-explanatory

46. Date investigation is completed (up to line 50).

47. This date will automatically be entered by system.

Section 2

IF POSSIBLE, LINES 27-35 SHOULD BE HANDWRITTEN BY INJURED INVOLVED EMPLOYEE. EMPLOYEE AND SUPERVISOR MUST SIGN.

27. Employee description of how the incident happened? (Use additional sheet if necessary.) This item not entered into SIMS.

28. When did you first realize you were injured/ill? _____

29. Describe extent of injury: _____

30. If this was a sprain, strain or joint inflammation, were you in an awkward or strained position? ☐ Yes ☐ No

31. If this was a sprain, strain or joint inflammation, have you had a similar injury before? ☐ Yes ☐ No

If yes, what date? _____

32. Describe first aid rendered: _____

33. When did you tell your supervisor about the injury/illness? Date: _____ Time: _____a.m. _____p.m.

34. Body part injured * (check up to six):

[1] Brain	[2] Ear(s)	[3] Eye(s)	[4] Face	[5] Scalp
[6] Skull	[7] Head	[8] Nose	[9] Teeth	[10] Neck
[11] Arms	[12] Wrist	[13] Hand(s)	[14] Finger(s)	[15] Abdomen
[16] Back strain	[17] Chest	[18] Hip(s)	[19] Shoulder(s)	[20] Trunk
[21] Leg(s)	[22] Ankle(s)	[23] Foot (feet)	[24] Toe(s)	[25] Skin surface
[26] Digestive system	[27] Nervous system	[28] Circulatory system	[29] Excretory system	[30] Respiratory system
[31] Auditory system	[32] Back (other)	[33] Groin	[34] Knee	

[35] Other (list) _____

35. Injured's signature: _____ Date: _____

36. Supervisor in charge signature: _____ Date: _____

Section 3

TO BE FILLED OUT BY SUPERVISOR OR INVESTIGATOR

PRELIMINARY ASSESSMENT (SUBJECT TO FURTHER INVESTIGATION) — CHECK ALL BLOCKS THAT APPLY

37. Unsafe Action:

[1] Cleaning, oiling, adjusting, or repairing of moving, energized, or pressurized equipment
[2] Failure to use personal protective equipment/incorrect PPE
[3] Failure to wear safe personal attire
[4] Failure to secure or warn of observed hazardous situation or hazardous exposure
[5] Horseplay
[6] Improper use of equipment
[7] Improper use of hands or body parts
[8] Inattention to footing or surroundings
[9] Defeating/making safety devices inoperative
[10] Operation or working at unsafe speed
[11] Taking sustained or unsafe position or posture
[12] Result of preventable vehicle incident
[13] Unsafe placing, mixing, combining
[14] Failure to follow procedure
[15] Other (list) _____
[16] Over exertion
17] Failure to recognize hazard
[18] Improper positioning/placement of equipment/materials

38. Unsafe Condition:

[1] Poor ventilation and/or lighting
[2] Unsafe design and/or construction
[3] Poor and/or defective equipment
[4] Hazardous arrangement/storage
[5] Slip hazard (water, oil, mud, etc.)
[6] Chemical leak/spill
[7] Hot uninsulated surface
[8] Pinch hazard
[9] Trip/bump hazard
[10] Inadequately guarded machine
[11] No procedure
[12] Procedure less than adequate
[13] Specific procedure not available
[14] Hazardous exposure (chemicals, poison ivy, etc.)
[15] Other (list) _____
[16] Poor visibility
[17] Animal/insect

39. Type of Injury/Illness: (Check all that apply; circle primary type)

[1] Amputation
[2] Asphyxia
[3] Burn or scald (heat)
[4] Burn (chemical)
[5] Concussion
[6] Contagious disease
[7] Contusion
[8] Crushing/pinching
[9] Bruise/cut/laceration
[10] Puncture/open wound
[11] Dermatitis/skin irritation/rash
[12] Dislocation
[13] Electric shock
[14] Electrocution
[15] Fracture
[16] Freezing/frostbite
[17] Hearing loss/impairment
[18] Heat stroke/sunstroke/heat cramps, heat exhaustion
[19] Hernia
[20] Rupture
[21] Inflammation or irritation of joints/tendonitis
[22] Poisoning
[23] Asbestosis, silicosis, etc.
[24] Scratches
[25] Abrasions (superficial wounds)
[26] Sprains/strains
[27] Other (list) _____
[28] Bloodborne pathogens contact
[29] Chronic muscle or joint pain
[30] Flashburn/eye irritation
[31] Animal/insect bite/sting
[ ] Respiratory irritation

