EPA REGION 3 ORIGINAL (Red)
AUGUST 1994

RECORD OF DECISION
DOVER GAS LIGHT SUPERFUND SITE
DOVER, KENT COUNTY, DELAWARE

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RECORD OF DECISION
DOVER GAS LIGHT SITE

DECLARATION

SITE NAME AND LOCATION

Dover Gas Light Site,
Dover, Kent County, Delaware

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Dover Gas Light Site (Site), in Dover, Kent County, Delaware, which was chosen in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended, 42 U.S.C. §§ 9601 et seq., and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R. Part 300. This decision document explains the factual and legal basis for selecting the remedy for this Site. The information supporting this remedial action decision is contained in the Administrative Record file for this Site.

The State of Delaware has concurred on the selected remedy as stated in its August 2, 1994, letter (see Attachment A of this Record of Decision).

ASSESSMENT OF THE SITE

The Site is highly contaminated and this contamination is mainly the result of approximately 100 years of operation of a coal gas plant. Pursuant to duly delegated authority, I hereby determine, pursuant to Section 106 of CERCLA, 42 U.S.C. § 9606, that actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present an imminent and substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF THE SELECTED REMEDY

The selected remedy addresses both the ground water and soil adversely impacted by the contamination at the Site. This is the final remedy for the Site. The selected remedy for the ground water includes hydraulic containment of an area containing non-aqueous phase liquids (NAPLs), removal of any accessible and pumpable NAPLs, and natural attenuation of the portion of the plume containing only dissolved contaminants. In the future, if EPA determines that attainment of maximum contaminant levels

(MCLs) or non-zero maximum contaminant level goals (MCLGs) in the NAPL area is technically impracticable from an engineering perspective, then EPA will invoke the "technical impracticability" ARAR (applicable or relevant and appropriate requirement) waiver, to the extent required by law.

For the soil, Site-specific clean-up criteria have been developed. Soils at the location of the former coal gas plant that do not meet these criteria will be excavated and treated off-site using commercially available thermal destruction facilities. The total estimated present worth cost of this remedy is $6,000,000.

DECLARATION OF STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment; complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action (or a waiver will be justified for any Federal and State applicable or relevant and appropriate requirements that cannot be met); and is cost-effective. This remedy utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable, and it satisfies the statutory preference for remedies that employ treatment that reduce toxicity, mobility, or volume as their principal element.

Because this remedy will result in hazardous substances remaining on-site in the ground water above health-based levels and in soil above levels which allow for unrestricted use, CERCLA requires that a review be conducted within five years after remedial action is initiated to ensure that the remedy continues to provide adequate protection of human health and the environment. Such reviews will be conducted every five years thereafter until EPA determines that the clean-up levels set forth in this ROD have been achieved, or that the hazardous substances remaining on the Site do not prevent unlimited use and unrestricted exposure.

for W Rasmewski

Peter H. Kostmayer
Regional Administrator
Region III

8.16.94
Date

DECISION SUMMARY

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 the original retort building, 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 on-site. The original retort building 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 plant 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 plant itself has contamination from the coal gas 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 on-site and oily soil samples yielded significant contamination levels. As a result, the Delaware Department of Natural Resources and Environmental Control (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 plant 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,

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entered into an Administrative Order on Consent with EPA and DNREC to conduct a remedial investigation and feasibility study (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.

HISTORY OF OTHER ENFORCEMENT ACTIVITIES

DNREC is currently negotiating an agreement under the State's Hazardous Substance Cleanup Act (HSCA) with Capitol Cleaners & Launderers to perform an RI/FS that includes an investigation of a former dry cleaning establishment that has contributed to the ground-water contamination at the Site. DNREC's Underground Storage Tank (UST) Program directed a project to remove underground storage tanks at this location.

Chesapeake Utilities has filed a civil action for contribution under CERCLA against Capitol for reimbursement of its costs incurred at the Site.

HIGHLIGHTS OF COMMUNITY PARTICIPATION

Pursuant to Section 113(k)(2)(B)(i-v) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended 42 U.S.C. § 9613(k)(2)(B)(i-v), a Proposed Remedial Action Plan (Proposed Plan), and its supporting documentation, was released to the public for comment on February 2, 1994. The notice of availability of these documents was published in The Delaware State News and the Dover Post on February 2, 1994. A public comment period on the documents was originally held from February 2, 1994 to March 4, 1994, and due to a request, was extended to April 4, 1994. In addition, a public meeting was held on February 17, 1994, at DNREC's Richardson and Robbins Building. At this meeting, representatives from EPA answered questions about conditions at the Site and the remedial alternatives under consideration. Responses to the comments received during the public comment period, including those expressed verbally at the public meeting, are included in the Responsiveness Summary, which is part of this Record of Decision (ROD). This ROD presents the selected remedial action for the Dover Gas Light Site in Dover, Kent County, Delaware, chosen in accordance with CERCLA and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR Part 300. The decision for this Site is based on the Administrative Record which contains all of the supporting documentation for this ROD. The Administrative Record file is located at the EPA Administrative Record Room in Region III's

Philadelphia office, at the Dover Public Library, and at the State Library of Delaware (also located in Dover).

SUMMARY OF SITE CHARACTERISTICS

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, Cheswold, and Piney Point 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 the Cheswold and Piney Point aquifers, the deeper of the four aquifers, for its drinking water supply. Ground-water flow from the Site moves in a 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 which was enclosed in a concrete culvert 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 two lower aquifers. Finally, an in-depth archaeological assessment was conducted to evaluate the potential presence of significant cultural resources at the Site.

The soils investigation revealed that the former plant 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 extended approximately 800 feet from the

former plant 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 soil contamination at the former plant location were found primarily in the 25 to 50 foot interval BGS. See Figure 2 for selected soil sample results.

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 plant and extends to the east and southeast approximately 1,600 feet. The levels of BTEX were as high as 3,310 parts per billion (ppb) and the levels of PAHs were as 4,611 ppb at the former plant location. Away from the former plant, the levels of BTEX were as high as 8,350 ppb and the levels of PAHs as high as 8,330 ppb. 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 and Piney Point aquifers below the Frederica aquifer have not been impacted by the Site. See Figure 3 for selected ground-water sample results.

The high levels of ground-water and soil contamination plus field observations indicate that layers of both dense non-aqueous phase liquids (DNAPLs) and light non-aqueous phase liquids (LNAPLs) are present. At MW-4, located at the northwest corner of Governor's Avenue and Water Streets, an oil coating has been observed on the inside of a well casing. Soil data from the plant shows that a source of non-aqueous phase liquid (NAPL) exists. The soil data and boring logs away from the plant 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 former plant and MW-6 indicated a continuous layer(s) of DNAPL from the plant 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 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 1,600 feet from the former coal gas plant to the southeast (near Water and Federal Streets). In ground water, the chlorinated contaminants are highest (47 ppm maximum) downgradient of the former coal gas plant at MW-6 and extend at least 2,500 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 (as discussed in detail in the "Scope and Role of the Remedial Action" section below, the State is investigating this contamination). 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 semi-volatile 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 pose 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 Site-related contamination 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 only a potential future pathway 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 (see Table 1 for a list of exposure assumptions).

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. The actual or potential risk is calculated by multiplying an intake factor (calculated from all of the exposure assumptions) by a cancer potency factor or CPF[2] (for carcinogenic risks) and by a reference dose or RfD[3] (for non-carcinogenic risks) and by the concentration of each contaminant for each exposure pathway.[4]

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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.

[2]CPFs, also known as slope factors, have been developed by EPA's Carcinogenic Assessment Group for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenic chemicals. CPFs, which are expressed in units of $(mg/kg\text{-}body\ weight/day)^{-1}$, are derived from the results of human epidemiological studies or chronic animal bioassays to which animal-to-human extrapolation and uncertainty factors have been applied.

[3]An RfD is a toxicity value used to estimate the potential for adverse non-carcinogenic health effects. The model to determine RfDs from the dose-response assessment assumes that there is a concentration for non-carcinogens below which there is little potential for adverse health effects over a lifetime of exposure. The RfD is designed to represent this threshold level. The RfD is calculated from the highest chronic exposure level that did not cause adverse effects (the no-observed-adverse-effect level, or NOAEL) in animals. The NOAEL is divided by a factor to account for any uncertainty such as using data on animals to predict effects on humans and an allowance for sensitive individuals. Uncertainty factors range from 1 to 10,000, based on the confidence level associated with the data. The resulting RfD (mg/kg-body weight/day) is used to quantify the risk.

[4]The concentration value used here is the 95% upper confidence limit (UCL) for the arithmetic mean of the levels of each contaminant found in the samples taken from the appropriate media in each area. This particular concentration value is a statistical estimate of the highest average concentration

Table 2 provides a summary of the non-carcinogenic risks, and Table 3 provides a summary of the carcinogenic risks. Each table shows the separate contribution of the coal gas plant-related contaminants (BTEX, PAHs, and metals) and non-coal gas plant-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 (the coal gas plant- or Site-related contaminants).

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 2), and exceed the acceptable target of 1x10-4, for carcinogenic risks, for two of the eight receptors that were evaluated (as shown in Table 3). 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.

It should be noted that if the soil is never remediated and construction takes place, the contaminated subsurface soil may become the top soil. If this were to happen, then the risks

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predicted to occur in 95 out of 100 sets of samples. The use of the 95% UCL produces an estimate of risks for the "Reasonable Maximum Exposure" (RME) scenario. The 95% UCL is used to account for the fact that the actual number of samples is relatively small to accurately predict the average. This method of calculating risks is designed to provide a conservative estimate and makes the underestimation of actual risks highly unlikely.

associated with the museum worker and visitors would be underestimated.

In conclusion, the risk assessment shows that actual or threatened releases of hazardous substances from this Site, if not addressed by the selected remedy, may present a current or potential threat to public health or welfare.

SCOPE AND ROLE OF REMEDIAL ACTION

As discussed in the section above, 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 general, 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 (the coal gas plant- or site-related contaminants).

Once EPA determines from the risk assessment that remedial action is necessary at a site, EPA characterizes waste on-site as either a principal threat waste or a low level threat waste. The concept of principal threat waste and low level threat waste as developed by EPA in the NCP is applied on a site-specific basis when characterizing source material. "Source material" is defined as material that includes or contains hazardous substances, pollutants, or contaminants that acts as a reservoir for migration of contamination to ground water, to surface water, to air, or that acts as a source for direct exposure. Source materials are considered to be principal threat wastes when they contain high concentrations of toxic compounds (e.g., several orders of magnitude above levels that allow for unrestricted use and unlimited exposure) or are highly mobile and generally cannot be reliably contained.

From the results of the RI/FS, EPA considers the heavy deposits of coal tar and NAPLs to be principal threat waste meaning that the material includes or contains hazardous substances, pollutants, or contaminants that acts 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.

Originally, EPA proposed that 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) be addressed in two operable units. The first operable unit would have addressed 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). The second operable unit would have addressed 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 reason the former dry cleaner became part of the Superfund project was that although it was not included in the original scope of the project, it would not have been possible to clean up the ground water without addressing soil contamination at the former dry cleaner.

In the Proposed Plan, EPA stated that the goal for the ground water was to return it to its beneficial use as drinking water. The Proposed Plan also stated, however, that "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." Due to comments received during the public comment period expressing concern about trying to achieve a remedial goal that was likely unachievable, especially in an aquifer that has only a very remote possibility of being used for drinking water, EPA has modified its goals regarding the ground water at the Site.

Section 300.430(a)(1)(iii) of the NCP discuss EPA's expectations for cleanups at Superfund sites. For ground water, "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. When restoration of ground water to beneficial uses is not practicable, EPA expects to prevent further migration of the plume, prevent exposure to the contaminated ground water, and evaluate further risk reduction." [Section 300.430(a)(1)(iii)(F) of the NCP] In order to determine whether ground water is usable as drinking water, EPA relies on a classification system. By applying the "Guidelines for Ground-Water Classification under the EPA Ground-Water Protection Strategy," EPA has determined that the Columbia aquifer at the Dover Gas Light Site is a Class IIB aquifer, meaning that it is a potential source of drinking water. As a result EPA's general expectation would be to return the Columbia aquifer to a condition where it can be used as a source of drinking water. However, EPA has determined that in the NAPL area, due to the presence of free phase product and due to the high number of contaminants which has driven the clean-up criteria down (see the following section for a discussion about the specific clean-up goals for the ground water), returning the Columbia aquifer to a drinkable condition is not practicable.[5]

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[5]Other Site-specific conditions which entered into EPA's determination included the low yield of the aquifer, the location

Therefore, in the NAPL area, EPA's goal is to remove as much free-phase product as possible and to prevent the continued migration of contaminants from the NAPL area. In the area(s) of the plume containing only dissolved contamination, the goal remains to return the ground water to its beneficial use.

One commenter suggested that use of the "technical impracticability" ARAR (applicable or relevant and appropriate requirements) waiver[6] be evaluated due to the problems associated with remediating the ground water. Although EPA has determined that it is not practicable to return the NAPL area to drinking water condition, it may be possible for a ground water remediation system to attain most, if not all, of the Maximum Contaminant Levels (MCLs) under the Safe Drinking Water Act, which are ARARs, for the contaminants of concern. Listed below are the particular MCLs that are ARARs for this Site:

benzene	5	ppb
toluene	1000	ppb
styrene	100	ppb
xylenes	10000	ppb
trichloroethene	5	ppb
tetrachloroethene (PCE)	5	ppb
1,1-dichloroethene	7	ppb
1,2-dichloroethene	70	ppb
vinyl chloride	2	ppb
benzo(a)anthracene	0.1	ppb

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of the Site in an urban area (both of which make innovative technologies extremely difficult to implement), the low solubility and mobility of some of the contaminants of concern (the PAHs), the resistance of some of the more toxic PAHs to bioremediation, the difficulty of detecting all of the pools of DNAPLs, and the poor history to date of traditional pump-and-treat systems in remediating DNAPLs to levels safe to drink.

