EPA REGION 3
FEBRUARY 1994

PROPOSED REMEDIAL ACTION PLAN
DOVER GAS LIGHT SUPERFUND SITE
DOVER, KENT COUNTY, DELAWARE

This Proposed Remedial Action Plan (Proposed Plan) has been prepared by the U.S. Environmental Protection Agency (EPA) to provide the public with the opportunity to review and comment upon alternatives for remediation of contaminated **ground water** and soils at the Dover Gas Light **Superfund** Site. It contains a brief comparative evaluation of each remedial alternative considered by EPA.

EPA will select a final remedial alternative for the Dover Gas Light Superfund Site in consultation with the Delaware Department of Natural Resources and Environmental Control (DNREC) only after the public comment period has ended and the information submitted during this period has been reviewed and considered. EPA is issuing this Proposed Plan as part of its public participation responsibilities under Section 117(a) of the **Comprehensive Environmental Response, Compensation, and Liability Act of 1980**, as amended **(CERCLA)**, 42 U.S.C. §9617(a). EPA has been the support agency and DNREC the lead agency for the **Remedial Investigation and Feasibility Study (RI/FS)**.

This document summarizes information that can be found in greater detail in the RI/FS reports and other documents contained in the **Administrative Record** file for this Site. EPA and DNREC encourage the public to review these documents in order to gain a more comprehensive understanding of the Site and the Superfund activities that have been conducted there. The Administrative Record file, which contains the information upon which the selection of the response action will be based, is available at the following locations:

Dover Public Library
Ms. Holly Johnson
45 S. State Street
Dover, Delaware 19901
(302) 736-7030

Hours:
Monday - Thursday, 9:00 a.m. - 9:00 p.m.
Friday - Saturday, 9:00 a.m. - 5:00 p.m.
Sunday, 1:00 p.m. - 5:00 p.m.

State Library of Delaware
Mr. Steve Newton
43 South Du Pont Highway
Dover, Delaware 19901
(302) 739-4748

Hours:
Monday - Friday, 8:00 a.m. - 4:30 p.m.

U.S. EPA Region III, Docket Room
Ms. Anna Butch
841 Chestnut Building, 9th Floor
Philadelphia, PA 19107
(215) 597-3037

Hours:
Monday - Friday, 8:30 a.m.- 4:30 p.m.

Based upon the comments received by EPA on each of the alternatives described below, or any new information that may be collected, EPA, in consultation with DNREC, may modify the preferred alternative or select an entirely different response action. All comments received within the comment period will be considered and addressed by EPA. See the "Community Participation in the Selection Process" section on page 23 for details of the public comment period and the public meeting.

A glossary explaining terms that may be unfamiliar to the general public is provided at the end of this Proposed Plan. Glossary terms are noted by **bold** print the first time they appear in the text.

SITE DESCRIPTION AND BACKGROUND

The Dover Gas Light Site is located in Kent County, Delaware, within the city of Dover, and occupies the western half of the city block bounded by New Street, Bank Lane, North Street, and Governor's Avenue (see Figure 1). From 1859 to 1948 the Site was used for the production of gas from coal through a process known as coal gasification. The gas was used primarily for lighting and cooking purposes. During this time period, various buildings, gas holders, and storage areas used in the gasification process were located on the Site.

When the plant was closed in 1948, the structures, except for a brick garage, were demolished. Much of the plant was removed, but sections of the tanks and other process equipment containing coal oil, coal tar, coke, and possibly acid, were buried onsite. The brick garage was used by the Delaware State

Museum for storage until it was destroyed by a fire in 1982. The Site is currently an unpaved parking area used by the Delaware State Museum and other nearby businesses. Site topography is generally flat.

The size of the former coal gas facility is approximately one acre while the size of the Superfund Site is approximately 23 acres due to the spread of contamination in the ground water. Only the facility itself has contamination from the coal process near the surface.

Contamination was first discovered at the Site in 1984 when the Delaware Development Office conducted studies in preparation for the construction of a Family Court building. Remains of the coal gasification plant were found buried onsite and oily soil samples yielded significant contamination levels. As a result, DNREC installed and sampled 16 monitoring wells on and in the vicinity of the Site at varying depths below ground surface. The shallow ground water at and to the southeast of the location of the former coal gas facility was found to be contaminated with several **volatile organic compounds** (VOCs) including benzene, toluene, ethylbenzene, and xylenes, (collectively known as **BTEX**), and **polynuclear aromatic hydrocarbons (PAHs)** such as naphthalene and acenaphthylene.

The Site was subsequently proposed for inclusion on the **National Priorities List** (NPL) in January 1987 and was finalized on the NPL in October 1989. In July 1990, Chesapeake Utilities Corporation, a **potentially responsible party (PRP)** at the Site, entered into an **Administrative Order on Consent** with EPA and DNREC to conduct an RI/FS at the Site. The purpose of the RI/FS was to determine the nature and extent of contamination at the Site, and to screen, develop, and evaluate potential clean-up options.

Geologically, the Site is underlain by the unconfined Columbia **aquifer** which is composed of coarse sand and gravel with thin, discontinuous low-permeability clay and clay/silt layers at varying depths. The Columbia aquifer extends to approximately 58 to 65 feet below ground surface (BGS) and is underlain by the Frederica and Cheswold aquifers. These three aquifers are separated by silty sand/clay layers that form **aquitards** which inhibit downward migration of contamination in the ground water. The city of Dover uses only the Cheswold aquifer, the deepest of the three, for its drinking water supply. Ground water flow from the Site moves in an southeasterly direction towards the St. Jones River. The **water table** in the area is generally found at 8 to 15 feet BGS.

The Dover Gas Light RI included soil and ground water sampling, water sampling from the Tar Branch (formerly a drainage ditch or stream into which a concrete culvert was installed in the 1930's), and surface water and **sediment** sampling in the St. Jones River. An aerial photography and a historical map investigation was performed to identify and locate features that existed at the Site during its operation. An inventory was conducted to identify potential sources for ground-water and soil contamination other than the former coal gas plant.

In order to determine the degree of hydraulic connection between the Frederica and Cheswold aquifers beneath the Site, aquifer tests were conducted. Prior to the RI, aquifer tests were performed to determine the hydraulic connection between the Columbia aquifer and the lower two aquifers. Finally, an in-depth archaeological assessment was conducted to evaluate the potential presence of significant archaeological resources at the Site.

The soils investigation revealed that the former facility soils are contaminated with BTEX at concentrations as high as 4,890 parts per million (ppm) and with PAHs at concentrations as high as 26,000 ppm. The highest concentrations were found in the vicinity of former gas holders, tanks, and storage areas of the coal gas plant and were located in the 8 to 16 foot interval BGS; however, elevated levels of PAHs and BTEX were found in one soil sample within two feet of the surface and low levels of PAHs were found as deep as 57 feet BGS near the bottom of the Columbia aquifer. During soil borings, black streaks with coal tar odors and oily substances with fuel odors were found in many borings. Soil contamination extends approximately 800 feet from the former facility to the east and southeast. Elevated levels of BTEX, as high as 12 ppm, and PAHs, as high as 8,000 ppm and similar to onsite contamination were found primarily in the 25 to 50 foot interval BGS.

Ground water has been impacted by the same classes of contaminants as the soil (i.e., BTEX and PAHs). The BTEX and PAH contamination were found to be highest in an area which includes the former facility and extends to the east and southeast approximately 1600 feet. The levels of BTEX were as high as 3,310 parts per billion (ppb) onsite and 8,350 ppb offsite, and the levels of PAHs were as 4,611 ppb onsite and 8,330 ppb offsite. Vertically, the ground-water contamination has had an impact only on the Columbia aquifer to any great extent, though very low levels of benzene were found in two monitoring wells in the Frederica aquifer. The clay layers within the Columbia aquifer have helped limit the downward migration of PAHs. The Cheswold aquifer below the Frederica aquifer has not been impacted by the Site.

