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RECORD OF DECISION
OPERABLE UNIT 3

6041

SHERWOOD MEDICAL NPL SITE

DeLand, Volusia County, Florida

Prepared by:

Environmental Protection Agency

Region 4

Atlanta, Georgia

RECORD OF DECISION
SHERWOOD MEDICAL COMPANY
OPERABLE UNIT 3

1. DECLARATION

SITE NAME AND LOCATION

Sherwood Medical Industries Site
DeLand, Volusia County, Florida

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for Operable Unit 3 at the Sherwood Medical site in DeLand, Florida, which was chosen in accordance with CERCLA, as amended by SARA, and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record for this site.

DESCRIPTION OF THE REMEDY

The remedy selected in this ROD addresses contaminated sediment in Lake Miller. Based on the administrative record, EPA has determined that no further action is necessary to address sediment contamination in Lake Miller. However, the site Operation and Maintenance Plan shall be revised to incorporate the following additional monitoring requirements to ensure that no unacceptable exposures to risks posed by conditions at the site occur in the future:

- Semiannual sampling of Lake Miller sediment and surface water;
- Limited fish tissue sampling in Lake Miller and adjoining lakes.

DECLARATION STATEMENT

EPA has determined that no further remedial action is necessary at the site. The previous response actions identified in the ROD for Operable Unit 1 eliminated the need to conduct additional remedial action. Therefore, because ongoing long-term response actions do not require additional physical construction, the site now qualifies for inclusion on the Construction Completion List. However, because contamination remains at the site, EPA will conduct a review every five years in accordance with Section 121 of CERCLA to ensure that all remedies for the site continue to provide adequate protection of human health and the environment.

The Florida Department of Environmental Protection (FDEP) has provided input as the support agency for the site in accordance with 40 CFR 300.430. Based upon comments received from FDEP, concurrence by the State of Florida is expected, but a letter of concurrence has not yet been received.

Richard D. Green, Acting Director
Waste Management Division
U.S. EPA Region 4

18 SEP 97
Date

RECORD OF DECISION
SHERWOOD MEDICAL COMPANY
OPERABLE UNIT 3

2. DECISION SUMMARY

1.0 Site Name, Location, and Description

The Sherwood Medical Company site is an active medical supply manufacturing facility located in Volusia County, Florida approximately three miles northeast of downtown DeLand, Florida. Though the facility was originally outside the city limits in an unincorporated area of Volusia County, the Sherwood property was annexed by the City of DeLand in 1996.

The site occupies approximately 42 acres, including a section of Lake Miller along the western site boundary (see Figure 1). International Speedway Boulevard (U.S. Highway 92) runs along the northern boundary of the site while a wooded, swampy area lies to the south. A commercial and residential area along Kepler Road is located directly east of the site. The Sherwood property is currently occupied by several manufacturing buildings, a biological laboratory, sizeable parking areas, plus additional structures, including an industrial wastewater treatment facility.

To generate water for plant operations, the Sherwood facility pumps approximately 175,000 gallons of water per day from the underlying Floridan Aquifer. The water is used for industrial operations such as cleaning, manufacturing, and cooling, and for some potable uses. An industrial wastewater treatment facility was constructed in July 1983 to meet the Florida Drinking Water Standards. The facility was permitted by the Florida Department of Environmental Regulation (FDER) to treat wastewater from the plant and discharge it to the denitrification field and perimeter percolation pond. In late 1985 Sherwood installed an air stripper to pretreat water used onsite in facility operations. The air stripper removes contaminants in the water pumped from the Floridan Aquifer production wells onsite. As a result of the annexation of the Sherwood property by the City of DeLand, treated industrial wastewater is now discharged to the City's wastewater treatment facility.

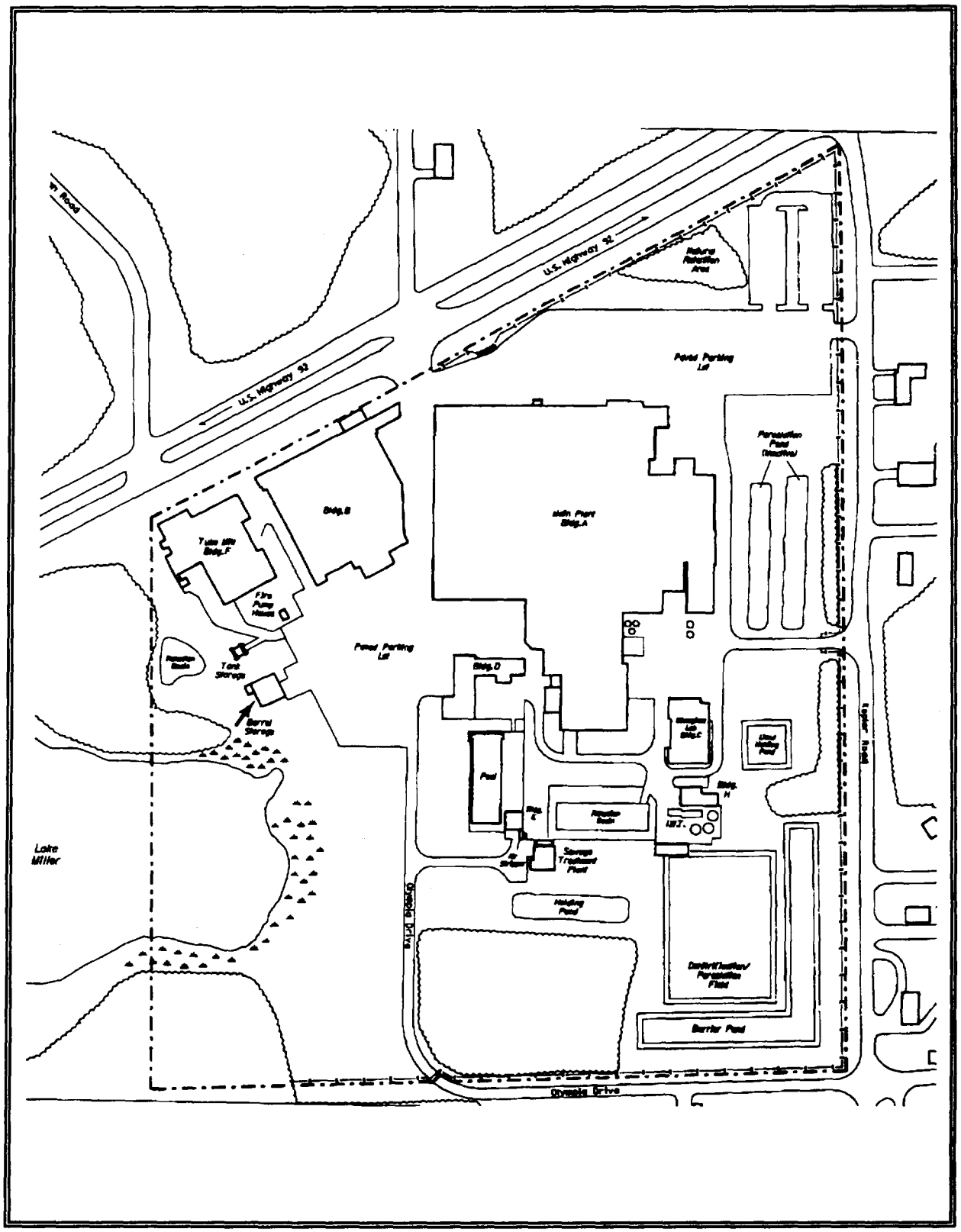
2.0 Site History and Enforcement Activities

Sherwood Medical Industries, now known as Sherwood Davis & Geck, has used the property since 1959 for the manufacture of medical supplies, primarily hypodermic needles and syringes. Industrial operations currently include grinding, hub processing, and cleaning of stainless steel and aluminum parts used to manufacture hypodermic syringes. Sherwood also molds plastic syringes and conducts in-house laboratory work.

2.1 Site History

Between 1971 and 1980, the company disposed of approximately two tons of liquid and sludge waste into two unlined percolation ponds. During this time, solids were removed from the ponds and placed

Figure 1. Sherwood Site Map



into unlined impoundments on the site. From 1980 through 1982, Sherwood analyzed the contents of the impoundments. Under the direction of FDER (predecessor to FDEP), Sherwood then disposed of the wastes in an onsite landfill.

At the request of FDER, EPA proposed the Sherwood site for listing on the National Priorities List (NPL) on December 20, 1982, with a Hazard Ranking System (HRS) score of 39.83, primarily because of the threat of contamination from wastes stored in the holding ponds and impoundments. The site's listing on the NPL was finalized on September 8, 1983.

FDER was designated as the lead agency for the site and remained in that capacity until November 1990, when both agencies agreed that EPA should assume the role of lead agency for completing actions at the site. Though FDER initially believed that the removal of wastes from onsite storage areas was sufficient to eliminate the threat of contamination, subsequent testing conducted by Sherwood and FDER revealed significant groundwater contamination in onsite wells.