[6]ARARs are Federal and state environmental requirements that a selected remedy must attain for on-site actions. The NCP provides certain instances where ARARs may be waived. Sections 300.430(f)(1)(ii)(C)(*1-6*) of the NCP outline six different ARAR waivers, including the interim measure waiver, the equivalent standard of performance waiver, the greater risk to human health and the environment waiver, the technical impracticability waiver, the inconsistent application of state standard waiver, and the Fund-balancing waiver. The technical impracticability waiver may be invoked when it is not possible from an engineering perspective to achieve the ARAR. The selected remedy must still provide for the overall protection of human health and the environment even if an ARAR waiver is invoked by EPA.

benzo(k)fluoranthene	0.2	ppb
benzo(a)pyrene	0.2	ppb

Some of the MCLs such as the ones for toluene and the xylenes are high enough that, coupled with the high mobility of the compounds, that MCLs should be attained. Others, such as the one for PCE which is present in the ground water at extremely high levels, will likely not be attained. However, it is EPA's policy not to grant "technical impracticability" ARAR waivers for ground water without either a field demonstration (i.e., try to remediate first) or an extensive investigation during the RI/FS showing that MCLs can not be attained. Since the RI/FS did not adequately address whether MCLs could be attained and since no attempts have been made to date to remediate the plume, EPA is not in a position to invoke the "technical impracticability" ARAR waiver. However, in each of the ground water remediation alternatives described in the "Summary of Remedial Alternatives" section below, the same pump-and-treat systems would be required whether a "technical impracticability" waiver is invoked or not.

In this ROD, EPA is selecting the final remedial action for this Site. The remedy will attain ground water ARARs or a waiver will be invoked in the future through the issuance of an Explanation of Significant Differences if attainment of ground-water ARARs is determined by EPA to be technically impracticable. Alternatives GW-1 to GW-4 are the same alternatives that were presented in the Proposed Plan except for the addition, in Alternatives GW-2 to GW-4, of this potential ARAR waiver and several other minor changes. A new alternative, GW-5, has been added in response to public comment.

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 itself, return the ground water to its beneficial use. Therefore, the chlorinated organics in the ground water must be remediated as well. However, since EPA is modifying its remedial goals for the NAPL area as discussed above, there is no need to remediate the soils of the former dry cleaner as part of this Superfund project. Continued leaching of contaminants to the ground water from this soil will not interfere with the remedy for this portion of the Superfund Site (i.e., hydraulic containment of the NAPL area). However, the soils at the former dry cleaner may present a health risk and, as discussed in the Proposed Plan, will be addressed by DNREC. DNREC is negotiating an agreement with Capitol 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

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suspected of causing or contributing to the chlorinated organic ground-water contamination.

Originally in the Proposed Plan, EPA's goal for the former coal gas plant was to remediate the soil to such an extent as to allow for future construction of facilities allowed by the "Institutional & Office" zoning designation. This necessitated the proposal of clean-up goals that would allow the construction of a school with a playground. The Proposed Plan also acknowledged that the Delaware State Museum is currently planning an expansion. Soil clean-up goals that are protective of museum workers and visitors and construction workers are not as stringent as those necessary for the protection of children at a school. In response to comments that the soil clean-up criteria in the Proposed Plan were based on an unlikely future land use and were therefore too stringent, EPA has added a new alternative, S-3, that has soil clean-up criteria that were developed assuming that the only land use for the former coal gas plant would be for the museum expansion and a parking lot. Alternative S-2 retains the soil clean-up criteria that allow the former coal gas location to be used as a school.

In both of the above soil alternatives, the remediation of the former coal gas plant must allow for future construction which usually involves some intrusive work. Therefore, 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.

REMEDIAL ACTION OBJECTIVES AND CLEAN-UP GOALS FOR GROUND WATER AND SOIL

All remedial action shall be conducted in accordance with CERCLA, the NCP, the performance standards, including the remedial action objectives and clean-up goals set forth herein. The Risk Assessment indicates that the carcinogenic and non-carcinogenic 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 non-carcinogenic risks. Therefore, at this Site 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.

The remediation goals for the Site are as follows:

1. To restore ground water at the Site (which includes all areas impacted by Site-related contaminants except the NAPL area) to health-based levels (i.e., to a level where the cumulative carcinogenic risk is 5.6x10-6[7] 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 health-based clean-up levels for each of the compounds would be as follows:[8]

a.	benzene	0.04	ppb
b.	toluene	76	ppb
c.	ethylbenzene	136	ppb
d.	xylenes	10	ppb
e.	styrene	100	ppb
f.	trichloroethene	0.17	ppb
g.	tetrachloroethene	0.12	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

[7]In the Proposed Plan, the cumulative carcinogenic risk remaining once the ground-water clean-up criteria were met was 4.0x10-6. The change was caused by the addition of three contaminants of concern (t.-v.). These contaminants where not detected in the ground water until the Phase III study in the summer of 1993. The data used to determine the original set of contaminants of concern was presented in the RI report which was submitted in May 1993.

[8]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 5.6x10-6 (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.

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
t.	benzo(a)anthracene	0.01	ppb
u.	benzo(k)fluoranthene	0.1	ppb
v.	benzo(a)pyrene	0.016	ppb

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

3. To prevent any NAPL from providing a continuing source of contamination to non-NAPL areas of the ground water.

4. To remove mobile NAPLs from the ground water.

5. To prevent migration of unacceptable levels of contamination to the Frederica aquifer.

6. To return the soil at the former coal gas plant to a condition where (1) it can either be used consistently with its "Institutional & Office" zoning designation with no other restrictions or it can be used for the museum expansion, (2) construction can safely take place, and (3) it no longer is a continuing source of unacceptable levels of contamination to ground water (see Figure 4 for the area where the soil clean-up criteria apply). Each soil alternative identifies the specific contaminant clean-up criteria that apply to that alternative.

SUMMARY OF REMEDIAL ALTERNATIVES

The following alternatives for addressing the risks at the Site were described in detail in the Feasibility Study and/or the Administrative Record. 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 (See Table 4), 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 plant soils. EPA's selected remedy for 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 shortest 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 5). Care would be taken in determining the screen placement of the wells to maximize the recovery of any NAPLs. Additional wells may be required just to address NAPLs. The presence of NAPLs in ground water makes remediation of ground water in the immediate vicinity of the NAPL difficult. Therefore, this alternative would include a provision for invoking the "technical impracticability" ARAR waiver in the future for the portions of the ground water plume containing NAPLs if attainment of MCLs is determined by EPA to be technically impracticable from an engineering perspective.

The recovered ground water would either be (1) treated and then discharged to the St. Jones River or to a publicly owned treatment works (POTW) or (2) discharged directly to a POTW. The actual treatment method would be determined by EPA during the remedial design. Factors affecting this determination include the availability of an acceptable POTW, capacity requirements of the POTW, whether or not the POTW could handle the contamination and any pre-treatment requirements of the POTW. If on-site treatment with discharge to the river is necessary, the levels of contamination in the effluent stream would comply with the 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, metals precipitation, and phase separators to remove NAPLs. 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). Any necessary on-site ground-water treatment system would be located at the

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location of the former coal gas plant. Construction of any treatment system would have meet the requirements of the National Historical Preservation Act of 1966 (NHPA), as amended 16 U.S.C. § 470.

Institutional controls are already in place which prevent private drinking water wells from being installed in Dover. Some of the controls may have to be modified to highlight that in the NAPL area, the ground water is not potable. 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 6). 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 NAPLs. The line of wells in the middle of the plume may require wells screened at several depths in the same location to address NAPLs. As described in Alternative GW-2, the "technical impracticability" ARAR waiver would be invoked for the NAPL area in the future if attainment of MCLs is determined by EPA to be technically impracticable from an engineering perspective. Treatment of the recovered ground water would be handled as described in Alternative GW-2.

This system would require approximately 20 wells. Institutional controls are already in place which prevent private drinking water wells from being installed in Dover. Some of the controls may have to modified to highlight that in the NAPL area, the ground water is not potable. 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 7). 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 NAPLs), several lines of recovery wells (as opposed to just one line for this area in Alternative GW-3) would be installed to recover the NAPLs to the maximum extent practicable (limitations being the general difficulty of recovering NAPLs and the ability to properly locate the wells in an urban setting). As described in Alternative GW-2, the "technical impracticability" ARAR waiver would be invoked in the future for the NAPL area if attainment of MCLs is determined by EPA to be technically impracticable from an engineering perspective. Treatment of the recovered ground water would be handled as described in Alternative GW-2.

The description and placement of the treatment system is the same as in Alternative GW-2. This system would require approximately 35 wells. Institutional controls are already in place which prevent private drinking water wells from being installed in Dover. Some of the controls may have to be modified to highlight that ground water in the NAPL area is not potable. The cost for this alternative would include $952,000 of capital costs and operations and maintenance costs of $76,500 per year (for 30 years) for a present worth cost of $1,900,000.

Alternative GW-5

This alternative involves using a combination of a pump-and-treat system and natural attenuation to address the ground-water contamination. 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 (i.e., the presence or absence of NAPLs, see Figure 8). A line of recovery wells would be installed at the downgradient edge of the NAPL area to prevent continued migration of contamination from the NAPL area to the area of dissolved contamination. Other wells (a combination of horizontal and vertical) would be installed inside the NAPL area to withdraw any mobile free-phase product to the maximum extent practicable (limitations being the general difficulty of recovering NAPLs and the ability to properly locate the wells in an urban setting). As described in Alternative GW-2, the "technical impracticability" ARAR waiver would be invoked in the future for the NAPL area if attainment of MCLs is determined by EPA to be technically impracticable from an engineering perspective. Treatment of the recovered ground water would be handled as described in Alternative GW-2.

For the portion of the plume containing only dissolved contamination, natural attenuation would be used to return the ground water to its beneficial use. No drinking water wells would be allowed until the contaminant levels reached levels considered safe to drink (the levels listed in the "Remediation Goals" section). Contaminant migration would be monitored. If the contaminants were determined by EPA to be threatening the river, a line of recovery wells would be installed along the St. Jones River to prevent the plume from adversely impacting the river. The cost for this alternative would include $1,827,000 of capital costs and operations and maintenance costs of $70,000 year (for 30 years) for a present worth cost of $2,700,000.

Former Coal Gas Plant 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 listed below at the location of the former coal gas plant (see Figure 4). These criteria have been developed with the goal being to allow any future use that complies with the current "Institutional & Office" zoning designation. These clean-up levels result in a 2.1x10-6 residual carcinogenic risk and a residual Hazard Index of 1.0 at the Site 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

Any debris that could be cleaned would be separated from the rest of the excavated material and cleaned at the Site and disposed of on-site. All other material that fails the clean-up criteria (including debris, soil, and coal tar sludge) would be treated off-site and disposed of off-site. 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 include sandblasting, steam cleaning, and solvent cleaning. All other contaminated material would be disposed of in one of several ways. Some or all may be incinerated off-site, 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, subject to EPA approval. 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, a data recovery survey would be performed in order to satisfy the requirements of the National Historic Preservation Act. This survey would likely include trenches to examine and recover information about cultural resources that may be buried at the Site. 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 $4,800,000.[9] There are no operation and maintenance costs associated with this alternative, so the present worth cost of this alternative is also $4,800,000.

Alternative S-3

This alternative is the same as Alternative S-2 except that the goal is to return the former coal gas plant to a condition were it can be used for a museum expansion and/or a parking lot (or use with similar exposure to the soil subject to EPA approval). The clean-up criteria developed to meet this goal are depth-dependent. For the surficial soils (defined as the top two

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[9]The cost estimate in the Proposed Plan for this alternative was $3,700,000. The new cost estimate is based on a revised estimate of the amount of soil that would be excavated in this alternative.

feet), criteria were set to protect the museum worker over a career of exposure and are listed below:

a.	benzene	28	ppm
b.	toluene	56000	ppm
c.	ethylbenzene	28000	ppm
d.	styrene	56000	ppm
e.	benzo(a)anthracene	1.1	ppm
f.	benzo(b)fluoranthene	1.1	ppm
g.	benzo(k)fluoranthene	11	ppm
h.	benzo(a)pyrene	0.11	ppm
i.	benzo(g,h,i)perylene	5	ppm
j.	indeno(1,2,3-c,d)pyrene	1.1	ppm
k.	naphthalene	11200	ppm

The residual risk associated with the above contaminant levels for an exposure scenario assuming a 25-year career working at the museum is 1x10-6 for carcinogenic risks and 1.0 for non-carcinogenic risks.

For the subsurface soils (defined as below two feet) criteria were set to protect the construction worker during a building project and are listed below:

a.	benzene	1750	ppm
b.	toluene	28000	ppm
c.	ethylbenzene	14000	ppm
d.	styrene	28000	ppm
e.	benzo(a)anthracene	70	ppm
f.	benzo(b)fluoranthene	70	ppm
g.	benzo(k)fluoranthene	695	ppm
h.	benzo(a)pyrene	7	ppm
i.	benzo(g,h,i)perylene	315	ppm
j.	indeno(1,2,3-c,d)pyrene	70	ppm
k.	naphthalene	5600	ppm

The residual risk associated with the above contaminant levels for a two-year construction project exposure scenario is 1x10-5 for carcinogenic risks and 1.0 for non-carcinogenic risks. These soil clean-up levels are also protective of ground water. The criteria would apply from the two-foot depth to the clay lens identified during the remedial investigation that is located at various depths ranging from 14 to 18 feet. By removing contamination to this depth (which is several feet below the water table), a significant amount of NAPL material would be removed.

