DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

RCRA Corrective Action
Environmental Indicator (EI) RCRAInfo Code (CA750)
Migration of Contaminated Groundwater Under Control

Facility Name:	**Safety-Kleen Envirosystems Company (formerly McKesson Envirosystems Company)**
Facility Address:	**600 Doremus Avenue, Newark, New Jersey 07105**
Facility EPA ID#:	**NJD002153922**

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EIs developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of "Migration of Contaminated Groundwater Under Control" EI

A positive "Migration of Contaminated Groundwater Under Control" EI determination ("YE" status code) indicates that the migration of "contaminated" groundwater has stabilized, and that monitoring will be conducted to confirm that contaminated groundwater remains within the original "area of contaminated groundwater" (for all groundwater "contamination" subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

Relationship of EI to Final Remedies

While final remedies remain the long-term objectives of the RCRA Corrective Action program, the EIs are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993 (GPRA). The "Migration of Contaminated Groundwater Under Control" EI pertains ONLY to the physical migration (i.e., further spread) of contaminated groundwater and contaminants within groundwater (e.g., non-aqueous phase liquids [NAPL]). Achieving this EI does not substitute for achieving other stabilization or final remedy requirements and expectations associated with sources of contamination and the need to restore, wherever practicable, contaminated groundwater to be suitable for its designated current and future uses.

Duration / Applicability of EI Determinations

EI Determination status codes should remain in the RCRAInfo national database ONLY as long as they remain true (i.e., RCRAInfo status codes must be changed when the regulatory authorities become aware of contrary information).

Facility Information

The Safety-Kleen Envirosystems Company (Safety-Kleen) site is located on approximately 9.5 acres in a heavily industrialized area in Newark, New Jersey. The site is bounded on the west by Doremus Avenue, and on the east by the confluence of the Passaic River and Newark Bay. Industrial facilities are located both north and south of the site, and the area has been zoned for “third industrial” use; as such, residential usage is strictly prohibited. The only building that remains at the site is a small pump house. The main portion of the site is surrounded by a six-foot high fence. The site has been completely paved with asphalt or concrete (Ref. 4).

During the 1800s, this site was part of the Balbach Smelting and Refining Corporation Works, which refined lead and copper. Operations ceased in 1938 and ownership of the site was transferred to the City of Newark. The site was inactive until purchased in 1952 by Kolker Chemical Company to construct a chemical plant at the site. Operations at the chemical plant included the manufacture of chlorine, methylene chloride, methyl chloride, chloroform, and plasticizers. In 1962, the Kolker Chemical Company merged with Vulcan Materials Company. The site was purchased by Inland Chemical Corporation (Inland) in 1974, which subsequently phased out chemical manufacturing and initiated solvent recovery operations at the site in 1975. In 1976, under Inland’s ownership, the southern portion of the property was sold to Darling International for rendering of animal byproducts. Inland and McKesson Envirosystems Company (McKesson) merged in 1981. On October 10, 1982, an explosion and fire destroyed much of the facility. The New Jersey Department of Environmental Protection (NJDEP) closed the site two days later and the property has been inactive and vacant since. In 1987, Safety-Kleen Corporation acquired the stock of McKesson and renamed the company Safety-Kleen Envirosystems Company.

In August 1982, McKesson signed an Administrative Consent Order (ACO) with NJDEP, requiring that a groundwater and soil investigation be performed on the subject property based on evidence from site inspections by NJDEP that frequent spills and operational losses occurred during the facility’s operation. A Resource Conservation and Recovery Act (RCRA) Part B permit application was submitted to NJDEP in 1984. Subsequently, a RCRA Facility Assessment (RFA) was performed by NJDEP in November 1985 which identified a number of environmental concerns at the site. A site inspection conducted by NJDEP in 1987 indicated that a number of surface units and structures (remaining after the explosion) were deteriorating and/or leaking. In response to the RFA and site inspection, another ACO was signed by the facility in August 1993 which required that a remedial investigation (RI), feasibility study (FS), and remedial action be conducted at the site. This ACO also exempted the facility from responsibility for remedying conditions resulting from the former metal refining practices at the site or any other activities which predate 1952. In accordance with the ACOs, several phases of investigation have been conducted at the site between 1984 and 1999. The initial RI was submitted in 1994. Subsequent phases of investigation (Phase II, Supplemental Phase II, and Phase III) were conducted between 1995 and 1998.

A number of soil remedial actions have been conducted at the site since 1991. An interim remedial measures program was implemented in December 1991 and January 1992, involving removal of drums, emptying of compressed gas cylinders, and construction of chain link fencing around the site. A site-wide aboveground storage tank decommissioning program was implemented in 1995. Between October 2000 and June 2001, soils containing polychlorinated biphenyl (PCB) concentrations above 50 parts per million (ppm) in the vicinity of soil boring SB-24 were excavated and disposed of off site, and a low permeability asphalt cap was installed across the site property to minimize infiltration of storm water into impacted areas and subsequent contaminant migration to groundwater. This cap will be inspected and maintained as necessary, on at least an annual basis. The only remaining soil action for the Safety-Kleen site involves corrective actions for site-related impacts in a discrete area of the adjacent Cardolite Corporation property to the north. Safety-Kleen is currently in the process of developing a Remedial Action Selection Report for this effort.

Several groundwater remedial actions have also been conducted at the Safety-Kleen site. A source area reduction program (SARP), involving in-situ chemical oxidation, was implemented between May and August 2000. The purpose of this effort was to reduce the mass of volatile organic compounds (VOCs) in potential shallow groundwater contaminant source areas. Supplemental groundwater remedial actions included installation of a low permeability subsurface barrier wall between November 2003 and August 2004 to contain residual product in shallow groundwater. This wall was constructed around the entire Safety-Kleen site, through the shallow fill unit and into the upper portions of the underlying meadow mat. Natural attenuation is expected to continue to reduce VOC concentrations downgradient of and below the barrier wall. A quarterly groundwater monitoring program was initiated in October 2004 to monitor VOC concentrations and assess effectiveness of the barrier wall in controlling contaminant migration in groundwater. This monitoring program is ongoing, with the most recent sampling event conducted in July 2005.

A deed notice for the Safety-Kleen site was filed in April 2005 to limit future site activities that could result in direct contact to contaminated soil and to minimize the potential for future site uses that could compromise the integrity of the asphalt cap. Administrative requirements for designation of a groundwater Classification Exception Area (CEA) are currently being finalized and should be filed in late summer or early fall 2005. The CEA would document that applicable constituent standards are not being met in groundwater in the shallow fill and Glacial Ground Moraine units at and around the Safety-Kleen site, and would suspend usage of groundwater in the designated area for the term of the CEA.

1. Has **all** available relevant/significant information on known and reasonably suspected releases to the groundwater media, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?

_X_ If yes - check here and continue with #2 below.

___ If no - re-evaluate existing data, or

___ If data are not available, skip to #8 and enter "IN" (more information needed) status code.

Summary of Areas of Environmental Concern (AECs): Seven AECs were identified during the Phase I RI. Based upon available information, AECs were only established for the chemical manufacturing activities that took place before 1974. Thus, it appears that activities at the identified AECs were discontinued in 1974. Industrial activities at all units and structures at the site were discontinued when the site was closed after the fire in October 1982. Formal closure and/or cleanup of these units and areas, as discussed above in the facility information section, has been ongoing per the ACOs and RCRA permitting requirements.

AEC 1: This AEC was located along the western boundary of the site, adjacent to the former process building area. This area contained several aboveground storage tanks (ASTs), which supported operations in the process building. From 1962 to 1974, the former process building housed operations to process benzoic acid and produce plasticizers (Ref. 3). The ASTs were formally decommissioned as part of a site-wide AST Decommissioning Program implemented in 1995 (Ref. 5). Surface soil sampling conducted during the Phase I RI indicated that total polychlorinated biphenyls (PCBs) were present above New Jersey Non-Residential Direct Contact Soil Cleanup Criteria (NJ NRDCSCC) (Ref. 1). In addition, volatile organic compounds (VOCs) were detected in surface and subsurface soil during the Phase II RI above NJ NRDCSCC and New Jersey Impact to Groundwater Soil Cleanup Criteria (NJ IGWSCC) (Ref. 4). Excavation of contaminated soil has not been performed in this area (Ref. 5). This AEC has been covered with an asphalt cap as part of the site-wide capping program implemented to prevent exposure to contaminated soil and prevent further infiltration of contaminants to groundwater (Ref. 8).

AEC 2: This AEC was located south of AEC 1 and west of the process building. AEC 2 was used as a truck transfer area associated with transport of the materials in the ASTs at AEC 1 (Ref. 3). Surface soil sampling conducted during the Phase I and Phase II RI indicated that PCBs were present above NJ NRDCSCC (Refs. 1, 4). Semi-volatile organic compounds (SVOCs) were detected in surface and subsurface soil during the Phase I RI above the NJ NRDCSCC and NJ IGWSCC (Ref. 1). VOCs and SVOCs were also detected in subsurface soil during the Phase II RI above NJ IGWSCC (Ref. 4). Excavation of contaminated soil has not been performed in this area (Ref. 5). This AEC has been covered with an asphalt cap as part of the site-wide capping program implemented to prevent exposure to contaminated soil and prevent further infiltration of contaminants to groundwater (Ref. 8). Two phases of in-situ chemical oxidation have been implemented at well MP-2S to reduce groundwater contaminant concentrations in this area; however, the results were mixed (Refs. 6, 7). A subsurface barrier wall has been constructed around the Safety-Kleen property, in part to control contaminant migration from the AEC 2 area. Long-term monitoring of groundwater quality within and downgradient of the barrier wall is ongoing (Ref. 10).