In October 1985, Sherwood Medical notified EPA that they would perform a focused Remedial Investigation (RI) at the site. During EPA's negotiations with Sherwood to conduct the RI, FDER and the Florida Department of Health and Rehabilitation Services received health related complaints about private wells from nearby residents. Water samples were collected and analyzed in September 1986 from off-site private wells and Sherwood's onsite supply wells, but no violations of drinking water standards were found in private well samples. However, additional samples collected in October 1986 from onsite Floridan Aquifer wells confirmed onsite contamination of trichloroethylene (TCE) and tetrachloroethylene (PCE) in the Floridan Aquifer. These compounds were historically used by Sherwood for degreasing purposes. In light of this new information, it was agreed that a full scale Remedial Investigation and Feasibility Study (RI/FS) would be conducted at the site. In October 1987 Sherwood Medical entered into an Administrative Order on Consent (AOC) with EPA Region 4 to perform the RI/FS.

In August 1987, at FDER's request, Sherwood sampled the onsite Floridan water wells and a down gradient residential well to assess the extent of contamination and evaluate the need to implement interim remedial measures (IRM) to control and treat the contamination of the Floridan Aquifer prior to completion of the RI/FS. Based on the observed onsite Floridan Aquifer contamination, FDER recommended that an IRM action be undertaken. In July 1988, Sherwood hired Roy F. Weston, Inc., as primary contractor for IRM and RI/FS activities. Sherwood developed an investigation plan to evaluate the Floridan Aquifer and the shallower surficial aquifer through a thorough sampling program. Field testing was completed in April of 1989.

As part of the IRM, Sherwood tested all of the private wells along Kepler Road semi-annually. The wells are located immediately adjacent to the site and extend from the intersection of U.S. 92 and Kepler Road through the intersection of Marsh and Kepler Roads. Sherwood also monitored another private well, to the west of the site, just across Lake Miller. The investigation identified one private well with volatile organic compound (VOC) concentrations above safe drinking water standards. This well is located on Kepler Road, and the test results indicated PCE and TCE concentrations of

11 ppb and 4 ppb, respectively. The applicable Florida Drinking Water Standard for both PCE and TCE is 3 ppb. This well was plugged and a new well was installed.

In October 1989, Sherwood submitted a design workplan to FDER outlining further interim measures to be conducted at the site including the installation of a pump and treat system to extract and treat contaminated water from the surficial aquifer. In September 1990, FDER approved the design workplan following the receipt of the Final IRM study report. In November 1990, FDER requested that EPA assume the lead role for all actions at the site.

In December 1989, EPA and FDER approved the RI/FS Workplan. The initial field work for the RI began in January 1990 and included the installation and sampling of additional Floridan aquifer monitoring wells, drilling and sampling of soil borings, and sampling and analysis of surface water, sediment, surface soil, and all existing wells. The draft RI was submitted to EPA in March 1991.

In January 1991, EPA issued a Proposed Plan for Interim Action to address surficial aquifer contamination at the site. During the 30-day public comment period, EPA held a public meeting on January 31, 1991, at Stetson University to discuss the Proposed Interim Action and to allow concerned citizens to comment on EPA's preferred alternative and ask questions about the Sherwood site. On March 27, 1991, following the public comment period, EPA issued a Interim Action Record of Decision (ROD) for the surficial aquifer. The goal of the interim action was to prevent the spread of contaminated groundwater by treating the surficial aquifer early in the process before the RI/FS was completed. The Interim Action ROD called for installation of recovery wells and an air stripper for treatment of contaminated surficial groundwater and discharge of treated water to Lake Miller. FDER concurred on the Interim Action ROD on April 2, 1991.

Between January 7 and April 17, 1991, additional IRM activities were conducted at the site. These activities included the rehabilitation of two Floridan aquifer water supply wells SMFW and SMWS, conversion of an out of service Floridan aquifer well SMFA 1 to a stainless steel monitoring well, and installation of nine extraction wells in the surficial aquifer as part of the surficial groundwater recovery system. In April 1991, Sherwood submitted the Remedial Design (RD) Work Plan and Preliminary Design for the Surficial Aquifer Groundwater Remedial Action. Following EPA and FDER review and comment, Sherwood submitted a Final Design Package for the IRM Remedial Design/Remedial Action (RD/RA) in June 1991. However, in a subsequent meeting between FDER, EPA, and Sherwood on June 20, 1991, Sherwood agreed to undertake a study of Lake Miller's water quality to determine if Lake Miller was in compliance with applicable FDER Class III Ambient Water Quality Standards for metals, thereby making it suitable for treatment system discharge.

Surface water and sediment samples were collected at the site from July 1991 through November 1991 to further characterize the metals concentrations in Lake Miller in order to verify the lake's compliance with applicable FDER Class III Ambient Water Quality Standards. The November 1991 Lake Miller Water Quality Report concluded that, with the exception of cadmium, metals concentrations in Lake Miller were in compliance with FDER Class III Water Quality Standards. Based on this report, Sherwood submitted a National Pollutant Discharge Elimination System

(NPDES) application for the proposed discharge to Lake Miller. The data gathered for the Lake Miller study was incorporated into the RI.

In February 1992, Sherwood resubmitted the Final Design Package along with the Remedial Action Work Plan and the Operation and Maintenance Plan for the Interim Action treatment system. Following EPA approval of these documents in March 1992, construction of the IRM system began on May 5, 1992, and the system began operating on July 31, 1992.

On October 8, 1992, following publication of the final RI/FS in July 1992 and a 30-day public comment period, EPA issued a second ROD (known as Operable Unit 1) specifying the final groundwater remedy for the site. In addition to requiring the continued operation of the surficial aquifer extraction and treatment system, the OU1 ROD called for a comprehensive groundwater monitoring program, including periodic sampling of residential wells, and continued operation of the Floridan Aquifer water supply well and associated treatment system.

Based on the RI results, EPA directed Sherwood to conduct further studies on the potential ecological effects of chromium contamination in Lake Miller sediment. The results were published in a December 1993 draft report entitled "Evaluation of Effects of Chromium in Sediments, Lake Miller, FL, Sherwood Medical Company." This report generally confirmed the findings of the RI with respect to sediment contamination in the lake. After extensive discussions concerning the need for and scope of additional sediment studies, EPA and Sherwood conducted independent investigations in June and July of 1994. The results of EPA's sampling effort were summarized by EPA's contractor, ManTech Environmental Technology, Inc., in a draft report dated July 1994. Sherwood's findings were published in a May 1995 draft report entitled "Evaluation of Impacts to Biota from Chromium Sediments in Lake Miller, Florida," by O'Brien & Gere Engineers, Inc.

2.2 Enforcement Activities

Following issuance of the Interim Action ROD and four months of settlement negotiations, a Consent Decree (CD) between EPA and Sherwood Medical was lodged by the Department of Justice (DOJ) on October 24, 1991, with the United States District Court for the Middle District of Florida, Orlando Division. The CD required Sherwood to perform the Remedial Design and Remedial Action (RD/RA) of the remedy outlined in the March 1991 ROD. Notice of the proposed settlement was published in the Federal Register on November 14, 1991, initiating a 30-day public comment period. The District Court entered the CD on February 3, 1992.

Upon signature of the final ROD dated October 8, 1992, EPA and Sherwood negotiated the terms of an Amendment to the Consent Decree to incorporate additional requirements of the new ROD. The Amended CD was lodged by DOJ on October 4, 1993. Following notice of the proposed settlement in the Federal Register on October 26, 1993, and a 30-day public comment period, the District Court entered the Amended CD on December 10, 1993.

3.0 Highlights of Community Participation

In accordance with Sections 113 and 117 of CERCLA, as amended, EPA has conducted community involvement activities at the Sherwood site to solicit community input and to ensure that the public remains informed about site activities. EPA's Proposed Plan Fact Sheet for OU3 was mailed to the public on June 19, 1997, and a copy of the Administrative Record for OU3 was made available in the information repository at the DeLand Public Library. Public notices were published in *The Volusian* on June 21, 1997 and the *Daytona News-Journal* on July 6, 1997 advising the public of the availability of the administrative record and the date of the upcoming public meeting. EPA held a public meeting on July 8, 1997 to answer questions and receive comments on the Agency's preferred alternative for addressing Lake Miller sediment contamination. In addition, a public comment period was held from June 23, 1997 to July 23, 1997. EPA's response to any significant oral or written comments received during this period is included in the Responsiveness Summary in Section 3 of this ROD.

4.0 Scope and Role of Operable Unit

Because of the variety and complexity of problems at the Sherwood site, EPA determined that the remedial actions needed to resolve these problems could best be addressed in discrete phases known as operable units. The interim action outlined in EPA's March 27, 1991, ROD addressing contamination in the surficial aquifer is known as Operable Unit 2 (OU2) in the site management strategy. The OU2 remedy called for pumping and treating contaminated groundwater from the surficial aquifer to reduce the potential for contaminant migration downward into the Floridan aquifer, which is the primary source of drinking water in the DeLand area.

The final groundwater and soil remedial action, known as Operable Unit 1 (OU1), is documented in EPA's October 8, 1992 ROD. The OU1 ROD specified the following elements: continued operation of the surficial aquifer pump and treat system and the Floridan Aquifer water supply well and treatment system; groundwater monitoring, including offsite residential wells; and excavation and disposal of chromium-contaminated soil whenever existing site features are removed. Deed restrictions and other institutional controls were also required to restrict the property to industrial use and prevent access to contaminated areas and Lake Miller.

Based on the results of surface water and sediment sampling in Lake Miller during the design of the interim remedial measures, EPA identified the need for a third operable unit (OU3) to evaluate and address sediment contamination in Lake Miller. This ROD presents EPA's selected remedy for addressing Lake Miller sediment.