The high levels of ground-water and soil contamination indicate that layers of **dense non-aqueous phase liquids (DNAPLs)** are present. Soil data from the facility shows that a source of a DNAPL exists. The soil data and boring logs away from the facility also indicate the presence of a NAPL and/or heavy contamination. At MW-6 (located just east of a former dry cleaner between Governor's Avenue and State Street, see Figure 1), "product" was reported in the staining section of the drilling log at 46 feet BGS. "Moderate" odors were also reported from 46 feet BGS to 60 feet BGS. A soil sample from 45 to 57 feet BGS had approximately 140 ppm total PAHs. Data collected between the facility and MW-6 indicate a continuous layer(s) of DNAPL from the facility to at least as far as MW-6. At MW-6, the contamination problem is compounded by the potential presence of a tetrachloroethylene or perchloroethylene (PCE) DNAPL (see discussion in paragraph below). The PCE could increase the solubility and mobility of the PAHs thus allowing the PAHs to migrate further and faster.

The investigation of contaminants associated with the former coal gas plant (BTEX and PAHs) uncovered widespread contamination of another class of compounds called chlorinated organic compounds such as perchloroethylene (PCE), trichloroethene (TCE), 1,1-dichloroethene, and 1,2-dichloroethene. In soils (but below the water table), these compounds are present at concentrations as high as 32 ppm and extend as far as 1600 feet from the former coal gas facility to the southeast (near Water and Federal Streets). In ground water, the chlorinated contaminants are highest (47 ppm maximum) downgradient of former coal gas plant at MW-6 and extend at least 2500 feet to the east near the St. Jones River (see Figure 1). The chlorinated compounds have also been detected upgradient and to the north (hydraulically side-gradient) of the former coal gas plant (see Figure 1). EPA has determined from data examined to date that the former coal gas plant is not the source of this chlorinated organic contamination.

There are undoubtedly two or more sources of this chlorinated organic contamination. It appears that the source of the greatest contamination is a former dry cleaning establishment located at 411 South Governor's Avenue. Both leaking underground storage tanks (USTs) and a spill during a 1989 fire are likely sources of the heavy chlorinated contamination in the vicinity of MW-6. The level of PCE is high enough to indicate the presence of a DNAPL. The dry cleaner also had several leaking USTs which were used to store fuel oil. These USTs have undoubtedly contributed to the BTEX and PAH contamination in the ground water as discussed above. All of the tanks have been emptied and removed.

Vertically, the chlorinated contamination has behaved similar to the BTEX and PAH contamination. The clay layers within the Columbia have helped limit the downward migration, but have not completely contained it as chlorinated contamination has been detected in several Frederica aquifer wells.

SUMMARY OF SITE RISKS

A baseline **risk assessment** was prepared to assess the potential human health and environmental impacts that may result from exposure to contaminants associated with the Site in the absence of active remediation. A risk assessment is typically composed of two parts: (1) the human health risk assessment that examines current and potential future threats to the public and (2) the environmental risk assessment that examines current and potential future threats to environmental receptors such as plants, aquatic life, and wildlife. In order for a site to pose a current or potential future risk to a human or environmental receptor, a complete exposure pathway must be established. A complete exposure pathway consists of the following components:

1. A source or mechanism for contaminants to be released to the environment.
2. A medium through which contaminants may be transported such as water, soil, sediment, or air.
3. A point of actual or potential exposure or contact for humans or environmental receptors.
4. A route or mechanism such as ingestion, inhalation, or dermal contact for exposure at the contact point.

Current and potential future exposure scenarios were evaluated for complete exposure pathways which met the above criteria.

For the environmental portion of the risk assessment, a survey of the area near the Site showed that the only potentially impacted environmental receptors were in the St. Jones River. The RI/FS showed that contaminants associated with or like those associated with the Site are not currently adversely impacting the St. Jones River. Although contaminants (PAHs, VOCs, other **semivolatile organic compounds**, metals, and pesticides) detected in the sediments in the St. Jones River include some which are similar to those found at the Site, they may be attributed to other urban sources in the area. The environmental assessment concluded that the sediments were not toxic to test organisms and, therefore, present no threat to environmental receptors in the St. Jones River. However, contaminants in the ground water from the Site could migrate and then discharge into the St. Jones River and present a threat in the future to aquatic receptors.

For the human health portion of the risk assessment, current and potential future exposure pathways for eight potential receptors were evaluated. The following is a list of the potential receptors:

1. Adult resident living over the ground-water **plume** and near the former coal gas plant
2. Child resident living over the ground-water plume and near the former coal gas plant
3. Adult museum visitor
4. Child museum visitor
5. Worker washing a truck using contaminated ground water
6. Museum worker
7. Construction worker
8. Utility repairman

The representative list of receptors was developed by examining the current and potential future activities that could occur in areas that currently are or could become contaminated by the Site.

Several exposure pathways were examined for most of the above receptors. For the adult and child residents the following pathways were examined: (1) drinking contaminated ground water, (2) showering (for adults) or bathing (for children) with contaminated ground water, (3) watering the lawn with contaminated ground water, (4) ingesting of fish from the St. Jones River, and (5) wading in contaminated water in the St. Jones River. Each of these pathways is a hypothetical future pathway. Currently there are no private drinking water wells in Dover near the Site, and the municipal water supply wells are not contaminated. Exposure to Site-related contamination in the St. Jones River could only occur once the ground-water plume migrates to the river. Currently it has only migrated to the vicinity of Federal Street which is two or more blocks from the river.

For the adult and child museum visitor, exposure to contamination in shallow soils from the location of the former coal gas plant was examined. This exposure is a current pathway. For the worker washing a truck, exposure to contamination from ground water was examined. This is a potential future pathway only because there is no current use of the contaminated ground water. For the museum worker, exposure to contamination from shallow soil contamination during a normal working day and exposure to contamination from subsurface soils while planting trees around the museum was examined.

For the construction worker, exposure to contamination in subsurface soils during construction projects both at the location of the former coal gas plant and nearby was examined. This is a potential future pathway only because there are currently no subsurface construction projects in areas of contaminated soil. For the utility repairman, exposure to contamination in subsurface soils at the location of the former coal gas plant during the repair of underground utilities was examined.

The human health risk assessment was divided into two categories of impacts: **carcinogenic** and non-carcinogenic or systemic. Many contaminants cause both types of impacts. **Remedial action** is generally warranted when the calculated carcinogenic risk level exceeds 1x10-4 (meaning that one additional person out of 10,000 is at risk of developing cancer caused by a lifetime of exposure to contaminants at a site) under current or future conditions for any of the evaluated exposure scenarios. Remedial action is also generally warranted if the calculated non-carcinogenic **Hazard Index**[1] exceeds 1.0 under current or future conditions for any of the evaluated exposure scenarios. Table 1 provides a summary of the non-carcinogenic risks, and Table 2 provides a summary of the carcinogenic risks. Each table shows the separate contribution of the Site-related contaminants (BTEX, PAHs, and metals) and non Site-related contaminants (chlorinated volatile organic compounds) as well as the total risks for all contaminants of concern. Significant risks are or could be caused by the chlorinated compounds alone. In general, however, any remediation at the Dover Gas Light Site will be triggered by exceedances of 1x10-4 for carcinogenic risks or 1.0 for non-carcinogenic risks for the BTEX and/or the PAHs only. See the "Scope and Role of the Remedial Action" section below for a discussion on how the chlorinated compounds will be addressed.

The risks caused by contaminants associated with the former coal gas plant (BTEX, PAHs, and metals) exceed the acceptable target Hazard Index of 1.0, for non-carcinogenic risks, for four of the eight receptors that were evaluated (as shown in Table 1),

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[1]The potential for health effects resulting from exposure to non-carcinogenic compounds is estimated by comparing an estimated dose to an acceptable level, or reference dose. If this ratio exceeds 1.0, there is a potential health risk associated with exposure to that chemical. The ratios can be added for exposures to multiple contaminants. The sum, known as the Hazard Index, is not a mathematical prediction of the severity of toxic effects, but rather a numerical indicator of the transition from acceptable to unacceptable levels.

and exceed the acceptable target of 1X10-4, for carcinogenic risks, for two of the eight receptors that were evaluated (as shown in Table 2). For those scenarios involving the use of ground water, the chlorinated VOCs associated with the former dry cleaning operation often contributed greatly to the overall risk caused by all of the contaminants present in the ground water. For example, the carcinogenic risks associated with the chlorinated VOCs were two to three orders of magnitude greater than the risks associated with the contaminants from the former coal gas plant.

