Final

SITE INSPECTION REPORT
KEY WEST GAS AND ELECTRIC CO.
KEY WEST, MONROE COUNTY, FLORIDA

EPA ID. No. FLN000410751
FDEP Comet Site ID #303264

Investigation Conducted Jointly By:

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August 16, 2012

EXHIBIT D
#2

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1.0 Introduction

This Site Inspection (SI) report for the Key West Gas and Electric Co. has been prepared by the Florida Department of Environmental Protection (FDEP) Program and Technical Support Section (PTSS). The SI work for this site was conducted pursuant to the authority of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), 42 United States Code (USC) 9601 et seq., as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), Public Law 99-499, and Florida Statutes (FS), Chapter 403. This report was developed, based on an initial Pre-CERCLIS Screening Assessment (PSA), dated January 7, 2011 and an Abbreviated Preliminary Assessment (APA), dated October 31, 2011. The field sampling investigation was conducted the week of February 6-10, 2012 for this SI. FDEP PTSS also consulted with the FDEP South District, regarding past activities at this site. The purpose of the SI is to determine whether this site warrants further CERCLA Superfund action. SI activities included:

- Collecting environmental samples
- Interviewing the property owner and business manager,
- Using health and safety instrumentation during field activities
- Photographing site features and environmental sampling locations
- Preparing sampling and chain of custody documentation
- Collecting and confirming target information to evaluate the site
- Preparing a draft Hazard Ranking System[1] (HRS) score using data gathered during the SI investigation.

2.0 Site Description and History

The former Key West Gas and Electric Co (KWGE) operated a manufactured gas plant (MGP) at this site during the middle to late 1880's. It is situated within Section 6, Township 68S, Range 25E, the site address includes eight adjacent parcels (Parcel #s 13830, 13860, 13870, 13900, 13910, 13950, 13960, 13970) located at the corner of Fort and Geraldine Streets, in Key West, Monroe County, Fl. These addresses include 101-111 Geraldine Street and 709 Fort Street. The approximate geographic coordinates of the site are 24°33'4.23" N latitude and 81°48'17.36" W. longitude [1]. The decimal geographic coordinates are 24.5512 and -81.8048. (Figures 1, 2, 2a & 2b) [1, 4].

On March 18, 1884, the Key West Gas Light Company constructed a manufactured gas plant (MGP), which reportedly used the Oil Gasification (OG) process. This is based on Sanborn Fire

[1] The HRS is the scoring system used by EPA's Superfund program to assess the relative threat, associated with the actual or potential releases of hazardous substances. The HRS is the primary screening tool for determining whether a site warrants further CERCLA Superfund action and is considered for inclusion on the National Priorities List (NPL). The HRS rule and Guidance manual can be accessed via this link http://www.epa.gov/superfund/sites/npl/hrsres/index.htm

Insurance maps from this time period, historical information concerning the City of Key West and the annual Browns Directory for American Gas Companies for the years 1887 and 1889. However, the gas furnished by the company's plant was deemed smoky with inferior lighting power (low BTU value) and the company did not thrive. John Jay Philbrick subsequently acquired controlling interest in the gas company's stock [5, 8, 10, 26, 40].

By 1887, the name of the Key West Gas Light Company had been changed to the Key West Gas and Electric Light Company [8, 23]. In 1889, Philbrick reportedly discontinued the manufacture of gas on the property formerly occupied by the old gas plant and erected an electrical lighting power house, using water-gas or oil-gas to generate electricity, in its place [5, 40]. The Browns Directory for American Gas Companies for the years 1891 and 1892 indicate that crude petroleum was used. Soon after 1890, Philbrick bought an existing ice manufacturing company—established in 1890 in the southeast quadrant of town (on County Road near George Street)—and moved its equipment to the new electrical plant for the purpose of manufacturing ice [5, 12, 40]. The Key West Gas and Electric Light Company ceased operations under that name prior to 1899, possibly during 1898 [24] (Figures 2a & 2b).

The Key West Electric Company was incorporated in 1898 and carried on general electric business at the subject site for the City of Key West [2, 7, 18, 40]. The electrical lighting power plant, also referred to as the Angela Street Diesel plant, included dynamo engines, boilers and oil tanks for the generation of electricity. In 1943, the City of Key West acquired the Key West Electric Company [6, 40]. The electric company was subsequently referred to as the City Electrical System (CES). Most of the Angela Street Diesel plant operations ceased by the late 1960's. However, a high speed diesel generator, located just outside the plant building, operated on-site till the 1970's. The diesel engines were fueled by four diesel fuel ASTs. Tank 1 (27,000 gallon capacity) and Tank 2 (25,000 gallons) were situated in the northwest corner of the site. They were constructed of steel and concrete, respectively. A containment wall surrounded both these tanks. Portions of Tank 2 were below grade. Tank 3 (12,000 gallons), a steel tank, was located near Tanks 1 & 2 in the northern part of the site. Tank 4 (500 gallons) was situated just south of Tank 3. However, based on Sanborn Insurance maps, prior to 1912 and before 1926, six 25,000-gallon capacity crude oil tanks were located along the eastern edge of the site adjacent to Geraldine Street. The fuel from the tanks was subsequently piped into Building via underground piping. A cement groundwater pit, approximately 20 feet deep, was located in the central part of the site near the Plant building. The pit was used for cooling water for the diesel generators. In 2002, the name of the company was changed to Keys Energy Services (KEYS). The former Angela Street Diesel plant building is currently abandoned and in disrepair. The actual area of the former MGP operations is now an electrical substation for KEYS [10, 11, 40, 49].

The City of Key West is the current owner of the subject property. Portions of the site are now occupied by Keys Energy Services (KEYS), the present provider of electricity for Key West [3, 4, 40]. The old abandoned electrical plant occupies the southernmost parcels of the site (Parcels 13950, 13960 & 13970). It is a two story brick building and is in disrepair. The dynamo engines, which utilized diesel fuel, are still visible inside the old plant building. The KEYS substation occupies parcels 13830, 13870 and 13910). The substation consists of transformers, two brick one story buildings, and a concrete block building. One of the brick buildings appears to have been a blacksmith shop. The brick buildings are currently used as a storage shed and machine shop. The concrete block building serves as the control building. All the buildings in the substation area were built after the operation of the MGP. No remnants of the former MGP structures (Retort & Holder tank) were found in the substation area. The holder tank was located in the area of the transformers. A common area, maintained by KEYS, exists outside the substation. A large concrete pad, associated with a former above ground storage tank (AST), occupies the common area adjacent to the old plant building. The site is located within the area of the historic Bahama Village Community Redevelopment Area (CRA) and is located adjacent to the Naval Air Station Key West – Truman Annex [33, 47, 49] (Appendix A).

Operation of the subject MGP predated environmental regulatory authority [5, 14 & 15]. During 9/93, a CERCLA Site Inspection was conducted on property formerly occupied by the Key West Gasification Plant on Catherine Street. However, the latter plant is unrelated to the subject MGP [4, 5, 11, 19 & 25].

2.1 Previous Site Contamination Information

Previous investigations involved contamination assessment activities related to the abandoned Diesel Plant and its fuel storage and distribution system. These activities, conducted from 1991 to 1995, were conducted and monitored under the State of Florida Petroleum Cleanup Programs (FDEP Facility No. 449101950). In July 1995, following successful completion of these activities, a Site Rehabilitation Completion Order (SRCO) was issued by FDEP [59]. The activities included:

- Petroleum Above Ground Storage Tank Removal (Tanks 1-4)
- Tank Content Removal (Diesel fuel and residual petroleum sludge)
- Groundwater concrete Pit abandonment and sealing
- Free-product removal
- Groundwater monitoring via monitor wells
- Soil contamination assessment
- Contaminated soil excavation and removal (near MW-7)
-

However, it should be noted that no assessment activities, directed specifically to the MGP, were conducted. A comparison of the petroleum program related sample locations to the CERCLA sample locations is presented in Figure 4. A detailed summary of the petroleum contamination assessment and cleanup activities is presented in Appendix E of this report.

On April 27, 1992, as part of FDEP search of MGPs in Florida, Metcalf and Eddy provided information regarding MGPs in the State of Florida. One of the MGPs was the KWGE site in Key West [12, 13].

On January 7, 2011, FDEP completed a Pre-CERCLIS Screening Assessment (PSA) on the KWGE site. The PSA documented the site history, potential contaminants of concern and evaluated potential receptors. The PSA noted possible concerns to surface water and sensitive environments from MGP wastes as well as possible soil contamination both on and immediately off-site. Based on these concerns, the PSA recommended a Pre-CERCLIS Screening Assessment with Sampling (PSAWS) [60].

