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PHASE 2 RESOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION WORKPLAN

COASTAL SYSTEMS STATION PANAMA CITY
PANAMA CITY, FLORIDA

UNIT IDENTIFICATION CODE: N60200
NAVY CLEAN - DISTRICT I
CONTRACT NO. N62467-89-D-0317

MARCH 1994

SOUTHERN DIVISION
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NORTH CHARLESTON, SOUTH CAROLINA
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PHASE 2

RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) FACILITY INVESTIGATION WORKPLAN

COASTAL SYSTEMS STATION PANAMA CITY
PANAMA CITY, FLORIDA

Unit Identification Code (UIC): N60200

Contract No. N62467-89-D-0317

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TABLE OF CONTENTS

RCRA Facility Investigation Workplan Addendum
CSS Panama City
Panama City, Florida

Section	Title	Page No.
7.0	SITE-SPECIFIC PHASE 2 RFI ACTIVITIES	7-1
7.1	SUMMARY OF PHASE 1 RFI FIELD INVESTIGATIONS	7-1
7.2	PHASE 2 RFI PROPOSED EXPLORATIONS	7-2
7.2.1	Geophysical Surveys	7-2
7.2.1.1	Magnetometry	7-2
7.2.1.2	Electromagnetic Induction (EM)	7-5
7.2.1.3	Ground-Penetrating Radar (GPR)	7-6
7.2.2	Test Pit Excavation	7-7
7.2.3	Surface Soil Sampling	7-7
7.2.4	Well Construction Details	7-8
7.2.5	Ecological Investigation	7-8
7.2.6	Investigation Derived Waste Management Plan	7-16
7.3	PROPOSED FACILITY-WIDE PHASE 2 RFI ACTIVITIES	7-16
7.3.1	Background Surface Soil Sample Collection	7-16
7.3.2	Background Surface Water and Sediment Sampling	7-19
7.3.3	Installation and Sampling of Background Monitoring Wells	7-19
7.3.4	Background Ecological Sampling	7-19
7.3.5	Water Level Measurements	7-20
7.4	SITE-SPECIFIC SAMPLING AND ANALYTICAL PROGRAM	7-20
7.4.1	SWMU 2, Landfill B, Burn and Landfill Area	7-20
7.4.1.1	Geophysical Surveys	7-22
7.4.1.2	Soil Gas Survey	7-22
7.4.1.3	Test Pit Excavation	7-22
7.4.1.4	Surface Soil Lead Screening	7-22
7.4.1.5	Surface Soil Sampling	7-22
7.4.1.6	Soil Borings and Subsurface Soil Sampling	7-27
7.4.1.7	Monitoring Well Installation and Groundwater Sampling	7-28
7.4.1.8	Surface Water and Sediment Sampling	7-29
7.4.1.9	Ecological Investigation	7-29
7.4.2	SWMU 3, Landfill C, Burn and Disposal Area	7-30
7.4.2.1	Surface Soil Sampling	7-30
7.4.2.2	Soil Borings and Subsurface Soil Sampling	7-30
7.4.2.3	Groundwater Sampling	7-34
7.4.2.4	Surface Water and Sediment Sampling	7-34
7.4.2.5	Ecological Investigation	7-34
7.4.3	SWMU 4, Landfill D, Filled Gully	7-35
7.4.3.1	Surface Water and Sediment Sampling	7-35
7.4.4	SWMU 5, Paint Equipment Cleaning Area	7-35
7.4.4.1	Surface Soil Sampling	7-40
7.4.4.2	Soil Borings and Subsurface Soil Sampling	7-40
7.4.4.3	Monitoring Well Installation and Groundwater Sampling	7-40

TABLE OF CONTENTS (Continued)

RCRA Facility Investigation Workplan Addendum
CSS Panama City
Panama City, Florida

Section	Title	Page No.
7.4.5	SWMU 9, Fire Training Area No. 2	7-41
7.4.5.1	Surface Soil Sampling	7-41
7.4.5.2	Soil Borings and Subsurface Soil Sampling	7-41
7.4.5.3	Monitoring Well Installation and Groundwater Sampling	7-45
7.4.5.4	Ecological Investigation	7-45
7.4.6	AOC 1, Old Fire Training Area No. 1	7-45
7.4.6.1	Surface Soil Sampling	7-45
7.4.6.2	Soil Borings and Subsurface Soil Sampling	7-48
7.4.6.3	Monitoring Well Installation and Groundwater Sampling	7-48
7.4.7	SWMU 1 and AOC 2, Landfill A, Original Disposal Area and Underground Oil Contaminated Area	7-48
7.4.7.1	Geophysical Surveys	7-50
7.4.7.2	Surface Soil Sampling	7-50
7.4.7.3	Soil Borings and Subsurface Soil Sampling	7-50
7.4.7.4	Groundwater Sampling	7-53
7.4.7.5	Surface Water and Sediment Sampling	7-53
7.4.7.6	Ecological Investigation	7-54
7.5	SUMMARY OF PHASE 2 RFI SAMPLING AND ANALYSIS PROGRAM	7-54
7.6	ADDITIONAL SITES TO BE INVESTIGATED DURING THE PHASE 2 RFI	7-54
7.6.1	Site Histories	7-54
7.6.2	Site-Specific Sampling and Analytical Program	7-63
7.6.2.1	SWMU 10, Oil-Water Separator, Site 363	7-63
7.6.2.2	Building 455, Paint Stripping Area	7-66
7.6.3	Summary of Additional Work to be Completed During the Phase 2 RFI Sampling and Analysis Program	7-70

LIST OF FIGURES

RCRA Facility Investigation Workplan Addendum
CSS Panama City
Panama City, Florida

Figure	Title	Page No.
7-1	Locations of Existing and Proposed Monitoring Wells	7-10
7-2	Proposed Phase 2 RFI, Background Exploration Locations	7-17
7-3	Solid Waste Management Unit 2, Landfill B, Burn and Landfill Area, Proposed Phase 2 RFI Exploration Locations	7-21
7-4	SWMU 3, Landfill C, Burn and Disposal Area, Proposed Phase 2 RFI Exploration Locations	7-33
7-5	SWMU 4, Landfill D, Filled Gully, Proposed Phase 2 RFI Exploration Locations	7-37
7-6	SWMU 5, Paint Equipment Cleaning Area, Proposed Phase 2 RFI Exploration Locations	7-39
7-7	SWMU 9, Fire-Fighting Training Area No. 2, Proposed Phase 2 Exploration Locations	7-44
7-8	Area of Concern (AOC) 1, Fire Training Area No. 1, Proposed Phase 2 RFI Exploration Locations	7-47
7-9	AOC 2 and SWMU 1, Underground Oil Contaminated Area and Landfill A, Original Disposal Area, Proposed Phase 2 RFI Exploration Locations	7-49
7-10	SWMU 10, Oil-Water Separator, Previous Surface Soil and Subsurface Soil Sample Locations	7-58
7-11	SWMU 10, Oil-Water Separator, Existing Monitoring Well Locations	7-60
7-12	Building 455, Paint Stripping Area, Previous Exploration Locations	7-62
7-13	SWMU 10, Oil-Water Separator, Proposed Phase 2 RFI Exploration Locations	7-65
7-14	Building 455, Paint Stripping Area, Proposed Phase 2 RFI Exploration Locations	7-68

LIST OF TABLES

RCRA Facility Investigation Workplan Addendum
CSS Panama City
Panama City, Florida

Tables	Title	Page No.
7-1	Phase 2 RFI Explorations	7-3
7-2	Monitoring Well Construction Details	7-9
7-3	Decision Matrix for Use of Ecological Sampling Results for Soils	7-12
7-4	Decision Matrix for Use of Ecological Sampling Results for Surface Water and Sediments	7-14
7-5	Rationale for Background Sampling	7-18
7-6	Phase 2 RFI Rationale for Explorations at SWMU 2	7-23
7-7	Phase 2 RFI Rationale for Explorations at SWMU 3	7-31
7-8	Phase 2 RFI Rationale for Explorations at SWMU 4	7-36
7-9	Phase 2 RFI Rationale for Explorations at SWMU 5	7-38
7-10	Phase 2 RFI Rationale for Explorations at SWMU 9	7-42
7-11	Phase 2 RFI Rationale for Explorations at AOC 1	7-46
7-12	Phase 2 RFI Rationale for Explorations at SWMU 1 and AOC 2	7-51
7-13	Summary of Sampling and Analysis	7-55
7-14	Phase 2 RFI Rationale for Explorations at SWMU 10	7-64
7-15	Phase 2 RFI Rationale for Explorations at Building 455	7-67
7-16	Summary of Sampling and Analysis, SWMU 10 and Building 455	7-71

GLOSSARY

AA	Atomic Absorption
ABB-ES	ABB Environmental Services, Inc.
bls	below land surface
CA	Contamination Assessment
CAR	Contamination Assessment Report
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
CSS	Coastal Systems Station
DQO	data quality objectives
FAC	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FDER	Florida Department of Environmental Regulation
FRP	fiberglass reinforced plastic
GC	gas chromatograph
HPLC	high performance liquid chromatography
mg/kg	milligrams per kilogram
MS	mass spectrometer
OVA	organic vapor analyzer
OWS	oil-water separator
PAH	polynuclear aromatic hydrocarbons
PCB	polychlorinated biphenyls
ppb	parts per billion
ppm	parts per million
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
SOUTHNAV-FACENGCOM	Southern Division, Naval Facilities Engineering Command
SVOCs	semivolatile organic compounds
SWMU	solid waste management unit
TAL	target analyte list
TCL	target compound list
TCLP	Toxicity Characteristic Leaching Procedure
TIC	tentatively identified compounds
TRPH	total recoverable petroleum hydrocarbons
USEPA	U.S. Environmental Protection Agency
VOCs	volatile organic compounds

7.0 SITE-SPECIFIC PHASE 2 RFI ACTIVITIES

Chapter 7.0 presents the proposed Phase 2 RFI field investigation sampling and analysis program scheduled for SWMU 1 and AOC 2, SWMU 2, SWMU 3, SWMU 4, SWMU 5, SWMU 9, and AOC 1 at Coastal Systems Station (CSS) Panama City. The proposed sampling activities are based on findings and conclusions presented in Chapters 5.0 and 6.0 of the Final Draft Phase 1 RFI report.

The Phase 2 RFI is necessary to fill data gaps identified in Phase 1 that are needed to characterize the nature and extent of contamination and to support human health and ecological risk assessments at each of the above mentioned SWMUs and AOCs. Proposed activities include a facility-wide background investigation and site-specific investigations, including sampling and analysis of groundwater, surface water, sediment, subsurface soil, and surface soil. This chapter represents the workplan for Phase 2 RFI activities at CSS Panama City. This section is supplemented by the RFI Workplan prepared by E.C. Jordan Co. in 1990 (E.C. Jordan Co., 1989).

A summary of the Phase 1 RFI field investigation is provided in Section 7.1. Section 7.2 provides a summary of exploration methods that will be used during the Phase 2 field investigation. Section 7.3 provides a description of facility-wide investigations that will be completed to characterize media for background conditions and to develop water level contour maps for each SWMU and AOC. Section 7.4 discusses the Phase 2 RFI field program for each SWMU and AOC, and Section 7.5 provides a summary of all planned Phase 2 RFI activities.

7.1 SUMMARY OF PHASE 1 RFI FIELD INVESTIGATIONS. ABB-ES conducted the Phase 1 RFI from April 1991 to September 1991 at seven SWMUs and two AOCs at CSS Panama City, Florida. The Phase 1 RFI field program included the following activities:

- monitoring well installation;
- soil, sediment, and groundwater sampling;
- aquifer testing (*in-situ*, rising head, and hydraulic conductivity tests); and,
- a receptor study for both human and ecological receptors.

The following SWMUs and AOCs at CSS Panama City were included in the Phase 1 RFI field program:

- SWMU 2, Landfill B, Burn and Landfill Area;
- SWMU 3, Landfill C, Burn and Disposal Area;
- SWMU 4, Landfill D, Filled Gully;
- SWMU 5, Paint Equipment Cleaning Area;
- SWMU 8, Classified Documents Incinerator;
- SWMU 9, Fire Training Area No. 2;
- AOC 1, Fire Training Area No. 1; and
- SWMU 1 and AOC 2, Landfill A, Original Disposal Area and Underground Oil Contaminated Area.

The objective of the Phase 2 RFI investigation is to collect the information that is needed to address the data gaps identified during the Phase 1 RFI and to adequately characterize the nature and extent of contamination at these SWMUs and

AOCs. Based on the results of the Phase 1 RFI, No Further Action (NFA) was proposed for SWMU 8. Sufficient information is currently available to support the NFA decision on SWMU 8; therefore, no field activities are scheduled for SWMU 8 during the Phase 2 RFI investigation.

7.2 PHASE 2 RFI PROPOSED EXPLORATIONS. The proposed Phase 2 RFI explorations include facility-wide and site-specific investigations. The facility-wide background investigation will be completed to identify variability in soil, groundwater, surface water, and sediment located on the facility. This information will be used to compare site-specific sampling data to CSS Panama City background conditions.

In addition, site-specific investigations are planned for each SWMU and AOC. Table 7-1 summarizes the site-specific investigations planned for the Phase 2 RFI investigation. The site-specific investigations are designed to provide additional information to characterize the nature and extent of contamination at each SWMU and AOC. This information will be used to support the Health and Environmental Assessment (HEA) and to assist in the development of corrective action objectives for each SWMU and AOC.

All field activities including sample handling, chain of custody, monitoring well installation, field QA/QC, and decontamination procedures completed during the Phase 2 RFI will be performed in accordance with the Phase 1 RFI Workplan, Quality Assurance Plan (E.C. Jordan Co., 1989) and the *Environmental Compliance Branch Standard Operation Procedures and Quality Assurance Manual* (USEPA, 1991a). The Phase 1 RFI Workplan discusses procedures for many of the above-listed activities. Procedures for geophysical surveys, test pit excavation, surface soil sampling, and ecological sampling (sediment and soil toxicity testing, macroinvertebrate identification, and plant tissue sampling and analysis) were not included in the Phase 1 RFI Workplan and are, therefore, discussed in the following subsections. Although procedures for monitoring well installations were included in the Phase 1 RFI Workplan, a summary of site-specific well construction details for the installation of 15 new monitoring wells is included in subsection 7.2.4.

7.2.1 Geophysical Surveys Magnetometer and electromagnetic (EM) induction surveys will be completed at SWMU 1 and AOC 2 and SWMU 2. A ground-penetrating radar (GPR) survey may also be used if the other survey methods do not provide results and if soil conditions prove to be satisfactory. The purpose of these surveys will be to: (1) identify the lateral (and possibly vertical) extent of landfilling and disposal activities, (2) provide general characterization of wastes (i.e., evidence of buried drums or highly conductive materials), and (3) locate buried utility lines and fuel distribution lines. A metal detector may also be used before drilling at selected sites to screen for possible underground utility lines, fuel distribution lines, or other obstructions that could interfere with the completion of subsurface explorations. These data will allow optimization of subsurface exploration locations and may provide data for volume of waste calculations during the CMS. A brief discussion of the geophysical methods that will be used at these sites is provided in the following subsections.

7.2.1.1 Magnetometry Landfilled areas may contain appreciable amounts of ferrous materials as well as other types of non-metallic wastes. Ferromagnetic

Table 7-1
Phase 2 RFI Explorations

RCRA Facility Investigation Report
CSS Panama City, Florida

Site	Geophysical Survey	Soil Gas Survey (points)	Monitoring Wells	Soil Borings	Test Pits	Surface Soil Samples	Subsurface Soil Samples	SW/SD Samples	Groundwater Well Samples
Background soil	--	--	--	--	--	5	--	--	--
Background groundwater	--	--	3	--	--	--	--	--	3
Background surface water and sediment	--	--	--	--	--	--	--	3	--
SWMU 1 / AOC 2	([1])	--	--	10	--	9	10	8	13
SWMU 2	([1])	10 (M)	1	9	11	26	33	4	11
SWMU 3	--	--	--	3	--	3	3	5	2
SWMU 4	--	--	--	--	--	--	--	3	--
SWMU 5	--	--	4	2	--	4	4	--	4
SWMU 9	--	--	3	5	--	9	15	--	6
AOC 1	--	--	4	10	--	10	20	--	17
Total		10 (M)	15	39	11	66	85	23	56

See notes at end of table.

Table 7-1 (Continued)
Phase 2 RFI Explorations

RCRA Facility Investigation Report
CSS Panama City, Florida

Site	Toxicity Testing Soil	Earthworm Chemical Analysis	Toxicity Testing Sediment	Aquatic Macroinvertebrate Identification Sediment	Plant Tissue Analysis
Background Soil	2	2	--	--	1
Background Sediment	--	--	3	3	--
SWMU 1 and AOC 2	--	--	6	6	--
SWMU 2	10	5	2	2	5
SWMU 3	--	--	5	5	--
SWMU 5	--	--	--	--	--
SWMU 9	9	3	--	--	--
AOC 1	--	--	--	--	--
Total	21	10	16	16	6

[1] Survey is scheduled; specifics of the task included in text.

Notes: -- = sample collection not scheduled.
M = soil gas survey specific to methane gas.
SWMU = Solid Waste Management Unit.
AOC = Area of Concern.
SW/SD = surface water/sediment.

materials cause local deviations in the earth's magnetic field and can be measured by using magnetic surveying. Deviations caused by these landfilled materials can be mapped and targeted for further exploration activities.

Therefore, based on the reported nature of activities at the site, magnetometer surveys will be conducted at documented landfills to help delineate the lateral extent of waste disposal.

Resolution of magnetic anomalies is primarily a function of the depth and mass of the ferromagnetic object(s). These parameters are most often unknown in landfill settings and are difficult to quantify considering landfill non-homogeneity. Magnetometry is used to define the lateral extent of wastes and to compare the relative magnitude of detected anomalies on a site-specific basis. Anthropogenic or natural interferences such as metallic fences, buildings, and even sunspot activity can affect the quality of magnetic data.

Deviations or anomalies in the earth's magnetic field caused by landfilled ferrous debris will be measured with an Omni IV™ or GEM gradiometer. Measurements will be recorded every 20 feet within a pre-established grid across the site (subject to site conditions). Diurnal measurements of the total magnetic field of the area surrounding CSS Panama City will be taken for base station measurements. As a quality control check, these base station measurements will be compared to the radiometer measurements taken at the SWMU and AOC. Magnetic data will be downloaded to a field computer at the completion of each day. Data will be processed using assorted applications software.

7.2.1.2 **Electromagnetic Induction (EM)** Landfilled areas may contain appreciable amounts of conductive wastes such as leachate and metals. Conductance can be mapped and targeted for further exploration activities.

Instrumentation consists of a transmitter and receiver. When a measurement is made, the transmitter is energized by an alternating current that produces a magnetic field, designated as the primary field, H_p. This artificial magnetic field induces small electric currents to flow in the earth which, in turn, produce a secondary magnetic field, H_s, which is made up of two components: the quadrature phase and in-phase components. The secondary magnetic field is related to the transmitter-receiver separation and to the operating frequency of the transmitter, both of which are selected by the operator. The ratio of the quadrature phase of the secondary field to the primary field (H_s/H_p) is linearly proportional to the terrain conductivity under most conditions. This ratio is measured by the receiver and converted into conductivity values in units of milliohms per meter. Field measurements may be recorded on a digital data logger, capable of recording simultaneously both the quadrature phase and in-phase components of the induced magnetic field. The quadrature-phase component, as stated earlier, gives the ground conductivity value in milliohms per meter. The in-phase component, used also for calibration, is significantly more sensitive to metallic objects and, hence, is useful for locating buried tanks and drums. Data from the in-phase component may be thought of as being equivalent to a metal detector survey.

Conductivity and in-phase measurements will be made with a Geonics™ EM-31 equipped with a data logger. Measurements will be recorded every 20 feet within a pre-established grid across the site (subject to site conditions). Data will

be downloaded to a field computer at the completion of each day. Data will be processed using assorted applications software.

7.2.1.3 **Ground-Penetrating Radar (GPR)** The GPR technique uses high frequency radio waves to determine the presence of subsurface objects and structures. Energy is radiated downward into the subsurface from an antenna that is pulled slowly across the ground at speeds varying from about 0.25 to 5 miles per hour (mph), depending on the amount of detail desired and the nature of the target. The radio wave energy is reflected from surfaces where there is a contrast in the electrical properties of subsurface materials. These surfaces may be naturally occurring geologic horizons (e.g., soil layers, changes in moisture content, or voids and fractures in bedrock) or manmade (e.g., buried utility lines, tanks, or drums). The reflected energy is processed and displayed as a continuous strip chart recording of distance versus time (where time can be thought of as proportional to depth). The depth of penetration of a GPR system is highly site specific, and depends upon factors such as: (1) the soil types at the site (clean sands are best), (2) moisture conditions (dry yields most accurate results), and (3) the frequency of the antenna (the lower the frequency, the deeper the penetration, and the less the resolution capability).

It is theoretically possible to detect groundwater contamination from both ionic chemicals (acids, salts, and bases) and non-ionic chemicals (petroleum products, solvents, and pesticides). This detection is possible because the radar wave is generally quite sensitive to changes in the conductivity of the media through which it passes. However, in practice, it is very difficult to interpret, with confidence, lateral changes in conductivity from radar recordings and attribute those changes to the presence of such chemicals. Lateral changes in soil composition and moisture content can produce changes of similar appearance to those changes due to chemicals. If the shallow geology is very uniform, tracking an ionic plume of sufficiently high conductivity would be feasible with GPR. It might also be possible to track a shallow non-ionic plume under uniform geologic conditions if there is a free product layer of sufficient thickness floating on the water table.

Typical applications for GPR include delineating the boundaries of buried waste materials; finding steel reinforcement bars and voids in concrete structures; recording the depth of geological interfaces, bedrock, and coal seams; locating and mapping buried utility lines; bottom and shallow sub-bottom profiling on lakes; and determining glacial ice stratification and thickness. More recently, this geophysical method has been employed in archaeological and forensic investigations to delineate burial areas.

The GPR system consists of a control unit, an antenna assembly (transmitter and receiver), and a recording device for analog field recordings. A tape-recording unit may also be present for further data processing after field activities are completed. The antenna transmits EM pulses of short duration into the ground. The pulses are reflected from geologic or manmade surfaces and are picked up by the receiver, which transmits the signals to the control unit for processing and analog display. Shallow objects appear near the top of the strip chart recording (less time elapsed between the outgoing pulse and the return of reflected energy), whereas deeper objects appear farther down the recording (more time elapsed). The time required for the EM pulse to traverse the path down to and back from the reflecting medium is measured in nanoseconds (one nanosecond = 1×10^{-9} seconds). The two-way travel time is proportional to the depth of burial

of the reflecting medium and is dependent on the dielectric properties of the medium through which the EM pulse travels. The dielectric properties of a medium are related to the moisture content and composition of a material.

A GSSI SIR™ System III GPR unit equipped with a 500 megahertz antenna will be used for profiling. Analog strip chart data will be analyzed and interpreted in the field.

7.2.2 Test Pit Excavation To examine subsurface conditions and to assess the vertical and horizontal distribution of soil contamination (i.e., at depths of approximately 0 to 10 feet), a backhoe will be used to excavate test pits and trenches. Pending the results of the geophysical survey, test pits or trenches will be excavated at locations where electromagnetic or magnetic anomalies are found. Soils, stratigraphy, groundwater conditions, and evidence of contamination will be noted in a field log book. Excavated soil will be backfilled into the excavated area.

7.2.3 Surface Soil Sampling Surface soil samples will be collected to characterize the chemical contamination at the surface of the SWMUs and AOCs. This information is needed to assess risks for human and ecological receptors associated with exposures to contamination in soils.

Samples collected for VOC analysis will be collected using a clean stainless steel or Teflon™ lined scoop or trowel. Sufficient material will be collected in one grab sample to fill the sample containers. Samples will be collected directly from the sampling device; stones, twigs, grass, etc., will be removed from the sample. The sample will be immediately secured with a Teflon™-lined cap. Once filled, sample containers will be rinsed with deionized water and wiped dry. The outside of the sample containers will be labeled with the appropriate information, placed in a Ziplock™ bag, protected from breakage, and placed in a cooler along with the chain-of-custody documents.

Samples for analysis for other than volatile organic compounds will be collected with a stainless-steel scoop or trowel. Sufficient sample volume will be collected into a stainless-steel bucket and thoroughly mixed to provide a homogenized sample. The sample will then be divided among the various sample jars and labeled appropriately. The sample jars will be placed in a Ziplock™ bag, protected from breakage, and put in a cooler with the chain-of-custody documents.

Composite samples will be collected at SWMU 2 in the One-Time Base Cleanup Disposal Area. The composite samples will be collected from several locations within an established grid that overlies the site. Within each grid space, surface soil samples will be collected, combined, and analyzed as one sample. Equal sample volume will be collected from each of the sampling locations within the grid space with a stainless-steel spoon, scoop, or trowel and placed in a stainless-steel bucket. The sample will then be thoroughly mixed to provide a homogeneous sample. The homogeneous sample will then be prepared for shipment to the analytical laboratory by placing the sample jars in a Ziplock™ bag, protecting it from breakage, and placing the sample jars in a cooler with the chain-of-custody documents.

Mixing of the composite sample would most likely volatilize any VOCs present in the surface soil sample; therefore, composite surface soil samples will be

analyzed for SVOCs, polynuclear aromatic hydrocarbons (PAHs), metals, total cyanide, pesticides, and PCBs.

7.2.4 Well Construction Details A total of 15 monitoring wells will be installed during the Phase 2 RFI field investigation. Procedures for installing these wells are summarized in the Phase 1 RFI Workplan (E.C. Jordan Co., 1989). The construction details for these monitoring wells are summarized in Table 7-2. The data obtained from these newly installed monitoring wells will be used in conjunction with data obtained from existing monitoring wells to delineate contamination and evaluate potential contamination migration pathways from the SWMUs and AOCs. Figure 7-1 shows the location of all existing monitoring wells. The locations of the proposed Phase 2 RFI monitoring wells are shown in figures in Section 7.4, Site Specific Sampling and Analytical Program.