The total capital cost of this alternative is estimated to be $3,300,000. There are no operations and maintenance costs

associated with this alternative, so the present worth cost of this alternative is also $3,300,000.

SUMMARY OF THE COMPARATIVE ANALYSIS OF 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 4. The first two criteria (overall protection of human health and the environment, compliance with ARARs) are threshold criteria. The selected remedy must meet both of these threshold criteria (unless 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.

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, GW-4, and GW-5 all meet this threshold criteria. In Alternatives GW-2, GW-3, and GW-4, the recovery systems in the dissolved portion of the plume would be operated until the contaminant levels are reduced to levels considered safe to consume (i.e., until the clean-up goals have been achieved). In Alternative GW-5, the contamination in the dissolved portion of the plume would be allowed to attenuate naturally to the clean-up levels. In each of the alternatives, the portion of the recovery system in the NAPL area would be operated in such a way as to prevent continued migration of contamination from this area. Limits would be set for the air and water emissions from any treatment system such that the emissions do not pose a threat to human health or the environment. Existing institutional controls would prevent any exposure to the contaminated ground water while it is being remediated. A ground-water management zone would be set up by the State to ensure the NAPL area is never used for drinking water. Alternatives GW-2, GW-3, and GW-4 would 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. Alternative GW-5 would protect the environment by providing for the possible installation of recovery wells near the St. Jones River should contaminated ground water pose a threat to the river.

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. Alternatives S-2 and S-3 meet this threshold criteria. Through the combination of excavation, debris washing, backfilling with clean fill, and off-site 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. Since Alternative S-2 allows for unlimited types of building occupancy, it is more protective of human health than Alternative S-3. Under Alternative S-3, the land use would be restricted to use for the museum expansion and a parking lot or similar use. Off-site treatment of the highly contaminated soil and debris by incineration would permanently destroy the contaminants so they would never pose a threat again. Landfilling of the soil with low levels of contamination would prevent exposure to the soil.

Compliance with ARARs

Alternatives GW-2, GW-3, GW-4, and GW-5 each meet this threshold criteria. However, there is the possibility that the ground water ARARs (MCLs and non-zero MCLGs) may not be met in the NAPL area. If EPA determines that attainment of MCLs and non-zero MCLGs is technically impracticable from an engineering perspective, then EPA would invoke the "technical impracticability" ARAR waiver. The clean-up criteria for the dissolved portion of the plume are at or below any MCLs or non-zero MCLGs for the contaminants of concern. The treatment plant would be operated in accordance with ARARs addressing air emissions, RCRA waste generation and storage, and discharge of the treated ground water to the St. Jones River or a POTW. The design of the treatment plant and the installation of wells would also take into consideration any affected cultural resources as required by the National Historic Preservation Act, as amended (NHPA).

For the soil, Alternatives S-2 and S-3 meet this threshold criteria. The major ARARs associated with these alternatives are the NHPA, RCRA, and Delaware's Hazardous Substance Cleanup Act (HSCA). Many of the requirements of the NHPA were met during the RI/FS through cultural resource surveys. As part of each of these alternatives, 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, on-site treatment by stabilization would 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 on-site treatment, storage, and handling practices would be done in accordance with RCRA. Some stabilization might also be required in Alternative S-3 because of the potential high water content of some of the soil. 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. DNREC has stated that the soil criteria in Alternative S-3 (and therefore Alternative S-2 as well) meet HSCA requirements.

Long-Term Effectiveness and Permanence

Overall for the ground water, Alternatives GW-2, GW-4, and GW-5 have the greatest degree of long-term effectiveness and permanence because they each call for aggressive measures to remove free-phase product from the NAPL area which poses a long-term threat to the rest of the Columbia and the Frederica aquifers (Alternative GW-3 only calls for containment of the NAPL area). In each of the alternatives for the dissolved portion of the plume, the Site-related contaminants would no longer pose a threat to human health and the environment once the clean-up criteria are achieved. Each alternative would likely always require some hydraulic controls at the end of the NAPL area to prevent the spread of contamination. Local laws and DNREC's well permitting program will prevent drinking water wells from being installed in areas of contaminated ground water. The residual risk once the clean-up criteria are met would be 5.6x10-6 for carcinogenic risks and 1.0 for non-carcinogenic risks.

For the soil, Alternatives S-2 and S-3 rank well in terms of long-term effectiveness and permanence. Alternative S-2 would return the property to unrestricted "Institutional & Office" use (the land's current zoning designation). Since the clean-up requirements for an area zoned "Institutional & Office" (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

would be 2.1x10-6 for carcinogenic risks and 1.0 for non-carcinogenic risks for Alternative S-2 (assuming a residential exposure scenario).

Although not providing for unrestricted land use, Alternative S-3 would allow the land to be used as currently planned (museum expansion and/or a parking lot). Although allowable under the zoning designation, the chances that a school would be built at this location are very remote meaning that Alternative S-3 still provides a good degree of long-term effectiveness for protection of human health. The residual risk once the clean-up criteria under Alternative S-3 are met would be 1x10-6 for carcinogenic risks and 1.0 for non-carcinogenic risk (assuming the museum worker scenario).

In each alternative institutional controls would be necessary to prevent subsurface contamination from being brought to and remaining on the surface after a construction project. This is especially true for Alternative S-3, where the soil below two feet can not remain on the surface after a construction project.

Reduction of Toxicity, Mobility, or Volume Through Treatment

For the ground water, Alternatives GW-2, GW-3, GW-4, and GW-5 each offer a significant reduction of toxicity, mobility and volume through treatment, but the degree of reduction varies. Alternatives GW-2, GW-4, and GW-5 provide the greatest reduction because they remove any mobile NAPLs which represent the greatest volume of contaminant, the highest level of contamination (i.e., the most toxic), and the part of the contamination most likely to migrate significantly into the Frederica aquifer. In Alternative GW-3, dense NAPLs could migrate downward and threaten the Frederica aquifer since this alternative only requires horizontal containment of the NAPL area. The use of emission controls (if such equipment is necessary to protect human health and the environment) and NAPL separation equipment would allow the capture and permanent destruction or containment of the contaminants.

For the soil, both Alternatives S-2 and S-3 offer a large reduction of toxicity, mobility, and volume through treatment. By removing the contaminated soil from the Site, the mobility of the contaminants would be greatly reduced. This is a significant step in helping remediate the ground water since it will eliminate one major source of contamination. Overall, Alternative S-3 provides a greater reduction because, although the clean-up criteria are higher, the depth of excavation may be greater (to a clay lens in the upper portion of the Columbia aquifer) potentially allowing a removal of a much larger mass of

contaminants. The toxicity and the volume of contaminated material would be greatly reduced in both alternatives through the use of off-site 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 would be incorporated into the final product so that there would not be a final waste stream requiring disposal.

Short-Term Effectiveness

For the ground water, Alternative GW-5 ranks the best in terms of short-term impacts because it is the only alternative that would not require recovery wells to be installed along Federal Street which is a major street in Dover. Construction along Federal Street would cause major disruptions to traffic and businesses and would have to be scheduled around several parades that are yearly events in Dover. Alternative GW-2 ranks the worst because it would require the greatest number of recovery wells to be installed. The greater the number of wells that are drilled, the more significant the impact would be to the local community since this is an urban area. Also, due to the historical significance of the area, the more wells required, the greater the possibility of disturbing cultural resources.

In terms of the time frame necessary to reach the remediation goals, Alternative GW-2 would be the fastest and Alternatives GW-3, GW-4, and GW-5 would be the slowest. Although Alternatives GW-3 and GW-4 would require active pumping of the dissolved portion of the plume, compared to natural attenuation for Alternative GW-5, they may not remediate the ground water much faster than Alternative GW-5 because the withdrawal rate would be approximately equal to the regional flow rate. Due to the fact that the Columbia aquifer underneath this area of Dover will probably never be used for drinking water purposes anyway, the difference in the time-frames necessary to meet the ground-water clean-up goals is not a significant factor.

In each of the alternatives, the local community would be protected during the remedial action by properly blocking off streets and sidewalks during well installation and by 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, Alternatives S-2 and S-3 would have moderate short-term impacts. The possibility exists for the release of volatile organic compounds during the excavation. Measures would be taken to ensure the protection of the workers and the local community. A health and safety plan for the workers would 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 could be used to protect the local community. The parking lot will be closed during the excavation. Engineering controls might be necessary to protect the museum and cemetery during excavation.

Implementability

Each of the ground water alternatives is implementable since the necessary equipment and contractors are readily available. Alternative GW-5 is by far the easiest to implement because it would not involve installation of wells along Federal Street. Wells along Federal Street would require the most coordination with the City of Dover and the State. Alternative GW-3 is the next easiest to implement, then Alternative GW-4, and then Alternative GW-2 with the determining factor being the number of wells required. However, each alternative would require extensive planning because of the construction in an urban environment. Impacts to businesses, traffic, utility locations, property access, and cultural resource concerns are examples of the things that will increase the difficulty in implementing any of the ground water alternatives. 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. The location of utilities and cultural resources may also limit the placement of wells.

For the soil, both Alternatives S-2 and S-3 are implementable. Alternative S-3 would be the easiest to implement because of the smaller volume of soil to be excavated. The reduced volume would make it easier to conduct excavations since the area to be excavated is surrounded by streets, a cemetery, and the museum. Precautions can be taken to ensure the safety of workers and the local community in either case. 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, GW-4, and GW-5 are $4,000,000, $1,200,000, $1,900,000, and $2,700,000, respectively. The present worth cost for each of these alternatives include significant operational and maintenance costs due to the length of pumping time required. It should be noted that although the cost estimate for Alternative GW-5 is higher than that for Alternative GW-4, it involves less work than Alternative GW-4. Both involve NAPL recovery, but Alternative GW-4 includes wells along Federal Street that are not part of Alternative GW-5.

Alternative GW-5 was developed in response to public comments, and therefore the cost estimate was not performed at the same time as the others. Alternative GW-5 contains a more reliable cost estimate for the recovery of the NAPLs.

For the soil, the cost of excavation and disposal under Alternative S-2 is $4,800,000, and the cost under Alternative S-3 is $3,300,000.

State Acceptance

The State's preferred alternatives are Alternatives S-3 and GW-5. For the Site soils, the State believes that the proposed clean-up levels are consistent with the foreseeable use of the Site and are protective of individuals most exposed to the Site. For the ground water, Alternative GW-5 is preferred to the other four alternatives as best balancing the environmental benefits of improving the ground water and the environmental risks involved in wide-scale disruption of human activities, traffic, utilities, and cultural resources. Alternative GW-5 is protective of human health and is thought to be as protective of the St. Jones River as are the other alternatives. The State and community are concerned that the design of the treatment plant be in keeping with the historical and aesthetic nature of the neighborhood.

Community Acceptance

Overall, since the development of Alternatives GW-5 and S-3 were based significantly upon the comments received during the extended public comment period, EPA believes that the selection of these two alternatives as the overall selected remedy is supported by the community.

SELECTED REMEDY

Based on an evaluation of the alternatives using the nine criteria identified above, EPA has selected a combination of Alternative GW-5 for the ground water and Alternative S-3 for the soil as the remedy at this Site. The "no action" alternative for either media does not protect human health and the environment which is one of the threshold criteria and, therefore, can not be selected.

For the ground water, Alternative GW-5 provides for overall protection of human health because it prevents human exposure to unacceptable levels of contamination through a combination of remediation and institutional controls. It provides for overall protection of the environment by preventing the ground water

contamination from the Site from ever causing an adverse impact to the river.

Alternative GW-5 complies with ARARs with the possible exception of the ground water ARARs (MCLs and non-zero MCLGs). As noted previously, if it is determined by EPA, that the ground water ARARs can not be achieved in the NAPL area, EPA will invoke the "technical impracticability" waiver by issuing an Explanation of Significant Differences (ESD). The clean-up criteria for the dissolved portion of the plume are at or below any MCLs or non-zero MCLGs for the contaminants of concern. The treatment plant would be operated in accordance with ARARs addressing air emissions, RCRA waste generation and storage, and NPDES requirements for the discharge of the treated ground water to the St. Jones River or a POTW. The design of the treatment plant would also take into consideration any affected cultural resources as required by the National Historic Preservation Act, as amended.

Alternative GW-5 has the greatest degree of long-term effectiveness and permanence because it calls for aggressive measures to remove free-phase product from the NAPL area which poses a long-term threat to the rest of the Columbia and the Frederica aquifers. Alternative GW-5 ranks among the highest in terms of reduction of toxicity, mobility, and volume through treatment because it calls for the removal of any NAPLs which represent the greatest volume of contaminant, the highest level of contamination (i.e., the most toxic), and the part of the contamination most likely to migrate significantly into the Frederica aquifer.

Alternative GW-5 ranks the best in terms of short-term impacts and implementability because it is the only alternative that would not require recovery wells to be installed along Federal Street which is a major street in Dover. The total present worth of Alternative GW-5 is $2,700,000, and it ranks third in terms of cost (however, the actual cost differences between Alternatives GW-2, GW-3, and GW-5 are likely smaller than previously discussed because of hidden costs in Alternatives GW-2 and GW-3 likely associated with installation of wells along Federal Street). The State favors the selection of Alternative GW-5. Although Alternative GW-5 was not in the Proposed Plan and therefore has not been commented on by the public, it was developed in response to comments received from the public and is therefore judged to be the most favorable in terms of community acceptance. One major advantage Alternative GW-5 has for the local community is that it would not require wells along Federal Street and offers the greatest opportunity not to require a permanent treatment plant that would occupy land that could be available for other purposes. Therefore, EPA has determined that

it is the best alternative for addressing the ground-water contamination at the Dover Gas Light Superfund Site.