It is important to note that there are no unacceptable risks associated with current use scenarios. All unacceptable risks are associated with future use scenarios involving the installation of a Columbia aquifer water supply well or construction at the location of the former coal gas plant. Benzene was the largest contributor to the risks caused by contaminants from the former coal gas plant primarily through exposure to ground water.

For several reasons, the risks associated with the construction project at the former coal gas plant probably underestimate the potential threat that the soil in this area presents to human receptors. One, there are places of actual or suspected pools of coal tar that were not sampled. A construction worker could be exposed to the extremely high levels of contaminants in these pools. If so, the risks presented in Tables 1 and 2 are low. Two, if the soil is never remediated and construction takes place, the contaminated subsurface soil may become the top soil where building occupants could be exposed to the contamination for a long period of time rather than just a short period which was used to estimate risks to construction workers.

In conclusion, the risk assessment shows that actual or threatened releases of hazardous substances from this Site, if not addressed by the preferred alternative or one of the other active measures considered, may present a current or potential threat to public health or welfare.

Scope and Role of Remedial Action

As currently planned, the Dover Gas Light Site (which is defined by the BTEX and PAH soil and ground-water contamination resulting from operation and demolition of the former coal gas plant, see Figure 1), is being addressed in two operable units. This Proposed Plan is for the first operable unit (Operable Unit I) and describes remedial alternatives that address soil contamination at the location of the former coal gas plant and ground-water contamination within the area defined as the Site (see Figure 1). Although Site-related contaminants have been detected in the Frederica aquifer, the levels are barely detectable and are low enough that the water is safe to consume although no one currently does. The second operable unit (Operable Unit II) will address potential soil contamination at the location of the former dry cleaning establishment at 411 South Governor's Avenue which may be continually contributing to ground-water contamination.

The results of the risk assessment showed that there are two major areas of the Site which require remediation: (1) the soils at the location of the former coal gas plant and (2) ground water in the Columbia aquifer. EPA considers the heavy deposits of coal tar and DNAPLs to be principal threat waste meaning that the material includes or contains hazardous substances, pollutants, or contaminants that act as a reservoir for migration of contamination to, for example, ground water. Generally, EPA expects to use treatment to address principal threat waste as opposed to containment.

EPA's goal for the former coal gas facility is to remediate the soil to such an extent as to allow for future construction of facilities allowed by the "Institutional & Office" zoning designation. The Delaware State Museum is currently planning an expansion. Since most construction involves some intrusive work, containment of the soils "in place" (for example, by capping the Site to prevent rain water infiltration and to prevent direct contact with contaminated soils) would not be a viable remedial option. If the soils are only contained in place, intrusive construction would ruin any containment structure (such as the cap that was described in the Feasibility Study) allowing the soils to pose an unacceptable risk to human health and the environment. The remedial alternatives addressing soil apply only to contamination in the **vadose zone.** Soil contamination in the saturated zone will be remediated as part of the ground-water remediation.

EPA's goal for the ground water is to return the Columbia aquifer to its beneficial use. Although in the area of the Site, the Columbia aquifer is not currently used as water supply, it has the potential to be used in the future and therefore is considered by EPA to be a Class IIB aquifer. For drinking water aquifers that have been contaminated "EPA expects to return usable ground waters to their beneficial uses wherever practicable, within a time frame that is reasonable given the particular circumstances of the site". [Section 300.430(a)(iii)(F) of the **National Oil and Hazardous Substances Pollution Contingency Plan (NCP)**]

Due to the presence of the chlorinated organic contamination in the ground water which is not from the former coal gas plant, achievement of the ground-water remediation goals for BTEX and PAHs would not, in and of themselves, return the ground water to its beneficial use. Therefore, the chlorinated organics must be remediated as well.

EPA is not currently taking action at the second operable unit because DNREC is negotiating an agreement with Capital Cleaners & Launderers (the owner of the South Governor's Avenue location) to perform an RI/FS, under the State's Hazardous Substance Cleanup Act (HSCA), of two existing or former dry cleaners that are suspected of causing or contributing to the chlorinated organic ground-water contamination. If the DNREC study adequately addresses the potential soil contamination at the former dry cleaning establishment and, if necessary, leads to proper remediation, EPA will only issue a "no action" **Record of Decision (ROD)** for this area. If a "no action" ROD is not able to be issued, EPA will take steps to properly address any potential contamination at the former dry cleaner site that continues to contribute to ground-water contamination.

Remediation Action Objectives and Clean-up Goals for Ground Water and Soil

The Risk Assessment indicates that the carcinogenic and noncarcinogenic risks associated with the Site exceed acceptable levels and therefore warrant remedial action. For ground water, **Maximum Contaminant Levels (MCLs)** and non-zero **Maximum Contaminant Level Goals (MCLGs)** are often used as remediation goals. At this Site, however, since there are multiple contaminants, the cumulative carcinogenic and non-carcinogenic future use risks associated with the MCLs and non-zero MCLGs for the contaminants of concern exceed both 1x10-4, for carcinogenic risks, and 1.0, for noncarcinogenic risks. Therefore, EPA does not consider MCLs and non-zero MCLGs to be protective of human health when there is a possibility of residential consumption. Under such circumstances risk- or health-based levels are used as remediation goals. Therefore, the remediation goals for the ground water are as follows:

1. **To** restore ground water at the Site (which includes all areas impacted by Site-related contaminants, see Figure 1) to health-based levels (i.e., to a level where the cumulative carcinogenic risk is 4.0x10-6 and the Hazard Index does not exceed 1.0) through active remediation. If each of the contaminants of concern listed below were present at a particular

location, the individual clean-up levels for each of the compounds would be as follows:[2]

a.	benzene	0.07	ppb
b.	toluene	76	ppb
c.	ethylbenzene	136	ppb
d.	xylenes	10	ppb
e.	styrene	100	ppb
f.	trichloroethene	0.3	ppb
g.	tetrachloroethene	0.2	ppb
h.	1,1-dichloroethene	0.05	ppb
i.	1,2-dichloroethene	6	ppb
j.	1,1-dichloroethane	83	ppb
k.	1,1,1-trichloroethane	131	ppb
l.	vinyl chloride	0.04	ppb
m.	acenaphthene	223	ppb
n.	anthracene	10950	ppb
o.	fluoranthene	149	ppb
p.	fluorene	1102	ppb
q.	naphthalene	149	ppb
r.	pyrene	112	ppb
s.	manganese	179	ppb

2. To prevent exposure to contaminated ground water until the above clean-up criteria are achieved.

3. Prevent any DNAPL from providing a continuing source of contamination to non-DNAPL areas.

4. Prevent unacceptable levels of contamination from developing in the Frederica aquifer.

For the soil, the goal is to return the soil at the former coal gas facility to a condition where (1) it can be used consistently with its "Institutional & Office" zoning designation with no other restrictions, (2) construction can safely take place, and (3) it no longer is a continuing source of unacceptable levels of contamination to ground water (see

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[2]At some well locations, either some contaminants of concern may not be present (especially the chlorinated organics) or there may be other contaminants that are not listed (other PAHs from coal tar or carbon disulfide which was found in soils within the Columbia aquifer but has not yet been detected in the ground water). At the end of the remedial action, the cumulative risk at each monitoring location should not exceed 4.0x10-6 (for carcinogenic risks) or 1.0 (for non-carcinogenic risks) for those contaminants present at that location using a lifetime residential ground-water exposure scenario.

