DRAFT EXPANDED SITE INSPECTION REPORT

BORDEN CHEMICAL COMPANY/TENOROC MINE
AUBURNDALE, POLK COUNTY, FLORIDA

U.S. EPA ID NO. FLD980727432

Revision 0

Prepared for

U.S. ENVIRONMENTAL PROTECTION AGENCY
Region 4
Atlanta, Georgia 30303

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EPA Task Monitor	:	Kevin Misenheimer
Telephone No.	:	404-562-8922
Prepared by	:	Tetra Tech EM Inc.
START Project Manager	:	Franki J. Jewell
Telephone No.	:	(404) 522-2867

Prepared by	Reviewed by	Approved by
Franki J. Jewell	*Sandra Harrigan*	*R. Steve Pierce*
Franki J. Jewell	Sandra Harrigan	R. Steve Pierce
START Project Manager	START Technical Reviewer	START Leader

1.0 INTRODUCTION

The U.S. Environmental Protection Agency (EPA) tasked the Tetra Tech EM Inc. Superfund Technical Assessment and Response Team (START) to conduct an expanded site inspection (ESI) at the Borden Chemical Company/Tenoroc Mine site (the site), EPA ID No. FLD980727432, under Contract No. 68-W-0021, Technical Direction Document (TDD) No. 04-9904-0006. The ESI was completed under Contract No. 68-W-00-120, TDD No. 4T-01-10-A-013.

The primary objective of an ESI is to determine whether a site has the potential to be placed on the National Priorities List (NPL). The NPL identifies sites at which a release, or threatened release, of hazardous substances poses a serious enough risk to public health or the environment to warrant further investigation and possible remediation under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 and the Superfund Amendments and Reauthorization Act of 1986.

Information gathered during the ESI is used to generate a preliminary Hazard Ranking System (HRS) score. The HRS score is the primary criterion EPA uses to determine whether a facility should be placed on the NPL. ESIs are generally conducted at sites where additional environmental sampling or monitoring well installation is necessary to fulfill HRS documentation requirements. ESIs are also conducted to address issues not adequately resolved in previous investigations.

Specifically, the objectives of the ESI are as follows:

- Obtain and review relevant file material
- Collect samples to attribute hazardous substances to site operations
- Collect samples to establish representative background levels
- Evaluate target populations for the groundwater migration, surface water migration, soil exposure, and air migration pathways
- Collect any other missing HRS data
- Document current facility conditions
- Develop a site layout map

This report documents the results of the ESI conducted at the site during the week of February 10, 2000. Information reviewed for the ESI was gathered from EPA Region 4 CERCLA files and from the Florida Department of Environmental Protection (FDEP).

2.0 SITE BACKGROUND

This section describes the mine; its current and past operations, including waste disposal practices and regulatory history; previous investigations; and the potential source areas located at the site.

2.1 SITE DESCRIPTION

The Borden Chemical Company/Tenoroc Mine site is a 6,000-acre tract of partially reclaimed phosphate strip mines that the Borden Chemical Company (Borden) donated to the state of Florida in 1982 to create the Tenoroc Fish Management Area (TFMA) (Refs. 1; 2). The site is located between Lakeland and Auburndale, Florida, with the centrally located TFMA office at geographical coordinates 28°05'56" north latitude and 81°52'45" west longitude (Ref. 1). The site consists of approximately 1,000 acres of former phosphate mining pit lakes (phosphate pits) and 5,000 acres of reclaimed recreational areas for picnicking, hiking, horseback riding, shooting, fishing, and small game hunting (see Figures 1 and 2) (Refs. 2; 3; 4).

The topography of the area is generally flat, ranging from 115 feet above mean sea level (msl) to 140 feet above msl. TFMA is a state-designated fish management area and a unique recreational area (Refs. 1; 2). The areas surrounding the site are primarily rural residential, with another unrelated phosphate strip mine of similar size located upgradient and north of the site. Tri-City Landfill is located adjacent to the southeastern corner of the site. The City of Auburndale is located 1.5 miles southeast of the site, Lakeland is located 1.5 miles to the southwest, and Polk City is located 5 miles to the northeast (Ref. 1).