For the soil, Alternative S-3 provides for overall protection of human health and the environment by reducing soil contamination to levels considered safe for the expected land use and by removing a major source of continued ground-water contamination. Alternative S-3 also complies with ARARs. Alternative S-3 ranks best in terms of reduction of toxicity, mobility, or volume through treatment, implementability, and cost and is comparable to Alternative S-2 in terms of short- and long-term effectiveness. Alternative S-3 has the support of the State because the soil clean-up criteria are based on the most realistic future land use. Although not in the Proposed Plan, Alternative S-3 is judged to be supported by the community because of its lower cost and its smaller potential for impacts to the museum and the cemetery during construction.

In summary, EPA's selected remedy for the Dover Gas Light Superfund Site addresses the former coal gas plant soils and the ground water and involves installing one line of ground-water recovery wells at the downgradient edge of the NAPL contamination and other recovery wells within the NAPL area to remove mobile NAPLs, pumping and treating the ground-water; allowing the portion of the ground-water plume that only contains dissolved contamination to naturally attenuate to the ground-water clean-up levels; excavating contaminated soils at the location of the former coal gas plant and incinerating the soils off-site. Recovery of cultural resource information buried at the former coal gas plant likely involving excavation of several trenches would take place prior to complete excavation. The total present worth cost of EPA's selected remedy is $6,000,000.

SELECTED REMEDY: PERFORMANCE STANDARDS

1. GROUND WATER

1.1. NAPL Area

1.1.1. A line of ground-water recovery wells shall be installed at the downgradient edge of the area of the plume containing NAPLs. These wells shall be installed and operated in such a way as to prevent any passage of contamination (either dissolved or free phase) from the NAPL area. This may require wells screened at several depths.

1.1.2. These wells shall continue to operate until any ground water that would migrate from the NAPL area once the wells

were turned off has contaminant levels below the ground-water clean-up criteria as described in Performance Standard 1.3.1.

1.1.3. Between the line of wells called for in Performance Standard 1.1.1 and the location of the former coal gas plant, wells shall be installed to remove any NAPL (dense or light) to the maximum extent practicable given the hydrogeology of the Columbia aquifer and accessibility to the aquifer. Both horizontal and vertical wells shall be considered in the remedial design. No innovative technologies shall be required.

1.1.4. The remedial design shall include an investigation to further define the extent of any NAPLs in order for the recovery system to be designed to remove mobile NAPLs to the maximum extent practicable.

1.1.5. All extracted ground water shall be treated and discharged to the St. Jones River (or if determined by EPA during the remedial design to be acceptable, the treated ground water may be discharged to a publicly owned treatment works (POTW). This treatment shall include removing all contaminants (metals and organics, including NAPLs) necessary to meet all discharge requirements (especially compliance with the substantive requirements of a National Pollution Discharge Elimination System [NPDES] permit if discharging to the St. Jones River). If an air stripper or other vented system is used to treat the ground water, secondary controls will be necessary in order to comply with Federal and State air ARARs (see Table 5) if the emissions exceed the specified amounts in these ARARs. Secondary controls will also be installed if necessary to ensure protectiveness of human health and the environment (for protection of human health, secondary emission controls shall be installed if the emissions from the air stripper cause a greater than $1x10^{-6}$ excess cancer risk). It is anticipated that the treatment sludges will be hazardous waste. Disposal of any treatment sludges or other wastes including any recovered NAPLs shall be in accordance with appropriate Federal and State regulations.

1.1.6. The wells described in Performance Standard 1.1.3 shall operate until all recoverable NAPL has been removed from the Columbia aquifer. The remedial design shall include an operating plan, to be approved by EPA, for the NAPL recovery wells that discusses such things as the mode of operation (such as pulsed pumping), monitoring frequency, and methods for determining the extent of NAPL recovery.

1.2 **Area of Dissolved Contamination**

1.2.1. The ground-water plume downgradient or side-gradient of the line of recovery wells described in Performance Standard

1.1.1 that only contains dissolved contamination shall be allowed to attenuate naturally to the clean-up criteria described in Performance Standard 1.3.1.

1.2.2. The remedial design shall include the development of a ground-water monitoring plan, to be approved by EPA, which shall describe the sampling of monitoring wells (and installation if current well locations are not adequate) to monitor the extent of contamination and the rate of attenuation. The plume shall be considered clean when twelve consecutive quarters of sampling results are at or below the criteria listed in Performance Standard 1.3.1.

1.2.3. The remedial design shall include the development of ground-water criteria which protect human and environmental receptors in the St. Jones River from exposure to contaminants in ground water discharging to the river. If the plume does not attenuate to these levels prior to reaching the river,[10] recovery wells shall be installed near the river to prevent discharge of ground water containing contamination above these criteria into the river.[11] These well(s) shall operate until the ground-water near the river is below the criteria to be developed per this Performance Standard. Any recovered ground water shall be treated as discussed in Performance Standard 1.1.5.

1.3. **Ground-water Clean-up Criteria**

1.3.1. Below are the ground-water clean-up criteria for the Dover Gas Light Superfund Site. These criteria apply to the complete Site except the NAPL area. The criteria are:

a.	benzene	0.04	ppb
b.	toluene	76	ppb
c.	ethylbenzene	136	ppb
d.	xylenes	10	ppb
e.	styrene	100	ppb
f.	trichloroethene	0.17	ppb

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[10]Note that these criteria only need to be developed for contaminants related to the former coal gas plant and not for any chlorinated organic contaminants.

[11]Only contamination from the Dover Gas Light Superfund Site ground-water plume (currently estimated to extend from the former coal gas plant to Federal Street) could trigger the criteria to be developed in this Performance Standard. Similar contamination from sources that EPA determines are not part of this plume would not trigger the installation of recovery wells at the river under this ROD.

g.	tetrachloroethene	0.12	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
t.	benzo(a)anthracene	0.01	ppb
u.	benzo(k)fluoranthene	0.1	ppb
v.	benzo(a)pyrene	0.016	ppb

2. SOIL

2.1 Soil Excavation

2.1.1. All soil in the area shown in Figure 4 that contains contaminant levels above those listed in Performance Standard 2.4 shall be excavated.

2.1.2. The depth of the excavation shall not exceed the top of the clay lens located at an average depth of 14 to 20 feet below ground surface. In areas of the former coal gas plant that do not have this clay lens, the excavation shall not go below the depth the lens would have been expected to be found (i.e., the depth of lowest adjacent lens in the 14 to 20 foot range).

2.1.3. The excavation shall be performed in such a manner as to minimize the release of contaminants to the atmosphere.

2.1.4. Steps shall be taken to avoid structural or other damage to the museum, the streets, the cemetery, or the church property during excavation.

2.1.5. A statistically significant number of confirmatory soil samples shall be collected to indicate that the soil remaining in the bottom (unless the excavation has already extended to the clay lens located at a depth of 14 to 20 feet) and sides of the excavation is below the contaminant levels in Performance Standard 2.4.

2.1.6. Any trees or scrubs that are removed or destroyed as a result of the excavation shall be replaced with a similar type.

2.1.7. The area that is currently used as a parking lot shall be returned to use as a parking lot. Gravel shall be placed on the top of any backfilled areas of the original parking lot. Areas of grass that were destroyed by the remedial action shall be resodded.

2.2. **Soil Handling and Disposal**

2.2.1. Any soil that is excavated but has contaminant levels below the clean-up criteria listed in Performance Standard 2.4 can be used as backfill material. However, any soil used to backfill the top two feet must meet the criteria listed in Performance Standard 2.4.2.

2.2.2. Any excavated soil that can be used as backfill may be stockpiled at or near the Site.

2.2.3. Excavated soil that contains contaminant levels above the levels listed in Performance Standard 2.4 shall be treated off-site by thermal destruction. Thermal destruction includes, but is not limited to, incineration at a hazardous waste incinerator, destruction at a resource recovery unit such as a cement kiln or utility boiler, and low temperature thermal desorption with off-gas incineration. The choice of treatment facility is subject to EPA approval. Soil that must be excavated but is not a RCRA-hazardous waste and is only slightly contaminated, may be landfilled at an acceptable disposal facility subject to EPA approval. The contaminant levels below which soil may be landfill shall be determined during remedial design and subject to EPA approval.

2.2.4. Contaminated debris shall either be cleaned at the Site or treated in the same manner as the soil. Decontaminated debris may be backfilled at the Site. Any on-site debris cleaning shall be performed in such a way as to prevent unacceptable discharge of contaminants from the Superfund Site. Residue or waste from any debris cleaning operation shall be disposed of off-site in accordance with all appropriate Federal and State regulations.

2.3. **Cultural Resource Recovery**

2.3.1. Prior to any excavation and removal of contaminated soil, a cultural resource data recovery operation shall be performed. This operation shall be performed in accordance with substantive requirements of the National Historic Preservation Act, as amended.

2.4. Soil Clean-up Criteria

2.4.1. Below are the soil clean-up criteria that apply to the soil from a depth of two feet below ground surface to the clay lens that is located at an approximate depth of 14 to 20 feet:

a.	benzene	1750	ppm
b.	toluene	28000	ppm
c.	ethylbenzene	14000	ppm
d.	styrene	28000	ppm
e.	benzo(a)anthracene	70	ppm
f.	benzo(b)fluoranthene	70	ppm
g.	benzo(k)fluoranthene	695	ppm
h.	benzo(a)pyrene	7	ppm
i.	benzo(g,h,i)perylene	315	ppm
j.	indeno(1,2,3-c,d)pyrene	70	ppm
k.	naphthalene	5600	ppm

2.4.2. Below are the soil clean-up criteria that apply to the soil from the ground surface to a depth of two feet below ground surface:

a.	benzene	28	ppm
b.	toluene	56000	ppm
c.	ethylbenzene	28000	ppm
d.	styrene	56000	ppm
e.	benzo(a)anthracene	1.1	ppm
f.	benzo(b)fluoranthene	1.1	ppm
g.	benzo(k)fluoranthene	11	ppm
h.	benzo(a)pyrene	0.11	ppm
i.	benzo(g,h,i)perylene	5	ppm
j.	indeno(1,2,3-c,d)pyrene	1.1	ppm
k.	naphthalene	11200	ppm

2.5. Institutional Controls

2.5.1. A ground-water management zone shall be established that encompasses both the Columbia and the Frederica aquifer in any area of the Site that has ground water contaminant levels above those listed in Performance Standard 1.3.1 plus an adequate safety zone.

2.5.2. No industrial, agricultural, public drinking water supply or other wells shall be installed in the Frederica aquifer in a location such that it may increase the migration of Site contamination from the Columbia aquifer.

2.5.3. The deed(s) of property that requires excavation as part of this ROD shall be modified to give notice to the public of past land disposal and of the fact that releases and threats of releases of hazardous substances have affected the respective parcels. Notice shall also be placed on the deed(s) that states that the soil clean-up criteria were not developed to allow unrestricted use of the land, but that they were developed to safely allow expansion of the museum and use as a parking area, as long as unexcavated, yet contaminated, subsurface soil does not become surface soil.

3. OTHER MISCELLANEOUS PERFORMANCE STANDARDS

3.1. Operations and Maintenance Plan

3.1.1. An operations and maintenance plan shall be developed and implemented for the ground-water recovery system. The plan shall include a list of all vendor-required maintenance activities.

3.1.2. The plan shall include a list of potential operations and maintenance problems and their proposed solution.

3.1.3. The plan shall include a list of all required inspections and general guidelines for the inspections.

3.1.4. The plan shall include operating instructions.

3.1.5. The plan shall include reporting requirements and forms.

3.1.6. The plan shall include health and safety requirements.

3.1.7. The plan shall include a monitoring plan for the emissions from the ground-water treatment system.

3.1.8. The plan shall include a waste management plan describing how treatment wastes and/or recovered NAPLs will be disposed of.

3.1.9. Performance standards 3.1.1 to 3.1.8 are the minimum requirements of the operation and maintenance plan. The plan, including all of the appropriate information, shall be submitted to EPA for approval.

3.1.10. All requirements of the approved plan shall be carried out.

3.2. **Erosion Control Plan**

3.2.1. An erosion control plan shall be developed and implemented which outlines procedures to be used to control transport of soil and sediment due to erosion, to the maximum extent practicable and in accordance with the ARARs in Table 5, for all activities which present the potential for transporting soils or sediments. This plan shall also include procedures to be used to properly control and discharge stormwater from the construction areas.

3.2.2. This plan shall be developed in accordance with State and local regulations and shall be submitted to EPA for approval.

3.3. **Particulate Air Emissions**

3.3.1. All remedial work shall be done in such a manner as to minimize transport of airborne particulate emissions.

3.3.2. As part of the remedial action health and safety plan, levels of particulate considered to pose an unacceptable health risk shall be developed along with monitoring requirements to measure particulate counts.

3.3.3. Air monitoring shall be done at appropriate times to ensure protectiveness of human health.

3.3.4. If the air monitoring results indicate that particulate counts are high enough that EPA concludes that unacceptable health risks are posed to people on-site or off-site, appropriate measures shall be taken to reduce the particulate count to safe levels off-site, and either to reduce the particulate count to safe levels on-site or to protect the workers through personal protective equipment.

3.4. **Waste Management Plan**

3.4.1. A waste management plan shall be developed, submitted to EPA for approval, and implemented to handle any other wastes generated during remedial design or remedial action that have not previously had waste management performance standards set. The plan shall outline how all Federal, State, and local regulations will be complied with.

3.5. **ARARs**

3.5.1. The selected remedy shall attain, at a minimum, all chemical, location, and action specific ARARs listed in Table 5 unless a statutory waiver is invoked by EPA.

