

**DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION**

Interim Final 2/5/99

**RCRA Corrective Action**

**Environmental Indicator (EI) RCRIS code (CA725)**

**Current Human Exposures Under Control**

Facility Name: Lyondell Chemical Company  
Facility Address: 3801 West Chester Pike, Newtown Square, Pennsylvania 19073  
Facility EPA ID #: PAD046538211

1. Has **all** available relevant/significant information on known and reasonably suspected releases to soil, groundwater, surface water/sediments, and air, 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?

If yes – check here and continue with #2 below.

If no – re-evaluate existing data, or

If data are not available skip to #6 and enter “IN” (more information needed) status code.

**BACKGROUND**

**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 EI 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 “Current Human Exposures Under Control” EI**

A positive “Current Human Exposures Under Control” EI determination (“YE” status code) indicates that there are no “unacceptable” human exposures to “contamination” (i.e., contaminants in concentrations in excess of appropriate risk-based levels) that can be reasonably expected under current land- and groundwater-use conditions (for all “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 objective of the RCRA Corrective Action program the EI are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993, GPRA). The “Current Human Exposures Under Control” EI are for reasonably expected human exposures under current land- and groundwater-use conditions ONLY, and do not consider potential future land- or groundwater-use conditions or ecological receptors. The RCRA Corrective Action program’s overall mission to protect human health and the environment requires that Final remedies address these issues (i.e., potential future human exposure scenarios, future land and groundwater uses, and ecological receptors).

**Duration / Applicability of EI Determinations**

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

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2. Are groundwater, soil, surface water, sediments, or air **media** known or reasonably suspected to be “contaminated”<sup>1</sup> above appropriately protective risk-based “levels” (applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action (from SWMUs, RUs or AOCs)?

	<u>Yes</u>	<u>No</u>	<u>?</u>	<u>Rationale/Key Contaminants</u>
Groundwater	<u>X</u>	<u>      </u>	<u>      </u>	No known releases due to facility operations. Exceedances of PADEP residential and non-residential groundwater MSCs for bis(2-ethylhexyl)phthalate and barium. SPL (presumably No. 2 fuel oil) was identified in MW-1 in 2010 (non-facility location).
Air (indoors) <sup>2</sup>	<u>      </u>	<u>X</u>	<u>      </u>	No known releases due to facility operations. Bis(2-ethylhexyl)phthalate is not a VI constituent of concern. SPL (presumably No. 2 fuel oil) identified in MW-1 adjacent to Training Center Building (non-facility location).
Surface Soil (e.g., <2 ft)	<u>      </u>	<u>X</u>	<u>      </u>	No known releases due to facility operations. No further action issued for UST excavation at Training Center in 1991; however, SPL (presumably No. 2 fuel oil) identified at MW-1 (non-facility location).
Surface Water	<u>      </u>	<u>X</u>	<u>      </u>	No known releases due to facility operations. SPL (presumably No. 2 fuel oil) identified in MW-1; Extent of groundwater contamination unknown (non-facility location).
Sediment	<u>      </u>	<u>X</u>	<u>      </u>	No known releases due to facility operations. SPL (presumably No. 2 fuel oil) identified in MW-1; Extent of groundwater contamination unknown (non-facility location).
Subsurf. Soil (e.g., >2 ft)	<u>      </u>	<u>X</u>	<u>      </u>	No known releases due to facility operations. No further action issued for UST excavation at Training Center in 1991; however, SPL (presumably No. 2 fuel oil) recently identified at MW-1 (non-facility location).

<sup>1</sup> “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 appropriately protective risk-based “levels” (for the media, that identify risks within the acceptable risk range).

<sup>2</sup> Recent evidence (from the Colorado Dept. of Public Health and Environment, and others) suggest that unacceptable indoor air concentrations are more common in structures above groundwater with volatile contaminants than previously believed. This is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration necessary to be reasonably certain that indoor air (in structures located above (and adjacent to) groundwater with volatile contaminants) does not present unacceptable risks.

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Air (outdoors)	<u>        </u> <u>        </u>	<u>        </u> <u>        </u>	<u>        </u> <u>        </u>
	X		Currently operating under a State Only Operating Permit with no known violations.

