DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

RCRA Corrective Action
Environmental Indicator (EI) RCRAInfo code (CA725)
Current Human Exposures Under Control

Facility Name: **Chevron Phillips Chemical Puerto Rico Core Inc.**
Facility Address: **Road #710 and State Route #3, Guayama, Puerto Rico 00655**
Facility EPA ID#: **PRD991291972**

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 "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 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 "Current Human Exposures Under Control" EI is for reasonably expected human exposures under current land- and groundwater-use conditions ONLY, and does 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 Determination status codes should remain in the RCRAInfo 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).

Facility Information

Chevron Phillips Chemical Puerto Rico Core, Inc. (CPCPRC) is a 211-acre petrochemical plant located on the southeast coast of Puerto Rico, just west of the town of Guayama and approximately one-quarter mile north of the Caribbean Sea. The CPCPRC facility was originally constructed in 1966 on land previously graded and used for sugar cane cultivation. A man-made harbor, Las Mareas Harbor, built approximately one-half mile southwest of the main operation area, is used for receiving and shipping CPCPRC products.

The plant is located in the Coastal Lowlands physiographic province, which is approximately three miles wide in the vicinity of the plant and occurs along much of the southern coast of Puerto Rico. The general topography of the area is gently sloping, dipping southward from the mountains to the coast.

Several industrial facilities are located north of Highway 3, which is approximately one-half mile north of the facility. Directly west of the facility is a sugar cane field (West Cane Field) on which Advanced Energy Systems (AES) is constructing a new power station. The village of Las Mareas, a small community consisting of a single row of dwellings, is located approximately 1,000 feet south of the site on the coast of the Caribbean Sea (Ref. 3). The Puerto Rico Aqueduct and Sewer Authority (PRASA) operates a wastewater treatment facility directly east of the facility.

The facility is divided into four main operational areas that include: (1) the process area, (2) the tank storage area, (3) the wastewater treatment area, and (4) Las Mareas Harbor. CPCPRC processes naphtha into a variety of refined hydrocarbon products including, but not limited to, benzene, toluene, xylenes, cyclohexane, liquid petroleum gas, gasoline, and diesel fuels. Production of cyclohexane was stopped in March 2001 due to total plant shutdown; production is anticipated to resume in October 2002 (Ref. 5). Approximately 21 permanent structures are located at CPCPRC, primarily in the northern portion of the site, and house the majority of the process area operational/support centers and storage. These structures range in size from a large warehouse and shop building to small structures which contain chemicals and supplies. The facility currently has three National Pollutant Discharge Elimination System (NPDES) permitted outfalls that discharge into the effluent channel located in the southern portion of the CPCPRC facility.

USEPA issued an Administrative Consent Order (ACO) to CPCPRC in September 1989. The facility submitted a RCRA permit application in September 1991, but subsequently withdrew it in 1992. A draft RCRA Facility Investigation (RFI) was completed in May 1995. Ongoing investigations were reported in a 1998 Supplemental RFI and a 1999 final RFI. The July 1999 Final RFI was conditionally approved by USEPA in September 1999. A Corrective Measures Study (CMS) Work Plan was completed in September 2000 and a subsequent Risk Characterization Report was submitted in July 2001.

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?

  X   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

Summary of Operable Units (OUs): The CPCPRC facility has been the subject of ongoing investigations since 1989. The RFI Work Plan subdivided the facility into ten operable units (OUs). A brief description of each OU and the contaminants detected above relevant standards are outlined below. A site plan is provided as Attachment 1.

OU1, Production Facility: This OU consists of areas where hydrocarbons are produced and/or stored. The following operational equipment or areas constitute OU1: the tank storage area, the container storage area, the sludge pit at the API separator, the API oil separator system, the stormwater pond, the holding pond, the mix box, the oxidation pond (also part of OU8), the clarifier, the knockout pot, the flares, the fire fighting training area, the former underground storage tank (UST) area, the off-spec pond (also part of OU8), the truck loading area, the process (production) area, the burner cleaning waste management sites, and the land treatment unit (Ref. 1). These areas have been investigated during the 1995 RFI and subsequent investigations. Media were sampled for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), metals, and poly-chlorinated biphenyls (PCBs). Based on the RFI investigation and sampling results, VOCs, SVOCs, metals, and PCBs were not detected above screening criteria (e.g., below receptor-specific PRGs[1]). Thus, CPCPRC proposed no further action for the following units: the container storage area, the sludge pit at API separator, the API oil separator system, the stormwater pond, the mix box, the truck loading area, the clarifier, the knockout pot, the flares, the fire fighting training area, the former UST area, the burner cleaning waste management sites, and the process area. The Puerto Rico Environmental Quality Board (EQB) and USEPA approved the Final RFI and thus approved no further action for these areas.

The following areas have not been approved for no further action at OU1: portions of the tank storage area, the holding ponds, the oxidation ponds, and the off-spec ponds. The tank storage area consists of 14 multi-tank storage basins (Tank Basins A through N) located across much of the western and southern portions of the facility. Each basin area is defined by a berm and consists of multiple above ground storage tanks (AST). Tanks and basins have been added intermittently during the life of the facility. Chemicals stored in the tanks include intermediate products (i.e., reformate and raffinate), benzene, ethylene, toluene, and xylene (BTEX), methyl-tert butyl ether (MTBE), finished gasoline and fuel oil.

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1 CPCPRC developed receptor-specific and site-specific Preliminary Remediation Goals (PRGs) in the July 2001 Risk Characterization Report for all impacted environmental media (e.g., soil, sediment, groundwater, and surface water) using standard default USEPA exposure parameters in conjunction with site-specific information. PRGs were developed for the following receptors: trespassers, residential receptors, construction workers, and on- and off-site industrial workers. Concentrations of contaminants in the various media were evaluated based upon the various receptors who were presumed to be exposed to that medium within the specified exposure area.

Results of the RFI indicated that certain portions of the tank storage area did not require remediation, while the remaining portions need a CMS. Surface and subsurface soil at the following tank basins are below receptor-specific PRGs: Tank Basins E, F, G, H, I, L, M, and N (Ref. 5). Thus, EQB and USEPA approved the proposal for no further action for these tank basins upon approval of the Final RFI. Subsurface soil samples collected from Tank Basins A, B, C, D, J, and K during the RFI indicated VOC and SVOC concentrations above receptor-specific PRGs (Ref. 3). Additionally, considering the proximity to known light non-aqueous phase liquid (LNAPL) contamination in underlying groundwater in this area, subsurface soil may be impacted by contaminated groundwater. Thus, these tank basins will be evaluated in the CMS along with the underlying OU1 groundwater (Ref. 4).

RFI surface soil sample results from the holding pond did not demonstrate the presence of contamination; however, concentrations of contaminants in sediment exceeded the PRGs developed for the on-site worker during construction/excavation activities. Thus, holding pond sediments will be evaluated in the CMS along with the underlying OU1 groundwater (Ref. 4).

RFI sediment sampling results at the oxidation pond indicate that contaminants (metals, poly-cyclic aromatic hydrocarbons [PAHs]) in sediment exceed the PRGs developed for the on-site worker during construction/excavation activities. CPCPRC submitted a closure plan for this unit in September 1994 (Ref. 4). Given the sediment contamination, this unit will be further evaluated in the CMS.

RFI surface and subsurface sampling results at the off-spec pond indicate contaminants in subsurface soil (i.e., benzene, benzo(a)pyrene, and mercury) exceed the PRGs developed for the on-site worker during construction/excavation activities. CPCPRC submitted a closure plan for this unit in September 1994. The oxidation pond and off-spec pond will be closed under the on-going corrective action work and will be addressed in the CMS (Ref. 5). Given the presence of subsurface soil contamination, this unit will be further evaluated in the CMS.

OU2, Harbor Facility (Ballast Water Treatment Facility): This OU contains a sludge pit and old and new ballast water basins, located adjacent to the Las Mareas Harbor. Tankers dock at the Las Mareas Harbor Facility and exchange ballast water for petroleum product. The ballast water and ship wash water empty into two basins on site. Allegedly, sludge from the ballast area API separator was transported to the sludge pit. Both ballast water basins were considered SWMUs and became regulated (interim status) hazardous waste units in September 1990. Subsurface soil and sediment sampling was conducted during the RFI and analyzed for VOCs, SVOCs, and metals. Results indicated that concentrations of lead in sediment exceeded the PRGs developed for the on-site worker during construction/excavation activities (Ref. 3). The units are currently inactive. CPCPRC will submit a revised closure plan in 2002 based on the results of recent investigations and will then request EQB and EPA approval for clean closure (Ref. 6).

OU3, Production Facility Lime Ponds and Sewers: This OU contains three lime ponds, a lime sewer, and a sludge storage area. The lime ponds are earthen ponds, located on the southern portion of the facility south of Tank Basin L, and are used for settling lime from wastewater generated during operations. Prior to 1983, the lime ponds were considered to be a hazardous waste unit, but were subsequently closed when the waste stream was modified (Ref. 2). The lime sewer is located under Road D and runs from the production area (OU1) to the lime ponds. Although metals are the contaminant of concern due to the lime sludge management activities, VOCs and SVOCs were also analyzed for during RFI investigations. Results demonstrated that contaminant concentrations in surface and subsurface soil did not exceed receptor-specific PRGs (Ref. 3). However, considering the proximity to LNAPL contamination in underlying groundwater, subsurface soil in these areas could potentially pose unacceptable risk during construction and excavation activities. Thus, subsurface soil and groundwater in this area will be further evaluated as part of the CMS (Ref. 4).

OU4, Southeast Lime Sludge Management Area: This OU is located southeast of the lime sludge storage area, which is part of OU3. This area, operational from 1976 to 1989 for the disposal of spent lime from water treatment operations, and 1989 to 1991 for the disposal of non-hazardous waste, has been inactive since 1991 due to modifications to the Industrial Wastewater Treatment Plant (Ref. 1). Although metals are the contaminant of concern due to the lime sludge management activities, VOC and SVOC contamination were also investigated during RFI investigations. Results indicated that contaminant concentrations in surface and subsurface soil were below receptor-specific PRGs (Ref. 3). However, considering the proximity to LNAPL contamination in underlying groundwater, subsurface soil in these areas could potentially pose unacceptable risk during construction and excavation activities. Thus, subsurface soil and groundwater in this area will be further evaluated as part of the CMS (Ref. 4).

OU5, Southwest Lime Sludge Management Area: This OU, in operation from 1976 to 1979, was located southwest of the lime sludge storage area (OU3). This area was formerly referred to as the lime storage area No. 3 and was used to dispose of spent lime from water treatment operations. Although metals are the contaminant of concern due to the lime sludge management activities, VOC and SVOC contamination were also investigated during RFI investigations. Results indicated that contaminant concentrations in surface and subsurface soil were below receptor-specific PRGs (Ref. 3). Groundwater in the area however, appears to be impacted by metals (e.g., arsenic, barium, chromium, and lead). Thus, groundwater at this OU will be further evaluated in the CMS (Ref. 4).

OU6, Scrap Pile Storage Area: The scrap pile storage area is located in the southwestern corner of the production facility (OU1). This area was used from 1967 to 1980 for the management of tank bottoms, various sludges, spent fuel oil, scrap metals, and asbestos-containing materials. This area was also used to store empty drums prior to recycling. In early 1991, seven discarded electrical capacitors were discovered during weed clearing with a bulldozer in this OU. The capacitors were slightly damaged by contact with the bulldozer and a small amount soil was stained from leakage. USEPA was immediately notified of the capacitor discovery. The capacitors, as well as the stained soil, were excavated and disposed off site. An eighth capacitor was subsequently discovered in the same area during a later weed clearing event and was removed along with PCB contaminated soil (Refs. 2, 3). Presently, a portion of this area is used for Tank Basin M. Surface and subsurface soil samples were obtained during the RFI and analyzed for VOCs, SVOCs, metals, and PCBs. Results indicate that concentrations of benzene in subsurface soil exceed PRGs developed for on-site workers during construction/excavation activities (Ref. 4). SVOCs in surface soil also exceed PRGs developed for on-site workers (Ref. 4). Thus, surface soil, subsurface soil, and underlying groundwater will be evaluated as part of the CMS (Ref. 4).

OU7, Land Treatment Area: This OU is located on the southeast corner of the production facility (OU1), east of the off-spec pond (OU8). Prior to 1980, heat exchanger sludge, spilled fuel oil, fuel contaminated sand, asbestos-containing materials, and clean soil were disposed in this area. After 1980, this unit was used a staging area for the temporary storage of spent clay, spent metal blasting grit, and spent silica gel before disposal (Ref. 1). Subsurface soil samples were obtained during RFI investigations and analyzed for VOCs, SVOCs, and metals. Results indicated that contaminant concentrations were below receptor-specific PRGs (Ref. 3). However, considering the proximity to LNAPL contamination in underlying groundwater, subsurface soil in these areas could potentially pose unacceptable risk during construction and excavation activities. Thus, subsurface soil and groundwater in this area will be further evaluated as part of the CMS investigations at OU1 (Ref. 4).