STATUTORY DETERMINATIONS

EPA's primary responsibility at Superfund sites is to undertake remedial actions that are protective of human health and the environment. In addition, Section 121 of CERCLA, 42 U.S.C. § 9621, establishes several other statutory requirements and preferences. These requirements specify that when complete, the selected remedial action for each site must comply with applicable or relevant and appropriate (ARARs) environmental standards established under Federal and state environmental laws unless a statutory waiver is invoked. The selected remedy also must be cost effective and utilize treatment technologies or resource recovery technologies to the maximum extent practicable. Finally, the statute includes a preference for remedies that permanently and significantly reduce the volume, toxicity, or mobility of hazardous substances. The following sections discuss how the selected remedy for this Site meets these statutory requirements.

PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

The selected remedy provides overall protection of human health and the environment. It protects human health by:

1. Excavating and removing contaminated soils that pose a threat to construction workers and possibly museum workers once a construction project was completed.

2. Returning a portion of the Columbia aquifer to a quality where it no longer poses a threat to human health.

3. Removing highly concentrated levels of contamination from the ground water to significantly reduce the possibility of the Frederica aquifer becoming contaminated and thereby unusable as a drinking water source.

4. Preventing any drinking water wells from being installed in areas that have not attained the ground-water clean-up criteria.

The selected remedy will protect the environment by:

1. Preventing levels of contaminants from the former coal gas plant that would pose threat to aquatic life from entering the St. Jones River.

2. By remediating the ground water (as described above), a natural resource.

COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

The selected remedy, a combination of Alternative GW-5 and Alternative S-3, shall attain all action, location, and chemical specific applicable or relevant and appropriate requirements for the Site which are listed in Table 5 unless waived by EPA. Also included in the table are criteria, advisories, or guidance to be considered (TBCs) for the implementation of this remedy.

Several of the ARARs in Table 5 merit further discussion. First, for the NAPL area, the selected remedy will attain ground water ARARs (MCLs or non-zero MCLGs) or EPA will invoke the "technical impracticability" ARAR waiver if EPA determines from data collected during the remediation that it is technically impracticable to meet these requirements.

Second, the substantive requirements of the National Historic Preservation Act, as amended, shall be met during the remedial action through the consideration of how the selected remedy adversely affects cultural resources that are included or eligible for inclusion on the National Register of Historic Places. The soil excavation, well drilling, and the treatment plant construction are examples of portions of the remedial action that have the potential to impact cultural resources. Measures will be taken to minimize and/or mitigate any adverse impacts.

COST-EFFECTIVENESS

Of the alternatives that offer adequate protection of human health and the environment, the selected remedy is the among the least costly. It also meets all other requirements of CERCLA and affords overall effectiveness proportionate to the cost. For the soil, cost was a major factor in selecting the remedy.

UTILIZATION OF PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE

Of those alternatives that are protective of human health and the environment, EPA has determined that the selected remedy provides the best tradeoff in terms of long-term effectiveness and permanence; reduction in toxicity, mobility, or volume achieved through treatment; short-term effectiveness; implementability; and cost; as well as considering the statutory preference for treatment as a principal element and considering State and community acceptance.

PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT

From the results of the RI/FS, EPA has determined that the heavy deposits of coal tar and any NAPLs are principal threat wastes meaning that the material includes or contains hazardous substances, pollutants, or contaminants that acts as a reservoir for migration of contamination to, for example, ground water. These principal threats are being treated as part of the selected remedy. The heavy deposits of coal tar will be excavated and incinerated off-site. The NAPLs are being removed from the ground water with the extracted ground water undergoing treatment.

DOCUMENTATION OF SIGNIFICANT CHANGES

Section 117(b) of CERCLA, 42 U.S.C. § 9617(b), requires an explanation of any significant changes from the preferred alternative originally presented in the Proposed Plan. The selected remedy described in this ROD contains a number of significant changes from EPA's preferred alternative in the Proposed Plan. The changes were made in response to comments on the Proposed Plan and consultations with the State of Delaware. The major changes are described below:

1. In response to public comments expressing concern about the fact that EPA's proposed remedy would not meet the goal of returning the area of NAPLs to drinking water quality, EPA has added the potential for the "technical impracticability" ARAR waiver to be invoked (for the NAPL area only) if it becomes apparent that the pump-and-treat systems described in each of the ground-water alternatives cannot attain ARARs in the NAPL area.

2. In response to public comments, the selected remedy includes natural attenuation of the dissolved portion of the ground-water plume and aggressively attacking the free-phase product layers in the NAPL area. This prevents wells from being installed along Federal Street, offers greater protection for the Frederica aquifer, offers the greatest potential for not having a permanent treatment plant, and uses the wells that are to be installed to remove the greatest mass of contaminants.

3. In response to concerns about the soil clean-up criteria in the Proposed Plan being based on a residential exposure scenario (since the area is zoned such that a school could be built at the location of the former coal gas plant), EPA has modified the criteria. The soil clean-up criteria in the selected remedy are based on a combination of exposure to soils during a construction project and long-term exposure while working at the museum. Institutional controls regulating the

land use have also been added to the selected remedy to prevent use of the land in ways for which the criteria would not be protective.

4. The soil clean-up criteria have been modified to apply to soil down to a clay lens approximately four feet below the water table rather than just to the water table. This is to help remove NAPL material and protect the ground water.

5. The carcinogenic and non-carcinogenic risk values for the lawn watering and truck washing scenarios have been lowered due to an error in the numbers reported in the Proposed Plan. This change did not affect the remedial action objectives or the selected remedy.

TABLE 1
EXPOSURE ASSUMPTIONS FOR RISK ASSESSMENT

POTENTIAL RECEPTORS	Exposure Time (hours/day)	Exposure Frequency (days/year)	Exposure Duration (years)	Inhalation Rate (cubic meters/hour)	Ingestion Rate (milligrams of soil/day unless noted otherwise)
Adult Resident					
Drinking ground water	N/A	350	24	N/A	2 liter/day
Showering with ground water	0.34	350	24	0.83	N/A
Wading in the St. Jones River*	2	24	24	N/A	N/A
Eating fish from the St. Jones	N/A	350	24	N/A	54 grams of fish/day
Lawn watering*	0.2	20	24	0.83	N/A
Child Resident					
Drinking ground water	N/A	350	6	N/A	1 liter/day
Bathing with ground water*	0.34	350	6	N/A	N/A
Wading in the St. Jones River*	2	24	6	N/A	N/A
Eating fish from the St. Jones	N/A	350	6	N/A	35 grams of fish/day
Lawn watering*	0.2	20	6	0.625	N/A
Washing a truck*	1	25	25	0.83	N/A
Adult Museum Visitor	2	1	5	0.83	100
Child Museum Visitor	2	1	5	0.625	200
Museum Worker: Normal daily activity	8	250	25	0.83	100
Museum Worker: Tree planting	8	1	25	0.83	100
Construction worker: Project at coal gas location	8	250	2	0.83	100
Construction worker: Nearby project	8	250	2	N/A	100
Utility repairman	8	250	2	N/A	50

*The risk assessment included dermal exposure as well.

TABLE 2
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	0.57	0.94	1.5
TOTAL	151	73.	224
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	0.44	4.4	4.8
TOTAL	121	278	399
Washing a truck–TOTAL	1.6	0.94	2.5
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 3
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	2.2x10-6	3.6x10-6	3.6x10-6
Eating fish from the St. Jones	6.8x10-6	8.1x10-5	8.8x10-5
Lawn watering	3.0x10-7	1.8x10-4	1.8x10-4
TOTAL	2.7x10-4	5.0x10-2	5.0x10-2
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	3.6x10-7	2.2x10-4	2.2x10-4
TOTAL	6.8x10-5	2.2x10-2	2.2x10-2
Washing a truck--TOTAL	9.5x10-5	4.0x10-2	4.0x10-2
Adult Museum Visitor--TOTAL	5.6x10-6	0.0	5.6x10-6
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 4

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.

TABLE 5

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) AND TO BE CONSIDERED MATERIAL (TBCs) DOVER GAS LIGHT SITE

ARAR or TBC	Legal Citation	ARAR Class	Requirement Synopsis	Applicability to Selected Remedy
I. CHEMICAL SPECIFIC				
1. Safe Drinking Water Act	42 U.S.C. § 300f et seq.			
a. Maximum Contaminant Level Goals (MCLGs)	40 C.F.R. § 141.50-51	Relevant and Appropriate	Non-enforceable health goals for public water supplies. The NCP requires that non-zero MCLGs shall be attained by remedial actions for ground water that is a current or potential source of drinking water, where the MCLGs are relevant and appropriate under the circumstances of the release.	The Site-specific clean-up criteria are at or below non-zero MCLGs. The portion of the plume containing only dissolved concentrations of contaminants of concern must attain, through natural attenuation, the clean-up criteria (and therefore comply with this ARAR) prior to any use of the water for drinking water purposes. This ARAR may or may not be attained in the portion of the plume containing NAPLs. If EPA determines that attainment of non-zero MCLGs is technically impracticable from an engineering perspective, EPA will invoke the "technical impracticability" ARAR waiver.
b. Maximum Contaminant Levels (MCLs)	40 C.F.R. § 141.61-62	Relevant and Appropriate	Enforceable standards for public drinking water supply systems (with at least fifteen service connections or used by at least 25 persons). The NCP requires that MCLs, for those contaminants whose MCLG is zero, shall be attained by remedial actions for ground water that is a current or potential source of drinking water, where the MCLs are relevant and appropriate under the circumstances of the release.	The Site-specific clean-up criteria are at or below MCLs. The portion of the plume containing only dissolved concentrations of contaminants of concern must attain, through natural attenuation, the clean-up criteria (and therefore comply with this ARAR) prior to any use of the water for drinking water purposes. This ARAR may or may not be attained in the portion of the plume containing NAPLs. If EPA determines that attainment of MCLs is technically impracticable from an engineering perspective, EPA will invoke the "technical impracticability" ARAR waiver.

ARAR or TBC	Legal Citation	ARAR Class	Requirement Synopsis	Applicability to Selected Remedy
2. Health Effects Assessment	No Legal Citation	To be Considered	Non-enforceable toxicity data for specific chemicals for use in public health assessments. Also "to be considered" are Carcinogenic Potency Factors and Reference Doses provided in the EPA Region 3's Risk-Based Concentration Table.	Much of this information was used to developed the soil and ground-water clean-up criteria.
3. Delaware Comprehensive Water Resources Management Committee Reports, December 13, 1983	No Legal Citation	To Be Considered	The reports were adopted as policy by the DNREC Secretary. Among these reports is the Groundwater Quality Management Report, July 1983, which provided Delaware with a number of tools for dealing with ground-water contamination.	To be considered for ground-water monitoring.
4. Delaware Surface Water Quality Standards as amended, Feb. 26, 1993	Delaware Surface Water Quality Standards as amended, Feb. 26, 1993 Sections 3, 4, 5, 6, 8, 9, 10, 11.1, 11.2, 11.3, 11.4, 11.6, 12	Applicable	Criteria are provided to maintain surface water for streams, lakes, rivers, and standing water in wetlands of satisfactory quality consistent with public health and recreational purposes, the propagation and protection of fish and aquatic life, and other beneficial uses of water.	Any surface water discharge must not cause exceedances of these criteria, if more stringent than federal water quality criteria, in the St. Jones River.
		Relevant and Appropriate		Any standards more stringent than federal water quality standards must be used to develop the trigger criteria for installing pumping wells at the St. Jones River in the event that the plume has not attenuated prior to reaching the river.
II. LOCATION SPECIFIC				
1. Coastal Zone Management Act of 1972; Coastal Zone Act Reauthorization Amendments of 1990	15 C.F.R. §§ 930.30, 930.37(a), 930.39(b-c)	Applicable	Requires that Federal agencies conducting or supporting activities directly affecting the coastal zone, conduct or support those activities in a manner that is consistent with the approved State coastal zone management program. (See Delaware's Comprehensive Update and Routine Program Implementation, March 1993)	Any remedial actions affecting the St. Jones River are required to be consistent, to the maximum extent practicable, with Delaware's coastal zone management program. Consistency must be considered if treated ground water is to be discharged into the St. Jones River, if pumping is required along the river in the future if natural attenuation does not work, or if alternative clean-up levels are set for the Columbia aquifer in order to protect the river.

ARAR or TBC	Legal Citation	ARAR Class	Requirement Synopsis	Applicability to Selected Remedy
2. National Historic Preservation Act of 1966, as amended	36 C.F.R. §§ 800.4(b-c), 800.4(e), 800.5(e), 800.9	Applicable	Requires remedial action to take into account effects on properties included on or eligible for the National Register of Historic Places.	Cultural resource information recovery step to take place at the beginning of the soil excavation to gather further information to determine the eligibility of the former coal gas plant location for the National Register of Historic Places, and, if eligible, this step will provide the information necessary to mitigate any adverse effect caused by the excavation. Also, design of the ground water treatment plant will have to take into account effects on the historical setting of the area. Installation of wells will have to take into account potential effects to cultural resources. Only substantive requirements must be met.
3. Ground Water Protection Strategy of 1984 EPA 440/6-84-002	No Legal Citation	To be Considered	Identifies ground water quality to be achieved during remedial actions based on aquifer characteristics and use.	The classification of the aquifers at this Site as Class IIB means that EPA's goal is to return the aquifer(s) to its beneficial use (a drinkable condition) where practicable. EPA has determined it is practicable to return the Columbia aquifer to its beneficial use except in the NAPL area.
III. ACTION SPECIFIC				
A. Miscellaneous				
1. Delaware Regulations Governing Hazardous Substance Cleanup, 1/93	Delaware Regulations Governing Hazardous Substance Cleanup, 1/93 Section 9	Relevant and Appropriate	Establishes clean-up criteria for hazardous waste sites. Only criteria considered relevant and appropriate are for ground water and soil ($1x10^{-5}$ and Hazard Index of 1 using exposure assumptions approved by DNREC; or natural background if higher).	Applies to the determination of soil clean-up criteria at the location of the former coal gas plant.
B. Water				
1. Clean Water Act (CWA); National Pollutant Discharge Elimination System Requirements	40 C.F.R. §§ 122.41(E), 122.44, 122.45, 125.61-63, 125.73	Applicable	Enforceable standards for all discharges to waters of the United States.	Discharge limits shall be met for all on-site discharges from the ground water treatment facility. Only substantive requirements shall be met since the treatment facility will be an on-site facility.
2. General Pretreatment Regulations	40 C.F.R. §§ 403.5, 403.6(c-e)	Applicable	Standards for discharge to POTW.	Applicable should the extracted ground water or treated ground water be discharged to a POTW.