5.0 Summary of Site Characteristics

5.1 Environmental Setting

The Sherwood site is situated in a low topographic area 40 to 60 feet above mean sea level (MSL). The foliage typical of the site is best described as floodplain with flatland soil and is a combination

of deciduous and coniferous trees with intermittent grazing lands and wetlands. Due to the large number of freshwater lakes (e.g., Lake Miller, Cypress Lake, North and South Lake Talmadge) and low topography, much of the area is best described as swamp.

The land surrounding the Sherwood site is primarily residential, with some commercial properties. Residential areas are divided into 6-acre lots. According to real estate maps, 95% of the individual parcels of land (419 out of 440) within a 0.5 mile target area are north or east of the site. Most of the residential areas are sparsely populated, and their growth is restricted by zoning codes. There are about 800 private residences with approximately 2,500 people located within one mile of the site.

Forested areas and swamps occupy approximately 200 acres of land to the south of the site. Most of this land is owned in large tracts. The area to the east of the site is almost entirely residential. Next to the site on Kepler Road is an 80 acre residential area with 15 homes. Approximately 1,000 feet to the east of the Sherwood site lies a residential area occupying one to two square miles known as Daytona Park Estates. North of U.S. 92, the northern border for the Sherwood site, lies a 150 acre, moderately populated development, DeLand Highlands. This area has shown the greatest recent growth, and the size of the housing lots are the smallest in the area. Beyond DeLand Highlands the area is characterized as rural. Southwest of the site is mostly wooded swamp. Northwest of the site are large tracts of land owned by the DeLand Municipal Airport, the Municipal Waterworks and the Florida Military School.

The land near the Sherwood site supports recreational activities including fishing, hunting, boating, and swimming. Lakes generally used for fishing in the area include Cypress, Daytona, and Talmadge. Because of the relatively large tracts of undeveloped land, hunting occurs in the area.

The predominant natural feature of the Sherwood site is Lake Miller, a 12-acre swamp lake. Lake Miller is partially on the Sherwood site, located along the western boundary of the site. It receives inflow from North Lake Talmadge south of the site via a narrow canal, base flow from the surficial aquifer, and site run-off. Lake Miller is the primary area of concern for potential ecological damage from the site and is a Florida Class III water body designated for wildlife and recreational purposes.

5.2 Lake Investigation Summary

During the RI, sediment sampling episodes were first conducted in April and August 1990. A total of 18 sediment samples were collected within, upstream, and downstream of Lake Miller and in on-site drainage ditches and basins. At the request of EPA and FDER, an additional 19 sediment samples were taken in November 1991 in Lake Miller and upstream in North Lake Talmadge to further define the extent of metals concentrations in the sediment of these water bodies.

The RI concluded that the highest levels of site-related compounds (TCE, PCE, and chromium) were found in the sediment along the eastern bank of Lake Miller. This area received aqueous wastes containing spent solvents from floor drains in buildings B and F, which led into former drain fields along the bank of Lake Miller. In addition, this contamination may have resulted from the discharge of groundwater from the surficial aquifer into Lake Miller. Chromium concentrations in sediment

ranged as high as 922 mg/kg. Based on sampling results for surface soil, the chromium detected in Lake Miller sediment was assumed to be the less toxic and less mobile trivalent chromium. The chlorinated solvents trichloroethene (TCE) and tetrachoroethene (PCE) were detected at maximum concentrations of 8.8 mg/kg and 30 mg/kg, respectively.

Based on the results of the RI, EPA directed Sherwood to conduct further study on the potential ecological effects of chromium contamination in Lake Miller sediment. The results were published in a December 1993 draft report entitled "Evaluation of Effects of Chromium in Sediments, Lake Miller, FL." Analytical results from 10 sediment sampling locations in and around Lake Miller and 2 from an upstream reference lake (South Lake Talmadge) generally confirmed the RI findings. Chromium was detected in 9 of 13 samples, up to a maximum concentration of 1150 mg/kg in Lake Miller. An additional 13 sediment samples were collected from Lake Miller to evaluate the oxidation state of chromium in the sediment. The results confirmed that hexavalent chromium was not present in the sediment. In addition, toxicity tests of a small crustacean (*Hyalella azteca*) were unsuccessful.

After extensive discussions concerning the need for and scope of additional sediment studies, EPA and Sherwood conducted independent investigations in June and July of 1994. In June 1994, EPA's ESAT Biological Assessment Team collected 13 sediment samples (12 stations, plus a duplicate at Station 7) from Lake Miller and two upstream background reference lakes, South Lake Talmadge and Blue Lake. The approximate sampling locations are shown in Figure 2. Sediment samples were analyzed for Target Analyte List (TAL) metals and Target Compound List (TCL) organic compounds. Analyses for purgeable organics, extractable organics, and pesticides revealed no organic contamination with the exception of a spike of DCE (2.4 mg/kg) and TCE (0.24 mg/kg) in one location (Station 1) at the eastern end of the lake near the Sherwood facility. For metals, chromium levels were substantially lower than previous sampling events, with a maximum concentration of 60 mg/kg at Station 4 near the southeastern edge of the lake. Sampling results for metals are shown in Table 1.

In addition to the chemical analyses described above, 5 samples from Lake Miller and the two reference lake samples were subjected to various toxicity tests to assess sediment and sediment pore water toxicity. Toxicity tests of the *Hyalella azteca* were again unsuccessful due to the low survival rate of the control organisms. Whole sediment toxicity tests of water fleas (*Ceriodaphnia dubia*) revealed no toxicity related to any constituents found in the sediment. The Microtox test indicated sediment pore water toxicity in only one location, Station 1. This result is probably due to elevated levels of TCE and DCE, since the bacteria used in the Microtox test is known to be sensitive to TCE. The lettuce seed (*Lactuca sativa*) root elongation tests of a sediment pore water sample from Station 9 near the western end of the lake indicated some toxicity, probably due to a marginally toxic level of cadmium in the sediment. However, no toxicity related to chromium contamination was observed.

During June and July 1994, Sherwood's consultant, O'Brien & Gere Engineers, Inc.(O&G), also performed a number of tests to evaluate the biological impact of chromium in the sediment of Lake Miller. Among other things, the effort included a Lake Miller chromium stratification study and biota sampling in Lake Miller and the two reference lakes, South Lake Talmadge and Blue Lake. It should be noted that before the study was conducted, EPA and Sherwood did not agree on the scope of the

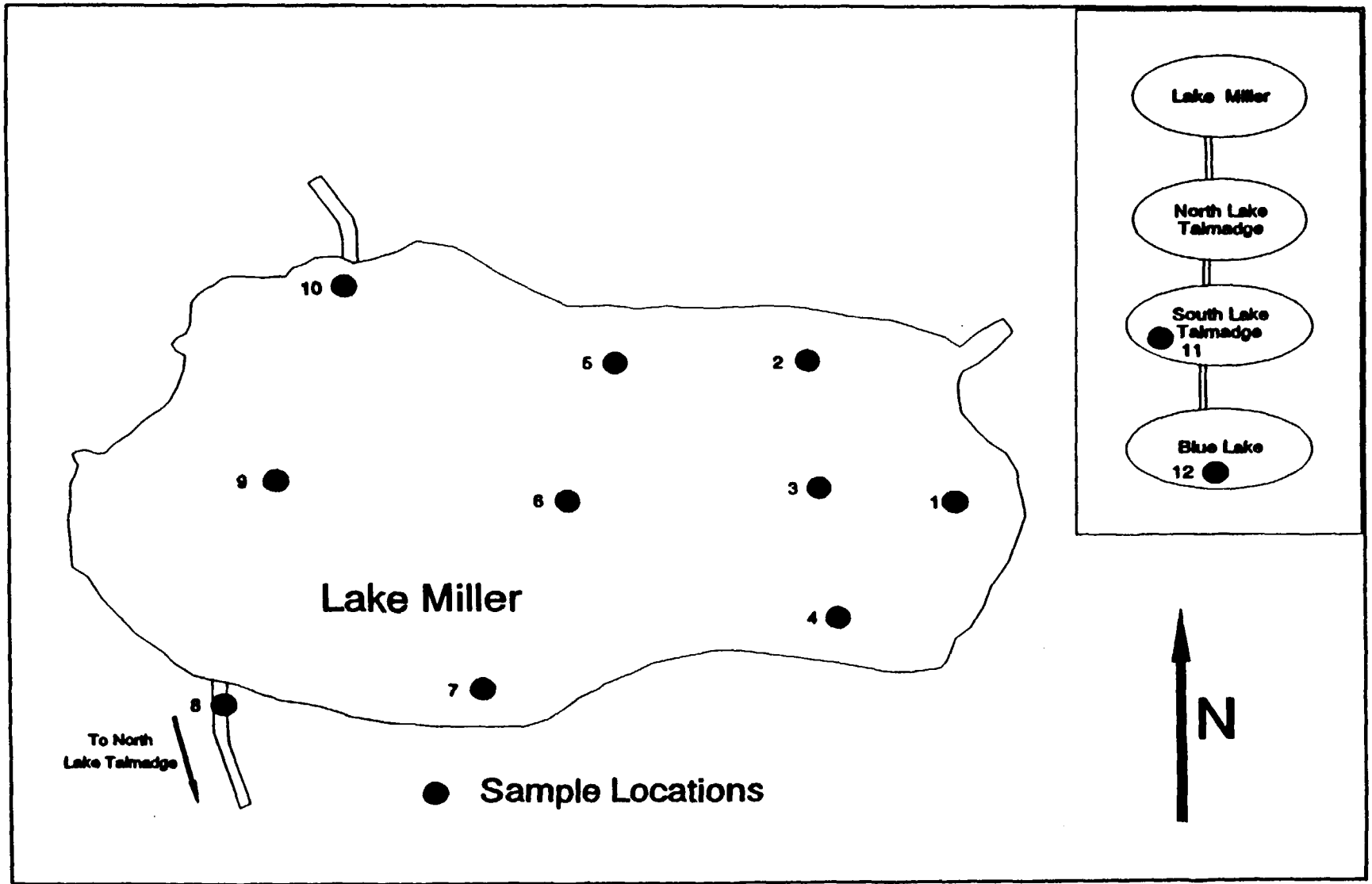


Figure 2. **A map showing the locations of the sampling stations on Lake Miller and the background lakes, Deland, Florida.**

Table 1. Levels of metals in sediment of Lake Miller and from background lakes in the vicinity of Sherwood Medical, Deland, Florida, June 1994.