         If no (for all media) - skip to #6, and enter “YE,” status code after providing or citing appropriate “levels,” and referencing sufficient supporting documentation demonstrating that these “levels” are not exceeded.

    X     If yes (for any media) - continue after identifying key contaminants in each “contaminated” medium, citing appropriate “levels” (or provide an explanation for the determination that the medium could pose an unacceptable risk), and referencing supporting documentation.

         If unknown (for any media) - skip to #6 and enter “IN” status code.

**Rationale and Reference(s):**

Lyondell Chemical Company (Lyondell or facility) is situated on 312 acres of land located at 3801 West Chester Pike, Newtown Square, Newtown Township, Delaware County, Pennsylvania. The property was previously subdivided into two separate parcels. The western 112 acres of the property (west of the main entry road) are currently owned and occupied by SAP America, Inc. (SAP). The eastern 200 acres of the property (east of the main entry road) are currently owned by BPG Real Estate Investors LP (BPG). Lyondell, along with multiple separate operating entities (Graham Partners, Catholic Health East and Medstaff, SAP, and the Ellis Athletic Center), currently lease building space from BPG. Non-facility buildings in the complex included the Cottages, Gymnasium, Training Center, Auditorium, and Medical Building (also referred to as the Dispensary).

The facility is bordered to the north by vacant land and residences. Properties to the east, west, and south of the facility are primarily residential with some commercial properties intermixed. Bryn Mawr Hospital Health Center is located directly south of the facility on BPG’s property. The remainder of the property owned by BPG has been approved for redevelopment, which will include office, retail, and residential uses. Currently, the property consists of approximately 20 percent impermeable surfaces (buildings and paved areas) and 80 percent permeable surfaces (vegetation and stormwater ponds).

The facility and surrounding properties are provided with potable water supplied by Aqua Pennsylvania, Inc.’s main system. There are no surface water intakes located within one mile of the facility, according to the PADEP eMapPA website (accessed February 1, 2010). According to the Department of Conservation and Natural Resources Pennsylvania Groundwater Information System, there are two water supply wells located within 0.5 miles of the facility. One well (reportedly a domestic supply well) is shown approximately 0.35 miles south of the facility at the current location of the CVS store located directly across West Chester Pike from the facility’s main entry road. The second well (reportedly a public supply well for a skateboard park) is shown approximately 0.5 miles south of the facility in a residential area. Both wells are listed as 161 feet deep and installed in November 1977. Based on the current land uses at the reported locations of the wells, and because the township is serviced by the public water supply, it is not expected that these wells currently exist.

From 1921 through 1977, the property on which the facility is located was the campus of the Ellis School for Fatherless Girls. The property was purchased in October 1978 by Atlantic Richfield Company (ARCO) who subsequently constructed a facility complex on the eastern portion of the property from which its chemicals division operated under the name of ARCO Chemical Division of Atlantic Richfield Company. The facility was constructed in 1979 and began operating in 1981 as a research and development (R&D) center focusing on chemicals (primarily propylene oxide and its derivatives) that are used to make consumer end products. Research conducted at the facility ranged from small bench-scale experiments performed in its laboratories to pilot plants. No commercial chemical manufacturing was performed at this facility.

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In October 1987, ARCO spun-off its chemicals division, transferring substantially all of the assets and liabilities of the ARCO Chemical Division of Atlantic Richfield Company. At this time, the facility began operating under the name of ARCO Chemical Company (ACC). ARCO retained ownership of the property and leased the facilities to ACC. In October 1997, ARCO (later bought by British Petroleum [BP]) sold the western half of the property (west of the main entry road) to SAP, on which it constructed its headquarters building. The remaining eastern half of the property (east of the main entry road), including the ACC lease, was ultimately sold to SAP in March 2000. In July 1998, Lyondell Chemical Worldwide, Inc. acquired ACC, with ACC becoming a wholly-owned subsidiary of Lyondell Chemical Worldwide, Inc. and Lyondell assuming ACC's lease. In December 1999, Lyondell Chemical Worldwide, Inc. was merged into Lyondell Chemical Company. Lyondell Chemical Company continued to lease the facility from SAP.