40. Source of Injury/Illness: (Check all that apply; circle primary source)

[1] Air pressure
[2] Animals/insects
[3] Bodily position or motion
[4] Boxes/containers
[5] Buildings/structures
[6] Chemicals/chemical compounds
[7] Clothing/apparel/shoes
[8] Coal/petroleum products
[9] Cold (atmospheric or environmental)
[10] Conveyors
[11] Drugs/medicine
[12] Electrical apparatus (overhead/underground)
[13] Electrical flame/fire/smoke
[14] Electrical flash (list voltage _____)
[15] Electrical contact (list voltage _____)
[16] Furniture/furnishings/fixtures
[17] Office equipment
[18] Glass items
[19] Hand tools (not powered)
[20] Hand tools (powered)
[21] Heat (atmospheric or environmental)
[22] Heating equipment
[23] Hoisting or lifting apparatus/valves/chains
[24] Infectious agents
[25] Insulation fibers
[26] Knives/sharp instruments
[27] Ladders
[28] Liquids
[29] Mechanical power transmission apparatus
[30] Metal items
[31] Noise
[32] Particles
[33] Plants/trees/vegetation
[34] Pumps/prime movers
[35] Radiation substances and equipment
[36] Soaps/detergents/cleaning compounds
[37] Open neutral
[38] Loose/corroded connector
[39] Capacitor/transformer failure
Low/down wire
[40] Single phase
[ ] Voltage imbalance
[42] Line in tree
[45] Other (list) _____
[44] Underground cable failure
[47] Hot/cold surface
[46] Dog bite
[48] Walking surface

Incident Type: (Check all that apply; circle primary type)

[1] Hand tool/machinery in use [2] Falling/flying/rolling object [3] Object(s) being handled
[4] Broken object(s) [5] Sharp object(s) [6] Equipment failure
[7] Lifting [8] Pushing/pulling [9] Holding/carrying
[10] Reaching/bending [11] Climbing/descending [12] Leaning/twisting
[13] Fall on same level [14] Fall from elevation [15] Slipped, did not fall
[16] Welding operation [17] Foreign body in eye [18] Explosion/flareback
[19] Sports injury [20] Caught in/under/between [21] Rubbed or abraded
[22] Bodily reaction [23] Overexertion [24] Contact with elec. current (any voltage)
[25] Contact with temp. extremes [26] Contact with radiation [27] Caustics/toxic/noxious materials
[28] Motor vehicle incident [29] Other
[30] Animal/insect bite/sting [31] Repetitive motion [32] Sustained awkward position
[33] Ergonomic (see instructions)

42. Incident description. Describe the sequence of events leading up to the incident. (Use additional sheet if necessary; attach sketch if needed for explanation.) Enter into SIMS:

43. At the time of incident, supervisor in charge (name and social security number): _____

_____

44. Base supervisor's name and social security number, if different than line 43: _____

_____

45. How often does the injured or involved employee perform this specific task?

☐ once a month or more ☐ once a quarter ☐ once a year ☐ less than once a year

46. Date Incident Investigation Report (IIR) completed _____

47. Date incident information entered on SIMS: _____

IF APPLICABLE, COMPLETE. (NORMALLY USED BY PGG)

48. Written work request #: _____ 49. PIP #: _____

50. Incident occurred on which shift: ☐A ☐B ☐C ☐D ☐E

51. Last date trained for task: _____

52. Investigator's name (printed): _____

53. Supervisor's or investigator's signature: _____ Date: _____

OSHA illness code ___ ___ (See instructions for Code list.)