OU8, Surface Impoundments: This OU includes a storm water pond, holding pond, oxidation pond, and off-spec pond (Ref. 1). The storm water pond is located in the southern portion of the production facility (OU1), southeast of Tank Basin M. The pond currently receives storm water from the production area (OU1), Tank Basins N, F, and K (OU1), and the wastewater/container storage areas (OU1). Supernatant flows in sequence to the holding pond and then is pumped to the off-spec pond, and then to the mix box for final treatment (Ref. 3). The off-spec pond and oxidation pond became regulated hazardous waste units in 1990. Surface soil and sediment were sampled during the RFI and samples were analyzed for VOCs, SVOCs, and metals. Results indicated that concentrations of contaminants in surface soil and sediment in the storm water pond were below receptor-specific PRGs. Thus, EQB and USEPA approved no further action for this area. Benzene, benzo(a)pyrene, and mercury were detected in subsurface soil at the off-spec pond above receptor-specific PRGs for an on-site worker exposure during construction/excavation activities. The benzene contamination is likely a result of the underlying LNAPL plume in this area; the impact to subsurface soil will be evaluated further in the CMS (Ref. 4). In addition, contaminants in sediment (metals, PAHs) at the holding pond and oxidation pond were also determined to exceed receptor-specific PRGs developed for an on-site worker exposure during construction/excavation activities. A closure plan for the off-spec pond and oxidation pond was submitted to EQB and USEPA in September 1994. The off-spec pond and oxidation pond will be closed under the on-going corrective action work and will be addressed in the CMS (Ref. 5). Sediment in the holding pond and oxidation pond will be evaluated further in CMS. Underlying groundwater in these areas will also be evaluated in the CMS as part of the CMS groundwater investigations at OU1.

OU9, Cooling Towers Area: The cooling towers are comprised of four separate towers housed in one structure at the northern border of the Production Facility. Chemical fungicides were added to the cooling tower waters, and in the past chromium and zinc were used as additives (Ref. 1). Surface soil, subsurface soil, and sediment samples were collected from the area during the RFI and samples were analyzed for VOCs, SVOCs, and metals. Results indicated that contaminant concentrations in all media were below receptor-specific PRGs. Based on the results presented in the Final RFI, EQB and USEPA approved the no further action determination for this OU.

OU10, Miscellaneous Hazardous Materials Management Area: This OU consists of the following areas or units: drum washing station, butane tank area, cooling tower tank area, chemical storage area, and drum storage area. All units at OU10 are currently active (Ref. 5). The RFI Work Plan states that no additional investigations are planned for these areas because there are no records of releases or significant data gaps in the history of these units. Based on the results presented in the Final RFI, EQB and USEPA approved the no further action determination for this OU.

Effluent Channel: The man-made effluent channel is an open, unlined ditch. It was constructed to facilitate transport of petroleum hydrocarbon products from the facility to Las Mareas Harbor.

Currently, surface water in the effluent channel discharges to Las Mareas Harbor. Surface water and sediment were sampled during the RFI investigations and analyzed for VOCs, SVOCs, metals, and PCBs. Benzene and metals (arsenic, copper, and vanadium) in surface water and several metals and PAHs in sediment exceeded receptor-specific PRGs for the construction worker and trespasser. Surface water and sediment contamination at this OU will be further evaluated as part of the CMS.

Groundwater: Two water bearing units (upper and lower alluvial units) are present at the CPCPRC facility. Groundwater investigations began in 1989 as part of the RFI when sampling detected the presence of petroleum hydrocarbons, existing both as LNAPL and dissolved phase contamination, over much of CPCPRC facility. This is primarily due to multiple and overlapping sources of hydrocarbons from spills, leaks, and past management practices. BTEX compounds have been detected in both the upper and lower alluvial units. In addition, several other VOCs, SVOCs, and metals (chromium and lead) have been detected in excess of receptor-specific PRGs (Ref. 3). Groundwater contamination has migrated across facility boundaries in three plumes; these plumes have extended beyond the east boundary, along the southeast corner, and into the west cane field. A subsurface investigation was performed in November 1998 to further delineate the extent of these three plumes (Ref. 2). The CMS Work Plan includes a plan for continued goundwater investigations in these off-site areas. Additionally, under the 1995 ACO, CPCPRC is removing free product under a Free Product Management Plan. Free product is currently being removed using an enhanced fluid recovery technology, which employs a duel-phase extraction with vacuum enhanced recovery. CPCPRC has also installed an air sparging interceptor trench as a voluntary interim stabilization measure to mitigate contaminated groundwater migration from the southeastern portion of the facility to the east cane field.

In summary, portions of OU1, and all of OU9 and OU10 have received a no further action determination from EQB and USEPA. CMS investigations will be performed for subsurface soil and groundwater at the remaining portions of OU1, OU3, OU4, OU5, OU6, OU7, and OU8. CPCPRC will submit a revised closure plan and request for clean closure for OU2 upon completion of recent investigation (Ref. 6).

References:

1. Draft RFI, Phillips Puerto Rico Core Inc., Guayama, Puerto Rico. Prepared by CH2MHILL. Dated 1995.
2. Letter from CPCPRC to USEPA, re: Subsurface Investigation related to the USEPA’s Technical Review of April 20, 1998. Dated January 29, 1999.
3. Final RFI, Phillips Puerto Rico Core Inc., Guayama, Puerto Rico. Prepared by CH2MHILL. Dated July 1999.
4. CMS Work Plan, Phillips Puerto Rico Core Inc., Guayama, Puerto Rico. Prepared by CH2MHILL. Dated September 2000.
5. E-mail from Sam Ezekwo, USEPA to Kristin McKenney, Booz Allen Hamilton, re: Phillips EI Determination. Dated January 10, 2002.
6. E-mail from Sam Ezekwo, USEPA to Kathy Rogovin, Booz Allen Hamilton, re: Old/New Ballast Water Basins. Dated January 10, 2002.

2. Are groundwater, soil, surface water, sediments, or air **media** known or reasonably suspected to be "**contaminated**"[2] 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)?

Media	Yes	No	?	Rationale/Key Contaminants
Groundwater	X			VOCs, SVOCs, and metals
Air (indoors)[3]		X		
Surface Soil (e.g., <2 ft)	X			SVOCs and metals
Surface Water	X			VOCs and metals
Sediment	X			VOCs, SVOCs, and metals
Subsurface Soil (e.g., >2 ft)	X			VOCs and metals
Air (Outdoor)		X		

____ 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:

Groundwater

The CPCPRC facility is located in the south coast groundwater province of Puerto Rico. This province is defined by the alluvial plain aquifer that extends from Ponce (approximately 30 miles west of the facility) to Patillas (approximately 9 miles to the east of the facility). The facility is located in the area where coarser-grained fan material transition into finer grained coastal marine beach and lagoon sediments (Ref. 1).

2 "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).

3 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.

Individual yields from wells completed in the alluvial fan sediments reportedly range from 40 to 2,000 gallons per minute, depending on the well's proximity to the coarse-grained deposits. Two water bearing units, the upper and lower alluvial units, are present underneath the facility. Regional groundwater flow in the South Coastal Plain aquifer (upper and lower alluvial units) is generally toward the south. The facility is in an area where groundwater is considered to occur under confined conditions. In the southern portion of the facility, groundwater flow in the upper alluvial unit diverges from the general regional southward flow and separates into an eastern and western flow direction. This change in groundwater flow direction is believed to be due to geologic controls at the site, the permeability contrasts, and local recharge. The groundwater flow direction of the lower alluvial unit underneath the site is generally south-southwest (Ref. 1).

Groundwater at this site has been monitored on a semi-annual basis since 1989. The facility calculated receptor-specific groundwater PRGs during the RFI based upon potential human exposure scenarios[4]. Thus, groundwater was separated by depth and location to determine chemicals of concern in the receptor-specific exposure areas (Ref. 3). The maximum concentration detected during the most recent (December 2000) round of groundwater monitoring data was compared to the receptor-specific PRGs. Table 1 presents the most recent groundwater data that exceeded a receptor-specific PRGs separated by depth and location of contaminated groundwater. The location of these exceedences is depicted on Attachments 2 through 4.

As presented in Table 1, SVOCs, VOCs, and various metals were detected above receptor-specific PRGs in shallow and deep groundwater both on and off site.

4 Receptor specific PRGs for groundwater were developed considering a construction worker exposure via incidental ingestion, dermal contact, and inhalation. PRGs were also developed for a residential exposure scenario (e.g. ingestion, dermal contact, and inhalation) for off-site groundwater.

Table 1. Contaminant Concentrations in Groundwater Above the Receptor-Specific PRGs (µg/L)

Contaminant	Receptor-Specific PRG	Maximum Concentration	Location
On-Site Shallow Groundwater[a]			
Benzene	170	570,000	MW-28
Mercury	0.874	0.98	MW-28
Naphthalene	8.71	280	MW-29
Off-Site Shallow Groundwater[b]			
4-Methylphenol	7.72	54	MW-158
Benzene	5	570,000	MW-28
Bis(2-ethylhexyl)phthalate	6	21	MW-119
Chromium	100	140	MW-158
Cobalt	93	180	MW-158
Lead	150	21	MW-158
Nickel	31.3	140	MW-126, MW-127
MTBE	6.55	64	MW-30
Vanadium	10.9	1,300	MW-158
On- and Off-Site Deep Groundwater[c]			
Arsenic	50	65	MW-129D
Benzene	5	57,000	MW-21D
Bis(2-ethylhexyl)phthalate	6	2.0E-02	MW-124D
Chromium	100	130	MW-159D
Cobalt	93.8	120	MW-159D
Naphthalene	0.266	15	MW-159D
Nickel	31.3	59	MW-159D
MTBE	6.55	7.2	MW-133D
Vanadium	10.9	890	MW-159D
Xylene (total)	1,000	6,500	MW-159D
Zinc	469	530	MW-159D

[a] The receptor-specific PRGs calculated for comparison to on-site shallow groundwater maximum detections were based upon a construction worker scenario.

[b] The receptor-specific PRGs calculated for comparison to off-site shallow groundwater maximum detections were based upon a residential exposure scenario.

[c] The receptor-specific PRGs calculated for comparison to on- and off-site deep groundwater were based upon residential exposure scenario.

Air (Indoors)

Volatile contaminants are present in both on- and off-site groundwater at the CPCPRC facility. Thus, migration of contaminants from groundwater into indoor air is considered a potentially complete exposure pathway for both on- and off-site receptors.

The maximum detected VOC concentrations in groundwater from the most recent round of sampling, dated December 2000, were compared to the State of Connecticut Groundwater Standards for Protection of Indoor Air under the Residential (CT RES VC) and the Industrial/Commercial Scenario (CT I/C VC) to determine whether migration of VOCs to indoor air may be of concern. Based on this comparison, benzene was the only VOC that exceeded the CT RES VC and CT I/C VC. Table 2 lists the benzene concentrations in on- and off-site shallow groundwater, and on-and off-site deep groundwater that exceeded the CT RES VC and CT I/C VC.

Table 2. Maximum Groundwater Concentrations Exceeding CT RES VC and CT I/C VC (μg/L) during December 2000

Contaminant	CT RES VC	CT I/C VC	Maximum Concentration	Location
On- and Off-Site Shallow Groundwater				
Benzene	215	530	570,000	MW-28
On- and Off-Site Deep Groundwater				
Benzene	215	530	57,000	MW-21D

Given these exceedences, CPCPRC utilized the Johnson-Ettinger (J-E) Model to calculate receptor-specific PRGs for benzene in both on- and off-site areas. PRGs were developed for four exposure areas: (1) on site at the Administration Building, (2) off-site in the West Cane Field at the AES Building, (3) off site in the West Cane Field at the coal conveyance structure, and (4) off site at the community of Las Mareas. Calculated PRGs for the four exposure areas were as follows: (1) 1,547 μg/L, (2) 2,386 μg/L, (3) 3,213 μg/L, (4) 117 μg/L. CPCPRC compared maximum detected groundwater concentrations from the most recent groundwater sampling data in each exposure area to determine if exposure to indoor air was of concern. Benzene groundwater concentrations were determined to exceed the PRGs for the on-site Administration Building, off-site AES Building, and off-site coal conveyance structure (Ref. 4).