The climate in Polk County is subtropical, characterized by long, hot, humid summers and warm winters. The average annual temperature in Bartow, Florida, (the county seat) is 72.5° F; January is the coldest month, averaging 60.8° F, and August is the warmest, averaging 82.2 °F (Ref. 5, p. 140).

The primary cyclone overflow, or clay slime, is transferred to the primary slime settling area, or clay ponds (Ref. 12, pp. 21-3, 21-4). Sands settle out in the feed bins and compacts to 60 to 80 percent solids. The sand is further treated in the sizing and beneficiation plant. Secondary clays are transferred to a large thickener to recover water from the overflow for reuse. Underflow from the thickener is then pumped to the primary settling system (Ref. 12, p. 21-5).

Sizing and desliming the flotation plant feed is typically the most important point in the operation of the flotation plant. Sizing is used to remove materials that are too coarse to float and clay slimes that interfere in the flotation process (Ref. 12, p. 21-5). Feed for flotation is stored in feed bins, removed with centrifugal pumps, and pumped to feeder bins. Several feeder bins are used if several size ranges will be floated. In 1974, the most prevalent flotation method used in Florida was the Crago "double-float" process which first floats phosphates using earlier developed methods and then conditions the rougher concentrate with sulfuric acid. This cuts the fatty acid surface coating which is washed out with clean water. The washed rock is then subjected to flotation using cationic reagents to float silica. Prior to the development of the Crago method, phosphate was roughed and cleaned several times. The Crago method uses the following reagents: alkali (sodium hydroxide), tall oil (a mixture of rosin acids and fatty acids), No. 5 fuel oil, kerosine, amine, and sulfuric acid (Ref. 17, p. 21-6).

The phosphate product from the silica flotation circuit comes out as flotation tailings; it is then pumped to cyclones located over drain binds. The cyclone overflow is transferred to the water system and the apex product is transferred to drain bins. The bins product, after draining to about 14 to 20 percent water is transferred to the wet storage pile at the dry plant. The wet storage pile provides a storage area for thousands of tons of rock at different grades. A tunnel beneath the wet storage pile removes the drained phosphate flotation concentrate, or washer rock, for drying. Rotary or fluosolids dryers are then used for drying. In 1974, the typical Florida washing and beneficiation plants produced between 1 and 6 million tons per year of phosphate rock concentrate (ref. 17, p. 21-6).

Numerous environmental problems are associated with phosphate mines and their processing plants, including phosphogypsum generation and contamination of surface water and groundwater by fluorides, acids, heavy metals, and radionuclides (Ref. 13).

"ELEVATED" =

The concentration of a constituent is considered to be elevated if it is greater than or equal to three times the concentration detected in the background or control sample. In cases where a constituent is not detected in the background or control sample, any concentration equal to or greater than the SQL is considered to be elevated. The complete set of analytical data sheets is presented in Appendix A.

The following discussion of hazardous constituents detected at elevated levels in samples collected at the site includes only those hazardous constituents that can be associated with mining operations and that may pose a threat to human health or the environment.

4.1 SOURCE SAMPLE LOCATIONS AND ANALYTICAL RESULTS

START personnel collected a total of 17 surface soil samples, 4 subsurface soil samples, and 1 sediment sample from source areas during the ESI. Surface soil, subsurface soil, and sediment sampling locations were described in Tables 1 through 3, and are illustrated on Figure 3. The background surface and subsurface soil samples (BTBG-01-SS and BTBG-01-SB) were collected in an undisturbed location south of Tenoroc Mine Road and east of the railroad tracks paralleling Combie Road. Control surface and subsurface soil samples (BTBG-02-SS, BTBG-02-SB, BTBG-03-SS, and BTBG-03-SB) were collected from upgradient locations along the eastern border and the northeastern corner of The site, respectively (Refs 25; 26).