Metals mg/kg	Sampling Stations												
	01*	02*	03	04*	05*	06	07	07 Duplicate	08	09*	10	11*	12*
Alumimnum	1200	300	3900	5900	570	2200	900	950	4800	5100	1500	450	1000
Antimony	0.84U	0.61U	1.3U	0.7U	0.6U	0.59U	0.7U	0.64U	0.55U	1.2U	0.9U	0.5U	0.5U
Arsenic	1.7U	1.2U	2.6U	3.0U	1.2U	1.2U	1.4U	2.0U	1.1U	5.0U	1.8U	1.0U	1.0U
Barium	7.7	2.5	18	11.0	3.5	4.1	3.6	2.8	8.9	19.0	7.2	3.7	8.5
Cadmium	0.84U	0.61U	1.3U	0.7U	0.6U	0.59	0.7U	0.64U	0.55U	1.2	0.9U	0.5U	0.5U
Calcium	510	240	1100	540	340	810	380	250	190	1100	27000	200	350
Chromium	3.5J	1.5U	7.6	60	1.5U	3.5	1.8U	1.6	8.1	8.1	2.9J	1.2U	1.7J
Cobalt	0.84U	0.61U	1.3U	0.7U	0.6U	0.59U	0.7U	0.64	0.55U	1.2U	0.9U	0.5U	0.5U
Copper	20U	5.0U	20.0U	20.0U	5.0U	5.0U	5.0U	5.0U	10.0U	20U	10.0U	4.0U	4.0U
Iron	430	230	1800	320	160	200	240	160	260	1900	530	70	120
Lead	8.7	1.3	3.6	30.0	2.8J	2.4	2.0	1.2	6.3	5.5	7.7	1.7	2.6
Magnesium	120	50	450	140	71	120	110	75	82	400	300	38.0	65
Manganese	2.0	1.4	9.1	2.0	1.2	1.6	1.5	1.0	1.0	8.0	6.7	1.4	4.3
Mercury	0.21U	0.15U	0.32U	0.17U	0.15U	0.15U	0.18U	0.16U	0.14U	0.31U	0.22U	0.12U	0.12U
Nickel	4.2U	3.1U	6.4U	3.5U	3.0U	2.9U	3.5U	3.2U	2.9	8.4	5.6	2.5U	2.5U
Potassium	120	70U	130U	180	70U	70	80U	70U	100	130U	170	50	50U
Sodium	220U	140U	260U	180U	110U	110U	130U	130U	110U	290U	300U	80U	80U
Vanadium	0.97	0.61U	1.5	5.7	0.6U	0.7	0.7U	0.64U	2.9	1.7	1.8	0.5U	0.79
Zinc	21.0	11.0	30.0	18	10.0	9.7	12.0	10.0	10.0	26.0	5.3	9.2	8.0

J - Estimated Value, U - Undetected, NA - Not Analyzed

* - Toxicity tests were performed on this sediment sample.

studies to be performed. In addition, EPA and FDEP provided comments to Sherwood citing serious disagreement with some of the analysis and conclusions drawn in the draft report prepared by O&G. However, much of the data generated for the study is valuable and is discussed below.

To evaluate the stratification of chromium in Lake Miller sediment, O&G collected three sediment core samples from each of three locations, producing a single composite sample per location for the following depth ranges: 0-5, 5-10, 10-20, 20-30, and >30 cm. Chromium concentrations generally decreased with increasing sediment depth, with the highest observed chromium concentration of 50.7 mg/kg occurring in the 0-5 cm horizon from Station 1, located in the southeast quadrant of the lake adjacent to the Sherwood site. This result was consistent with EPA's findings noted above.

O&G also performed extensive sampling and analysis of biota living in Lake Miller and the two reference lakes. The organisms collected for chromium analysis included two aquatic vegetative species, arrow arum and smartweed, and five fish species, bluegill, golden shiner, seminole killifish, carp, and largemouth bass. The analysis of smartweed root tissue suggested the potential for uptake of chromium. Chromium was detected in all 8 smartweed samples in areas of historically high chromium levels in sediment, with concentrations ranging from 1.6 to 3.6 mg/kg, whereas smartweed root tissue concentrations in lesser contaminated areas of Lake Miller and the reference lakes were low or non-detect. Detection of chromium in arrow arum root tissue samples was limited, indicating no statistically significant difference in concentrations between Lake Miller and the reference lakes.

Twenty-seven fish from Lake Miller and 25 fish from South Lake Talmadge and Blue Lake were analyzed for chromium. In Lake Miller, chromium concentrations in fish tissue ranged from non-detect to 2.3 mg/kg. Fish tissue samples from the reference lakes ranged from non-detect to 1.3 mg/kg. A statistical analysis of the data concluded that there was no significant difference between chromium concentrations in fish from Lake Miller and the reference lakes.

6.0 Summary of Site Risks

A Baseline Risk Assessment (BRA) was conducted during the RI to determine whether contamination at the Sherwood site, if not addressed by any remedial action, could pose a current or future threat to human health or the environment. This evaluation serves as a baseline for determining whether any cleanup actions are necessary. The BRA evaluated human health and ecological risks associated with contamination in soil, groundwater, surface water, and sediment. Based on the conclusions of the BRA, EPA determined that remedial actions were necessary to address the potential risks associated with soil and groundwater contamination at the site. These actions are documented in the final ROD for OU1. In addition, the following institutional and access controls were included in the OU1 ROD to address the potential risks to off-site residents and Sherwood workers associated with eating fish from or swimming in Lake Miller:

- posting of 10 signboards around Lake Miller with the inscription "NO FISHING OR SWIMMING IN LAKE MILLER"
- notification of the adjacent property owner on Lake Miller that the lake should not be used for fishing or swimming purposes

- maintenance of the current security fence around the site property and enforcement of the current Sherwood policy restricting employee access to Lake Miller
- deed restrictions to ensure the Sherwood property remains industrially zoned
- monitoring of the surficial and Floridan aquifers and Lake Miller.

The risks related to soil, groundwater, and surface water are being addressed by implementation of the OU1 remedy pursuant to the CD entered into by Sherwood and EPA. Therefore, the following risk summary focuses on the potential human health and ecological risks attributed to *sediment* contamination in Lake Miller. Although several sediment sampling investigations were conducted following the RI, the risk assessment relied upon data collected during the RI.

6.1 Contaminants of Concern

In identifying contaminants of concern, the risk assessment included all *organic* chemicals confirmed to be present in sediment samples from the site. However, since *inorganic* compounds such as metals occur naturally in the environment, only those inorganic compounds which exceeded background concentrations were selected as chemicals of concern. The contaminants of concern for sediment at the Sherwood site and their associated range of concentrations from the RI are shown in Table 2. Although all of the compounds presented in Table 2 were included in evaluating human health risks, EPA considered the following additional factors when determining whether a remedial action was necessary: the frequency of detection of the compound; the toxicity of the compound; and whether the compound has been linked to facility operations.

6.2 Exposure Assessment

In the exposure assessment, EPA considered ways in which people could come into contact with Lake Miller sediment under both current and future conditions. The BRA evaluated the risk to a swimmer as a potential future scenario using the same exposure assumptions applied to a resident swimmer in a backyard pool (see Table 3). The swimmer is assumed to be a child aged 10 to 18 years who would come into contact with surface water and sediment for 78 days per year (3 times per week for 6 months). The exposure routes evaluated included ingestion and dermal contact with Lake Miller surface water and sediment. These assumptions are conservative, since the following factors make swimming in Lake Miller fairly unlikely: access to the lake is limited by its location, partial ownership by Sherwood and only one other private owner, and the presence of thick vegetation up to the water's edge; alligators have been observed in the lake, which may deter prospective swimmers; and other area lakes are more attractive and accessible for swimming.

6.3 Toxicity Assessment

The toxicity assessment evaluated possible harmful effects of exposure to contaminants of concern and assigned toxicity values to each contaminant based on the scientific literature. Some of the compounds found at the site have the potential to cause cancer (carcinogenic). Other contaminants of concern may cause other problems not related to cancer.