In March 2000, Bayer Corporation (Bayer) purchased Lyondell's polyolefins business and continued to operate it from this location under its own USEPA generator identification number (PAR000023994), sub-leasing the space from Lyondell. Lyondell continued to operate the remainder its R&D facility at this time. In December 2002, Bayer vacated the property, retaining ownership of the polyols business. Bayer took some equipment with them when they vacated the property, then sold any of the equipment remaining at the facility back to Lyondell. Bayer does not own any of the equipment currently on-site, and did not own any of the property.

In June 2004, SAP sold approximately 200 acres of the 312-acre property, including the buildings leased by the facility and its lease, to BPG. SAP retained the remaining 112 acres where they constructed their current headquarters building. The 200 acre property (east of the main entry road) is currently owned by separate limited partnerships affiliated with BPG Properties Ltd. and managed by BPG Management Company L.P. The Lyondell-leased areas of the facility are operated by Lyondell Chemical Company, an indirect wholly-owned subsidiary of LyondellBasell Industries. N.V. (LyondellBasell). Lyondell merged with Basell Polyolefins in December 2007, but continued to operate under the name of Lyondell Chemical Company. SAP currently owns the western 112 acres of the 312 acre property.

The facility currently serves as a R&D center for the company's chemicals and fuels businesses. It also served as the commercial office of its North American (N.A.) Polymers business from late 2009 through late 2010 when the N.A. Polymers business moved to its Houston location. R&D work (which is either conducted in the facility's laboratories, bays, high pressure cells, or pilot plants) focuses on improving the technology used to manufacture raw materials for consumer end products such as plastics, furniture foams, athletic footwear, paints, cosmetics, fabrics, gasoline and more. No commercial manufacturing takes place at this facility.

The facility is a large quantity generator of various types and quantities of chemical wastes. Wastes are stored in small containers (e.g., lab packs) and in 55-gallon drums until shipped off-site by licensed transporters for disposal at permitted facilities. In general, wastes generated at the facility have included acetone, isopropyl methanol, styrene, toluene, methylene chloride, acetone isopropanol, mixed amines, polyester resin, chloroform, methyl alcohol, allyl alcohol, toluene, diisocyanate, acetaldehyde, propylene oxide, propylene, isobutylene, n-butane, and petroleum hydrocarbons. Wastes are generated in the laboratories and bays located in the B-building and the pressure cells, and the E-building pilot plants. The wastes are stored in satellite accumulation areas until they are transferred to the main waste storage area located outside and north of the B-building. Wastes generated in the E-building pilot plants are temporarily stored in the separate smaller drum storage area (known as the E-Pad) located outside the northwest corner of the E-building, and are transferred daily to the main drum storage area. Two releases (one-liter container of acryloyl chloride and approximately six gallons of propylene oxide) were reported at the facility that were contained on concrete surfaces and immediately cleaned up.

Non-contact industrial cooling water and wastewater from the facility's laboratories and pilot plants are stored in two wastewater pretreatment aboveground storage tanks (ASTs) located behind (north of) the E-building. The wastewater pretreatment system consists of two open-top steel ASTs, one of 143,000 gallon capacity (interim tank) and one of 36,000 gallon capacity (overflow tank). The non-contact cooling water and laboratory wastewater is directed via underground drains to the 143,000 gallon AST which acts as a settling and equalization tank before the water is discharged daily under

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permit to the Delaware County Regional Water Quality Control Authority (DELCORA) Publicly Owned Treatment Works (POTW). The smaller AST (36,000 gallon AST) is available for overflow purposes. Facility representatives indicate the smaller holding tank is typically empty.

Multiple underground storage tanks (USTs) and ASTs were located on the 312 acre property. These included two 30,000-gallon USTs at the heating and cooling plant; two 7,500-gallon USTs at the Training Center; one 1,000-gallon UST at the Dispensary; and one 550 gallon UST at the President's House. The USTs were used to store No. 2 fuel oil for heating purposes. These USTs (with the exception of the two 30,000-gallon USTs) were removed from the property by ACC in 1991. Extensive contamination was identified in the excavation for the two 7,500-gallon USTs located at the Training Center. Oil was observed flowing beneath the fill pipe of one of the USTs. The contaminated soil was excavated, and post-excavation soil samples analyzed for total petroleum hydrocarbons (TPH) showed the concentrations were below 100 parts per million (ppm). A TPH concentration of 377 ppm was detected in one of the post-excavation floor samples, and additional soil was reportedly removed in the vicinity of this sample. However, there was no documentation that confirmatory soil samples were collected from this area prior to backfilling the excavation.