ARAR or TBC	Legal Citation	ARAR Class	Requirement Synopsis	Applicability to Selected Remedy
3. State of Delaware Regulations Governing the Construction of Water Wells, January 20, 1987	State of Delaware Regulations Governing the Construction of Water Wells, January 20, 1987 Sections 3, 4, 5, 6, 7, 8, 9, 10	Applicable	Contain requirements governing the location, design, installation, use, disinfection, modification, repair, and abandonment of all wells and associated pumping equipment.	Installation of any monitoring and recovery wells and the abandonment of wells shall meet all substantive requirements.
4. Delaware River Basin Commission (DRBC) Water Quality	DRBC Ground Water Protected Area Regulation, No. 4, 6(f), 9, 10; Water Code of the Basin, Sections 2.20.4, 2.50.2	Applicable	Regulate restoration, enhancement, and preservation of waters in the Delaware River basin. In particular, require certain recovery well design, alternate water supply if recovery wells interfere with any domestic or other existing wells, require recovery system not to cause adverse impacts to the environment.	Applicable if remedial action involves discharge of >50,000 gallons/day average over any month or a withdrawal of ground water of 100,000 gallons/day or more average over any month.
5. Delaware Regulations Governing the Allocation of Water March 1, 1987	Delaware Regulations Governing the Allocation of Water March 1,1987 Sections 1, 3, 5.05	Applicable	Contain information pertaining to water allocation permits and criteria for their approval.	May be applicable for the ground-water recovery system. Only substantive requirements shall be met since the system will be on-site.
6. State of Delaware Groundwater Management Plan November 1, 1987	No Legal Citation	To Be Considered	Policy for ground-water management.	To be considered in establishing the ground-water management zone.
7. Delaware Regulations Governing Control of Water Pollution, amended 6/23/83	Delaware Regulations Governing Control of Water Pollution, amended 6/23/83 Sections 7, 8, 9, 10, 11, 12, and 13	Applicable	Contain water quality regulations for discharges into surface and ground water.	Applicable for discharge of treated ground water into surface water.
C. Air				
1. Control of Air Emissions from Air Strippers at Superfund Ground Water Sites, June 15, 1989 EPA OSWER Directive 9355.0-28	No Legal Citation	To be Considered	Policy to guide the selection of controls for air strippers at ground-water sites according to the air quality status of the site's location (i.e., ozone attainment or non-attainment area).	To be considered in determining if air emissions controls are necessary for an air stripper because Kent County is an ozone non-attainment area. Sources most in need of controls are those with emissions rates in excess of 3 lbs./hour or 15 lbs./day or a potential rate of 10 tons/year of total VOCs.

ARAR or TBC	Legal Citation	ARAR Class	Requirement Synopsis	Applicability to Selected Remedy
2. Delaware Regulations Governing the Control of Air Pollution	Delaware Regulations Governing the Control of Air Pollution Regulations Numbers 2, 19, and 24	Applicable	Sets forth the requirement that a permit is necessary to operate an air stripper if emissions will exceed 2.5 lbs./day. Section 2 describes general conditions. Section 19 deals with odor. Section 24 deals with volatile organic compounds.	If emissions exceed 2.5 lbs./day then the substantive requirements of the regulation must be met. Permit procedural requirements are not ARARs. In addition, the emissions from the air stripper must meet the Ambient Air Quality Standards set forth in Regulation 3 of 7 Delaware Code, Chapter 60, Section 6003.
D. Sediments/Solids				
1. Delaware Sediment and Stormwater Regulations January 23, 1991	Delaware Sediment and Stormwater Regulations January 23, 1991 Sections 3, 6, 9, 10, 11, and 15	Applicable	Establishes a statewide sediment and stormwater management program.	A stormwater and sediment management plan consistent with Delaware requirements must be developed and approved by EPA before construction disturbing over 5,000 square feet of land can begin.
E. Waste Handling and Disposal				
1. Standards Applicable to Generators of Hazardous Waste	Delaware Regulations Governing Hazardous Waste, §§ 262.10(b), 262.11, 262.34, 262.41	Applicable	Establishes standards for generators of hazardous wastes including waste determination and accumulation times.	Applicable during soil excavation and to operator(s) of the wastewater treatment plant if the wastes generated are RCRA-hazardous wastes.
2. Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities (TSDF)	Delaware Regulations Governing Hazardous Waste, §§ 264.13-18, 264.30-37, 264.50-56	Applicable	Regulations for owners and operators of TSDFs which define acceptable management of hazardous wastes.	Applies to on-site recovery and treatment systems which handle hazardous waste including ground-water treatment, soil excavation, and debris cleaning.
3. RCRA Requirements for Use and Management of Containers	Delaware Regulations Governing Hazardous Waste, §§ 264.170-177	Applicable	Requirements for storage of hazardous waste in storage containers.	Applicable for temporary storage containers and on-site treatment systems.
4. RCRA Requirements for Tanks Systems	Delaware Regulations Governing Hazardous Waste, §§ 264.191-199	Applicable	Requirements for storage or treatment of hazardous waste in tank systems.	Applicable for on-site treatment systems and temporary storage tanks containing hazardous wastes.
5. RCRA Requirements for Tanks Systems	EPA Regulations, 40 C.F.R. §§ 264.190-196, 264.198-199	Applicable	Requirements for storage or treatment of hazardous waste in tank systems.	Applicable for on-site treatment systems and temporary storage tanks containing hazardous wastes.

ARAR or TBC	Legal Citation	ARAR Class	Requirement Synopsis	Applicability to Selected Remedy
6. RCRA Requirements for Waste Piles	Delaware Regulations Governing Hazardous Waste, §§ 264.251, 264.254, 264.256-257, 264.258(a)	Applicable	Requirements for storage or treatment of hazardous waste in waste piles.	Applicable for on-site storage and/or treatment of excavated soil.
7. RCRA Requirements for Waste Piles	EPA Regulations, 40 C.F.R. §§ 264.251-254	Applicable	Requirements for storage or treatment of hazardous waste in waste piles.	Applicable for on-site storage and/or treatment of excavated soil.
8. Identification and Listing of Hazardous Wastes	Delaware Regulations Governing Hazardous Wastes, §§ 261.20-24, 264.31, 261.33	Applicable	Identifies solid wastes which are regulated as hazardous wastes.	Use to determine which materials to be disposed of are hazardous wastes.

FIGURE 1
Dover Gas Light Superfund Site Map

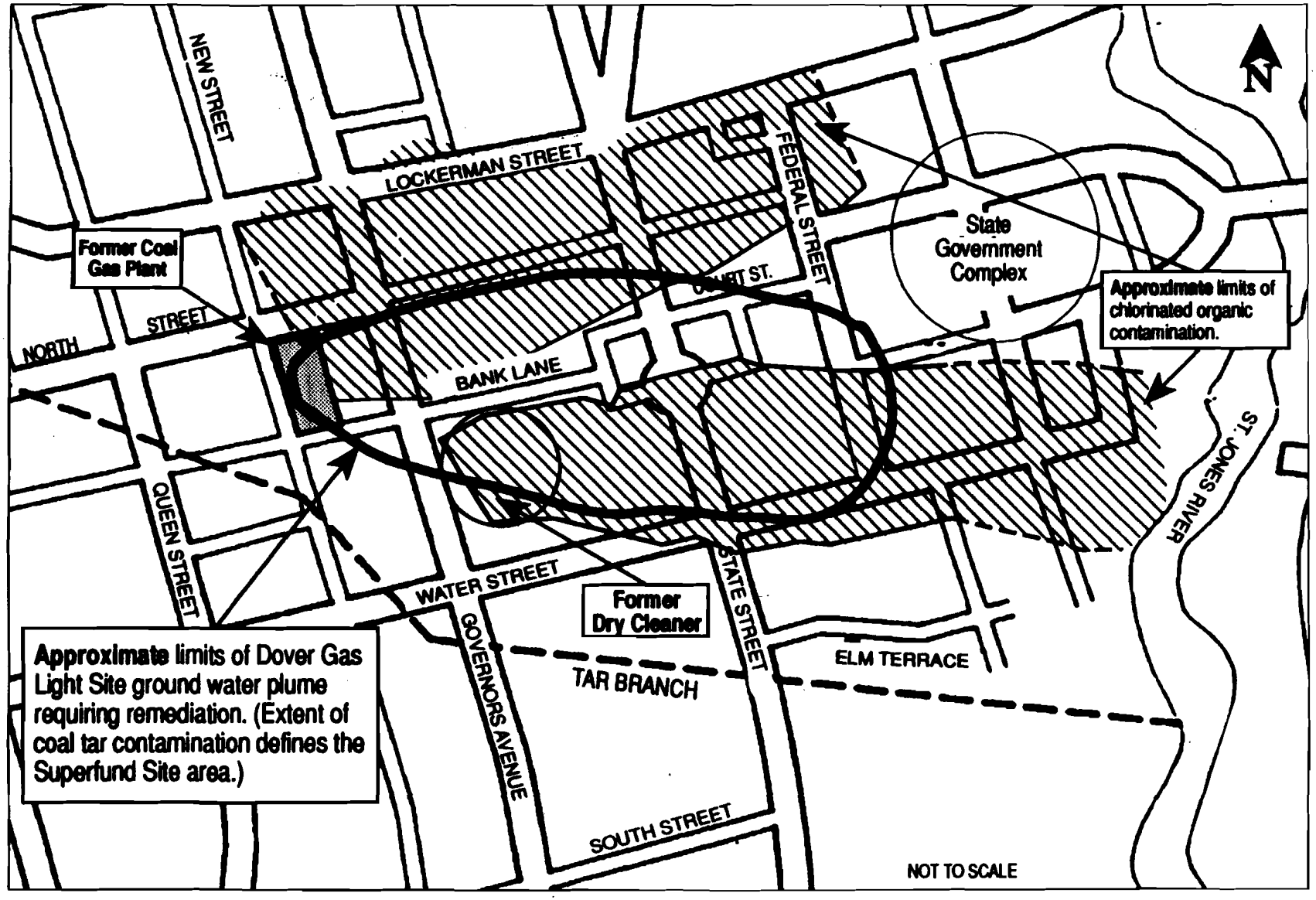


FIGURE 2
Dover Gas Light Superfund Site
Former Coal Gas Plant: Selected Soil Sample Results