Table 2

Sediment — Lake Miller
Chemicals of Concern
Data Summary

Chemical	Frequency of Detection	Range of Sample Quantitation Limits (mg/kg)	Range of Concentrations (mg/kg)	Mean Concentration (mg/kg)	Upper 95% Confidence Limit of the Mean (mg/kg)
Organics					
Acetone	6/6	NAV	0.13-9.5	2.5	5.2
Benzoic Acid	2/6	1.6	1.6-1.9J	1.6	1.7
Bis(2-ethylhexyl) phthalate	2/6	0.059-1.3	1.6J-11J	2.2	5.5
2-Butanone	3/6	0.020-0.19	0.047-0.17	0.072	0.12
Chloromethane	1/6	0.02-0.12	0.14J	0.043	0.081
4,4'-DDT	1/6	0.038-0.041	0.038J	0.035	0.041[b]
1,1-Dichloroethane	1/6	0.013-0.06	0.019J	0.019	0.032[b]
1,1-Dichloroethene	2/6	0.01-0.093	0.01J-0.02	0.020	0.032[b]
1,2-Dichloroethene (total)	4/6	0.06-0.093	0.078-0.46	0.20	0.34
Ethylbenzene	2/6	0.015-0.020	0.013J-0.041J	0.014	0.024
Methylene Chloride	5/6	0.015	0.021-0.22	0.092	0.16
4-Methylphenol	1/6	0.29-18.0	0.29J	1.7[b]	4.4[b]
Tetrachloroethene	3/6	0.01-0.093	8.3-30.0	8.6	17.4
Toluene	5/6	0.093	0.007J-0.11	0.049	0.082
Trichloroethene	4/6	0.06-0.093	0.002J-8.8	2.7	5.3
Vinyl Chloride	2/6	0.02-0.19	0.036-0.051	0.045	0.068[b]
Xylenes (total)	5/6	0.093	0.007J-0.0074	0.037	0.061[b]
Inorganics					
Aluminum	20/20	NAV	1,330-14,100	9,290	10,800
Arsenic	16/20	0.58-6.8	0.75-5.4	2.9	3.5
Cadmium	15/20	0.44-4.5	0.53-2.7	0.56	1.6
Calcium	19/20	2,390	500-39,870	13,100	16,300

Table 2

Sediment — Lake Miller
Chemicals of Concern
Data Summary
(continued)

Chemical	Frequency of Detection	Range of Sample Quantitation Limits (mg/kg)	Range of Concentrations (mg/kg)	Mean Concentration (mg/kg)	Upper 95% Confidence Limit of the Mean (mg/kg)
Chromium	20/20	NAV	4.9-922	237	332
Copper	16/20	1.7-22.5	10.2-132	44.0	57.1
Iron	20/20	NAV	222-9,870	6,070	7,210
Lead	20/20	NAV	2.7-228	82.3	102
Magnesium	19/20	2,390	85.8-1,400	1,000	1,170
Nickel	14/20	1.7-34.3	5.3-25.8	13.1	15.6
Potassium	17/20	60-2,390	144-917	516	620
Sodium	19/20	2,390	21.1-869	505	606
Vanadium	15/20	0.87-23.9	2.7-20.0	12.5	14.8
Zinc	20/20	NAV	2.2-300	143	177

J = Estimated value.
NAV = Sample quantitation limits or method detection limits were not available.

Table 3
Exposure Assumptions

Exposure Factor	Abbreviation	Value
General exposure factors		
Exposure Time	ET	2.6 hours/event
Exposure Frequency	EF	78 events/year
Exposure Duration	ED	9 years
Averaging Time	AT	3,285 days
Body Weight (child)	BW	50 kg
Surface water (ingestion)		
Ingestion Rate	IR	0.05 liters/hour
Surface water (dermal contact)		
Surface Area (entire body)	SA	14,900 cm^2/day
Sediment (ingestion)		
Ingestion rate (sediment)	IR	100 mg/day
Sediment (dermal contact)		
Surface Area (hands and feet)	SA	1,970 cm^2

Surface Water Ingestion:

$$Dose = \frac{CW \times IR \times ET \times EF \times ED}{BW \times AT}$$

where CW = Surface Water Concentration

Sediment Ingestion:

$$Dose = \frac{CSD \times IR \times CF \times EF \times ED}{BW \times AT}$$

where CSD = Sediment Concentration

Surface Water Dermal Contact:

$$Dose = \frac{CW \times CF \times SA \times PC \times ET \times EF \times ED}{BW \times AT}$$

where CF = Conversion factor (10^{-3} L/cm^3)
PC = Dermal permeability constant

Sediment Dermal Contact:

$$Dose = \frac{CSD \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$$

where CF = Conversion factor (10^{-6} kg/mg)
AF = Sediment/skin adherence factor
ABS = Absorption factor

Slope factors (SFs) have been developed by EPA's Carcinogenic Assessment Group for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenic contaminants of concern. SFs, which are expressed in units of $(mg/kg\text{-}day)^{-1}$, are multiplied by the estimated intake of a potential carcinogen, in mg/kg-day, to provide an upper-bound estimate of the excess lifetime cancer risk associated with exposure at that intake level. The term "upper bound" reflects the conservative estimate of the risks calculated from the SF. Use of this approach makes underestimation of the actual cancer risk highly unlikely.

Reference doses (RFD's) have been developed by EPA for indicating the potential for adverse health effects from exposure to contaminant(s) of concern exhibiting noncarcinogenic effects. RfDs, which are expressed in units of mg/kg-day, are estimates of lifetime daily exposure levels for humans, including sensitive individuals. Estimated intakes of contaminants of concern ingested from contaminated sediment can be compared to the RfD.

Both RfDs and cancer SFs are derived from the results of human epidemiological studies or chronic animal bioassays to which animal-to-human extrapolation and uncertainty factors have been applied (to account for the use of animal data to predict effects on humans). Cancer SFs and chronic RfDs for contaminants of concern are shown in Table 4. It should be noted that dermal SFs and RfDs must be derived from oral route values for each applicable chemical, in accordance with EPA guidance.

6.4 Risk Characterization

The risk characterization combines the other components of the evaluation to estimate the risk from exposure to site contamination. For cancer-causing compounds, risk is a probability expressed in scientific notation. For example, an excess lifetime cancer risk of $1x10^{-6}$ means that an individual has an additional 1 in 1,000,000 chance of developing cancer as a result of site-related exposure over an estimated 70 year lifetime. EPA has established a target risk range for Superfund cleanup actions of between $1x10^{-4}$ (1 in 10,000) and $1x10^{-6}$. Cancer risk is calculated from the following equation:

$$Risk = CDI \times SF$$

where:

risk = a unitless probability (e.g., $2x10^{-5}$) of an individual developing cancer;
CDI = chronic daily intake averaged over 70 years (mg/kg-day)
SF = slope factor, expressed as $(mg/kg\text{-}day)^{-1}$

The overall excess cancer risk to a swimmer in Lake Miller is $1.21x10^{-5}$, or just over 1 in 100,000. Although this risk level falls within EPA's target risk range, it exceeds the $1x10^{-6}$ point of departure cited in the National Contingency Plan (NCP) as a basis for Superfund action. It should be noted that sediment contamination contributes only 6 percent of the risk to the swimmer (refer to Table 5). The remainder of the cancer risk relates primarily to the presence of vinyl chloride, arsenic, DCE, TCE, and PCE, in surface water. The presence of these compounds in Lake Miller surface water is thought to result from the historical discharge of contaminated groundwater from the surficial aquifer

Table 4
Critical Toxicity Values

Compound	Oral SF $(mg/kg\text{-}day)^{-1}$	Reference	Dermal SF $(mg/kg\text{-}day)^{-1}$	Oral RfD (mg/kg-day)	Reference	Dermal RfD (mg/kg-day)
Acetone	NA	--	NA	1.0E-01	IRIS, 1992	9.0E-02
Benzoic Acid	NA	--	NA	4.0E+00	IRIS, 1992	2.0E+00
Bis(2-ethylhexyl) phthalate	1.4E-02	IRIS, 1992	2.8E-02	2.0E-02	IRIS, 1992	1.0E-02
2-Butanone	NA	--	NA	5.0E-02	HEAST	4.5E-02
Chloromethane	NA	--	NA	2.3E-01	Derived	2.1E-01
4,4'-DDT	3.4E-01	IRIS, 1992	6.8E-01	5.0E-04	IRIS, 1992	2.5E-04
1,1-Dichloroethane	NTV	--	NTV	1.0E-01	IRIS, 1992	9.0E-02
1,1-Dichloroethene	6.0E-01	IRIS, 1992	6.7E-01	9.0E-03	IRIS, 1992	8.1E-03
Ethylbenzene	NA	--	NA	1.0E-01	IRIS, 1992	9.0E-02
Methylene Chloride	7.5E-03	IRIS, 1992	8.3E-03	6.0E-02	IRIS, 1992	5.4E-02
4-Methylphenol	NTV	--	NTV	5.0E-02	IRIS, 1992	2.5E-02
Tetrachloroethene	5.1E-02	HEAST	5.7E-02	1.0E-02	IRIS, 1992	9.0E-03
Toluene	NA	--	NA	2.0E-01	IRIS, 1992	1.8E-01
Trichloroethene	1.1E-02	HEAST	1.2E-02	7.4E-03	HEAST	6.7E-03
Vinyl Chloride	1.9E+00	HEAST	2.1E+00	1.3E-03	Derived	1.2E-03
Xylene	NA	--	NA	2.0E+00	IRIS, 1992	1.8E+00
Aluminum	NA	--	NA	1.9E-02	Derived	9.5E-04
Arsenic	1.8E+00	IRIS, 1992	3.6E+01	3.0E-04	IRIS, 1992	1.5E-05