Figure 2 for the area that the soil clean-up criteria apply to). Below are the clean-up levels that produce a 2.1x10-6 carcinogenic risk and a 1.0 Hazard Index at this Site for a commercial setting and a construction scenario and are protective of the ground water:

a.	benzene	3	ppm
b.	toluene	3200	ppm
c.	ethylbenzene	1560	ppm
d.	xylenes	32000	ppm
e.	styrene	3200	ppm
f.	benzo(a)anthracene	0.33	ppm
g.	benzo(b)fluoranthene	0.33	ppm
h.	benzo(k)fluoranthene	1.24	ppm
i.	benzo(a)pyrene	0.023	ppm
j.	benzo(g,h,i)perylene	1.57	ppm
k.	indeno(1,2,3-c,d)pyrene	0.33	ppm
l.	naphthalene	12	ppm

SUMMARY OF REMEDIAL ALTERNATIVES

The following alternatives for addressing the risks at the Site were described in detail in the feasibility study. The next section, "Evaluation of Remedial Alternatives," will discuss the effectiveness of each of the alternatives relative to the nine criteria established in Section 300.430(e)(9)(iii) of the NCP, the Site remedial action objectives, and to each other. The alternatives have been separated into those that address the ground water and those that address the former facility soils. EPA's preferred alternative for Operable Unit I of the Site will contain one alternative for each area.

Ground Water

Alternative GW-1

The first alternative is the "no action" alternative. Under this alternative, the Site ground water would remain as it is. The identification and evaluation of this alternative is required under Section 300.430(e)(6) of the NCP in order to establish a baseline for comparison to the other alternatives. There is no cost associated with this alternative.

Alternative GW-2

This alternative involves using a pump-and-treat system to remediate the ground water in the fastest time practicable. The estimated area requiring ground water remediation is shown in Figure 1. The ground-water recovery system would be designed in such a way that the **recovery wells** would have overlapping zones of influence throughout the plume area. This would require the installation of approximately 80 recovery wells (see Figure 3). Care would be taken in determining the screen placement of the wells to maximize the recovery of any DNAPLs. Additional wells may be required just to address DNAPLs. It should be noted that the presence of DNAPLs in ground water means that remediation of ground water in the immediate vicinity of the DNAPL is difficult. It is unlikely that a pump-and-treat system without enhancements could remediate the portions of the ground water containing a DNAPL to levels that would allow human consumption.

The recovered ground water would be treated and then discharged to the St. Jones River. The levels of contamination in the discharge stream would comply with substantive requirements of the National Pollutant Discharge Elimination System (NPDES) program. The treatment system may include, but not be limited to, such unit processes as: **air stripping**, biological treatment, carbon adsorption, and metals precipitation. Emissions from any of the unit processes would be captured using secondary controls such as carbon adsorption (unless the emissions posed no threat to human health or the environment). EPA is currently considering three possible locations for the treatment facility: the location of the former coal gas plant (currently used as a parking lot), the location of the former dry cleaner at 411 South Governor's Avenue, and the location of the old City of Dover sewage treatment plant below the Court Street Bridge at the city maintenance facility.

Institutional controls are already in place which prevent private drinking water wells from being installed in Dover. The cost for this alternative would include $2,176,000 of capital costs and operations and maintenance costs of $144,000 per year (for 30 years) for a **present worth** cost of $4,000,000.

Alternative GW-3

This alternative also involves using a pump-and-treat system to remediate the ground water. The estimated area requiring ground water remediation is shown in Figure 1. This alternative involves splitting the plume into two areas based on the magnitude of contamination (see Figure 4). A line of recovery wells would be installed at the downgradient edge of each of the areas. The wells would be located and operated in such a way as to prevent contaminants from each particular area from bypassing the wells at the edge of that area. Care would be taken in determining the screen placement of the wells to maximize the recovery of any DNAPLs. The line of wells in the middle of the plume may require wells screened at several depths in the same location to address DNAPLs. It should be noted that the presence of DNAPLs in ground water means that remediation of ground water in the immediate vicinity of the DNAPL is difficult. It is unlikely that a pump-and-treat system without enhancements could remediate the portions of the ground water containing a DNAPL to levels that would allow human consumption.

The recovered ground water would be treated and then discharged to the St. Jones River. The levels of contamination in the discharge stream would comply with substantive requirements of the NPDES program. The treatment system may include, but not be limited to, such unit processes as: air stripping, biological treatment, carbon adsorption, and metals precipitation. Emissions from any of the unit processes would be captured using secondary controls such as carbon adsorption (unless the emissions posed no threat to human health or the environment). This system would require approximately 20 wells. EPA is currently considering three possible locations for the treatment facility: the location of the former coal gas plant (currently used as a parking lot), the location of the former dry cleaner at 411 South Governor's Avenue, and the location of the old City of Dover sewage treatment plant below the Court Street Bridge at the city maintenance facility.

Institutional controls are already in place which prevent private drinking water wells from being installed in Dover. The cost for this alternative would include $544,000 of capital costs and operations and maintenance costs of $54,000 per year (for 30 years) for a present worth cost of $1,200,000.

Alternative GW-4

This alternative also involves using a pump-and-treat system to remediate the ground water. The estimated area requiring ground water remediation is shown in Figure 1. As with Alternative GW-3, this alternative involves splitting the plume into two areas based on the magnitude of contamination (see Figure 5). A line of recovery wells would be installed at the downgradient edge of the complete plume. This line of wells would be located and operated in such a way as to prevent contaminants in the Site plume from bypassing the wells. In the area of greatest contamination (defined by the area of potential DNAPLs), several lines of recovery wells (as opposed to just one line for this area in Alternative GW-3) would be installed to recover the DNAPLs to the maximum extent practicable (limitations being the general difficulty of recovering DNAPLs and the ability to properly locate the wells in an urban setting). It should be noted that the presence of DNAPLs in ground water means that remediation of ground water in the immediate vicinity of the DNAPL is difficult. It is unlikely that a pump-and-treat system without enhancements could remediate the portions of the ground water containing a DNAPL to levels that would allow human consumption.

The recovered ground water would be treated and then discharged to the St. Jones River. The levels of contamination in the discharge stream would comply with substantive requirements of the NPDES program. The treatment system may include, but not be limited to, such unit processes as: air stripping, biological treatment, carbon adsorption, and metals precipitation. Emissions from any of the unit processes would be captured using secondary controls such as carbon adsorption (unless the emissions posed no threat to human health or the environment). This system would require approximately 35 wells. EPA is currently considering three possible locations for the treatment facility: the location of the former coal gas plant (currently used as a parking lot), the location of the former dry cleaner at 411 South Governor's Avenue, and the location of the old City of Dover sewage treatment plant below the Court Street Bridge at the city maintenance facility.

Institutional controls are already in place which prevent private drinking water wells from being installed in Dover. The cost for this alternative would include $952,000 of capital costs and operations and maintenance costs of $76,500 year (for 30 years) for a present worth cost of $1,900,000.

Former Coal Gas Facility Soils

Alternative S-1

The first alternative is the "no action" alternative. Under this alternative, the Site soils would remain as they are. The identification and evaluation of this alternative is required under Section 300.430(e)(6) of the NCP in order to establish a baseline for comparison to the other alternatives. There is no cost associated with this alternative.

Alternative S-2

This alternative involves excavating soil that exceeds the soil clean-up goals described above at the location of the former coal gas plant (see Figure 2). Any debris that could be cleaned would be separated from the rest of the excavated material and treated at the Site and disposed of onsite. All other material that fails the clean-up criteria (including debris, soil, and coal tar sludge) would be treated offsite and disposed of offsite. The estimated depth of excavation would be the top of the water table in former locations of coal gas plant equipment although the exact depth would be determined by the clean-up criteria (excavation would not extend below the water table).

Potential treatment technologies for cleanable debris includes sandblasting, steam cleaning, and solvent cleaning. All other contaminated material could be disposed of in several ways. Some or all may be incinerated offsite either in a resource recovery kiln such as a cement manufacturer where it would become part of the product or in a hazardous waste incinerator. Some of the excavated soil that contains low levels of contaminants may be landfilled. Clean fill would be placed in the area of excavation to return the area to its original elevation. Crushed stone would be placed in the sections used for parking and grass would be planted in the other areas.

Prior to any excavation, trenches would be dug to examine and recover information regarding a portion of any cultural resources that may be buried at the Site in order to satisfy the requirements of the National Historical Preservation Act. The construction activities associated with this alternative are expected to take six months to complete once the remedial design is finished. The total capital cost of this alternative is estimated to be $3,720,000. There are no operations and maintenance costs associated with this alternative, so the present worth of this alternative is also $3,720,000.