Elevated levels of radiochemical and inorganic constituents have been detected in soil samples collected from several former tailings areas, clay settling ponds, and the former processing operations area located on TFMA property (see Appendix A). Inorganic elements and radionuclides are concentrated through the beneficiation process that extracts the phosphate material. These materials are then released back into the environment in the tailings and clay pond sediments (Refs. 10, pp. 1, 3, 5; 27, pp. 13, 12-4, 12-7).

4.1.1 Abandoned Clay Settling Ponds

The four abandoned clay settling ponds (Source Nos. 1, 2, 3, and 4) total 1,169 acres and are illustrated on Figure 3 (Refs. 1; 23; 24). Nine surface soil samples, four subsurface soil samples, and one sediment sample were collected from the clay settling pond sources (Refs. 25; 26). The analytical results from the clay pond samples are summarized in Tables 4 through 12 at the end of Section 4. The complete analytical results are located in Appendix A.

Several inorganic constituents including arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, iron, lead, magnesium, manganese, nickel, selenium, vanadium, and zinc were detected at elevated levels in surface soil samples (BT1-01-SS, BT1-02-SS, and BT1-03-SS) collected from the Source No. 1 clay pond. Acetone and benzo(ghi)perylene were the only organic constituents detected at elevated levels in surface soil samples collected from the Source No. 1 clay pond; however, these constituents are not typically associated with phosphate mining operations, and therefore, may not be site-attributeable. Subsurface soil samples were not collected from Source No. 1 clay pond (see Tables 4 and 5).

Barium, beryllium, cadmium, chromium, iron, magnesium, nickel, and vanadium were the (in) organic constituents detected at elevated levels in surface soil sample BT6-03-SS and sediment sample BT6-02-SD collected from the Source No. 2 clay pond. Arsenic, cobalt, copper, lead, manganese, and zinc were also detected in the sediment sample collected from the Source No. 2 clay pond. Bis(2-ethylhexyl)phthalate, detected in sample BT6-03-SS, was the only organic constituent detected at an elevated level in samples collected from the Source No. 2 clay pond. However, bis(2-ethylhexyl) phthalate is not typically associated with phosphate mining operations, and therefore, may not be site-attributable. No subsurface soil samples were collected from the Source No. 2 clay pond (see Tables 4 and 5).

Inorganic constituents detected at elevated levels in surface soil samples (BT3-01-SS and BT3-03-SS) and in subsurface soil samples (BT3-01-SB and BT3-03-SB) collected from the Source No. 3 clay pond include arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, iron, magnesium, manganese, nickel, vanadium, and zinc. Selenium was also detected at an elevated level in subsurface soil sample BT3-01-SB. No organic constituents were detected at elevated levels in surface soil samples collected from the Source No. 3 clay pond. Although bis(2-ethylhexyl)phthalate was detected at an elevated level in a subsurface soil sample (BT3-03-SB) collected from the Source No. 3 clay pond, it is not a constituent typically associated with phosphate mining processes and may not be site-attributable (See Tables 4, 5, and 7).

Several inorganic constituents were detected at elevated levels in both surface soil (BT4-01-SS, BT4-02-SS, and BT3-02-SS) and subsurface soil (BT4-01-SB and BT3-02-SB) samples collected from the Source No. 4 clay pond, including: arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, iron, magnesium, manganese, nickel, selenium, vanadium, and zinc. In addition, lead was detected at elevated levels in surface soil samples and silver was detected at an elevated level in a subsurface soil sample collected from the Source No. 4 clay pond. Benzaldehyde was the only organic constituent detected in soil samples (surface soil sample BT4-02-SS) collected from the Source No. 4 clay pond; however, benzaldehyde is not a constituent typically associated with phosphate mining processes and may not be site-attributable (see Tables 4, 5, and 7).