7.2.5 Ecological Investigation The Phase 1 RFI assessment of potential ecological risks was completed with the following results.

- Ecological risks associated with SWMU 5 and AOC 1 were not predicted.
- Exposure pathways for ecological receptors from soil contamination at SWMU 1 and AOC 2 were not identified but exposures for aquatic receptors could result from contaminated groundwater discharge to surface waters. Data were insufficient to predict contaminant exposures and risks for aquatic receptors.
- Potential risks were predicted for terrestrial wildlife from soil contamination at SWMUs 2 and 9. The assessment was, however, based on subsurface soil data that may not be representative of the contamination to which wildlife would be exposed. Surface soil data will be collected to support a more accurate exposure assessment in Phase 2.
- Potential risks were predicted for aquatic receptors exposed to contamination in sediments at SWMUs 3 and 4. As sediment sampling was limited at each SWMU during the Phase 1 RFI, further sampling and analysis was recommended in Phase 2 to assess the extent of contamination and any associated risks.

The Phase 2 assessment of ecological risks will be based on further chemical analyses of sediments and surface soils, laboratory toxicity testing of sediments and surface soils, and field studies of adverse ecological effects. The assessment will focus on surface soil contamination at SWMUs 2 and 9 and sediment contamination at SWMU 3 as recommended in the Phase 1 RFI ecological assessment. In addition, the assessment will address risks associated with potential sediment contamination in Alligator Bayou resulting from possible contaminant migration from SWMU 1 and AOC 2.

Three types of information are needed to establish a causal relationship between contamination and adverse ecological effects. First, chemical analyses of the appropriate media are necessary to establish the presence and concentration of a specific toxic contaminant. Second, ecological surveys can establish that adverse ecological effects have occurred, and, last, toxicity tests are necessary to establish a link between the adverse ecological effects and the toxicity of the wastes. For the following reasons, confidence in cleanup decisions is

Table 7-2
Monitoring Well Construction Details

RCRA Facility Investigation Report
CSS Panama City, Florida

Site	Well Number	Total Depth (feet bls)	Screened Interval (feet bls)
Background	PCY-BKG-1S	25	15 to 25
	PCY-BKG-1D	60	50 to 60
	PCY-BKG-2S	25	15 to 25
SWMU 2	PCY-2-1D	60	50 to 60
SWMU 5	PCY-5-5S	25	15 to 25
	PCY-5-5D	45	35 to 45
	PCY-5-6S	25	15 to 25
	PCY-5-7S	25	15 to 25
SWMU 9	PCY-9-3I	45	35 to 45
	PCY-9-4S	25	15 to 25
	PCY-9-5S	25	15 to 25
AOC 1	PCY-13-8S	15	5 to 15
	PCY-13-8I	45	35 to 45
	PCY-13-9S	15	5 to 15
	PCY-13-9I	45	35 to 45

Notes: RFI = RCRA Facility Investigation.
bls = below land surface.
SWMU = Solid Waste Management Unit.
AOC = Area of Concern.
S = shallow monitoring well.
I = intermediate monitoring well.
D = deep monitoring well.

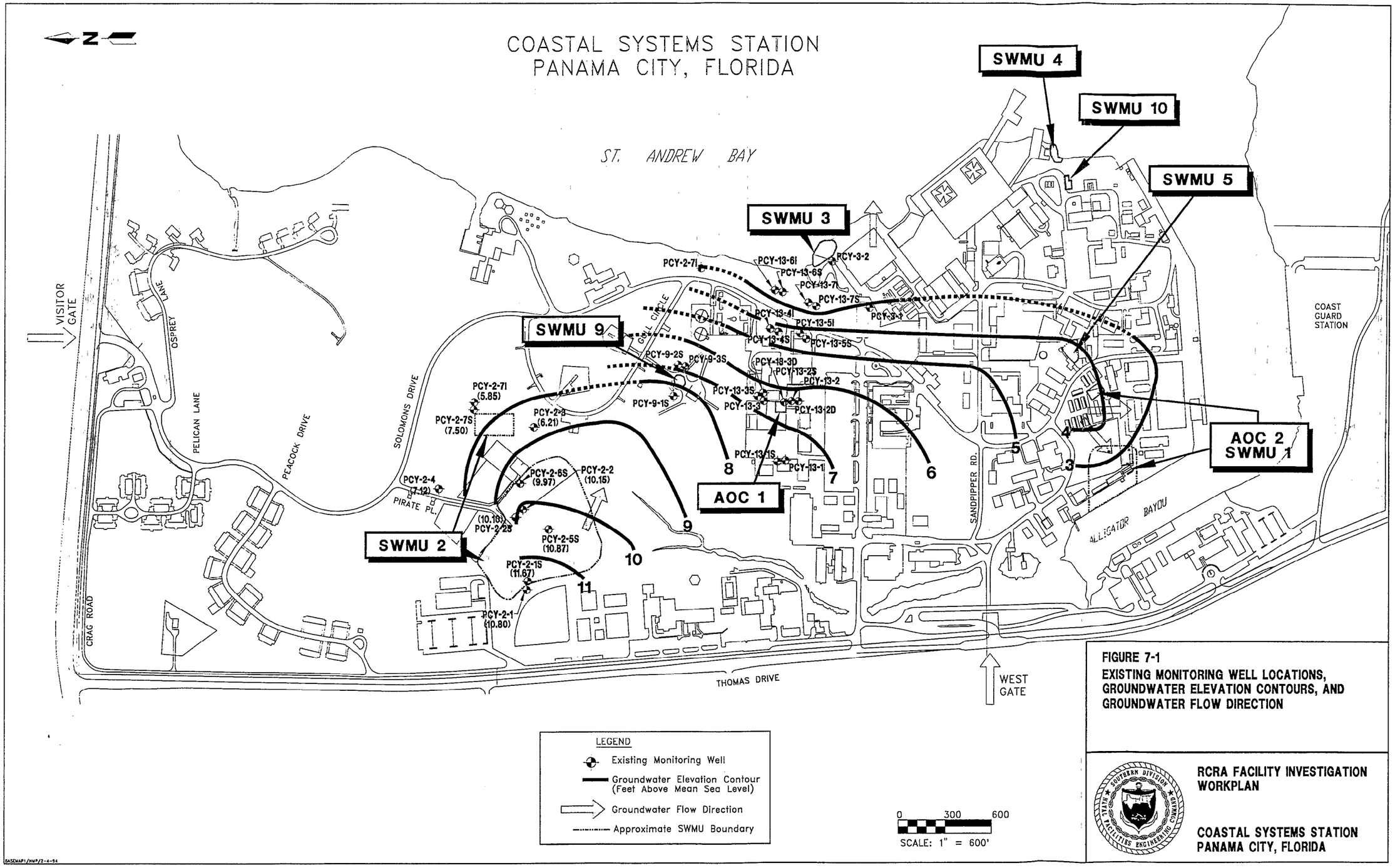


FIGURE 7-1
EXISTING MONITORING WELL LOCATIONS, GROUNDWATER ELEVATION CONTOURS, AND GROUNDWATER FLOW DIRECTION

RCRA FACILITY INVESTIGATION WORKPLAN

COASTAL SYSTEMS STATION PANAMA CITY, FLORIDA

greatly enhanced when based on a combination of chemical, ecological, and toxicological data (USEPA, 1989a).

- Ecological and toxicological data can be used to assess the aggregate toxicity of all toxic constituents at a SWMU and AOC.

- The bioavailability of a toxic chemical is measured with ecological and toxicological assessments, but not with chemical analyses, thereby providing greater confidence in toxicities of chemicals rather than chemical data alone.

- Ecological and toxicological assessments link chemical-specific toxicity with measurable biological responses, thereby providing a realistic assessment of environmental effects.

- Ecological and toxicological assessments provide information on the magnitude and variation of toxic effects, which may be useful in cleanup strategies. The proposed ecological sampling at SWMUs 2, 3, and 9 is intended to decrease the uncertainties associated with the Phase 1 assessment and to provide better information upon which potential cleanup decisions may be based. The ecological sampling to be completed for each of the SWMUs or AOCs is described in the following subsections. How the results will be used to support the ecological risk analyses and identification of corrective action objectives is described in Tables 7-3 and 7-4.

Surface soils collected from SWMU 2, SWMU 9, and background locations will be submitted for a 14-day earthworm (*Eisenia foetida*) survival test (USEPA, 1989b). At SWMUs 2 and 9, and background locations, a subset of the earthworms surviving the test will be analyzed for chemical content. Decisions regarding which earthworms will be analyzed will be based on the results of the chemical analyses of the corresponding surface soil samples. Earthworms that are exposed to a range of contaminant concentrations will be analyzed for SVOCs and metals. If contamination is not detected in corresponding surface soil samples, then earthworm analyses will not be necessary. At SWMU 2, if field screening for lead contamination identifies soils that are heavily contaminated, earthworms will be exposed to a range of lead concentrations by dilution of a soil sample from the most contaminated area. More specific discussions concerning the number of samples for each SWMU are included in Section 7.4. The results of the earthworm toxicity testing and chemical analyses will be used in the ecological risk assessment for identification of corrective action objectives as described in Table 7-3.

Sediment samples from SWMU 1 and AOC 2, SWMU 3, and background locations will be submitted for a 10-day static test with a marine amphipod (*Ampelisca abdita*) (ASTM, 1992). Sediments for toxicity testing will be collected and stored according to American Society of Testing and Materials protocol (ASTM, 1990). The results of the sediment toxicity testing will be used in the ecological risk assessment and the identification of corrective action objectives as described in Table 7-4.

At the same locations where sediments will be collected for toxicity testing, samples of aquatic macroinvertebrates will be collected. At each location, three replicate dredge samples will be collected with a petite ponar dredge. Each of

Table 7-3
Decision Matrix for Use of Ecological Sampling Results for Soils

RCRA Facility Investigation Report
CSS Panama City, Florida

Possible Results				Decision and Action
Chemical Analyses[1]	Earthworm Analyses[2]	Plant Analyses[3]	Toxicity Testing[4]	
-	-/+	-/+	-/+	Sufficient evidence exists to determine no exposure and no risk for ecological receptors.
+	-	-	-	Sufficient evidence exists to determine that soil contamination is not biologically available and poses no risk via food chain exposures for terrestrial receptors. Further analyses of potential risks related to indirect or direct ingestion of soils by terrestrial receptors will be completed in a separate risk evaluation based on the surface soil contamination data. The risk analyses will compare predicted exposures with those exposures expected to result in adverse effects to growth, reproduction, or survival. If risks are predicted, corrective action levels will be determined based on the results.
+	-	+	+/-	Sufficient evidence exists to determine that contamination in soils is biologically available with potential transport of contamination in the food chain and subsequent dietary exposures for terrestrial receptors. Risks will be evaluated in a separate analysis for the potential dietary exposures. The risk analyses will compare dietary exposures with those expected to result in adverse effects to growth, reproduction, or survival. Results of the earthworm and plant analyses will be used to predict the potential dietary contaminant exposures for terrestrial receptors. If adverse effects are predicted in the risk analyses, corrective action levels for the Corrective Measure Study (CMS) will be determined based on the results.
+	-	-	+	Sufficient evidence exists to determine that contamination in soils is biologically available and toxic to soil invertebrates and potentially toxic to other receptors. Negative results for earthworm analyses suggests that the contamination is not bioaccumulated by soil invertebrates and transport of contamination and subsequent exposures in the food chain is not likely for terrestrial receptors. Corrective action levels for the CMS will be determined based on the dose-response relationship between earthworm response and contaminant concentrations.

See notes at end of table.

Table 7-3 (Continued)
Decision Matrix for Use of Ecological Sampling Results for Soils

RCRA Facility Investigation Report
CSS Panama City, Florida

Possible Results				Decision and Action
Chemical Analyses[1]	Earthworm Analyses[2]	Plant Analyses[3]	Toxicity Testing[4]	
+	+	+/-	-	Sufficient evidence exists to determine that contamination in soils is biologically available with potential transport of contamination in the food chain and subsequent dietary exposures for terrestrial receptors. Risks will be evaluated in a separate analysis for potential contaminant exposures in the diet of terrestrial receptors. The risk analyses will predict dietary exposures and compare the exposures with those expected to result in adverse effects to growth, reproduction, or survival. Results of the earthworm and plant analyses will be used to determine the potential dietary contaminant exposures for terrestrial receptors. If adverse effects are predicted in the risk analyses, corrective action levels for the CMS will be determined based on the results.
+	+	+	+	Sufficient evidence exists to determine that contamination in soils is biologically available and toxic to terrestrial receptors. Corrective action levels for the CMS will be determined based on the dose-response relationship between earthworm response and contaminant concentrations.

[1] Contamination of media is detected that can be associated with waste disposal practices at the respective SWMU.
[2] Earthworms exposed to soils from the SWMU accumulate contaminants at concentrations higher than those exposed to the reference soils.
[3] Metals concentrations in plants collected from the SWMU are higher than those collected from a reference area.
[4] Survival of earthworms exposed to surface soils from the SWMU is significantly lower than those exposed to reference soils in a 14-day exposure.

Notes: - = negative result.
+ = positive result.

Table 7-4
Decision Matrix for Use of Ecological Sampling Results for Surface Water and Sediments

RCRA Facility Investigation Report
CSS Panama City, Florida

Possible Results			Decision and Action
Chemical Analyses[1]	Sediment Toxicity Testing[2]	Invertebrates[3]	
-SD/-SW	+/-	+/-	Sufficient evidence exists to determine no potential contaminant exposures for ecological receptors and no risks.
-SD/+SW	+/-	+	Sufficient evidence exists to suggest that chemical contamination in surface water may be adversely affecting the aquatic invertebrate community. Objectives for corrective measures will address prevention of migration of contamination to surface waters (control of surface run off and/or treatment of groundwater contamination).
-SD/+SW	+/-	-	Sufficient evidence exists to determine no risks for aquatic invertebrate receptors associated with surface water contamination. Further analyses of risks for fish via direct contact with contaminated surface water and the potential accumulation of contamination in fish tissue with subsequent exposures for foraging birds will be completed. Objectives for corrective measures will be determined based on the results of this risk analyses.
+SD	-	-	Sufficient evidence exists to suggest that sediment contamination is not causing measurable adverse ecological effects. Further evaluation of risks for terrestrial receptors related to ingestion of contaminated surface water or sediments will be completed. Objectives for corrective measures will be determined based on the results of the risk analyses.
+SD	+	-	Sufficient evidence exists to suggest that sediment contamination present is toxic to aquatic receptors. Corrective action levels will be determined based on the concentrations of contaminants in sediments not associated with toxicity in the bioassay.

See notes at end of table.

Table 7-4 (Continued)
Decision Matrix for Use of Ecological Sampling Results for Surface Water and Sediments

RCRA Facility Investigation Report
CSS Panama City, Florida

Possible Results			Decision and Action
Chemical Analyses[1]	Sediment Toxicity Testing[2]	Invertebrates[3]	
+ SD	-	+	Results will be interpreted to assess if habitat differences or other factors are responsible in differences observed between the SWMU and reference. If interpretation suggests that contamination in sediments may be associated with lower diversity, then sufficient evidence will be present to determine that contamination is impairing the aquatic invertebrate community. Corrective action levels will be determined based on the concentration of contaminants in sediments not associated with decreased species diversity in the aquatic invertebrate community.
+ SD	+	+	Sufficient evidence exists to determine that contaminant exposures are resulting in unacceptable risks. Corrective action levels will be determined based on the contaminant concentrations where no adverse effects were observed in either the toxicity test or macroinvertebrate community.

[1] Contamination of media is detected that can be associated with waste disposal practices at the respective Solid Waste Management Unit (SWMU).
[2] Survival of amphipods exposed to sediments from the SWMU is significantly lower than those exposed to the reference sediments.
[3] Species diversity is less than 75 percent of the reference.

Notes: + = positive result.
- = negative result.
SW = surface water.
SD = sediment.

the dredge samples will be sieved through a U.S. Standard No. 30 sieve bucket, placed in a labeled wide mouth jar, and preserved with 7 percent formalin. The preserved samples will be processed by a subcontract laboratory with macroinvertebrates identified to the lowest practicable taxonomic level (preferably species). The Shannon-Weaver diversity index will be calculated for each location. The diversity indices for SWMU locations will be compared to reference locations. The SWMU locations with diversity less than 75 percent of the average for the references will be identified as impacted (FDEP, 1992). The results of the macroinvertebrate sampling will be used with the results of the chemical analyses of sediments and toxicity testing to evaluate risks and to identify corrective action objectives as described in Table 7-4.

Samples of plant tissue will be collected and analyzed for metals at a background location and at SWMU 2. These data will be used to evaluate the bioavailability of metals in soils and to estimate dietary exposures for herbivores during the ecological assessment.

7.2.6 Investigation Derived Waste Management Plan Procedures for handling and disposing of investigation-derived waste (IDW) will be discussed in an IDW Management Plan that will be prepared prior to the Phase 2 RFI field investigation.

7.3 PROPOSED FACILITY-WIDE PHASE 2 RFI ACTIVITIES. This section presents background field explorations that will be completed during the Phase 2 RFI. The background explorations include: surface soil sample collection, surface water and sediment sampling in St. Andrew Bay, monitoring well installation, groundwater sampling, and a water level elevation survey. The results of the background investigation will be used to compare the results of chemical analyses of samples collected at the SWMUs and AOCs to natural background concentrations. Figure 7-2 presents approximate locations for background explorations at CSS Panama City. Table 7-5 presents the rationale for each of the planned background explorations at CSS Panama City. All background samples will be collected following procedures outlined in the *Environmental Compliance Branch Standard Operation Procedures and Quality Assurance Manual* (USEPA, 1991a).

Background samples for all media will be analyzed using Level III data quality objectives (DQOs). Approximately 10 percent of all background samples collected for each media (i.e., groundwater, soil, surface water, and sediments) will be analyzed using Level IV DQOs. All field quality control samples will be collected in accordance with *Environmental Compliance Branch Standard Operation Procedures and Quality Assurance Manual* (USEPA, 1991a).

7.3.1 Background Surface Soil Sample Collection Five surface soil samples will be collected (0 to 1 foot bls) to provide background surface soil information at CSS Panama City. The samples will be collected from each of the three primary soil groups present at CSS Panama City (Leon Sand, Mandarin Sand, and Arents Sand) to characterize background concentrations for each group. Two samples each will be collected from the Leon Sand and the Mandarin Sand soil groups (characteristic of SWMUs 2, 3, and 9 and AOC 1), and one sample will be collected from the Arents Sand (characteristic of AOC 2 and SWMU 5). Only one surface soil sample will be collected and analyzed from the Arents Sand soil group because

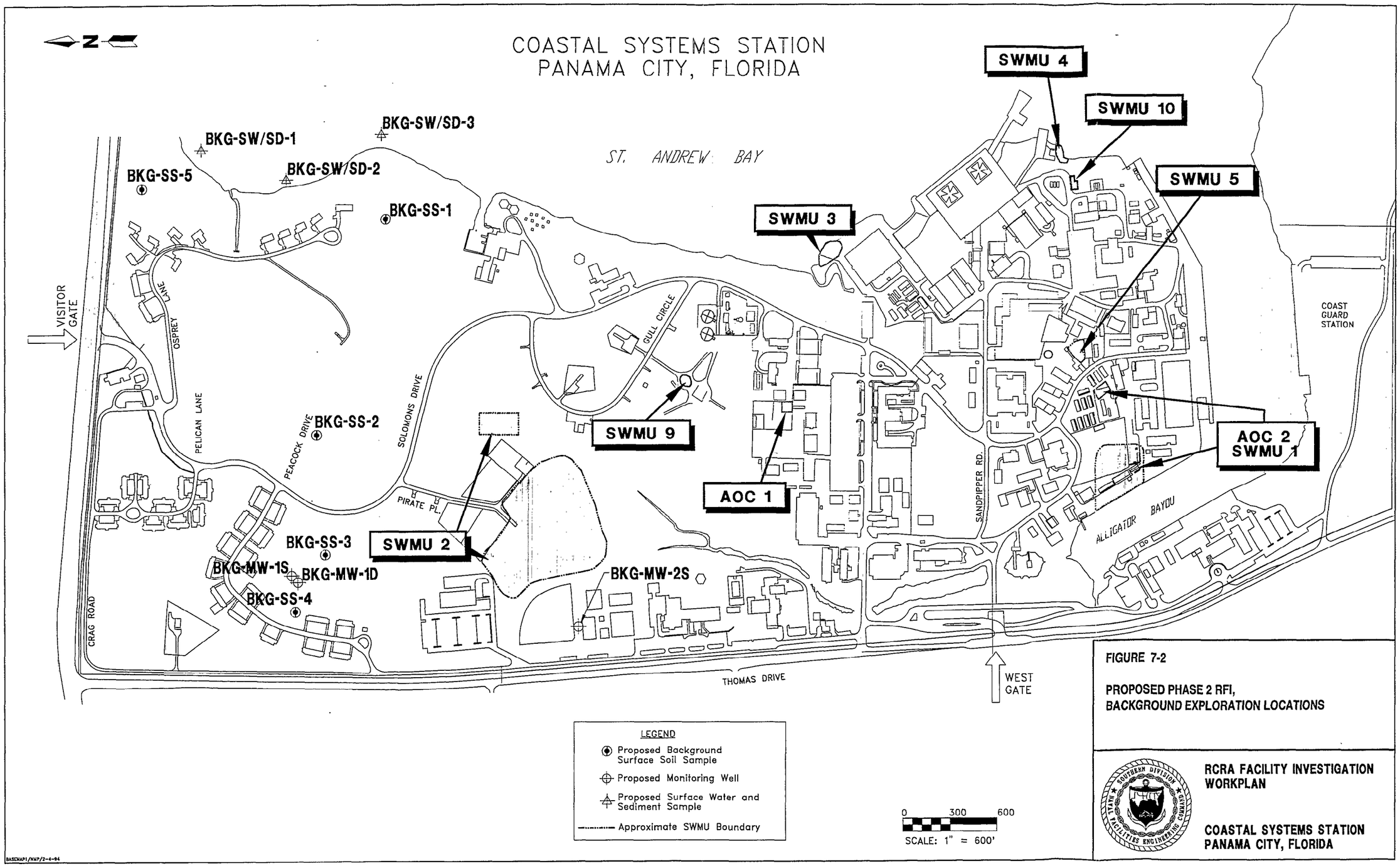


FIGURE 7-2

PROPOSED PHASE 2 RFI,
BACKGROUND EXPLORATION LOCATIONS

RCRA FACILITY INVESTIGATION
WORKPLAN

COASTAL SYSTEMS STATION
PANAMA CITY, FLORIDA

Table 7-5
Rationale for Background Sampling

RCRA Facility Investigation Report
CSS Panama City, Florida

Field Activity	Quantity	Analytical Program	Rationale
Surface soil sampling	5	VOCs, SVOCs, PAHs, pesticides and PCBs, total cyanide, and metals.	Five surface soil samples will be collected (0 to 1 foot bls) to provide background surface soil information at CSS Panama City. The samples will be collected from each of the three primary soil groups present at CSS Panama City.
Monitoring well installation	3	None	One deep and one shallow well will be installed in the northwest corner of the facility near Peacock Drive and one shallow well will be installed in the midwestern portion of the facility near Thomas Drive.
Groundwater sampling	3	VOCs, SVOC, PAHs, pesticides and PCBs, total cyanide, metals (unfiltered and dissolved [filtered]), TDS, and TSS.	Analytical results from samples collected from these wells will provide background groundwater data for use in comparison to source area groundwater quality at CSS Panama City.
Water level measurements	2	None	Two rounds of water level measurements will be collected from background monitoring wells at CSS Panama City during the Phase 2 RFI. Levels will be recorded once during the Phase 2 RFI investigation (upon installation of the wells) and once at the end of the field investigation. The data will be used to prepare a water table contour map to assess the direction of groundwater flow.
Surface water and sediment sampling	3	VOCs, SVOC, PAHs, pesticides and PCBs, total cyanide, metals (unfiltered), hardness (surface water), and TOC (sediment).	Background surface water and sediment samples will be collected from St. Andrew Bay to provide background data for use in comparison to source area surface water and sediment quality at CSS Panama City.
Surface water	3	Cadmium, copper, nickel, silver, beryllium, and chromium; phenols; and halogenated carbons.	Additional sample volume will be collected for background surface water and sediment samples and analyzed for these indicated parameters using the furnace method and SW846 methods. These analytical methods will achieve lower detection limits for the above compounds so that data can be compared to the State of Florida Surface Water Quality Standards for Class III marine water (FDEP, 1992) and the Region IV Waste Management Division Sediment Screening Values for Hazardous Waste Sites (USEPA, 1992).
Sediment	3	Antimony and polynuclear aromatic hydrocarbons.	

Notes: VOCs = volatile organic compounds.
SVOCs = semivolatile organic compounds.
PAHs = polynuclear aromatic hydrocarbons.
PCBs = polychlorinated biphenyls.
TDS = total dissolved solids.
TSS = total suspended solids.
TOC = total organic carbon.
FAC = Florida Administrative Code.
USEPA = U.S. Environmental Protection Agency.

this particular soil group comprises only a small portion of the overall CSS Panama City soil composition. These sample points will be located in areas remote from known past waste disposal activities to ensure that the surface soil samples have not been influenced by past waste disposal practices at the SWMU or AOCs. Background surface soil samples will be analyzed for VOCs, SVOCs, PAHs, pesticides and PCBs, metals, and total cyanide.

7.3.2 Background Surface Water and Sediment Sampling Surface water and sediment samples will be collected from St. Andrew Bay to provide background concentrations of inorganic and organic parameters. Sample locations are presented in Figure 7-2. Three surface water and sediment background samples will be collected and analyzed for VOCs, SVOCs, PAHs, pesticides and PCBs, metals (unfiltered), and total cyanide. Surface water samples will be analyzed for hardness and sediment samples will be analyzed for TOC. Samples will be collected at low tide.