Post-excavation soil samples collected at the Dispensary UST excavation showed TPH concentrations were 11 ppm. However, initial post-excavation soil samples collected at the President's House UST excavation showed TPH concentrations of 911 ppm and 1,246 ppm. Accordingly, additional soil was removed and post-excavation soil samples showed TPH concentrations were below 100 ppm (27 and 39 ppm). PADEP determined that no further action was necessary for the four USTs. During this time, ACC also removed two 550-gallon ASTs that contained gasoline and diesel fuel in the area referred to as the Contractor's Area (currently the property owned and operated by SAP located west of the main entrance road). While removing the original ASTs, gasoline-impacted soil was observed, and approximately 120 yards of soil was excavated. No additional information (particularly related to confirmatory soil sampling) was provided in the report. Groundwater was not encountered during the investigation; therefore, no groundwater investigation was conducted at that time.

In November 1992, ACC removed seven additional USTs that contained the facility's raw and waste materials located behind (north of) the E-building. Four of the USTs were removed. These included one 1,000-gallon light gasoline/oil tank (TK-103); one 6,500-gallon hexane tank (TK-104); one 6,500-gallon cyclopentane tank (TK-105); and one 6,500-gallon waste solvent/hexane tank (TK-107). The remaining three USTs were replaced with upgraded, compliant equipment. These included one 6,500-gallon styrene tank (TK-101), one 500-gallon pentane tank (TK-102), and one 2,500-gallon xylene/toluene tank (TK-106). The USTs appeared to be in good condition and no evidence of contamination was observed. All piping was aboveground. Three post-excavation soil samples were collected from beneath each UST. Samples were collected directly beneath and at three feet below the bottom of tanks T-101, T-102, and T-103; and at depths of one foot and four feet below the bottom of tanks T-104, T-105, T-106, and T-107. The samples were analyzed for volatile organic compounds (VOCs). The analytical results showed that VOCs were not detected in the soil samples. The excavation was backfilled with the excavated materials, which was reportedly pre-screened for contaminants. On March 8, 1993, PADEP issued a no further action determination for the seven USTs. Groundwater was not encountered during the investigation; therefore, no groundwater investigation was conducted at that time. The four USTs that remain are currently empty and are registered with PADEP.

In March 1998, while ACC was upgrading the equipment for the two 30,000-gallon fuel oil USTs adjacent to the boiler house, indications of a release were observed. Polynuclear aromatic hydrocarbons (PAHs) were identified in soil samples collected from the excavation area. However, none of the detected concentrations were above the PADEP direct contact residential and non-residential subsurface soil (2 to 15 feet) medium specific concentrations (MSCs) or the soil to groundwater, used aquifer, total dissolved solids (TDS) less than 2,500 milligrams per liter (mg/L) residential MSCs. Groundwater was not encountered during the investigation; therefore, no groundwater investigation was conducted at that time.

The current property owner (BPG) identified 15 groundwater monitoring wells on the property that were installed by

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previous property owners in 1997 (MW-104, MW-105, and MW-107) and 2000 (MW-1 through MW-11, and MW-4D). The wells range in depth from 28 to 60 feet below the ground surface (bgs). BPG determined that the wells were no longer necessary; however, prior to abandoning them, BPG contracted IES Engineers (IES) to collect one round of groundwater samples to determine the groundwater quality at the property. IES collected samples from 13 of the 15 wells in October 2010 and analyzed them for VOCs, semi-volatile organic compounds (SVOCs) and RCRA metals. One of the wells (MW-8) could not be located, and MW-1 could not be sampled because approximately 0.5 inches of separately phase liquid (SPL) was encountered in the well. (Note: MW-1 is located in the vicinity of the former 7,500-gallon fuel oil USTs removed at the Training Center in 1990.) The static water levels gauged in October 2010 ranged from 16.59 feet bgs on the northern portion of the property to 33.61 feet bgs at on the southern portion of the property. The interpreted direction of groundwater flow was to the south. EIS sampled 14 groundwater monitoring wells again in November and December 2011 to evaluate the groundwater quality at the property.