EVALUATION OF REMEDIAL ALTERNATIVES

The above alternatives were evaluated in detail to determine which would be the most effective in achieving the goals of CERCLA, and in particular, achieving the remedial action objectives for the Site. EPA uses nine criteria to evaluate alternatives. These criteria are summarized in Table 3. The first two criteria (overall protection of human health and the environment, compliance with **applicable or relevant and appropriate requirements (ARARs)**) are threshold criteria. The selected remedy must meet both of these threshold criteria (except when an ARAR waiver is invoked). The next five criteria (long-term effectiveness and permanence, reduction of toxicity, mobility, or volume through treatment, short-term effectiveness, implementability, and cost) are the primary balancing criteria. The remaining two criteria (state and community acceptance) are referred to as modifying criteria. These last two criteria will be taken into account following the close of the comment period on this Proposed Plan.

Overall Protection of Human Health and the Environment

For the ground water, the "no action" alternative does not meet this threshold criteria since, if no remedial action is taken, a person consuming water from a Columbia aquifer well in the future would be exposed to unacceptable levels of contamination. Since the "no action" alternative for the ground water does not meet this threshold criteria, it will not be considered any further.

Alternatives GW-2, GW-3, and GW-4 all meet this threshold criteria. In each of these alternatives the recovery systems would be operated until the contaminant levels are reduced to levels considered safe to consume (i.e., the clean-up goals have been achieved). Limits would be set for the air and water emissions from the treatment system such that the emissions do not pose a threat to human health or the environment. Existing institutional controls will prevent any exposure to the contaminated ground water while it is being remediated. Alternatives GW-2, GW-3, and GW-4 will protect the environment by preventing the eventual discharge of the contaminated ground water into the St. Jones River where it could pose a threat to aquatic receptors, as well as the public.

For the soil, the "no action" alternative does not meet this threshold criteria since, if no remedial action is taken, the contaminated soils will (1) continue to leach contaminants to the ground water and (2) pose an unacceptable threat to future construction workers and building occupants. Since the "no action" alternative for soils does not meet this threshold criteria, it will not be considered any further. Alternative S-2 meets this threshold criteria. Through the combination of excavation, debris washing, backfilling with clean fill, and offsite disposal, the soils at the former coal gas plant location would no longer pose a threat to human health or the environment. The area would be safe for building construction and occupancy and would no longer adversely contribute to ground-water contamination. Offsite treatment of the contaminated soil and debris by incineration would permanently destroy the contaminants so they would never pose a threat again.

<u>Compliance with ARARs</u>

For the ground water, Alternatives GW-2, GW-3, and GW-4 meet this threshold criteria. The major ARAR is the Safe Drinking Water Act. The Site ground-water clean-up criteria are at or below the limits set in the SDWA. The recovery systems will operate until the clean-up criteria are met. Other significant ARARs for the ground water involve the regulations which control the amount of air emissions from the air stripper and the allowable contaminant concentration in the treated ground water. Discharge limits, in compliance with ARARs, would be set during the remedial design.

For the soil, Alternative S-2 meets this threshold criteria. The major ARARs associated with this alternative are the National

Historical Preservation Act, the Resource Conservation and Recovery Act (RCRA), and Delaware's Hazardous Substance Cleanup Act (HSCA). Many of the requirements of the National Historical Preservation Act were met during the RI/FS through cultural resource surveys. As part of this alternative, a data recovery operation would be performed at the beginning of the excavation to gather archaeological information. Some of the soil may be RCRA-hazardous waste due to leachability of benzene. If so, onsite treatment by stabilization may be necessary to render the waste non-hazardous depending of the final disposal site. If any of the waste is considered a RCRA-hazardous waste, all onsite treatment, storage, and handling practices would be done in accordance with RCRA. The main requirement of HSCA as it relates to this Site is that the clean-up criteria must be equal to or below the criteria provided by DNREC for compliance with HSCA. The soil clean-up criteria are at or below the criteria provided by DNREC.

Long-Term Effectiveness and Permanence

For the ground water, Alternatives GW-2, GW-3, and GW-4 have the same degree of long-term effectiveness and permanence. Once the clean-up criteria are met, the Site-related contaminants will no longer pose a threat to human health and the environment. This is a permanent solution. Once the contaminants are removed from the ground water, most will be captured in the emissions control equipment (if such equipment is necessary to protect human health and the environment) and eventually incinerated offsite, thereby destroying the contaminants. The **residual risk** once the clean-up criteria are met will be 4.0x10-6 for carcinogenic risks and 1.0 for non-carcinogenic risks.

For the soil, Alternative S-2 provides excellent long-term effectiveness and permanence. This alternative will return the property to unrestricted "Institutional & Office" use. Since the clean-up requirements for an area zoned "Institutional" (i.e., could be used for a school) are the same as an area zoned "Residential," there is no need to prevent future use as residential property although this is highly unlikely since, among other reasons, the State is considering plans to expand the museum. The residual risk once the clean-up criteria are met will be 2.1x10-6 for carcinogenic risks and 1.0 for non-carcinogenic risks.

Reduction of Toxicity, Mobility, or Volume Through Treatment

For the ground water, Alternatives GW-2, GW-3, and GW-4 offer a large reduction of toxicity, mobility and volume through treatment. Removing the contaminants from the ground water will greatly reduce the volume of contaminated material. The recovery systems designed under any of these alternatives will prevent the expansion of the plume. The use of emission controls (if such equipment is necessary to protect human health and the environment) will allow the capture and permanent destruction of the contaminants.

For the soil, Alternative S-2 offers a large reduction of toxicity, mobility and volume through treatment. By removing the contaminated soil from the Site, the mobility of the contaminants will be reduced to zero. This is a significant step in helping remediate the ground water since it will eliminate one major source of contamination. The toxicity and the volume of contaminated material will be greatly reduced through the use of offsite incineration. Incineration is an effective technology for destroying the type of contaminants found at the Site. If a cement kiln is used to incinerate the waste, the soil will be incorporated into the final product so that there will not be a final waste stream to dispose of.

Short-Term Effectiveness

For the ground water, each alterative has specific advantages and disadvantages in regards to short-term effectiveness. Alternative GW-2 would obviously reduce the level of contamination at the fastest rate followed by Alternative GW-4 and then Alternative GW-3. However, due to the fact that Alternative GW-2 requires the greatest number of wells, this alternative will have a much greater degree of short-term impacts followed by Alternative GW-4 and then Alternative GW-3. The greater the number of wells that are drilled, the more significant the impact will be to the local community since this is an urban area. Also, due to the historical significance of the area, there is a much greater possibility of disturbing cultural resources with Alternative GW-2, followed by Alternative GW-4, and then Alternative GW-3. The local community will be protected during the remedial action under each of these alternatives by properly blocking off streets and sidewalks during well installation and the use of emission controls during the operation of the ground-water treatment equipment (if such equipment is necessary to protect human health and the environment).

For the soil, Alternative S-2 has moderate short-term impacts. The possibility exists for the release of volatile organic compounds during the excavation. Measures will be taken to ensure the protection of the workers and the local community. A health and safety plan for the workers will be written prior to any excavation to evaluate the type of personal protective equipment that will be required to perform the excavation. Air monitoring and emergency contingency plans are examples of the types of measures that can be used to protect the local community. The parking lot will be closed during the excavation.

Implementability

For the ground water, Alternative GW-3 is the easiest to implement, followed by Alternative GW-4 and then Alternative GW-2. Due to the urban setting, it is questionable if Alternative GW-2 is even implementable because building locations may prevent the proper spacing of wells to get complete coverage of the plume. Also, the greater the number of wells required, the greater the amount of coordination that will be required with Dover's Engineering office and the State's Bureau of Archaeology and Historical Preservation. The location of utilities and historical resources may also limit the placement of wells. Ground-water pump-and-treat services are easily obtainable.

For the soil, Alternative S-2 is implementable. Precautions can be taken to ensure the safety of workers and the local community. Excavation and archaeological services are obtainable. Facilities exist for the treatment of the excavated material.