In addition to the above analyses, the surface water samples will be analyzed for cadmium, copper, nickel, silver, beryllium by furnace, hexavalent chromium by colorimetric, phenols by SW846 Method 8040, and halogenated carbons by SW846 Method 8010. Background sediment samples will also be analyzed for antimony by furnace and polynuclear aromatic hydrocarbons by SW846 method 8100. These analytical methods will achieve lower detection limits for the above compounds so that data can be compared to the State of Florida Surface Water Quality Standards for Class III marine water (FDEP, 1992) and the Region IV Waste Management Division Sediment Screening Values for Hazardous Waste Sites (USEPA, 1992).

7.3.3 Installation and Sampling of Background Monitoring Wells Three monitoring wells will be installed in the northern section of CSS Panama City, upgradient of all SWMUs and AOCs. One deep and one shallow well will be installed in the northwest corner of the facility near Peacock Drive and one shallow well will be installed in the midwestern portion of the facility near Thomas Drive. The depth of the shallow wells will be 25 feet bls, with a 10-foot screened interval from 15 to 25 feet bls. The deep well will extend to 60 feet bls, with a 10-foot screened interval from 50 to 60 feet bls. Analytical results from groundwater samples will provide background groundwater data for use in comparison to source area groundwater quality at CSS Panama City. Planned locations of the background monitoring wells are presented in Figure 7-2. Groundwater samples will be collected from the three installed wells and will be analyzed for VOCs, SVOCs, PAHs, pesticides and PCBs, metals (unfiltered and dissolved [filtered]), total cyanide, total dissolved solids (TDS), and total suspended solids (TSS).

7.3.4 Background Ecological Sampling Ecological sampling will include toxicity testing with background soils and sediments, analyses of metals in plant tissue at background locations, analyses of contaminant concentrations in earthworms exposed to soils in the toxicity testing, and collection of aquatic macroinvertebrates at background surface water and sediment sample locations. Additional surface soil sample volume will be collected at the two background surface soil sample locations that are comparable to soils present at SWMU 2 and SWMU 9 (Leon Sand and the Mandarin Sand sampling locations). The samples will be submitted to a subcontract laboratory for a 14-day earthworm (*Eisenia foetida*) survival test (USEPA, 1989b). Earthworms that survive the toxicity testing will be analyzed for SVOCs and metals. One plant sample will also be collected from a background location for analyses of metals.

Additional sediment sample volume will be collected from the three background surface water and sediment sample locations and submitted to a subcontract laboratory for toxicity testing (Figure 7-2). The samples will be submitted for testing with a 10-day survival test with a marine amphipod (*Ampelisca abdita*) (ASTM, 1992). At each of the three locations, aquatic macroinvertebrate samples will also be collected as described in subsection 7.2.5. The results of the background ecological investigation will be compared with the results of the ecological investigations at SWMU 2, 3, and 9 to assess ecological risks and to evaluate objectives for the corrective measures study. A decision matrix is presented in Table 7-3 for soils and Table 7-4 for sediments and surface water. These tables describe how the data will be used in the ecological risk assessment.

7.3.5 Water Level Measurements During the Phase 2 RFI, three rounds of water level measurements will be collected from all monitoring wells located at CSS Panama City. Water level measurements will be collected once at the beginning of the field program, once during the field program, and once at the completion of the field program. The data will be used to prepare a water table contour map and to assess the direction of groundwater flow at each SWMU and AOC.

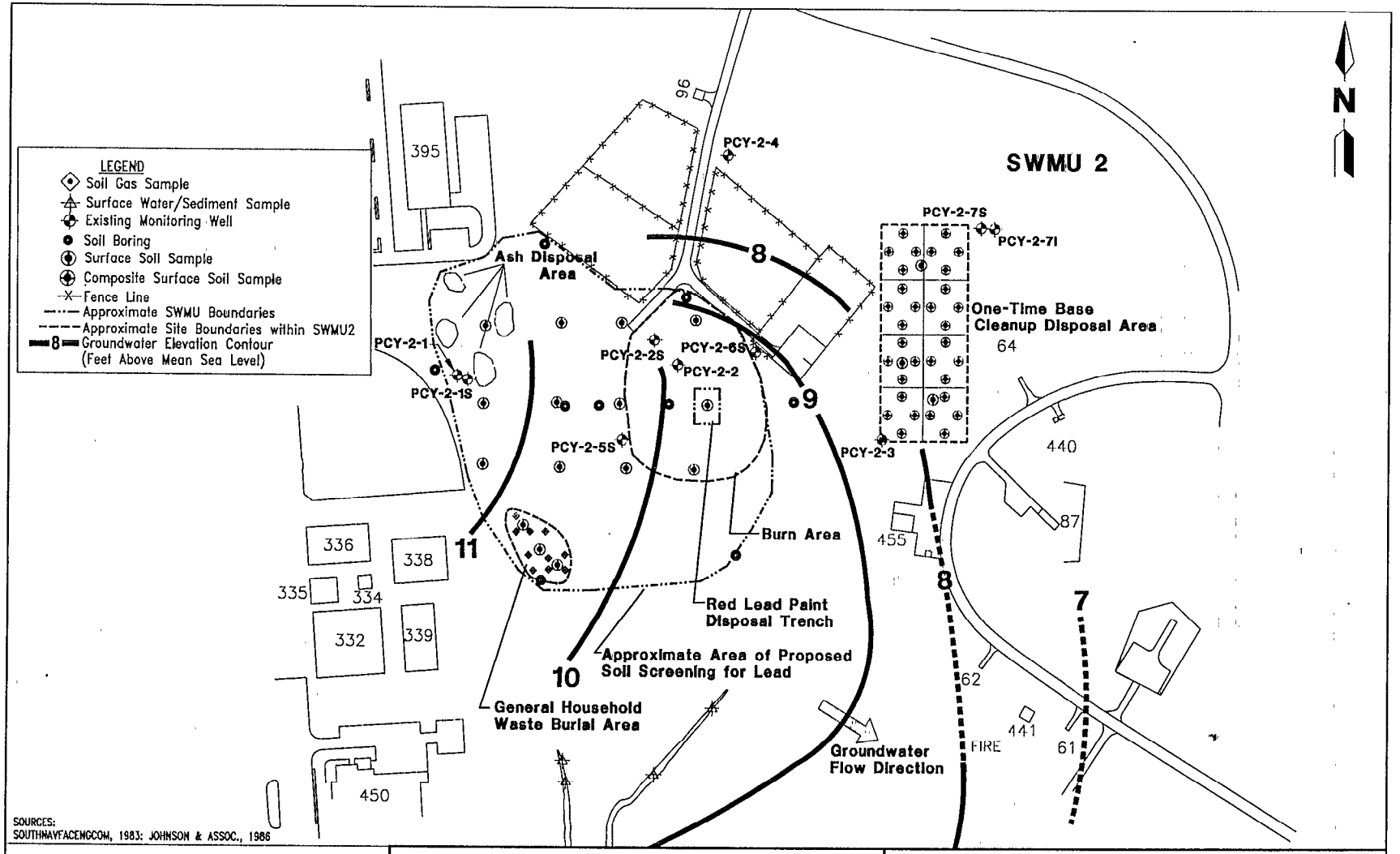
7.4 SITE-SPECIFIC SAMPLING AND ANALYTICAL PROGRAM. The following subsections describe the site-specific field investigative activities that will be performed at each of the individual SWMUs and AOCs. Tables summarizing the field investigative activities, rationale for sampling and analysis, and a site map are included in each discussion.

Analytical methods have been selected based on wastes known or suspected to be present at each site (C.C. Johnson & Associates, 1985), contaminants detected during the Confirmation Study (Environmental Science and Engineering, 1987), and data gaps identified during the Phase 1 RFI. All samples will be analyzed using Level III DQOs. Field quality control samples will be analyzed using Level IV DQOs; this represents approximately 10 percent of the total analytical program. A summary of the Phase 2 RFI sampling and analysis program, including the field quality control sampling, is presented in Section 7.5.

7.4.1 SWMU 2, Landfill B, Burn and Landfill Area SWMU 2 occupies approximately 11 acres near Pirate Place in the northern section of CSS Panama City (Figure 7-3). Within the confines of SWMU 2, five areas have been delineated where landfill operations have occurred. These areas include the Burn Area, the Ash Disposal Area, the Household Garbage (wet garbage) Disposal Area, the Red Lead Paint Disposal Area, and the One-Time Base Cleanup Disposal Area.

The Phase 2 RFI exploration program at SWMU 2 will consist of the following activities:

- geophysical survey,
- soil gas survey,
- test pit excavation,
- soil borings and subsurface soil sampling and analyses,
- surface soil sampling and analyses,
- monitoring well installation,
- water level measurements,
- groundwater sampling and analysis,



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SCALE: 1" = 300'

SWMU2/KPG/11-11-93

FIGURE 7-3
SOLID WASTE MANAGEMENT UNIT NO. 2, LANDFILL B, BURN AND LANDFILL AREA, PROPOSED PHASE 2 RFI EXPLORATION LOCATIONS

RCRA FACILITY INVESTIGATION WORKPLAN

COASTAL SYSTEMS STATION PANAMA CITY, FLORIDA

- surface water and sediment sampling, and
- ecological investigation.

The rationale for the Phase 2 RFI sampling and analysis program at SWMU 2 is presented in Table 7-6. Figure 7-3 depicts the locations of samples to be collected and analyzed at SWMU 2.

7.4.1.1 **Geophysical Surveys** Magnetic and terrain conductivity surveys will be completed in tandem at all the SWMU 2 study areas. Data will be collected at 2 foot increments along profile lines spaced 20 feet apart (based on site conditions). The purpose of the geophysical surveys is to delineate disposal boundaries. A GPR may also be used to complement magnetic and EM survey results in selected areas. Information from these surveys will be used to guide proposed exploration locations.

7.4.1.2 **Soil Gas Survey** The soil gas survey at SWMU 2 will consist of the collection of 10 active soil gas samples for methane that will be analyzed using an organic vapor analyzer on approximately 50-foot centers. The survey will include the area along the reported location of the General Household Waste Burial Area. Because of the uncertainty of the boundaries of the General Household Waste Burial Area, it is possible that soil gas data may not accurately represent methane production within SWMU 2. The soil gas sampling locations will be based on the best available information on the General Household Waste Burial Area's location. Details of the soil gas collection and analysis procedures are summarized in the Phase 1 RFI Workplan (E.C. Jordan Co., 1989).

7.4.1.3 **Test Pit Excavation** A total of 11 test pits will be excavated at SWMU 2 to identify the disposal boundaries and the type of waste disposed at each site. Exact locations will be determined in the field based upon the results of the geophysical survey. Test pits will be excavated with a backhoe to approximately 10 feet bls. No soil samples are scheduled to be collected for analysis from the test pits.

7.4.1.4 **Surface Soil Lead Screening** Surface soil lead screening will be done in the field for the Burn Area and the Red Lead Paint Disposal Area at SWMU 2 to delineate the area where lead concentrations exceed 500 ppm. The results of the lead screening will be used to locate the surface soil sampling points so that the maximum amount of information on the extent of surficial contamination can be determined with the minimum number of analytical samples. Samples will be collected from the areas with the highest lead screening concentrations and also along a gradient of lead concentrations. The analytical technique uses an atomic absorption (AA) unit calibrated for total lead concentration. The sample will be digested so that the total amount of lead is suspended in an aqueous solution. Once digested, a Perkin/Elmer™ AA unit will be used to determine the lead content of the soil sample. A maximum of 90 screening samples will be analyzed in the field.

7.4.1.5 **Surface Soil Sampling** A total of 26 surface soil samples (0 to 1 foot bls) will be collected at SWMU 2 to characterize the nature and horizontal extent of surface soil contamination and to provide the necessary information to develop

Table 7-6
Phase 2 RFI Rationale for Explorations at SWMU 2
SWMU 2 - Landfill B, Burn and Landfill Areas

RCRA Facility Investigation Report
CSS Panama City, Florida

Field Activity	Quantity	Analytical Program	Rationale
Geophysical survey		None	Magnetic and terrain conductivity surveys will be completed at Solid Waste Management Unit (SWMU) 2 to delineate the boundaries of disposal areas. A ground-penetrating radar (GPR) survey may also be completed to complement magnetic and electromagnetic (EM) induction survey results in selected areas. Information from these surveys will be used to delineate the disposal area boundaries of the One-Time Base Cleanup Disposal Area, the Red Lead Paint Disposal Area, and the General Household Waste Burial Area.
Soil gas survey (methane)	10	Methane	A soil gas survey will be completed in the General Household Waste Burial Area to detect the presence of methane. The presence of methane would indicate the potential of decaying organic matter typical of burial areas.
Test pits	11	None	After completion of the geophysical and the soil gas surveys, test pits and test trenches will be excavated at the One-Time Base Cleanup Disposal Area, the Red Lead Paint Disposal Area, and the General Household Waste Burial Area. The purpose of the test pits and trenches is to identify the disposal boundaries and the type of waste that was disposed at each site. This information will be used to develop corrective action alternatives, such as capping, for SWMU 2.
Subsurface soil sampling	33	SVOCs, pesticides and PCBs, PAHs, metals, and total cyanide.	Results of the RCRA Facility Investigation (RFI) Phase 1 indicated the presence of several metals and PAHs in subsurface soil samples collected at the Burn Area. Therefore, additional subsurface soil samples will be collected during the Phase 2 RFI to further characterize the nature and vertical and horizontal extent of subsurface soil contamination at SWMU 2. Three borings will be placed within the Burn Area to evaluate the vertical extent of contamination. Three samples will be collected from each boring within the Burn Area. Six soil borings will be completed along the perimeter of the Burn Area to evaluate the horizontal extent of subsurface contamination. Four samples will be collected from each boring along the perimeter. These analytical data will assist in the calculation of the volume of contaminated soil within the Burn Area. This information is necessary to evaluate corrective action alternatives.
Surface soil lead screening	≈90	Lead	Surface soil lead screening will be done in the field for the Burn Area at SWMU 2. The results of the lead screening will be used to locate the surface soil sampling points so that the maximum amount of information on the extent of surficial contamination can be determined with the minimum number of analytical samples.
Surface soil sampling (discrete sampling)	26	VOCs, SVOCs, pesticides and PCBs, PAHs, metals, and total cyanide. Composites: SVOCs, pesticides and PCBs, PAHs, metals, and total cyanide.	Twenty-six surface soil samples (18 samples at random discrete locations and 8 composite samples) will be collected during the Phase 1 RFI. These data will assist in the characterization of chemical contamination within the surface soil at the SWMU. This information is needed to assess risks to human and ecological receptors from contamination at the SWMU. Because of the uncertainty of the location of the One-Time Base Cleanup Disposal Area, 32 soil samples will be collected and composited to 8 samples for analyses. Because composite sampling yields average concentration values across an area, three surface soil samples will be collected from discrete locations to provide chemical data at random discrete locations across the site.

See notes at end of table.

Table 7-6 (Continued)
Phase 2 RFI Rationale for Explorations at SWMU 2
SWMU 2 - Landfill B, Burn and Landfill Areas

RCRA Facility Investigation Report
CSS Panama City, Florida

Field Activity	Quantity	Analytical Program	Rationale
Water level measurements	3 times	None	Three rounds of water level measurements will be collected from all monitoring wells at SWMU 2 during the Phase 2 RFI. Levels will be recorded at the beginning of the field program, during the Phase 2 RFI field investigation, and at the end of the field investigation. The data will be used to prepare a water table contour map to assess the direction of groundwater flow.
Monitoring well installation	1	None	Analytical results from the Phase 1 RFI field investigation identified heptachlor epoxide contamination in the shallow and intermediate monitoring wells PCY-2-1 and PCY-2-1S. To delineate the vertical extent of contamination, one deep monitoring well will be installed near these two wells.
Groundwater sampling	1	VOCs, SVOCs, pesticides and PCBs, PAHs, metals (unfiltered and dissolved [filtered]), and total cyanide.	Because the sample from the newly installed monitoring well will be the first sample collected from this well, the sample will be analyzed for all indicated parameters.
	1	SVOCs	The human health risk assessment completed for the Phase 1 RFI indicated a risk to human health via ingestion of groundwater contaminated with benzo-a-pyrene. Therefore, monitoring well PCY-2-2S will be resampled to assess the significance of SVOC contamination in this well and at the SWMU.
	6	VOCs	The Phase 1 RFI field investigation identified VOC contamination in six monitoring wells: PCY-2-7S, PCY-2-7I, PCY-2-6S, PCY-2-2, PCY-2-2S, and PCY-2-5S. Therefore, these wells will be resampled and analyzed for VOCs to confirm or deny the presence and significance of VOC contamination at the SWMU.
	2	Pesticides and PCBs	The Phase 1 RFI indicated that monitoring wells PCY-2-1 and PCY-2-1S exhibit pesticide and PCB contamination. These wells will be resampled during the Phase 2 RFI investigation and analyzed for these parameters.
	10	Metals (unfiltered and dissolved [filtered]),	Ten groundwater samples will be collected from all existing monitoring wells at SWMU 2. All samples will be analyzed for metals, both unfiltered and dissolved (filtered). These data will be used to assess whether elevated concentrations of metals detected during the Phase 1 RFI investigation were due to the presence of suspended soil particles in the samples. The data obtained from all groundwater analyses will be used in the development of the corrective action alternatives during the Corrective Measures Study.

See notes at end of table.

Table 7-6 (Continued)
Phase 2 RFI Rationale for Explorations at SWMU 2
SWMU 2 - Landfill B, Burn and Landfill Areas

RCRA Facility Investigation Report
CSS Panama City, Florida

Field Activity	Quantity	Analytical Program	Rationale
Surface water and sediment sampling	4	VOCs, SVOCs, pesticides and PCBs, PAHs, metals (unfiltered), total cyanide, hardness (surface water), and TOC (sediment).	Results of the RFA investigation indicate detectable levels of barium, copper, zinc, and petroleum hydrocarbons in surface water and sediment samples collected at SWMU 2. These results may indicate a potential release of chemicals from the SWMU. Therefore, four surface water and four sediment samples will be collected and analyzed from each of the ditches draining the SWMU to the south. All surface water and sediment samples collected during the Phase 2 RFI will be analyzed for all of the listed analytes. This information will be used to both verify the results of the RFA and assess whether other contaminants are present at concentrations that pose risk to the ecological receptors.
Surface water and sediment	4	**Surface water:** cadmium, copper, nickel, silver, beryllium, chromium, phenols, and halogenated carbons. **Sediment:** antimony and polynuclear aromatic hydrocarbons.	Additional sample volume will be collected for surface water and sediment samples collected at SWMU 2 and analyzed for these indicated parameters using the furnace method and SW846 methods. These analytical methods will achieve lower detection limits for the above compounds so that data can be compared to the State of Florida Surface Water Quality Standards for Class III marine water (FDEP, 1992) and the Region IV Waste Management Division Sediment Screening Values for Hazardous Waste Sites (USEPA, 1992).
Ecological Samples			
Surface soil	10	Toxicity testing	Additional surface soil sample volume will be collected at 10 surface soil sampling locations at SWMU 2. The additional soil samples will be submitted for a 14-day earthworm survival test. The earthworm response will be compared to the corresponding analytical data and used to evaluate ecological risks and corrective action objectives.
Earthworms	5	SVOCs and metals.	Earthworms exposed in the toxicity testing will be analyzed for chemical content. The results of the analyses will be used to assess chemical exposures for terrestrial receptors in the ecological risk analyses.
Sediment	2	Toxicity testing	Additional sediment sample volume will be collected at the surface water and sediment sample locations and will be submitted to the laboratory for toxicity testing with a marine amphipod. The toxicity testing results will be compared to corresponding analytical data to assess ecological risks for aquatic receptors.

See notes at end of table.

Table 7-6 (Continued)
Phase 2 RFI Rationale for Explorations at SWMU 2
SWMU 2 - Landfill B, Burn and Landfill Areas

RCRA Facility Investigation Report
CSS Panama City, Florida

Field Activity	Quantity	Analytical Program	Rationale
Macroinvertebrate	2	Identification	Sediment samples will be collected for macroinvertebrate identification. These results will be used to assess ecological risks at the SWMU.
Plant tissue	5	Metals	To evaluate the bioavailability of metals within plant tissue at SWMU 2 to ecological receptors, five plant tissue samples will be collected and analyzed. Locations for collection of these samples will be based on the results of the field screening for lead. These data will assist in the estimation of dietary exposures of herbivores during the ecological risk assessment.

Notes: SVOCs = semivolatile organic compounds.
PCBs = polychlorinated biphenyls.
PAHs = polynuclear aromatic hydrocarbons.
RCRA = Resource Conservation and Recovery Act.
VOCs = volatile organic compounds.
TOC = total organic compound.
RFA = RCRA Facility Assessment.
FAC = Florida Administrative Code.
USEPA = U.S. Environmental Protection Agency.

the human health and ecological risk assessments (Figure 7-3). The soil sample collection is as follows:

- 8 composite surface soil samples and 3 grab surface soil samples from the One-Time Base Cleanup Disposal Area;
- 12 surface soil samples from the Red Lead Paint Disposal Area (as defined in the screening results described in subsection 7.4.1.4), the Ash Disposal Area, and the Burn Area; and,
- 3 surface soil samples from the General Household Waste Burial Area.

One-Time Base Cleanup Disposal Area Because of the uncertainty of the location of the One-Time Base Cleanup Disposal Area, surface soil samples will be collected and composited to assess the overall horizontal extent of contamination within the disposal area. Rather than collect and analyze a large number of samples over a large surface area, composite sampling will allow for the same number of samples to be collected but a fewer number of samples to be analyzed by the off-site laboratory. Eight composite samples will be collected from locations within a 100 foot by 125 foot grid that overlies the assumed landfill boundaries. Information from the geophysical survey will be used to identify the location of the sampling grid that will overlie the disposal area. Within each grid space, four surface soil samples will be collected, combined, and analyzed as one sample (Figure 7-3). The sample will be thoroughly mixed to provide a homogeneous sample, then packaged and preserved for shipment to the analytical laboratory. Because composite sampling yields average values and does not yield concentrations of chemicals at random discrete locations, three random discrete surface soil samples will be collected within the disposal area. Data will be evaluated using procedures outlined in SW846: *Test Methods For Evaluation of Solid Waste, Volume 2, Field Manual Physical/Chemical Methods* (USEPA, 1986). Sample collection will be completed using methodology described in subsection 7.2.3.

Mixing of the composite samples would most likely volatilize any VOCs present in the surface soil sample. Therefore composite surface soil samples will be analyzed for SVOCs, PAHs, metals, total cyanide, and pesticides and PCBs.

Red Lead Paint Disposal Area, Ash Disposal Area, Burn Area, and General Household Waste Disposal Area. All surface soil samples except for the composite samples collected within the One-Time Base Cleanup Disposal Area will be analyzed for VOCs, SVOCs, metals, total cyanide, PAHs, and pesticides and PCBs. Subsurface soil samples collected and analyzed during earlier investigations (Environmental Science and
Engineering, 1987) and the RFI Phase I investigation contained detectable concentrations of the above analytes; therefore, surface soil samples collected from SWMU 2 during the Phase 2 RFI will be analyzed for all indicated parameters.

7.4.1.6 Soil Borings and Subsurface Soil Sampling Nine soil borings will be completed at SWMU 2 during the Phase 2 RFI activities (Figure 7-3). Three borings will be placed within the Burn Area and six borings will be placed along the perimeter of the Burn Area.

Three borings will be completed within the Burn Area to evaluate the vertical extent of contamination. Split-spoon samples will be collected at continuous

intervals to the water table. Subsurface soil samples will be collected for analysis at intervals from 2 to 4 feet, 4 to 6 feet, and 6 to 8 feet bls. Previous studies at SWMU 2 have reported concentrations of metals and SVOCs in soil samples collected from 0 to 2 feet. Subsurface soil analytical data from 2 feet to the water table is necessary to completely characterize the vertical extent of contamination within the subsurface soil at SWMU 2. These data are necessary for the CMS in order to calculate volumes of contaminated soil.

Six soil borings will be placed on the periphery of the Burn Area in order to evaluate the horizontal extent of contamination. Subsurface soil samples collected and analyzed during previous studies for SWMU 2 have indicated detectable concentrations of metals and SVOCs along the originally identified periphery of the Burn Area. Based on this information, the horizontal extent of contamination appears to extend beyond the originally identified perimeter of the Burn Area. Information obtained from the facility records search indicates that the extent of the Burn Area may be greater than originally anticipated. Six borings will be completed along the periphery of the Burn Area, as redefined based on the records search, to evaluate the horizontal extent of contamination for the CMS (Figure 7-3). Split-spoon samples will be collected at 2-foot intervals to the water table. Subsurface soil samples will be collected for analyses at intervals from 0 to 2 feet, 2 to 4 feet, 4 to 6 feet, and 6 to 8 feet bls. Analytical data from these borings will be used to calculate the volume of contaminated media during the CMS.

A total of 33 subsurface soil samples will be collected for analysis from these soil borings. All subsurface soil samples will be analyzed for SVOCs, metals, total cyanide, pesticides and PCBs, and PAHs. Subsurface soil samples collected and analyzed during the Phase 1 RFI and earlier investigations (Environmental Science and Engineering, 1987) contained detectable concentrations of the above-listed analyses in samples collected from 0 to 2 feet bls. Therefore, all soil samples collected from SWMU 2 during the Phase 2 RFI will be analyzed for all indicated parameters. Subsurface soil samples collected during previous investigations did not indicate the presence of VOCs; therefore, subsurface soil samples collected during the Phase 2 RFI will not be analyzed for this fraction.

7.4.1.7 **Monitoring Well Installation and Groundwater Sampling** Analytical results from the Phase 1 RFI field investigation identified heptachlor epoxide contamination in the shallow and intermediate monitoring wells PCY-2-1 and PCY-2-1S. To delineate the vertical extent of contamination, one deep monitoring well will be installed near these two wells. The sample from this well will be analyzed for VOCs, SVOCs, PAHs, metals (filtered and dissolved [unfiltered]), total cyanide, and pesticides and PCBs.

The human health risk assessment completed for the Phase 1 RFI indicated a risk to human health via ingestion of groundwater contaminated with benzo-a-pyrene. Therefore, monitoring well PCY-2-2S will be resampled to assess the significance of SVOC contamination at this location.