**Groundwater:** Several VOCs (chloroform, benzo(a)anthracene, bis(2-ethylhexyl)phthalate, dimethyl phthalate, and 2,6-dinitrotoluene) and dissolved metals (barium, cadmium, chromium, and silver) were detected in the 2010 groundwater samples. The concentrations were below the PADEP used aquifer, nonresidential MSCs except bis(2-ethylhexyl)phthalate and barium. Bis(2-ethylhexyl)phthalate was detected in one well (32 ug/L at MW-5) above the MSC of 6 ug/L, and barium was detected in two wells (2,500 ug/L at MW-4 and 2,600 ug/L at MW-4D) above the MSC of 2,000 ug/L. The source for these elevated concentrations was reportedly unknown; however, IES suspected that the elevated barium concentrations were naturally occurring conditions (IES, 2010). (Note: Bis(2-ethylhexyl)phthalate is used in the production of polyvinyl chloride [PVC] materials and is a common laboratory contaminant, which may contribute to the elevated concentration detected in the MW-5 sample. Monitoring well MW-5 is located upgradient of the facility's operational areas.) Groundwater sample results for wells surrounding the formerly and currently operational area of the facility indicate that groundwater has not been impacted by facility-related activities.

EIS sampled 14 groundwater monitoring wells again in November and December 2011 to evaluate the groundwater quality at the property. This time, MW-1 was sampled twice, in November and December 2011. Benzene (0.42 ug/L, 0.52 ug/L) was detected below the reporting limit, but greater than or equal to the method detection limit. The concentrations are below the used aquifer, residential and non-residential MSCs of 5 ug/L. No other monitoring wells samples detected benzene and only the MW-9 samples from both sampling events detected chloroform (2.4 ug/L and 1.1 ug/L) below the used aquifer, residential and non-residential MSCs of 80 ug/L.

The groundwater samples did detect SVOCs, most being detected in MW-1: acenaphthene, acenaphylene, bis(2-ethylhexyl)phthalate, 2-chlorophenol, di-n-butyl phthalate, fluorine, 2-methylnaphthalene, naphthalene, and phenanthrene; all SVOCs were below the respective used aquifer, residential and non-residential MSCs. Bis(2-ethylhexyl)phthalate and di-n-butyl phthalate were detected in the sample collected from MW-10, below the used aquifer, residential and non-residential MSCs. Only di-n-butyl phthalate was detected in MW-104, below the used aquifer, residential and non-residential MSCs.

Arsenic, barium, cadmium, chromium, lead, selenium, and silver were detected in one or more of the groundwater samples less than the respective used aquifer, residential and non-residential MSCs.

**Air:** The facility operates under a State Only Operating Permit (SMOP 23-00059) for its emissions sources. Emissions in excess of permit limits are not anticipated under normal operating scenarios. There are no known violations of the facility's air permits.

The vapor intrusion pathway was evaluated using the PADEP Land Recycling Program *Technical Guidance Manual – Section IV.A.4 (Vapor Intrusion into Buildings from Groundwater and Soil under the Act 2 Statewide Health Standard)* because it can be applied to both residential and nonresidential receptors. This guidance provides decision matrices for soil and groundwater (under a Statewide Health, generic approach) for determining if indoor air quality may be of concern. Therefore, the PADEP Technical Guidance Manual was used, as deemed appropriate, to evaluate a potential vapor

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intrusion pathway for purposes of this human health exposure evaluation.