Note: OSHA Illness Code is required for STS, poison ivy, cumulative trauma disorder, respiratory illnesses, skin disorders, etc.

Reorder by ID No. 059400892 Form 00892 (RG-99)

[; Power Company

INCIDENT INVESTIGATION REPORT

Instructions:
- For an injury/illness resulting in a doctor or emergency room visit: complete entire report.
- If the employee is hospitalized or fatally injured: contact Risk Management for instructions.
- For First Aid cases: complete all sections except Section 6.

For near-miss or non-injury flash incidents: complete only shaded areas of this report.

Date of Incident: ___/___/___
Time of Incident: ___ a.m. ___ p.m.
Social Security Number: ___-___-____
Supplier Tax ID Number ____
BLS Code: ☐ F(1) ☐ N(2) ☐ R(3) ☐ LR(4) ☐ LWCOAW(5) ☐ Fatality(6) ☐ First aid case(7)
☐ Near Miss(8)
☐ Electrical flash with no injury(9)
STS Code: ☐ P ☐ C ☐ N

Section 1

1a. Supplier Name (where applicable): ____

1b. Name of injured employee: *Last* ____ *First* ____ *M.I.* ____

2. Week day ____ 3. Date of birth: mo/day/yr: ___/___/___

4. ☐ Straight time ☐ Overtime 5. Sex: ☐ M ☐ F

6. Fatality? ☐ Yes ☐ No 7. Probable length of disability in days: ____

[...red's phone # and home address: ____ 9. Employment Date: ____

____

10. Employee's title and job class code: ____/____

11. Job class code at time of incident (if different than # 10) ____

12. Probable number of days restricted duty: ____

13. Employment category: ☐ Full-Time ☐ Part-Time ☐ Duke Temporary ☐ Contractor ☐ Public

14. Number of months employee has worked in job class involved in incident? ____ (enter 0 for less than 1 month)

15. Location code # where injury occurred: ____ 16. Claim Employee responsibility #: ____

17. Department name: ____ 18. Building/elevation (if applicable): ____

19a. Facility # (If applicable): ____ 19b. Outage related: ☐ Yes ☐ No

20. Specific location of incident: ____

21. Weather conditions: ____

22. Number of previous recordable injuries/occupational illnesses: ____

23. Doctor consulted: ☐ Yes ☐ No If yes, doctor's name, address, and phone number: ____

____

24 employee admitted to hospital? ☐ Yes ☐ No If yes, name and address of hospital: ____

____

NOTE: IF LINE 23 OR LINE 24 IS ANSWERED YES, COMPLETE SECTION 6 OF THIS REPORT. IF NEITHER IS ANSWERED YES, OMIT SECTION 6.

25. Names and social security number of others injured in same incident (if applicable):

____

26. Names and addresses of witnesses:

____

____

[illegible]. Normally used by Power Generation Group; complete if applicable.

[illegible]. Self-explanatory

54. If the incident is an illness, place the appropriate OSHA illness code in this field.

OSHA Illness Codes:

7A: Occupational skin diseases or disorders
7B: Dust diseases of the lungs
7C: Respiratory conditions due to toxic agents
7D: Poisoning (systemic effects of toxic materials)
7E: Disorders due to physical agents
7F: Disorders associated with repeated trauma
7G: All other occupational illnesses

SECTION 4

55. List in order of importance any recommendations to prevent recurrence.

SECTION 5

[illegible] Complete this section as soon as possible. If sufficient root cause analysis has not already been performed, list additional details about the actual root cause of the incident here along with the followup of each item recommended in Section 4. It is critical that each individual recommendation in Section 4 be addressed in Section 5. If a recommendation was not followed, explain in detail the rationale.

57. Area/location manager's signature and date.

SECTION 6

THE FOLLOWING QUESTIONS RELATE SPECIFICALLY TO WORKER'S COMPENSATION ISSUES.

58. Includes rights-of-way, parking lots, etc.

59-99. Self-explanatory. Fill out with best available answers.

If a particular question has no answer, or if the question doesn't apply, please specify in each applicable blank.