The Phase 1 RFI field investigation identified VOC contamination in six monitoring wells: PCY-2-7S, PCY-2-7I, PCY-2-6S, PCY-2-2, PCY-2-2S, and PCY-2-5S. Therefore, these wells will be resampled and analyzed for VOCs to confirm or deny the presence and significance of VOC contamination at the SWMU.

In addition, 10 groundwater samples will be collected from existing monitoring wells PCY-2-1, PCY-2-1S, PCY-2-2, PCY-2-2S, PCY-2-3, PCY-2-4, PCY-2-5S, PCY-2-6S, PCY-2-7S, and PCY-2-7I. These samples will be analyzed for metals (unfiltered and dissolved [filtered]). The Phase 1 RFI field investigation identified the presence of elevated concentrations of metals in groundwater samples. Groundwater analytical results from the Phase 2 RFI will be used to assess if elevated concentrations of metals detected during Phase 1 were due to the presence of suspended soil particles.

Groundwater samples collected from monitoring wells PCY-2-1 and PCY-2-1S will also be analyzed for pesticides and PCBs. Analytical data from the RFI Phase I indicate the presence of heptachlor epoxide in groundwater samples collected from these wells. Groundwater samples from these wells will be analyzed for pesticides and PCBs to evaluate the presence of this chemical in groundwater at SWMU 2.

7.4.1.8 **Surface Water and Sediment Sampling** Four surface water and four sediment samples will be collected from the ditches draining the SWMU to the south (Figure 7-3). These samples will be collected and analyzed to identify the potential for the migration of contamination into the surface water and sediments. The analytical data from this sampling effort will be used to assess chemical exposures to aquatic receptors in the ecological risk assessment.

Surface water and sediment samples will be analyzed for VOCs, SVOCs, PAHs, pesticides and PCBs, metals (unfiltered), and total cyanide. Surface water samples will be analyzed for hardness and sediment samples will be analyzed for TOC.

In addition to the above analysis, the surface water samples will be analyzed for cadmium, copper, nickel, silver, beryllium by furnace, hexavalent chromium by colorimetric, phenols by SW846 Method 8040, and halogenated carbons by SW846 Method 8010. Sediment samples will also be analyzed for antimony by furnace and PAHs by SW846 method 8100. These analytical methods will achieve lower detection limits for the above compounds so that data can be compared to the State of Florida Surface Water Quality Standards for Class III marine water (FDEP, 1992) and the Region IV Waste Management Division Sediment Screening Values for Hazardous Waste Sites (USEPA, 1992).

7.4.1.9 **Ecological Investigation** The ecological investigation of SWMU 2 will include soil toxicity testing, sediment toxicity testing, analyses of metals in plant tissue, analyses of chemical content in earthworms exposed to soils in the toxicity testing, and aquatic macroinvertebrate sampling. Additional surface soil sample volumes will be collected at 10 surface soil sample locations from the Red Lead Paint Disposal Area, the Ash Disposal Area, and the Burn Area. The samples will be submitted to a subcontract laboratory for a 14-day earthworm (*Eisenia foetida*) survival test (USEPA, 1989b). The locations for collection of the toxicity test samples will be determined in the field based on the results of the field screening. Samples will be selected that represent a range of contaminant exposure concentrations so it is possible to interpret the results to evaluate if there is a dose-response relationship between contaminant concentrations and earthworm mortality. Earthworms that survive the toxicity testing, to a maximum of five, will be analyzed for SVOCs and metals. Five plant samples will also be collected from SWMU 2 for analyses of metals. Locations for collection of plants will be based on the results of the field screening and will represent a range of contaminant concentrations in soils.

Additional sediment samples will be collected from two of the four surface water and sediment sampling locations and submitted to a subcontract laboratory for toxicity testing. The samples will be submitted for testing with a 10-day survival test with a freshwater amphipod (*Hyallea azteca*) (ASTM, 1993). Samples of aquatic macroinvertebrates will also be collected from two of the locations as described in subsection 7.2.5. The results of the ecological investigation will be used to assess ecological risks and to determine objectives for the corrective measures study. A decision matrix is presented in Table 7-3 for soils and Table 7-4 for surface water and sediments.

7.4.2 SWMU 3, Landfill C, Burn and Disposal Area SWMU 3 is located northeast of the Amphibious Assault Landing Craft area (Building 319) on the beach of St. Andrew Bay. The site is an area of approximately 150 feet by 50 feet and is approximately 12 feet deep. It was used from 1953 to 1959 (C.C. Johnson and Associates, 1985) (Figure 7-4). The Phase 2 RFI exploration program at SWMU 3 will consist of the following activities:

- surface soil sampling and analysis,
- soil borings and subsurface soil sampling and analysis,
- water level measurements,
- groundwater sampling and analysis,
- surface water and sediment sampling and analysis, and
- ecological investigation.

The rationale for the Phase 2 RFI sampling and analysis program at SWMU 3 is presented in Table 7-7. Figure 7-4 depicts the locations of samples to be collected and analyzed at SWMU 3.

7.4.2.1 **Surface Soil Sampling** Three surface soil samples (0 to 1 foot bls) will be collected at SWMU 3 to characterize the nature and extent of surface soil contamination and to provide the necessary information to develop the human health and ecological risk assessments. The soil samples will be collected from areas not covered by riprap (Figure 7-4). The riprap, which controls coastal erosion to the north of the hovercraft pad, prevents the collection of surface soil samples from within its boundaries.

All surface soil samples will be analyzed for VOCs, SVOCs, PAHs, pesticides and PCBs, metals, and total cyanide. Subsurface soil samples collected and analyzed during the Phase 1 RFI and earlier investigations (Environmental Science and Engineering, 1987) contained detectable concentrations of the above-listed parameters; therefore, surface soils samples collected from SWMU 3 during the Phase 2 RFI will be analyzed for all indicated parameters.

7.4.2.2 **Soil Borings and Subsurface Soil Sampling** Three soil borings will be completed in the area surrounding the disposal area to further characterize the nature and extent of subsurface soil contamination at SWMU 3 (Figure 7-4). Split-spoon samples will be collected at continuous 2-foot intervals to the water table. One soil sample will be collected for analysis from the 0- to 2-foot interval from each boring.

All subsurface soil samples will be analyzed for VOCs, SVOCs, PAHs, pesticides and PCBs, metals, and total cyanide.

Table 7-7
Phase 2 RFI Rationale for Explorations at SWMU 3

RCRA Facility Investigation Report
CSS Panama City, Florida

Field Activity	Quantity	Analytical Program	Rationale
Subsurface soil sampling	3	VOCs, SVOCs, metals, pesticides and PCBs, PAHs, and total cyanide.	Analytical data from the RCRA Facility Assessment (RFA) identified detectable levels of TPH and metals in subsurface soil samples. Three soil borings will be completed in the area surrounding the disposal area to further characterize the nature and vertical and horizontal extent of subsurface soil contamination at Solid Waste Management Unit (SWMU) 3. This information will be used to develop corrective action objectives for the SWMU. Split-spoon samples will be collected at continuous 2-foot intervals to the water table. One soil sample from each boring will be collected from the 0- to 2-foot interval for analyses.
Surface soil sampling	3	VOCs, SVOCs, metals, pesticides and PCBs, PAHs, and total cyanide.	Surface soil information is required to evaluate potential risks to human and ecological receptors from surface contamination at the SWMU. Therefore, three surface soil samples will be collected and analyzed at SWMU 3 during the RCRA Facility Investigation (RFI) Phase 2 investigation.
Water level measurements	3 times	None	Three rounds of water level measurements will be collected from all monitoring wells at SWMU 3 during the Phase 2 RFI. Levels will be recorded at the beginning of the field program, during the Phase 2 RFI field investigation, and at the end of the field investigation. The data will be used to prepare a water table contour map to assess the direction of groundwater flow.
Groundwater sampling	2	VOCs, SVOCs, pesticides and PCBs, PAHs, metals (unfiltered and dissolved), and total cyanide.	The results of the RFA investigations indicated that groundwater in the area of SWMU 3 was not contaminated. The data collected during Phase 2 will be used to confirm the RFA results.
	1	Cadmium, copper, nickel, silver, beryllium, chromium, phenols, and halogenated carbons.	Because of the proximity of monitoring well PCY-3-1 to St. Andrew Bay, additional sample volume will be collected from this monitoring well and analyzed for cadmium, copper, nickel, silver, beryllium by furnace, hexavalent chromium by colorimetric, phenols by SW846 Method 8040, and halogenated hydrocarbons by SW846 Method 8010. These analytical methods will achieve lower detection limits for the above compounds so that data can be compared to the State of Florida Surface Water Quality Standards for Class III marine waters (FDEP, 1992).
Surface water and sediment sampling	5	VOCs, SVOCs, pesticides and PCBs, PAHs, metals (unfiltered), and total cyanide, hardness (surface water), and TOC (sediment).	Five surface water and five sediment samples will be collected from St. Andrew Bay to evaluate the migration of contamination from the SWMU into the bay. All samples collected during the Phase 2 RFI investigation will be analyzed for all listed analytes. These data are necessary to evaluate risks to ecological receptors at the SWMU.

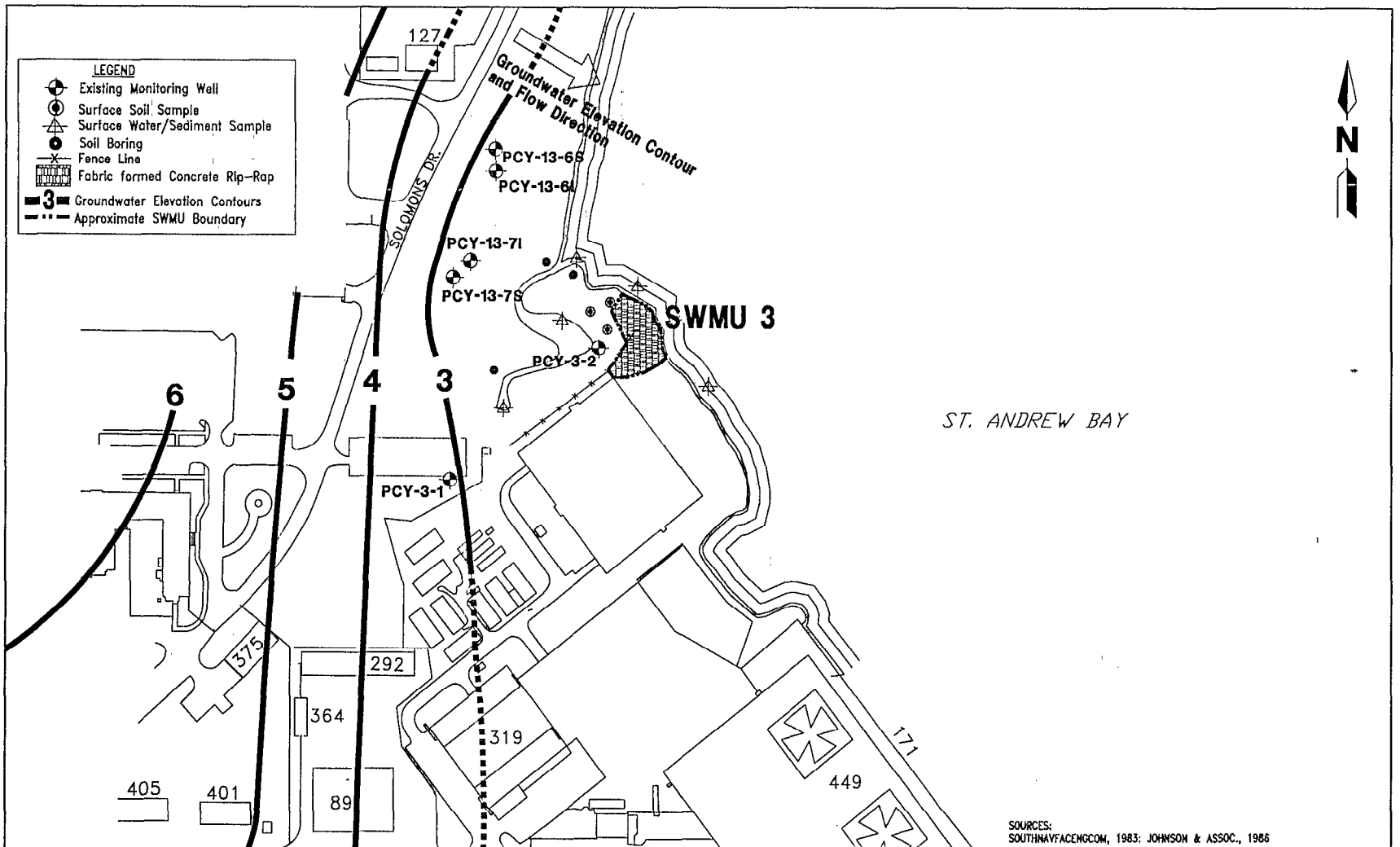
See notes at end of table.

Table 7-7 (Continued)
Phase 2 RFI Rationale for Explorations at SWMU 3

RCRA Facility Investigation Report
CSS Panama City, Florida

Field Activity	Quantity	Analytical Program	Rationale
Surface water and sediment	5	**Surface water:** cadmium, copper, nickel, silver, beryllium, chromium, phenols, and halogenated carbons. **Sediment:** antimony, and polynuclear aromatic hydrocarbons.	Additional sample volume will be collected for surface water and sediment samples at SWMU 3 and analyzed for these indicated parameters using the furnace method and SW846 methods. These analytical methods will achieve lower detection limits for the above compounds so that data can be compared to the State of Florida Surface Water Quality Standards for Class III marine water (FDEP, 1992) and the Region IV Waste Management Division Sediment Screening Values for Hazardous Waste Sites (USEPA, 1992).
Ecological Samples			
Sediment	5	Toxicity testing	Additional sediment sample volume will be collected at the surface water and sediment sample locations and will be submitted to the laboratory for toxicity testing with a marine amphipod. The toxicity testing results will be compared to corresponding analytical data to assess ecological risks for aquatic receptors.
Macroinvertebrate	5	Identification	Macroinvertebrate samples will be collected from the sediment sampling locations for identifying and assessing ecological risks at the SWMU.

Notes: VOCs = volatile organic compounds.
SVOCs = semivolatile organic compounds.
PCBs = polychlorinated biphenyls.
PAHs = polynuclear aromatic hydrocarbons.
RCRA = Resource Conservation and Recovery Act.
TPH = total petroleum hydrocarbons.
FAC = Florida Administrative Code.
TOC = total organic compound.
USEPA = U.S. Environmental Protection Agency.



SOURCES:
SOUTHNAVFACENGCOM, 1983; JOHNSON & ASSOC., 1986

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SCALE: 1" = 300'

SWMU3/HP/2-8-94

FIGURE 7-4
SOLID WASTE MANAGEMENT UNIT NO. 3, LANDFILL C, BURN AND DISPOSAL AREA, PROPOSED PHASE 2 RFI EXPLORATION LOCATIONS

RCRA FACILITY INVESTIGATION WORKPLAN

COASTAL SYSTEMS STATION PANAMA CITY, FLORIDA

7.4.2.3 **Groundwater Sampling** The RCRA Facility Assessment (RFA) reported that samples collected during the Confirmation Study did not indicate a release of chemicals from the SWMU to groundwater (Environmental Science and Engineering, 1987). Two groundwater samples will be collected from existing monitoring wells PCY-3-2 and PCY-3-1 to confirm the sampling and analytical results from the Confirmation Study (Figure 7-4).

Groundwater samples will be analyzed for VOCs, SVOCs, metals (unfiltered and dissolved [filtered]), PAHs, pesticides and PCBs, and total cyanide. All groundwater samples collected at SWMU 3 during the Phase 2 RFI will be analyzed for all indicated parameters.

Because of the proximity of monitoring well PCY-3-1 to St. Andrew Bay, additional sample volume will be collected from this monitoring well and analyzed for cadmium, copper, nickel, silver, beryllium by furnace, hexavalent chromium by colorimetric, phenols by SW846 Method 8040, and halogenated hydrocarbons by SW846 Method 8010. These analytical methods will achieve lower detection limits for the above compounds so that data can be compared to the State of Florida Surface Water Quality Standards for Class III marine waters (FDEP, 1992).

7.4.2.4 **Surface Water and Sediment Sampling** Five surface water and five sediment samples will be collected in the vicinity of SWMU 3. Two surface water and two sediment samples will be collected in St. Andrew Bay and three surface water and three sediment samples will be collected in the wetland area just northeast of SWMU 3. These samples will be collected during low tide conditions. These samples will provide information pertaining to potential migration of contamination into St. Andrew Bay and the wetlands located on the SWMU (Figure 7-4).

Surface water and sediment samples will be analyzed for VOCs, SVOCs, PAHs, pesticides and PCBs, metals (unfiltered), and total cyanide. Surface water samples will also be analyzed for hardness and sediment samples will also be analyzed for TOC.

In addition to the above analyses, the surface water samples will be analyzed for cadmium, copper, nickel, silver, beryllium by furnace, hexavalent chromium by colorimetric, phenols by SW846 Method 8040, and halogenated carbons by SW846 Method 8010. Sediment samples will also be analyzed for antimony by furnace and PAHs by SW846 method 8100. These analytical methods will achieve lower detection limits for the above compounds so that data can be compared to the State of Florida Surface Water Quality Standards for Class III marine water (FDEP, 1992) and the Region IV Waste Management Division Sediment Screening Values for Hazardous Waste Sites (USEPA, 1992).

7.4.2.5 **Ecological Investigation** The ecological investigation of SWMU 3 will include sediment toxicity testing and macroinvertebrate sampling. Additional sediment sample volume will be collected from the same five locations as the surface water and sediment samples and submitted to a subcontract laboratory for toxicity testing. The samples will be submitted for a 10-day survival test with a marine amphipod (*Ampelisca abdita*) (ASTM, 1992). Samples of aquatic macroinvertebrates will also be collected from each of the locations as described in subsection 7.2.5. The results of the toxicity testing and macroinvertebrate sampling will be used to assess ecological risks and to identify objectives for the corrective measures study that are protective of the environment. Use of each of the results in the ecological assessment and determination of corrective measures objectives is described in Table 7-4.

7.4.3 SWMU 4, Landfill D, Filled Gully SWMU 4, approximately ¼ acre in area, is located on the shoreline of St. Andrew Bay (Figure 7-5). This area was originally used as a surface water drainage ravine that discharged to St. Andrew Bay. Currently, the ravine receives surface water runoff from the surrounding areas.

The Final Draft Phase 1 RFI Report recommended an NFA decision for SWMU 4. Comments received from the regulatory agencies supported this decision, but requested that additional surface water and sediment samples be collected. These samples will be collected to evaluate the potential migration of contaminants into St. Andrew Bay.

The rationale for the surface water and sediment sampling at SWMU 4 is presented in Table 7-8. Figure 7-5 depicts the approximate locations of samples to be collected and analyzed at SWMU 4. Locations of samples will be identified during the Phase 2 RFI investigation based on observations made by the Field Operations Leader and the Senior Ecologist.

7.4.3.1 **Surface Water and Sediment Sampling** To support the NFA analysis for SWMU 4, and as requested by the regulatory agencies, three additional surface water and sediment samples will be collected and analyzed for VOCs, SVOCs, PAHs, pesticides and PCBs, metals (unfiltered), and total cyanide. Surface water samples will also be analyzed for hardness and sediment samples will also be analyzed for TOC. Samples will be collected during low tide conditions.

In addition to the above analyses, the surface water samples will be analyzed for cadmium, copper, nickel, silver, beryllium by furnace, hexavalent chromium by colorimetric, phenols by SW846 Method 8040, and halogenated carbons by SW846 Method 8010. Sediment samples will also be analyzed for antimony by furnace and PAHs by SW846 Method 8100. These analytical method will achieve lower detection limits for the above compounds so that data can be compared to the State of Florida Surface Water Quality Standards for Class III marine water (FDEP, 1992) and the Region IV Waste Management Division Sediment Screening Values for Hazardous Waste Sites (USEPA, 1992).

7.4.4 SWMU 5, Paint Equipment Cleaning Area SWMU 5 is the former location of a sand pit that was used to clean painting equipment. This pit was used from the early 1950's until 1979 (C.C. Johnson & Associates, 1985). According to CSS Panama City personnel, the location of the Paint Equipment Cleaning Area reported in the IAS was incorrect. The Paint Equipment Cleaning Area consists of an area of approximately 225 square feet, at the eastern corner of Building 47 (Figure 7-6). The Phase 2 RFI exploration program at SWMU 5 will consist of the following activities:

- surface soil sampling and analysis,
- soil borings and subsurface soil sampling and analysis,
- monitoring well installation,
- water level measurements, and
- groundwater sampling and analysis.

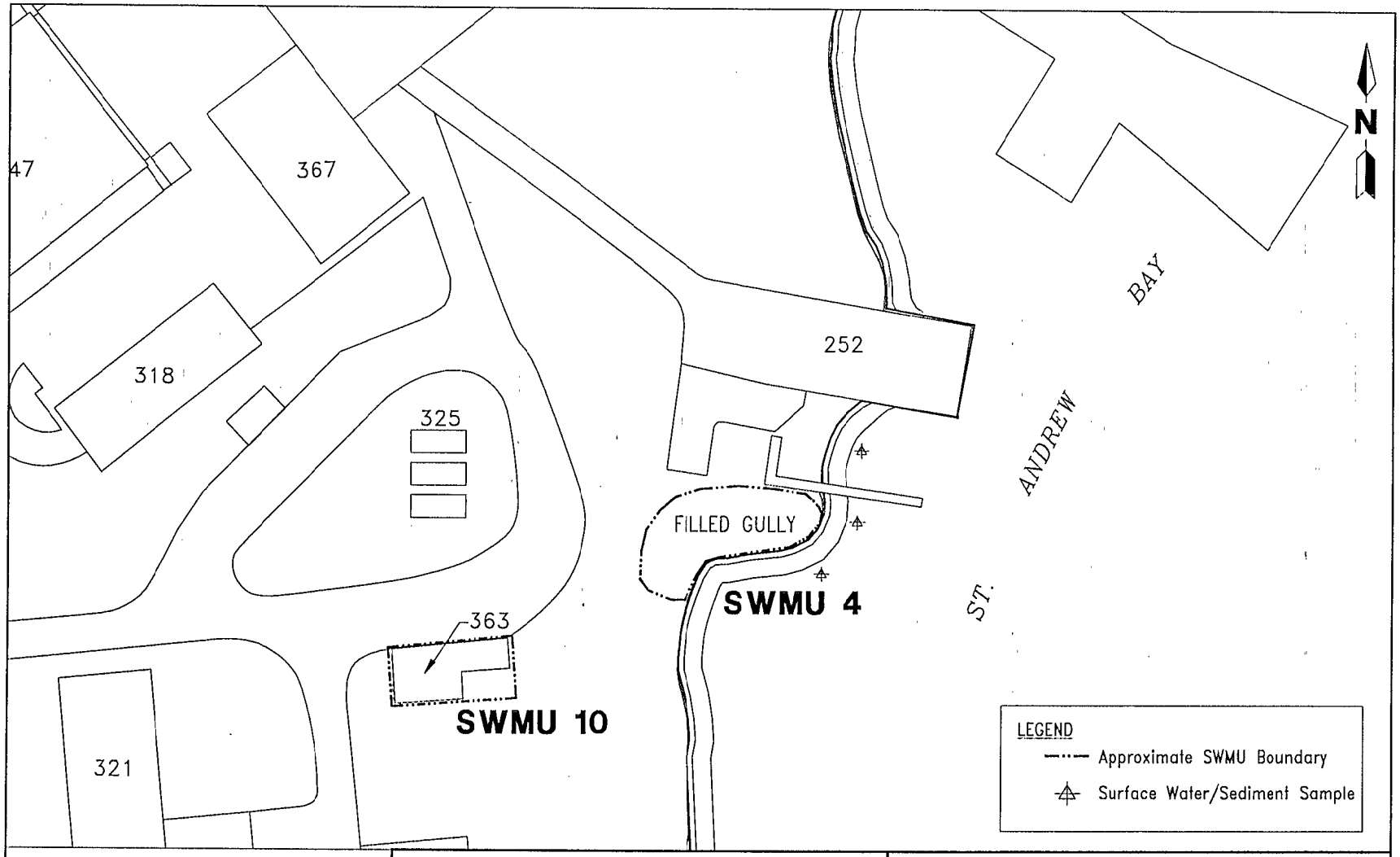
The rationale for the Phase 2 RFI sampling and analysis program at SWMU 5 is presented in Table 7-9. Figure 7-6 depicts the locations of samples to be collected and analyzed at SWMU 5.

Table 7-8
Phase 2 RFI Rationale for Explorations at SWMU 4

RCRA Facility Investigation Report
CSS Panama City, Florida

Field Activity	Quantity	Analytical Program	Rationale
Surface water and sediment sampling	3	VOCs, SVOCs, pesticides and PCBs, PAHs, metals (unfiltered), total cyanide, hardness (surface water), and TOC (sediment).	Three surface water and three sediment samples will be collected for analyses from St. Andrew Bay. These data will be collected to address regulatory agency comments and to evaluate the migration of contamination from the SWMU into the bay. These data will support the NFA analysis for the SWMU; in particular, the HEAs for NFA. Surface water and sediment samples collected during the Phase 2 RFI will be analyzed for all of the listed parameters.
Surface water and sediment	3	**Surface water**: cadmium, copper, nickel, silver, beryllium, chromium, phenols, and halogenated carbons. **Sediment**: antimony, and polynuclear aromatic hydrocarbons.	Additional sample volume will be collected for surface water and sediment samples at SWMU 4 and analyzed for these indicated parameters using the furnace method and SW846 methods. These analytical methods will achieve lower detection limits for the above compounds so that data can be compared to the State of Florida Surface Water Quality Standards for Class III marine water (FDEP, 1992) and the Region IV Waste Management Division Sediment Screening Values for Hazardous Waste Sites (USEPA, 1992).

Notes: VOCs = volatile organic compounds.
SVOCs = semivolatile organic compounds.
PCBs = polychlorinated biphenyls.
PAHs = polynuclear aromatic hydrocarbons.
TOC = total organic compound.
SWMU = solid waste management unit.
NFA = No Further Action.
HEA = Health and Environmental Assessment.
FAC = Florida Administrative Code.
USEPA = U.S. Environmental Protection Agency.