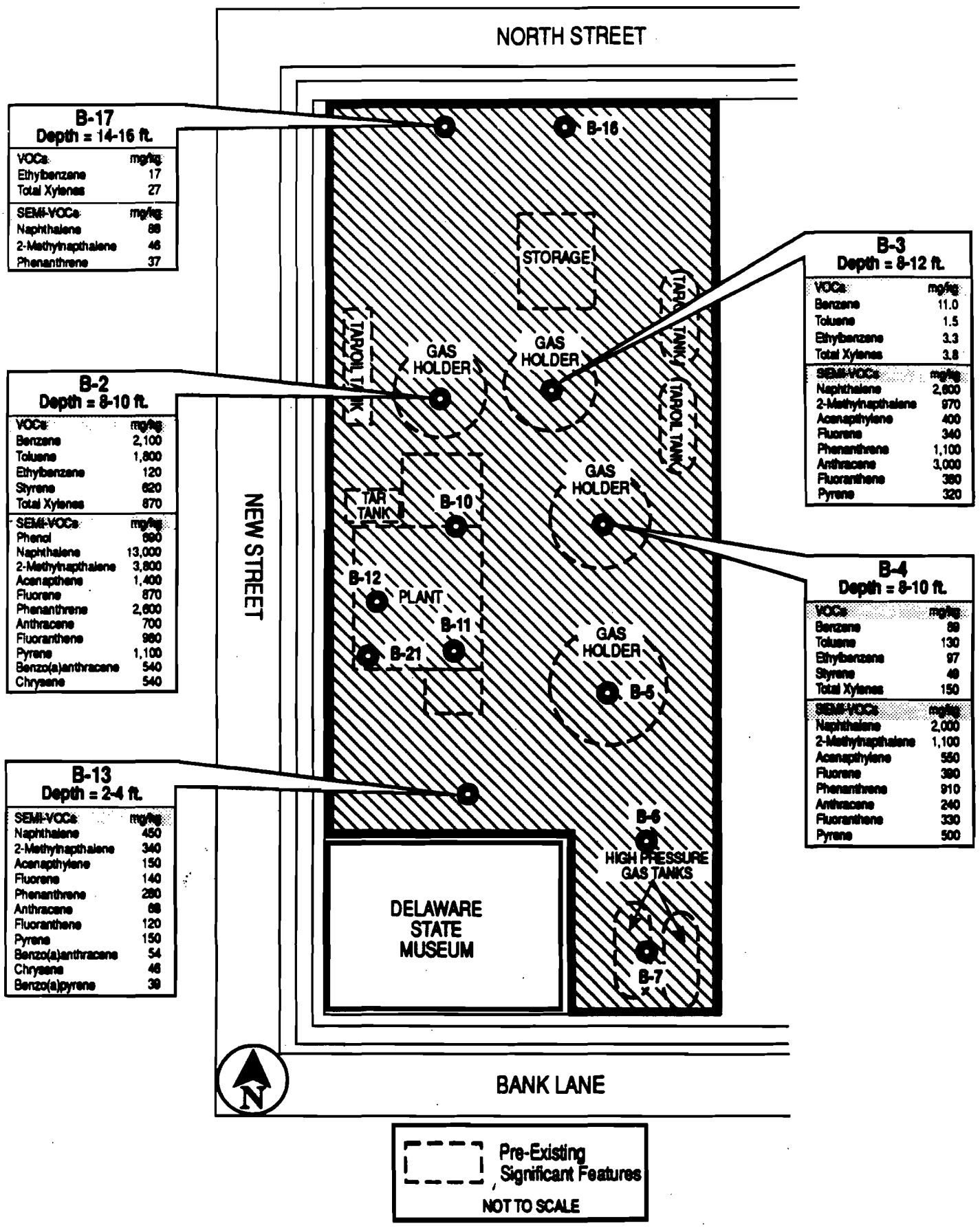
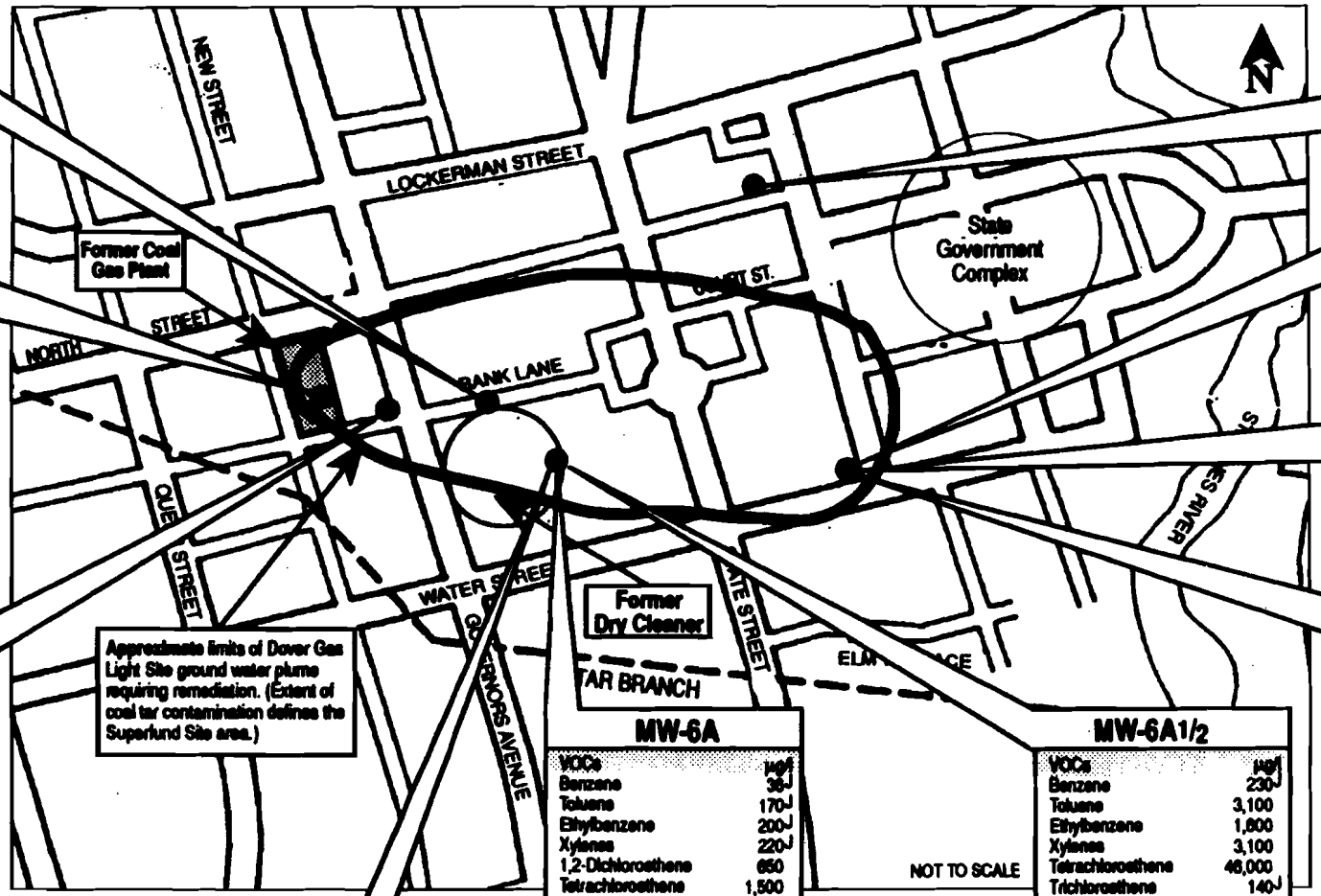


FIGURE 3
Dover Gas Light Superfund Site Map
Selected Ground Water Samples



P1A

VOCs	µg/l
Toluene	27
Ethylbenzene	670
Xylenes	3,100

MW-15A/B

VOCs	µg/l
Benzene	6.5J
Ethylbenzene	48.0
Xylenes	120.0
Styrene	21.0
SEMI-VOCs	**µg/l**
Acenaphthene	49
Acenaphthylene	51
Fluorene	20
Naphthalene	320
2-Methylnaphthalene	140

J = Approximate Value

MW-4A

VOCs	µg/l
Benzene	970
Toluene	4,300
Ethylbenzene	680
Xylenes	3,300
Tetrachloroethene	490J
Styrene	3,300
SEMI-VOCs	**µg/l**
Acenaphthene	51.0J
Acenaphthylene	440.0
Anthracene	83.0
Benzo(a)anthracene	23.0J
Benzo(a)pyrene	11.0J
Chrysene	21.0J
Fluorene	210.0
Fluoranthene	82.0
Naphthalene	440.0
2-Methylnaphthalene	1,200.0
Phenanthrene	320.0
Pyrene	101.0
Dibenzofuran	22.0J
Carbazole	6.8J

J = Approximate Value

MW-6C*

VOCs	µg/l
Tetrachloroethene	5.6

* Frederica Aquifer

MW-6A

VOCs	µg/l
Benzene	36J
Toluene	170J
Ethylbenzene	200J
Xylenes	220J
1,2-Dichloroethene	650
Tetrachloroethene	1,500
Trichloroethene	500
SEMI-VOCs	**µg/l**
Acenaphthene	6.1J
Acenaphthylene	120.0
Anthracene	20.0
Benzo(a)anthracene	5.0J
Benzo(a)pyrene	2.5J
Benzo(k)fluoranthene	1.7J
Chrysene	5.0J
Fluorene	53.0
Fluoranthene	18.0
Naphthalene	560.0
2-Methylnaphthalene	106.0
Phenanthrene	88.0
Pyrene	24.0
Dibenzofuran	5.4J

J = Approximate Value

MW-6A1/2

VOCs	µg/l
Benzene	230J
Toluene	3,100
Ethylbenzene	1,800
Xylenes	3,100
Tetrachloroethene	46,000
Trichloroethene	140J
Styrene	1,100
SEMI-VOCs	**µg/l**
Acenaphthene	11.0J
Acenaphthylene	180.0
Anthracene	9.8J
Fluorene	48.0
Fluoranthene	4.2J
Naphthalene	1,900.0
2-Methylnaphthalene	560.0
Phenanthrene	52.0
Pyrene	4.9J
Dibenzofuran	6.3J
Phenol	40.0
4-Methylphenol	4.8J
2,4-Dimethylphenol	8.9J

J = Approximate Value

MW-8A

VOCs	µg/l
Tetrachloroethene	63

MW-12B

VOCs	µg/l
1,2-Dichloroethene	18.7
Tetrachloroethene	777.0
Trichloroethene	28.8

MW-12A

VOCs	µg/l
1,2-Dichloroethene	179.0
Tetrachloroethene	4,700.0
Trichloroethene	81.1

MW-12C*

VOCs	µg/l
Benzene	1.6J
1,2-Dichloroethene	6.9

* Frederica Aquifer
J = Approximate Value

FIGURE 4
Dover Gas Light Superfund Site
Former Coal Gas Plant: Area of Potential Soil Remediation