Based on the exceedences of the receptor-specific PRGs, the J-E Model was used to determine the incremental risk associated with the potential migration of benzene into indoor air. Selected model input values included USEPA default values in conjunction with site-specific values used by the facility (Ref. 3), to calculate receptor-specific PRGs for the off-site AES facility (both AES Building and coal conveyance structure) and the on-site Administration Building. The maximum detection of benzene in groundwater (570,000 μg/L) was used to calculate risk for both the off-site AES facility and on-site Administration Building. The resulting calculated incremental risk value for carcinogenic effects of benzene for both the on- and off-site areas was 1.9E-03, which exceeds the USEPA target risk range of 1E-04 to 1E-06. However, the maximum detected concentration of benzene is from a well (MW-28) located on the western border of the facility, and not underneath any buildings. MW-28 is southwest, and downgradient of the Administration Building. Benzene concentrations underneath and in the vicinity of the on-site Administration Building are currently nondetect. MW-28 is also situated southeast of the off-site AES building and east of the coal conveyance structure. According to the risk characterization report (Ref. 3), the benzene groundwater plume currently does not extend underneath either off-site structure.

Thus, benzene contamination in groundwater is not currently expected to impact indoor air for any on- or off-site buildings.

In summary, benzene was detected above the receptor-specific PRGs calculated by CPCPRC. The maximum detected benzene concentration in on- and off-site groundwater indicated potential carcinogenic risk for indoor air using the J-E Model. However, current groundwater plume characteristics show that benzene contamination is not present underneath or in the vicinity of any inhabited buildings and thus not expected to be migrating into indoor air. Therefore, risk due to inhalation of benzene in indoor is not expected to be of concern at the site.

Surface/Subsurface Soil

VOCs, SVOCs, and metals were detected in surface and subsurface soil in both on- and off-site areas at the CPCPRC facility. Maximum detected concentrations in each of these exposure areas (on- and off-site impacted soil areas) were screened against receptor-specific PRGs. Base on this evaluation, exceedences in both surface and subsurface soil were identified for the construction worker and industrial worker (Ref. 3). Attachments 5 through 7 shows the exposure areas for the construction worker and industrial worker scenario separated by surface and subsurface soil. Receptor-specific PRGs were calculated considering potential exposure pathways (i.e., ingestion, dermal contact, inhalation). Table 3 presents the maximum detected contaminant concentrations in surface and subsurface soil that exceed the receptor-specific PRGs.

Table 3. Maximum Concentrations in Surface and Subsurface Soil (mg/kg) that Exceed Receptor-Specific PRGs

Contaminant	Receptor-Specific PRG	Surface Soil Maximum Concentration	Subsurface Soil Maximum Concentration
Construction Worker Scenario			
Arsenic	6.02	7	16.4
Barium	114	1,140	1,070
Benzene	2.04	--	570
Mercury	0.114	0.527	0.83
Vanadium	146	192	319
Industrial Worker Scenario			
Arsenic	2.82	4.6	NA
Benzo(a)pyrene	0.313	1.3	NA
Mercury	0.116	0.527	NA

NA (not applicable) indicates that the contaminant was not evaluated for that medium and receptor.
-- indicates that contaminant was not detected above the receptor-specific PRG in that medium.

Surface Water

A man-made effluent channel was developed at the southern border of the site to facilitate transport of petroleum hydrocarbon products from the facility to Las Mareas Harbor. Surface water samples were collected in the channel as part of the 1995 RFI. Receptor-specific PRGs (e.g. construction worker, trespasser) were calculated for surface water considering potential exposure pathways (e.g. incidental ingestion, dermal contact, and inhalation). The sampling locations for the exposure pathways are presented in Attachments 8 and 9. Table 4 presents the contaminants detected in surface water above receptor-specific PRGs.

Table 4. Receptor-Specific PRG Exceedences in Surface Water at the Effluent Channel (μg/L)

Contaminant	Receptor-Specific PRG	Maximum Concentration	Location
Construction Worker Exposure to Effluent Channel Surface Water			
Benzene	12	370	SW-3
Trespasser Exposure to Surface Water in the Effluent Channel			
Arsenic	0.93	11	SW-NPDES3
Benzene	4.99	370	SW-3
Copper	1,190	1,300	SW-NPDES3
Vanadium	225	5,100	SW-NPDES3

Sediment

Sediment sampling was conducted during the 1995 RFI and addressed in three general exposure areas, including: (1) the effluent channel, (2) the ponds in OU8, and (3) the southern portion of the AES facility. Receptor-specific PRGs (e.g. construction worker, trespasser) were calculated for these areas based on potential exposure pathways (e.g. incidental ingestion, dermal contact, and inhalation). Table 5 presents the contaminants detected in sediment above receptor-specific PRGs in each exposure area. Attachments 10 though 12 shows the sampling location in each exposure area.

Table 5. Receptor-Specific PRG Exceedences in Sediment (mg/kg)

Contaminant	Receptor-Specific PRG	Maximum Concentration	Location
Construction Worker Exposure to Effluent Channel Sediments			
Arsenic	3.8	7.16	SD-023
Benzo(a)pyrene	0.805	17	SD-002
Benzo(b)fluoranthene	8.46	94	SD-002
Dibenz(a,h)anthracene	0.846	1	SD-002
Indeno(1,2,3-cd)pyrene	8.46	9.2	SD-002
Mercury	1.42	1.43	SD-002
Construction Worker Exposure to Sediments at West Cane Field and OU8 Ponds			
Arsenic	6.02	26.6	SD-016
Barium	114	325	SD-016
Benzene	2.04	49	SD-007
Benzo(a)pyrene	1.61	10	SD-006
Benzo(b)fluoranthene	16.9	18	SD-006
Cadmium	10.4	11.6	SD-012
Lead	1E+03	1.43E+03	SD-Oldballast-03
Mercury	0.114	6.88	SD-016
Vanadium	146	236	SD-OX-01
Trespasser Exposure to Sediments in Effluent Channel			
Antimony	3.09	9	SW-NPDES3
Arsenic	0.387	9	HA-09
Benzo(a)pyrene	6.06E-02	17	SD-002
Benzo(b)fluoranthene	0.652	94	SD-002
Chrysene	65.2	110	SD-002
Indeno(1,2,3-cd)pyrene	0.652	9.2	SD-002
Mercury	0.619	1.43	SD-002
Vanadium	54.1	393	SW-NPDES3

Air (Outdoors)

No assessment of impacts to outdoor air has been conducted at this property. The majority of the CPCPRC site is covered by asphalt pavement. A few small areas on site are covered with vegetation or grass. In addition, the natural mixing which occurs during normal air flow would be expected to disperse any contaminant levels of concern. Based on the limited extent of exposed surface contamination, volatile emissions and/or the migration of particulates entrained on dust are not expected to be significant exposure pathways of concern at the CPCPRC facility.

References:

1. Final RFI, Phillips Puerto Rico Core Inc., Guayama, Puerto Rico. Prepared by CH2MHILL. Dated July 1999.
2. CMS Work Plan, Phillips Puerto Rico Core Inc., Guayama, Puerto Rico. Prepared by CH2MHILL. Dated September 2000.
3. Risk Characterization Report, Phillips Puerto Rico Core Inc., Guayama, Puerto Rico. Prepared by CH2MHILL. Dated July 2001.
4. Letter to Samuel Ezekwo, USEPA from Gregory Young, Chevron Phillips Chemical Company LP, re: Determination for Environmental Indicator for Human Exposure Controlled. Dated August 13, 2001.

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

Potential ***Human Receptors*** *(Under Current Conditions)*

“Contaminated” Media	Residents	Workers	Day-Care	Construction	Trespasser	Recreation	Food[5]
Groundwater	No	No	No	Yes	--	--	No
~~Air (indoors)~~							
Surface Soil (e.g. < 2 ft)	No	Yes	No	Yes	No	No	No
Surface water	No	No	--	Yes	Yes	Yes	No
Sediment	No	No	--	Yes	Yes	Yes	No
Subsurface Soil (e.g., > 2 ft)	No	No	--	Yes	--	--	No
~~Air (outdoors)~~							

Instruction 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. These spaces instead have dashes (“--”). While these combinations may not be probable in most situations they may be possible in some settings and should be added as necessary.

_____ 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).

__X__ 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:

Groundwater

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5 Indirect Pathway/Receptor (e.g., vegetables, fruits, crops, meat and dairy products, fish, shellfish, etc.)

SVOCs, VOCs, and various metals were detected above receptor-specific PRGs in shallow and deep groundwater at both on- and off-site locations. Potable water at the site and in the vicinity of the site (including the community of Las Mareas) is obtained by PRASA. Private wells have not been observed in the vicinity of the site, or the surrounding Las Mareas community. However, a number of wells have been identified within a two-mile radius of the facility. PRASA water supply wells in this area obtain groundwater from the lower alluvial aquifer; all of these supply wells are upgradient of the facility. There are ten non-potable groundwater wells downgradient of the groundwater flow from the site and include: two irrigation wells east of the facility, three industrial wells at SK&F Lab. Co. to the west of the facility, and a total five U.S. Geologic Survey (USGS) wells on either side of the facility (Ref. 1). Of the two irrigation wells located to the east of the facility, one well (Well 28) is upgradient from the facility and will therefore not be affected by contamination associated with the CPCPRC facility. The other well (Well 27) is cross gradient from the upgradient portion of the plume on the eastern side of the facility. It is approximately one-quarter of a mile from the facility boundary. It should also be noted that monitoring wells along this portion of the eastern boundary (near Well 27) of the facility in the lower alluvial aquifer have shown no contamination. Consequently, it can be concluded that it is very unlikely that irrigation Well 27 would be impacted by contamination from the facility (Ref. 3). Thus, as there are no potable wells on or in the vicinity of the site, groundwater is not currently considered a complete pathway.

Given that shallow groundwater is approximately 6 to 12 feet below ground surface there is the potential for construction workers performing intrusive activities at on- and off-site locations to be exposed to contaminated shallow groundwater. Thus, groundwater is considered a complete pathway for the construction worker scenario.

Surface/Subsurface Soil

Access to the facility is limited to CPCPRC employees and their contractors and visitors. The perimeter of the facility is fenced and guarded 24 hours a day. There are six access gates to the main facility which may be accessed from the north, south, east, and southwest sides of the facility (Ref. 1). Therefore, trespassers and off-site residents are not expected to gain access to the facility and are not expected to become exposed to impacted on-site soil.

Metals were detected in surface soil at levels exceeding the receptor-specific PRGs based on construction worker and industrial worker scenarios. In addition, benzo(a)pyrene was detected in surface soil at levels exceeding receptor-specific PRGs based upon the industrial worker exposure scenario. Based on the results of the RFI, contamination in on-site surface soil above receptor-specific PRGs is limited to OU6. A portion of this area is covered with vegetation and weeds, which are periodically cutback (Ref. 1). Therefore, the potential for exposure to surface soil may exist for on-site workers. In addition, there is the potential for a construction worker to be performing intrusive activities in this area.

VOCs and metals are present in subsurface soil above the receptor-specific PRGs. Thus, construction workers may be exposed to contaminated subsurface soil at portions of OU1, OU3, OU4, OU5, OU6, OU7, and OU8 while conducting intrusive activities. Industrial workers are not expected to be performing intrusive activities during normal facility operations; thus, industrial workers are not expected to be exposed to contaminated subsurface soil (Ref. 2).

Surface Water

Contaminated surface water is present in the effluent channel above receptor-specific PRGs. Therefore, construction workers in this area may be exposed to contaminated surface water in the effluent channel.

Trespassers and recreators may be exposed to contaminated surface water while performing recreational activities in the effluent channel (Ref. 2). Thus, there is the potential for recreators and trespasser to be exposed to contaminants in surface water.

Sediment

Contaminated sediment is present in the effluent channel, the ponds at OU8, and West Cane Field above receptor-specific PRGs. Therefore, construction workers may be exposed to contaminated sediment in the effluent channel, West Cane Field, and in the ponds at OU8.

Because access to the facility is restricted, trespassers are not expected to gain access to the CPCPRC facility. Therefore, trespasser exposure to sediment in the ponds at OU8 is not considered a concern. However, trespassers may be exposed to contaminated sediments from the effluent channel (Ref. 2) while performing recreational activities. Thus, there is the potential for recreators and trespasser to be exposed to contaminated sediment in the effluent channel.

References:

1. Final RFI, Phillips Puerto Rico Core Inc., Guayama, Puerto Rico. Prepared by CH2MHILL. Dated July 1999.
2. Risk Characterization Report, Phillips Puerto Rico Core Inc., Guayama, Puerto Rico. Prepared by CH2MHILL. Dated July 2001.
3. E-mail from Sam Ezekwo, USEPA to Kristin McKenney, Booz Allen Hamilton, re: Phillips EI Determination. Dated January 10, 2002.

4. Can the **exposures** from any of the complete pathways identified in #3 be reasonably expected to be **significant**[6] (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?