Table 4
Critical Toxicity Values

Compound	Oral SF $(mg/kg\text{-}day)^{-1}$	Reference	Dermal SF $(mg/kg\text{-}day)^{-1}$	Oral RfD (mg/kg-day)	Reference	Dermal RfD (mg/kg-day)
Cadmium	NA	--	NA	5.0E-04 (water) 1.0E-03 (sediment)	IRIS, 1992	5.0E-05
Calcium	NA	--	NA	1.1E+01	Derived	5.5E-01
Chromium (III)	NA	--	NA	1.0E+00	HEAST	5.0E-02
Copper	NA	--	NA	3.7E-02	HEAST	1.9E-03
Iron	NA	--	NA	2.6E-01	Derived	1.3E-02
Lead	NTV	--	NTV	9.4E-04	Derived	7.0E-06
Magnesium	NA	--	NA	5.7E+00	Derived	2.9E-01
Mercury	NA	--	NA	3.0E-04	HEAST	NC
Nickel	NA	--	NA	2.0E-02	IRIS, 1992	1.0E-03
Potassium	NA	--	NA	8.0E+00	Derived	4.0E-01
Sodium	NA	--	NA	4.7E+01	Derived	2.4E+00
Vanadium	NA	--	NA	7.0E-03	HEAST	3.5E-04
Zinc	NA	--	NA	2.0E-01	HEAST	1.0E-02

NA Not applicable. Chemical is not categorized as a carcinogen through this exposure route.
NC Chemical is not of concern through this exposure route.
NTV No toxicity value was available.

IRIS, 1992: Integrated Risk Information System computer database, 1992.
HEAST: Health Effects Assessment Summary Tables, EPA, 1991.

Table 5

CARCINOGENIC RISK - SWIMMER IN LAKE MILLER

CHEMICAL	ROUTE OF EXPOSURE: DERMAL CONTACT WITH SURFACE WATER	INGESTION OF SURFACE WATER	DERMAL CONTACT WITH SEDIMENT	INGESTION OF SEDIMENT	TOTAL RISK: ALL ROUTES	PERCENT OF RISK
ORGANICS						
BIS(2-ETHYLHEXYL)PHTHALATE	4.24E-07	7.30E-09	1.21E-08	4.22E-09	4.47E-07	3.7121
CHLOROMETHANE	NC	NC	8.92E-11	5.80E-11	1.47E-10	0.0012
4,4'-DDT	NC	NC	4.06E-10	7.10E-10	1.12E-09	0.0093
1,1-DICHLORETHANE	NC	NC	NTV	NTV	NTV	NTV
1,1-DICHLOROETHENE	9.39E-07	1.69E-07	1.05E-09	6.59E-10	1.11E-06	9.2137
METHYLENE CHLORIDE	3.60E-09	1.50E-09	1.03E-10	6.52E-11	5.26E-09	0.0436
4-METHYLPHENOL	NC	NC	NTV	NTV	NTV	NTV
TETRACHLOROETHENE	2.55E-07	1.40E-08	7.80E-08	4.89E-08	3.96E-07	3.2847
TRICHLOROETHENE	6.39E-07	5.58E-08	5.03E-09	3.23E-09	7.04E-07	5.8369
VINYL CHLORIDE	5.97E-06	2.26E-06	8.41E-09	5.32E-09	8.24E-06	68.3301
INORGANICS						
ARSENIC	NC	6.04E-07	2.00E-07	3.49E-07	1.15E-06	9.5683
LEAD	NC	NTV	NTV	NTV	NTV	NTV
TOTAL RISK						
PATHWAY RISK	8.23E-06	3.11E-06	3.05E-07	4.12E-07	1.21E-05	
PERCENT TOTAL RISK	68.2531	25.7966	2.5281	3.4221		

NC = Chemical is not of concern through this exposure route.
NTV = No toxicity value was available.

into Lake Miller prior to implementation of the interim groundwater remedy. However, EPA believes that the groundwater pump and treat system and the swimming and fishing restrictions and other institutional controls specified in the OU1 ROD have adequately addressed this potential risk.

For compounds which cause toxic effects other than cancer, EPA compares the concentration of a contaminant found at the site with a reference dose representing the maximum amount of a chemical a person could be exposed to without experiencing harmful effects. The ratio of the actual concentration to the reference dose for a particular compound is the hazard quotient (HQ). The HQ is calculated as follows:

$$HQ = CDI/RfD$$

where:

CDI = Chronic Daily Intake
RfD = reference dose; and

CDI and RfD are expressed in the same units and represent the same exposure period (i.e., chronic, subchronic, or short-term).

The sum of the hazard quotients of all the contaminants of concern for each contaminated media (i.e. sediment and surface water) is known as the hazard index (HI). EPA considers an HI of 1.0 to be the maximum acceptable hazard. For the swimmer scenario, the HI was 0.7, which is below EPA's threshold for non-cancer risks (see Table 6).

6.5 Ecological Risk Assessment

As part of the BRA, an Ecological Risk Assessment (ERA) was conducted to evaluate the potential ecological risks posed by sediment and surface water contamination in Lake Miller. Like the human health evaluation, the ecological assessment involves selecting chemicals of concern, identifying ecological receptors and pathways, estimating exposure point concentrations, identifying toxicity data, and characterizing ecological risk.

The ERA identified six chemicals in surface water which exceeded critical toxicity values: aluminum, cadmium, copper, lead, mercury, and zinc. However, none of these compounds were determined to relate to Sherwood site operations, and copper, mercury, and nickel were detected in only 1 of 14 surface water samples.

In Lake Miller sediment, four compounds exceeded biological effect levels: 4,4-DDT, chromium, lead, and zinc. Of these compounds, 4,4-DDT was detected in only one of six sediment samples, and only chromium is known to be site-related. The most recent sediment sampling data, however, indicate that chromium levels in Lake Miller sediment fall below the National Oceanic and Atmospheric Administration's (NOAA's) Effects Range-Low (ER-L) screening value of 81 mg/kg.

Table 6

HAZARD INDEX - SWIMMER IN LAKE MILLER

CHEMICAL	ROUTE OF EXPOSURE: DERMAL CONTACT WITH SURFACE WATER	INGESTION OF SURFACE WATER	DERMAL CONTACT WITH SEDIMENT	INGESTION OF SEDIMENT	HAZARD INDEX: ALL ROUTES	PERCENT OF INDEX
ORGANICS						
ACETONE	8.05E-06	4.44E-05	3.51E-05	2.21E-05	1.10E-04	0.0160
BENZOIC ACID	NC	NC	5.30E-07	1.85E-07	7.15E-07	0.0001
BIS(2-ETHYLHEXYL)PHTHALATE	1.18E-02	2.03E-04	3.35E-04	1.17E-04	1.24E-02	1.8076
2-BUTANONE	NC	NC	1.60E-06	1.01E-06	2.61E-06	0.0004
CHLOROMETHANE	NC	NC	2.36E-07	1.51E-07	3.87E-07	0.0001
4,4'-DDT	NC	NC	1.86E-05	3.25E-05	5.10E-05	0.0074
1,1-DICHLORETHANE	NC	NC	1.29E-07	8.12E-08	2.10E-07	0.0000
1,1-DICHLOROETHENE	1.35E-03	2.44E-04	1.51E-06	9.50E-07	1.59E-03	0.2317
1,2-DICHLOROETHENE(TOTAL)	4.85E-02	6.22E-03	2.31E-05	1.45E-05	5.47E-02	7.9594
ETHYLBENZENE	NC	NC	1.63E-07	1.03E-07	2.66E-07	0.0000
METHYLENE CHLORIDE	6.24E-05	2.58E-05	1.79E-06	1.13E-06	9.12E-05	0.0133
4-METHYLPHENOL	NC	NC	7.08E-06	2.48E-06	9.56E-06	0.0014
TETRACHLOROETHENE	3.87E-03	2.14E-04	1.18E-03	7.45E-04	6.01E-03	0.8738
TOLUENE	1.30E-04	7.75E-06	2.76E-07	1.74E-07	1.39E-04	0.0201
TRICHLOROETHENE	6.19E-02	5.33E-03	4.87E-04	3.09E-04	6.80E-02	9.8880
VINYL CHLORIDE	1.84E-02	7.11E-03	2.59E-05	1.68E-05	2.56E-02	3.7175
XYLENES(TOTAL)	5.94E-06	2.78E-07	2.51E-09	1.58E-09	6.22E-06	0.0009
INORGANICS						
ALUMINUM	NC	1.15E-02	1.39E-01	2.43E-01	3.93E-01	57.2067
ARSENIC	NC	8.70E-03	2.87E-03	5.03E-03	1.66E-02	2.4158
BARIUM	NC	5.79E-04	NC	NC	5.79E-04	0.0843
CADMIUM	NC	9.57E-04	3.82E-04	6.70E-04	2.01E-03	0.2922
CALCIUM	NC	NC	3.62E-04	6.34E-04	9.97E-04	0.1450
CHROMIUM	NC	2.28E-05	8.11E-05	1.42E-04	2.46E-04	0.0357
COPPER	NC	4.44E-04	3.67E-04	6.60E-04	1.47E-03	0.2138
IRON	NC	1.53E-03	6.77E-03	1.18E-02	2.01E-02	2.9305
LEAD	NC	4.86E-03	2.66E-02	4.65E-02	7.80E-02	11.3380
MAGNESIUM	NC	NC	4.91E-05	8.74E-05	1.36E-04	0.0198
MERCURY	NC	2.52E-04	NC	NC	2.52E-04	0.0366
NICKEL	NC	3.63E-04	1.91E-04	3.34E-04	8.88E-04	0.1291
POTASSIUM	NC	NC	1.89E-05	3.31E-05	5.20E-05	0.0076
SODIUM	NC	NC	3.08E-06	5.51E-06	8.59E-06	0.0012
VANADIUM	NC	1.97E-03	5.18E-04	9.06E-04	3.39E-03	0.4932
ZINC	NC	1.80E-04	2.16E-04	3.79E-04	7.75E-04	0.1127
HAZARD INDEX						
PATHWAY INDEX	1.46E-01	5.08E-02	1.79E-01	3.12E-01	6.88E-01	
PERCENT OF INDEX	21.2244	7.3857	26.0847	45.3052		

NC = Chemical is not of concern through this exposure route.
0. = Chemical contributes less than 0.0001 percent of index.