Because increased radiochemical activity is associated with phosphate mining, a select number of samples were analyzed for radiochemical contaminants. Radiochemical results are summarized in Tables 6, 9, and 12. The complete analytical report is located in Appendix A. Radiochemical analysis is a measurement of activity that differs from routine chemical analysis, which determines concentrations. Elevated activities are determined as activity exceeding two standard deviations of multiple background activities. Radiochemical analysis of two abandoned clay settling pond area surface soil samples indicated non-specific gross alpha activity ranging from 73.6 pCi/g to 146 pCi/g, and non-specific gross beta activity ranged from 70.2 pCi/g to 160 pCi/g (see Tables 6, 9, and 12).

Additional radiochemical analysis of the two clay pond samples identified elevated levels of the following radionuclides:

- Bismuth-212 — 0.649 to 1.26 pCi/g
- Bismuth-214 — 11.4 to 30.1 pCi/g
- Potassium-40 — 1.1 to 3.61 pCi/g
- Protactinium-234m — 13.9 to 41.2 pCi/g
- Lead-212 — 0.874 to 1.21 pCi/g
- Lead-214 — 12.2 to 32.5 pCi/g
- Radium-223 — 0.539 to 1.81 pCi/g
- Radium-224 — 0.537 to 0.621 pCi/g
- Radium-226 — 19.7 J to 41.9 J pCi/g
- Radium-228 — 0.72 to 1.11 pCi/g
- Radon-219 — 0.718 to 1.57 pCi/g
- Thorium-227 — 0.861 to 2.01 pCi/g
- Thorium-234 — 8.69 to 31 pCi/g
- Thallium-208 — 0.256 to 0.382 pCi/g
- Uranium-235 — 0.481 to 1.74 pCi/g

Results exceed the EPA Superfund Chemical Data Matrix (SCDM) Cancer Risk Screening Concentration ingestion value of 2.7 pCi/g for radium-226 (Ref. 28).

Radiochemical results for four tailings area surface soil samples were similar to results of the clay pond samples. Non-specific gross alpha activity ranged from 10.2 pCi/g to 47.5 pCi/g, and non-specific gross beta activity ranged from 18.3 pCi/g to 75.3 pCi/g (see Table 6).

Additional radiochemical analysis of the four tailings area samples identified elevated levels of the following radionuclides:

- Bismuth-212 — 1.07 pCi/g (1 elevated result)
- Bismuth-214 — 4.58 to 14.9 pCi/g
- Potassium-40 — 1.82 to 11.6 pCi/g
- Protactinium-234m — 16.3 J pCi/g (1 elevated result)
- Lead-212 — 1.3 pCi/g (1 elevated result)
- Lead-214 — 4.95 to 16.5 pCi/g
- Radium-223 — 0.283 to 0.777 pCi/g
- Radium-224 — 1.33 pCi/g (1 elevated result)
- Radium-226 — 9.94 J to 20.7 J pCi/g
- Radium-228 — 1.15 pCi/g (1 elevated result)
- Radon-219 — 0.567 pCi/g (1 elevated result)
- Thorium-234 — 10.8 J pCi/g (1 elevated result)
- Thallium-208 — 0.144 to 0.382 pCi/g
- Uranium-235 — 0.611 to 1.09 pCi/g

Results exceed the EPA SCDM Soil Exposure Cancer Risk Screening Concentration ingestion value of 2.7 pCi/g for radium-226 (Ref 28).

4.1.3 Contaminated Soil in the Operations Area and Picnic Area

The third source type is an undetermined area of contaminated soil from the former operations area (Source No. 8) and from the present picnic area. The area of the former operations area was estimated to be approximately 20 acres based on historical photographs (Ref. 23). The area of the picnic area will be evaluated as greater than zero. The operations area contained the beneficiation plant that processed the ore matrix into phosphate rock. This area also contained the phosphate rock storage area where the highest radiation activity was identified (Ref. 29) (see Appendix A).