Cost

For the ground water, the present worth costs for Alternatives GW-2, GW-3, and GW-4 are $4,000,000, $1,200,000, and $1,900,000, respectively. The present worth cost for each of these alternatives include significant operational and maintenance costs due to the length of pumping time required. For the soil, the cost of excavation and disposal under Alternative S-2 is $3,700,000.

State Acceptance

The State is in general agreement with EPA's preferred alternative (described in the next section, "EPA's PREFERRED ALTERNATIVE"). The State commented that it is mandatory that any recovery system and treatment plant be sensitive to the historical and aesthetic nature of the area. One specific request of this nature by the State was that there be no above grade changes in appearance along Federal Street (although manhole covers in the sidewalk or street would be acceptable). The State also requested that construction activities along Federal Street be limited to the time period of November to March to avoid conflicts with public events. EPA intends to honor these requests.

One part of EPA's preferred alternative that the State does not support are the soil clean-up criteria. EPA's clean-up criteria were based on a residential exposure scenario since the property has an "Institutional & Office" zoning designation allowing for the construction of a school. The State believes that the location of the former coal gas plant will only be used for expansion of the museum and associated facilities and that EPA's use of a residential exposure scenario is conservative. The State has proposed a soil clean-up goal of approximately seven ppm total PAHs based on the types of exposure expected at the museum. The State's goal is expressed as a total of all PAHs present rather than a goal for each individual compound. If each of EPA's individual clean-up goals is added together, the total is approximately four ppm. EPA's goals also include BTEX. EPA will continue discussions with the State regarding this issue during the public comment period.

Community Acceptance

Community acceptance of the EPA's preferred alternative (see below) will be evaluated after the public comment period ends and will be described in the ROD for the Site.

EPA's PREFERRED ALTERNATIVE

Based on an evaluation of the alternatives using the criteria identified above (with the exception of State and community acceptance), EPA proposes a combination Alternative GW-3 for the ground water and Alternative S-2 for the soil as its preferred alternative for this Site. The "no action" alternative does not meet the threshold criteria for either media and, therefore, can not be selected. For the ground water, Alternatives GW-2, GW-3, and GW-4 all meet the threshold criteria. Although Alternative GW-2 would return the ground water to its beneficial use in the shortest time, it is much more difficult to implement, more costly, and has a much greater short-term impact. Alternative GW-3 has the least amount of short-term impacts, is the least costly, and is the easiest to implement, but it will do the least to address the DNAPLs which will remain a continuing source of contamination for an extremely long time. Although Alterative GW-4 would provide for greater short-term DNAPL recovery than Alternative GW-3, it would do so at higher costs. In view of the fact that even aggressive remediation of the DNAPLs may not provide drinkable ground water in the immediate vicinity of the DNAPL, and in view of the low probability that this ground water will be used for drinking water, EPA has identified Alternative GW-3 as its preferred alternative for ground water.

In summary, EPA's preferred alternative for Operable Unit I of the Dover Gas Light Superfund Site addresses the former coal gas plant soils and the ground water and involves installing two lines of ground-water recovery wells, one in the middle of the plume (at the downgradient edge of the DNAPL contamination to be used for DNAPL/ground-water extraction) and one at the edge of the plume, pumping and treating the ground-water until the Site reaches ground-water clean-up levels; excavating contaminated soils at the location of the coal gas plant and incinerating the soils offsite. An archaeological data recovery operation involving excavation of several trenches would take place prior to complete excavation. The total present worth cost of EPA's preferred alternative for Operable Unit I is $4,900,000.

As discussed previously, Operable Unit II includes the soils at the former dry cleaner at 411 South Governor's Avenue. EPA is not currently taking action at the second operable unit because DNREC is negotiating an agreement with Capital Cleaners & Launderers (the owner of the South Governor's Avenue location) to perform an RI/FS, under the State's Hazardous Substance Cleanup Act (HSCA), at two existing or former dry cleaners that are suspected of causing or contributing to the chlorinated organic ground-water contamination. If the DNREC study adequately addresses the potential soil contamination at the former dry cleaning establishment and, if necessary, leads to proper remediation, EPA will only issue a "no action" ROD for this area. If a "no action" ROD is not able to be issued, EPA will take steps to properly address any contamination at the former dry cleaner site that is still contributing unacceptably to ground-water contamination within the plume of contamination from the Dover Gas Light Superfund Site.

COMMUNITY PARTICIPATION IN THE SELECTION PROCESS

EPA relies on public input during the remedy selection process to make sure that the alternative selected for each Superfund site is not only effective but addresses the concerns of the local community. For this reason, EPA is providing a public comment period on the Proposed Plan. This comment period will allow the public to comment on the alternatives in the feasibility study, the alternatives summarized in this Proposed Plan, and on the preferred alternative in particular. EPA will select a remedy based on the information in the Administrative Record and on public comments. The remedy selected will be documented in a Record of Decision that summarizes EPA's decision process and responds to comments received from the public.

Copies of the feasibility study and other Site-related documents are available for public review in the Administrative Record file, the location of which is identified in the introductory section of this Proposed Plan.

EPA will hold a public meeting at 7:00 p.m., on Thursday, February 17, 1994, at DNREC's Richardson and Robbins Building, 89 Kings Highway, Dover, Delaware, (302) 739-4506, to present a summary of the RI/FS and the preferred alternative. Interested citizens will have an opportunity to ask questions and provide comments. The public comment period begins on February 2, 1994, and concludes on March 4, 1994. EPA encourages citizens to review Site-related documents and submit written comments to one of the following people:

Terri White (3EA21)
Community Relations Coordinator
U.S. EPA Region III
841 Chestnut Building
Philadelphia, PA 19107
(215) 597-6925

Randy Sturgeon (3HW42)
Remedial Project Manager
U.S. EPA Region III
841 Chestnut Building
Philadelphia, PA 19107
(215) 597-0978

Written comments may also be sent to or further information obtained from DNREC. Please contact the DNREC representative listed below:

Steve Johnson
Project Officer
DNREC
715 Grantham Lane
New Castle, DE 19720
(302) 323-4540

TABLE 1
NON-CARCINOGENIC RISK SUMMARY

POTENTIAL RECEPTORS	HAZARD INDEX FOR BTEX, PAHs, METALS (Site-related contaminants)	HAZARD INDEX FOR CHLORINATED VOCs (Non-Site-related contaminants)	TOTAL HAZARD INDEX FOR ALL CONTAMINANTS
Adult Resident			
Drinking ground water	23	71.	94.
Showering with ground water	127	0.55	127.
Wading in the St. Jones River	0.0012	0.019	0.02
Eating fish from the St. Jones	0.15	0.44	0.59
Lawn watering	10.	0.94	10
TOTAL	160	73.	233
Child Resident			
Drinking ground water	54	165	219
Bathing with ground water	66	107	173
Wading in the St. Jones River	0.0011	0.016	0.017
Eating fish from the St. Jones	0.45	1.3	1.8
Lawn watering	37	4.4	41
TOTAL	157	278	435
Washing a truck--TOTAL	67	1.0	68
Adult Museum Visitor--TOTAL	0.04	0.0	0.04
Child Museum Visitor--TOTAL	0.13	0.0	0.13
Museum Worker			
Normal daily activity	0.18	0.0	0.18
Tree planting	0.0062	0.0	0.0062
TOTAL	0.18	0.0	0.18
Construction worker			
Project at coal gas location	7.8	0.0	7.8
Nearby project	0.0	0.0	0.0
TOTAL	7.8	0.0	7.8
Utility repairman--TOTAL	0.0	0.0	0.0