AEC 3: This AEC was located just northeast of the former process building and contained two cooling towers that circulated 2,400 gallons per minute (gpm) of water (Ref. 3). Surface and subsurface soil sampling conducted during the Phase II RI indicated that VOCs were present above NJ NRDCSCC and NJ IGWSCC (Ref. 4). Excavation of contaminated soil has not been performed in this area (Ref. 5). This AEC has been covered with an asphalt cap as part of the site-wide capping program implemented to prevent exposure to contaminated soil and prevent further infiltration of contaminants to groundwater (Ref. 8).

AEC 4: This area was located north of the former process building and was used as a loading dock and tank storage area for empty ASTs (Ref. 3). Benzo(a)pyrene was detected in surface soil above the NJ NRDCSCC during Phase I RI (Ref. 1). Subsurface soil sampling conducted during the Phase II RI indicated that VOCs were present above NJ NRDCSCC and NJ IGWSCC (Ref. 4). Excavation of contaminated soil has not been performed in this area (Ref. 5). This AEC has been covered with an asphalt cap as part of the site-wide capping program implemented to prevent exposure to contaminated soil and prevent further infiltration of contaminants to groundwater (Ref. 8).

AEC 5: This AEC was located east of former process building and contained approximately 12 ASTs situated within two adjacent berms. From 1962 to 1974, methylene chloride manufactured at the site was stored in this area (Ref. 3). Surface soil sampling conducted during previous investigations indicated that PCBs and SVOCs were present above NJ NRDCSCC and NJ IGWSCC (Ref. 5). VOCs were detected in subsurface soil above NJ NRDCSCC and NJ IGWSCC (Ref. 4). Approximately 75 cubic yards of PCB-impacted soil was excavated from this area prior to capping. This AEC has been covered with an asphalt cap as part of the site-wide capping program implemented to prevent exposure to contaminated soil and prevent further infiltration of contaminants to groundwater (Ref. 8).

AEC 6: This AEC was located at the far eastern end of the site closest to Newark Bay, and consisted of several tanks which were associated with chemical processing (Ref. 3). Surface soil sampling conducted during the Phase I and Phase II RI indicated that PCBs were present above NJ NRDCSCC (Refs. 1, 9). VOCs were detected in subsurface soil above NJ IGWSCC (Ref. 4). Excavation of contaminated soil has not been performed in this area (Ref. 5). This AEC has been covered with an asphalt cap as part of the site-wide capping program implemented to prevent exposure to contaminated soil and prevent further infiltration of contaminants to groundwater (Ref. 8). Two phases of in-situ chemical oxidation were conducted at well MW-11S to reduce groundwater contaminant concentrations in this area (Refs. 6, 7). A subsurface barrier wall has been constructed around the Safety-Kleen property, in part to control contaminant migration from the AEC 6 area. Long-term monitoring of groundwater quality within and downgradient of the barrier wall is ongoing (Ref. 10).

<u>AEC 7</u>: This AEC was located in the southwestern portion of the property and contained a 225,000-gallon AST (Tank C-19) which stored mixed organics (Ref. 3). One surface soil sample was collected during the Phase I RI and PCBs were detected above the NJ NRDCSCC (Ref. 1). However, additional soil samples collected during Phase II RI to delineate the extent of PCB contamination indicated that PCB concentrations were below NJ NRDCSCC (Ref. 4). Excavation of contaminated soil was not performed in this area (Ref. 5). This AEC has been covered with an asphalt cap as part of the site-wide capping program implemented to prevent exposure to contaminated soil and prevent further infiltration of contaminants to groundwater (Ref. 8).

<u>Groundwater:</u> Groundwater at the site occurs in a shallow fill unit and a deeper Glacial Ground Moraine unit. VOCs have been detected in the shallow fill unit above New Jersey Ground Water Quality Criteria (NJ GWQC) for Class II-A potable groundwater, since groundwater monitoring was initiated in 1982. In 1994 and 1995, VOCs (chloroform, benzene, trichloroethene, and methylene chloride) were detected in deep groundwater above NJ GWQC.

The remedial action selected for shallow groundwater includes in-situ chemical oxidation at two monitoring wells (MP-2S and MW-11S), monitored natural attenuation of the entire plume, and a contingency plan if NAPL is encountered during monitoring. Two ten-day reagent chemical oxidation treatments (Phase I and II) were performed in May 2000 and July 2000 (Refs. 6, 7). Post-treatment groundwater sampling results show some reduction of total VOC mass in all injection and downgradient monitoring wells.

Supplemental groundwater remedial actions includes the installation of a low permeability subsurface barrier wall between November 2003 and August 2004 to contain residual product in shallow groundwater. As shown on Figure 1 from the most recent Quarterly Progress Report (Ref. 12), this wall was constructed around the entire Safety-Kleen site, through the shallow fill unit and into the upper portions of the underlying meadow mat. Natural attenuation is expected to continue to reduce VOC concentrations downgradient of and below the barrier wall. A quarterly groundwater monitoring program was initiated in October 2004 to monitor VOC concentrations and assess effectiveness of the barrier wall in controlling contaminant migration in groundwater. This monitoring program is ongoing, with the next sampling round planned for October 2005.

References:

1. Remedial Investigation Report, Safety-Kleen Envirosystems Company, Newark, New Jersey. Prepared by Malcolm Pirnie, Inc. Dated August 1994.
2. Letter to Agi Nadai, USEPA, from M. Cathy Geraci, Blasland, Bouck & Lee, Inc. re: Safety-Kleen Envirosystems Company Site. Dated November 1994.
3. Phase II Remedial Investigation Work Plan, Safety-Kleen Envirosystems Company, Newark, New Jersey. Prepared by Blasland, Bouck & Lee, Inc. Dated March 1995.
4. Phase II Remedial Investigation Report, Safety-Kleen Envirosystems Company, Newark, New Jersey. Prepared by Blasland, Bouck & Lee, Inc. Dated December 1995.
5. Remedial Action Work Plan, Safety-Kleen Envirosystems Company, Newark, New Jersey. Prepared by Blasland, Bouck & Lee, Inc. Dated February 2000.
6. Letter to Mark Walters, NJDEP, from David J. Ulm, Blasland, Bouck & Lee, Inc. re: Source Area Reduction Program. Dated September 21, 2000.
7. Letter to Mark Walters, NJDEP, from David J. Ulm, Blasland, Bouck & Lee, Inc. re: Source Area Reduction Program. Dated October 13, 2000.
8. Letter to NJDEP Land Use Regulation Program from David J. Ulm, Blasland, Bouck & Lee, Inc. re: Waterfront Development Permit Completion Report. Dated July 31, 2001.
9. Letter to Mark Walters, NJDEP, from David J. Ulm, Blasland, Bouck & Lee, Inc. re: Quarterly Progress Report. Dated July 31, 2001.
10. Remedial Action Report, Safety-Kleen Envirosystems Company Site, Newark, New Jersey. Prepared by Blasland, Bouck & Lee, Inc. Dated September 2004.
11. Letter to Mark Walters, NJDEP, from David J. Ulm, Blasland, Bouck & Lee, Inc. re: Recorded Deed Notice. Dated April 27, 2005.
12. Letter to Mark Walters, NJDEP, from David J. Ulm, Blasland, Bouck & Lee, Inc. re: Quarterly Progress Report. Dated July 18, 2005.

2. Is **groundwater** known or reasonably suspected to be "**contaminated**"[1] above appropriately protective "levels" (i.e., applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action, anywhere at, or from, the facility?

__X__ If yes - continue after identifying key contaminants, citing appropriate "levels," and referencing supporting documentation.

____ If no - skip to #8 and enter "YE" status code, after citing appropriate "levels," and referencing supporting documentation to demonstrate that groundwater is not "contaminated."

____ If unknown - skip to #8 and enter "IN" status code.

Rationale:

Local Hydrology and Groundwater Flow

Groundwater at the Safety-Kleen site occurs in two hydrostratigraphic units: the shallow fill unit and the deeper Glacial Ground Moraine unit. The shallow fill unit is comprised of a mix of non-native material including rubble, debris, ashes, slag, sand, and gravel. Due to its composition, the shallow fill is highly conductive, with hydraulic conductivity values ranging between 10^{-4} and 10^{-1} centimeters per second (Ref. 11). Groundwater in the shallow fill typically occurs between three and seven feet below ground surface (bgs) at the Safety-Kleen site. The groundwater flow direction in the shallow fill is generally towards the south in the western and central portions of the site. Shallow groundwater on the eastern portion of the site is tidally influenced and flows eastward, discharging to the Passaic River and Newark Bay.