Risk Management will use the information in Section 6, with data from the other parts of the incident investigation form, to complete the necessary state Worker's Compensation forms. In North Carolina, a copy of the completed Worker's Compensation form must be given to the injured employee. A completed copy will be mailed to the Worker's Compensation Coordinator listed on line 94.

Section 4

(ecommendations to prevent recurrence. Be as specific as possible. Use additional sheet if necessary. Include findings from Root Cause Analysis if done. Root cause analysis is required for all fatalities, hospitalizations, lost workday cases and serious near misses. For information on root cause analysis, refer to "Occupational Injury Root Cause Analysis Process" manual (Reorder No. 0594413719 in Office Supply).

Section 5

5[illegible]OLLOW-UP TO RECOMMENDATIONS

[illegible]nagement completes this section and forwards it to the appropriate person for data entry into the SIMS data base. List follow-up actions taken to respond to recommendations listed above. This section MUST be completed for all recommendations made.

Was a root cause analysis done on this incident? ☐ Yes ☐ No Date completed: _____

If so, what root cause method was used?

☐ Rohm & Haas

☐ FPI

☐ I[illegible]

57. Manager's Signature: _____ Date: _____

Section 6

ETE THIS SECTION ONLY IF EMPLOYEE WAS TREATED BY A MEDICAL PROFESSIONAL. (NOTE: TREATED BY MEDICAL PROFESSIONAL INCLUDES TRIP TO HOSPITAL)

58. Did the incident occur on employer's premises? ☐ Yes ☐ No

59. Where injury occurred. Plant: _____
City: _____
County: _____
State or province: _____ Country: _____

60. If this is a lost workday case, date disability began: _____

61. Was injured paid in full for the day of the incident?
☐ Yes ☐ No

62. Is injured ☐ Single ☐ Married ☐ Divorced ☐ Widowed

63. Injured's nationality: _____

64 Number of children under 18: _____

65. Occupation when injured: _____

66. Was this his/her regular occupation? ☐ Yes ☐ No

67. If line 66 is no, list department or branch of work regularly employed in: _____

68. Number of hours worked per day: _____

69. Number of days worked per week: _____

70. Wages per hour $ _____
Wages per day $ _____

72. Wages per week $ _____

73. If board, lodging, fares, or other advantages were furnished in addition to wages, estimated value per week
$ _____

74. Value per month $ _____

75. Machine, tool, substance, or object most closely connected with the accident: _____

76. Kind of power (e.g., hand, foot, electrical, steam):
_____

77. Part of machine on which injury occurred:
_____

78. Was safety appliance or regulation provided?
☐ Yes ☐ No

79. Was safety appliance or regulation in use at the time of the incident? ☐ Yes ☐ No

80. In what way, if any, was the machine, tool, or object defective? _____

81. How could the injured have prevented the accident? _____
_____

82. First date of medical treatment: _____

83. Has employee returned to work? ☐ Yes ☐ No

84. If yes, give date: _____

85. At what weekly wage did he/she return? $ _____

86. Are you continuing the employee's salary in full?
☐ Yes ☐ No

87 At what occupation? _____
fatally injured, date of death: _____

89. In case of death, name and address of nearest relative:
_____

90. Date of this report: _____

91. Report completed by (signature):
_____

92. Name typed: _____

93. Official position of person completing report:
_____

94. Worker's comp. coordinator: _____

95. SS # _____

96. Worker's comp. coordinator phone #: _____

97. Worker's comp. case to be filed in which state? ☐ NC ☐ SC

98. Interoffice address: _____

99. Co. MD/RN and location: _____

APPENDIX G

NOTIFICATION OF ACCESS TO EMPLOYEE EXPOSURE AND MEDICAL RECORDS

NOTICE

TO ALL EMPLOYEES: THIS NOTICE IS TO PROVIDE INFORMATION FOR COMPLIANCE WITH 29 CFR PART 1910 SUBPART C - GENERAL SAFETY AND HEALTH PROVISIONS - PARAGRAPH 1910.20, ACCESS TO EMPLOYEE EXPOSURE AND MEDICAL RECORDS.

i. The existence, location, and availability of any records covered by this section is as follows:

EMPLOYEE EXPOSURE RECORDS	MEDICAL RECORDS
See your supervisor	See your regional nurses.

ii. Each employee has the right to access these records.

iii. A copy of this standard and its appendices are available to all affected employees at your base location's safety and industrial hygiene office.