Several inorganic constituents were detected in surface soil samples (BTO-01-SS, BTO-02-SS, and BTO-02D-SS) collected from the Source No. 8 operations area, including arsenic, barium, beryllium, cadmium, chromium, cobalt, iron, lead, magnesium, manganese, nickel, selenium, silver, vanadium, and zinc. Mercury was also detected at a low, although elevated, level in the duplicate surface soil sample (BTO-02D-SS) collected from the Source No. 8 operations area; however, mercury was not detected at an elevated level in the corresponding surface soil sample (BTO-02-SS). No organic constituents were detected at elevated levels in surface soil samples collected from the Source No. 8 operations area. Furthermore, no subsurface soil samples were collected from the Source No. 8 operations area.

Cadmium, chromium, and vanadium were the only inorganic constituents detected at elevated levels in the surface soil sample (BTP-01-SS) collected from the picnic area. No organic constituents were detected at elevated levels in the surface soil sample collected from the picnic area. Furthermore, no subsurface soil sample was collected from the picnic area (see Table 4).

Radiochemical results for the operations area surface soil samples were similar to results for the clay pond samples. Non-specific gross alpha activity ranged from 92.6 pCi/g to 168 pCi/g, and non-specific gross beta activity ranged from 139 pCi/g to 182 pCi/g (see Table 6).

Additional radiochemical analysis of the operations area samples identified elevated levels of the following radionuclides:

- Bismuth-212 0.627 to 0.971 pCi/g
- Bismuth-214 27.9 to 41.0 pCi/g
- Potassium-40 0.528 to 0.7 pCi/g
- Protactinium-234m 31.9 to 45.3 pCi/g
- Lead-212 0.756 to 0.851 pCi/g
- Lead-214 30.4 to 44.4 pCi/g
- Radium-223 1.67 to 2.12 pCi/g
- Radium-226 32.1 to 47.0 pCi/g
- Radium-228 0.641 to 0.681 pCi/g
- Radon-219 1.45 to 2.18 pCi/g
- Thorium-227 1.74 to 2.44 pCi/g
- Thorium-234 18.4 to 33.1 pCi/g
- Thallium-208 0.213 to 0.248 pCi/g
- Uranium-235 1.91 to 2.50 pCi/g

Results exceed the EPA SCDM Soil Exposure Cancer Risk Screening Concentration ingestion value of 2.7 pCi/g for radium-226 (Ref. 28).

4.2 SOURCE CONCLUSIONS

The analytical results for on-site source samples indicate the presence of elevated levels of inorganic and radiochemical contamination in most source areas at the site. Several elevated organic constituents were also identified in source samples, including acetone, methylend chloride, heptachlor epoxide, benzaldehyde, and bis(2ethylhexyl)phthalate. However, these constituents were detected only in one or two total samples and are not widespread throughout the site. In addition, these constituents are not typically associated with phosphate mining operations, and therefore, may not be site-attributable.

Analysis of on-site surface soil samples and subsurface soil samples (clay ponds) identified elevated concentrations of several inorganic constituents including arsenic, barium, cadmium, chromium, cobalt, manganese, nickel, vanadium, and zinc. Radiochemical analysis identified gross alpha and beta radiation activity in excess of 20 times the background activity. Gamma radiation analysis identified elevated activities of 14 radionuclides in most source samples, including bismuth-212 and -214, potassium-40, protactinium-234m, lead-212 and 214, radium-226 and 228, thallium-208, and uranium-235. Radium-226 levels (9.94 to 47 pCi/g) were identified above the soil exposure pathway Cancer Risk Screening Concentration of 2.7 pCi/g.

5.2.2 Surface Water and Sediment Sample Locations and Analytical Results

A total of six sediment samples were collected during the ESI. Sediment sampling locations are illustrated on Figure 3 and described in Table 3. Inorganic analytical results for sediment samples are summarized in Table 10, organic analytical results are summarized in Table 11, and radiochemical results are summarized in Table 12. Because the on-site lakes are manmade, one background sample and one control sample was collected. The background sample BTBG2-SD was collected from Lake Arietta, a nearby natural lake. The control sample BTBG-SD was collected from on-site Lake 5, which, based on historic photograph review and soil type, apparently was not used as a clay settling pond (Refs. 1; 23; 26, p. 1). Sediment sample BT6-02-SD was collected from the Source No. 2 clay pond and was discussed in Section 4.1.1.