As previously discussed, ACC removed and/or upgraded seven USTs that contained both raw and waste materials from the area directly north of the E-building in 1992. No visual evidence of contamination was observed in the surrounding soils, which was confirmed by the results of post-excavation soil samples collected from beneath each of the USTs. PADEP issued a NFA determination for this area in March 1993. Several VOCs and SVOCs (chloroform, benzo(a)anthracene, bis(2-ethylhexyl)phthalate, dimethyl phthalate, and 2,6 dinitrotoluene) were detected in the 2010 groundwater samples. The concentrations were below the PADEP used aquifer, residential and non-residential MSCs except bis(2-ethylhexyl)phthalate, which was detected in one well (32 ug/L at MW-5) above the MSC of 6 ug/L. IES stated that the source for the bis(2-ethylhexyl)phthalate was unknown; however, MW-5 is located upgradient to the facility's operational areas. Therefore, it is not expected to be related to facility operations. In addition, bis(2-ethylhexyl)phthalate is not listed as a compound of concern in the PADEP guidance and is not a chemical of sufficient toxicity or volatility according to the USEPA vapor intrusion guidance. No other VOCs or SVOCs were detected in the groundwater samples above the PADEP residential groundwater MSCs.

EIS sampled 14 groundwater monitoring wells again November and December 2011 to evaluate the groundwater quality at the property. This time, MW-1 was sampled twice, in November and December 2011. Benzene (0.42 ug/L, 0.52 ug/L) was detected below the reporting limit, but greater than or equal to the method detection limit. The concentrations are below the used aquifer, residential and non-residential MSCs of 5 ug/L. No other monitoring wells samples detected benzene and only the MW-9 samples from both sampling events detected chloroform (2.4 ug/L and 1.1 ug/L) below the used aquifer, residential and non-residential MSCs of 80 ug/L.

Benzene and chloroform are listed as chemicals of sufficient toxicity or volatility according to the USEPA vapor intrusion guidance. Chloroform was detected at a low concentration (2.4 micrograms per liter [ug/L]) in one well (MW-9) during one sampling event. Benzene concentrations in MW-1 are below the used aquifer, residential and non-residential MSCs of 5 ug/L. The detected concentrations are below corresponding "Target Groundwater Concentration Corresponding to Indoor Air Concentration." The Training Center Building is adjacent/west/sidegradient of MW-1. The closest downgradient buildings are more than 150 away from MW-1. BPG indicated that the Training Center building is currently vacant and used only for storage at this time. This building is expected to be demolished in the future. None of the buildings are occupied. Therefore, it is concluded that the vapor intrusion pathway is not complete

**Soil:** The soils underlying the property consist of clayey and sandy silt mixtures with various percentages of rock fragments to depths of 12 to 18 feet bgs. Highly weathered gneiss saprolite underlies the silt with a gradual transition to weathered gneiss bedrock. As previously discussed, approximately 20 percent of the 312 acre property is covered with impermeable surfaces. The remaining 80 percent is grass covered, which includes the areas where subsurface soil sampling was conducted in conjunction with UST removal activities. There have been no known releases to soil as a result of the facility's operations. The facility's waste handling and storage areas are within buildings, or situated on concrete surfaces with proper containment structures. In addition, post-excavation soil sampling conducted in conjunction with removal of the seven raw and waste materials USTs located north of the E-building that were used by the facility indicated that the soils beneath the USTs had not been impacted by the organic compounds once stored in them. Three of the USTs were replaced with upgraded systems; however, they remain empty.

Post-excavation soil sampling for the four fuel oil USTs located at the Training Center, Dispensary, and President's House buildings (non-facility location) indicated that where contaminated soil was encountered, it was removed to PADEP's satisfaction and the excavations were backfilled. During the October 2010 groundwater sampling event, it was documented that SPL was present in monitoring well MW-1 located near the Training Center (former location of two 7,500-gallon fuel oil USTs). The extent of the SPL in the subsurface soil has not been defined; therefore, the current chemical quality of the soil in this area is unknown.

**Surface Water and Sediment:** Two surface water bodies were identified within 0.5 miles of the operating area of the

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facility. Foxes Run is located approximately 0.4 miles east of the facility. Foxes Run flows eastward to its convergence with Darby Creek located approximately two miles east of the facility. Reeses Run is located approximately 0.15 miles northwest of the facility. Reeses Run flows southwesterly to its convergence with Crum Creek located approximately two miles southwest of the facility.