On March 11, 2011, FDEP notified the City of Key West of the PSA and its intent to conduct contamination assessment activities at the site under the CERCLA Superfund program [61] On March 29, 2011, the City of Key West's attorney sent a letter to FDEP requesting a copy of the PSA report and provided a copy of the SRCO regarding the petroleum cleanup at the Abandoned Angela Street Diesel Electric Plant [62]. On April 11, 2011, FDEP notified the City of Key West's attorney that its CERCLA assessment pertained to the former MGP and not the abandoned diesel plant. FDEP also noted that, despite the previous remediation activities, remnant petroleum contamination could not be discounted but would be exempt from CERCLA Superfund action under the CERCLA petroleum exclusion rule (Section 101 [14]) [63]. On October 31, 2011, as part of an upgrade from PSAWS to SI evaluation, FDEP completed an Abbreviated Preliminary Assessment (APA) [64]. The SI QAPP Work plan for the site was finalized January 27, 2012 [65].

2.2 Historical Sanborn Insurance Map and Aerial Photography Review

FDEP conducted a review of the years 1892, 1899, 1912, 1926 and 1948 Sanborn Insurance Maps of the site area. The 1889 Sanborn Insurance map did not include the site. In addition, the aerial photographs for 1959, 1963, 1971, 1985, 1994 and 2009 were reviewed [2, 10, 11, 35] (Figure 2a; Appendix D).

- 1892 Sanborn, The actual MGP consisted of a Retort Room and Gas Holder. The electrical lighting power house, which consisted of dynamo engines and boilers, occupied the southwestern and southern parts of the site. A number of unidentified buildings were associated with the operation. Government Slip, a water body, is visible across Fort Street southwest of the site in this and the 1889 Index Key map. Standard Oil Co and tanks visible on east side of Geraldine Lane across street from former MGP.

- 1899 Sanborn, After operation of the MGP, the Gas Holder was being used as a cistern. The Retort is still present. Standard Oil Co and tanks still visible on east side of Geraldine Lane across street from former MGP.

- 1912 Sanborn, The Retort is gone. The electrical lighting power house still present. Six 25,000-gallon crude oil above ground storage tanks (ASTs) are located along the eastern edge of the site near Geraldine Lane. Two elevated 500-gallon ASTs are situated adjacent to the electrical lighting power house. Oil House situated just north of the two 500-gallon ASTs. Former Gas Holder apparently used as Stock Room. A Machine Shop and Blacksmith Shop located in northern and central parts of site, respectively. Government Slip, a water body, has been filled in and is now part of the Government Reservation. Standard Oil Co and tanks still visible on east side of Geraldine Lane across street from former MGP.

- 1926 Sanborn, Similar to 1912. A new rectangular cistern replaces former Gas Holder tank and Stock Room. Standard Oil Co and tanks gone from east side of Geraldine Lane across street from former MGP.

- 1948 Sanborn, The six 25,000-gallon crude oil ASTs formerly located along the eastern edge of the site near Geraldine Lane are gone. However, two Oil Tanks (concrete [square]

& iron [round]), surrounded by 4-foot concrete wall, are situated in the northwest part of the site. Oil House and Machine Shop have been converted to storage. Cistern is still present. The electrical lighting power house building still present. Residential homes situated on former Standard Oil Co.

- 1959 Aerial, The two Oil Tanks (concrete & iron-Tanks 1 & 2) are visible in the northwest part of the site. Storage Buildings, Blacksmith Shop and Cistern still visible. The electrical lighting power house building still present.

- 1963 and 1971 Aerials, Similar to 1959 aerial.

- 1985 Aerial, Similar to 1971 aerial. Poor resolution. Part of site obscured in deep shadow from the electrical lighting power house building. Some structures visible in the future area of the transformers and power grid area.

- 1994 Aerial, Electrical Substation structures visible. Portions of the two elevated 500-gallon ASTs visible on north side of plant building. The two Oil Tanks (concrete & iron-tanks 1 & 2) formerly located in the northwest part of site are gone.

- 2009 Aerial, Electrical Substation structures visible. Northern Storage Building and former Blacksmith Shop visible. Cistern gone. The electrical lighting power house building still present.

2.3 Typical MGP Operations and Waste Characteristics

OG MGPs typically produced a relatively high quality of gas (approximately 1,000 BTU/Cu. Ft) that was rich in methane, ethane, hydrogen and light hydrocarbons. This gas was produced by the pyrolysis of naphtha and heavier petroleum oils. Feedstocks at OG MGPs included kerosene or diesel oil, including Bunker C fuel oil. A single shell or double shell apparatus, utilizing checkerboard brick, was commonly utilized. The production of the gas involved several cycles which included the injection of air, heating with air and oil and injection of high pressure steam and oil. Following the steam purge, the gas was usually routed through iron oxide purifiers for the removal of hydrogen sulfide (H_2S). The gas was then placed into a Gas Holder for distribution to area customers. Toxic, persistent and bio-accumulative wastes, including tars, lamp black, polycyclic aromatic hydrocarbons (PAHs), benzene, metals, aqueous ammoniacal liquor and hydrogen cyanide, are common contaminants at MGP sites. Based on the literature, OG waste types typically included Lamp Black, Iron Oxide Box wastes with ferri-ferrocyanides, sludges, tars, pitch and some ash. The ash often contained vanadium and nickel compounds. Tar yields at OG MGPs ranged from 2 gallons per thousand cubic feet (gal/MCF) for light oil feedstocks to over 4 gal/MCF for heavy oils. MGP wastes were routinely disposed at or near such plants as a matter of convenience [26, 33, 34].

2.4 Site Ownership

The City of Key West currently owns all the parcels of the site. A KEY is owned by the City of Key West and operates an electrical substation at the site at parcels 13910, 13870 & 13830. The KEYS administration offices are located at 1001 James Street, Key West, Florida [4, 40].

Figure 1:
Key West Gas & Electric Company Site Vicinity Map
101-111Geraldine Sreet / 709 Fort Street
Key West, Monroe County, Florida 33040
(Aerial Imagery 2004-2009)
Prepared by: B.K. McClain Date: 12/8/2010

⊗ Key West Gas & Electric Company Site Location
Radius Buffer
0 750 1,500 3,000 Feet

Figure 2:
Key West Gas & Electric Company Site Vicinity Map
101-111Geraldine Sreet / 709 Fort Street
Key West, Monroe County, Florida 33040
(2009 Aerial Imagery)
Prepared by: B.K. McClain Date: 12/8/2010