Beneath the shallow fill is a silt and clay unit that appears to act as an aquitard, restricting vertical groundwater flow between shallow and deep groundwater. This silt and clay layer is first encountered at approximately 10 and 15 feet bgs across the site, and is between 10 and 21 feet thick. Hydraulic conductivity in the silt and clay unit ranges between 10^{-7} and 10^{-3} centimeters per second (Ref. 4), but the mean value is 6.63×10^{-4} centimeters per second (Ref. 3).

Bedrock is encountered approximately 50 feet bgs in the southeastern corner of the site, and approximately 90 feet bgs at the western end of the site. The Glacial Ground Moraine unit, situated immediately above the bedrock, ranges in thickness from a minimum of ten feet near the Passaic River/Newark Bay shoreline, to a maximum of 70 feet in the northwestern corner of the site (Ref. 3). As in the shallow fill unit, the Glacial Ground Moraine unit is heterogeneous, consisting of pebbles interspersed in silt and clay. This nonuniformity causes some areas of the unit to be more conductive than others. Hydraulic conductivity in this deeper water-bearing zone ranges from 10^{-3} to 10^{-6} centimeters per second (Ref. 3). Groundwater level measurements obtained during the Phase I RI indicated northerly groundwater flow toward the confluence between the Passaic River and Newark Bay; however, observed tidal effects were large enough to cause periodic northwesterly fluctuations in the flow pattern. Tidal influence data show that the Glacial Ground Moraine unit is hydraulically connected to Newark Bay

[1] "Contamination" and "contaminated" describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriate "levels" (appropriate for the protection of the groundwater resource and its beneficial uses).

(Ref. 1).

<u>Groundwater Quality Issues at Safety-Kleen</u>

Monitoring of groundwater quality at the Safety-Kleen site has been ongoing as part of various investigations since 1982. Historic monitoring well and piezometer locations are illustrated on Figure 2 of the September 2004 Remedial Action Report (RAR, Ref. 13). Maps showing current shallow fill and Glacial Ground Moraine monitoring well locations are presented as Figures 1 and 2, respectively, in the most recent Quarterly Progress Report from July 2005 (Ref. 14). Groundwater data generated during each investigation and sampling round were compared to NJ GWQC for Class II-A potable groundwater because the shallow fill is formally classified as a Class II-A groundwater unit and because NJ GWQC for Class III-B units have not yet been established.

Shallow Fill Groundwater Quality

Numerous organic contaminants, primarily volatile chlorinated solvents, have been detected above NJ GWQC in the shallow groundwater beneath the Safety-Kleen site. Shallow groundwater samples collected during the Phase I RI indicated a total of 16 VOCs, seven SVOCs, and two PCBs above NJ GWQC. Intermittent occurrences of NAPL were also observed in shallow wells, but no NAPL detections have been reported since 1995 (Ref. 13). [It should be noted that metals were reported in groundwater above NJ GWQC during previous investigations, but the site-wide occurrence of metals in soil and groundwater has been attributed to historic smelting and refining operations conducted at the site prior to 1952 (Ref. 11). According to the 1993 ACO, Safety-Kleen is not required to address this contamination, and metals have been eliminated from the list of site-specific constituents of concern (COCs).]

Although PCBs are no longer reported in the shallow groundwater, a total of 17 VOCs and SVOCs remained above applicable NJ GWQC in Phase III RI samples collected in October 1998 (the latest period for which *site-wide* contaminant-specific groundwater data were available in the file material). The most significant contamination was detected in shallow wells on the eastern portion of the site near the Passaic River and Newark Bay (MP-8S, MW-11S, and MW-12S), and in the center of the site at well MP-2S. Maximum contaminant concentrations exceeding NJ GWQC in shallow fill groundwater during the Phase III RI effort are listed in Table 1 below.

Since October 2004, shallow groundwater quality at well MW-13S has been evaluated five times. This well is situated within the Safety-Kleen property boundary but outside the subsurface barrier wall, immediately upgradient of the point at which groundwater would naturally discharge to the Passaic River and Newark Bay. The most recent sampling event at this well was conducted on May 16, 2005. Contaminant concentrations reported in well MW-13S during this round are also presented in Table 1. No other shallow wells are currently being monitored on site.

Table 1 - Maximum NJ GWQC Exceedances in On-Site Shallow Fill Groundwater (µg/L)

Constituent	NJ GWQC*	Well	February 1999 Phase III RI Concentration	May 2005 Concentration in Well MW-13S
Carbon Tetrachloride	2	MW-11S	310	NE
Chloroform	6	MW-11S	7,000	41
Methylene Chloride	2	MW-12S	4,800 B	1,400
Tetrachloroethene (PCE)	1	MW-11S	660	51
Trichloroethene (TCE)	1	MW-12S	2,800	54
1,1,2-Trichloroethane	3	MW-12S	470	NE
1,1,2,2-Tetrachloroethane	2	MW-12S	410	NE
Vinyl Chloride	5	MW-12S	200	810
1,1-Dichloroethane	70	MW-11S	1,300	180
cis-1,2-Dichloroethene	10	MW-12S	8,200	1,400
1,2-Dichloroethane	2	MW-12S	460	NE
1,1,1-Trichloroethane	30	MW-12S	2,300	NE
Benzene	1	MW-12S	170	130
Ethylbenzene	700	MW-12S	1,100	NE
Total Xylenes	40	MW-12S	6,600	180
Chlorobenzene	4	MW-12S	39	430
1,1-Dichloroethene	2	MW-12S	110	NE

Sources: Reference 8 and 14.
NE: Concentration reported below applicable NJ GWQC or not detected.
* NJ GWQC listed are the established groundwater quality criteria or the practical quantitation level (PQL), whichever is higher.

Glacial Ground Moraine Groundwater Quality

Deep groundwater samples from the Phase I RI showed that, while the overall water quality in the Glacial Ground Moraine unit was better than in the shallow fill unit, five VOCs and two SVOCs were present at levels exceeding NJ GWQC. However, samples collected from this unit during the Phase II RI contained only two VOCs above NJ GWQC: methylene chloride in well MP-1D and TCE in well MP-4D. Neither of these constituents were reported in the co-located shallow wells. No SVOCs were detected above applicable NJ GWQC during the Phase II deep groundwater sampling effort. These deep groundwater impacts were generally isolated and appeared to be declining as a result of natural attenuation. Furthermore, the lack of corresponding VOC contamination between co-located shallow and deep wells suggested that the aquitard between the shallow and deep groundwater units effectively hinders downward vertical contaminant migration, and that observed deep groundwater contamination may be associated with the industrialized nature of the area rather than the Safety-Kleen site alone.

Three Glacial Ground Moraine unit wells (wells MP-1DR, MP-4DR, and MP-6DR) have been monitored on a quarterly basis since October 2004. All three of these wells are situated within the footprint of the subsurface barrier wall, are replacement wells for deep wells previously abandoned, and are intended to provide data for assessing potential downward contaminant migration from the shallow fill groundwater unit. The highest contaminant concentrations detected above NJ GWQC in these wells during the April 2005 sampling round are presented in Table 2 below.

Table 2 - Maximum NJ GWQC Exceedances in On-Site Glacial Ground Moraine Groundwater (µg/L)

Constituent	NJ GWQC*	Well	April 2005 Concentration
Chloroform	6	MP-6DR	27
Tetrachloroethene (PCE)	1	MP-4DR	83
Trichloroethene (TCE)	1	MP-4DR	90
Vinyl Chloride	5	MP-4DR	47
cis-1,2-Dichloroethene	10	MP-4DR	270
1,2-Dichloroethane	2	MP-6DR	3
Benzene	1	MP-6DR	7.3

Source: Reference 14.
* NJ GWQC listed are the established groundwater quality criteria or the PQL, whichever is higher.

Off-Site Groundwater Quality Issues

As stated previously, quarterly groundwater monitoring has been ongoing since October 2004. Shallow off-site wells MW-3, MW-4, MW-5, and MW-6 are included in this monitoring program. These wells, located on the Darling property south of the Safety-Kleen site, are sampled and analyzed for VOCs to assess the effectiveness of the subsurface barrier wall in preventing continued contaminant migration off site. These wells were most recently sampled in July 2005, but the most recent data available are from the April/May 2005 sampling event. No VOCs were reported above NJ GWQC at wells MW-4 or MW-5 during the April 2005 round. Contaminant concentrations exceeding NJ GWQC in off-site shallow fill wells MW-3 and MW-6 during that round are listed in Table 3 below.

Table 3 - Maximum NJ GWQC Exceedances in Off-Site Shallow Fill Groundwater (µg/L)

Constituent	NJ GWQC*	May 2005 Concentration in Well MW-3	May 2005 Concentration in Well MW-6
Chloroform	6	NE	99
Methylene Chloride	2	NE	57
Tetrachloroethene (PCE)	1	NE	12
Trichloroethene (TCE)	1	NE	52
1,1,2-Trichloroethane	3	NE	11
1,1,2,2-Tetrachloroethane	2	NE	26
Vinyl Chloride	5	NE	480
1,1-Dichloroethane	70	NE	320
cis-1,2-Dichloroethene	10	NE	800
1,2-Dichloroethane	2	NE	29
1,1,1-Trichloroethane	30	NE	210
Benzene	1	10	66
Total Xylenes	40	1,300	51
Chlorobenzene	4	NE	570

Source: Reference 14.
NE: Concentration reported below applicable NJ GWQC or not detected.
* NJ GWQC listed are the established groundwater quality criteria or the PQL, whichever is higher.