__X__ If no (exposures cannot 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:

Groundwater

Potential risks associated with construction worker exposure to impacted groundwater were evaluated in the baseline human health risk assessment (HHRA), submitted in July 2001 (Ref. 1). This scenario considered construction workers exposed to contaminated shallow groundwater via ingestion, dermal absorption, and inhalation for on- and off-site exposure areas (refer to Attachments 2 and 3). The total hazard index for an on-site construction worker exposed to groundwater was 3,212, which exceeds the USEPA target hazard quotient (1.0) for noncarcinogenic risk. The total excess lifetime cancer risk for the on-site construction worker was 2E-03, which exceeds the USEPA target cancer risk range of 1E-04 to 1E-06. The total hazard index for an off-site construction worker (i.e. AES facility) was 851, which also exceeds the USEPA target hazard index (1.0) for noncarcinogenic risk. The total excess lifetime cancer risk for the off-site construction worker was 6E-04, which also exceeds the USEPA target risk range. Therefore, risks to on- and off-site construction workers who are exposed to shallow groundwater exceed USEPA acceptable risk levels. The HHRA calculations and results have been reviewed by USEPA and deemed acceptable. USEPA has discussed the results with CPCPRC. CPCPRC has indicated that they are aware of the risks and confirmed that they follow appropriate Occupational Safety and Health (OSHA) health and safety protocols (Ref. 4). To mitigate exposure to construction workers, CPCPRC has implemented a standard operating procedure (SOP) that mandates the use of personal protective equipment (PPE) and notification of the facility's Environmental Department prior to any excavation. Intrusive activities are conducted under the appropriate health and safety protocols (i.e. dewatering) set in place at the site. In addition, CPCPRC has communicated the potential for contaminated groundwater to both AES and its contractor, and PRASA. CPCPRC has a good working relationship with the adjacent neighbors, and works closely with AES and its contractor during all phases

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6 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.

of projects at their facility. AES correspondence indicates that anytime excavation occurs within one foot of the water table, CPCPRC is notified and conducts monitoring (Ref. 3). Furthermore, CPCPRC will develop another agreement with AES that will allow CPCPRC to monitor conditions at the AES site on both monthly and semi-annual basis as well as submit an annual report to EPA to confirm that the human exposure at the site is under control (Ref. 5). CPCPRC is utilizing this same procedure for other work in close proximity of the CPCPRC facility where there is known or suspected contamination (Ref. 2). It should also be noted that risks to construction workers at the AES facility are also expected to be minimal because there are no excavation activities currently occurring at the site, only filling activities (Ref. 1). In addition, any intrusive activities are conducted under the appropriate health and safety protocols set in place at the site. Given AES's knowledge of the groundwater contamination at their property and the close working relationship between AES and CPCPRC, risks due to direct exposure to contaminated shallow groundwater for construction workers are not expected to be significant.

Surface/Subsurface Soil

Potential risks associated with industrial worker exposure to surface soil were evaluated in the HHRA (Ref. 1). This scenario considered industrial workers who are exposed to contaminated surface soil via ingestion, dermal absorption, and inhalation. The total hazard index for an industrial worker exposed to surface soil was 0.33, which is below the USEPA target hazard index (1.0) for noncarcinogenic risk. The total excess lifetime cancer risk was 5E-06, which falls within the USEPA target cancer risk range of 1E-04 to 1E-06. Therefore, on-site industrial workers risks associated with exposure to surface soil contamination are not expected to be significant (Ref. 1).

Potential risks associated with on-site construction worker exposure to surface soil were evaluated in the HHRA (Ref. 1). This scenario considered construction workers who are exposed to contaminated surface soil via ingestion, dermal absorption, and inhalation for on-site exposure areas. The total hazard index for a construction worker exposed to surface soil was 1.3, which slightly exceeds the USEPA target hazard index (1.0) for noncarcinogenic risk. The total excess lifetime cancer risk was 9E-07, which falls below the USEPA target cancer risk range of 1E-04 to 1E-06. Therefore, exposure for an on-site construction worker exposed to surface soil contamination may be a concern for noncarcinogenic risk. To mitigate exposure to construction workers, CPCPRC has implemented a SOP that mandates the use of PPE during all construction activities. Because construction activities are conducted under the appropriate health and safety protocols set in place at the site, risks due to direct exposure to surface soil contamination for on-site construction workers are not considered to be significant.

Potential risks associated with on- and off-site construction worker exposure to subsurface soil were evaluated in the HHRA (Ref. 1). This scenario considered construction workers who are exposed to contaminated subsurface soil via ingestion, dermal absorption, and inhalation for on- and off-site exposure areas. The total hazard index for an on-site construction worker exposed to subsurface soil was 28, which exceeds the USEPA target index (1.0) for noncarcinogenic risk. The total excess lifetime cancer risk for the on-site construction worker was 2E-05, which falls within the USEPA target cancer risk range. The total hazard index for an off-site construction worker (i.e. AES facility) was 1.1, which slightly exceeds the USEPA level of concern for noncarcinogenic risk. The total excess lifetime cancer risk for the off-site construction worker was 1E-06, which falls within the USEPA target risk range of 1E-04 to 1E-06. Therefore, risks for a construction worker exposed to on- or off-site subsurface soil contamination via ingestion, dermal absorption, and inhalation may be a concern for noncarcinogenic contamination. To mitigate exposure to on-site construction workers, CPCPRC has implemented a SOP that mandates the use of PPE and notification of the facility's Environmental Department prior to any excavation (in both on- and off-site areas). In addition, as mentioned in the groundwater discussion above, CPCPRC has communicated the potential for contaminated soil to both AES and its contractor, and PRASA. CPCPRC works closely with AES and its contractor during all phases of projects at their facility. AES correspondence indicates that anytime excavation occurs within one foot of the water table, CPCPRC is notified and conducts monitoring (Ref. 3). Furthermore, CPCPRC will develop another agreement with AES that will allow CPCPRC to monitor conditions at the AES site on both monthly and semi-annual basis as well as submit an annual report to EPA to confirm that the human exposure at the site is under control (Ref. 5). CPCPRC is utilizing this same procedure for other work in close proximity of the CPCPRC facility where there is known or suspected contamination (Ref. 2). It should also be noted that risks to construction workers at the AES facility are also expected to be minimal because there are no excavation activities currently occurring at the site, only filling activities (Ref. 1). Because any intrusive activities are conducted under the appropriate health and safety protocols set in place at the site, and other precautions are taken by both CPCPRC and AES to prevent exposure to on- and off-site construction workers, risks due to direct exposure to subsurface soil contamination for construction workers are not considered to be significant.

Surface Water

Potential risks associated with construction workers exposed to surface water were evaluated in the HHRA (Ref. 1). This scenario considered construction workers who are exposed to contaminated surface water via ingestion, dermal absorption, and inhalation at the effluent channel. The total hazard index for a construction worker exposed to surface water was 0.06, which falls below the USEPA target hazard index (1.0) for noncarcinogenic risk. The total excess lifetime cancer risk for a construction worker was 1E-06, which falls within the USEPA target cancer risk range of 1E-04 to 1E-06. Therefore, construction worker risk associated with exposure to surface water contamination in the effluent channel are not expected to be significant.

Risks associated with trespasser exposure to effluent channel surface water were evaluated in the HHRA (Ref. 1). This scenario considered trespasser exposure to contaminated surface water while wading in the effluent channel and is therefore protective of exposure to a recreator. Trespasser exposure to contaminated surface water was evaluated via incidental ingestion, inhalation, and dermal contact. The total hazard index for trespasser exposed to surface water was 0.40, which fell below the USEPA target hazard index (1.0) for noncarcinogenic risk. The total excess lifetime cancer risk for surface water was 1E-05, which fell within the USEPA target cancer risk range of 1E-04 to 1E-06. Therefore, exposure to surface water is not currently expected to pose significant risk for a trespasser or recreator (Ref. 1).

Sediment

Potential risks associated with on-site construction workers exposure to sediments were evaluated in the HHRA (Ref. 1). This scenario considered construction workers who are exposed to contaminated sediment via ingestion, dermal absorption, and inhalation at the effluent channel, West Cane Field, and ponds at OU8. The total hazard index for a construction worker exposed to contaminated effluent channel sediments was 0.01, which falls below the USEPA target hazard index (1.0) for noncarcinogenic risk. The total excess lifetime cancer risk for a construction worker exposed to contaminated effluent channel sediments was 2E-06, which falls within the USEPA target risk range of 1E-04 to 1E-06. The total hazard index for a construction worker exposed to contaminated pond sediments was 4.2, which exceeds the USEPA target hazard index (1.0) for noncarcinogenic risk. The total excess lifetime cancer risk for a construction worker exposed to contaminated pond sediments was 8E-06, which falls within the USEPA target risk range Therefore, risk to a construction worker exposed to West Cane Field and OU8 ponds sediment may be a concern for noncarcinogenic effects. To mitigate exposure to construction workers, CPCPRC has implemented a SOP that mandates the use of PPE and notification of the facility's Environmental Department prior to any construction activities in these impacted areas. Because construction activities are conducted under the appropriate health and safety protocols set in place at the site, risks due to direct exposure to subsurface soil contamination for construction workers are not considered to be significant.

Risks associated with trespasser exposure to effluent channel sediments were evaluated in the HHRA (Ref. 1). This scenario considered trespasser exposure to contaminated sediments while wading in the effluent channel and is therefore protective of exposure to a recreator. Trespasser exposure to contaminated sediment was evaluated via incidental ingestion, inhalation, and dermal contact. The total hazard index for trespasser exposed to sediment was 0.8, which fell below the USEPA target hazard index (1.0) for noncarcinogenic risk. The total excess lifetime cancer risk for sediment were 4E-05, which fell within the USEPA target cancer risk range of 1E-04 to 1E-06. Therefore, exposure to sediment is not expected to pose significant risk for a trespasser or recreator (Ref. 1).

References:

1. Risk Characterization Report, Phillips Puerto Rico Core Inc., Guayama, Puerto Rico. Prepared by CH2MHILL. Dated July 2001.
2. Email from Greg Young, CP Chemical, to Sam Ezekwo, USEPA, re: Environmental Indicator Determination for Human Exposure Controlled. Dated August 10, 2001.
3. Letter from David Stone, AES Puerto Rico, to Nestor Marquez, CPCPRC, re: Excavations. Dated October 30, 2001.
4. E-mail from Sam Ezekwo, USEPA to Kristin McKenney, Booz Allen Hamilton, re: Phillips EI Determination. Dated January 10, 2002.
5. Letter from Nestor Marquez, CPCPRC, to Nicoletta DiForte, re: Letter related to Monitoring Changes at AES. Dated April 11, 2002.

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:

This question is not applicable. See response to question #4.

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 CPCPRC Inc. facility, EPA ID #PRD991291972 located at Road #710 and State Route #3, Guayama, Puerto Rico, 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: _______________________________ Date:______________ ______

Kathy Rogovin
Risk Assessor
Booz Allen Hamilton

Reviewed by: _______________________________ Date:____________________

Kristin McKenney
Risk Assessor
Booz Allen Hamilton

_______________________________ Date:____________________

Sam Ezekwo, RPM
RCRA Programs Branch
USEPA Region 2

_______________________________ Date:____________________

Nicoletta Diforte, Section Chief
RCRA Programs Branch
USEPA Region 2

Approved by: Original signed by: Date: 5/10/2002

Raymond Basso, Chief
RCRA Programs Branch
USEPA 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.

Contact telephone and e-mail numbers: Sam Ezekwo, USEPA RPM
(212) 637-4168
ezekwo.sam@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.