Key West Gas & Electric Company Site Location
Site Boundary

0 250 500 1,000 Feet

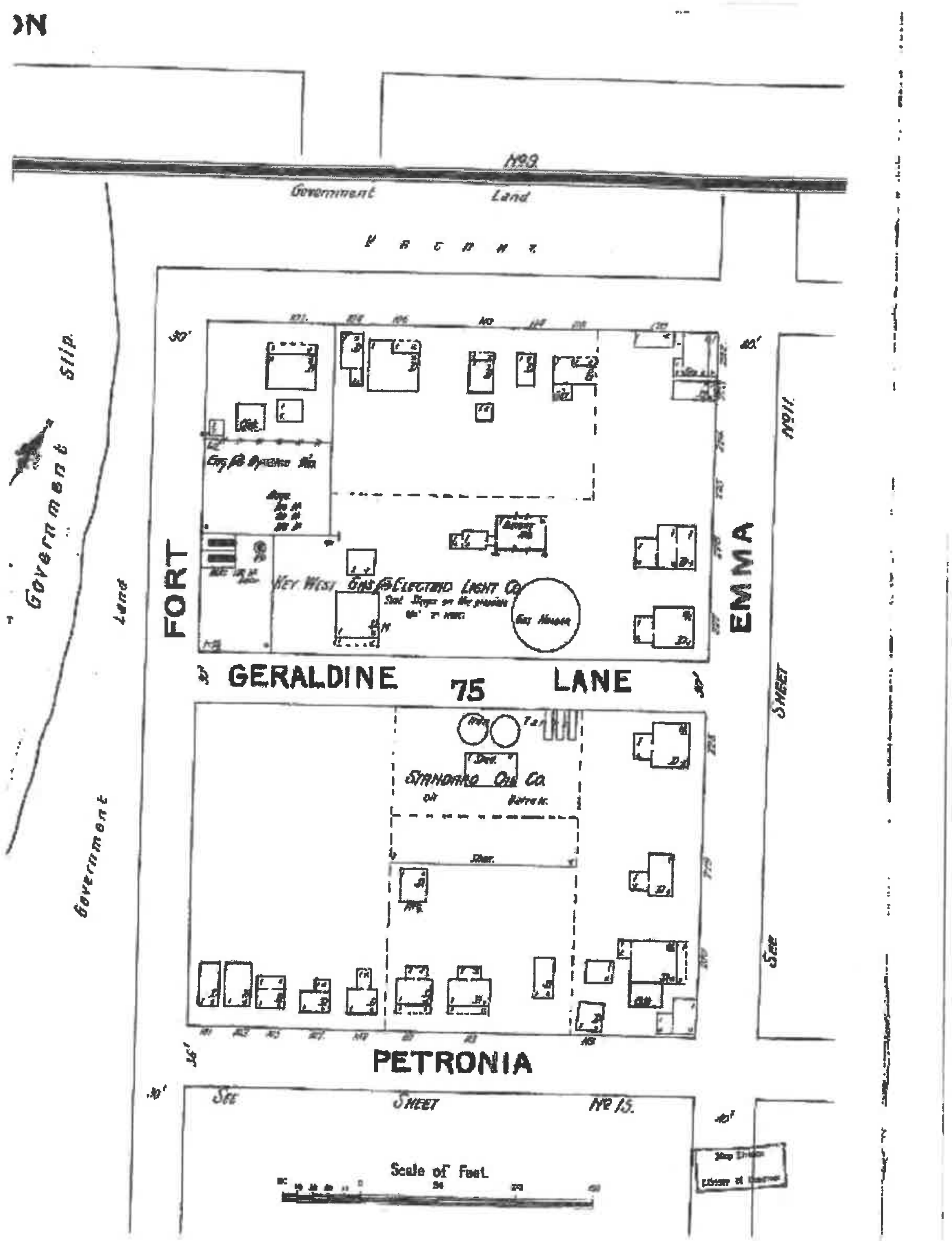


Figure 2a 1892 Sanborn Insurance map

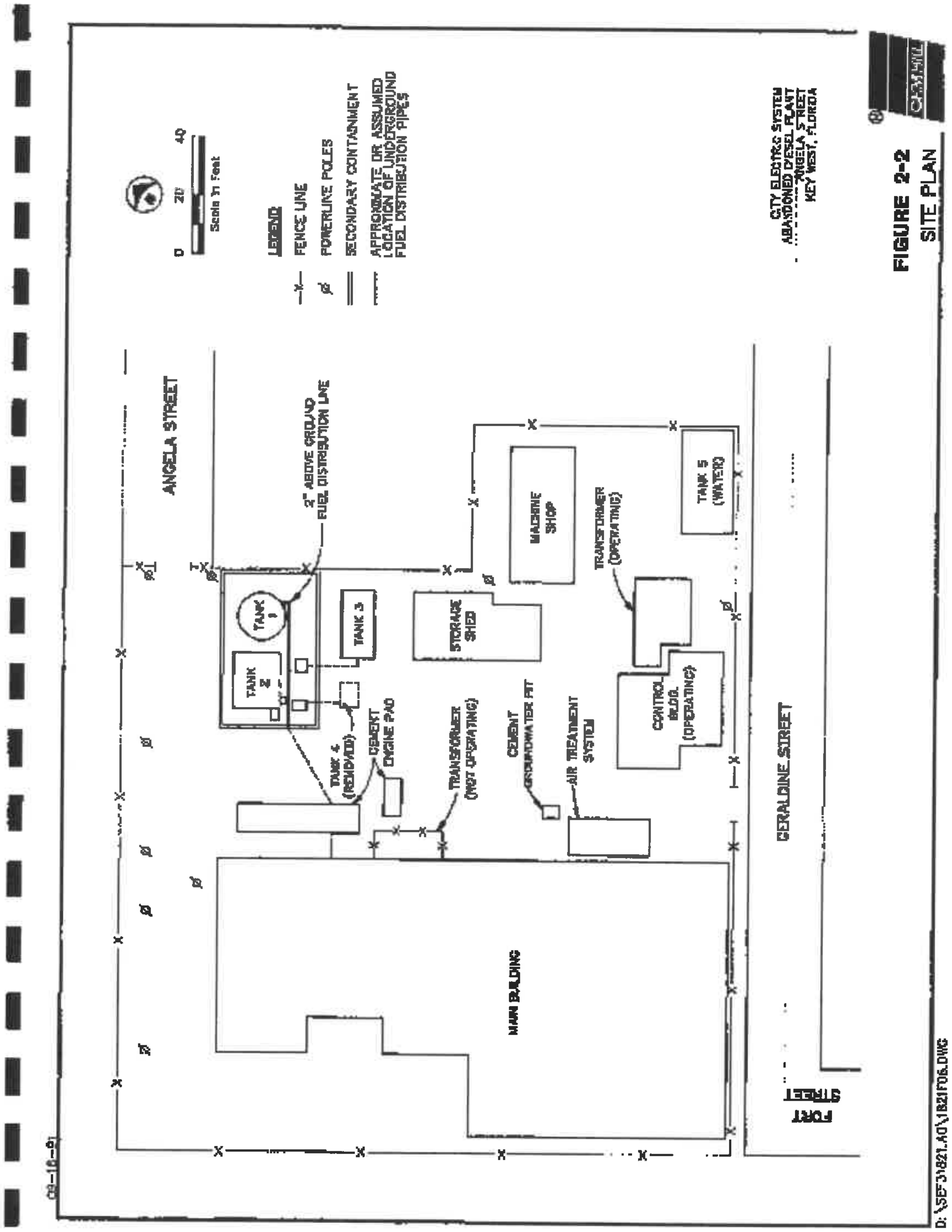


Figure 2b KEYS Substation Layout Circa early 1990s

3.0 Regional Geology and Hydrogeology

Key West is located in the Oolite Keys geomorphologic feature of the Southern or Distal Zone geomorphologic province. The lower Florida Keys are an extension of the same oolitic limestone lithology underlying Miami and much of southeastern Florida. The Keys represent coral reef colonies which built up during the Pleistocene Epoch as a result of fluctuations in sea level. The last major drop in sea level exposed the ancient reefs which make up to Keys today [20, 32, 36, 37].

The Pleistocene age deposits underlying the site include, in descending order, the Miami Limestone (Miami oolite) and the Key Largo Limestone. The Pleistocene deposits are underlain, in descending order, by the Hawthorn Group (Miocene age) and the Suwannee Limestone (Oligocene age) [20, 32, 36, 37].

The Miami Limestone (5 to 35 feet thick) is composed of white-cream to pale orange, crystalline, granular, and porous to cavernous oolitic limestone. The ooliths may be up to 2.0 mm in diameter. The existence and plenitude of corals and other marine fossils indicates deposition in a marine environment. The oolitic limestone is honeycombed with solution holes, giving it an extremely high permeability. Porosity generally increases with depth. The solution holes may connect with channels open to the ocean. This interconnection would allow for interchange of rainwater to the ocean and sea water into the oolitic limestone. The oolitic limestone in Key West extends to a depth of about 200 feet [20,32,36,37].

The coralline Key Largo Limestone underlies the Miami Limestone in the lower (oolite) keys. The Key Largo Limestone is a white to tan limestone, consisting of lime-sand, coral skeletal remains and invertebrate shells, marine plant and algal debris. The thickness of the Key Largo Limestone varies irregularly from 75 feet to over 200 feet [20, 32, 36, 37,38].

The Hawthorn Group includes the Arcadia and Peace River Formations. The Hawthorn Group consists primarily of interbedded carbonates (limestone, dolostone), quartz sands and clays. The Hawthorn is considered to be a confining unit and is approximately 900 feet thick in the Key West area. The Suwannee Limestone is composed of highly fossiliferous, cream colored limestone and is found approximately 1300 feet bls in the Key West area [20, 32, 36, 37].

The Miami and Key Largo Limestones together comprise the surficial aquifer system on the island. A freshwater lens exists on the western half of the island. No measurable fresh water lens exists in the eastern half of the island due to extensive areas of artificial fill. A fresh groundwater lens exists on top of the saltwater due to the density differences The lens exists under water-table conditions and is found between 5 to 8 feet bls in the site area. The water-table fluctuates and the shape of the lens changes due to tidal effects. Precipitation is the primary type of recharge to the fresh water lens. The lens is approximately 5 feet thick (less than 250 mg/L chloride) in the center of the island. The freshwater head is greater in the center of the island where land surface elevations are higher. Ground water moves from the center of to lens and discharges along beaches and salt ponds. Based on regional flow patterns, the surfical aquifer flow in the site area is to the southwest [20, 32, 36, 37].