In order to determine if any threatened or endangered species could be impacted by the site, the Florida Natural Resources Survey was consulted. Three threatened species were identified within a 1-mile radius of the Sherwood site: the Florida Scrub Jay, the Florida Pine Snake, and the Bald Eagle. Because of the dense vegetation that borders most of Lake Miller, a fish-eating bird (avian piscivore) was selected to evaluate potential risks to land-based (terrestrial) animals. The *osprey* was selected instead of the bald eagle because ospreys eat fish exclusively, whereas bald eagles usually eat fish from lakes larger than Lake Miller as well as other terrestrial animals.

Potential risks to the osprey due to the ingestion of fish from Lake Miller exceeded EPA's risk criteria, with a cumulative HI of 1.39. Bis(2-ethylhexyl)phthalate accounted for 55% of the HI and was detected at trace levels in all of the surface water samples from Lake Miller. However, this compound, which is a widely used plasticizer and common laboratory contaminant, was also detected in the associated laboratory method blank, suggesting that its detection was likely to be related to laboratory contamination. Mercury accounted for 24% of the HI, but was detected in only 1 of 14 surface water samples in Lake Miller. Neither of these compounds has been linked to site operations.

In summary, actual or threatened releases of hazardous substances from the Sherwood site have been addressed by previous response actions. Therefore, no further action is needed to ensure protection of human health or the environment.

Because historical sampling results have indicated the presence of elevated levels of chromium contamination in Lake Miller sediment and volatile organic contamination in Lake Miller surface water, routine sediment and surface water sampling shall be conducted to provide the data necessary for evaluating the protectiveness of this remedy in the 5-year review. The specific details of these additional sampling requirements, including contaminants of concern and sampling locations, shall be incorporated into revisions of the Operation and Maintenance Plan for the site.

7.0 Explanation of Significant Changes

The Proposed Plan for OU3 at the Sherwood site was released for public comment on June 19, 1997. The Plan indicated that EPA was recommending no further action to address sediment contamination in Lake Miller, indicating that response actions outlined in previous RODs had adequately addressed potential risks posed by the site. More specifically, the OU1 ROD called for a ban on fishing in Lake Miller based on potentially unacceptable risks documented in the BRA associated with ingestion of fish caught from Lake Miller.

During the public meeting, residents advised that fishing in Lake Miller has occurred historically and continues to occur in the present. Because the risk estimates in the BRA were extrapolated by applying bioconcentration factors for fish to surface water contaminant concentrations, EPA has determined that sampling of fish from Lake Miller is necessary to provide a more direct evaluation of the fish consumption pathway. In addition, comments received during the public comment period raised concern about the possibility of fish from Lake Miller swimming through canals to adjoining lakes. Therefore, fish tissue samples from Lake Miller and any adjoining lakes which can reasonably be assumed to be reached by fish navigating through the canals shall be collected and analyzed for

contaminants of concern identified in the BRA. The results of these analyses will allow EPA to determine whether the fishing ban should be lifted or additional actions should be taken to ensure the protection of human health or the environment.

8.0 Construction Completion Certification

The construction of the surficial aquifer pump and treat system pursuant to the OU2 ROD is documented in the IRM-2 Remedial Action Report dated January 1993. Construction activities consisted of the installation of 9 surficial aquifer extraction wells complete with submersible pumps and the following additional components:

- air stripper
- chlorination system
- underground extraction piping
- discharge pipe to Lake Miller for treated water

Representatives of EPA, FDEP, Sherwood, and Weston conducted a final inspection at the site on July 29, 1992, at which time no outstanding construction items were identified. EPA accepted the IRM-2 Remedial Action Report on February 24, 1993, certifying that construction was complete and the surficial aquifer pump and treat system was operational and functional.

The OU1 ROD required continued operation of the surficial aquifer pump and treat system, extraction and treatment of groundwater drawn from an existing Floridan aquifer supply well, and implementation of institutional controls. However, no additional physical construction activities were necessary to implement the requirements of the OU1 ROD. Therefore, since no physical construction activities are required by this OU3 ROD, the site now qualifies for inclusion on the Construction Completion List. Because contamination remains at the site, EPA will conduct a review every five years in accordance with Section 121 of CERCLA to ensure that all remedies for the site continue to provide adequate protection of human health and the environment.

Sherwood Medical Company
DeLand, Volusia County, Florida

3. RESPONSIVENESS SUMMARY

In accordance with Sections 113 and 117 of CERCLA, as amended, EPA has conducted community involvement activities at the Sherwood site to solicit community input and ensure that the public remains informed about site activities. EPA's Proposed Plan Fact Sheet for Operable Unit 3 (OU3) was mailed to the public on June 19, 1997, and a copy of the Administrative Record for OU3 was made available in the information repository at the DeLand Public Library. Public notices were published in *The Volusian* on June 21, 1997 and the *Daytona News-Journal* on July 6, 1997 advising the public of the availability of the Administrative Record and the date of the upcoming public meeting. EPA held a public meeting on July 8, 1997 in the Stetson Room on the Stetson University campus to answer questions and receive comments on the Agency's preferred alternative for addressing Lake Miller sediment contamination. Comments received during the public meeting were recorded in an official transcript of the meeting, a copy of which is included in the Administrative Record. In addition, a public comment period was held from June 23, 1997 to July 23, 1997.

This Responsiveness Summary provides information about the views of the community and potentially responsible parties regarding EPA's proposed action, documents how the Agency has considered public comments during the decision-making process, and provides answers to major comments received during the comment period. It consists of the following sections:

1.0 Overview: This section discusses the recommended action for the site and the public reaction to this alternative.

2.0 Background on Community Involvement: This section provides a brief history of community interest in the site and identifies key public issues.

3.0 Summary of Comments Received and EPA's Responses: This section provides EPA's responses to oral and written comments submitted during the pubic comment period.

4.0 RD/RA Concerns: This section discusses community concerns raised during the comment period regarding ongoing remedial action activities at the site.

1.0 Overview

EPA's Proposed Plan for Operable Unit 3 recommended *no further action* to address sediment contamination in Lake Miller at the Sherwood site. The Plan cited the Baseline Risk Assessment (BRA) for the site as the basis for concluding that human health risks posed by sediment contamination in the lake fall within EPA's acceptable risk range for both carcinogenic and non-carcinogenic contaminants. The Plan further stated that previous institutional controls required by the Record of Decision (ROD) for Operable Unit 1, namely a prohibition on fishing in Lake Miller,

provided public health protection against the potential risks associated with consumption of fish caught in Lake Miller.

During the public meeting, residents advised that fishing still occurs in Lake Miller and that no signs have been observed around the lake. In addition, concerns were voiced about the possibility of fish from Lake Miller swimming through canals to adjoining lakes. Therefore, in the ROD, EPA will require the collection and analysis of fish tissue samples from Lake Miller and adjoining lakes. The results of these analyses will allow EPA to determine whether the current fishing ban on Lake Miller should be lifted or whether additional actions such as the extension of the ban to other lakes should be taken to ensure the protection of human health or the environment.

Very few comments directly related to EPA's proposed *no further action* recommendation for Lake Miller were received either in the public meeting or during the public comment period. However, a DeLand city official commented that though he was comfortable with EPA's proposal, if the volume of impacted material were small, EPA should consider removing the contaminated sediment. In addition, an editorial in the July 12, 1997 edition of *The Volusian*, though generally positive about EPA and Sherwood cleanup efforts at the site, expressed regret that "the federal government won't go the extra mile and finish the cleanup it began" with respect to Lake Miller.

Finally, EPA has received letters from American Home Products Corporation (AHPC), parent company of Sherwood Davis & Geck (the responsible party for the site), expressing strong support for no further action to address Lake Miller sediment. In addition, EPA provided an opportunity for AHPC to comment on the proposed fish tissue sampling since it was not included in the Proposed Plan. AHPC raised no objections to the additional sampling requirements.

2.0 Background on Community Involvement

Despite Sherwood Medical's presence in the community since the early 1960's, community concern about the Sherwood site has historically been low. Although a few residents recall being concerned when the site was first proposed for inclusion on the National Priorities List in 1982, many residents were not aware that it was a Superfund site until publication of an article in the *DeLand Sun News* in September 1986. This article raised the possibility of a link between physical symptoms experienced by residents in the area who rely on private well water and potentially contaminated groundwater emanating from the Sherwood site. Between September and December of 1986, several citizens filed complaints with local and state health officials, city officials, and their U.S. Representative concerning potential contamination of their drinking water drawn from private wells by the Sherwood site.