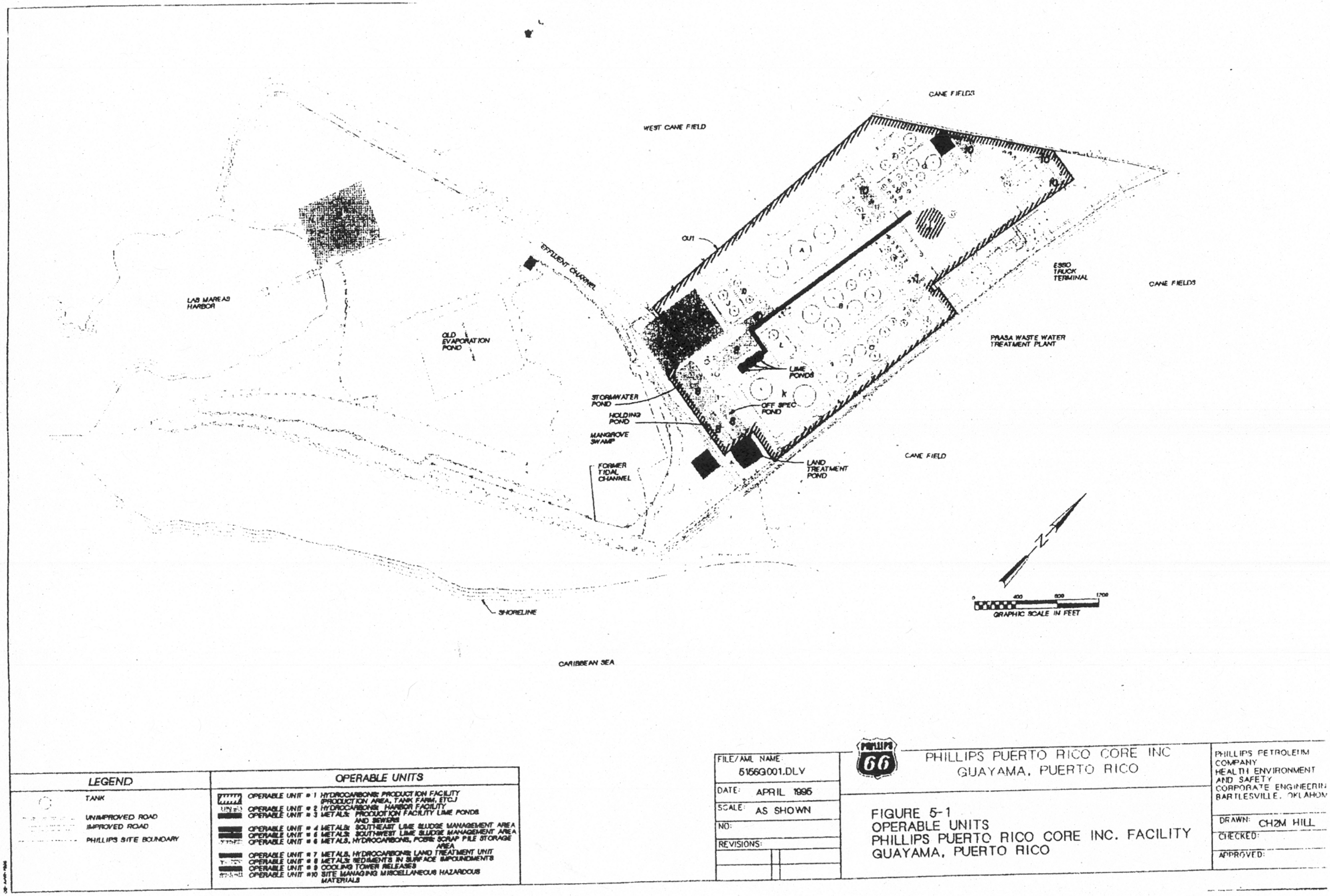
Attachments

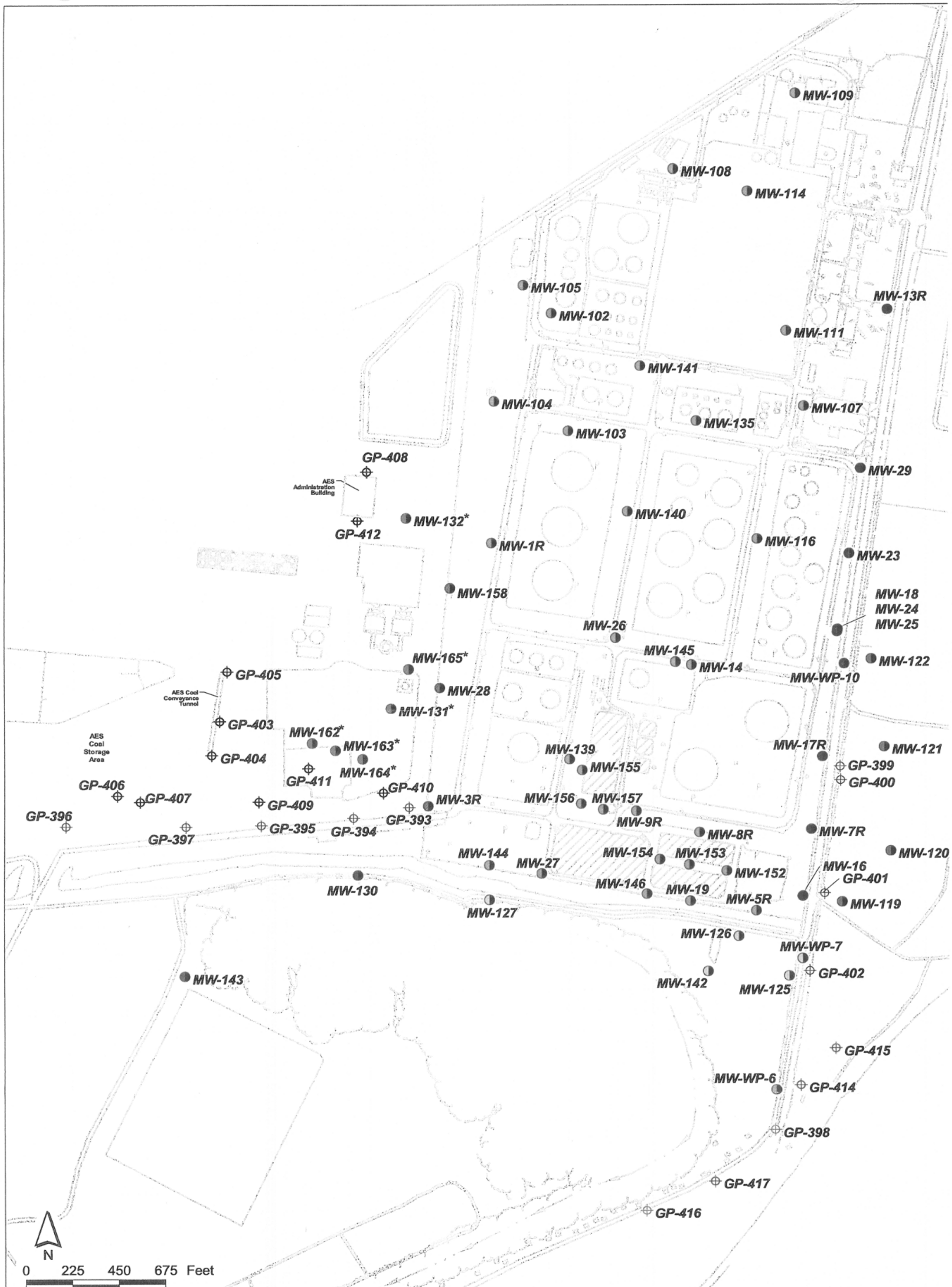
The following attachments have been provided to support this EI determination.

- Attachment 1 - Site/OU Map
- Attachment 2 - Construction Worker Exposure to Shallow Groundwater Sample Locations
- Attachment 3 - Residential Exposure to Shallow Groundwater Sample Locations
- Attachment 4 - Residential Exposure to Deep Groundwater Sample Locations
- Attachment 5 - Construction Worker Exposure to Surface Soils Sample Locations
- Attachment 6 - Industrial Worker Exposure to Surface Soils Sample Locations
- Attachment 7 - Construction Worker Exposure to Subsurface Soils Sample Locations
- Attachment 8 - Construction Worker Exposure to Effluent Channel Surface Water Locations
- Attachment 9 - Trespasser Exposure to Surface Water Locations
- Attachment 10 - Construction Worker Exposure to Sediment in the Effluent Channel
- Attachment 11 - Construction Worker Exposure to Sediment Sample Locations
- Attachment 12 - Trespasser Exposure to Sediment
- Attachment 13 - Summary of Media Impacts Table

Attachment 1 - Site/OU Map

(Source: Final RFI. Phillips Puerto Rico Core Inc., Guayama, Puerto Rico. Prepared by CH2MHILL. Dated July 1999.)





Legend

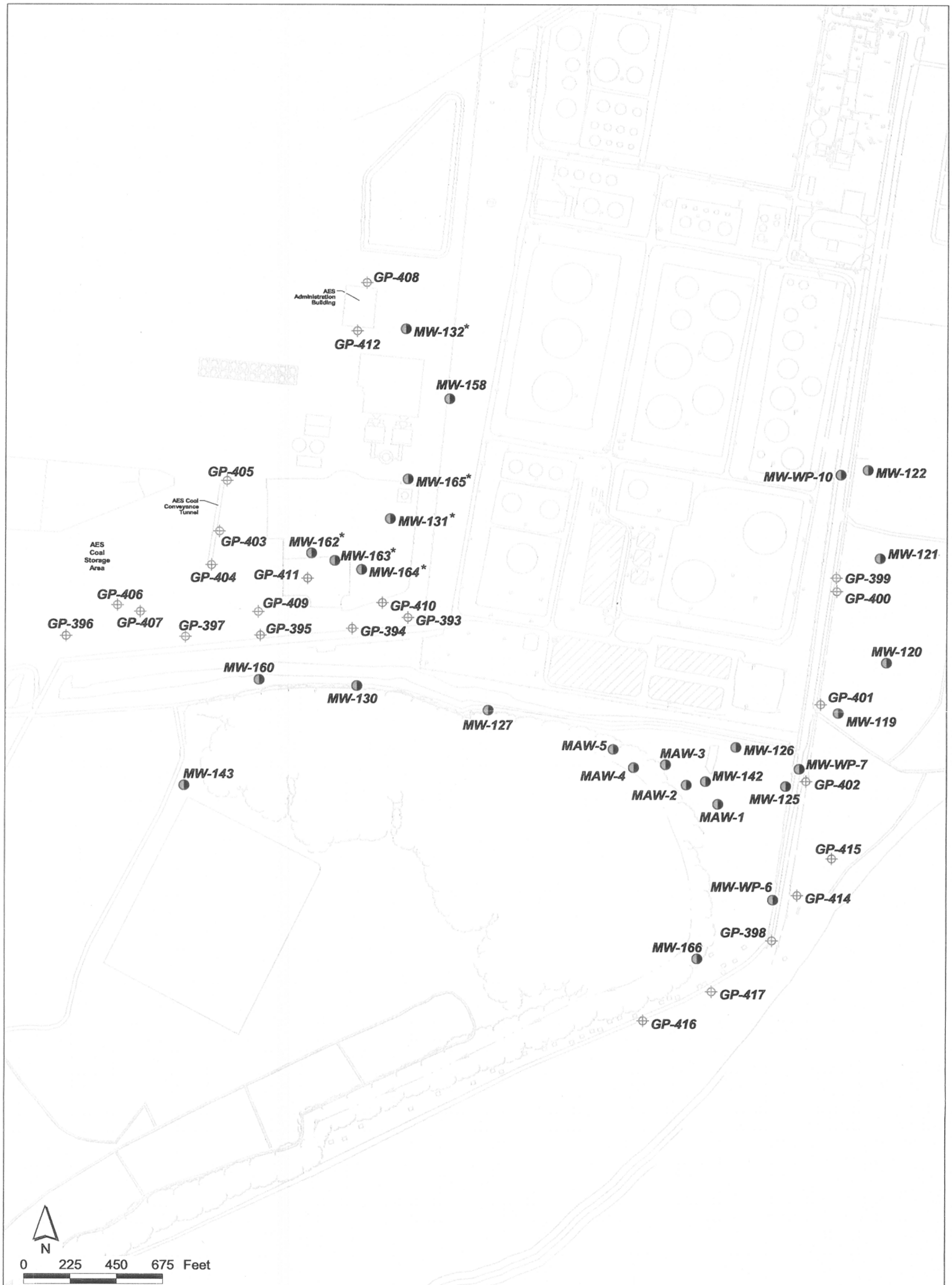
CPCPRC Area	East Boundary	Beach Area
West Boundary Area	West Area	Note:
West Area	AES Area	Indicates Monitoring Well
AES Area	Las Mareas Area	Indicates Temporary Well (Geoprobe Boring)
East Area	Prasa Area	* Well Abandoned November 1999

Chevron Phillips Chemical Company

CPC Puerto Rico Core Inc.