Environmental investigation and remedial action efforts have been undertaken by Darling as part of their own underground storage tank (UST) closure efforts, and significant groundwater impacts have been identified. Specifically, free product was observed on the water table, and chlorinated VOCs and benzene, toluene, ethylbenzene, and xylene (BTEX) were reported in shallow groundwater. NJDEP has determined that BTEX contamination in shallow groundwater beneath the Darling site is associated with USTs on that site and are the sole responsibility of Darling (Ref. 8). NJDEP has also found that Safety-Kleen has adequately delineated the VOC plume migrating from their property, and will require ongoing monitoring of well MW-5 as a sentinel well (Refs. 9, 13). Furthermore, based on the fact that Darling contaminant concentrations in groundwater are higher than those upgradient on the western portion of the Safety-Kleen property (Refs. 7, 14), some VOC contamination in groundwater appears to have been contributed by past chemical activities on the Darling site itself. McKesson divested the Darling property prior to implementation of the Industrial Site Recovery Act (ISRA) program; thus, Darling is responsible for remediating the VOC contamination beneath their property (Ref. 12). As outlined in the RAR (Ref. 13), Safety-Kleen intends to rely on natural attenuation processes to reduce *site-related* contamination in shallow groundwater outside the subsurface barrier wall, and groundwater conditions are conducive for biological reductive dehalogenation.

References:

1. RI Report (Phase I). Prepared by Malcolm Pirnie. Dated August 1994.
2. Phase II RI Work Plan. Prepared by Blasland, Bouck, & Lee, Inc. Dated March 1995.
3. Phase II RI Report, Volume 1 of 2. Prepared by Blasland, Bouck, & Lee, Inc. Dated December 1995.

4. Letter to Michael Rosenberg, McKesson, from Mark Walters, NJDEP, re: Phase II RI Report. Dated April 16, 1996.
5. Letter to Patrick Nucciarone, Law Offices, from Mark Walters, NJDEP, re: October 11, 1996 Supplemental RI Report. Dated February 18, 1997.
6. Letter to Mark Walters, NJDEP, from David Ulm, Blasland, Bouck, & Lee, Inc., re: Safety-Kleen Envirosystems Company Site (Darling Site HydroPunch Investigation Results). Dated September 30, 1998.
7. Groundwater Remedial Action Selection Report. Prepared by Blasland, Bouck, & Lee, Inc. Dated February 1999.
8. Phase III RI Report. Prepared by Blasland, Bouck, & Lee, Inc. Dated February 1999.
9. Letter to Mark Walters, NJDEP, from David Ulm, Blasland, Bouck, & Lee, Inc., re: Safety-Kleen Envirosystems Company Site (NJDEP Comments on the Draft Remedial Action Work Plan). Dated January 24, 2000.
10. Remedial Action Work Plan. Prepared by Blasland, Bouck, & Lee, Inc. Dated February 2000.
11. Letter to Agi Nadai, USEPA, from Cathy Geraci, Blasland, Bouck, & Lee, Inc., re: Safety-Kleen Envirosystems Company Site. Dated November 14, 2000.
12. Personal communication with Agi Nadai, USEPA, re: Status Update from Mark Walters of NJDEP. Dated August 22, 2001.
13. Remedial Action Report, Safety-Kleen Envirosystems Company Site, Newark, New Jersey. Prepared by Blasland, Bouck & Lee, Inc. Dated September 2004.
14. Letter to Mark Walters, NJDEP, from David J. Ulm, Blasland, Bouck & Lee, Inc. re: Quarterly Progress Report. Dated July 18, 2005.

3. Has the **migration** of contaminated groundwater **stabilized** (such that contaminated groundwater is expected to remain within "existing area of contaminated groundwater"[2] as defined by the monitoring locations designated at the time of this determination)?

__X__ If yes - continue, after presenting or referencing the physical evidence (e.g., groundwater sampling/measurement/migration barrier data) and rationale why contaminated groundwater is expected to remain within the (horizontal or vertical) dimensions of the "existing area of groundwater contamination"[2].

____ If no (contaminated groundwater is observed or expected to migrate beyond the designated locations defining the "existing area of groundwater contamination"[2]) - skip to #8 and enter "NO" status code, after providing an explanation.

____ If unknown - skip to #8 and enter "IN" status code.

Rationale:

Source Area Reduction Program – In-situ Chemical Oxidation

To address specific contaminant source areas in shallow groundwater and accomplish remediation more quickly, Safety-Kleen has implemented a treatment program involving in-situ chemical oxidation. These source areas are not necessarily related to the AECs identified in the response to Question 1, but rather are areas where significant groundwater contamination has been detected. Two phases of the source area reduction program were implemented at monitoring wells MP-2S and MW-11S in June and July of 2000. Each phase of the treatment program involved a ten-day reagent chemical oxidation treatment regimen.

Supplemental post-treatment groundwater sampling results show some reduction of VOC constituents in all injection wells and downgradient monitoring wells. Shallow groundwater samples collected in September 2000 (approximately seven weeks after the treatment period) indicated a decline in total VOC concentrations of 56 and 20 percent in the overall MP-2S and MW-11S source areas, respectively (Ref. 9). The total mass of VOCs removed during the program was estimated at 32 pounds around well MP-2S and 11 pounds around well MW-11S (Ref. 9).

Supplemental Groundwater Remedial Action – Subsurface Barrier Wall

A low permeability subsurface barrier wall was installed at the Safety-Kleen site between November 2003 and August 2004 to contain residual contamination in shallow fill groundwater. As shown on Figure 1 from the most recent Quarterly Progress Report (Ref. 15), this wall was constructed around the entire property, through the shallow fill unit and into the upper portions of the underlying meadow mat. The wall consists of a combination slurry-stabilized trench and vertical high-density polyethylene (HDPE) panels. The HDPE panels are between 17 and 25 feet long and 80 mils thick, with a permeability of 10^{-7} cm/sec

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[2] "existing area of contaminated groundwater" is an area (with horizontal and vertical dimensions) that has been verifiably demonstrated to contain all relevant groundwater contamination for this determination, and is defined by designated (monitoring) locations proximate to the outer perimeter of "contamination" that can and will be sampled/tested in the future to physically verify that all "contaminated" groundwater remains within this area, and that the further migration of "contaminated" groundwater is not occurring. Reasonable allowances in the proximity of the monitoring locations are permissible to incorporate formal remedy decisions (i.e., including public participation) allowing a limited area for natural attenuation.

or less (Ref. 14). A 2.5-foot wide trench was excavated through the asphalt cap along the entire site perimeter to a depth approximately three feet into the meadow mat. The HDPE panels were connected to a steel frame template and were placed in the center of the slurry-stabilized trench. Approximately 121 HDPE panels were installed around the site. Following panel placement, the slurry trench was backfilled with suitable excavation materials and imported sand. Removed sections of the asphalt cap were then restored to original condition and grade.

To confirm the hydraulic effectiveness of the barrier wall, eight piezometers (PZ-16S through PZ-23S) were installed in pairs at locations across the site. Each pair consists of one piezometer inside the barrier wall and one piezometer outside the barrier wall. Groundwater level measurements are obtained from these piezometers on a quarterly basis, with results reported in the quarterly progress reports submitted to NJDEP. Data obtained from these piezometers in April 2005 show that the horizontal component of the hydraulic gradient within the shallow fill unit (across the barrier wall) has been reduced by approximately 91 percent (Ref. 15).

Stabilization Within the Barrier Wall Area

Natural attenuation is expected to continue to reduce VOC concentrations in shallow groundwater within the barrier wall. Although several COCs remain above NJ GWQC in the shallow fill unit on site (as indicated in Table 1 above), significant decreases have been observed since 1982 with regard to COC concentrations and the areal extent of impacted groundwater. According to data gathered in 1996 as part of the Supplemental Phase II RI effort (Ref. 1), natural attenuation processes have caused the VOC impact areas in shallow groundwater to decrease. Between 1982 and 1996, the areal extent of:

- Total VOCs greater than 1 ppm was reduced by approximately 50 percent
- Total VOCs between 10 and 100 ppm was reduced by approximately 70 percent
- Total VOCs greater than 100 ppm was reduced by approximately 95 percent (Ref. 1).

Reductions in the concentrations of many individual constituents have also been observed in on-site shallow wells since 1994. Data obtained during the Phase III RI effort in 1998 show significant decreases in contaminant concentrations from the maximum values reported in 1994 (Ref. 6); these data are summarized in Table 4 below for several key constituents.

Table 4 - Reductions in Key On-Site Shallow Groundwater Contaminant Concentrations from 1994 to 1998 (μg/L)

Constituent	NJ GWQC	Maximum 1994 Concentration	Maximum 1998 Concentration
Chloroform	6	35,000	7,000
Methylene Chloride	2	16,000	4,800
Tetrachloroethene (PCE)	1	2,900	660
Trichloroethene (TCE)	1	170,000	2,800
Vinyl Chloride	5	390	200

Source: Reference 4.