APPENDIX C

AIR MONITORING PROGRAM

BRAMLETTE ROAD MGP SITE

AIR MONITORING PLAN

Introduction

An ambient air monitoring program will be conducted at the Bramlette Road MGP site to measure concentrations of airborne constituents of interest associated with planned remediation activities (excavation, screening, truck loading, etc.). The ambient monitoring program will consist of both real-time screening and constituent-specific sampling, and will be conducted in addition to, or to supplement, air monitoring requirements stipulated in the site Health and Safety Plan (HASP). The air monitoring program will be conducted and/or overseen by the designated site health and safety coordinator.

Primarily, the air monitoring program specifies air monitoring to be conducted at site perimeter (fenceline) locations to characterize constituents of interest and fugitive dust emissions entering and leaving the site. Monitoring will be conducted at perimeter locations on a daily basis both prior to, and throughout the duration of excavation work, screening operations, and truck loading activities. The air monitoring program also specifies the installation of a meteorological station to be maintained at the site to provide a record of wind speed and direction on a daily basis.

Constituents of interest for the air monitoring program will include the volatile organics benzene, toluene, ethyl benzene, and total xylenes (BTEX); naphthalene, polycylic aromatic hydrocarbons (PAHs); and total suspended particulate (TSP) matter.

Real-Time Field Screening

Field screening will be conducted using direct reading instruments designed to detect contaminant concentrations on real-time bases. These instruments will provide contaminant concentrations at the time of sampling, and will provide a basis for rapid decision making with regards to levels of respiratory protection required for on-site workers as specified in the HASP. Field screening results will also be used to assist in the selection of constituent specific sampling location(s) to be submitted for laboratory analyses.

Types of direct-reading instruments to be employed are:

- Photo-Ionization Detector (PID): Measures the total concentration of volatile organic compounds in parts per million by volume (ppmv) using a PID calibrated to a known concentration of a benzene substitute compound.

- Colorimetric Tubes: Measures the concentration of a specific volatile organic compound in ppmv by drawing a known quantity of air across an indicator tube. The specific compound reacts with an 'indicator' within the tube producing a staining effect. The color or length of staining is proportional to the individual compound concentration.

- Aerosol Meter: Measures the concentration of TSP matter in milligrams per cubic meter of air (mg/m^3) by continuously sensing the population of particles present in the air with an electromagnetic radiation source near the infrared spectrum.

Field screening for total organic compounds and dust will be conducted by the health and safety coordinator as specified in the HASP.

Constituent-Specific Sampling

Constituent-specific sampling will target BTEX, PAHs, and TSP matter. Constituent-specific sampling methodologies are outlined as folows:

BTEX:

Ambient concentrations of BTEX and naphthalene will be characterized by the use of a GC/FID Expanded Organic Solvents Scan. Samples will be taken by the use of constant flow sampling pumps equipped with activated charcoal adsorbent tubes. VOCs are adsorbed onto the charcoal as sample air is passed through the tube by the pump. Tubes are collected at the conclusion of individual sampling rounds and returned to the laboratory.

Samples will be collected during the normal work shift (8 to 10 hour period), providing a total collection volume of approximately 24 liters of air. Detection limits for benzene will be approximately 0.01 ppm.

PAHs:

Ambient concentrations of PAHs in air at the site will be determined by laboratory gravimetric analyses in accordance with NIOSH Method 0500. PAH samples will be collected by low volume air samplers using 37 millimeter diameter glass fiber filters with 0.8 micron pore diameters. PAH samples will be collected during the normal work shift (8 to 10 hour period) and will be submitted for PAH analyses by OSHA Method 58. The detection limits for PAHs as represented by Benzo(a)pyrene will be approximately 1 $\mu g/m^3$.