Figure 3-7
Construction Worker Exposure to Shallow Groundwater (CW_GWS) Sample Locations

CA725
Attachment 2



Legend

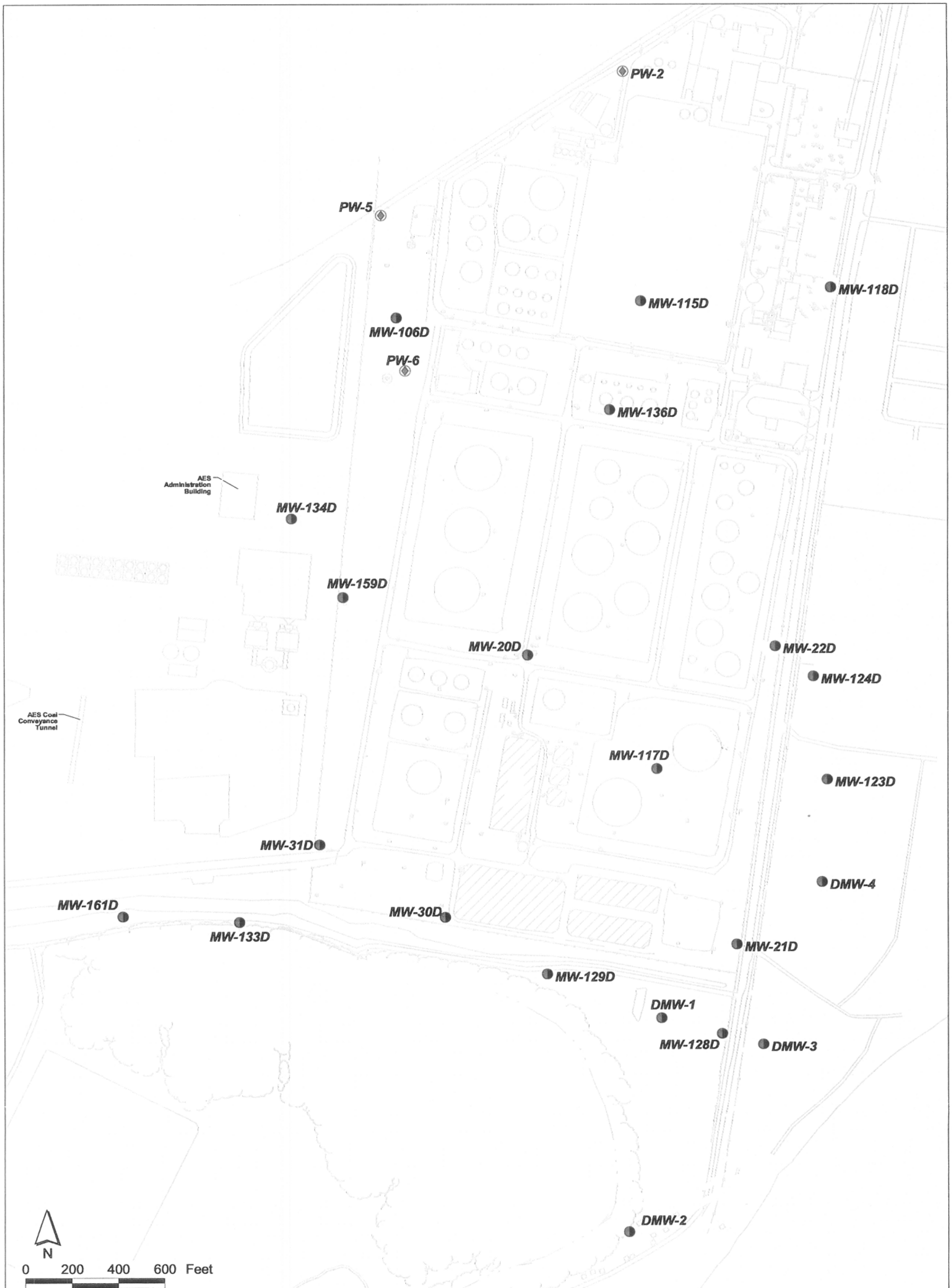
- Monitor Well
- Geoprobe
- * Well Abandoned November 1999

Chevron Phillips Chemical Company

CPC Puerto Rico Core Inc.

Figure 3-13
Residential Exposure to Shallow Groundwater (RES_GWS) Sample Locations

CA725
Attachment 3



Legend

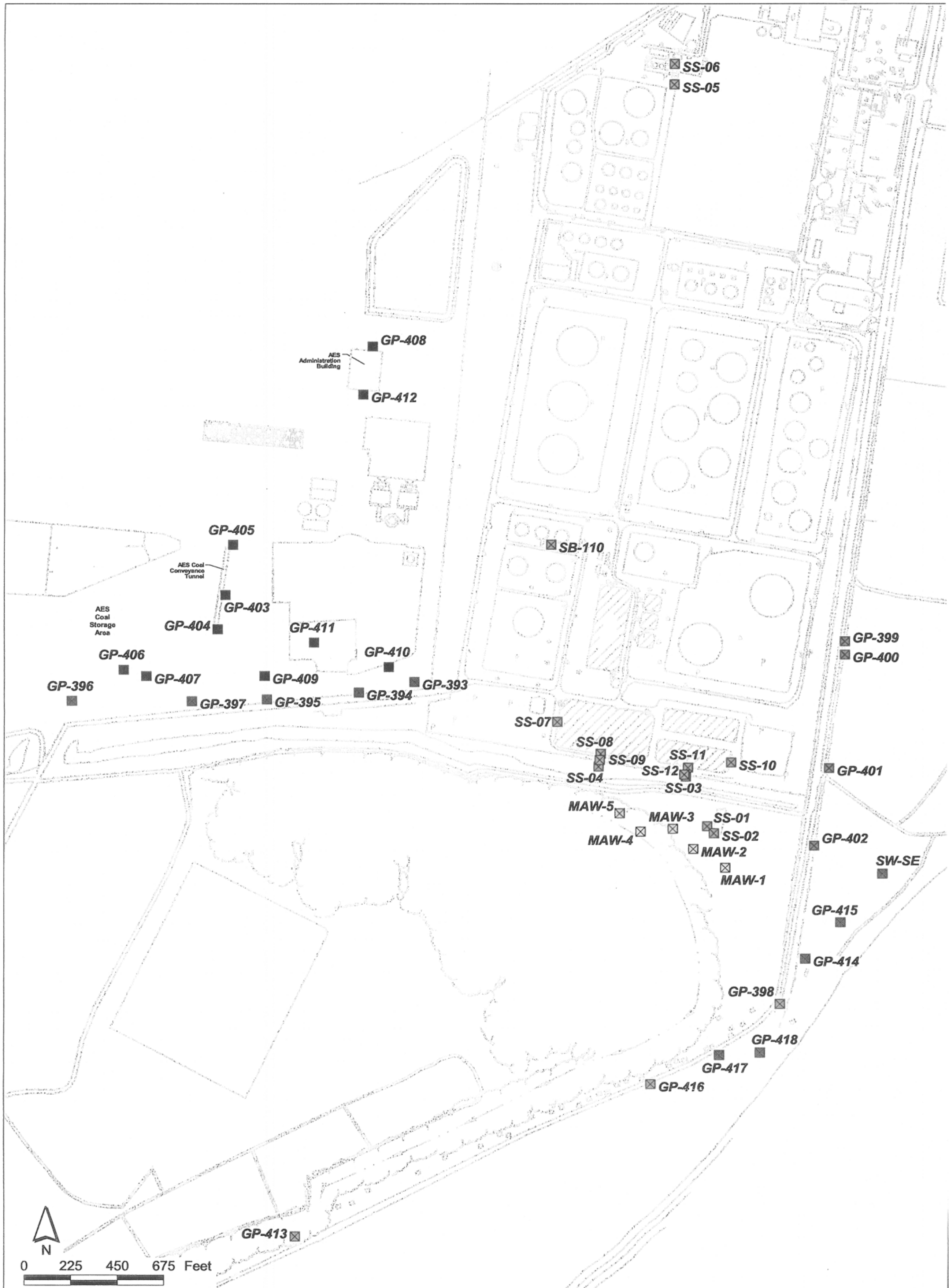
- Monitor Well
- Production Well

Chevron Phillips Chemical Company

CPC Puerto Rico Core Inc.

Figure 3-14
Residential Exposure to Deep Groundwater (RES_GWD) Sample Locations

CA725
Attachment 4



Legend

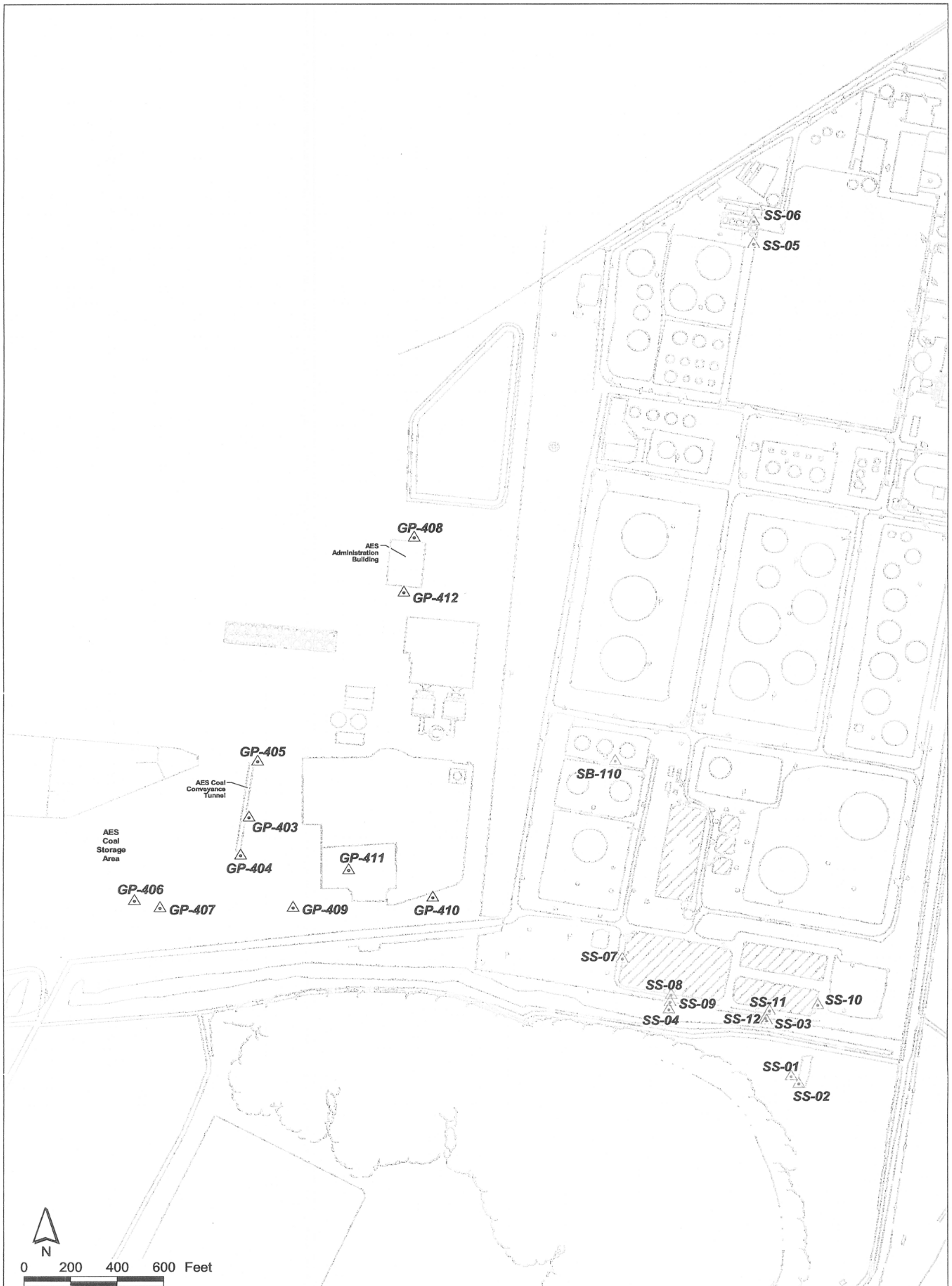
- CPCPRC Area
- West Area
- AES Area
- Beach Area
- Las Mareas Area
- PRASA Area
- South Area

Chevron Phillips Chemical Company

CPC Puerto Rico Core Inc.