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SCALE: 1" = 100'

SWMU4/KPG/11-11-93

FIGURE 7-5
SOLID WASTE MANAGEMENT UNIT NO. 4, LANDFILL D, FILLED GULLY, PROPOSED PHASE 2 RFI EXPLORATION LOCATIONS

RCRA FACILTIY INVESTIGATION WORKPLAN

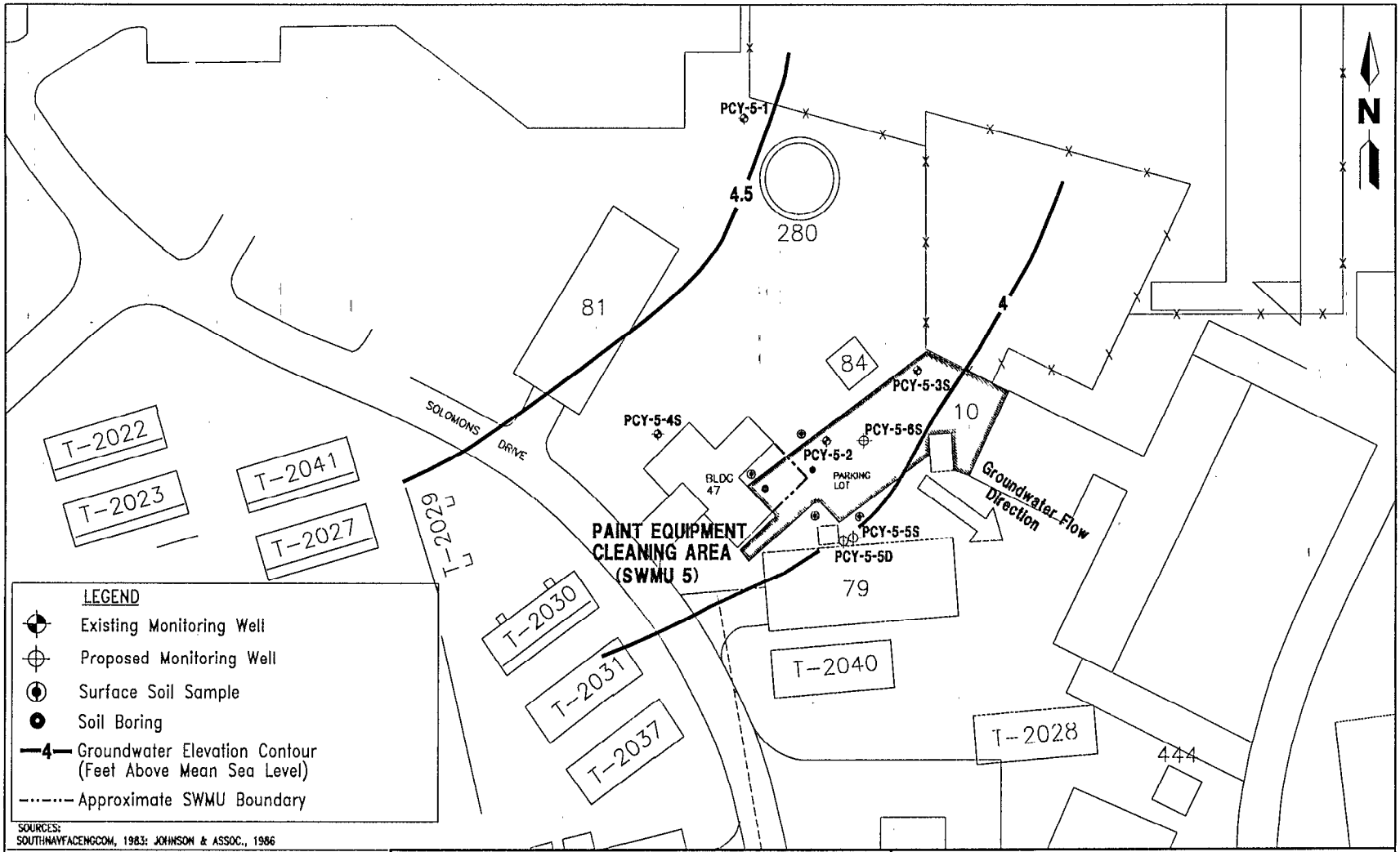
COASTAL SYSTEMS STATION PANAMA CITY, FLORIDA

Table 7-9
Phase 2 RFI Rationale for Explorations at SWMU 5

RCRA Facility Investigation Report
CSS Panama City, Florida

Field Activity	Quantity	Analytical Program	Rationale
Subsurface soil sampling	4	VOCs, SVOCs, metals, and total cyanide.	During the Phase 1 investigation, metals, toluene, and acetone were detected in subsurface soil samples collected at Solid Waste Management Unit (SWMU) 5. To further characterize the nature and vertical extent of subsurface soil contamination at the SWMU, two additional soil borings will be completed at SWMU 5. Two subsurface soil samples will be collected at each soil boring location. The information obtained from the analyses of the subsurface soil samples will be used to develop corrective action objectives for the SWMU.
Surface soil sampling	4	VOCs, SVOCs, metals, and total cyanide.	Surface soil data are required to evaluate risks to human and ecological receptors from surface contamination at the SWMU and to evaluate the horizontal extent of contamination within the surface at the SWMU. Four surface soil samples will be collected for analyses at the SWMU.
Monitoring well installation	4	None	Methyl ethyl ketone (MEK) was detected in monitoring well PCY-5-2 during the Phase 1 investigations. The Initial Assessment Study (IAS) indicates that an estimated 2,000 gallons of MEK was disposed at the site between 1950 and 1978. However, MEK is a common laboratory contaminant and, thus, the results of the Phase 1 RFI groundwater samples are suspect. Therefore, monitoring well PCY-5-2 will be sampled during the RCRA Facility Investigation (RFI) Phase 2 to confirm the results of the Phase 1 investigation. If the presence of MEK is confirmed, four additional monitoring wells will be installed downgradient of the SWMU to assess the extent of groundwater contamination. The data obtained from groundwater sampling will be used to assess what corrective measures, if any, will be necessary at SWMU 5.
Water level measurements	3 times	None	Three rounds of water level measurements will be collected from all existing monitoring wells at SWMU 5 during the Phase 2 RFI. Levels will be recorded at the beginning of the field program, during the Phase 2 RFI field investigation, and at the end of the field investigation. The data will be used to prepare a water table contour map to assess the direction of groundwater flow.
Groundwater sampling	1	MEK	MEK was detected in a groundwater sample collected from monitoring well PCY-5-2. To confirm this observation, one sample will be collected from monitoring well PCY-5-2 at the beginning of the Phase 2 RFI field investigation. If the presence of MEK is confirmed, four additional wells will be installed and sampled.
	4	VOCs, SVOCs, metals (filtered and dissolved), and total cyanide.	If monitoring wells are installed at SWMU 5, groundwater samples collected from the four new monitoring wells will be analyzed for all indicated parameters. Pesticides and PCBs and PAHs were not detected in samples collected during the Phase 1 RFI; therefore, these compounds will not be analyzed for during the Phase 2 field investigation.

Notes: VOCs = volatile organics compounds.
SVOCs = semivolatile organic compounds.
RCRA = Resource Conservation and Recovery Act.



0 50 100

SCALE: 1" = 100'

SWMU5/KGP/11-11-93

FIGURE 7-6
SOLID WASTE MANAGEMENT UNIT NO. 5, PAINT EQUIPMENT CLEANING AREA, PROPOSED PHASE 2 RFI EXPLORATION LOCATIONS

RCRA FACILITY INVESTIGATION WORKPLAN

COASTAL SYSTEMS STATION PANAMA CITY, FLORIDA

7.4.4.1 **Surface Soil Sampling** Four surface soil samples (0 to 1 foot bls) will be collected at SWMU 5 to characterize the nature and extent of surface soil contamination and to provide the necessary information to develop human health and ecological risk assessments. The sampling points will be uniformly spread within the boundaries of SWMU 5 in areas not covered by asphalt. The approximate locations of surface soil samples are presented on Figure 7-6.

Surface soil samples will be analyzed for VOCs, SVOCs, metals, and total cyanide. Subsurface soil samples collected and analyzed during the Phase 1 RFI and earlier investigations (Environmental Science and Engineering, 1987) contained detectable concentrations of the above-listed analytes; therefore, surface soil samples collected from SWMU 5 during the Phase 2 RFI will be analyzed for all indicated parameters. Based on the history of this SWMU as reported in previous studies and based on the chemical properties of the wastes reported to be disposed, PAHs, PCBs, and pesticides are not suspected to be present within the soil at SWMU 5; therefore, surface soil samples will not be analyzed for these parameters.

7.4.4.2 **Soil Borings and Subsurface Soil Sampling** Two soil borings will be completed at SWMU 5. Split-spoon samples will be collected at continuous 2-foot intervals to the water table. Two soil samples will be collected from each boring at intervals from 2 to 4 and 4 to 6 feet bls. Analytical data from the analyses of these samples will be used to further characterize the nature and vertical extent of subsurface soil contamination at the SWMU.

Subsurface soil samples will be analyzed for VOCs, SVOCs, metals, and total cyanide. Based on the history of this SWMU as reported in previous studies and based on the chemical properties of wastes disposed at this SWMU, PAHs, PCBs, and pesticides are not suspected to be present within the soil at SWMU 5; therefore, subsurface soil samples will not be analyzed for these parameters.

7.4.4.3 **Monitoring Well Installation and Groundwater Sampling** Analytical results from groundwater samples collected at monitoring well PCY-5-2 during the Phase 1 RFI indicate the presence of methyl ethyl ketone (MEK) at elevated concentrations. To evaluate potential groundwater contamination of MEK at SWMU 5, existing well PCY-5-2 will be resampled and analyzed for MEK during the Phase 2 RFI. Results of this analysis will be used to evaluate the presence or absence of MEK within groundwater at this SWMU. If the analytical results of this sampling effort indicate elevated concentrations of MEK, four monitoring wells will be installed downgradient of the SWMU (Figure 7-6). Information regarding monitoring well installation details is presented in Table 7-2. The locations of the proposed monitoring wells will be as follows:

- two monitoring wells (one cluster) will be installed downgradient of PCY-5-2 in the southeasterly direction (Figure 7-6),
- one monitoring well will be installed downgradient of PCY-5-2 in the easterly direction (Figure 7-6), and
- one shallow monitoring well will be installed upgradient of SWMU 5 and of monitoring well PCY-5-2.

Groundwater analytical data from the existing monitoring well (PCY-5-2), the two shallow wells, and the one deep well will assist in the evaluation of the migration of contamination from SWMU 5 within the water table both horizontally

and vertically. Groundwater samples from the four new monitoring wells will be analyzed for VOCs, SVOCs, metals (unfiltered and dissolved [filtered]), and total cyanide. Based on the history of this SWMU as reported in previous studies and the chemical properties of wastes reported to be disposed, PAHs, PCBs, and pesticides are not suspected to be present within the soil or groundwater at SWMU 5; therefore, groundwater samples will not be analyzed for these parameters.

7.4.5 SWMU 9, Fire Training Area No. 2 SWMU 9 is located southwest of Gull Circle near Building 61 (Figure 7-7). The area includes a trailer located southwest of Gull Circle that was used for smoke training. During its period of operation, a 4,500-gallon aboveground storage tank was located northeast of the training area. This tank contained fuel for fire training exercises.

The Phase 2 RFI exploration program at SWMU 9 will consist of the following activities:

- surface soil sampling and analysis,
- soil borings and subsurface soil sampling and analysis,
- monitoring well installation,
- water level measurements,
- groundwater sampling and analysis, and
- ecological investigation.

The rationale for the Phase 2 RFI sampling and analysis program at SWMU 9 is presented in Table 7-10. Figure 7-7 depicts the locations of samples to be collected and analyzed at SWMU 9.

7.4.5.1 Surface Soil Sampling Nine surface soil samples (0 to 1 foot bls) will be collected and analyzed at SWMU 9 to characterize the nature and extent of surface soil contamination and to provide the necessary information to support human health and ecological risk assessments. The soil sampling points will be uniformly distributed.

Surface soil samples will be analyzed for VOCs, SVOCs, PAHs, pesticides and PCBs, metals, and total cyanide. Subsurface soil samples collected and analyzed during the Phase 1 RFI and earlier investigations (Environmental Science and Engineering, 1987) contained detectable concentrations of some analytes in the above-listed analyses; therefore, surface soil samples collected from SWMU 9 during the Phase 2 RFI will be analyzed for all indicated parameters.

7.4.5.2 Soil Borings and Subsurface Soil Sampling Five soil borings will be completed at SWMU 9 and 15 subsurface soil samples will be collected for laboratory analyses. Four soil borings will be placed on the periphery and one in the center of SWMU 9 to evaluate the horizontal extent of contamination. Subsurface soil samples collected and analyzed during previous studies for SWMU 9 have indicated detectable concentrations of contaminants along the periphery of the SWMU. Split-spoon samples will be collected at continuous 2-foot intervals to the water table. Samples for analysis will be collected at intervals from 4 to 6 feet bls, 6 to 8 feet bls, and 8 to 10 feet bls from each boring. Analytical data from these borings will be used to calculate the volume of contaminated media during the CMS. Subsurface soil samples will be analyzed for VOCs, SVOCs, PAHs, pesticides and PCBs, metals, and total cyanide.

Table 7-10
Phase 2 RFI Rationale for Explorations at SWMU 9

RCRA Facility Investigation Report
CSS Panama City, Florida

Field Activity	Quantity	Analytical Program	Rationale
Subsurface soil sampling	15	VOCs, SVOCs, pesticides and PCBs, PAHs, metals, and total cyanide.	The Phase 1 RFI investigation identified metals, PAH, and VOC contamination in subsurface soils at SWMU 9. To further delineate the horizontal and vertical extent of contamination at the SWMU, four borings will be placed along the perimeter and one in the center of the SWMU. Three samples will be collected from each boring. Delineation of the horizontal and vertical extent of contamination will support the evaluation of the approximate volume of contaminated soil at SWMU 9. This information is necessary to evaluate corrective action alternatives.
Surface soil sampling	9	VOCs, SVOCs, pesticides and PCBs, metals, PAHs, and total cyanide.	Surface soil data are required to assess potential risks to both human and ecological receptors from contamination at the SWMU. Nine surface soil samples will be collected at SWMU 9 during the Phase 2 RFI investigation. These data will also be used to evaluate the horizontal extent of contamination within the surface soil at the SWMU.
Monitoring well installation	3	None	The Phase 1 RFI investigation identified contamination in the groundwater at SWMU 9. The sample collected from upgradient monitoring well PCY-9-1S indicated that the groundwater contamination extended upgradient to this well. Therefore, one additional monitoring well will be installed upgradient (approximately 120 feet) upgradient of monitoring well PCY-9-1S. To delineate the vertical extent of contamination, one intermediate well will be installed slightly upgradient of well PCY-9-3S and downgradient of the fire training area. To delineate the horizontal extent of contamination, one monitoring well will be installed downgradient of monitoring well PCY-9-3S.
Water level measurements	3 times	None	Three rounds of water level measurements will be collected from all existing monitoring wells and two rounds of water level measurements will be collected from the three newly installed monitoring wells at SWMU 9 during the Phase 2 RFI. Levels will be recorded at the beginning of the field program, during the Phase 2 RFI field investigation, and at the end of the field investigation. The data will be used to prepare a water table contour map to assess the direction of groundwater flow.
Groundwater sampling	6	VOCs, SVOCs, metals (unfiltered and dissolved), total cyanide, PAHs, and pesticides and PCBs.	The Phase 1 RFI investigation indicated the presence of several inorganics, xylene, phenanthrene, and anthracene in groundwater samples collected from monitoring wells PCY-9-2S and PCY-9-3S. Therefore, groundwater samples will be collected from all future and existing wells at the SWMU to confirm the presence of these chemicals in groundwater. Sampling from the future monitoring wells is proposed for delineation of the vertical and horizontal extent of contamination.

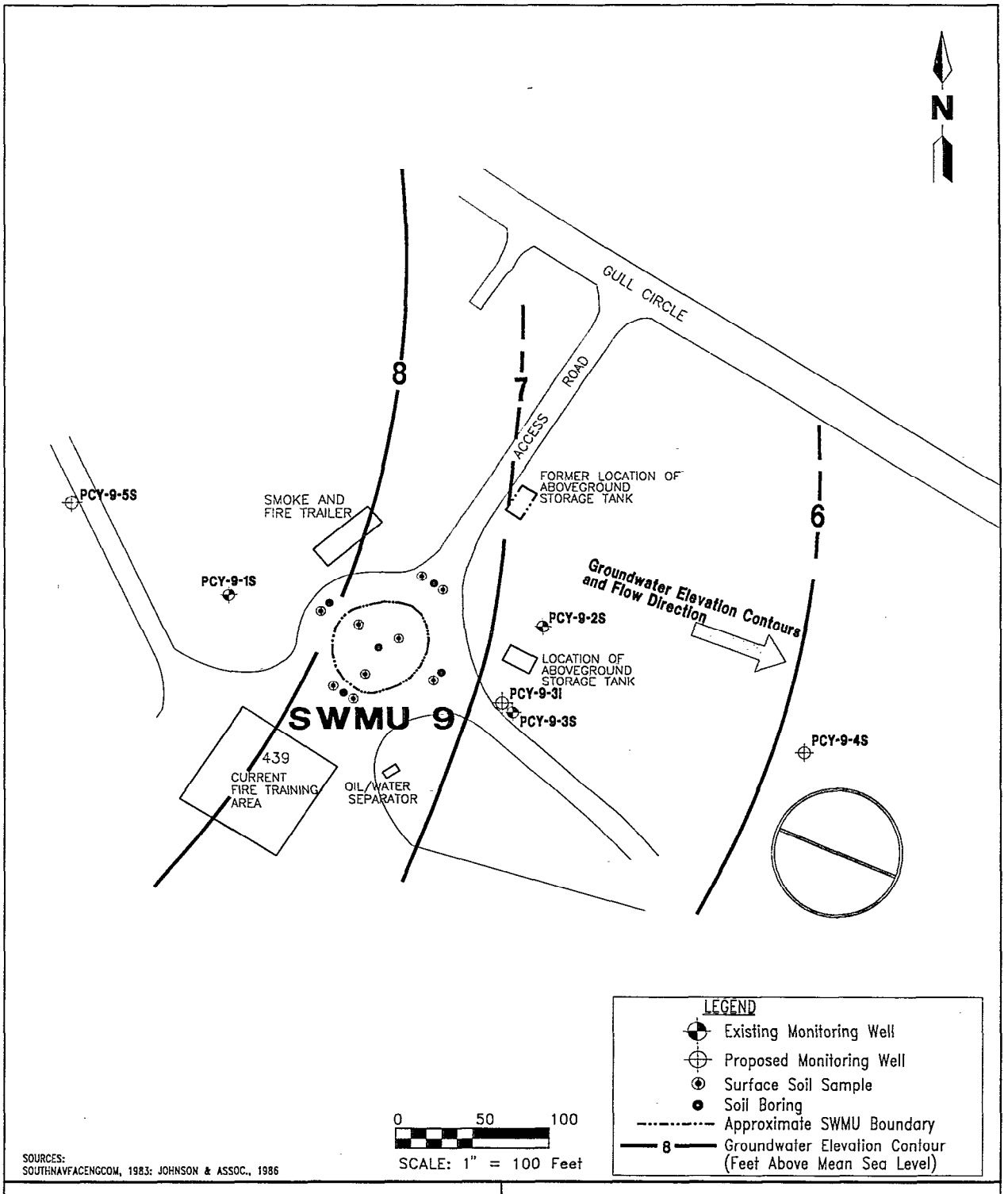
See notes at end of table.

Table 7-10 (Continued)
Phase 2 RFI Rationale for Explorations at SWMU 9

RCRA Facility Investigation Report
CSS Panama City, Florida

Field Activity	Quantity	Analytical Program	Rationale
Ecological samples			
Surface soil	9	Toxicity testing	Additional surface soil sample volume will be collected at all surface soil sampling locations at SWMU 9 and submitted for a 14-day earthworm survival test. The earthworm response will be compared to the corresponding analytical data and be used to evaluate risks to ecological receptors from contamination at the SWMU.
Earthworms	3	SVOCs, and metals	Earthworms exposed in the toxicity testing will be analyzed for chemical content. The results of the analyses will be used to assess chemical exposures for terrestrial receptors in the ecological risk analyses.

Notes: VOCs = volatile organic compounds.
SVOCs = semivolatile organic compounds.
PCBs = polychlorinated biphenyls.
PAHs = polynuclear aromatic hydrocarbons.
SWMU = solid waste management unit.
RFI = RCRA Facility Investigation.



SOURCES:
SOUTHNAVFACENGCOM, 1983; JOHNSON & ASSOC., 1986

FIGURE 7-7
SOLID WASTE MANAGEMENT UNIT NO. 9, FIRE-FIGHTING TRAINING AREA NO. 2

SWMU9/KGP/11/11/93

RCRA FACILITY INVESTIGATION WORKPLAN

COASTAL SYSTEMS STATION PANAMA CITY, FLORIDA

7.4.5.3 **Monitoring Well Installation and Groundwater Sampling** Three additional monitoring wells will be installed at SWMU 9 during the Phase 2 RFI field program. One monitoring well will be installed upgradient of monitoring well PCY-9-1S. Another will be installed upgradient of monitoring well PCY-9-3S, and downgradient of the fire training area. The third will be installed downgradient of monitoring well PCY-9-3S. Six groundwater samples will be collected (three from the existing wells and three from the new wells) and analyzed for specific parameters. The data collected from this sampling event will be used to confirm the sampling and analysis results from the Phase 1 RFI investigation, and to delineate the horizontal and vertical extent of contamination at SWMU 9. Groundwater samples will be analyzed for VOCs, SVOCs, PAHs, pesticides and PCBs, metals (unfiltered and dissolved [filtered]), and total cyanide.

7.4.5.4 **Ecological Investigation** The ecological investigation of SWMU 9 will include soil toxicity testing and analyses of chemical content in earthworms exposed to soils in the toxicity testing. Additional sample volume will be collected from each of the nine surface soil sample locations. The samples will be submitted to a subcontract laboratory for a 14-day earthworm (*Eisenia foetida*) survival test (USEPA, 1989b). Earthworms that survive the toxicity testing, to a maximum of three, will be analyzed for SVOCs and metals.

7.4.6 AOC 1, Old Fire Training Area No. 1 AOC 1 is located approximately 140 feet west of Building 100 and approximately 700 feet west of St. Andrew Bay.

Fire-fighting training exercises were conducted at this site from the mid-1950s to late 1970 when Fire Training Area No. 2 was constructed (Figure 7-8). Fire-fighting training exercises occurred approximately once a month in an unlined pit of approximately 500 square feet (C.C. Johnson & Associates, 1985). In 1978, the site was paved with concrete and asphalt. Presently, the site is being used as an open storage area. The Phase 2 RFI exploration program at AOC 1 will consist of the following activities:

- surface soil sampling and analysis,
- soil borings and subsurface soil sampling and analysis,
- monitoring well installation,
- water level measurements, and
- groundwater sampling and analysis.

The rationale for the Phase 2 RFI sampling and analysis program at AOC 1 is presented in Table 7-11. Figure 7-8 depicts the locations of samples to be collected and analyzed at AOC 1. Proposed monitoring well installation details are shown in Table 7-2.

7.4.6.1 **Surface Soil Sampling** Ten surface soil samples (0 to 1 foot bls) will be collected from AOC 1 to characterize the nature and extent of surface soil contamination, and to provide the necessary information to support human health and ecological risk assessments. All of the sampling locations will be distributed uniformly in the area that is not covered with concrete or asphalt. Subsurface soil samples will be collected within the asphalted area and are discussed in the following subsection.