The most dramatic reductions during this time frame were detected in shallow wells along the eastern edge of the property, but still within the barrier wall (i.e., wells MP-8S and MW-11S). It is expected that natural attenuation processes will continue to reduce contaminant concentrations within the subsurface barrier wall.

Stabilization in Shallow Fill Groundwater on the Darling Property (Outside the Barrier Wall)

As stated in the response to Question 2, the extent of the VOC plume beneath the Safety-Kleen site has been defined. Prior to installation of the barrier wall, shallow groundwater in the central and western portions of the site flowed southward. The leading edge of the Safety-Kleen plume flowing southward outside the barrier wall (existing prior to barrier installation) is located between wells MW-6 and MW-5 on the Darling property. With the exception of vinyl chloride and chlorobenzene, COC concentrations in well MW-6 declined significantly between 1998, 2002, and 2005 (Ref. 15). Increases in vinyl chloride levels in this well may be attributable to ongoing natural attenuation (with vinyl chloride being a daughter product of the reductive dechlorination process). Chlorobenzene concentrations in well MW-6 increased by less than an order to magnitude between 2002 and 2005, but have not yet been detected in downgradient wells MW-3 or MW-5. Furthermore, despite these relatively minor increases, total VOC concentrations in well MW-6 dropped significantly (from 104,360 to 3,373 μg/L) between 1998 and May 2005 (Ref. 15). Data from these wells will be closely evaluated during future groundwater monitoring events to ensure that chlorobenzene and vinyl chloride concentrations remain within the existing area of impacts until natural attenuation reduces these contaminant levels below applicable NJ GWQC, and that other COC concentrations continue to decline.

Stabilization in Shallow Fill Groundwater at Well MW-13S (Outside the Barrier Wall)

Prior to installation of the barrier wall, shallow groundwater beneath the eastern portion of the site flowed toward and into the Passaic River and Newark Bay. Post-remedial groundwater monitoring results from well MW-13S (located immediately outside and east of the barrier wall, and roughly 100 feet upgradient of the Passaic River and Newark Bay) indicate that the barrier is effectively reducing contaminant migration toward surface water. As shown in Table 5 below, concentrations of all COCs have declined relatively dramatically in well MW-13S over the nine months between October 2004 and May 2005. Only COC concentrations exceeding applicable NJ GWQC are included in the table.

As stated in the response to Question 2, shallow fill groundwater outside the barrier wall in the vicinity of well MW-13S flows toward and discharges into Newark Bay. Thus, despite continued NJ GWQC exceedances for several VOCs, shallow fill groundwater contamination in this area is not expected to migrate beyond the existing area of impacts.

Table 5 - Decreases in COC Levels in Shallow Fill Well MW-13S Between October 2004 and May 2005 (μg/L)

Constituent	NJ GWQC*	October 2004 Concentration	May 2005 Concentration
Chloroform	6	1,900	41
Methylene Chloride	2	28,000	1,400
Tetrachloroethene (PCE)	1	960	51
Trichloroethene (TCE)	1	1,900	54
Toluene	1,000	2,000	NE
Vinyl Chloride	5	3,000	810
1,1-Dichloroethane	70	1,600	180
cis-1,2-Dichloroethene	10	8,500	1,400
Benzene	1	300	130
Total Xylenes	40	360	180
Chlorobenzene	4	560	430

Source: Reference 15.
NE: Concentration reported below applicable NJ GWQC or not detected.
* NJ GWQC listed are the established groundwater quality criteria or the PQL, whichever is higher.

Stabilization in Deep Groundwater Beneath the Safety-Kleen Site

Natural attenuation is expected to reduce VOC concentrations in Glacial Ground Moraine groundwater beneath the Safety-Kleen property. The site-wide asphalt cap also appears to have reduced infiltration of precipitation and runoff into the subsurface, mitigating additional migration of source contamination into groundwater. Groundwater contaminant concentrations in the Glacial Ground Moraine unit have been and continue to be lower than those reported for the shallow fill unit.

No VOCs have been reported above Class II-A NJ GWQC in deep well MP-1D (or its replacement well MP-1DR) since 1995 (Ref. 15). Contaminant concentrations in deep well MP-6D (or its replacement well MP-6DR) were reported at their highest levels for most constituents in 2002, but have since declined to levels only slightly greater than NJ GWQC (Ref. 15). Exceedances were only reported for benzene, chloroform, TCE, and 1,2-dichloroethane in April 2005. Concentrations for these and other COCs in well MP-6DR appear to be declining and/or stabilizing. VOC levels reported in deep well MP-4D (or its replacement well MP-4DR) increased between 2002 and 2004, with the highest concentrations generally reported during the January 2005 sampling round. In April 2005, exceedances were reported in this well for benzene, PCE, TCE, vinyl chloride, and cis-1,2-dichloroethene. With the exception of TCE and PCE (which were reported at their highest levels during the April 2005 sampling round), COCs in deep well MP-4DR appear to be stabilizing. Furthermore, despite minor TCE and PCE increases (less than an order of magnitude), total VOC concentrations in this well dropped from 835 to 540 μg/L between January and April 2005 (Ref. 15). Data from this well will be closely evaluated during future groundwater monitoring events to ensure that this stabilization trend continues. If significant increases are observed during future sampling rounds, this EI determination may need to be revisited and/or updated to reflect changing site conditions.

Although the discussion above cites Class II-A NJ GWQC, it should be noted that the Glacial Ground Moraine unit has been formally classified as a Class III-B aquifer. No generic numerical Class III-B NJ GWQC, which would be directly applicable to this unit, have yet been established. NJ Administrative Code 7:9E-6.7(f) states that GWQC for Class III-B areas will be determined on a case-by-case basis and will not be more stringent than necessary to ensure that there will be no impairment of existing groundwater uses; no violations of surface water quality criteria (SWQC); no pollutant releases to the ground surface, structures, or air at levels that pose threats to human health; and no violations of constituent standards in downgradient classification areas into which there is a significant possibility of contaminant migration.

Groundwater at the site and in the surrounding area is not currently used as a potable water source, nor is it expected to be used as a potable water supply in the future (Ref. 14). No potential groundwater receptors have been identified. Conservative quantitative analyses provided to NJDEP (and discussed in the response to Question 5) have fully and consistently demonstrated that potential surface water concentrations in the Passaic River and Newark Bay resulting from discharges of impacted shallow groundwater from the Safety-Kleen site will be below applicable NJ SWQC (Ref. 14). Given the fact that deep groundwater contaminant concentrations are lower than those reported in the shallow fill groundwater, any discharges of impacted Glacial Ground Moraine groundwater to surface water are also expected to be insignificant. Finally, no adverse impacts on potential human health or ecological receptors have been identified with respect to groundwater emanating from the Safety-Kleen site (Ref. 14). Because conditions in the Class III-B Glacial Ground Moraine unit appear to meet the above-referenced performance-based Class III-B GWQC, contamination in this unit need not be further considered in this EI determination.

Designation of a Formal CEA

Administrative requirements for designation of a groundwater CEA are currently being finalized and should be filed in late summer or early fall 2005 (Ref. 14). The CEA would document that applicable constituent standards are not being met in groundwater in the shallow fill and Glacial Ground Moraine units at and around the Safety-Kleen site, and would suspend usage of groundwater in the designated area for the term of the CEA.

Based on historical information (which may not match plans currently in progress), the proposed CEA will cover the entire Safety-Kleen site and the western portion of the Darling property. Vertically, the CEA will extend through the entire depth of the shallow fill unit groundwater, estimated at 6.6 feet bgs. Based on modeling results (Ref. 5), the required duration of the CEA had been estimated at eight years (i.e., the time frame estimated for concentrations of TCE and other contaminants to drop below NJ GWQC given then-current site conditions and treatment operations). Prior to finalization, this CEA duration estimate must be revisited to account for additional remedial actions implemented since the initial attenuation models were developed, as well as updated environmental conditions and contaminant concentrations.

References:

1. Phase II Supplemental RI Report. Prepared by Blasland, Bouck, & Lee, Inc. Dated October 1996.
2. Letter to Mark Walters, NJDEP, from David Ulm, Blasland, Bouck, & Lee, Inc., re: Safety-Kleen Envirosystems Company Site (Darling Site HydroPunch Investigation Results). Dated September 30, 1998.
3. Groundwater Remedial Action Selection Report. Prepared by Blasland, Bouck, & Lee, Inc. Dated February 1999.
4. Phase III RI Report. Prepared by Blasland, Bouck, & Lee, Inc. Dated February 1999.
5. Letter to Mark Walters, NJDEP, from David Ulm, Blasland, Bouck, & Lee, Inc., re: Safety-Kleen Envirosystems Company Site (NJDEP Comments on the Draft Remedial Action Work Plan).