The surficial aquifer system in Key West is generally not considered to be an adequate or reliable source of potable water. As stated earlier, due to density differences, a small freshwater lens floats on top the salt water. The freshwater lens on Key West has chloride concentrations varying from zero to 250 milligrams per liter [mg/l]. It is underlain by a number of successively deeper transition zones. These transition zones become progressively more saline with depth and include a very slightly saline water zone (250-400 mg/l), a slightly saline water zone (400-1,500 mg/l), a moderately saline water zone (1,500-5,000 mg/l) and very saline water zone (5,000-19,000 mg/l). The water table has been known to fluctuate from 0.8 feet above mean sea level [MSL] to 2.4 feet above MSL near the center of Old Town. Tidal effects greatly influence the depth to water table and configuration of the freshwater lens. The freshwater lens averages about 5 feet in thickness in the center of the western half (Old Town) of Key West. The thickness and amount of the freshwater is dependent on precipitation, discharge to the ocean, evapotranspiration and withdrawal. It is underlain by a freshwater-saltwater mixture. This mixture extends to a depth of about 40 feet deep in the center of the island. The salt-water interface (19,000 mg/l chloride) exists around this depth. A number of private wells may tap the fresh-water lens in the western half of the island. Most of them are used primarily for irrigation purposes. However, Florida Keys Aqueduct Authority (FKAA) and Monroe County Health Department (MCHD) report that an undetermined number of residents on the island refuse to hookup to the FKAA water lines and use private wells for potable water [16, 18, 19, 32, 34, 35, 36, 37, 49]

The Suwannee Limestone forms the upper part of the Floridan aquifer system in south Florida. This aquifer exists under artesian conditions. Water in this aquifer is saline and unsuitable as a potable water source [32, 33, 34, 43, 44].

3.1 Site Specific Geology and Hydrogeology

A number of borings were conducted as part of the Key West Gas and Electric SI. Gravel and brown, fine sand were encountered in the shallow portion of the aquifer. Some of this shallow material appeared to be fill material. "Cap rock", a local term, and tan limestone were encountered in a few of the borings between depths of 12 to 24 inches. Gray crushed limestone, fine sand and some oolitic limestone was encountered between the depths of 24 to 45 inches. However, in some places a light tan or brown sand was encountered at the same depth intervals. A USGS Core (MO-155) from the center of the island near White Street consisted of vary pale orange, oolitic limestone from land surface to a depth of 40 feet. Numerous vugs and caverns were found in the core. Abundant corals (*Monastrea sp*), worm borings and mollusks were observed in the lower portions of the core. The water table at the site was encountered between 3.7 and 4.5 below ground surface [32; Appendix B].

3.2 Climate

The climate of Key West is categorized as Tropical Savannah. The average temperatures at the Key West Weather Bureau weather station ranged from 89.5° F in the summer (August) to 75.3° F during the winter (January). The temperature rarely gets below 50° F. The average annual rainfall in the area is 38.94 inches per year. The heaviest amount of rainfall (53%) occurs between May and October during the islands wet season. Numerous showers and summer thunderstorms account for most of the rainfall. Infrequent tropical storms and hurricanes, migrating from the Atlantic

Ocean and Florida Straits, also occur during this period. The 2-Year, 24 Hour rainfall value is approximately 5 inches [41, 42].

4.0 Potential Receptors

4.1 Groundwater Migration Pathway

The vast majority of Key West residents are provided drinking water by the Florida Keys Aqueduct Authority (FKAA). The water is drawn from a Florida City, Miami-Dade County well field. This well field is situated on the mainland more than 100 miles from Key West. The water is piped to Key West via a 130 mile long transmission main. This system supplies water to approximately 30,000 people in the Key West area. In addition, in the event of an emergency or pipeline disruption, the FKAA maintains two reverse-osmosis (RO) WTPs on Stock Island and Marathon, respectively. The two RO WTPs extract salt water and produce freshwater. The water for the Kermit H. Lewis RO facility on Stock Island RO is derived from two 24-inch "seawater wells", Well #1 & Well# 2, located adjacent to the plant on the southern part of Stock Island. These wells range in depth from 102 to 110 feet are located approximately 4.5 miles east-northeast of the site. The RO plants serve as an emergency source of 3 million gallons per day (MGD) of potable water to the middle and lower Keys [9, 43, 44]. No other community or non-community wells systems were identified within the 4-mile Target Distance Limit (TDL).

The FKAA and Monroe County Health Department have reported that a number of unpermitted private wells exist in Key West [32]. These wells tap the fresh-water lens present on the island. The aqueduct water is utilized for cooking, bathing, and drinking purposes. The private wells are generally used for flushing toilets, washing clothes and lawn irrigation. A FKAA official has reported that as many as 2,000 private wells exist in the Key West area. However, only a few of these wells are used for drinking water purposes. Based on this information, the groundwater migration pathway is not a major pathway of concern.
A summary of drinking water well systems within 4-miles of the site is presented in Table 1.

Table 1
Estimated Number of Potable Wells and Population Served
Key West Gas and Electric
Key West, Monroe, Florida
Surficial aquifer (AOC)
(# wells/Population served)

Well Type	0-1/4	1/4-1/2	1/2-1	1-2	2-3	3-4
FKAA[1]						
Community/non community	0/0	0/0	0/0	0/0	0/0	0/0
[2]Private	0/0	0/0	0/0	0/0	0/0	0/0
Totals	0/0	0/0	0/0	0/0	0/0	0/0

Total Estimated Population served by wells located within 4 miles = 0
Key:
AOC=Aquifer of Concern
TDL=Target Distance Limit
Footnotes:

[1] Key West residents and businesses are provided drinking water by the Florida Keys Aqueduct Authority (FKAA). The water is drawn from a Florida City, Miami-Dade County well field. This well field, which consists of ten Biscayne aquifer (60-80 feet deep) and four Floridan aquifer wells, is situated on the mainland more than 100 miles from Key West. In the event of an emergency or pipeline disruption, the FKAA maintains two reverse-osmosis (RO) WTPs on Stock Island and Marathon, respectively. The two RO WTPs extract salt water and produce freshwater. The water for the Kermit H. Lewis RO facility on Stock Island RO is derived from two 24-inch "seawater wells", Well #1 & Well# 2, located adjacent to the plant on the southern part of Stock Island. These wells range in depth from 102 to 110 feet.

[2] The FKAA and Monroe County Health Department have reported that a number of unpermitted private wells exist in Key West. These wells tap the fresh-water lens present on the island. A FKAA official has reported that as many as 2,000 private wells exist in the Key West area. However, only a few of these wells are used for drinking water purposes.

4.2 Surface Water Migration Pathway

This site is located approximately 8 feet above National Geodetic Vertical datum (NGVD) [1]. According to the FEMA floodplain map, the site area is located within the 100-year floodplain zone [27] (Figure 1). Based on field observations, it appears that the site slopes gently to the south and southeast (Appendix D). Storm water runoff from the site area is collected by a catch basin situated near the intersection of Geraldine Street and Fort Street. According to the City of Key West Storm water drainage map and conversations with the City of Key West Storm water division, water collected in this catch basin is routed south down Fort Street, through Navy property and discharges via a permitted outfall pipe situated 60 to 80 feet out into the Florida Straits. The distance from the catch basin to the end of the outfall pipe is approximately 2,250 feet [39] (Appendix D). Surrounding marine waters (≥ 34 ‰) [21] of the Gulf of Mexico and Florida Straits are unsuitable for potable use.

Recreational fisheries supported by the Gulf include red snapper, Florida pompano, snook, bluefish, permit, bonefish, great barracuda, and silver perch. An exclusively commercial fishery for white mullet has also been identified within the Gulf. Gulf species, exploited both as sports and commercial fisheries, include the stone crab; pink. brown and white shrimp; spiny lobster; king mackerel; Cero; mutton, gray, lane, and yellowtail snappers; red grouper; grunt; and Crevalle jack [22].

The off-shore waters are habitats for the Federally-designated endangered Green sea turtle (Chelonia mydas mydas), the Leatherback sea turtle (Dermochelys coriacea), Kemp's Ridley sea turtle (Lepidochelys kempii), the Hawksbill sea turtle (Eretmochelys imbricata) and West Indian manatee (Trichechus manatus latirostris). The Federally-designated threatened Atlantic Loggerhead sea turtle (Caretta caretta) has also been identified as an inhabitant of the Keys. In addition, the Key West National Wildlife Refuge borders the western end of Key West [28, 29, 30, 31, 45, 48].

Based on the available information, prior to the SI, the surface water migration pathway was deemed to be the major pathway of concern at this time

4.3 Soil Exposure and Air Migration Pathways

The site now consists of the abandoned Angela Street Diesel plant and the KEYS electrical substation. The site is surrounded by a maintained 6-foot, barbed wire top chain link fence. Site access is further restricted by a locking sliding gate. The substation is periodically maintained by KEYS employees. Residential properties bound the northern and northwestern parts of the site. No schools or day-care center were identified near the site [46, 60, 61]. Based on this information, the soil exposure and air migration pathways were not deemed to be a major concern.