TSP Matter:

Ambient concentrations of particulate matter in air at the site will be determined by laboratory gravimetric analyses in accordance with NIOSH Method 0500 - *Reference Method for the Determination of Total Nuisance Dust*. TSP samples will be collected by low volume air samplers using 37 millimeter diameter pvc filters with 0.8 micron pore diameters. TSP samples will be collected during the normal work shift (8 to 10 hour period). Detection limits for TSP matter will be approximately 0.09 milligrams per cubic meter (mg/m^3).

Meteorological Monitoring Station

A meteorological monitoring station will be installed and maintained at the site. The station will be capable of providing continuous data relating to wind speed and direction which will be used in the prioritization of laboratory analyses of constituent-specific samples. The station will be capable of documenting data on an hourly (as a minimum) basis. The system will be installed in accordance with procedures outlined in *Quality Assurance Handbook for Air Pollution Measurement Systems*, Volume 4, Meteorological Measurements (EPA 600/4-82-060).

The station will be mounted at an elevation greater than the top elevation of the perimeter fence.

Monitoring Location, Schedule and Sample Prioritization

Constituent-specific samples will be collected by the health and safety coordinator from each monitoring point location on each day beginning at least 5 workdays prior to the start of excavation activities; and continuing throughout the period of soil excavation, screening, and truck loading. Samples will be collected on a daily basis at a minimum of 2 locations around the perimeter of the site.

On a daily basis, the health and safety coordinator will establish at least one perimeter sampler in the vicinity of those remedial operations which would be expected to result in the greatest impact to air quality. Sampling locations for the remaining sampler(s) will be established by the health and safety coordinator based on recorded meteorological data, weather conditions, prior sampling results, expected site activities, local area concerns, and experience.

Air samplers will be placed approximately 1.5 meters (55 inches) above the ground surface.

Constituent-specific monitoring will require the collection of a substantial number of air samples over the duration of the project. As a result, it will be necessary to prioritize samples for laboratory analyses. The site engineer or HASP representative will select at least one sample each week from perimeter sampling locations to be submitted for

laboratory analyses. All perimeter samples taken during the minimum 5 day period prior to the beginning of site remediation activities will be submitted for laboratory analyses.

Additional samples may also be analyzed based on the results of real-time analyses. These samples will be prioritized for laboratory analyses based on the following decision criteria:

1. Significant concentrations above background levels as indicated in analyzed samples;

2. VOC levels greater than 25 ppmv as recorded by real-time monitoring equipment as part of this air monitoring program or the HASP;

3. VOC levels greater than 5 ppmv as recorded by real-time monitoring equipment as part of this air monitoring program or the HASP;

4. VOC levels greater than 2.5 ppmv as recorded by real-time monitoring equipment as part of this air monitoring program or the HASP.

Samples from locations not submitted for laboratory analyses will be labeled, identified as to the spatial relationship with regards to work area location and wind direction, and archived for future analyses if needed.

Quality Assurance and Reporting

The health and safety coordinator will be proactive in preventing the failure of equipment or instruments associated with the air monitoring program. A diligent program of preventative maintenance and careful calibration will be established to assure the accuracy of measurements taken. The health and safety coordinator will also be diligent in the identification of necessary adjustments to sampling frequency should sampler breakthrough occur.

Analytical methods will be chosen to meet the requirements of the specific analytical objectives, and will be capable of measuring the concentrations of constituents of interest to the required levels of accuracy and detection limits.

All field data including calibration activities, pump inspections, site notes, monitoring times and ambient temperatures will be documented on appropriate field data sheets.

All meteorological data (wind speed and direction) will be documented on a daily basis during work activities.

Laboratory analyses will be documented using sample chromatogram and integrator readings. Data from the analyses of air samples will be reported as milligrams per cubic meter or as micrograms per cubic meter as required. Appropriate blank corrections will be applied in all cases.

Field biased blank samples will be submitted as required to maintain quality assurance of actual field samples. Blank samples will be subjected to the same treatment and analyses as the field samples. Records of all data, including outlying data, will be maintained. The quality of all data will be evaluated in consideration of the use of approved test procedures, the use of properly operated and calibrated equipment and instrumentation, and the use of approved analytical procedures.

Samples exceeding the contaminant specific allowable holding time will be discarded.