TABLE 2
CARCINOGENIC RISK SUMMARY

POTENTIAL RECEPTORS	RISKS FOR BTEX, PAHs, METALS (Site-related contaminants)	RISKS FOR CHLORINATED VOCs (Non-Site-related contaminants)	TOTAL CARCINOGENIC RISKS FOR ALL CONTAMINANTS
Adult Resident			
Drinking ground water	9.2X10-5	2.8x10-2	2.8x10-2
Showering with ground water	1.7x10-4	2.2x10-2	2.2x10-2
Wading in the St. Jones River	2.2x10-8	3.6x10-6	3.6x10-6
Eating fish from the St. Jones	6.8x10-6	8.1x10-5	8.8x10-5
Lawn watering	1.5x10-5	6.3x10-3	6.3x10-3
TOTAL	2.8x10-4	5.6x10-2	5.6x10-2
Child Resident			
Drinking ground water	5.4x10-5	1.6x10-2	1.6x10-2
Bathing with ground water	8.5x10-6	5.2x10-3	5.2x10-3
Wading in the St. Jones River	4.8x10-9	7.9x10-7	7.9x10-7
Eating fish from the St. Jones	5.2x10-6	6.1x10-5	6.6x10-5
Lawn watering	1.3x10-5	5.6x10-3	5.6x10-3
TOTAL	8.1x10-5	2.7x10-2	2.7x10-2
Washing a truck--TOTAL	9.5x10-5	4.0x10-2	4.0x10-2
Adult Museum Visitor--TOTAL	5.6x10-8	0.0	5.6x10-8
Child Museum Visitor--TOTAL	4.5x10-7	0.0	4.5x10-7
Museum Worker			
Normal daily activity	2.1x10-6	0.0	2.1x10-6
Tree planting	6.4x10-7	0.0	6.4x10-7
TOTAL	2.7x10-6	0.0	2.7x10-6
Construction worker			
Project at coal gas location	9.1x10-4	0.0	9.1x10-4
Nearby project	2.5x10-6	0.0	2.7x10-6
TOTAL	9.1x10-4	0.0	9.1x10-4
Utility repairman--TOTAL	1.3x10-6	0.0	1.3x10-6

TABLE 3

EPA CRITERIA FOR EVALUATING ALTERNATIVES

Threshold Criteria

• **Overall Protection of Human Health and the Environment:** Describes how the alternative, as a whole, achieves and maintains protection of human health and the environment, and how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

• **Compliance with ARARs:** Addresses whether a remedy will meet all of the applicable or relevant and appropriate requirements (ARARs) of Federal and State environmental laws and/or justifies invoking a waiver.

Primary Balancing Criteria

• **Long-Term Effectiveness and Permanence:** Considers the ability of the remedy to maintain reliable protection of human health and the environment over time once clean-up goals have been met.

• **Reduction of Toxicity, Mobility, or Volume Through Treatment:** Describes the anticipated performance of the treatment technologies that may be employed in a remedy.

• **Short-Term Effectiveness:** Examines the effectiveness of alternatives in protecting human health and the environment during the construction and implementation of the remedy, until the clean-up levels are achieved.

• **Implementability:** Evaluates the technical and administrative feasibility of alternatives and the availability of required materials and services.

• **Cost:** Considers the capital and operation and maintenance (O&M) costs of the alternatives.

Modifying Criteria

• **State Acceptance:** Indicates whether the State agency, based on its review of the Proposed Plan, concurs with, opposes, or has no comment regarding the preferred alternative.

• **Community Acceptance:** The community's general response to the alternatives will be assessed in the Record of Decision following a review of the public comments received on the Administrative Record and the Proposed Plan.

FIGURE 3
Dover Gas Light Superfund Site
Alternative GW-2 Well Locations

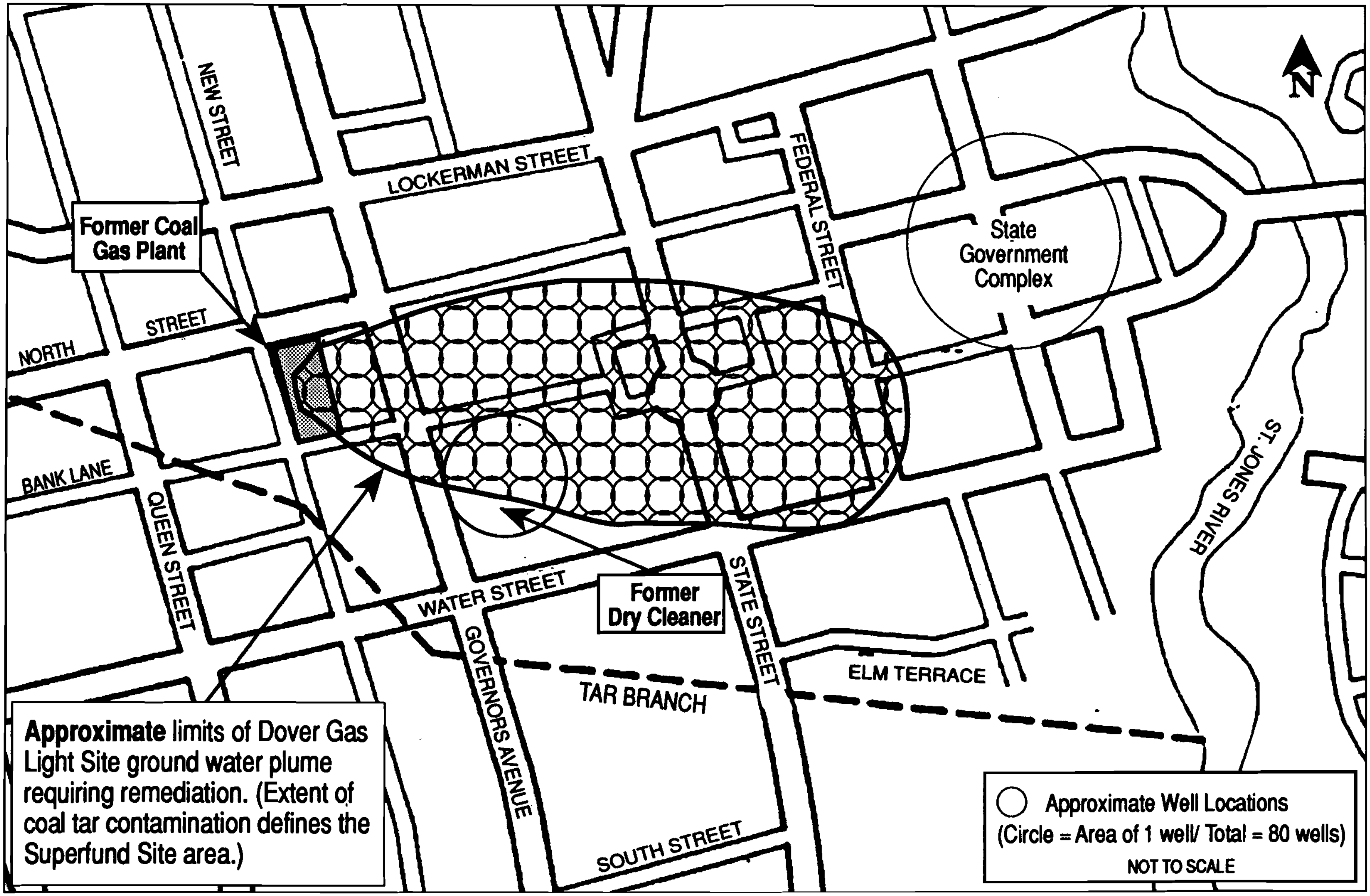
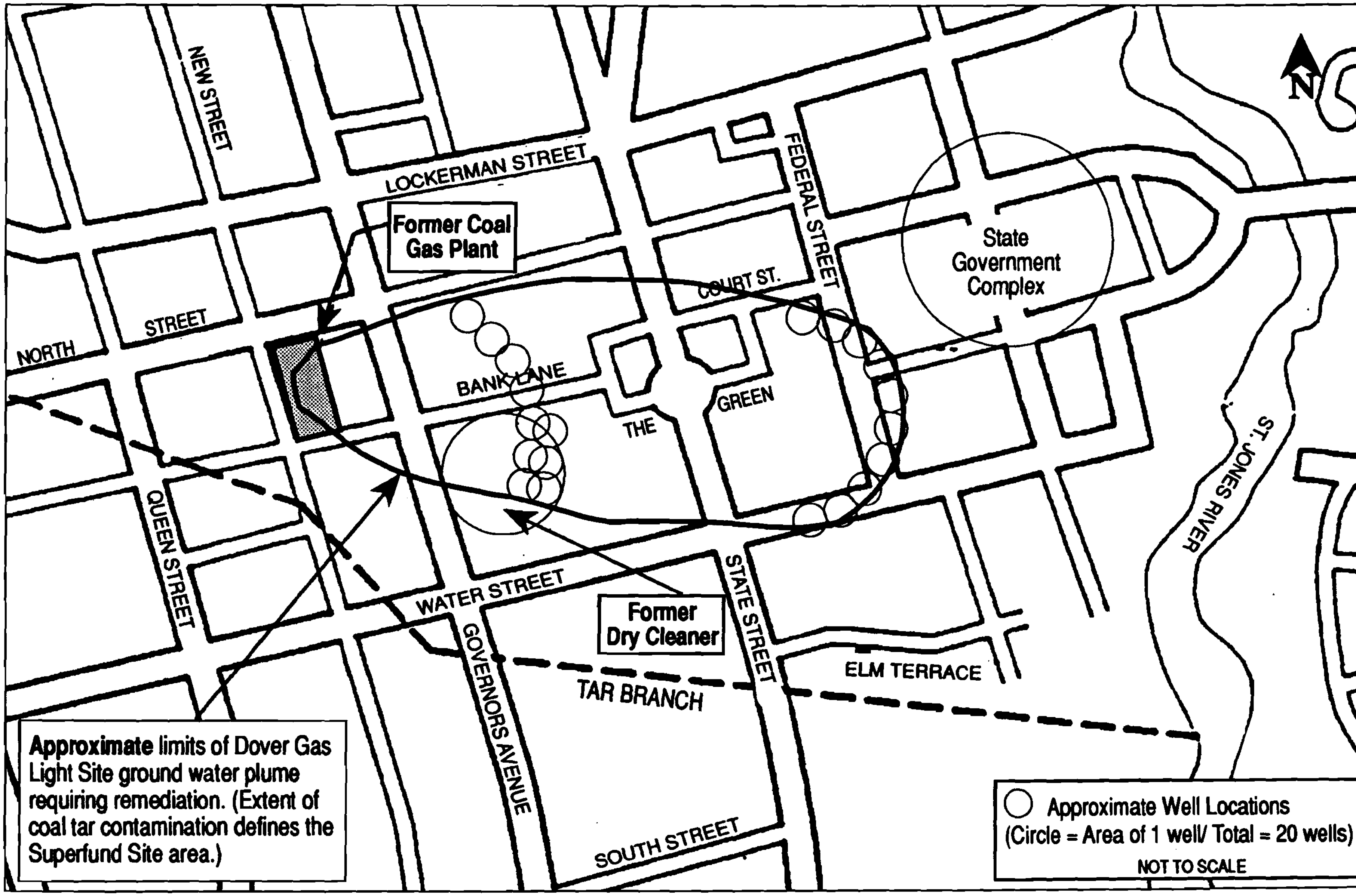