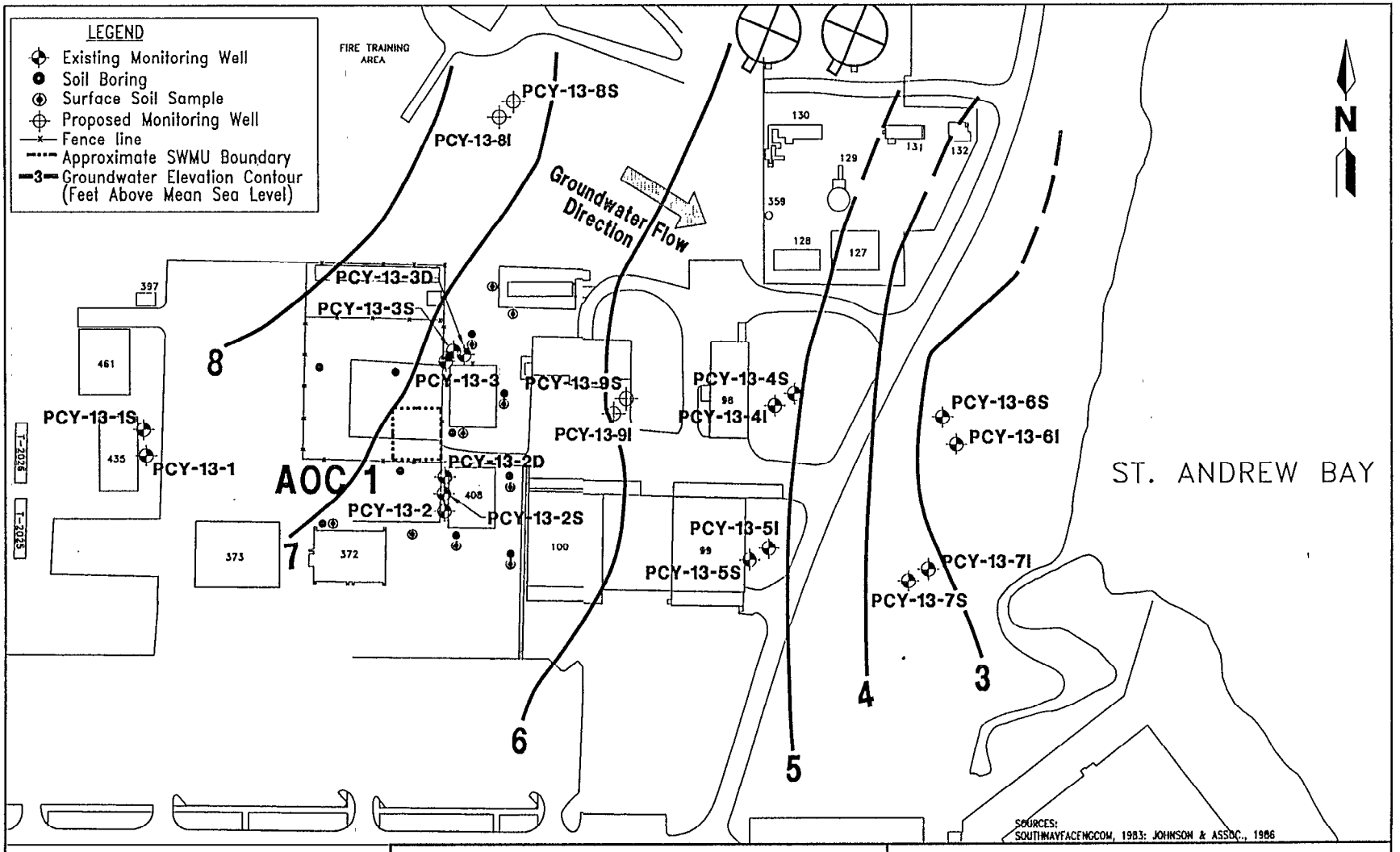
Surface soil samples will be analyzed for VOCs, SVOCs, PAHs, metals, and total cyanide. Subsurface soil samples collected and analyzed during the Phase 1 RFI and earlier investigations (Environmental Science and Engineering, 1987)

Table 7-11
Phase 2 RFI Rationale for Explorations at AOC 1

RCRA Facility Investigation Report
CSS Panama City, Florida

Field Activity	Quantity	Analytical Program	Rationale
Subsurface soil sampling	20	VOCs, SVOCs, PAHs, metals, and total cyanide.	Analytical results from subsurface soil samples collected during the RCRA Facility Investigation (RFI) Phase 1 investigation indicated the presence of metals above the contract required detection limit (CRDL) at Area of Concern (AOC) 1. 4,4'-DDD was detected in one soil sample at a concentration above the IDL but below the CRDL. No other pesticides or polychlorinated biphenyls (PCBs) were detected in soil samples collected during previous investigations; therefore, soil samples collected during the Phase 2 RFI will not be analyzed for pesticides and PCBs. Ten soil borings (two samples per boring) will be completed to evaluate the horizontal and vertical extent of contamination at the AOC.
Surface soil sampling	10	VOCs, SVOCs, PAHs, metals, and total cyanide.	Ten surface soil samples will be collected during Phase 2 to evaluate the extent of surface contamination at the AOC and to assess potential risks to both human and ecological receptors from contamination at the AOC. Because pesticides and PCBs were not detected in the subsurface soil samples at AOC 1 during the Phase 1 investigation, surface soil samples collected during the Phase 2 investigation will not be analyzed for these compounds.
Monitoring well installation	4	None	Analytical groundwater data collected from monitoring well PCY-13-4I contained elevated levels of organics. In addition, free product was found in monitoring well PCY-13-3S. To evaluate the migration of contamination from the AOC into the groundwater, two additional monitoring wells will be installed (one shallow and one intermediate) between AOC 1 and the two aforementioned downgradient monitoring wells and two monitoring wells will be installed north of monitoring well PCY-13-3S as shown on Figure 7-8.
Water level measurements	3 times	None	Three rounds of water level measurements will be collected from all monitoring wells at AOC 1 during the Phase 2 RFI. Levels will be recorded at the beginning of the field program, during the Phase 2 RFI field investigation, and at the end of the field investigation. The data will be used to prepare a water table contour map to assess the direction of groundwater flow.
Groundwater sampling	17	VOCs, SVOCs, PAHs, metals (unfiltered and dissolved [filtered]), and total cyanide.	Groundwater samples will be collected from 13 existing wells and 4 new monitoring wells to delineate the vertical and horizontal migration of the contamination in the groundwater at AOC 1. Pesticides and PCBs were not detected in groundwater samples collected during the Phase 1 investigation; therefore, groundwater samples will not be analyzed for these parameters during the Phase 2 investigation. Monitoring well cluster PCY-13-2 will not be sampled during the Phase 2 RFI investigation because the analytical results indicate no contaminants were detected for this cluster of wells.

Notes: VOCs = volatile organic compounds.
SVOCs = semivolatile organic compounds.
PAHs = polynuclear aromatic hydrocarbons.
RCRA = Resource Conservation and Recovery Act.
DDD = dichlorodiphenyl dichloroethane.
IDL = instrument detection limit.



0 125 250

SCALE: 1" = 250 Feet

AOC1/KGP/11-12-93

FIGURE 7-8
AREA OF CONCERN (AOC) NO. 1, FIRE TRAINING AREA NO. 1, PROPOSED PHASE 2 RFI EXPLORATION LOCATIONS

RCRA FACILITY INVESTIGATION WORKPLAN

COASTAL SYSTEMS STATION PANAMA CITY, FLORIDA

contained detectable concentrations of the above-listed parameters; therefore, surface soils samples collected from AOC 1 during the Phase 2 RFI will be analyzed for all indicated parameters. In addition, analytical results from soil samples collected at AOC 1 during previous investigations did not indicate evidence of pesticide or PCB contamination in soil; therefore, surface soil samples will not be analyzed for these parameters.

7.4.6.2 **Soil Borings and Subsurface Soil Sampling** Ten soil borings will be completed at AOC 1. Two samples will be collected from each soil boring to further characterize the nature and vertical extent of subsurface soil contamination at AOC 1. Soil borings will be placed as shown on Figure 7-8.

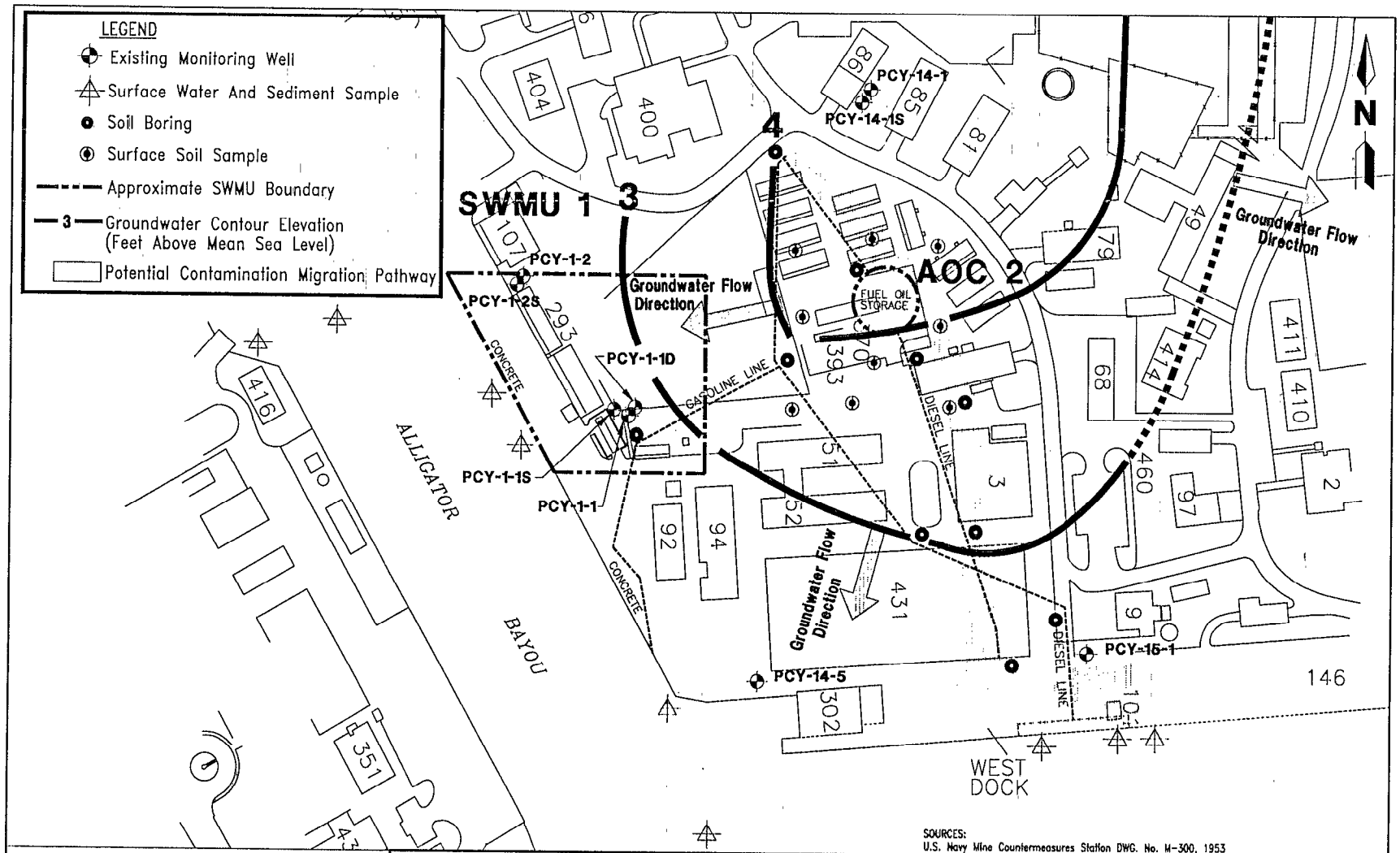
Split-spoon samples will be collected at continuous 2-foot intervals to the water table. Soil samples from 2 to 4 and 4 to 6 feet bls will be analyzed for VOCs, SVOCs, PAHs, metals, and total cyanide. Analytical results from soil samples collected at AOC 1 during the Phase 1 RFI and earlier investigations (Environmental Science and Engineering, 1987) did not indicate evidence of contamination in soils for pesticides and PCBs; therefore, subsurface soil samples will not be analyzed for these parameters.

7.4.6.3 **Monitoring Well Installation and Groundwater Sampling** Four monitoring wells (two clusters of shallow and deep wells) will be installed at AOC 1 to identify the potential source of organics detected in groundwater samples analyzed during the Phase 1 RFI investigation. The location of monitoring wells will be as follows:

- two monitoring wells (one cluster) at an area immediately downgradient of AOC 1 and upgradient of monitoring well PCY-13-4I, and
- two monitoring wells (one cluster) north of the existing monitoring well PCY-13-3S, in the direction of SWMU 9.

Groundwater samples will be collected from the four new monitoring wells and from 13 existing monitoring wells. The analytical results for samples collected from monitoring well cluster PCY-13-2 during the Phase 1 RFI did not indicate contamination and, therefore, samples will not be collected from these wells during the Phase 2 RFI. Groundwater samples collected from the new and existing wells will be analyzed for VOCs, SVOCs, PAHs, metals (unfiltered and dissolved [filtered]), and total cyanide. Analytical results from groundwater samples collected during the Phase 1 RFI did not indicate evidence of contamination in groundwater for pesticides and PCBs; therefore, groundwater samples will not be analyzed for these compounds.

7.4.7 <u>SWMU 1 and AOC 2, Landfill A, Original Disposal Area and Underground Oil Contaminated Area</u> SWMU 1 encompasses 1 acre along the edge of Alligator Bayou (Figure 7-9). This site was the Original Disposal Area and was in operation from approximately 1945 to 1953. The part of the SWMU nearest the bayou is presently covered by the concrete deck of the west dock (Figure 7-9). AOC 2 is located in the area of a former aboveground 10,000-barrel petroleum storage tank (No.11) (Figure 7-9). The AOC includes the associated distribution and supply lines and an area under the south dock that was contaminated by a break in the off-loading oil supply line (C.C. Johnson & Associates, 1985). Because SWMU 1 is immediately downgradient of AOC 2, these two sites are being investigated as a single unit.



0 125 250
SCALE: 1" = 250 Feet

SWMU1/NMP/2-7-94

FIGURE 7-9
AREA OF CONCERN (AOC) 2 AND SOLID WASTE MANAGEMENT UNIT NO. 1, UNDERGROUND OIL CONTAMINATED AREA AND LANDFILL A, ORIGINAL DISPOSAL AREA, PROPOSED PHASE 2 RFI EXPLORATION LOCATIONS

RCRA FACILITY INVESTIGATION WORKPLAN

COASTAL SYSTEMS STATION PANAMA CITY, FLORIDA

The Phase 2 RFI exploration program at SWMU 1 and AOC 2 will consist of the following activities:

- geophysical survey,
- surface soil sampling and analysis,
- soil borings and subsurface soil sampling and analysis,
- groundwater sampling and analysis,
- surface water and sediment sampling and analysis, and
- ecological investigation.

The rationale for the Phase 2 RFI sampling and analysis program at SWMU 1 and AOC 2 is presented in Table 7-12. Figure 7-9 depicts the locations of samples to be collected and analyzed at AOC 1.

7.4.7.1 **Geophysical Surveys** Magnetic and terrain conductivity surveys will be completed in tandem at the SWMU 1 and AOC 2 study areas to delineate underground fuel lines prior to intrusive exploration. A GPR survey may also be used to complement magnetic and EM survey results in selected areas. Profile spacing will be dictated by site conditions. The footprint of the fuel line will be staked in the field.

7.4.7.2 **Surface Soil Sampling** Nine surface soil samples (0 to 1 foot bls) will be collected at SWMU 1 and AOC 2 to characterize the nature and horizontal extent of surface soil contamination and to provide the necessary information to develop human health and ecological risk assessments. Surface soil samples will be uniformly distributed to investigate the area at SWMU 1 and AOC 2 that is not covered with concrete or asphalt.

Surface soil samples will be analyzed for VOCs, SVOCs, PAHs, metals, and total cyanide. Subsurface soil samples collected and analyzed during the Phase 1 RFI and earlier investigations (Environmental Science and Engineering, 1987) contained detectable concentrations of some of the above-listed parameters; therefore, surface soils samples collected from SWMU 1 and AOC 2 during the Phase 2 RFI will be analyzed for all indicated parameters. In addition, analytical results from subsurface soil samples collected at SWMU 1 and AOC 2 during the Phase 1 RFI and earlier investigations (Environmental Science and Engineering, 1987) did not indicate evidence of pesticide or PCB contamination in soil; therefore, surface soil samples will not be analyzed for these parameters.

7.4.7.3 **Soil Borings and Subsurface Soil Sampling** Ten soil borings will be completed at SWMU 1 and AOC 2. Locations of the soil borings will be identified by the Field Operations Leader during the Phase 2 RFI investigation. Split-spoon samples will be collected at continuous 2-foot intervals to the water table. One sample for laboratory analysis will be collected from each boring. The sample depth will be based on field observations such as stained soils. The information obtained from the soil borings will be used to characterize the nature and vertical extent of subsurface soil contamination within the area. Soil borings will be completed at the following locations:

- two soil borings will be completed in the area covered by the former aboveground storage tank; and

- eight soil borings will be completed at the turning points (bends) of the fuel supply lines.

Table 7-12
Phase 2 RFI Rationale for Explorations at SWMU 1 and AOC 2

RCRA Facility Investigation Report
CSS Panama City, Florida

Field Activity	Quantity	Analytical Program	Rationale
Geophysical survey		None	Magnetic and terrain conductivity surveys will be completed in tandem at SWMU 1 and AOC 2 study areas to delineate underground fuel lines prior to intrusive exploration. A GPR survey may also be used to complement magnetic and EM survey results in selected areas. Profile spacing will be dictated by site conditions. The footprint of the fuel line will be staked in the field.
Subsurface soil sampling	10	VOCs, SVOCs, PAHs, metals, and total cyanide.	Results of the RCRA Facility Investigation (RFI) Phase 1 investigation indicated the presence of metals, and volatile organic compounds (VOCs) in subsurface soil samples collected at SWMU 1 and AOC 2. Ten additional subsurface soil borings will be completed during the Phase 2 RFI investigation. One sample per boring will be collected at each soil boring location. Sample depths will be chosen in the field based on visual observations and field screening. Because pesticides and polychlorinated biphenyls (PCBs) were not detected in the subsurface soil at SWMU 1 and AOC 2 during the Phase 1 investigation, surface soil samples collected during the Phase 2 investigation will not be analyzed for these compounds.
Surface soil sampling	9	VOCs, SVOCs, PAHs, metals, and total cyanide.	Surface soil samples are necessary to evaluate risks to human and ecological receptors from contamination at these SWMUs and AOCs. Nine surface soil samples will be collected at SWMU 1 and AOC 2 during the Phase 2 RFI investigation. In addition, the data obtained from the surface soil samples will be used in conjunction with the subsurface soil samples collected during the Phase 1 RFI and Phase 2 investigations to evaluate the vertical and horizontal extent of soil contamination at SWMU 1 and AOC 2. Because pesticides and PCBs were not detected in the subsurface soil samples taken at SWMU 1 and AOC 2 during the Phase 1 investigation, surface soil samples collected during the Phase 2 investigation will not be analyzed for these analytes.
Water level measurements	3 times	None	Three rounds of water level measurements will be collected from all monitoring wells at SWMU 1 and AOC 2 during the Phase 2 RFI. Levels will be recorded at the beginning of the field program, during the Phase 2 RFI field investigation, and at the end of the field investigation. The data will be used to prepare a water table contour map to assess the direction of groundwater flow.
Groundwater sampling	9	VOCs, SVOCs, PAHs, metals (unfiltered and dissolved [filtered]), and total cyanide.	Groundwater samples collected and analyzed during the Confirmation Study indicated the presence of polynuclear aromatic hydrocarbons (PAHs), ethylbenzene, toluene, lead, and mercury in groundwater at SWMU 1 and AOC 2. Groundwater samples collected during the Phase 1 RFI investigation indicated the presence of metals, ethanol, dimethyl ether, benzo(a)anthracene, and chrysene. Because of the variation in the contaminants identified in these two investigations, additional groundwater samples will be collected at SWMU 1 and AOC 2 to verify the presence of these contaminants, and to evaluate possible retardation effects. Pesticides and PCBs were not detected in either of the two previous investigations; therefore, groundwater samples will not be analyzed for these analytes during the Phase 2 RFI.

See notes at end of table.

Table 7-12 (Continued)
Phase 2 RFI Rationale for Explorations at SWMU 1 and AOC 2

RCRA Facility Investigation Report
CSS Panama City, Florida

Field Activity	Quantity	Analytical Program	Rationale
Groundwater sampling--continued	4	Metals (unfiltered and dissolved [filtered]).	The Phase 1 RFI indicated that monitoring wells PCY-14-2D and PCY-14-3D exhibited higher concentrations of metals than the shallow monitoring wells (PCY-14-2S and PCY-14-3S) in these clusters. These four monitoring wells will be resampled during the Phase 2 RFI investigation to confirm these findings. The samples collected from these wells will be analyzed for both unfiltered and filtered metals. These data will be used to assess whether elevated concentrations of metals detected during the Phase 1 RFI investigation were due to the presence of suspended soil particles in the samples.
	7	Cadmium, copper, nickel, silver, beryllium, chromium, phenols, and halogenated carbons.	Seven of the monitoring wells located at SWMU 1 and AOC 2 are in close proximity to Alligator Bayou. Additional sample volume will be collected from these seven wells and analyzed for cadmium, copper, nickel, silver, beryllium by furnace, hexavalent chromium by colorimetric, phenols by SW846 Method 8040, and halogenated hydrocarbons by SW846 Method 8010. These analytical methods will achieve lower detection limits for the above compounds so that data can be compared to the State of Florida Surface Water Quality Standards for Class III marine waters (FDEP, 1992).
Surface water and sediment sampling	8	VOCs, SVOCs, pesticides and PCBs, PAHs, metals (unfiltered), and total cyanide; hardness (surface water) and TOC (sediment).	Surface water and sediment samples collected and analyzed during the Confirmation Study indicated the presence of several trace metals in sediments. Eight surface water and eight sediment samples will be collected during the Phase 2 RFI to evaluate the migration of contamination from the SWMU and AOC into Alligator Bayou and St. Andrew Bay.
Surface water and sediment sampling	8	**Surface water:** Cadmium, copper, nickel, silver, beryllium, chromium, phenols, and halogenated carbons. **Sediment:** Antimony, and polynuclear aromatic hydrocarbons.	Additional sample volume will be collected for surface water and sediment samples at SWMU 1 and AOC 2 and analyzed for these indicated parameters using the furnace method and SW846 methods. These analytical methods will achieve lower detection limits for the above compounds so that data can be compared to the State of Florida Surface Water Quality Standards for Class III marine water (FDEP, 1992) and the Region IV Waste Management Division Sediment Screening Values for Hazardous Waste Sites (USEPA, 1992).
Ecological samples			
Sediments	6	Toxicity testing	Additional sediment sample volume will be collected and submitted for toxicity testing with a marine amphipod. The toxicity testing results will be compared to corresponding analytical data to assess ecological risks for aquatic receptors.
Macroinvertebrate	6	Identification	Macroinvertebrate samples will be collected from the sediment sampling locations for identification of aquatic receptors and assessment of the status of the invertebrate community.

Notes: VOCs = volatile organic compounds.
SVOCs = semivolatile organic compounds.
PAHs = polynuclear aromatic hydrocarbons.
GPR = ground-penetrating radar.
EM = electromagnetic.
SWMU = solid waste management unit.
AOC = Area of Concern.
RCRA = Resource Conservation and Recovery Act.
FAC = Florida Administrative Code.
USEPA = U.S. Environmental Protection Agency.

Soil samples will be analyzed for VOCs, SVOCs, PAHs, metals, and total cyanide. Analytical results from soil samples collected during the Phase 1 RFI did not indicate evidence of contamination in soils for pesticides and PCBs; therefore, soil samples will not be analyzed for these parameters.

7.4.7.4 **Groundwater Sampling** Nine groundwater samples will be collected from the monitoring wells located along the edge of the south dock area and the area upgradient of the AOC 2 in order to characterize the migration of chemicals from SWMU 1 and AOC 2 into groundwater. These monitoring wells include: PCY-1-2, PCY-1-2S, PCY-1-1, PCY-1-1S, PCY-1-1D, PCY-14-5, PCY-15-1, and the upgradient monitoring wells PCY-14-1, and PCY-14-1S (Figure 7-9).

Groundwater samples will be analyzed for VOCs, SVOCs, PAHs, metals (unfiltered and dissolved [filtered]), and total cyanide. Analytical results from groundwater samples collected during the Phase 1 RFI did not indicate evidence of contamination in groundwater for pesticides and PCBs; therefore, groundwater samples will not be analyzed for these compounds during the Phase 2 RFI.

In addition, the Phase 1 RFI indicated that monitoring wells PCY-14-2D and PCY-14-3D exhibited higher concentrations of metals than the shallow monitoring wells (PCY-14-2S and PCY-14-3S) in these clusters. These four monitoring wells will be resampled during the Phase 2 RFI investigation to confirm these findings. The samples collected from these wells will be analyzed for metals (unfiltered and dissolved [filtered]) and total cyanide. These data will be used to assess whether elevated concentrations of metals detected during the Phase 1 RFI investigation were due to the presence of suspended soil particles in the samples.

Seven of the monitoring wells located at SWMU 1 and AOC 2 are in close proximity to Alligator Bayou. Additional sample volume will be collected from these seven wells and analyzed for cadmium, copper, nickel, silver, beryllium by furnace, hexavalent chromium by colorimetric, phenols by SW846 Method 8040, and halogenated hydrocarbons by SW846 Method 8010. These analytical methods will achieve lower detection limits for the above compounds so that data can be compared to the State of Florida Surface Water Quality Standards for Class III marine waters (FDEP, 1992).

7.4.7.5 **Surface Water and Sediment Sampling** Eight surface water and eight sediment samples will be collected in Alligator Bayou downgradient of SWMU 1 and AOC 2. Analytical results from this sampling event will assist in the evaluation of the migration of chemicals from SWMU 1 and AOC 2 into Alligator Bayou. The eight surface water and eight sediment samples will be distributed along the edge of the south dock and across Alligator Bayou as shown on Figure 7-9. All samples will be collected during low tide conditions.

Surface water and sediment samples will be analyzed for VOCs, SVOCs, PAHs, pesticides and PCBs, metals (unfiltered), and total cyanide. Surface water samples will also be analyzed for hardness and sediment samples will also be analyzed for TOC.

In addition to the above analyses, the surface water samples will be analyzed for cadmium, copper, nickel, silver, beryllium by furnace, hexavalent chromium by colorimetric, phenols by SW846 Method 8040, and halogenated carbons by SW846 Method 8010. Sediment samples will also be analyzed for antimony by furnace and

PAHs by SW846 method 8100. These analytical methods will achieve lower detection limits for the above compounds so that data can be compared to the State of Florida Surface Water Quality Standards for Class III marine water (FDEP, 1992) and the Region IV Waste Management Division Sediment Screening Values for Hazardous Waste Sites (USEPA, 1992).

7.4.7.6 **Ecological Investigation** Additional sediment sample volumes will be collected from six of the sediment sampling locations and submitted for toxicity testing with a marine amphipod (*Ampelisca abdita*). The toxicity testing results will be compared to corresponding analytical data to assess ecological risks to aquatic receptors. Macroinvertebrate samples will also be collected from these six sediment sampling locations. The results will be used to identify aquatic receptors and to assess the status of the invertebrate community. The macroinvertebrate community results will be used with the toxicity testing results and the chemical analyses results to assess ecological risks.

7.5 SUMMARY OF PHASE 2 RFI SAMPLING AND ANALYSIS PROGRAM. A summary of the Phase 2 RFI sampling and analytical program including the field quality control sampling is presented in Table 7-13. The number of samples and the requested analyses have been identified for each site. All field quality control samples are scheduled in accordance with the Region IV USEPA Standard Operating Procedures (USEPA, 1991a).