Figure 3-5
Construction Worker Exposure to
Surface Soils (CW_SS) Sample Locations
(0 to 2 feet sample interval)

CA725
Attachment S



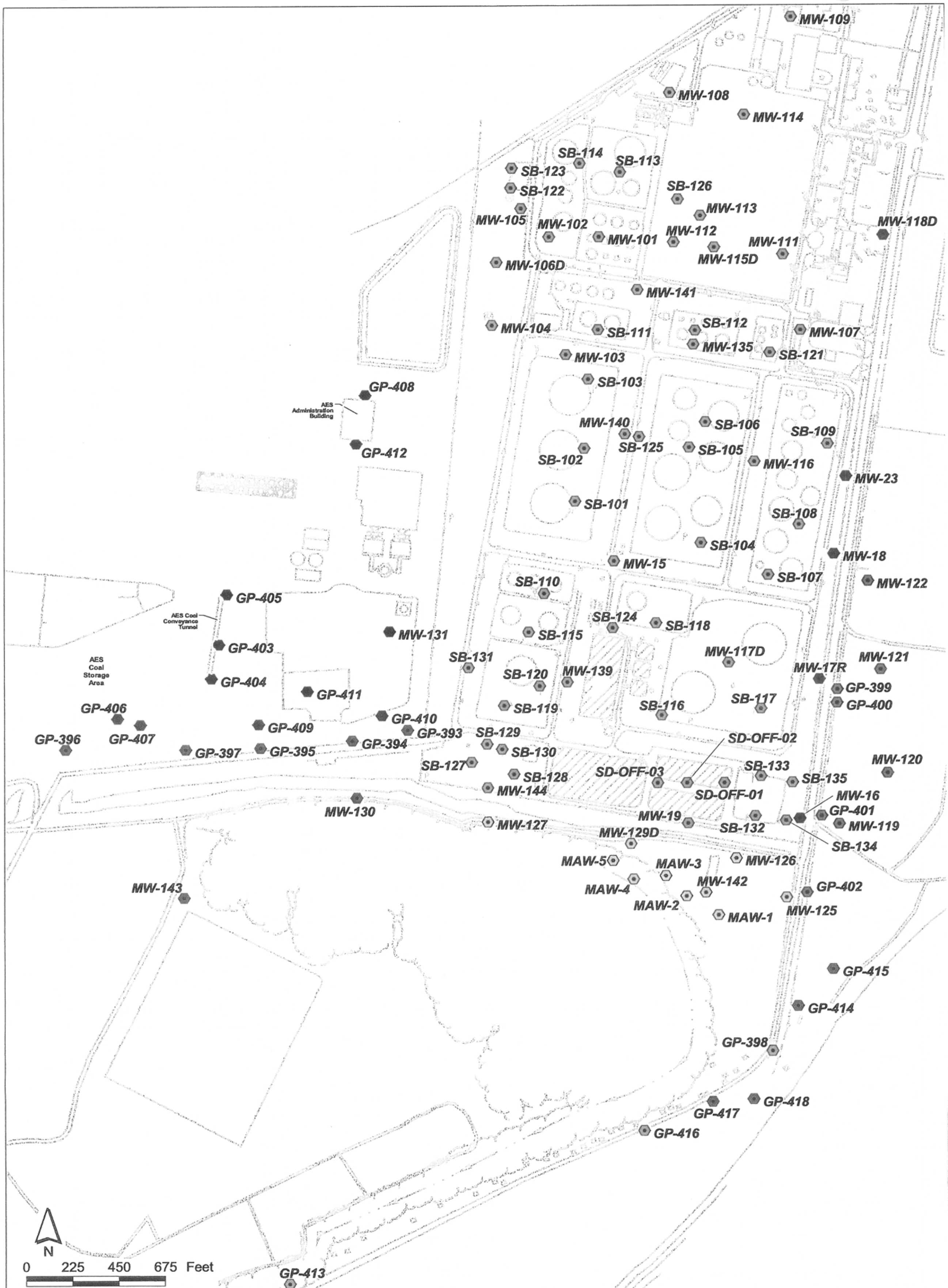
Legend

- AES Area
- CPCPRC Area

CPC Puerto Rico Core Inc.

Figure 3-4
Industrial Worker Exposure to
Surface Soils (IW_SS) Sample Locations
(0 to 2 feet sample interval)

CA725
Attachment 6



Legend

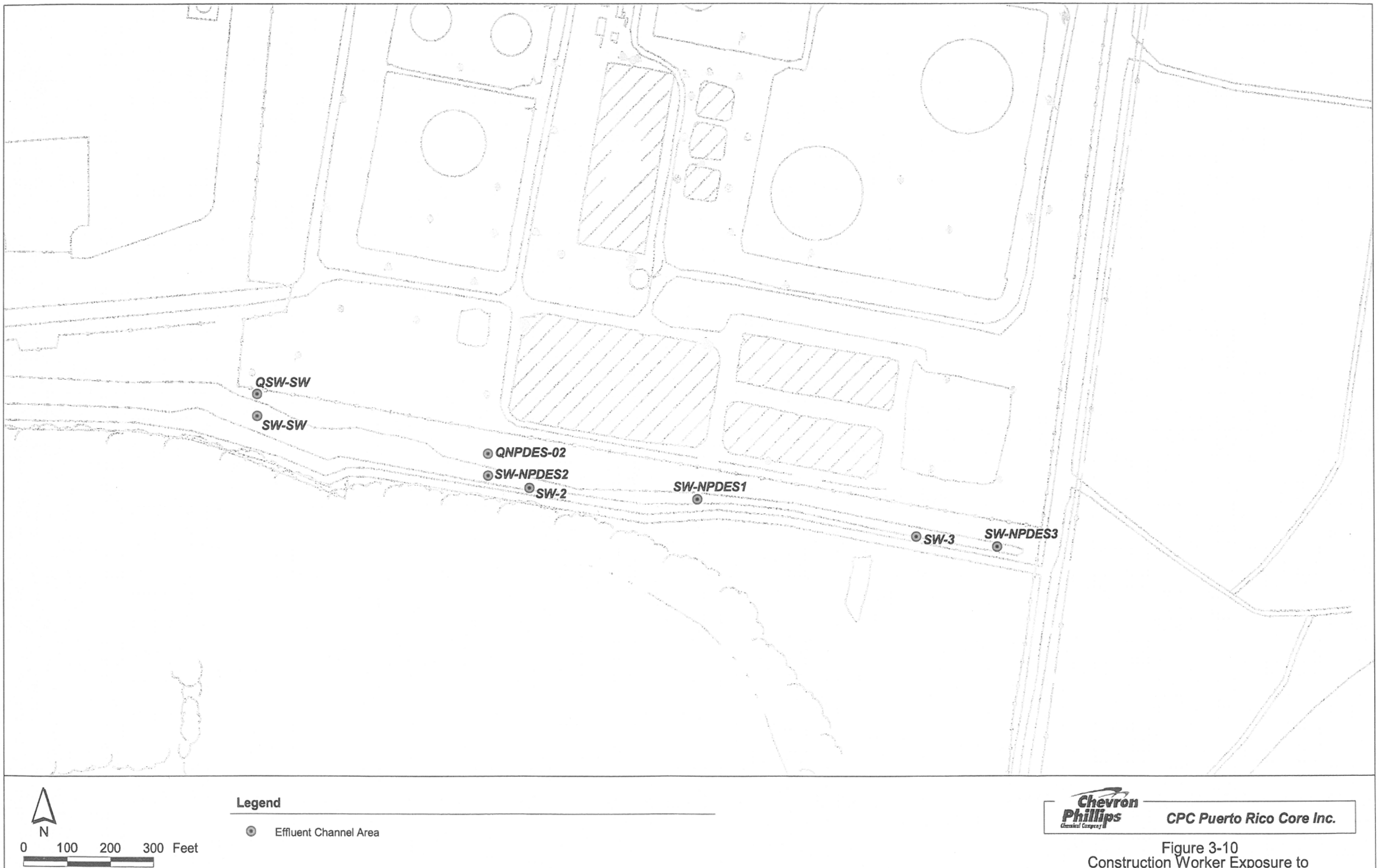
CPCPRC Area	AES Area	Beach Area
West Area	Las Mareas Area	
East Area	PRASA Area	
East Boundary Area	South Area	

Chevron Phillips Chemical Company

CPC Puerto Rico Core Inc.

Figure 3-6
Construction Worker Exposure to
Subsurface Soils (CW_SB) Sample Locations
(> 2 feet sample depth)

CA725
Attachment 7



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CPC Puerto Rico Core Inc.

Figure 3-10
Construction Worker Exposure to
Effluent Channel Surface Water
(CW_EFF_SW) Locations