5.0 Scope of Work and Methodology

Based on the available information and the findings of the PSA and the APA, the surface water migration pathway was identified as the primary pathway of concern. This assessment focused on 1). Obtaining on-site soil samples for laboratory analysis; 2). Installation of temporary monitor wells; 3). Collection of groundwater samples from the temporary monitor wells for laboratory analyses; 4). Collection of a sediment sample from the nearby storm drain for laboratory analysis and 5). Collection of sediment samples were from the Florida Straits adjacent to the Fort Street outfall for laboratory analysis. The purpose of sampling was to determine whether potentially contaminated areas of the site were impacting soils and/or surface water. However, groundwater samples were also collected to assess possible impacts to the shallow fresh water lens. The work for the assessment was jointly conducted by the FDEP PTSS in Tallahassee and the EPA Region 4 Science and Ecosystem Support Division (SESD) personnel out of Athens, Georgia. FDEP PTSS, EPA Region 4 and EPA Region 4 SESD mobilized to the site Tuesday February 7, 2012. The fieldwork for this investigation was completed Friday February 10, 2012.

FDEP and EPA work together. It is important to note that EPA is not a contractor responsible for a certain aspect of the job. FDEP and EPA work as a team with committed and shared responsibilities. As part of that committed and shared effort, SESD provided: 1) The necessary equipment and containers to collect the soil and groundwater samples. 2) A Health and Safety Plan for the site. 3) A sample custodian to maintain the Sample Chain-of-Custody (SCRIBE); & 4) assistance with packaging and shipping samples to the EPA SESD and/or Contract Laboratory Program (CLP) Laboratories for subsequent sample analysis. FDEP secured site access, completed a site sampling Plan and Quality Assurance Project Plan (QAPP), cleared underground utilities, provided photo documentation resources and assisted in the field sampling activities. FDEP assessed the data and completed a SI report. All sampling and fieldwork activities were conducted in accordance with FDEP's SOPs and US-EPA, Region-4, Science and Ecosystem Support Division, Field Branches Quality System and Technical Procedures.

- The members of the site field sampling team included:

KWGE Site Planning and Sampling Team		
Name	**Organization**	**Responsibilities**
Jim McCarthy, PG	FDEP/BWC/PTSS/CERCLA	FDEP Site Project Mgr/Sampler
Barbara Alfano	EPA Region 4	EPA Florida Project Mgr
Roger Carlton	EPA Region 4 SESD	SESD Project Mgr
Linda George	EPA Region 4 SESD	Safety Officer/Sampler
Brian Striggow	EPA Region 4 SESD	Geoprobe Operator
Tim Slaggle	EPA Region 4 SESD	SESD Field Project Leader
Fred Sloan	EPA Region 4 SESD	Sample Custodian
Jerry Ackerman	EPA Region 4 SESD	Geoprobe Assistant/Sampler
Phyllis Meyer	EPA Region 4 SESD	Geoprobe Assistant/Sampler
Don Forston	ESAT-ILS	Sampler/Air Monitoring

A4 Scientific Inc. of The Woodlands, Texas was responsible for the metals and cyanide analyses. KAP Technologies, Inc, also of The Woodlands, Texas was responsible for the semi-volatile analyses and the EPA Region 4 SESD Analytical Support Branch (ASB) in Athens, Georgia was responsible for the volatile organic analyses (Appendix C).

5.1 Soil Sampling

Seven surface (0-2 feet BLS) and six subsurface (2-4 feet BLS) soil samples, including background samples (KGE001SF/SB), were collected and analyzed for VOCs, SVOCs, RCRA 8 Metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium & silver) and Cyanide (Figure 3). A surface and subsurface soil sample was collected at each boring location. The one exception was the subsurface soil sample for KGE002 which was not collected due to boring refusal. The presence of the substation transformers precluded detailed sampling of the former Gas Holder location. A number of the soil samples were dedicated to the former Retort location. Due to the shallow depth to bedrock (Miami Limestone), a Geoprobe® Macrocore system with PVC liners was employed to collect the soil samples. The contents of the core were transferred
To a decontaminated Pyrex glass pan, the soil was thoroughly mixed to form a homogenous sample, prior to filling the appropriate sample containers. The aliquots for VOC analyses were collected directly from the core using 5 gram o2si Smart Solutions VOC sampling kit in accordance with EPA 5035 methodology. The mouth of the o2si Smart Solutions sampler was placed into the 40ml VOA vial containing the appropriate amount of distilled water or preservative

(methanol). Due to the remote location of the site, the vials were subsequently placed into a small dorm sized freezer and frozen to extend the normal 48 hour hold time. A breakdown of the sampling location rationale is presented in Table 2. The sampling locations are shown on Figure 3.

5.2 Temporary Monitor Well Installation

Six temporary monitor wells were installed during the investigation using a Geoprobe® 6620DT track mounted, direct-push rig and a Geoprobe® Screen Point (SPT) 15 groundwater sampler. The temporary monitor well planned for KGE002 was not collected due to boring refusal. It was replaced with a temporary well at the KGE007 location. With the exception of the KGE002 location, the six temporary monitor wells were collocated with the same numbered soil sample locations (i.e. KGE-001SF/SB and KGE-001GW). The SPT 15 sampler consists of a drive point, screen, sampler sheath and drive head. The sampler is typically pushed using a 1.25-inch outside diameter (OD) steel rod. The sampler (i.e. well screen) consists of a wire-wound, stainless steel screen with a 1.0-inch OD and a 0.010-inch screen slot. The minimum inside diameter (ID) of the screen is 0.65 inches. As much as 44 inches of screen can be exposed to the formation for sampling. The stainless steel screen, protected in a steel sheath (1.5 inches OD), is driven to the desired depth for deployment and sampling. The rods are then pulled up about 4 feet, exposing the well screen. A knockout grout plug is provided at the end of the screen for grouting purposes. The temporary wells were installed to a depth of between 12 to 14 feet. At the conclusion of the investigation, the down-hole well components were withdrawn and the boreholes backfilled from bottom to top, with appropriate grout material. The rationale for each temporary monitor well location is explained in Table 2. The general areas of the temporary well locations are shown on Figure 3.

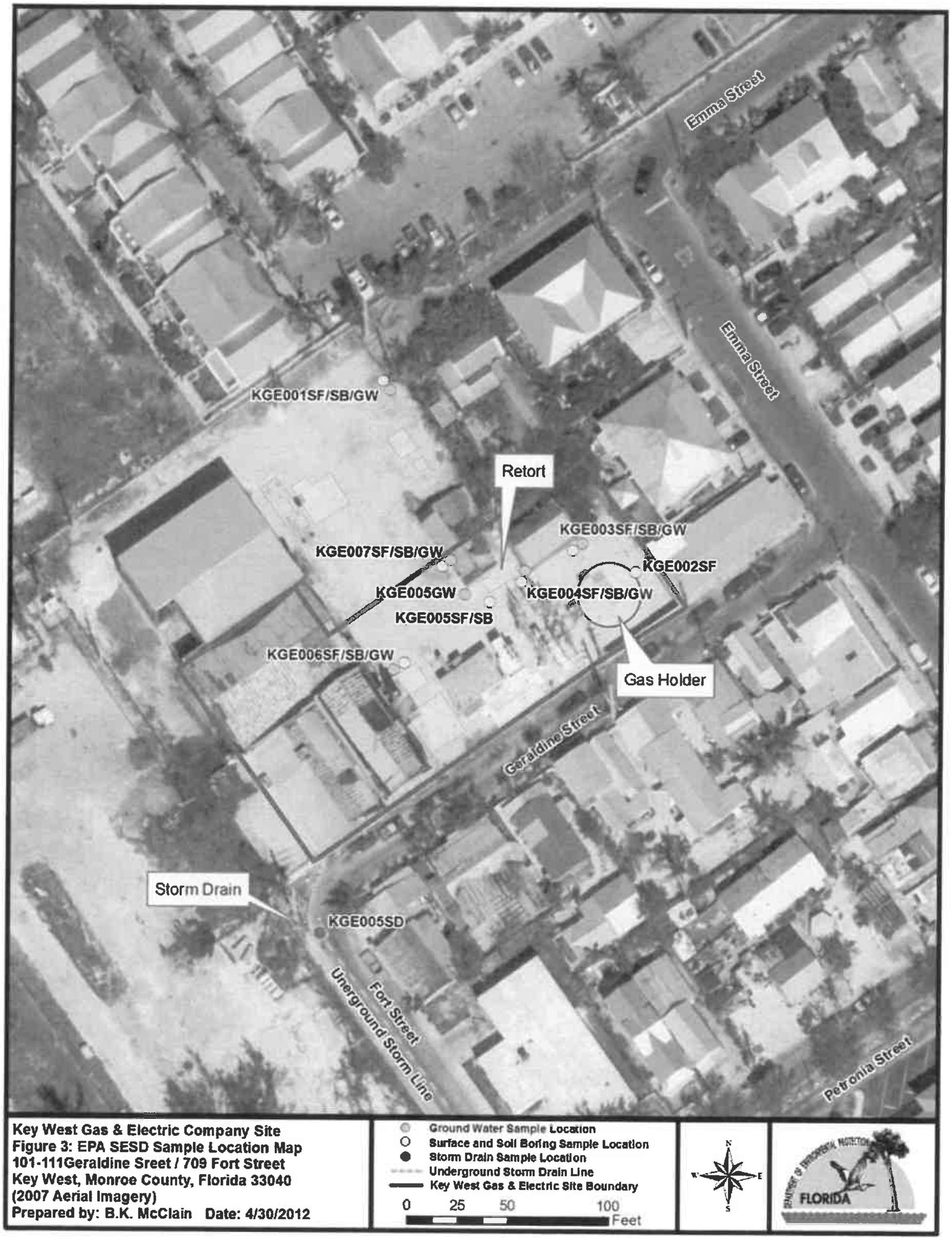
5.3 Groundwater Sampling

Groundwater samples were collected from each of the six temporary monitor wells using low flow/low stress sampling techniques in accordance with FDEP's SOP and the EPA Region 4 Field Branches Quality System and Technical Procedures. Groundwater samples collected from the temporary wells were analyzed for VOCs, SVOCs, RCRA 8 Metals and Cyanide.