7.6 ADDITIONAL SITES TO BE INVESTIGATED DURING THE PHASE 2 RFI. This section summarizes the proposed activities for the addition of solid waste management unit (SWMU) 10 and Building 455 into the Resource, Conservation, and Recovery Act (RCRA) Facility Investigation (RFI) Phase 2 field program. Site histories and the site-specific sampling and analytical programs for both SWMU 10 and Building 455 are included in subsections 7.6.1 and 7.6.2.

7.6.1 Site Histories

SWMU 10, Oil-Water Separator, Site 363. SWMU 10 is an underground oil-water separator (OWS) system located along the eastern boundary of Coastal Systems Station (CSS) Panama City, approximately 120 feet directly south of the JP-5 subsurface storage facility and approximately 120 feet from St. Andrew Bay (Figure 7-10). The OWS system consists of a 6,000-gallon waste oil tank, a 10,000-gallon fiberglass reinforced plastic (FRP) oily waste holding tank, the OWS, pumps, controls, and associated piping. The area adjacent to the OWS system is used as a retention pond (approximately 15 feet southeast of the OWS system). SWMU 10 was investigated as part of the RFA, which recommended no further action because no evidence of release to groundwater, surface water, air, or soil was documented.

According to CSS Panama City personnel, two releases have occurred at SWMU 10 since the no further action decision. The first release occurred in February 1992. It was noted that a petroleum-like discharge was rising to the surface at the area above the 10,000-gallon FRP tank. CSS Panama City personnel removed approximately two 55-gallon drums of soil from the area of the release. The cause of this release was never determined. Visual inspection of the pipes at this time did not indicate leakage.

Table 7-13
Summary of Sampling and Analysis

RCRA Facility Investigation Report
CSS Panama City, Florida

Site	Type	TCL VOC GC/MS	TCL SVOC GC/MS	TCL Pest/PCBs	PAH HPLC	TAL Metals	Total CN	SAS	TDS	TSS	TOC	Hardness	Dissolved Metals
Background	SO	5	5	5	5	5	5	--	--	--	--	--	--
	GW	3	3	3	3	3	3	--	3	3	--	--	3
	SW	3	3	3	3	3	3	3	--	--	--	3	--
	SD	3	3	3	3	3	3	3	--	--	3	--	--
AOC 2 and SWMU 1	SO	19	19	--	19	19	19	--	--	--	--	--	--
	GW	9	9	--	9	13	13	7	--	--	--	--	13
	SW	8	8	8	8	8	8	8	--	--	--	8	--
	SD	8	8	8	8	8	8	8	--	--	8	--	--
SWMU 2	SO	18	59	59	59	59	59	--	--	--	--	--	--
	GW	7	2	3	1	11	1	--	--	--	--	--	11
	SW	4	4	4	4	4	4	4	--	--	--	4	--
	SD	4	4	4	4	4	4	4	--	--	4	--	--
SWMU 3	SO	6	6	6	6	6	6	--	--	--	--	--	--
	GW	2	2	2	2	2	2	1	--	--	--	--	2
	SW	5	5	5	5	5	5	5	--	--	--	5	--
	SD	5	5	5	5	5	5	5	--	--	5	--	--
SWMU 4	SW	3	3	3	3	3	3	3	--	--	--	3	--
	SD	3	3	3	3	3	3	3	--	--	3	--	--
SWMU 5	SO	8	8	--	--	8	8	--	--	--	--	--	--
	GW	5	4	--	--	4	4	--	--	--	--	--	4
SWMU 9	SO	24	24	24	24	24	24	--	--	--	--	--	--
	GW	6	6	6	6	6	6	--	--	--	--	--	6
AOC 1	SO	30	30	--	30	30	30	--	--	--	--	--	--
	GW	17	17	--	17	17	17	--	--	--	--	--	17
Total Number of Environmental Samples	SO	110	151	94	143	151	151	0	0	0	0	0	0
	GW	49	43	14	38	56	46	8	3	3	0	0	56
	SW	23	23	23	23	23	23	23	0	0	0	23	0
	SD	23	23	23	23	23	23	23	0	0	23	0	0

See notes at end of table.

Table 7-13 (Continued)
Summary of Sampling and Analysis

RCRA Facility Investigation Report
CSS Panama City, Florida

Site	Type	TCL VOC GC/MS	TCL SVOC GC/MS	TCL Pest/PCBs	PAH HPLC	TAL Metals	Total CN	SAS	TDS	TSS	TOC	Hardness	Dissolved Metals
Summary Environmental Samples	Soil	133	174	117	166	174	174	23	0	0	23	0	0
	Water	72	66	37	61	79	69	31	3	3	0	23	56
Field QC Samples													
Trip Blank (TB)	W	27	--	--	--	--	--	4	--	--	--	--	--
Field Blank (FB)	W	5	5	5	5	5	5	1	1	1	1	--	5
Rinsate Blank (RB)	W	10	10	10	10	10	10	2	1	1	1	--	10
Field Duplicate (FD)	SO	11	15	9	14	15	15	--	--	--	--	--	--
	GW	5	4	2	4	6	5	1	1	1	--	--	6
	SW	2	2	2	2	2	2	2	--	--	--	2	--
	SD	2	2	2	2	2	2	2	--	--	2	--	--
Matrix Spike / Matrix Spike Duplicate (MS/MSD)	SO	12	16	10	14	16	16	--	--	--	--	--	--
	GW	6	4	2	4	6	6	2	2	2	--	--	6
	SW	2	2	2	2	2	2	2	--	--	--	2	--
	SD	2	2	2	2	2	2	2	--	--	2	--	--
Summary QA/QC Samples	Soil	27	35	23	32	35	35	4	0	0	4	0	0
	Water	57	27	23	27	31	30	14	5	5	2	4	26

See notes at end of table.

Table 7-13 (Continued)
Summary of Sampling and Analysis

RCRA Facility Investigation Report
CSS Panama City, Florida

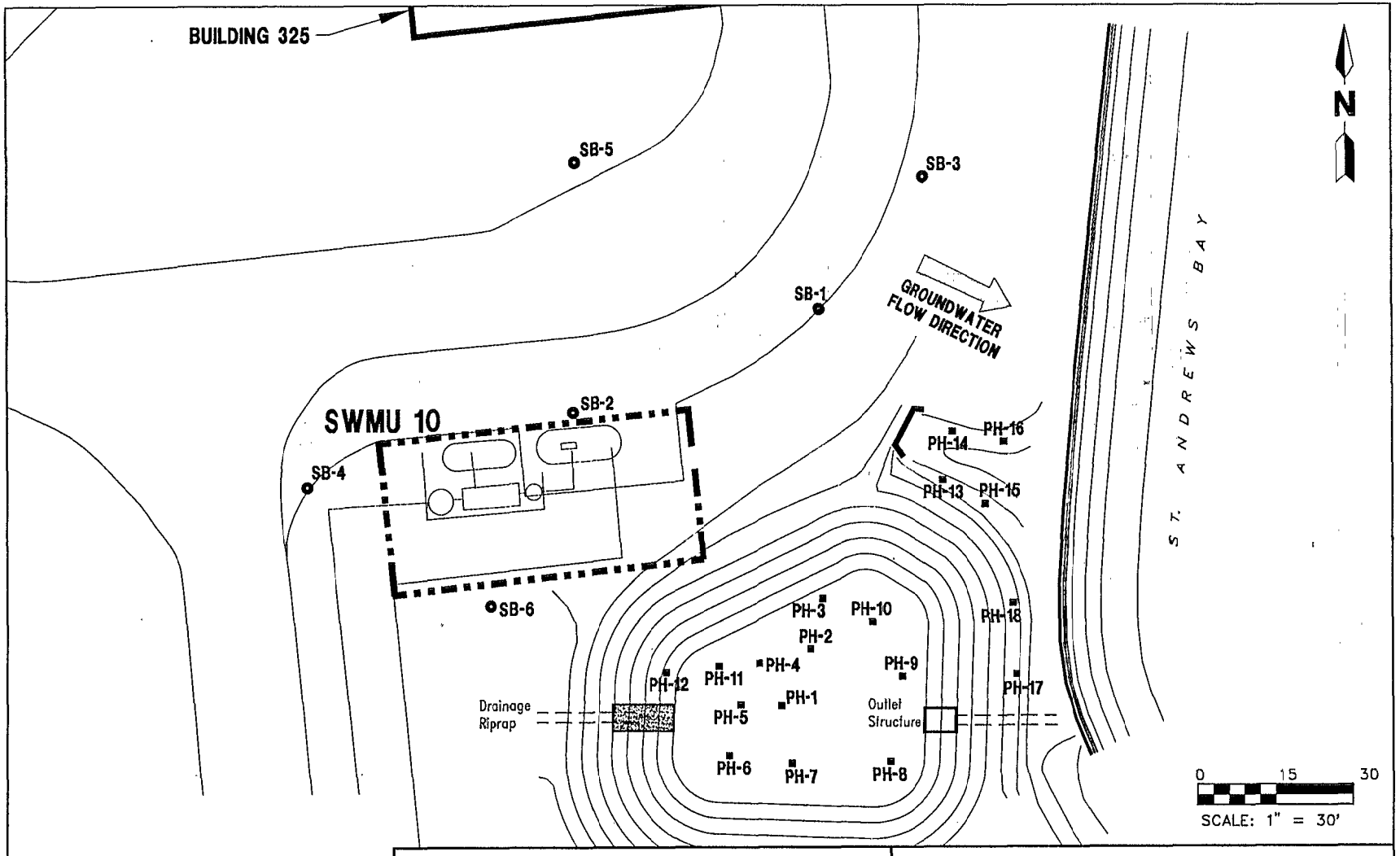
Site	Type	TCL VOC GC/MS	TCL SVOC GC/MS	TCL Pest/PCBs	PAH HPLC	TAL Metals	Total CN	SAS	TDS	TSS	TOC	Hardness	Dissolved Metals
Total	Soil	160	209	140	198	209	209	27	0	0	27	0	0
	Water	129	93	60	88	110	99	45	8	8	2	27	76

[1]Special Analytical Services Methods.

Groundwater:
- Cadmium (furnace)
- Copper (furnace)
- Nickel (furnace)
- Silver (furnace)
- Beryllium (furnace)
- Chromium (furnace)
- Phenols (SW846 Method 8040)
- Halogenated carbons (SW846 Method 8010)

Sediment:
- Antimony (furnace)
- Polynuclear aromatic hydrocarbons (SW846 Method 8100)

Notes:
TCL = target compound list.
VOC = volatile organic compounds.
GC/MS = gas chromatograph/mass spectrometer.
SVOC = semivolatile organic compounds.
Pest/PCBs = pesticides and polychlorinated biphenyls.
PAH = polynuclear aromatic hydrocarbons.
HPLC = high performance liquid chromatography.
TAL = target analyte list.
CN = cyanide.
SAS = special analytical services.
TDS = total dissolved solids.
TSS = total suspended solids.
TOC = total organic carbon.
SO = soil.
GW = groundwater.
SD = sediment.
AOC = Area of Concern.
SWMU = solid waste management unit.
W = water.
SW = surface water.



LEGEND
- Soil Boring Location
- PH-5 OVA Readings
- Approximate SWMU Boundary/ Fence Line

SITE363/WP/10-12-93

FIGURE 7-10
SOLID WASTE MANAGEMENT UNIT NO. 10, OIL/WATER SEPARATOR, PREVIOUS SUFACE SOIL AND SUBSURFACE SOIL SAMPLE LOCATIONS

RCRA FACILITY INVESTIGATION WORKPLAN

COASTAL SYSTEMS STATION
PANAMA CITY, FLORIDA

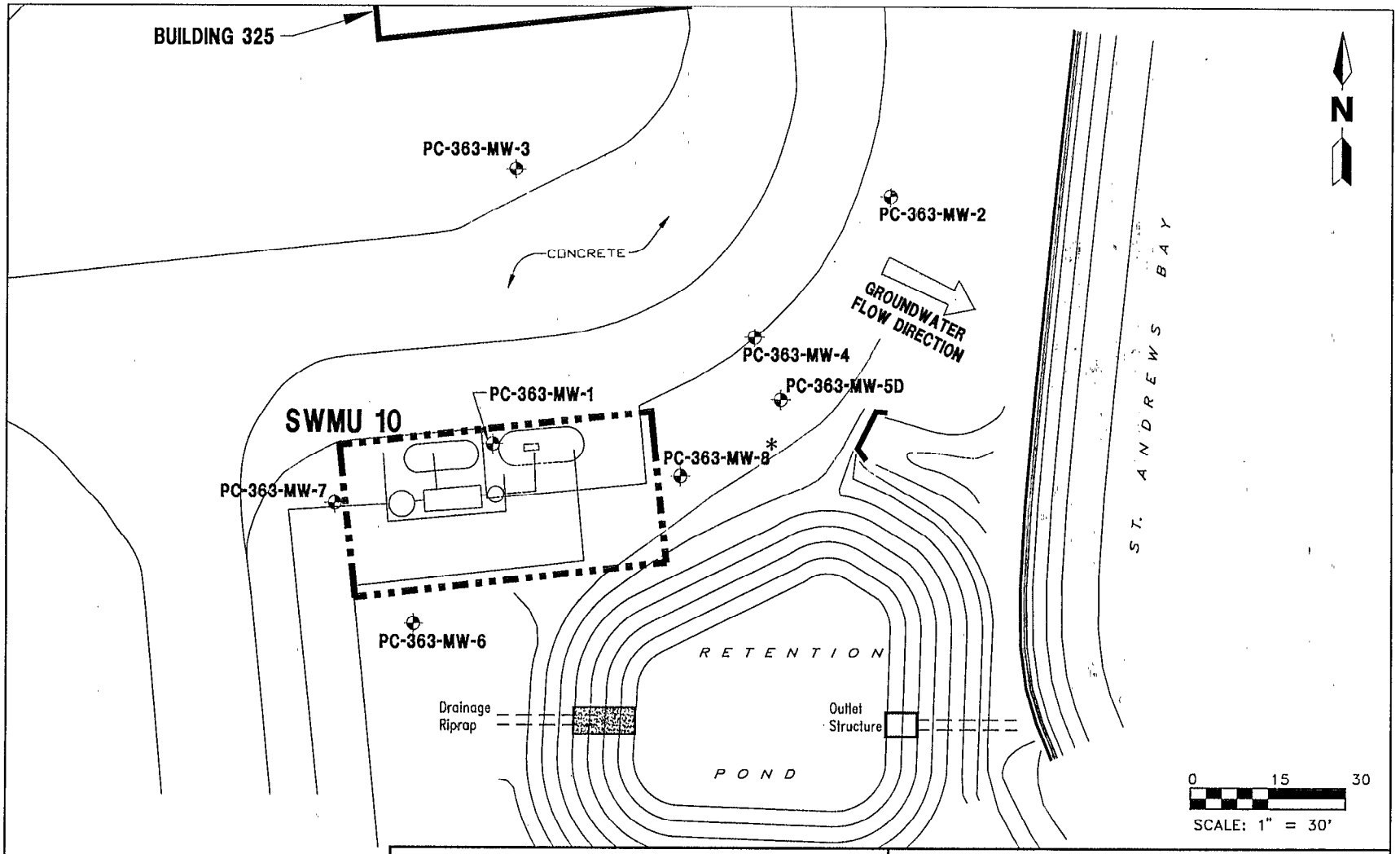
The second release occurred in March 1992 when valves were inadvertently left in the wrong position and stormwater was diverted into the 10,000-gallon holding tank. The manway at the top of the tank was not fastened securely, and storm water and bilge water that was already in the tank was released into the ground and onto the ground surface. Some of the release was retained by the retention pond; however, an estimated 600 gallons of stormwater and bilge water were discharged to St. Andrew Bay from a stormwater outfall located in a low lying area approximately 20 feet from the bay. CSS Panama City personnel removed approximately 20 cubic yards of soil from the retention pond. The soil was later disposed at the Steelfield landfill. A toxicity characteristic leaching procedure (TCLP) analysis was completed on the soil. The results indicated that the soils were not characteristic hazardous waste. The connection between the manway and the holding tank was then secured.

ABB-ES, was contracted in 1992 by SOUTHNAVFACENGCOM to perform a Contamination Assessment (CA) and submit a Contamination Assessment Report (CAR) for SWMU 10. The CA at SWMU 10 was completed in October 1992. The results of this investigation are discussed below.

As part of the CA, 36 subsurface soil samples were collected in the unsaturated zone for headspace analyses using an organic vapor analyzer (OVA), and from the saturated zone for field gas chromatograph (GC) screening (Figure 7-10). The GC was used to help place monitoring wells at optimal locations to collect groundwater samples to delineate contamination at the site. Six subsurface soil samples were collected and sent to a laboratory for total metals analysis. Sample locations are shown on Figure 7-10. One subsurface soil sample, collected from the area with the highest headspace reading, was also analyzed for total recoverable petroleum hydrocarbons (TRPH), volatile organic compounds (VOCs) by U.S. Environmental Protection Agency (USEPA) Method 8240, and semivolatile organic compounds (SVOCs) by USEPA Method 8270.

VOCs were detected (using OVA headspace techniques) in 23 of the 36 subsurface soil samples collected from the area surrounding SWMU 10. Concentrations ranged from 0 parts per million (ppm) to 1,700 ppm. Total metal analyses indicate the presence of arsenic in one sample (2.3 milligrams per kilogram [mg/kg]), chromium in one sample (17 mg/kg), and lead in two samples (5.1 mg/kg and 5.2 mg/kg). These detections were all below the Florida Department of Environmental Protection (FDEP) (formerly Florida Department of Environmental Regulation [FDER]) guidance concentrations of 55 mg/kg for arsenic, 275 mg/kg for chromium, and 77 mg/kg for lead. The results of the TRPH analysis reported a concentration of 39,000 mg/kg. This concentration exceeds the FDEP guidance concentration for maximum TRPH in soils of 50 mg/kg. Eight VOCs (USEPA Method 8240), with concentrations ranging from 45 mg/kg to 705 mg/kg, and 20 tentatively identified compounds (TICs), with concentrations ranging from 86 mg/kg to 5,900 mg/kg, were detected in the sample collected for TRPH analysis. The TICs were identified as normal components or breakdown products of petroleum.

Seven groundwater samples were collected and analyzed for VOCs (USEPA Method 624), PAHs (USEPA Method 625), TRPH (USEPA Method 418.1), and filtered metals analysis. Sample locations are shown on Figure 7-11. Results of laboratory analyses indicated detections of benzene, ethylbenzene, xylenes, methylene chloride, 1,1-dichloroethane, 1,1-trichloroethane, naphthalene, 1,1-trichloroethane, naphthalene, 1-methyl-



LEGEND

- Monitoring Well Location
- * Damaged Well, MW-8 Not Used.
- Approximate SWMU Boundary/ Fence Line

SITE363/MP/10-12-93

FIGURE 7-11
SOLID WASTE MANAGEMENT UNIT NO. 10, OIL/WATER SEPARATOR, EXISTING MONITORING WELL LOCATIONS

RCRA FACILITY INVESTIGATION WORKPLAN

COASTAL SYSTEMS STATION PANAMA CITY, FLORIDA

naphthalene, fluorene, phenanthrene, total recoverable petroleum hydrocarbons, arsenic, cadmium, chromium, and lead. Samples collected from three of the seven wells had detections for some of these compounds reported at concentrations exceeding FDEP target levels. The analytical results for the sample collected from monitoring well CSS-363-MW-1 were equivalent to or exceeded the FDEP target level for fluorene (10 parts per billion [ppb]), phenanthrene (16 ppb), benzene (6 ppb), total volatile organic aromatics (VOAs) (268 ppb), total naphthalene (307 ppb), arsenic (78 ppb), lead (85 ppb), and TRPH (35,000 ppb). The sample collected from CSS-363-MW-6 exceeded FDEP target levels for arsenic (160 ppb), cadmium (21 ppb), chromium (140 ppb), and lead (110 ppb), and the sample collected from CSS-363-MW-5D exceeded FDEP target levels for chromium (120 ppb) and lead (77 ppb).

SWMU 10 was also investigated as part of a hazardous waste compliance inspection on November 19, 1992, by FDEP. The inspection was conducted to determine the compliance status of CSS Panama City with Title 40 Code of Federal Regulations (CFR), Parts 260 through 268, as adopted in Chapter 17-730, Florida Administrative Code (FAC). During the inspection, information was obtained indicating that hazardous waste was introduced into the OWS system on at least three occasions, once each in 1989, 1990, and 1992. As a result of this information, SOUTHNAVFACENGCOM has requested that SWMU 10 be investigated during the Phase 2 RFI field program.

Building 455, Paint Stripping Area. Building 455 is located on Gull Circle, and is approximately 500 feet east of the Burn Area at SWMU 2. According to CSS Panama City personnel, this area was formerly known as Building 63. Building 63 was demolished in 1989, and Building 455 was built at the same location. Paint stripping activities were conducted at this location for at least 15 years (pre-1978 until June 1993). During a Hazardous Material Minimization Survey, conducted by the facility in 1993, it was discovered that rinse water from the chemical stripping operation contained a listed hazardous waste (methylene chloride), which may have been released onto the ground around Building 455.

The facility notified FDEP of this potential release and discontinued paint stripping activities.

In June 1993, CSS Panama City collected six soil samples (three surface soil and three subsurface soil) at Building 455 (Figure 7-12). Two of the six sample locations (one surface soil and one subsurface soil sample) were collected as background samples. All samples were sent to an off-site laboratory and analyzed for acid extractables and base-neutral extractables using SW846 method 8270, VOAs by gas chromatography/mass spectroscopy (GC/MS) using SW846 method 8260, and cadmium, chromium, and lead using USEPA Methods 213.2, 218.1, and 239.2, respectively.

Phenol was the only acid extractable compound detected in the soil samples collected by CSS Panama City personnel at Building 455. Phenol was reported at 2,700 μg/kg in sample 4034. This sample was collected west of the sand blasting area. Phenol was not detected in any other samples. Base-neutral extractables (290 μg/kg to 3,900 μg/kg) including benzo(a)pyrene, benzyl alcohol, bis(2-ethylhexyl)phthalate, butylbenzyl phthalate, 4-chlorophenol phenyl ether, chrysene, and di-n-butyl phthalate were detected (240 μg/kg to 2,500 μg/kg) in surface soil sample 4034 collected from the area west of the sand blast area, and bis(2-ethylhexyl) phthalate and butylbenzyl phthalate were detected (1,100 μg/kg to 7,000 μg/kg) in surface soil sample 4036 and subsurface soil sample 4037,

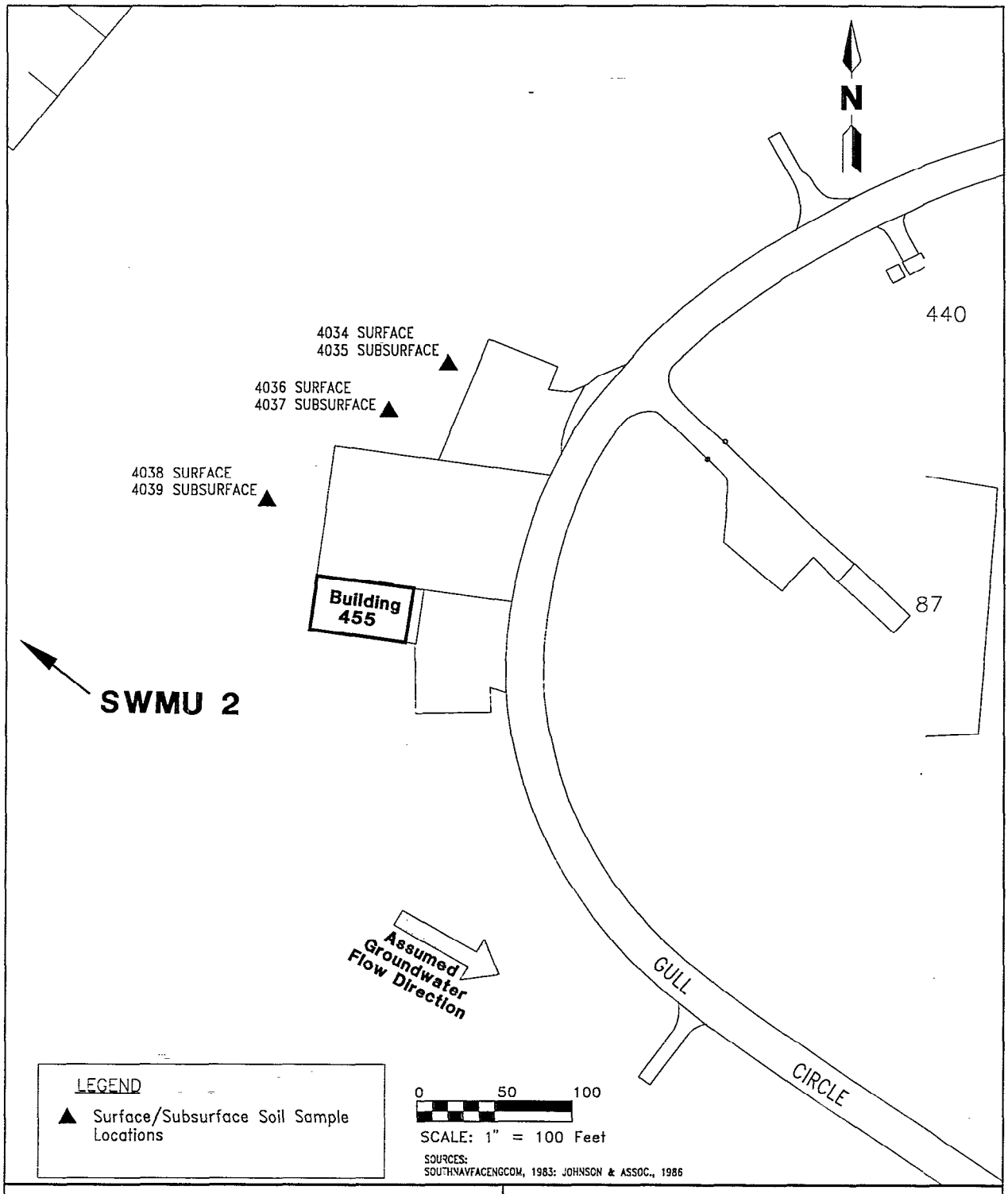


FIGURE 7-12

BUILDING 455, PAINT STRIPPING AREA, PREVIOUS EXPLORATION LOCATIONS

BLDG-455/NP/10-11-93

RCRA FACILITY INVESTIGATION WORKPLAN

COASTAL SYSTEMS STATION PANAMA CITY, FLORIDA

collected south of the paint stripping area. No base-neutral extractables were detected in subsurface soil sample 4035, collected south of the paint stripping area.