Dated January 24, 2000.
6. Remedial Action Work Plan. Prepared by Blasland, Bouck, & Lee, Inc. Dated February 2000.
7. Letter to Patrick Nucciarone, Law Offices, from Mark Walters, NJDEP, re: Remedial Action Work Plan. Dated March 28, 2000.
8. Letter to Mark Walters, NJDEP, from David Ulm, Blasland, Bouck, & Lee, Inc., re: Source Area Reduction Program. Dated September 21, 2000.
9. Letter to Mark Walters, NJDEP, from David Ulm, Blasland, Bouck, & Lee, Inc., re: Source Area Reduction Program. Dated October 13, 2000.
10. Letter to Agi Nadai, USEPA, from Cathy Geraci, Blasland, Bouck, & Lee, Inc., re: Safety-Kleen Envirosystems Company Site. Dated November 14, 2000.
11. Letter to Mark Walters, NJDEP, from Patrick Nucciarone, Law Offices, re: Safety-Kleen Envirosystems Company Site (Source Area Reduction Program). Dated November 28, 2000.
12. Letter to Patrick Nucciarone, Law Offices, from Mark Walters, NJDEP, re: Source Area Reduction Program. Dated December 22, 2000.
13. Personal communication with Agi Nadai, USEPA, re: Status Update from Mark Walters of NJDEP. Dated August 22, 2001.
14. Remedial Action Report, Safety-Kleen Envirosystems Company Site, Newark, New Jersey. Prepared by Blasland, Bouck & Lee, Inc. Dated September 2004.
15. Letter to Mark Walters, NJDEP, from David J. Ulm, Blasland, Bouck & Lee, Inc. re: Quarterly Progress Report. Dated July 18, 2005.

4. Does "contaminated" groundwater **discharge** into **surface water** bodies?

_X_ If yes - continue after identifying potentially affected surface water bodies.

____ If no - skip to #7 (and enter a "YE" status code in #8, if #7 = yes) after providing an explanation and/or referencing documentation supporting that groundwater "contamination"does not enter surface water bodies.

____ If unknown - skip to #8 and enter "IN" status code.

Rationale:

Shallow groundwater on the eastern portion of the Safety-Kleen site is tidally influenced and discharges into the Passaic River and Newark Bay. According to data obtained during the Phase II RI, the net discharge rate from shallow groundwater to Newark Bay is approximately 1.79 feet per day under average flow conditions (Ref. 2). Deep groundwater in the Glacial Ground Moraine unit is also tidally influenced and well connected to Newark Bay (Ref. 1), although the main direction of flow in this unit is to the northwest rather than toward the surface water body.

References:

1. Phase I RI Report. Prepared by Malcolm Pirnie. Dated August 1994.
2. Phase II RI Report, Volume 1 of 2. Prepared by Blasland, Bouck, & Lee, Inc. Dated December 1995.

5. Is the **discharge** of "contaminated" groundwater into surface water likely to be **"insignificant"** (i.e., the maximum concentration[3] of each contaminant discharging into surface water is less than 10 times their appropriate groundwater "level," and there are no other conditions (e.g., the nature, and number, of discharging contaminants, or environmental setting), which significantly increase the potential for unacceptable impacts to surface water, sediments, or ecosystems at these concentrations)?

__X__ If yes - skip to #7 (and enter "YE" status code in #8 if #7 = yes), after documenting: 1) the maximum known or reasonably suspected concentration[3] of key contaminants discharged above their groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) provide a statement of professional judgement/explanation (or reference documentation) supporting that the discharge of groundwater contaminants into the surface water is not anticipated to have unacceptable impacts to the receiving surface water, sediments, or ecosystem.

____ If no - (the discharge of "contaminated" groundwater into surface water is potentially significant) - continue after documenting: 1) the maximum known or reasonably suspected concentration[3] of each contaminant discharged above its groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) for any contaminants discharging into surface water in concentrations[3] greater than 100 times their appropriate groundwater "levels," the estimated total amount (mass in kg/yr) of each of these contaminants that are being discharged (loaded) into the surface water body (at the time of the determination), and identify if there is evidence that the amount of discharging contaminants is increasing.

____ If unknown - enter "IN" status code in #8.

Rationale:

Throughout the course of the phased RI effort, the interaction between VOC-impacted groundwater and Passaic River/Newark Bay surface water has been repeatedly evaluated. In 1995, surface water samples were collected from the Passaic River/Newark Bay at one location upstream and one location downstream from the site. Neither of the surface water samples contained measurable concentrations of the contaminants found in shallow groundwater beneath the Safety-Kleen site (Ref. 2). In support of these data, Safety-Kleen used a variety of assessment methods to show that continuing discharges of impacted groundwater from the shallow fill unit will have insignificant consequences to surface water quality in Newark Bay. More specifically, Safety-Kleen has indicated that ongoing discharges will not result in Passaic River/Newark Bay surface water contaminant concentrations above applicable NJ SWQC.

Development of Site-Specific Media Cleanup Standards

As part of the Phase II investigation, site-specific media cleanup standards (MCSs) were back-calculated from applicable NJ SWQC for Newark Bay. These MCSs quantified levels of key contaminants that could exist in shallow groundwater without negatively impacting Newark Bay from a risk assessment

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[3] As measured in groundwater prior to entry to the groundwater-surface water/sediment interaction (e.g., hyporheic) zone.

perspective. The more stringent of NJ SWQC for Class SE3 (secondary contact recreational use) waters and USEPA Clean Water Act Water Quality Standards (WQSs) were used as the applicable SWQC for this evaluation.

Using slug test data and an assumed groundwater discharge area approximately 450 feet long and 6.6 feet deep, Safety-Kleen estimated the average shallow groundwater flow rate into Newark Bay to be 4.31×10^{-2} cubic feet per second (cfs), and the maximum flow rate to be 1.76×10^{-1} cfs (Ref. 2). As groundwater mixes with surface water, contaminant concentrations are decreased through natural processes such as dilution. To account for these losses, Safety-Kleen developed site-specific attenuation factors for various flow conditions. The attenuation factors in this case were estimated only as a function of the groundwater discharge rate, the fresh water flow rate in the Passaic River, and the tidal flow through Newark Bay. To keep the assumptions conservative, other biological, chemical, and physical attenuation processes that could reduce COC concentrations were not considered in the calculations.

Safety-Kleen combined the site-specific attenuation factors with the applicable SWQC to determine MCSs for each COC in shallow groundwater at the site. The MCSs represented the quantity of each contaminant that would need to be present in groundwater (at minimum) such that, after dilution has occurred, the concentration of contaminants remaining in surface water would exceed SWQC. MCSs calculated for key contaminants in shallow groundwater at the Safety-Kleen site are presented in Table 6 below.

Table 6 - MCSs Calculated for Key Contaminants in Shallow Groundwater (mg/L)

Constituent	NJ SWQC	Average Flow MCS	Worst-case Flow MCS	1995 Maximum Concentration	May 2005 Concentration in Well MW-13S
Chloroform	0.47	18,177	1,851	6.8	0.041
Methylene Chloride	2	61,880	6,302	24	1.4
Tetrachloroethene (PCE)	0.00429	166	17	0.12	0.051
Trichloroethene (TCE)	0.081	3,133	319	300	0.054
Vinyl Chloride	0.525	20,304	2,068	0.71	0.81

Sources: References 2 (Tables 4-35 and 4-37) and 9.

By comparing the calculated MCSs to maximum contaminant concentrations from 1995 (the most current data available when the assessment was performed), Safety-Kleen showed that, under the assumed hydrogeological conditions, shallow groundwater contamination was not present at concentrations high enough to negatively impact surface water quality. For example, to overcome natural contaminant losses as groundwater discharges to surface water, the concentration of chloroform in groundwater would have to be at least 1,851 milligrams per liter (mg/L), even with maximum discharges to the Passaic River and Newark Bay, before the surface water concentration would be expected to exceed the human health SWQC of 0.47 mg/L. Under average flow rates, the groundwater concentration would need to reach 18,177 mg/L before the SWQC would be exceeded in the Passaic River/Newark Bay. The 1995 maximum concentration was only 6.8 mg/L; thus, the impact of chloroform contamination on the Passaic River and Newark Bay would be insignificant. Contaminant concentrations reported in well MW-13S during the May 2005 sampling event were lower than or relatively consistent with levels reported in 1995. Thus, potential impacts on surface water quality associated with groundwater discharges in the vicinity of well MW-13S would likely still be considered insignificant.

<u>Direct Calculation of Expected Surface Water Calculations</u>

After reviewing the Phase II Report, NJDEP expressed concerns over this method of evaluating potential surface water impacts (Ref. 3). As a result, the agency requested that Safety-Kleen use known contaminant concentrations in shallow groundwater to determine the specific surface water contaminant concentrations that would be expected in Newark Bay, rather than just attempting to prove that the SWQC could not be exceeded (Ref. 4). Safety-Kleen performed these forward calculations by applying the site-specific attenuation factors previously established (to account for dilution and other natural losses) to contaminant concentrations observed in shallow well MP-8S (the well closest to the Passaic River/Newark Bay shoreline at the time) in 1995. Table 7 below presents estimated surface water contaminant concentrations for average and maximum (worst-case) rates of discharge of shallow groundwater from the Safety-Kleen site. Key contaminant concentrations reported in well MW-13S in May 2005 are also provided in the table for informational purposes.