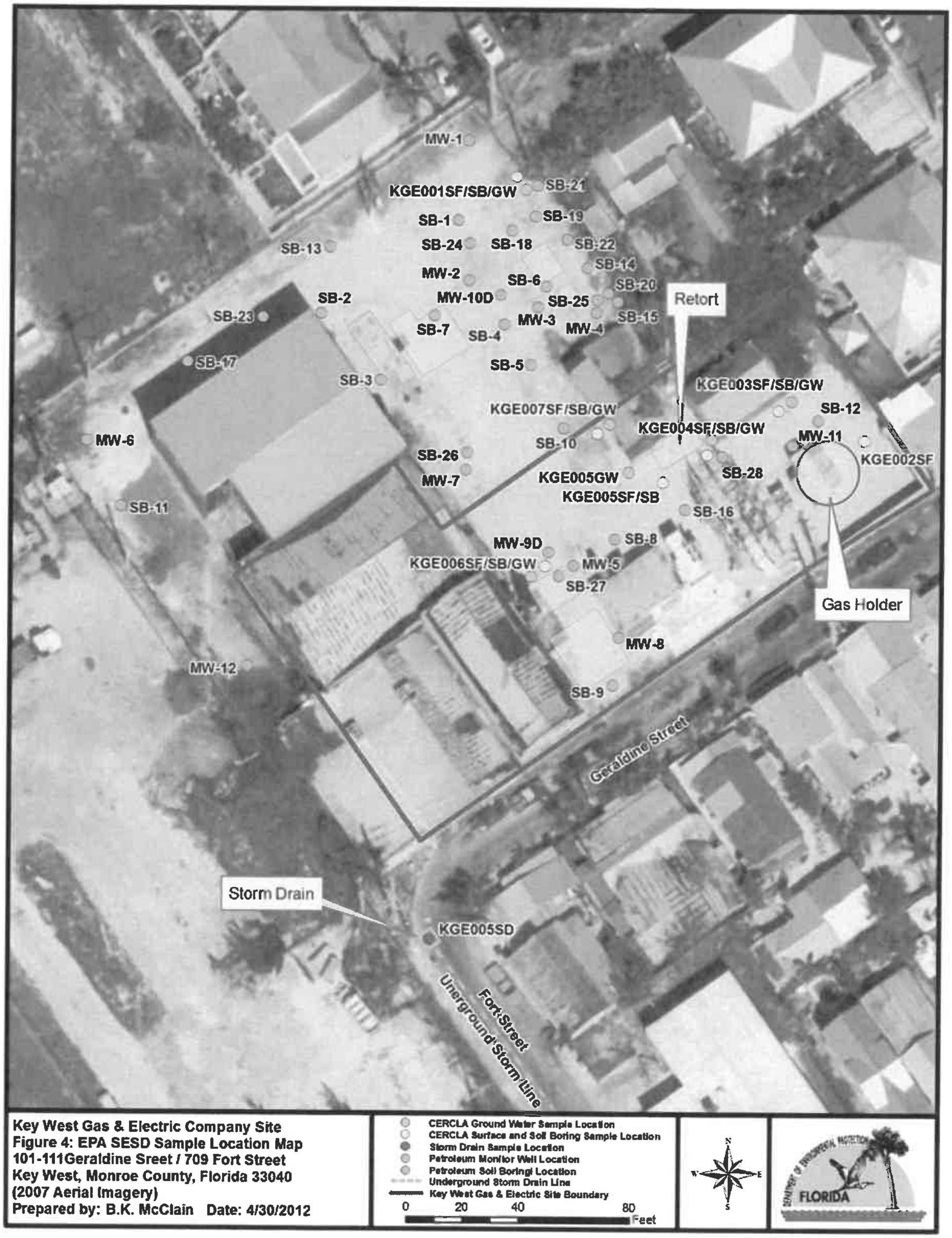
Prior to sampling, each well was purged with a variable speed, Geotech Geopump2 peristaltic pump. At the initiation of purging, an appropriate length of pre-cleaned disposable Teflon® tubing was slowly lowered to the bottom of the well screen. A new piece of Teflon® tubing was used at each well location. The purpose of lowering the tubing to the bottom of the screen is to achieve low turbidity conditions by removing any formation material, which may have entered the well screen during installation. Upon the removal of this material, the tubing was slowly raised through the water column to near the top of the column. The pump speed was adjusted, to match the draw down in the well. Field parameters (including temperature, pH, specific conductance, and turbidity) were measured and recorded in a bound logbook. The goal of purging water in a temporary well is to reduce turbidity and remove the water in the area directly impacted by the temporary well installation. When the field parameters stabilized and water turbidity was less than 10 Nephelometric Turbidity Units (NTU), the groundwater sample is typically collected. Stabilization is achieved when the pH remains constant (within 0.1 Standard Unit), specific conductivity varies no more than 10% and temperature is constant for at least three consecutive readings. If for any reason, parameters did not stabilize or turbidity of less than 10 NTU could not be achieved, it was at the discretion of the EPA SESD and FDEP project leaders whether to sample or continue the purging process. It should be noted that despite stabilization of the other parameters and additional purging, two of the final turbidity values were greater than 10 NTU. The VOC samples for laboratory analysis were collected with as little agitation or disturbance as possible.

5.4 Sediment Sampling

Five sediment samples were collected to assess possible impacts to surface water. The sediment samples were analyzed for VOCs, SVOCs, RCRA 8 Metals and Cyanide One of the sediment samples (KGES005SD) was collected from the storm drain located near the intersection of Geraldine and Fort Streets. Three of the sediment samples (KGES002SD to KGES004SD) were collected from the Florida Straits adjacent to the Fort Street outfall pipe. A background sediment sample (KGES001SD) was collected from the Florida Straits further to the northeast. The sediment sample from the storm drain was collected using a decontaminated stainless steel ice scoop attached to a piece of metal conduit pipe. A Zodiac inflatable dinghy, procured from nearby EPA Ocean Survey Vessel Bold, was utilized to collect the sediment samples from the Florida Straits. The sediment samples from the Florida Straits were collected using a decontaminated Ponar dredge. The contents of the sampling device were transferred to a decontaminated Pyrex glass pan. The soil was thoroughly mixed to form a homogenous sample, prior to filling the appropriate sample containers. The aliquots for VOC analyses were collected directly from the sampling device using a 5 gram o2si Smart Solutions VOC sampling kit in accordance with EPA 5035 methodology. The mouth of the o2si Smart Solutions sampler was placed into the 40ml VOA vial containing the appropriate amount of distilled water or preservative (methanol). Due to the remote location of the site, the vials were subsequently placed into a small freezer and frozen to extend the normal 48 hour hold time. A breakdown of the sampling location rationale is presented in Table 2. The sampling locations are shown on Figure 5.