Methylene chloride was detected in all six samples collected at Building 455. Concentrations ranged from 14 μg/kg to 180 μg/kg. Methylene chloride was the only VOC detected in the six soil samples. The highest concentrations (120 μg/kg and 180 μg/kg) were in surface soil sample 4034 and subsurface soil sample 4035, collected west of the sandblasting area.

Cadmium (0.35 mg/kg to 3.4 mg/kg), chromium (6.5 mg/kg to 150 mg/kg), and lead (2.5 mg/kg to 335 mg/kg) were detected in all six samples collected at Building 455. The concentrations of cadmium and chromium are well below FDEP guidance concentrations of 55 mg/kg and 275 mg/kg, respectively. The FDEP guidance concentration for lead is 77 mg/kg. Two of the six samples (4034 and 4038) exceeded this value.

7.6.2 Site-Specific Sampling and Analytical Program The site-specific field investigative activities that will be performed at SWMU 10 and Building 455 are included in this section. Tables summarizing the field investigative activities, analytical protocols, and sampling and analysis rationale are also included.

All samples will be collected following procedures outlined in USEPA Region IV Environmental Services Division, Standard Operation Procedures (USEPA, 1991a) and analyzed according to Contract Laboratory Program (CLP) methodologies (USEPA, 1991b). Ninety percent of the samples will be analyzed using Level III DQOs with 10 percent of the data analyzed using Level IV DQOs. A summary of the Phase 2 RFI sampling and analysis program, including the field quality control sampling, is presented in subsection 7.6.3.

7.6.2.1 **SWMU 10, Oil-Water Separator, Site 363** The Phase 2 RFI field program at SWMU 10 consists of the following activities:

- surface soil sampling and analysis;
- soil borings, subsurface soil sampling, and subsurface soil analysis;
- water level measurements; and
- groundwater sampling and analysis.

The rationale for the Phase 2 RFI sampling and analysis program at SWMU 10 is presented in Table 7-14. Figure 7-13 shows the locations of samples to be collected and analyzed at SWMU 10.

Surface Soil Sampling. Ten surface soil samples (0 to 1 foot below land surface [bls]) will be collected to characterize the nature and extent of surface soil contamination and to provide the necessary information to develop the human health and ecological risk assessments. Four of these samples will be collected from the area surrounding the SWMU, one will be collected from the area inside the fence, two will be collected from within the retention pond, and three will be collected from the drainage outfall north of the retention pond. All surface soil samples will be analyzed for VOCs, SVOCs, PAHs, pesticides and PCBs, metals, and total cyanide.

Soil Borings and Sampling. To further characterize the nature and extent of subsurface soil contamination at SWMU 10, nine soil borings will be completed in

Table 7-14
Phase 2 RFI Rationale for Explorations at SWMU 10

RCRA Facility Investigation Workplan Addendum
CSS Panama City, Florida

Field Activity	Quantity	Analytical Program	Rationale
Subsurface soil sampling	9	VOCs, SVOCs, pesticides and PCBs, PAHs, metals, and total cyanide.	Results from the CA investigation indicated the presence of 8 VOCs, 3 metals, TRPH, and 20 TICs in subsurface soil samples collected at SWMU 10. Nine additional subsurface soil samples will be collected during the Phase 2 RFI to further characterize the nature and vertical and horizontal extent of subsurface soil contamination at SWMU 10. Four soil borings will be placed outside the fenced area, two will be placed within the retention pond, and three will be placed in the drainage outfall located north of the retention pond. One soil sample will be collected from each soil boring at just above the water table.
Surface soil sampling	10	VOCs, SVOCs, pesticides and PCBs, PAHs, metals, and total cyanide.	Ten surface soil samples will be collected at SWMU 10 during the Phase 2 RFI. These data will assist in the characterization of chemical contamination in the surface soils at the SWMU, and will assist in the assessment of risks to human and ecological receptors. Four surface soil samples will be collected from outside the fenced area. One will be collected from inside the fenced area, two will be collected from within the retention pond, and three will be collected from the drainage outfall located north of the retention pond.
Water level measurements	3 times	None	Water levels will be measured three times in the seven monitoring wells at SWMU 10 during the Phase 2 RFI. Levels will be recorded at the beginning of the field program, during the Phase 2 RFI field investigation, and at the end of the field investigation. The data will be used in the preparation of a water table contour map to assess the direction of groundwater flow.
Groundwater sampling	5	VOCs, SVOCs, pesticides and PCBs, PAHs, metals (unfiltered and dissolved [filtered]), and total cyanide.	Results from the CA investigation indicated the presence of PAHs, benzene, arsenic, lead, and TRPH in groundwater samples collected from SWMU 10. Five monitoring wells will be resampled to further characterize the nature and extent of groundwater contamination at SWMU 10.
		Cadmium, copper, nickel, silver, beryllium, chromium (furnace), phenols (USEPA Method 8040), and halogenated carbons (USEPA Method 8010).	Because of the proximity of the monitoring wells located at SWMU 10 to St. Andrew Bay, additional sample volume will be collected from the five monitoring wells and analyzed for cadmium, copper, nickel, silver, beryllium, chromium by furnace, phenols by SW846 Method 8040, and halogenated hydrocarbons by SW846 Method 8010. These analytical methods will achieve lower detection limits for the above compounds so that data can be compared to the State of Florida Surface Water Quality Standards for Class III marine waters (FDEP, 1992).

Notes: VOCs = volatile organic compounds.
SVOCs = semivolatile organic compounds.
PCBs = polychlorinated biphenyls.
PAHs = polynuclear aromatic hydrocarbons.
CA = Contamination Assessment.
TRPH = total recoverable petroleum hydrocarbons.
TIC = tentatively identified compounds.
RCRA = Resource Conservation and Recovery Act.
RFI = RCRA Facility Investigation.

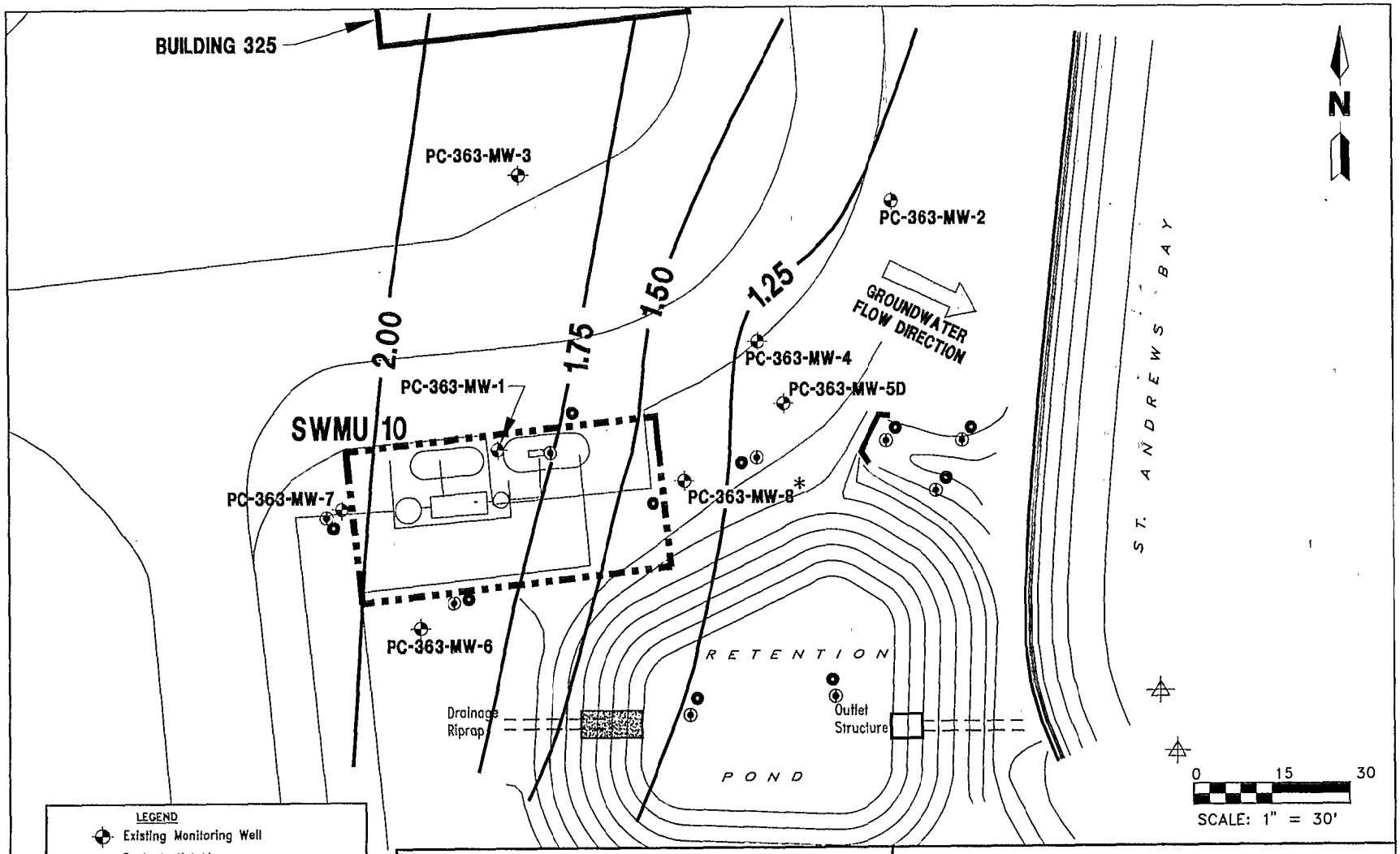


FIGURE 7-13
SOLID WASTE MANAGEMENT UNIT NO. 10, OIL/WATER SEPARATOR, PROPOSED PHASE II RFI EXPLORATION LOCATIONS

RCRA FACILITY INVESTIGATION WORKPLAN

COASTAL SYSTEMS STATION
PANAMA CITY, FLORIDA

the area of the SWMU. Four borings will be placed just outside the fenced area, two will be placed in the retention pond, and three will be placed in the outfall area located north of the retention pond (Figure 7-12). Split-spoon samples will be collected at continuous 2-foot intervals to the water table to characterize the shallow soil stratigraphy. One soil sample will be collected for analysis from the soil-water interface in each boring.

All subsurface soil samples will be analyzed for VOCs, SVOCs, PAHs, pesticides and PCBs, metals, and total cyanide.

Water Level Measurements. Water levels will be measured three times in all monitoring wells at SWMU 10 during the Phase 2 RFI. Levels will be recorded at the beginning of the field program, during the Phase 2 RFI field investigation, and at the end of the field investigation. The data will be used in the preparation of a water table contour map to assess the direction of groundwater flow.

Groundwater Sampling. To further delineate the nature and extent of groundwater contamination and to develop the human health and ecological risk assessments for SWMU 10, five of the seven existing monitoring wells (CSS-363-MW-1, CSS-363-MW-4, CSS-363-MW-5D, CSS-363-MW-6, and CSS-363-MW-7) will be resampled during the Phase 2 RFI investigation (Figure 7-12). Two of the seven monitoring wells (CSS-363-MW-2 and CSS-363-MW-3) are located approximately 90 feet and 65 feet from the OWS system, respectively, and are side gradient. These two monitoring wells will not be resampled during the Phase 2 RFI because of the location of these monitoring wells and because the results from the CA did not indicate the presence of any contamination in these two monitoring wells.

Groundwater samples will be analyzed for VOCs, SVOCs, PAHs, pesticides and PCBs, metals (filtered and unfiltered), and total cyanide.

Because of the proximity of the monitoring wells located at SWMU 10 to St. Andrew Bay, additional sample volume will be collected from the five monitoring wells and analyzed for cadmium, copper, nickel, silver, beryllium, and chromium by furnace, phenols by SW846 Method 8040, and halogenated hydrocarbons by SW846 Method 8010. These analytical methods will achieve lower detection limits for the above compounds so that data can be compared to the State of Florida Surface Water Quality Standards for Class III marine waters (FDEP, 1992).

7.6.2.2 Building 455, Paint Stripping Area The following activities will be completed at Building 455 during the Phase 2 RFI investigation:

- surface soil lead screening;
- surface soil sampling and analysis;
- soil borings, subsurface soil sampling, and subsurface soil analysis;
- water level measurements;
- monitoring well installation; and
- groundwater sampling and analysis.

The rationale for the Phase 2 RFI sampling and analysis program at Building 455 is presented in Table 7-15. Figure 7-14 shows the locations at Building 455 where samples will be collected for analysis.

Table 7-15
Phase 2 RFI Rationale for Explorations at Building 455

RCRA Facility Investigation Workplan Addendum
CSS Panama City
Panama City, Florida

Field Activity	Quantity	Analytical Program	Rationale
Surface soil lead screening	40	VOCs, SVOCs, PAHs, pesticides and PCBs, metals, and total cyanide.	Surface soil lead screening will be done in the field at Building 455. The results of the lead screening will be used to locate the surface soil sampling so that the maximum amount of information on the extent of surficial contamination can be determined with the minimum number of analytical samples.
Subsurface soil sampling	15	VOCs, SVOCs, PAHs, pesticides and PCBs, metals, and total cyanide.	Five soil borings will be completed and 15 subsurface soil samples will be collected at Building 455 during the Phase 2 RFI investigation to characterize the nature and vertical and horizontal extent of contamination. Analytical results of an investigation conducted by the facility in June 1993 indicated that surface and subsurface soil at Building 455 had detections of VOCs, SVOCs, PAHs, and metals; therefore, the subsurface soil samples collected during the Phase 2 RFI will be analyzed for these parameters. In addition, pesticides and PCBs and cyanide were not analyzed during the previous investigation; therefore, these parameters will also be analyzed during the Phase 2 RFI investigation. Split-spoon samples will be collected at continuous 2-foot intervals to the water table and sent to an off-site laboratory for the previously mentioned analyses. This information will be used to develop corrective action objectives for Building 455.
Surface soil sampling	8	VOCs, SVOCs, PAHs, pesticides and PCBs, metals, and total cyanide.	Surface soil information is required to evaluate potential risks to human and ecological receptors from surface contamination at Building 455. Therefore, eight surface soil samples will be collected and sent to an off-site laboratory for analysis. Results of an investigation conducted by the facility in June 1993 indicated that surface and subsurface soil at Building 455 had detections of VOCs, SVOCs, PAHs, and metals; therefore, the surface soil samples collected during the Phase 2 RFI will be analyzed for these parameters. In addition, analyses for pesticides and PCBs and cyanide were not completed during this previous investigation; therefore these parameters will also be analyzed during the Phase 2 RFI investigation.
Monitoring well installation	4		To evaluate the potential for groundwater contamination to migrate from Building 455, four shallow monitoring wells will be installed (one upgradient, one source, and two downgradient).
Water level measurements	2 times	None	Water level measurements will be collected twice during the Phase 2 RFI for the wells installed at Building 455. Levels will be recorded after the completion of the installations and once at the end of the Phase 2 RFI field program. Data will be used to prepare a water table contour map to assess the direction of groundwater flow.
Groundwater sampling	4	VOCs, SVOCs, PAHs, pesticides and PCBs, metals, and total cyanide.	Groundwater samples will be collected from the four newly installed monitoring wells at Building 455 to delineate the potential vertical and horizontal migration of contamination from paint stripping activities. Groundwater samples have not previously been collected from this area and analyzed; therefore, all groundwater samples collected at Building 455 during the Phase 2 RFI will be analyzed for all indicated parameters.

Notes: VOCs = volatile organic compounds.
SVOC = semivolatile organic compounds.
PAHs = polynuclear aromatic hydrocarbons.
PCBs = polychlorinated biphenyls.
RFI = RCRA Facility Investigation.

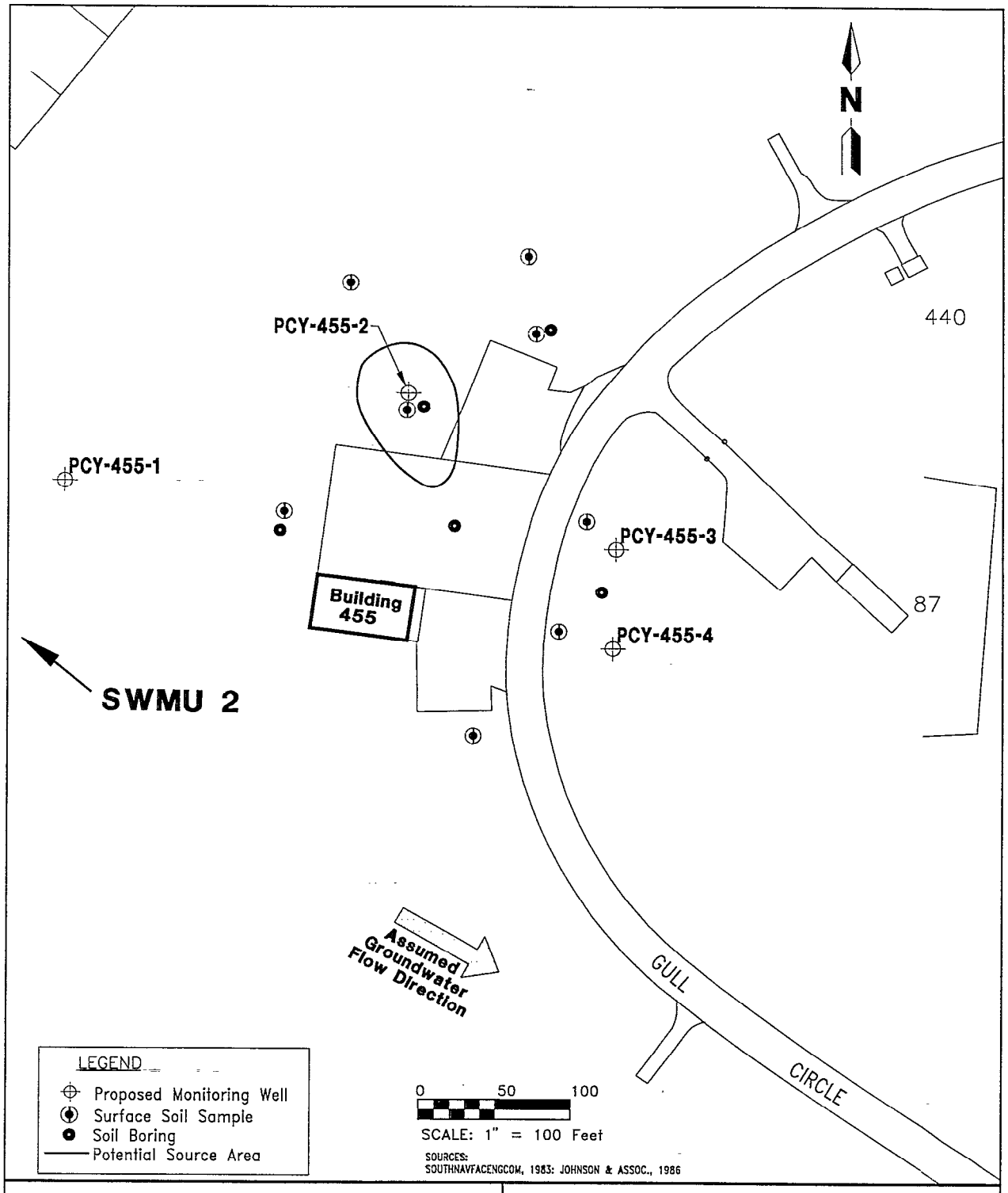


FIGURE 7-14

BUILDING 455, PAINT STRIPPING AREA, PROPOSED PHASE 2 RFI EXPLORATION LOCATIONS

BLDG-455/NP/10-11-93

RCRA FACILITY INVESTIGATION WORKPLAN

COASTAL SYSTEMS STATION PANAMA CITY, FLORIDA

Surface Soil Lead Screening. Surface soil lead screening will be completed at Building 455. The results of the lead screening will be used to locate the surface soil sampling locations so that the maximum amount of information on the extent of surficial contamination can be determined with the minimum number of analytical samples. Samples for off-site analysis will be collected from the areas with the highest lead screening concentrations. The analytical technique uses an AA unit calibrated for total lead concentration. The samples will be digested so that the total amount of lead is suspended in an aqueous solution. Once digested, a Perkin/Elmer™ AA unit will be used to determine the lead content of the soil sample. A maximum of 40 screening samples will be analyzed in the field.

Surface Soil Sampling. Eight surface soil samples (0 to 1 foot bls) will be collected at Building 455 to characterize the nature and horizontal extent of surface soil contamination and to provide the necessary information to develop the human health and ecological risk assessments.

All surface soil samples will be analyzed for VOCs, SVOCs, PAHs, pesticides and PCBs, metals, and total cyanide. Surface soil and subsurface soil samples collected by the facility in June 1993 detected VOCs, SVOCs, PAHs, and metals. Analyses for pesticides and PCBs and cyanide were not completed during this investigation. For these reasons, surface soil samples collected from Building 455 during the Phase 2 RFI will be analyzed for all indicated parameters.

Soil Borings and Sampling. Five soil borings will be completed at Building 455 and 15 subsurface soil samples will be collected for laboratory analyses to further characterize the nature and extent of vertical and horizontal subsurface soil contamination. Soil borings will be placed in areas surrounding Building 455. Three samples will be collected from each boring.

All subsurface soil samples will be analyzed for VOCs, SVOCs, PAHs, pesticides and PCBs, metals, and total cyanide. VOCs, SVOCs, PAHs, and metals were detected in surface soil and subsurface soil samples collected by the facility in June 1993. Analyses for pesticides and PCBs and cyanide were not completed during this investigation; therefore, subsurface soil samples will be completed for all indicated parameters.

Monitoring Well Installation and Groundwater Sampling. Four monitoring wells (one upgradient, one source, and two downgradient) will be installed at Building 455 to identify potential groundwater contamination from past paint stripping activities at Building 455.

Groundwater samples will be collected from each of the four monitoring wells and analyzed for VOCs, SVOCs, PAHs, pesticides and PCBs, metals, and total cyanide. Groundwater was not collected and analyzed during the June 1993 investigation; therefore, groundwater samples will be analyzed for all indicated parameters.

Water level measurements will be collected twice during the Phase 2 RFI for the wells installed at Building 455. Levels will be recorded after the completion of the installations and once at the end of the Phase 2 RFI field program. Data will be used to prepare a water table contour map to assess the direction of groundwater flow.

7.6.3 Summary of Additional Work to be Completed During the Phase 2 RFI Sampling and Analysis Program. A summary of the Phase 2 RFI sampling and analysis program including the field quality control sampling is presented in Table 7-16. All field quality control samples are scheduled in accordance with the Region IV USEPA Standard Operating Procedures (USEPA, 1991).

Table 7-16
Summary of Sampling and Analysis, SWMU 10 and Building 455

RCRA Facility Investigation Workplan Addendum
CSS Panama City
Panama City, Florida

Site	Type	TCL VOC GC/MS	TCL SVOC GC/MS	TCL Pest/PCBs	PAH HPLC	TAL Metals	Total Cyanide	SAS[1]	TOC	Hardness	Dissolved Metals
SWMU 10	SO	19	19	19	19	19	19	--	--	--	--
	GW	5	5	5	5	5	5	5	--	--	5
	SW	2	2	2	2	2	2	2	--	2	--
	SD	2	2	2	2	2	2	2	2	--	--
Building 455	SO	21	21	21	21	21	21	--	--	--	--
	GW	4	4	4	4	4	4	--	--	--	4
Total Number of Environmental Samples	SO	40	40	40	40	40	40	--	--	--	--
	GW	9	9	9	9	9	9	5	--	--	9
	SW	2	2	2	2	2	2	2	--	2	--
	SD	2	2	2	2	2	2	2	2	--	--
Field QC Samples											
Trip Blank (TB)	W	6	--	--	--	--	--	--	--	--	--
Field Blank (FB)	W	1	1	1	1	1	1	1	--	--	1
Rinsate Blank (RB)	W	2	2	2	2	2	2	1	--	1	2
Field Duplicate (FD)	SO	4	4	4	4	4	4	1	--	--	--
	GW	1	1	1	1	1	1	1	--	--	3
	SW	1	1	1	1	1	1	1	--	1	--
	SD	1	1	1	1	1	1	1	1	--	--
Matrix Spike/Matrix Spike Duplicate (MS/MSD)	SO	4	4	4	4	4	4	--	--	--	4
	GW	2	2	2	2	2	2	--	--	--	2
	SW	2	2	2	2	2	2	2	--	2	--
	SD	2	2	2	2	2	2	2	2	--	--
Total Including Field QC Samples	W	9	3	3	3	3	3	--	--	1	3
	SO	48	48	48	48	48	48	--	--	--	4
	GW	12	12	12	12	12	12	9	--	--	14
	SW	5	5	5	5	5	5	5	--	5	--
	SD	5	5	5	5	5	5	5	5	--	--

See notes at end of table.

Table 7-16 (Continued)
Summary of Additional Sampling and Analysis, SWMU 10 and Building 455

RCRA Facility Investigation Workplan Addendum
CSS Panama City
Panama City, Florida

[1]Special Analytical Services Methods for Groundwater and Surface Water:

Cadmium (furnace)	Beryllium (furnace)
Copper (furnace)	Chromium (colormetric)
Nickel (furnace)	Phenols (SW846 Method 8040)
Silver (furnace)	Halogenated carbons (SW846 Method 8010)

Notes:

TCL = target compound list.	TAL = target analyte list.
VOC = volatile organic compounds.	TOC = total organic carbon.
GC/MS = gas chromatograph/mass spectrometer.	SO = soil.
SVOC = semivolatile organic compounds.	GW = groundwater.
Pest/PCB = pesticides and polychlorinated biphenyls.	W = source water.
PAH = polynuclear aromatic hydrocarbons.	SAS = special analytical services.
HPLC = high performance liquid chromatography.	

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