There are three detention basins for retention of stormwater on the 312 acre property. Surface water runoff on the northern portion of the property flows to the north toward the northern most detention basin and Reeses Run. Surface water runoff on remainder of the property flows to the south and is intercepted by the detention basins located on the eastern and southern portions of the property. The facility formerly held an NPDES permit for discharges of stormwater to the detention basins that was superseded by a no exposure certification approved by PADEP in 2004. There have been no known discharges related to the facility operations to the detention basins. Based on this information, direct discharges of site-related chemicals to the nearby surface water bodies and sediment are not expected to be of concern at this time.

Collection of rainwater and spills that may occur in the drum storage containment pads are channeled by a sloped floor that discharges the water into a drain which is directed into either the main underground sump located centrally on the south edge of the main drum storage area or the self-contained underground sump located north of the E-building. Fluids contained in these sumps must be manually pumped and discharged either to the main stormwater drainage system or the facility's wastewater pretreatment ASTs.

Recent sampling of the onsite groundwater monitoring wells indicates that bis(2-ethylhexyl)phthalate and barium were present above the PADEP nonresidential MSCs in three of the wells. However, these two compounds were not detected at the nearest downgradient wells. In addition, it is believed that the presence of these compounds is not related to the operations formerly or currently conducted by the facility.

SPL indicative of No. 2 fuel oil was identified at MW-1 in October 2010; therefore, IES did not collect a groundwater sample from this well. EIS sampled MW-1 in November and December 2011. Benzene (0.42 ug/L, 0.52 ug/L) was detected below the reporting limit, but greater than or equal to the method detection limit. The concentrations are below the used aquifer, residential and non-residential MSCs of 5 ug/L. BPG plans further investigation of the groundwater contamination identified at the property, and has entered the property into the PADEP Act 2 Program to address MSC exceednces in groundwater.

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3. Are there **complete pathways** between “contamination” and human receptors such that exposures can be reasonably expected under the current (land- and groundwater-use) conditions?

Summary Exposure Pathway Evaluation Table

Contaminated Media	Potential <b>Human Receptors</b> (Under Current Conditions)						
	<u>Residents</u>	<u>Workers</u>	<u>Day-Care</u>	<u>Construction</u>	<u>Trespassers</u>	<u>Recreation</u>	<u>Food</u> <sup>3</sup>
Groundwater	No	No	No	No	No	No	No
Air (indoors)							
Soil (surface, e.g., <2 ft.)							
Surface Water							
Sediment							
Soil (subsurface e.g., >2 ft.)							
Air (outdoors)							

Instructions for Summary Exposure Pathway Evaluation Table:

1. Strike-out specific Media including Human Receptors’ spaces for Media which are not “contaminated” as identified in #2 above.
2. enter “yes” or “no” for potential “completeness” under each “Contaminated” Media -- Human Receptor combination (Pathway).

Note: In order to focus the evaluation to the most probable combinations some potential “Contaminated” Media - Human Receptor combinations (Pathways) do not have check spaces (“\_\_\_”). While these combinations may not be probable in most situations they may be possible in some settings and should be added as necessary.

  X If no (pathways are not complete for any contaminated media-receptor combination) - skip to #6, and enter “YE” status code, after explaining and/or referencing condition(s) in-place, whether natural or man-made, preventing a complete exposure pathway from each contaminated medium (e.g., use optional Pathway Evaluation Work Sheet to analyze major pathways).

       If yes (pathways are complete for any “Contaminated” Media - Human Receptor combination) - continue after providing supporting explanation.

       If unknown (for any “Contaminated” Media - Human Receptor combination) - skip to #6 and enter “IN” status code.

**Rationale and Reference(s):**

The static water levels in the on-site monitoring wells gauged in October 2010 ranged from 16.59 feet bgs on the northern portion of the property to 33.61 feet bgs on the southern portion of the property. Therefore, it is unlikely that direct contact with potentially contaminated groundwater would occur.

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<sup>3</sup> Indirect Pathway/Receptor (e.g., vegetables, fruits, crops, meat and dairy products, fish, shellfish, etc.

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The facility and surrounding area are supplied with public water, there are no known private or public water supply wells located within 0.5 miles of the facility, it is concluded that exposure to groundwater is not a potential exposure pathway for this facility.