Sediment sample BT-SL-SD was collected from Shop Lake, an on-site fishery. Cadmium and manganese were the only inorganic constituents detected at elevated levels in the sediment sample collected from Shop lake. Acetone was the only organic constituent detected at an elevated level in the sediment sample collected from Shop Lake. However, acetone is not a contaminant typically associated with phosphate mining operations, and therefore, may not be site-attributeable. Radiochemical analytical results did not identify elevated levels of radionuclides when compared to the on-site control sample; however, when compared to the background sample results, twice the radiation levels were identified in the Shop Lake Sample for bismuth-212, potassium-40, lead-212, and thallium-208. Other radionuclides detected at greater than twice the background activity include gross alpha, gross beta, bismuth-214, cesium-137, lead-214, and radium-226 (see Tables 10, 11, and 12).

Sediment sample BT-DL-SD was collected from Derby Lake, an additional on-site fishery. Arsenic and lead were the only inorganic constituents detected at elevated levels in the sediment sample collected from Derby Lake. Acetone was the only organic constituent detected at an elevated level in the sediment sample collected from Derby Lake. However, acetone is not a contaminant typically associated with phosphate mining operations, and therefore, may not be site-attributeable. The radiochemical analytical results from this sample also identified elevated levels of radionuclides when compared to the on-site control sample; these radionuclides include bismuth-212, lead-212, radium-228, thallium-208, and uranium-235. When compared to the background sample results, at least twice the radiation levels were identified in the Derby Lake sample for every radionuclide except cesium-137 and radon-219, which were not detected. Radionuclides detected at 10 times the background activity include gross alpha, gross beta, bismuth-214, lead-212, lead-214, and radium-226.

Sediment sample BT-12-SD was collected from the drainage canal at Saddle Creek Road, downgradient of the convergence of the three canals that drain TFMA and other phosphate-mined areas north of the site, up to Interstate 4 (Ref. 40, p. 9). Cadmium was the only contaminant identified at an elevated level in sediment sample BT-12-SD. No radionuclides were identified above the control sample results; however, the radionuclides lead-214 and radium-226 were detected in excess of eight times the background sample results (see Tables 10 and 12).

5.2.3 Surface Water Targets

No surface water intakes are located along the 15-mile surface water target distance limit. Fourteen public fishing lakes located on site in TFMA, a state wildlife management area are open for public fishing Friday through Monday. Creel information must be provided to the TFMA office upon check-out. Several TFMA lakes are catch and release only, and harvesting regulations fluctuate in an effort to manage the fish populations (Refs. 2; 3; 22; 38; 39). Approximately 10.5 miles of wetlands frontage are located along on-site drainage ways and source areas (Refs. 1; 44). Saddle Creek is used for recreational fishing, and 10 miles of wetland frontage are located along Saddle Creek within the surface water pathway (Refs. 1, 10). Sensitive habitats for federally-designated endangered and threatened species including the wood stork (*Mycteria americana*), gopher tortoise (*Gopherus Polyphemus*), and American alligator (*Alligator mississippiensis*) have been documented to occur on site and within the Saddle Creek watershed (Refs. 25, pp. 2, 5; 45, pp. 4, 5; 46; 47; 48).

5.2.4 Surface Water Conclusions

The surface water migration pathway is of primary concern due to the large number of on-site and off-site fisheries and sensitive environments. Two of the 14 on-site fisheries were sampled; results revealed elevated levels of arsenic, cadmium, lead, and manganese. Cadmium was also detected at an elevated concentration in a sediment sample collected from the canal crossing under Saddle Creek Road en route to Saddle Creek. In addition, several radiochemical compounds were identified.

5.3.4 Soil and Air Conclusions

The soil exposure pathway is of some concern at the site. The air migration pathway is of minimal concern. The site is situated on a state-designated fish management area, a recreational area that employs between six to nine people. Approximately 1,055 persons reside within 1 mile of on-site sources. Approximately 60,683 persons are located within a 4-mile radius of on-site sources. Several endangered or threatened species and over 500 acres of wetlands are located within 4 miles of on-site sources.