Table 7 - Estimated Surface Water Contaminant Concentrations Associated with Average and Maximum (Worst-Case) Shallow Groundwater Discharge Rates (mg/L)

Constituent	SWQC	Phase II RI Concentration in Well MP-8S	Potential SW Concentration Under Average Flow Conditions	Potential SW Concentration Under Worst-Case Flow Conditions	May 2005 Concentration in Well MW-13S
Chloroform	0.11*	0.94	2.43×10^{-5}	2.39×10^{-4}	0.041
Tetrachloroethene (PCE)	0.00429	0.12	3.10×10^{-6}	3.05×10^{-5}	0.051
Trichloroethene (TCE)	0.081	0.16	4.14×10^{-6}	4.06×10^{-5}	0.054
Vinyl Chloride	0.525	0.14	3.62×10^{-6}	3.55×10^{-5}	0.81

Sources: Reference 4 (Tables 7 and 8) and 9.
* The SWQC listed for chloroform in this table differs from that presented in Table 3 because this second assessment considered surface water quality standards for protection of both human health and aquatic life. The SWQC established for protection of aquatic life is lower than that used for protection of human health under Class SE3 surface water uses.
[Note: Methylene chloride is not included in this table with the other key COCs because forward calculations were not completed for this contaminant.]

As with the previous assessment method, these calculated values indicate an insignificant impact on surface water quality. For example, even with maximum discharges, the concentration of chloroform in the Passaic River and Newark Bay would be expected to reach only 0.000239 mg/L, well under the applicable SWQC of 0.11 mg/L. Contaminant concentrations reported in well MW-13S during the May 2005 sampling event were generally lower than levels reported in well MP-8S in 1995. The only exception noted was a slight increase (i.e., less than an order of magnitude) in vinyl chloride concentrations over the past ten years. However, this increase may be attributable to natural reductive dechlorination processes which produce vinyl chloride as an intermediate product. Because the increase was minor, and because increasing daughter product concentrations at this site are suggestive of ongoing natural attenuation, potential impacts on surface water quality associated with groundwater discharges in the vicinity of well MW-13S would likely still be considered insignificant.

<u>Re-evaluation with More Conservative Assumptions</u>

Subsequent calculations of expected surface water concentrations were performed assuming a larger potential discharge area along the Passaic River/Newark Bay shoreline and, consequently, a larger amount of impacted groundwater mixing into surface water. Specifically, the most recent calculations assume discharge along 650 feet of shoreline, extending 200 feet north of the site, based on data showing that well MW-12 (located along the northern property boundary) has also been significantly impacted. This set of forward calculations also used the highest concentration of each VOC detected in 1998 in any of the shallow wells along the Passaic River and Newark Bay (MP-8S, MW-10S, MW-11S, and MW-12S). Potential surface water concentrations calculated using this assumption will be highly conservative, because the maximum observed VOC concentrations are not actually present throughout the entire volume of groundwater discharging to the Passaic River and Newark Bay. Specific findings, as presented most recently in the Phase III RI Report, are noted in Table 8 below for key contaminants. Again, May 2005 COC concentrations in well MW-13S are presented for informational purposes.

Table 8 - Calculated Surface Water Concentrations in Newark Bay Assuming Large Potential Discharge Area Along Newark Bay (mg/L)

Constituent	SWQC	Phase III RI Maximum Shoreline Well Concentration	Potential SW Concentration Under Average Flow Conditions	May 2005 Concentration in Well MW-13S
Chloroform	0.11	7.0	2.6×10^{-4}	0.041
Methylene Chloride	0.485	4.8	1.8×10^{-4}	1.4
Tetrachloroethene (PCE)	0.00429	0.66	2.5×10^{-5}	0.051
Trichloroethene (TCE)	0.081	2.8	1.0×10^{-4}	0.054
Vinyl Chloride	0.525	0.2	7.5×10^{-6}	0.81

Sources: References 6 (Table 12) and 9. [Note: Worst case flow conditions were not evaluated and could not be presented in this table.]

Based on this assessment, expected surface water concentrations for each of the key contaminants in shallow groundwater are lower than applicable SWQC. Under average groundwater flow rates and assumed attenuation factors, the concentration of chloroform will be reduced from a Phase III RI maximum of 7.0 mg/L in shallow groundwater to 0.00026 mg/L in the Passaic River and Newark Bay – also well under the SWQC of 0.11 mg/L for this constituent. Confirming previous findings, this assessment shows that, under assumed hydrogeological conditions, impacted shallow groundwater at the Safety-Kleen site will have an insignificant impact on surface water quality in the Passaic River and Newark Bay. Contaminant concentrations reported in well MW-13S during the May 2005 sampling event were generally lower than levels reported in groundwater along the shoreline during the Phase III RI. The only exception noted was a slight increase (i.e., less than an order of magnitude) in vinyl chloride concentrations over the past ten years. As stated previously, this increase may be attributable to natural reductive dechlorination processes in the subsurface. Because the increase was minor, and because increasing daughter product concentrations at this site are suggestive of ongoing natural attenuation, potential impacts on surface water quality associated with groundwater discharges in the vicinity of well MW-13S would likely still be considered insignificant based on this assessment method.

The NJDEP-approved RAR (Ref. 8) specifically states that Safety-Kleen's quantitative analyses fully and consistently demonstrate that potential surface water concentrations in the Passaic River and Newark Bay resulting from discharge of impacted shallow groundwater will not be significant.

<u>Direct Comparison of Well Concentrations to Applicable SWQC</u>

In determining whether groundwater to surface water discharges are significant for EI purposes, reported contaminant concentrations are compared to NJ SWQC, multiplied by a factor of ten to account for dilution, dispersion, and other factors that serve to reduce groundwater contaminant concentrations at the point of discharge to surface water. The NJ SWQC were developed to ensure that surface water quality is acceptable for various activities which may include human consumption, primary and secondary contact recreation, and industrial or agricultural usage. Based on current status of surface water in the Passaic River and Newark Bay, NJ SWQC for Saline Estuary Class SE-3 surface water bodies are appropriate (Ref. 2).

As stated in the response to Question 3, shallow groundwater outside the subsurface barrier wall in the vicinity of well MW-13S is expected to move toward and discharge into surface water. Table 9 below presents a comparison between the most recent contaminant concentrations in this well and relevant SWQC. COCs without established SE SWQC are not included in the table.

Table 9 - Shallow Fill Well MW-13S Contaminant Concentrations Compared to Relevant NJ SWQC (μg/L)

Constituent	NJ SWQC	Adjusted NJ SWQC (i.e., x 10)	May 2005 Concentration in Well MW-13S
Chloroform	470	4,700	41
Methylene Chloride	1,600	16,000	1,400
Tetrachloroethene (PCE)	4.29	42.9	**51**
Trichloroethene (TCE)	81	810	54
Vinyl Chloride	525	5,250	810
Benzene	71	710	130
Chlorobenzene	21,000	210,000	430

Source: Reference 9.

As highlighted in the table, only the PCE concentration in well MW-13S exceeds the adjusted NJ SWQC. Because this exceedance is so slight, and because mixing may be more significant than usual at the point of confluence between the Passaic River and Newark Bay (where shallow groundwater from the Safety-Kleen site would enter surface water), it is unlikely that these PCE discharges would significantly impact surface water quality. Based on this conclusion, and given the volume and consistency of previous surface water quality assessments (discussed above), surface water quality will not be considered further in this EI determination.

References:

1. RI Report (Phase I). Prepared by Malcolm Pirnie. Dated August 1994.
2. Phase II RI Report, Volume 1 of 2. Prepared by Blasland, Bouck, & Lee, Inc. Dated December 1995.
3. Letter to Michael Rosenberg, McKesson Corporation, from Mark Walters, NJDEP, re: Phase II RI Report. Dated April 16, 1996.
4. Phase II Supplemental RI Report. Prepared by Blasland, Bouck, & Lee, Inc. Dated October 1996.
5. Letter to Patrick Nucciarone, Law Offices, from Mark Walters, NJDEP, re: October 11, 1996 Supplemental RI Report. Dated February 18, 1997.
6. Phase III RI Report. Prepared by Blasland, Bouck, & Lee, Inc. Dated February 1999.
7. Letter to Mark Walters, NJDEP, from David Ulm, Blasland, Bouck, & Lee, Inc., re: Source Area Reduction Program. Dated October 13, 2000.

8. Remedial Action Report, Safety-Kleen Envirosystems Company Site, Newark, New Jersey. Prepared by Blasland, Bouck & Lee, Inc. Dated September 2004.
9. Letter to Mark Walters, NJDEP, from David J. Ulm, Blasland, Bouck & Lee, Inc. re: Quarterly Progress Report. Dated July 18, 2005.

6. Can the **discharge** of "contaminated" groundwater into surface water be shown to be "**currently acceptable**" (i.e., not cause impacts to surface water, sediments or ecosystems that should not be allowed to continue until a final remedy decision can be made and implemented[4])?