CA725
Attachment 8

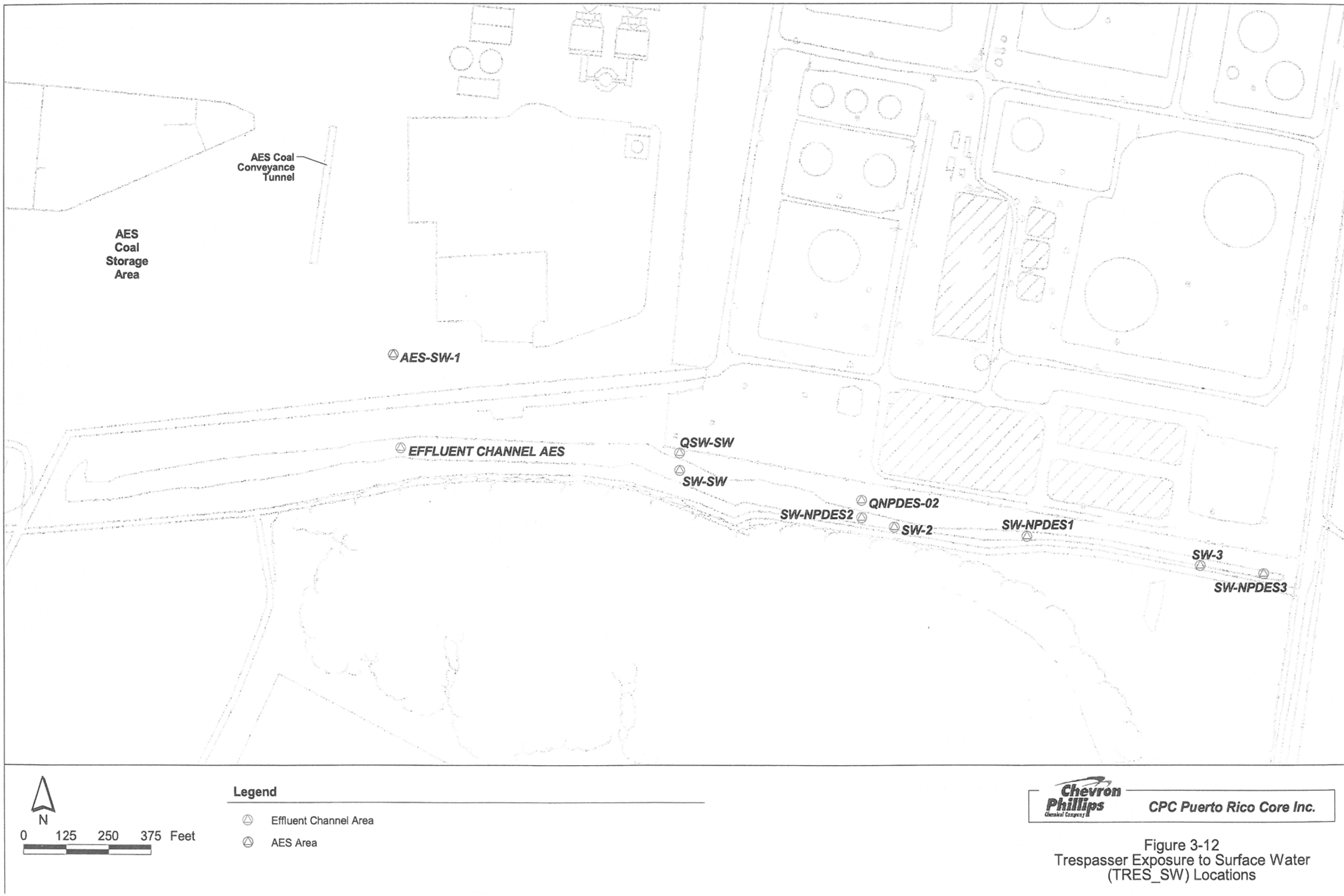


Figure 3-12
Trespasser Exposure to Surface Water (TRES_SW) Locations

CA725
Attachment 9

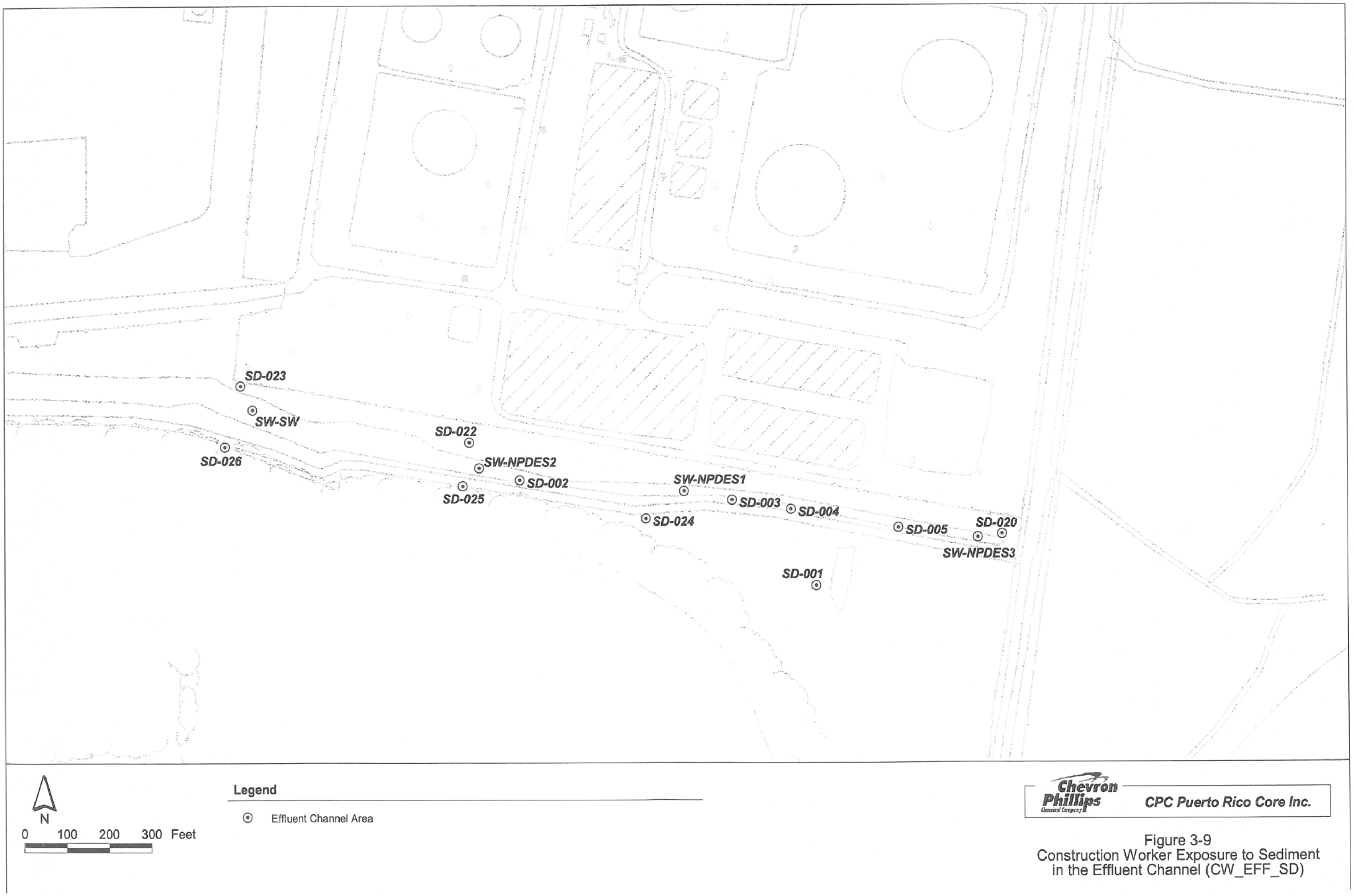
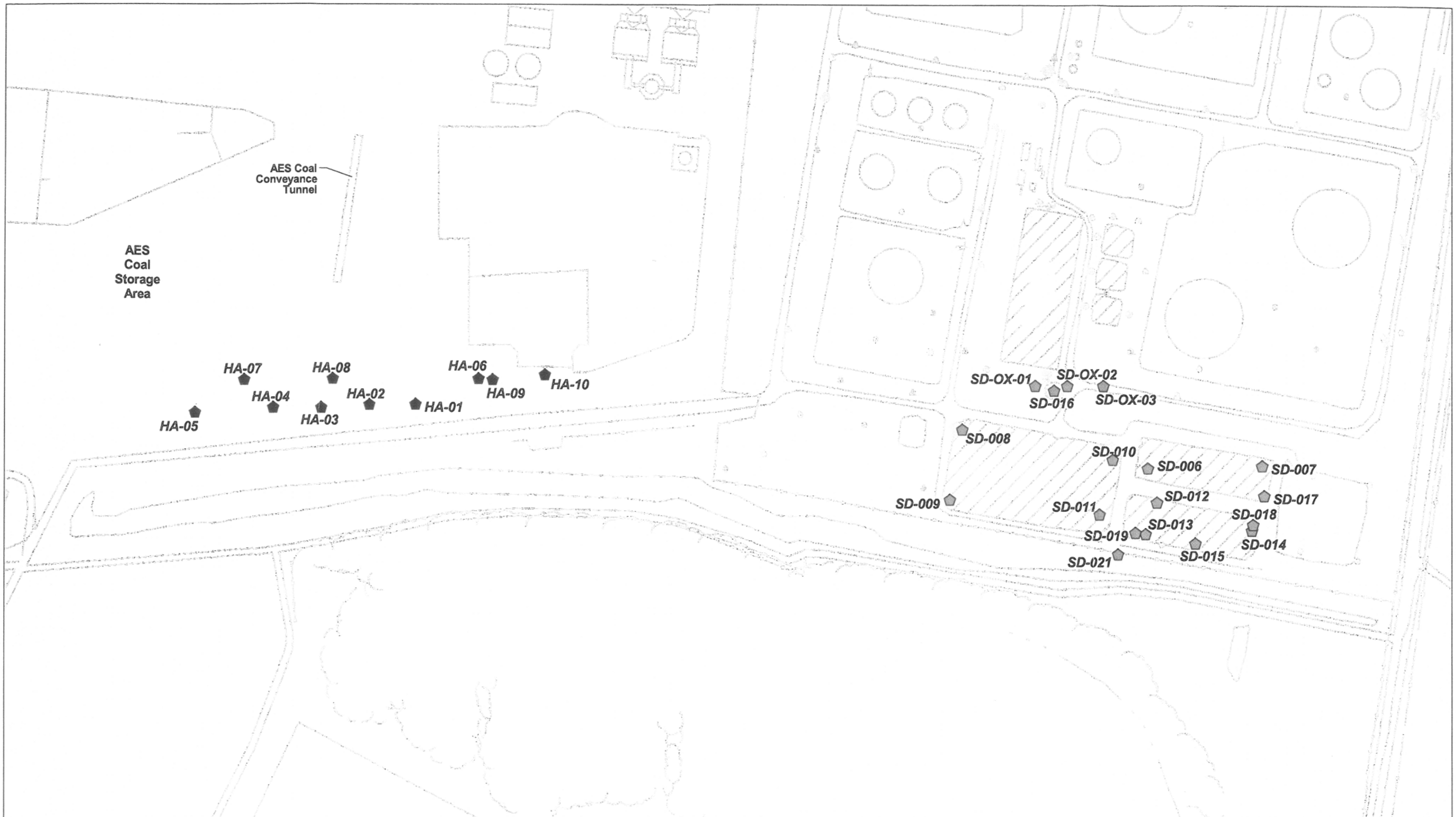


Figure 3-9
Construction Worker Exposure to Sediment in the Effluent Channel (CW_EFF_SD)

CA725
Attachment 10



Legend

- CPCPRC Area
- AES Area
- Harbor Area (Six sediment samples not shown: 3 in the Old Ballast Water Basin, 3 in the New Ballast Water Basin)

Chevron Phillips Chemical Company

CPC Puerto Rico Core Inc.

Figure 3-8
Construction Worker Exposure to Sediment (CW_SD) Sample Locations

CA725
Attachment 11

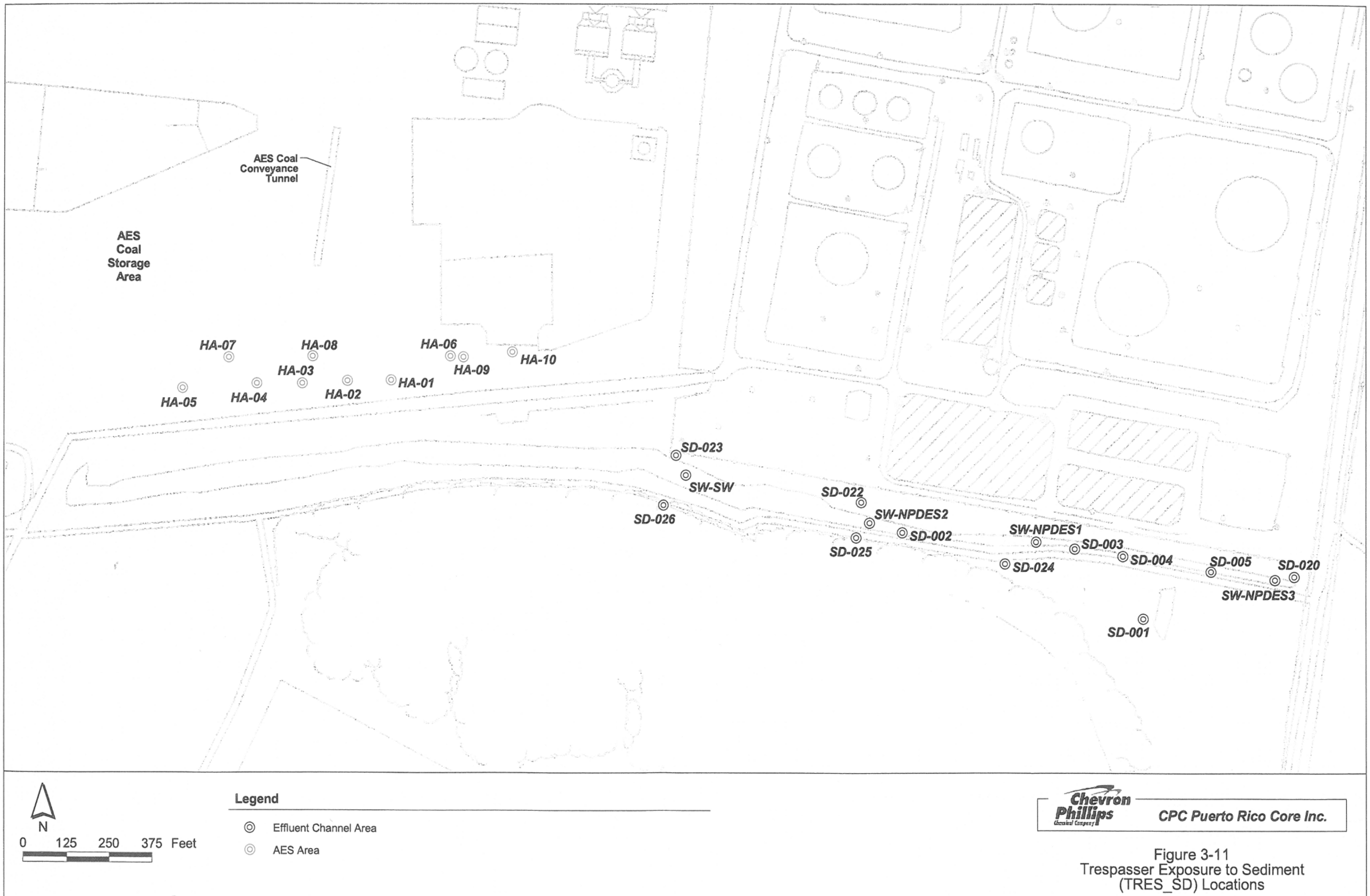


Figure 3-11
Trespasser Exposure to Sediment (TRES_SD) Locations

CA725
Attachment 12

Attachment 13 - Summary of Media Impacts Table
CPCPRC, Inc., Road #710 and State Route #3, Guayama, Puerto Rico 00655

OU	GW	AIR (Indoors)	SURF SOIL	SURF WATER	SED	SUB SURF SOIL	AIR (Outdoors)	CORRECTIVE ACTION MEASURE	KEY CONTAMINANTS
OU 1 - Production Facility	Yes	No	Yes	No	Yes	Yes	No	• Goundwater and possible subsurface soil contamination will be addressed in the CMS.	VOCs, metals, LNAPL
OU 2 - Harbor Facility	No	No	No	No	Yes	No	No	• RCRA Closure Pending	Lead
OU3 - Production Facility Lime Ponds and Sewers	Yes	No	No	No	No	No	No	• Groundwater and possible subsurface soil contamination will be addressed in the CMS.	VOCs, LNAPL
OU4 - Southeast Lime Sludge Management Area	Yes	No	No	No	No	No	No	• Groundwater and possible subsurface soil contamination will be addressed in the CMS.	VOCs, LNAPL
OU5 - Southwest Lime Sludge Management Area	Yes	No	No	No	No	No	No	• Groundwater contamination will be addressed in the CMS.	Metals
OU6 - Scrap Pile Storage Area	Yes	No	Yes	No	No	Yes	No	• Removal of capacitors and soil excavation. • Groundwater and subsurface soil will be addressed in the CMS.	VOCs, SVOCs
OU7 - Land Treatment Area	Yes	No	No	No	No	No	No	• Groundwater and potential subsurface soil contamination will be addressed in the CMS.	VOCs, LNAPL
OU8 - Surface Impoundments	Yes	No	No	No	Yes	Yes	No	• Groundwater, sediment and potential subsurface soil contamination will be addressed in the CMS.	Metals, VOCs, SVOCs
OU9 - Cooling Towers Area	No	No	No	No	No	No	No	No further action	NA

OU	GW	AIR (Indoors)	SURF SOIL	SURF WATER	SED	SUB SURF SOIL	AIR (Outdoors)	CORRECTIVE ACTION MEASURE	KEY CONTAMINANTS
OU10 - Misc. Hazardous Materials Management Area	No	No	No	No	No	No	No	No further action	NA
Effluent Channel	No	No	No	Yes	Yes	No	No	• Surface water and sediment contamination will be addressed in the CMS.	Metals, SVOCs,