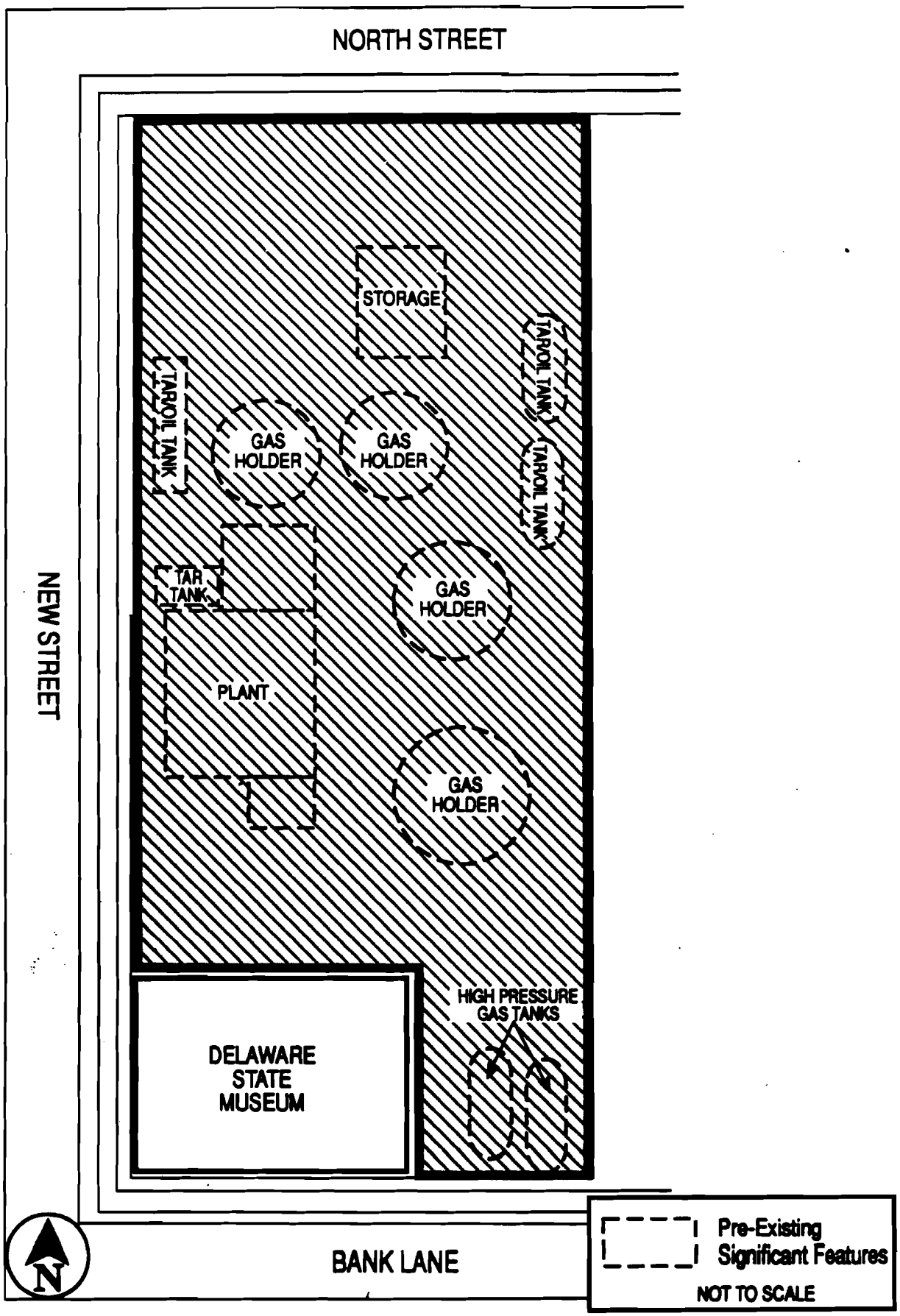


FIGURE 5
Dover Gas Light Superfund Site
Alternative GW-2 Well Locations

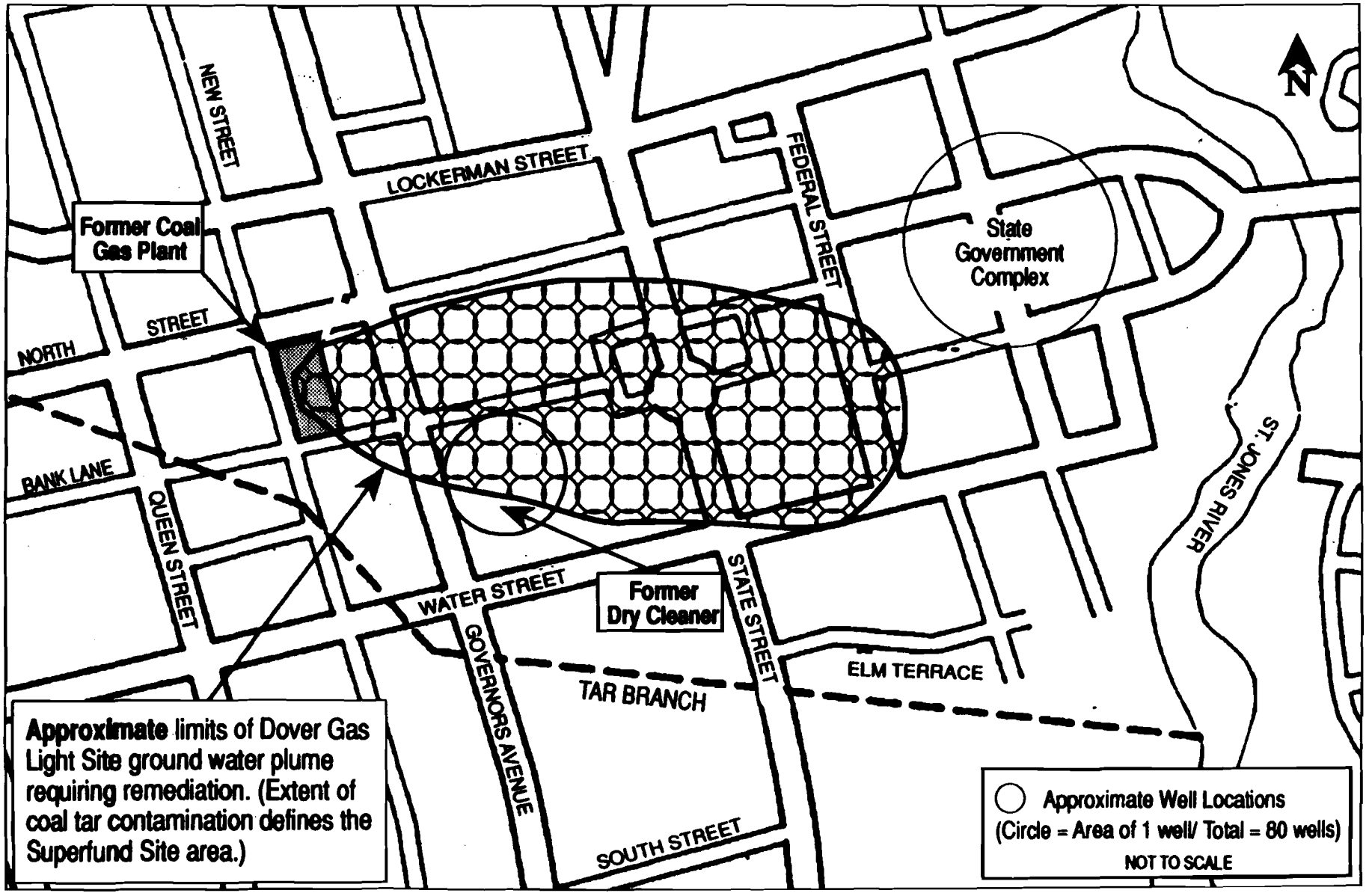


FIGURE 6
Dover Gas Light Superfund Site
Alternative GW-3 Well Locations

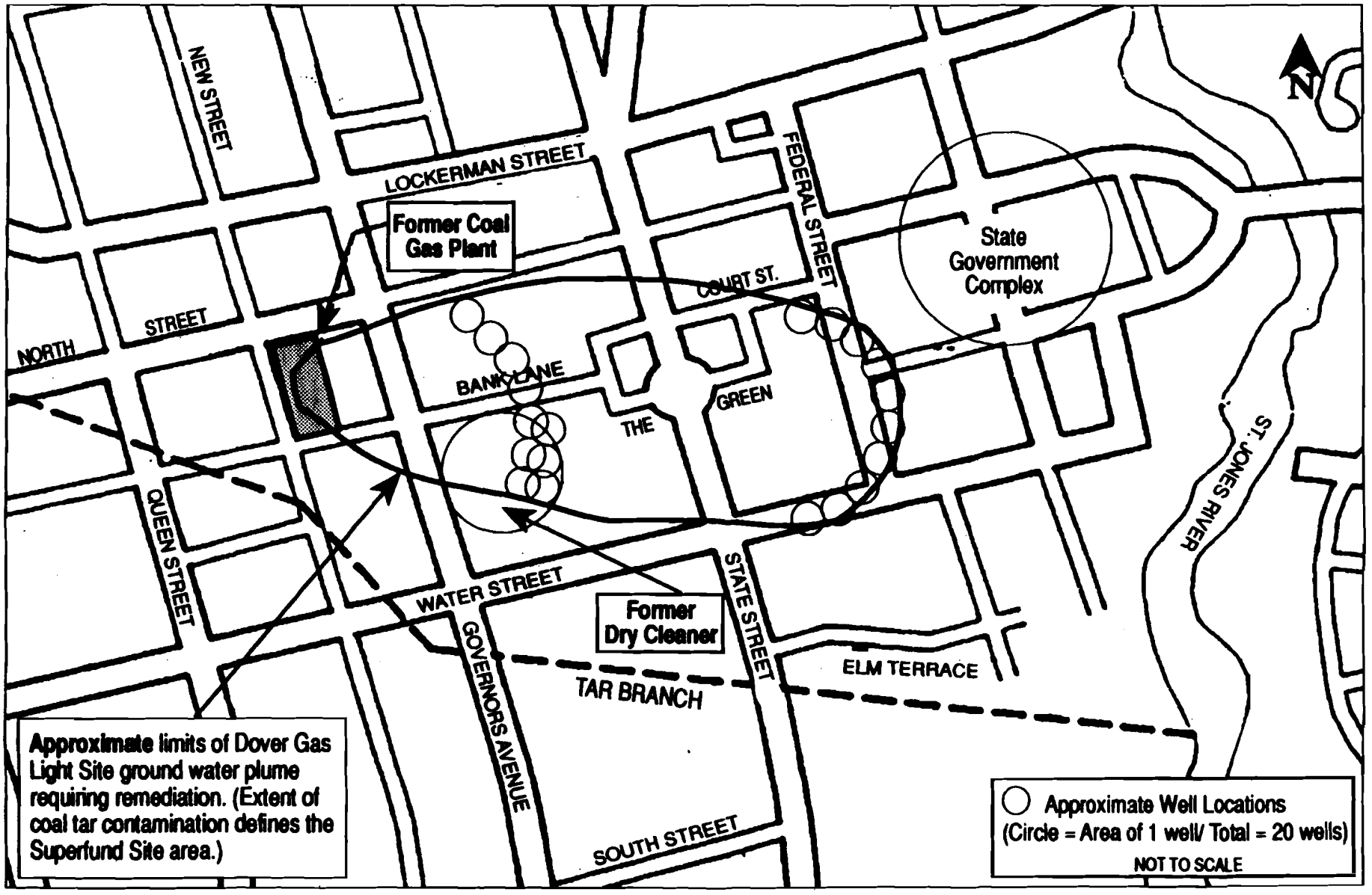


FIGURE 7
Dover Gas Light Superfund Site
Alternative GW-4 Well Locations

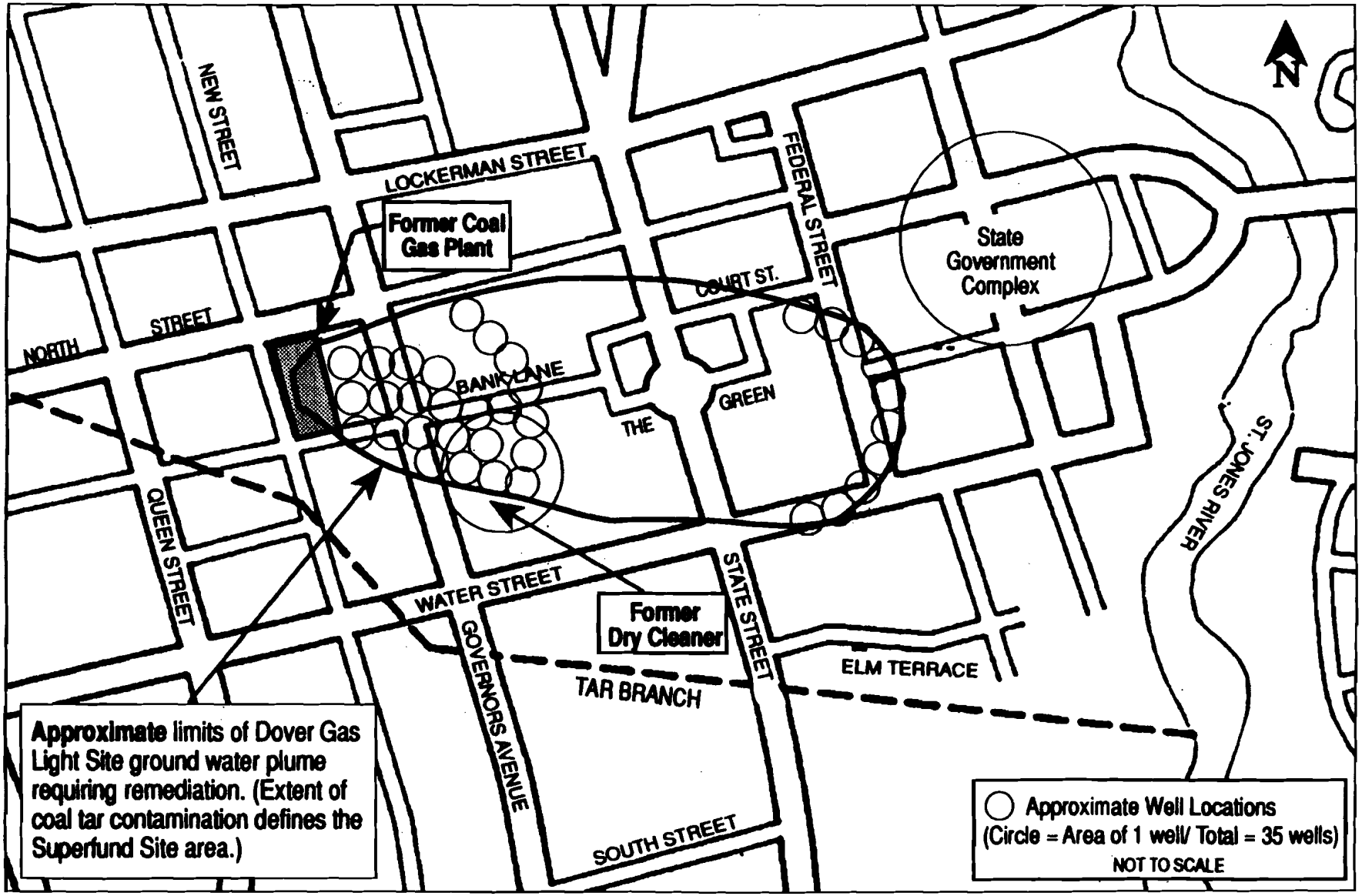
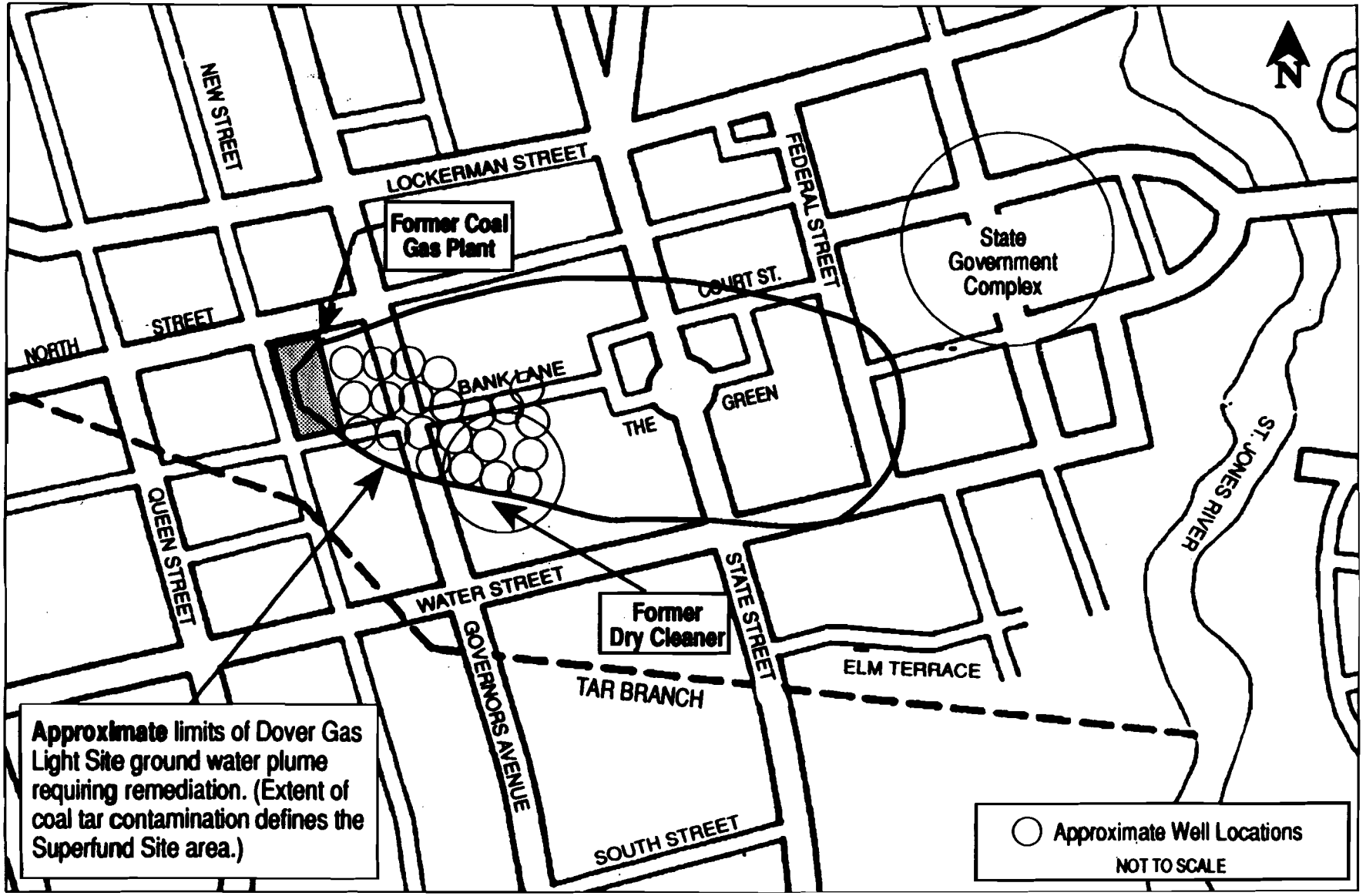



FIGURE 8
Dover Gas Light Superfund Site
Alternative GW-5 Well Locations