____ If yes - continue after either: 1) identifying the Final Remedy decision incorporating these conditions, or other site-specific criteria (developed for the protection of the site's surface water, sediments, and ecosystems), and referencing supporting documentation demonstrating that these criteria are not exceeded by the discharging groundwater; OR 2) providing or referencing an interim-assessment[5], appropriate to the potential for impact, that shows the discharge of groundwater contaminants into the surface water is (in the opinion of a trained specialist, including an ecologist) adequately protective of receiving surface water, sediments, and ecosystems, until such time when a full assessment and final remedy decision can be made. Factors which should be considered in the interim-assessment (where appropriate to help identify the impact associated with discharging groundwater) include: surface water body size, flow, use/classification/habitats and contaminant loading limits, other sources of surface water/sediment contamination, surface water and sediment sample results and comparisons to available and appropriate surface water and sediment "levels," as well as any other factors, such as effects on ecological receptors (e.g., via bio-assays/benthic surveys or site-specific ecological Risk Assessments), that the overseeing regulatory agency would deem appropriate for making the EI determination.

____ If no - (the discharge of "contaminated" groundwater cannot be shown to be "**currently acceptable**") - skip to #8 and enter "NO" status code, after documenting the currently unacceptable impacts to the surface water body, sediments, and/or ecosystem.

____ If unknown - skip to 8 and enter "IN" status code.

Rationale:

Question not applicable. See response to Question No. 5.

[4] Note, because areas of inflowing groundwater can be critical habitats (e.g., nurseries or thermal refugia) for many species, appropriate specialist (e.g., ecologist) should be included in management decisions that could eliminate these areas by significantly altering or reversing groundwater flow pathways near surface water bodies.

[5] The understanding of the impacts of contaminated groundwater discharges into surface water bodies is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration to be reasonably certain that discharges are not causing currently unacceptable impacts to the surface waters, sediments or eco-systems.

7. Will groundwater **monitoring** / measurement data (and surface water/sediment/ecological data, as necessary) be collected in the future to verify that contaminated groundwater has remained within the horizontal (or vertical, as necessary) dimensions of the "existing area of contaminated groundwater?"

__X__ If yes - continue after providing or citing documentation for planned activities or future sampling/measurement events. Specifically identify the well/measurement locations which will be tested in the future to verify the expectation (identified in #3) that groundwater contamination will not be migrating horizontally (or vertically, as necessary) beyond the "existing area of groundwater contamination."

____ If no - enter "NO" status code in #8.

____ If unknown - enter "IN" status code in #8.

Rationale:

The groundwater monitoring program established at the Safety-Kleen site consists of two separate components: a hydraulic monitoring program and a COC monitoring program.

Hydraulic Monitoring Program

Upon completion of the subsurface barrier wall installation effort, eight piezometers (PZ-16S through PZ-23S) were installed in pairs across the site. Each pair of piezometers consists of one piezometer inside the barrier wall, and one piezometer outside the barrier wall. To confirm the hydraulic effectiveness of the subsurface barrier wall, shallow fill groundwater level measurements will be collected from each piezometer pair on a quarterly basis for the first two years after wall installation, and annually thereafter. This portion of the monitoring program was initiated in October 2004, and results are provided to NJDEP in quarterly progress reports. The most recent monitoring event was conducted on July 7, 2005, and the next monitoring event is scheduled for October 2005 (Ref. 2).

COC Monitoring Program

A COC groundwater monitoring program was developed for the Safety-Kleen site in accordance with applicable NJDEP requirements. This program involves routine sampling of shallow fill groundwater at on-site monitoring well MW-13S and off-site wells MW-5 and MW-6 on the Darling property. Glacial Ground Moraine groundwater is also routinely sampled at on-site wells MP-1DR, MP-4DR, and MP-6DR under this program. All samples collected under this portion of the monitoring program are analyzed for VOCs. The purpose of this monitoring component is to confirm that site-related groundwater contaminants are attenuating as expected. As outlined in the RAR (Ref. 1), the COC monitoring program will be conducted on a quarterly basis until a total of eight rounds have been completed. At that time, the analytical data will be analyzed using the Mann-Whitney U-Test, and less frequent monitoring may be proposed if justified. This portion of the monitoring program was also initiated in October 2004, and results are provided to NJDEP in quarterly progress reports. The most recent monitoring event was conducted on July 7, 2005, and the next monitoring event (i.e., the fifth sampling round) is scheduled for October 2005 (Ref. 2).

References:

1. Remedial Action Report, Safety-Kleen Envirosystems Company Site, Newark, New Jersey. Prepared by Blasland, Bouck & Lee, Inc. Dated September 2004.
2. Letter to Mark Walters, NJDEP, from David J. Ulm, Blasland, Bouck & Lee, Inc. re: Quarterly Progress Report. Dated July 18, 2005.

8. Check the appropriate RCRIS status codes for the Migration of Contaminated Groundwater Under Control EI (event code CA750), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (attach appropriate supporting documentation as well as a map of the facility).

_X_ YE - Yes, "Migration of Contaminated Groundwater Under Control" has been verified. Based on a review of the information contained in this EI determination, it has been determined that the "Migration of Contaminated Groundwater" is "Under Control" at the Safety-Kleen Envirosystems (formerly McKesson) site, EPA ID #NJD002153922, located at 600 Doremus Avenue, Newark, New Jersey. Specifically, this determination indicates that the migration of "contaminated" groundwater is under control, and that monitoring will be conducted to confirm that contaminated groundwater remains within the "existing area of contaminated groundwater." This determination will be re-evaluated when the Agency becomes aware of significant changes at the facility.

___ NO - Unacceptable migration of contaminated groundwater is observed or expected.

___ IN - More information is needed to make a determination.

Completed by: ________________________________ Date:____________________

Michele Benchouk
Engineering Consultant
Booz Allen Hamilton

Reviewed by: ________________________________ Date:____________________

Lucas Kingston
Hydrogeologist
Booz Allen Hamilton

Also reviewed by: ________________________________ Date:____________________

Sameh Abdellatif, RPM
RCRA Programs Branch
EPA Region 2

________________________________ Date:____________________

Barry Tornick, Section Chief
RCRA Programs Branch
EPA Region 2

Approved by: Original signed by: Date: September 21, 2005

Adolph Everett, P.E., Chief
RCRA Programs Branch
EPA Region 2

Locations where references may be found:

References reviewed to prepare this EI determination are identified after each response. Reference materials are available at the USEPA Region 2, RCRA Records Center, located at 290 Broadway, 15th Floor, New York, New York, and the New Jersey Department of Environmental Protection Office located at 401 East State Street, Records Center, 6th Floor, Trenton, New Jersey.

Contact telephone and e-mail numbers: Sameh Abdellatif, EPA RPM
(212) 637-4103
abdellatif.sameh@epa.gov

Attachments

The following attachments have been provided to support this EI determination.

- Attachment 1 - Summary of Media Impacts Table

Attachment 1 - Summary of Media Impacts Table
Safety-Kleen Envirosystems Company, Newark, New Jersey

AEC	GW [1]	AIR (Indoors)	SURF SOIL	SURF WATER	SED	SUB SURF SOIL	AIR (Outdoors)	CORRECTIVE ACTION MEASURE	KEY CONTAMINANTS
AEC 1	NA	No	Yes	No	No	Yes	No	‣ Installation of site-wide asphalt cap. ‣ DER will be established.	PCBs, VOCs
AEC 2	NA	No	Yes	No	No	Yes	No	‣ Installation of site-wide asphalt cap. ‣ DER will be established.	PCBs, SVOCs, VOCs
AEC 3	NA	No	Yes	No	No	Yes	No	‣ Installation of site-wide asphalt cap. ‣ DER will be established.	VOCs
AEC 4	NA	No	Yes	No	No	Yes	No	‣ Installation of site-wide asphalt cap. ‣ DER will be established.	VOCs, SVOCs
AEC 5	NA	No	Yes	No	No	Yes	No	‣ Excavation of PCB contaminated soil. ‣ Installation of site-wide asphalt cap. ‣ DER will be established.	PCBs, VOCs, SVOCs
AEC 6	NA	No	Yes	No	No	Yes	No	‣ Installation of site-wide asphalt cap. ‣ DER will be established.	PCBs, VOCs
AEC 7	NA	No	Yes	No	No	No	No	‣ Installation of site-wide asphalt cap. ‣ DER will be established.	PCBs

AEC	GW [1]	AIR (Indoors)	SURF SOIL	SURF WATER	SED	SUB SURF SOIL	AIR (Outdoors)	CORRECTIVE ACTION MEASURE	KEY CONTAMINANTS
Site-wide Groundwater	Yes	No	NA	NA	NA	NA	No	▸ Implementation of two phases of in-situ chemical oxidation treatment to reduce source area contamination around shallow wells MP-2S and MW-11S. ▸ Asphalt capping of the site to reduce infiltration of precipitation and further leaching of contaminants to groundwater. ▸ Installation of a subsurface HDPE barrier wall through the Shallow Fill unit and into the underlying meadow mat around the Safety-Kleen property to minimize off-site contaminant migration. ▸ Implementation of monitored natural attenuation to address residual contamination in shallow groundwater. ▸ Ongoing groundwater level and COC monitoring program. ▸ Groundwater CEA proposed for the site and portions of the adjacent Darling property.	VOCs

[1] Groundwater has generally been evaluated on a site-wide basis, even though two primary areas of groundwater contamination have been identified in AEC 2 (MP-2S) and AEC 6 (MW-11S).