FIGURE 4
Dover Gas Light Superfund Site
Alternative GW-3 Well Locations



GLOSSARY

Administrative Order on Consent (AOC): A legal agreement between EPA and potentially responsible parties (PRPs) whereby PRPs agree to perform or pay the cost of a Remedial Investigation/ Feasibility Study at a Superfund site.

Administrative Record: An official compilation of documents, data, reports, and other information that form the basis of response actions selected for a Superfund site. The record is placed in the information repository to allow public access to the material. The preparation of such a record is required by CERCLA.

Air Stripping: A treatment system that removes, or "strips," **volatile organic compounds** from contaminated **ground water** by forcing an airstream through the water and causing the compounds to evaporate.

Aquifer: An underground formation composed of materials such as sand, soil, or gravel that can store and supply ground water to wells and springs.

Aquitard: A layer of low-permeability material in an aquifer that limits that vertical migration of ground water.

Applicable or Relevant and Appropriate Requirements (ARARs): The federal and state environmental requirements that a selected remedy must attain. These requirements may vary among sites and alternatives.

BTEX: A mixture of benzene, toluene, ethylbenzene, and xylenes which are volatile organic compounds commonly found in gasoline.

Carcinogenic: Cancer causing.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA): A federal law passed in 1980 and modified in 1986 by the Superfund Amendments and Reauthorization Act (SARA). The Acts created a special tax that goes into a trust fund, commonly known as **Superfund**, to investigate and clean up abandoned or uncontrolled hazardous waste sites.

Dense Non-aqueous Phase Liquid (DNAPL): An organic ground-water contaminant that is so concentrated that it is unable to completely dissolve in the ground water and forms a separate phase. It is heavier than water and tends to sink forming a layer of contamination.

Ground Water: The water beneath the earth's surface that flows through the soil and rock openings and often serves as a principal source of drinking water.

Hazard Index: The ratio between the average estimated dose of a toxic substance received by a human population and the reference dose. The reference dose is an average daily lifetime dose that is expected not to produce adverse health effects in human populations.

Maximum Contaminant Levels (MCLs): Enforceable standards for public drinking water supplies under the Safe Drinking Water Act. Also referred to as drinking water standards.

Maximum Contaminant Level Goals (MCLGs): Under the Safe Drinking Water Act, a non-enforceable concentration of a drinking water contaminant, set at the level at which no known or anticipated adverse effects on human health occur and which allows an adequate safety margin.

National Oil and Hazardous Substances Pollution Contingency Plan (NCP): The federal regulation that guides the Superfund program.

National Priorities List: EPA's list of the nation's top priority hazardous waste sites that are eligible to receive federal money for response under CERCLA.

Plume: A measurable discharge of a contaminant from a given point of origin.

Polynuclear Aromatic Hydrocarbons (PAHs): A class of organic compounds made up of benzene rings.

Potentially Responsible Party (PRP): An individual or company (such as a facility owner or operator, or a transporter or generator of hazardous substances) potentially responsible for, or contributing to, the contamination problems at a Superfund site. Whenever possible, EPA requires PRPs, through administrative and legal actions, to clean up hazardous waste sites they have contaminated.

Present Worth: A term used to indicate the discounting of sums to be received in the future to their present value equivalent, or the amount which will accumulate to the required sum if invested at prevailing interest rates.

Record of Decision (ROD): A legal document that describes the final remedy selected for a Superfund site and presents the reasons the remedy was selected. It summarizes the results of the RI/FS reports and the comments received during the comment period for the Proposed Plan.

Recovery Well: A well used to extract contaminated ground water from the aquifer for subsequent treatment.

Remedial Investigation and Feasibility Study (RI/FS): Two distinct but related studies conducted as part of the Superfund remedial process that support the selection of a remedial action for a site. The first part, the RI, identifies the nature and extent of contamination at the site. The second part, the FS, identifies and evaluates alternatives for addressing the contamination.

Remedial Action: The actual construction or implementation phase of a Superfund site cleanup.

Residual Risk: The risk remaining from a site once the cleanup is completed.

Resource Conservation and Recovery Act (RCRA): A federal law that established a regulatory system to track hazardous substances from the time of generation to disposal. The law requires safe and secure procedures to be used in treating, transporting, storing, and disposing of hazardous substances. RCRA is designed to prevent new, uncontrolled hazardous waste sites.

Risk Assessment: A means of estimating the amount of harm that a Superfund site could cause to human health and the environment. The objectives of a risk assessment are: (1) to help determine the need for action by estimating the harm if the site is not cleaned up, (2) to help determine the levels of chemicals that can remain at a site and still be protective of human health and the environment, and (3) to provide a basis for comparing different cleanup methods.

Sediments: Soils, sand, and minerals washed from land into water.

Semivolatile Organic Compounds: Chemical compounds that contain carbon and hydrogen and that, at a relatively low temperature, fluctuate between a vapor state (a gas) and a liquid state.

Superfund: The name commonly used for **CERCLA**.

Vadose Zone: The portion of soil between the surface and the water table.

Volatile Organic Compound (VOC): An organic (carbon-containing) compound that readily evaporates (volatilizes) under atmospheric conditions.

Water Table: The upper surface of the ground water. It is the level at which water stands in a well.