In developing its Community Relations Plan for the site, EPA conducted interviews of residents and local officials in the DeLand and West Volusia County area in November 1986. EPA's Community Relations Plan was finalized in May 1988. EPA distributed its first fact sheet to the public in December 1989, providing information on the Sherwood site history, the Remedial Investigation and Feasibility Study (RI/FS) process, and opportunities for public involvement. The fact sheet was

followed by a public meeting on January 9, 1990 to provide an opportunity for community members to ask questions on any aspect of the site or the upcoming RI.

Following issuance of EPA's Proposed Plan for Interim Action in January 1991, EPA hosted a second public meeting on January 31, 1991 at Stetson University to explain EPA's recommended action for addressing surficial aquifer contamination and to receive comments from the community on the proposed action. A 30-day comment period was also held to solicit public input. A Responsiveness Summary was prepared addressing questions and comments provided during the comment period. This document was included as part of the Interim Action ROD.

EPA conducted a third public meeting on July 30, 1992 to explain the proposed *final* remedy addressing groundwater, soil, and surface water contamination at the Sherwood site. Comments were received at the meeting and throughout the 30-day public comment period for this phase of the project.

Finally, following issuance of the Proposed Plan for OU3, EPA hosted a public meeting at Stetson University on July 8, 1997 to outline the *no further action* proposal for addressing Lake Miller sediment. A comment period was held from June 23, 1997 to July 23, 1997. This Responsiveness Summary provides EPA's responses to comments received during the meeting and comment period.

Based on EPA sign-in rosters, community participation at EPA public meetings has generally been light, with between 20 and 30 people typically in attendance. The key issue raised consistently by the community throughout the history of the site has been concern that groundwater contamination from the Sherwood site has already or may in the future impact their private drinking water wells. A host of other concerns stem from this issue, including potential health effects from drinking contaminated water, a desire for testing and treatment of their water, and property devaluation due to contamination.

3.0 Summary of Comments Received and EPA's Responses

1. An adjacent property owner advised that he and family and friends had caught and consumed fish from Lake Miller for many years. He has never been advised not to fish in the lake nor seen any "No Fishing or Swimming" signs posted around the lake. He asked if it is now safe to eat fish caught from the lake.

   EPA Response: Based on the results of the BRA, EPA recommends that residents *do not* eat fish caught from Lake Miller. Under the Amended Consent Decree between EPA and Sherwood effective on December 10, 1993, Sherwood is required to install 10 "No Fishing or Swimming" signs around the lake and notify the adjacent property owner concerning the restrictions. EPA will work with Sherwood and the adjacent property owner to identify appropriate locations for the signs.

2. A commenter advised that fishermen come into Lake Miller via canal from Blue Lake, Talmadge Lake, and North Talmadge Lake, and no sign has been posted along the canal.

Another commenter noted that since potentially contaminated fish could migrate through the canals to other lakes, EPA should consider whether fishing in these lakes should be restricted.

EPA Response: In response to these concerns, EPA believes that fish tissue samples of fish from Lake Miller and the adjoining lakes should be collected to better assess the risks associated with the fish consumption pathway. EPA is working with Sherwood and the Florida Department of Health to design an appropriate sampling plan for this evaluation. On the basis of these results, EPA can determine whether to extend the fishing ban to other lakes, leave the restriction on Lake Miller in place, or lift the ban altogether. However, in the meantime, signs will be posted at appropriate places around Lake Miller and along the canals leading into Lake Miller to advise fishermen of the restriction.

3. A commenter asked whether shallow wells in the area had been evaluated for potential contamination and whether there is a potential for downward movement of contaminants.

EPA Response: During the Remedial Investigation (RI), groundwater sampling was conducted in both the surficial (shallow) and Floridan aquifers. In addition, a number of private wells completed in the Floridan aquifer were sampled. Based on the results of these samples, EPA determined that a groundwater pump and treat system was needed for the surficial aquifer to prevent any further downward migration of contamination into the Floridan aquifer. This system was built and began operating in 1992 and continues to operate today. In addition, because of contamination found in the Floridan aquifer, EPA required Sherwood to continue operation of an industrial water supply well and treatment system for the Floridan aquifer. Sherwood conducts semi-annual groundwater sampling of monitoring wells in the Floridan and surficial aquifer and a few private water supply wells and reports the results to EPA. EPA reviews these semi-annual sampling reports to monitor progress toward cleanup of the aquifers. During the next year, EPA will conduct a formal review of the data collected over the last five years (known as the *five year review*) to ensure that the actions being implemented remain protective of human health and the environment.

4. A commenter asked if there were any potential effects to adjoining properties other than by contact with Lake Miller?

EPA Response: EPA believes that ongoing groundwater remediation activities are adequate to prevent any off-site migration of contamination from the site. In addition, once the institutional controls specified in the OU1 ROD are in place, public access to potentially contaminated areas (i.e. Lake Miller) will be restricted.

5. A commenter indicated that her late husband and her current husband's late wife both died of cancer. The commenter also indicated her husband has prostate cancer. All of these family members had consumed fish from Lake Miller, and the commenter was concerned that eating contaminated fish from Lake Miller may have contributed to these cancers.

EPA Response: EPA does not have the expertise to determine if there is a link between these cancers and the consumption of potentially contaminated fish from Lake Miller, so this health concern has been forwarded to the Florida Department of Health and the Agency for Toxic Substances and Disease Registry (ATSDR) for consideration. However, it should be noted that the only fish tissue sampling data available for Lake Miller and adjoining lakes is for chromium, which is not considered to be a carcinogen by EPA. This data suggests that the non-cancer risk associated with chromium levels in fish from Lake Miller are below EPA's threshold for concern. Since the BRA indicated a potentially unacceptable risk associated with eating fish from Lake Miller, EPA believes that fish tissue sampling should be conducted to provide the data needed to make a more representative assessment of the potential risks from this exposure pathway.

6. A commenter asserted that groundwater flows to the east of Sherwood toward his property, indicating that his well was determined to be contaminated in October 1986 with zinc chromate and alum. He advised that his well water is no longer useful for anything but the toilet. He also claimed that people were getting sick and pets were dying. The commenter also alleged that "in 1985 a 6" well was drilled at night to pour waste down," and efforts to do an onsite inspection at the time were thwarted.

EPA Response: The direction of groundwater flow in the Upper Floridan aquifer in the vicinity of the Sherwood site (where most private wells are completed) is heavily influenced by pumping of Sherwood's onsite industrial water supply well. Therefore, Upper Floridan groundwater generally flows toward the site from all directions. The Volusia County district of the Florida Department of Health & Rehabilitative Services collected groundwater samples from the private well in question in September 1996, and the results indicated no exceedences of EPA's National Primary Drinking Water Standards. This documentation has been added to the Administrative Record. However, the health concerns cited in the comment have been relayed to HRS and ATSDR for consideration. Throughout the history of EPA's involvement at the site, there is no indication of Sherwood denying access to inspect or investigate the facility. Extensive EPA investigations at the site have not revealed the presence of any disposal or injection wells at the site.

7. An official of the City of DeLand advised that Sherwood had been annexed into the city and was now being served by the city sewer system. Various supporting documents were submitted for inclusion in the Administrative Record. The commenter also asked what volume of sediment is contaminated, noting that if the amount is small, EPA should consider proceeding with removal of the contaminated sediment.

EPA Response: The estimated aerial extent of contaminated sediment is approximately 3.4 to 3.5 acres. The EPA cost estimate assumes that 1 foot of sediment must be removed, resulting in about 6,000 cubic yards of material at an estimated cost of about $480,000. The estimate prepared by Sherwood assumed a sediment removal depth of 2 feet, for an estimated volume of 11,000 cubic yards. Sherwood evaluated various dredging scenarios, resulting in widely divergent cost estimates ranging from $320,000 to $6.1 million, depending upon the

disposal options for contaminated sediment, the need for sediment stabilization, and the restoration actions necessary for the lake. Based upon the findings of the BRA and other actions already planned by EPA pursuant to earlier RODs, EPA determined that dredging of the lake was not warranted.

8. A commenter advised that she lives across the street from the Sherwood facility and has been diagnosed with bladder cancer. She indicated that she has lived in the same location for 21 years and that her well "went bad" in the 1980's. She currently buys bottled water. The commenter wondered whether the bladder cancer may be linked to groundwater contamination from the Sherwood site.

   EPA Response: EPA has forwarded this health concern to the Florida Department of Health for followup. EPA believes that the surficial aquifer treatment system and the Floridan aquifer water supply well on the Sherwood property are sufficient to prevent any further migration of groundwater contamination from the site. However, within the next year, EPA expects to conduct a review of the groundwater monitoring data collected over that last five years to determine whether any changes need to made to ensure protection of public health.

4.0 Remedial Design/Remedial Action Concerns

Since EPA is proposing no further action for addressing sediment contamination in Lake Miller at the Sherwood site, no additional design or construction activities are planned at this time. In response to concerns raised during the comment period, EPA met with Sherwood and the adjacent property owner to identify appropriate locations for the "NO FISHING OR SWIMMING" signs around Lake Miller. The signs are scheduled to be installed in the very near future.