6.0 SUMMARY AND CONCLUSIONS

The site is a 6,000-acre tract of partially reclaimed phosphate strip mines that the Borden Chemical Company donated to the state of Florida in 1982 to create TFMA. The site consists of approximately 1,000 acres of former phosphate mining pit lakes and 5,000 acres of reclaimed recreational areas for picnicking, hiking, horseback riding, shooting, fishing, and small game hunting.

The groundwater migration pathway is of some concern because of the proximity of the Auburndale municipal wells, which are located within 4 miles of on-site sources. Due to the presence of karst topography surrounding the site, the surficial and Floridan aquifers are hydraulically connected and considered to be one hydrogeologic unit. An observed release to groundwater has not been established at the site. Radium-226 and radium-228 have been identified at levels above the cancer risk screening concentrations of 0.16 and 0.19 pCi/L in the on-site TFMA private well and nearby private wells. The nearby private wells are located southeast of on-site source areas; groundwater flow in the Floridan Aquifer is reported to be toward the southwest.

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The soil exposure pathway is of some concern at the site. The air migration pathway is of minimal concern. The site is situated on a state-designated fish management area, a recreational area that employs between six to nine people. Approximately 1,055 persons reside within 1 mile of on-site sources. Approximately 60,683 persons are located within a 4-mile radius of on-site sources. Several endangered or threatened species and over 500 acres of wetlands are located within 4 miles of on-site sources.

The Florida Game and Fresh Water Fish Commission, and the Florida Department of Environmental Protection have developed a mitigation plan titled *"A Proposed Ecosystem Plan for the Upper Peace River: Alternative Mitigation for the Upper Saddle Creek."* The purpose of the mitigation plan is to coordinate reclamation activities and land use development projects requiring state approval using reclamation funds to restore significant functions of the damaged ecosystem. According to a news release dated April 9, 1999, FFWCC and FDEP are planning to reclaim and enhance portions of the 6,400-acre TFMA as part of an $8 million project presently underway. The project will benefit the Upper Peace River Basin by supplying additional water flow to Saddle Creek. Plans are underway to convert most of the clay ponds into diverse wetlands containing an array of plants that filter water. Biologists and engineers reportedly are working to create 400 to 600 acres of wetlands where clay settling ponds are located. These wetlands will provide habitat for waterfowl and wading birds and will also increase the discharge of clean water into Saddle Creek, also helping to remedy a water shortage in the Upper Peace River Basin.

Based on the analytical results for samples collected during the ESI, further remedial action is recommended for the Borden Chemical Company/Tenoroc Mine site. The radionuclides radium-226 and radium-228 were detected in the on-site TFMA private well and nearby private wells at a levels exceeding the EPA SCDM maximum contaminant level (MCL) concentrations of 0.16 pCi/L and 0.19 pCi/L, respectively, for the groundwater migration pathway. TFMA should be advised not to drink the water from the on-site private well located at the TFMA office. Furthermore, FGFFC conducts water quality monitoring at TFMA; however, only dissolved oxygen, and nutrient analyses are conducted. No chemical analyses of the surface water or fish tissue samples is conducted. Due to the recreational activities at TFMA, including fishing and swimming, FGFFC should include inorganic and radiochemical surface water and fish tissue sampling in their on-going monitoring process. In addition, EPA also may want to consider conducting human health and ecological risk assessments at the site. Although further action is recommended for the Borden Chemical Company/Tenoroc Mine site, it should be noted that FFWCC and FDEP are in the process of conducting a reclamation project at TFMA.