Key West Gas & Electric Company Site
Figure 3: EPA SESD Sample Location Map
101-111Geraldine Sreet / 709 Fort Street
Key West, Monroe County, Florida 33040
(2007 Aerial Imagery)
Prepared by: B.K. McClain Date: 4/30/2012



Key West Gas & Electric Company Site
Figure 4: EPA SESD Sample Location Map
101-111Geraldine Sreet / 709 Fort Street
Key West, Monroe County, Florida 33040
(2007 Aerial Imagery)
Prepared by: B.K. McClain Date: 4/30/2012

Key West Gas & Electric Company Site
Figure 5: EPA SESD Offsite Sampling Location Map
101-111Geraldine Sreet / 709 Fort Street
Key West, Monroe County, Florida 33040
(2007 Aerial Imagery)
Prepared by: B.K. McClain Date: 4/30/2012

Sediment Sample Location
Storm Drain Sediment Sample Location
Underground Storm Drain Line

0 150 300 600 Feet

N W E S

DEPARTMENT OF ENVIRONMENTAL PROTECTION FLORIDA

Table 2
KWGE Sample Identification and Rationale

Surface "SF" 0-2' & Subsurface "SB" 2'-4'				
Station ID	**Sample ID**	**Rationale**	**Sample Media**	**Analysis**
KGE001	KGE001SF KGE001SB	Background/ Control	SOIL	VOCs, SVOCs,8 RCRA Metals & Cyanide
KGE002	KGE002SF	Potentially Impacted/Affected Area		VOCs, SVOCs,8 RCRA Metals & Cyanide
KGE003	KGE003SF KGES003SB			VOCs, SVOCs,8 RCRA Metals & Cyanide
KGE004 Duplicate MS/MSD	KGE004SF KGE604SF KGE004SB			VOCs, SVOCs,8 RCRA Metals & Cyanide
KGE005	KGE005SF KGE005SB			VOCs, SVOCs,8 RCRA Metals & Cyanide
KGE006	KGE006SF KGE006SB			VOCs, SVOCs,8 RCRA Metals & Cyanide
KGE007	KGE007SF KGE007SB			VOCs, SVOCs,8 RCRA Metals & Cyanide
GROUNDWATER				
KGE001	KGE001GW	Background/ Control	WATER	VOCs, SVOCs, 8 RCRA Metals & Cyanide
KGE002	KGE002GW	Potentially Impacted/Affected Area		VOCs, SVOCs, 8 RCRA Metals & Cyanide
KGE003	KGE003GW			VOCs, SVOCs, 8 RCRA Metals & Cyanide
KGES004 Duplicate MS/MSD	KGE004GW KGE904GW			VOCs, SVOCs, 8 RCRA Metals & Cyanide
KGE005	KGE005GW			VOCs, SVOCs, 8 RCRA Metals & Cyanide
KGE006	KGE006GW			VOCs, SVOCs, 8 RCRA Metals & Cyanide

KWGE Table 2 (Cont)
Sample Identification and Rationale

SEDIMENT				
KGES001 (background)	KGES001SD	Background/ Control Florida Straits	SEDIMENT	VOCs, SVOCs,8 RCRA Metals & Cyanide
KGES002 Florida Straits	KGES002SD	Potentially Impacted/Affected Area		VOCs, SVOCs,8 RCRA Metals & Cyanide
KGES003 Florida Straits	KGES003SD			VOCs, SVOCs,8 RCRA Metals & Cyanide
KGES004 Duplicate MS/MSD Florida Straits	KGES004SD			VOCs, SVOCs,8 RCRA Metals & Cyanide
	KGES604SD			
KGES005 (Storm Sewer)	KGES005SD			VOCs, SVOCs,8 RCRA Metals & Cyanide

Key:

MS/MSD-Matrix Spike/Matrix Spike Duplicate
QA/QC- Quality Assurance/Quality Control
VOC-Volatile Organic Compounds
SF-Surface soil
SB-Subsurface Soil
GW-Groundwater
KGE Key West Gas & Electric
TB-Trip Blank Soil
TW-Trip Blank Water
RCRA 8 metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium & silver)

The metals and cyanide water samples were directly collected from the peristaltic pump discharge tubing. The semi-volatile organic samples were collected using the peristaltic pump/vacuum jug assembly. The vacuum jug assembly, which included an amber 1-liter glass sample bottle, was situated between the pump and the well for sample collection. The volatile organic samples were collected utilizing the "back flow" method. This involved running the pump at a slower speed and filling the Teflon® tubing with the sample. The pump speed was then further reduced and the direction of flow reversed to push out the sample into the 40 milliliter sample vials. In order to prevent water that may have been in contact with the flexible pump head tubing, the sampler avoided completely emptying the tubing when filling the sample vials. The sampling locations and rationale are presented in Table 2. The sampling locations are shown on Figure 3.

5.5 Quality Assurance/Quality Control

The field sampling equipment was cleaned and decontaminated at EPA's Field Equipment Center (FEC) prior to coming to the site. As a result, in accordance with the EPA Region 4 Field Branches Quality System and Technical Procedures, no equipment rinseate quality assurance/quality control (QA/QC) samples were collected. The decontaminated sampling equipment was wrapped in aluminum foil prior to leaving the FEC. Due to the ample supply of decontaminated sampling equipment, field cleaning of augers, bowls and spoons was not necessary. A soil sample duplicate and groundwater sample duplicate were collected. A metals and preservative blank were carried on-site and transported with the metals samples to assess possible cross contamination of the samples during transport. In addition a VOC sand (soil) trip blank and VOC (water) trip blank were prepared and placed in the VOC soil and groundwater sample coolers, respectively. All samples were collected, packaged, preserved and transported, in accordance with FDEP's SOP and EPA's Region 4 Field Branches Quality System and Technical Procedures. Furthermore, chain-of custody using EPA's SCRIBE software was utilized. Field notes were recorded in a bound field book (Appendix D). The GPS locations of the groundwater and soil samples were collected using a Garman® GPSmap76CSx unit, capable of between one to five meters accuracy. These coordinates were rectified using Google Earth Pro. The Reference datum used was WGS 84 and the coordinates were recorded in decimal degrees (Table 9).

6.0 Findings and Results

A more detailed description of the groundwater, soil and sediment analytical and QA/QC results is detailed below.

6.1 Groundwater Sampling Results

Detectable levels of volatile organic compounds (VOCs), semi-VOCs (SVOCs) and metals were detected in site groundwater. The sample locations are shown on Figure 3 and the groundwater analytical results are presented on Tables 4c, 5c, 6c and Appendix C.

6.1.1 Groundwater Chemistry Results

The final groundwater chemistry results were recorded at the end of the purging process. The pH of the groundwater was determined to be between 7.59 (KGE007GW) to 8.10 (KGE005GW) standard units (SUs). The pH values are reflective of groundwater from a carbonate bearing aquifer. All the measured pH values were determined to be within the range of acceptable pH values (6.5 to 8.5 SU) for State of Florida Secondary Drinking Water Standard (SDWS). Specific conductivity in the wells ranged from 756 (KGE007GW) to 7,460 (KGE001GW) micro-mhos per centimeter (μmhos/cm). The elevated specific conductance readings likely reflect carbonate content and increased total dissolved solids (TDS) as a result of increased salinity.. The temperatures in the well formation water ranged from 25 degrees Centigrade (°C) [KGE001GW] to 30° C [KGE003GW]. Following an extended purging process, the turbidity values exceeded 10 nephelometric turbidity units (NTUs) in two of the wells. These final values were 15.3 NTU (KGE001GW) and 70 NTU (KGE007GW) [66].

Please refer to Table 3 for a summary of the groundwater chemistry results.

6.1.2 Groundwater Sampling Laboratory Results

Detectable levels of chromium (3.0J [estimated] micrograms per liter [ug/l]) and cyanide (10 ug/l) were detected in groundwater samples KGE005GW and KGE007GW, respectively. Cyanide, which was detected right at the detection limit, is a component of MGP purifier waste. However, both these levels were below both EPA MCL and State of Florida GCTL criteria. Isopropylbenzene, also known as Cumene, was detected above background levels and State GCTLs in KGE004GW (1.9 ug/l), its duplicate KGE904GW (2.6 ug/l), KGE005GW (6.6 ug/l) and KGE007GW (4.6 ug/l). Isopropylbenzene is used as a high octane gasoline component and used as a thinner for paints and lacquers [67]. No other VOCs were detected in groundwater above EPA MCL and State of Florida GCTL criteria.

A number of PAHs were detected in groundwater above background concentration. Acenaphthene (48 ug/l) and naphthalene (32 ug/l) were detected in the groundwater sample KGE005GW above State GCTLs. None of the other detected PAHs exceeded State GCTLs. KGE005GW was located near the former retort location of the MGP (Figures 2a, 3). It should be noted that the detected PAHs are common to both petroleum and MGP wastes. However, the cyanide detection in groundwater, albeit low and below GCTLs, could be related to ferrocyanides, commonly associated with MGP spent purifier wastes. [33, 34, 68]. Please refer to Figures 2a & 3 for the former MGP layout and sample locations and Tables 4c, 5c & 6c for Summary of the detected metals, cyanide, VOCs and SVOCs in groundwater.

6.2 Soil Sampling Results

Detectable levels of metals, VOCs and semi-VOCs were found in site soils. The sample locations are shown on Figure 3 and the soil analytical results are presented on Tables 4a, 4b, 5a, 5b, 6a & 6b and Appendix C.
The metals detected included arsenic, chromium and lead. Arsenic was detected in surface soil sample KGE002SF (19 milligrams per kilogram [mg/kg]) in excess of the State of Florida Soil Cleanup Target Levels (SCTLs) for direct exposure for both residential (2.1 mg/kg) and industrial (12 mg/kg) settings. Elevated levels of lead were detected in background surface soil sample KGE001SF (900 mg/kg) and KGE006SF (440 mg/kg) in excess the State SCTL for direct exposure for residential (400 mg/kg) settings. Lead is a component of Gasifier ash and bag ore associated with MGPs. However, it is also used in paint, caulking, pipe work and roofing and was a former octane booster in gasoline [33, 67]. The chromium detection in subsurface soil sample KGE006SB was below State SCTL criteria.