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4. Can the **exposures** from any of the complete pathways identified in #3 be reasonably expected to be **“significant”**<sup>4</sup> (i.e., potentially “unacceptable” because exposures can be reasonably expected to be: 1) greater in magnitude (intensity, frequency and/or duration) than assumed in the derivation of the acceptable “levels” (used to identify the “contamination”); or 2) the combination of exposure magnitude (perhaps even though low) and contaminant concentrations (which may be substantially above the acceptable “levels”) could result in greater than acceptable risks)?

\_\_\_\_\_ If no (exposures can not be reasonably expected to be significant (i.e., potentially “unacceptable”) for any complete exposure pathway) - skip to #6 and enter “YE” status code after explaining and/or referencing documentation justifying why the exposures (from each of the complete pathways) to “contamination” (identified in #3) are not expected to be “significant.”

\_\_\_\_\_ If yes (exposures could be reasonably expected to be “significant” (i.e., potentially “unacceptable”) for any complete exposure pathway) - continue after providing a description (of each potentially “unacceptable” exposure pathway) and explaining and/or referencing documentation justifying why the exposures (from each of the remaining complete pathways) to “contamination” (identified in #3) are not expected to be “significant.”

\_\_\_\_\_ If unknown (for any complete pathway) - skip to #6 and enter “IN” status code

**Rationale and Reference(s):**

5. Can the “significant” **exposures** (identified in #4) be shown to be within **acceptable** limits?

\_\_\_\_\_ If yes (all “significant” exposures have been shown to be within acceptable limits) - continue and enter “YE” after summarizing and referencing documentation justifying why all “significant” exposures to “contamination” are within acceptable limits (e.g., a site-specific Human Health Risk Assessment).

\_\_\_\_\_ If no (there are current exposures that can be reasonably expected to be “unacceptable”)- continue and enter “NO” status code after providing a description of each potentially “unacceptable” exposure.

\_\_\_\_\_ If unknown (for any potentially “unacceptable” exposure) - continue and enter “IN” status code

**Rationale and Reference(s):**

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4 If there is any question on whether the identified exposures are “significant” (i.e., potentially “unacceptable”) consult a human health Risk Assessment specialist with appropriate education, training and experience.

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6. Check the appropriate RCRIS status codes for the Current Human Exposures Under Control EI event code (CA725), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (and attach appropriate supporting documentation as well as a map of the facility):

  X   YE – Yes, “Current Human Exposures Under Control” has been verified. Based on a review of the Information contained in this EI Determination, “Current Human Exposures” are expected to be “Under Control” at the   Lyondell Chemical Company   facility, EPA ID #   PAD046538211   located at   3801 West Chester Pike, Newtown Square, Pennsylvania 19073   under current and reasonably expected conditions. This determination will be re-evaluated when the Agency/State becomes aware of significant changes at the facility.

       NO - “Current Human Exposures” are NOT “Under Control.”

       IN - More information is needed to make a determination.

Completed by (signature) \_\_\_\_\_ Date \_\_\_\_\_  
(print)   Grant Dufficy     6/4/2013    
(title)   RCRA Project Manager   \_\_\_\_\_

Supervisor (signature) \_\_\_\_\_ Date \_\_\_\_\_  
(print)   Paul Gotthold     6/6/2013    
(title)   Assoc. Dir., PA Remediation, LCD   \_\_\_\_\_  
(EPA Region or State)   EPA region III   \_\_\_\_\_

Locations where References may be found:

USEPA Region III	PADEP
Waste and Chemical Mgmt. Division	South East Regional Office
1650 Arch Street	2 East Main Street
Philadelphia, PA 19103	Norristown, PA 19401

Contact telephone and e-mail numbers  
(name)   Grant Dufficy    
(phone #)   215-814-3455    
(e-mail)   dufficy.grant@epa.gov  

**FINAL NOTE: THE HUMAN EXPOSURES EI IS A QUALITATIVE SCREENING OF EXPOSURES AND THE DETERMINATIONS WITHIN THIS DOCUMENT SHOULD NOT BE USED AS THE SOLE BASIS FOR RESTRICTING THE SCOPE OF MORE DETAILED (E.G., SITE-SPECIFIC) ASSESSMENTS OF RISK.**