HEALTH CONSULTATION

TENOROC MINE SITE
(a/k/a BORDEN CHEMICAL COMPANY/TENORIC MINE)

AUBURNDALE, POLK COUNTY, FLORIDA

EPA FACILITY ID: FLD980727432

AUGUST 3, 2001

Prepared by:

Petition Response Branch
Exposure Investigations and Consultation Branch
Division of Health Assessment and Consultation
Agency for Toxic Substances and Disease Registry

Background and Statement of Issues

On June 14, 2001 the U.S. Environmental Protection Agency Region 4 Remedial Program (USEPA) requested that the Agency for Toxic Substances and Disease Registry (ATSDR) review available data for the Tenoroc Mine Site in Auburndale, Florida. The USEPA request specifically relates to upcoming plans to convert the site to a recreational park and whether or not soil, groundwater, and air represent a human health threat for fishing, camping, and hiking activities at the site [1].

The Tenoroc Mine site comprises 6000 acres of partially reclaimed phosphate strip mines operated by the Borden Chemical Company from 1965-1978 [2]. This site is one of many sites in Florida from which radium-rich phosphate rock was mined for fertilizer production. Several source areas have been identified at the site. These source areas include four clay settling ponds covering an area of almost 1200 acres, three tailings piles covering about 300 acres, and the former operations area [2].

In 1982 Borden donated the site to the Florida Department of Natural Resources (FDNR) to create the Tenoroc Fish Management Area (TFMA). The majority of the TFMA (5000 acres) consists of recreational areas for picnicking, hiking, horseback riding, shooting, fishing, and small game hunting. The remainder consists of lakes created from former phosphate pits [2].

Current usage of the site is unrestricted and children and fisherman reportedly access the site. Future plans for the site are not anticipated to involve any usage restrictions.

Discussion

The USEPA collected sediment samples as well as surface and subsurface soil samples during an Expanded Site Investigation [ESI] conducted in February 2000. These samples were analyzed for volatile organic compounds, semi-volatile organic compounds, pesticides, PCBs, metals, and cyanide. Some of the samples were also analyzed for gross alpha, gross beta, and gamma radiation activity [2].

The analytical results for onsite samples detected elevated levels of metals and radionuclide contamination in most source areas. Several elevated organic constituents were also identified in source samples, including acetone, methylene chloride, heptachlor epoxide, benzaldehyde, and bis(2-ethylhexyl)phthalate [2].

Physical Hazards

ATSDR has not been provided any information as to whether or not any physical hazards associated with the mining operation remain onsite. Although at least some of the mining equipment and materials have reportedly been removed, it is not clear if this removal operation has been completed. Exposure to sharp, rusted objects and exposed mining debris could pose a physical hazard to children and other visitors to the park.

Another type of physical hazard associated with this part of Florida is the development of sinkholes. According to the Florida Geological Survey's Sinkhole Database, ten sinkholes were reported in Auburndale, Florida during the period ranging from 1969-1986 [3]. The formation of sinkholes could either directly injure or create a physical hazard for recreational users onsite.

ATSDR's Child Health Initiative

ATSDR recognizes that in communities faced with contamination in their air, water, soil, or food, the unique vulnerabilities of children demand special emphasis. As part of its Child Health Initiative, ATSDR is committed to evaluating the health impact of environmental contamination on children. This site is a particular concern for children because they will have unrestricted access to the site and could be exposed to onsite contamination and physical hazards.

Conclusion

Question to ATSDR: Do soil, groundwater, and air contaminants represent a human health threat for recreational activities at this site?

ATSDR currently has insufficient information to make any public health determinations for this site. In particular, no information has been provided that clearly indicates planned uses for the various portions of the site and whether any access restrictions will be imposed. While some of the available sampling and analysis data may be useful for an evaluation of specific site exposure scenarios, additional environmental data will also be required.

Prepared by:

Gail E. Scogin
Environmental Health Scientist
Petitions Response Section
Exposure Investigations and Consultations Branch
Division of Health Assessment and Consultation

Michelle A. Colledge, MPH
Environmental Health Scientist
Petitions Response Section
Exposure Investigations and Consultations Branch
Division of Health Assessment and Consultation

Reviewed by:

Greg Zarus
Atmospheric Scientist
Exposure Investigation Section
Exposure Investigations and Consultations Branch
Division of Health Assessment and Consultation