A number of VOCs were also detected in the soil samples at low or trace levels. The VOCs included 1, 2, 4 trimethylbenzene, 1, 3, 5 trimethylbenzene, isopropylbenzene, *n*-propylbenzene, *o*-xylene, *p*-isopropyltoluene and sec-butylbenzene and were elevated with respect to the background samples. Many of these VOCs are common to both MGPs and petroleum products. However, none of the detected VOCs exceeded SCTLs for direct exposure (residential or industrial settings) or groundwater leachability. Detectable levels of semi-VOCs, in particular PAHs, were found in the soil samples collected from the site. These levels were significantly above the background soil concentrations of KGE001SF/SB. The following PAHs were detected above State SCTLs for groundwater leacability criteria. They included benzo (a) anthracene (1,900 to 4,500 ug/kg), benzo (a) pyrene (10,000 to 19,000 ug/kg), benzo (b) fluoranthene (2,700 to 12,000 ug/kg), dibenzo (a, h) anthracene (1,500 to 7,000 ug/kg) and indeno (1,2,3-cd) pyrene (7,800 to 14,000 ug/kg). The benzo (a) pyrene toxic equivalent [BaP TEQ] concentrations in four locations (eight samples) exceeded the State SCTL for direct exposure under an industrial setting. The sample included KGE002SF, KGE004SF, KGE004SB, KGE604SB, KGE005SF, KGE005SB and KGE007SF. The soil BaP TEQ calculations are presented in Appendix F. The highest levels of PAHs were found in the KGE004 (KGE004SF/SB) and KGE005 (KGE005SF/SB) boring locations. These two locations were adjacent to the former MGP retort (Figures 2a, 3). Many of the detected PAHs are common to both MGPs and petroleum products [33, 34, 68].

6.3 Sediment Sampling Results

Detectable levels of metals, VOCs and semi-VOCs were found in site soils. The sample locations are shown on Figures 3, 4 & 5 and the soil analytical results are presented on Tables 4d, 5d & 6d and Appendix C.

Detectable concentrations of barium (51 mg/kg) and lead (26 mg/kg) were found in the storm drain sediment sample KGES005SD. The storm drain, located at the intersection of Geraldine and Fort Streets, presumably collects runoff from the KWGE site. Lead (58 mg/kg) was detected in sediment sample KGES002SD collected from the Florida Straits adjacent to the Fort Street outfall. This level was significantly above the concentration of lead (8.2 mg/kg) found in the background sediment level. The lead level in KGES002SD exceeded the State FDEP Sediment Quality Assessment Guideline[2] (SQAG) Threshold Effect Level (TEL) of 30.2 mg/kg but is below the probable effects level (PEL) of 112 mg/kg. It also exceeded the EPA Region 4 Sediment Screening Value (SSV). Lower levels of lead, below SQAGs, were found in the two other sediment samples located near the outfall. It is important to note that the Fort Street outfall represents the discharge for a large area of Key West. As such, with the limited number of sediment samples, it is difficult, if not impossible, to specifically attribute the lead detections to the former MGP operation. A number of VOCs were also detected in the sediment samples at low or trace levels. No SQAGs have been developed for VOCs. The higher levels of VOCs were in the sediment sample collected from the storm drain KGES005SD. The VOCs included acetone, carbon disulfide, 1, 2, 4 trimethylbenzene, 1, 3, 5 trimethylbenzene, benzene, ethylbenzene, methyl ethyl ketone, isopropylbenzene, *n*-propylbenzene, *o*-xylene, *m* and/or *p*-xylene, *p*-isopropyltoluene and sec-butylbenzene. Acetone and carbon disulfide are common laboratory contaminants. Again, many of these VOCs are common to both MGPs and petroleum products. Detectable levels of semi-VOCs, in particular PAHs, were found in the sediment sample collected from the storm drain (KGES005SD). A number of unidentified semi-VOC compounds were detected in the Florida Straits sediment samples. However, no specific semi-VOC analytes were detected.

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[2] The SQAGs are intended to assist sediment quality assessment applications, such as identifying priority areas for non-point source management actions, designing wetland restoration projects, and monitoring trends in environmental contamination. They are not intended to be used as sediment quality criteria.

6.4 Quality Assurance/Quality Control Results

Low, estimated levels of mercury, 0.090J ug/l and 0.027J ug/l, were detected in the metals (KGEQA01) and preservative (KGEQA02) metals blanks, respectively. No other metals were detected. A low qualified concentration of toluene (1.8 J ug/kg) was detected in the soil trip blank sample KGEQA04. No other VOCs were detected. No VOCs were detected, above the detection limits; in the water trip blank KGEQA03. Based on the review of the QA/QC results, the detected analytes in the metals, preservative and trip blanks are of no consequence in the interpretation of potential contamination at this site. The analytical results of the groundwater duplicate (KGE904GW) and its parent sample (KGE004GW) were comparable. The analytical results of the soil duplicate (KGE604SB) and its parent sample (KGE004SB) were also comparable (Tables 4 through 7).

7.0 Conclusions and Recommendations

The conclusions and findings of this investigation follow:

- A review of Sanborn Insurance maps from 1912 and 1926 indicates that six 25,000-gallon crude oil above ground storage tanks (ASTs) were located along the eastern edge of the site near Geraldine Lane (now Street). This is currently the area of the KEYS substation transformers and electrical equipment. The earlier petroleum contamination assessment did not focus on this area. The CERCLA SI was also limited in this area due to the transformers and safety concerns.

- Heavy metals (arsenic & lead) and PAHs (benzo [a] pyrene, dibenzo [a, h] anthracene et. al) have been detected in soils from the KWGE site above State Soil Cleanup Target Levels (SCTLs) for direct contact and/or groundwater leachability criteria. The arsenic and benzo [a] pyrene TEQ concentrations exceed the State SCTLs for direct exposure under a commercial/industrial setting.

- A low concentration of cyanide, below its State Groundwater Cleanup Target Levels (GCTL), was detected at the detections limit in one of the groundwatwer samples. As mentioned above, the cyanide detection could be related to ferrocyanides, commonly associated with MGP spent purifier wastes. However, cyanide was not detected, above the detection limit, in any of the soil samples.

- Isopropylbenzene, acenaphthene and naphthalene were detected in on-site groundwater above State Groundwater Cleanup Target Levels (GCTLs).

- Lead was found in both the nearby storm sewer (KGES005SD) and Florida Straits sediment (KGES002SD) sample near the Fort Street outfall. The level of lead in the Florida Straits sediment sample exceeded both the State Sediment Quality Assessment Guideline (SQAG) Threshold Effect Level (TEL) and EPA Region 4 Sediment Screening Value (SSV). This level was significantly above the background sediment sample concentration. The other two sediment samples near the outfall had lower levels of lead.. However, the concentrations were below SQAG and SSV criteria. As noted above, the Fort Street outfall is part of a permitted discharge for a large area of Key West. As such, with the limited number of sediment samples, it is difficult, if not impossible, to specifically attribute the lead detections to the former MGP operation.

The recommendations of this investigation are:

- Additional soil and groundwater contamination assessment of the KWGE may be necessary. Any further investigation should include the delineation of lead in the soils. However, it may be difficult to separate MGP vs. petroleum fuel related impacts.

- No assessment activities were ever conducted on the vacant land situated across Fort Street, southwest of the site. This was a water body called "Government Slip" during the 1880s and 1890's. This was around the time of reported MGP operations. Government Slip was subsequently filled in during the late 1890s or early 1900's. Any future assessment activities, related to the MGP operations, should include this area. Although ultimately filled, nearby surface water bodies were often used for disposal of MGP wastes [10, 11] (Figure 2a).

- Possible impacts from the Standard Oil Co and tanks formerly located on east side of Geraldine Street, across street from former MGP, should be taken into account in any further contamination assessment activities.

- It is recommended that any future groundwater samples fromthe site be analyzed for total dissolved solids (TDS). The results can be used to determine whether Class G-II (potable) or Class G-III (non-potable) groundwater use criteria are applicable [69].

Site related soil and groundwater contamination is documented. However, many of the detected contaminants are common to both MGPs and petroleum fuels (leaded gasoline & diesel fuel). At this time, it is not possible to distinguish between MGP and petroleum impacts from the site. Based on the minimal impacts, a No Further CERCLA action is appropriate. However, the site will be referred to the FDEP South District office for consideration for further evaluation.