



FUGRO ENVIRONMENTAL, INC.

Project No. 0553-2040
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Texas Natural Resource Conservation Commission
P.O. Box 13087, MC143
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Attention: Mr. Scott Crouch

**Proposed Site Closure Plan
SAHA Central Maintenance Facility,
10 Acre Site, 1901 South San Marcos Street
San Antonio, Texas**

Fugro Environmental, Inc. is pleased to present this proposed Site Closure Plan for the above referenced site owned by the San Antonio Housing Authority (SAHA). This report is being submitted to the Texas Natural Resource Conservation Commission (TNRCC) for review under the Voluntary Cleanup Program (VCP).

The provisions of the TNRCC VCP include the execution of an agreement with the TNRCC and an application fee of \$1,000. The completed application is provided in Appendix A and is signed by a representative of SAHA. A check payable to the TNRCC has already been submitted by SAHA.

The regulatory provisions for closure of this site were previously discussed with Mr. Jay Carsten, Project Manager, of the VCP. If you have any questions concerning this report, please do not hesitate to call me at (210) 590-8393.

Sincerely,

FUGRO ENVIRONMENTAL, INC.

Timothy J. Dudit, R.G., C.P.G.
Environmental Manager

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Copies Submitted:

- Oscar Cervantes, SAHA, San Antonio, Texas (2)
- Scott Crouch, TNRCC, MC143, Austin, Texas (2)



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- APPENDIX B: Remedial Site Investigation Report
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INTRODUCTION

This report was prepared by Fugro Environmental, Inc. (Fugro) for the San Antonio Housing Authority (SAHA) for a ten acre site located at 1901 South San Marcos Street in San Antonio, Texas (Plate 1 in Appendix B). This report was prepared for review by the Texas Natural Resource Conservation Commission (TNRCC) Voluntary Cleanup Program concerning the closure of a historical, 0.91 acre coal ash waste landfill located at the above referenced site (Plate 2 in Appendix B). This report is intended to fulfill closure requirements under 30 TAC §335.563, Media Cleanup Requirements for Risk Reduction Standard No. 3.

The closure information for this site is provided in sections below concerning site setting, chemical constituent characteristics, exposure pathway evaluation, TNRCC risk reduction standards, and closure plan. Additional information is provided in appendices to this report. The plates and maps referred to in this report are presented in Appendix B, Remedial Site Investigation Report.

SITE SETTING

Site History and Environmental Chronology

The site is a 10.01 acre property located at 1901 South San Marcos Street. The site is located adjacent to the Union Stock Yards, and was formerly the location of a meat packing facility from circa 1889 to 1960. The historical coal ash waste landfill is presumed to be a byproduct of coal fired boilers used at the site to produce steam for heating and meat packing from 1889 to circa 1920. The site is currently cleared of all buildings and surface facilities, and is fenced with a locked gate.

A chronology of the environmental studies at the site to date is provided below. This chronology is based on activities conducted by Fugro and on reports provided by SAHA. This chronology represents all environmental studies currently known by Fugro to have been conducted on this site.

- January, 1989: Aptus Environmental Services - Report on the removal and disposal of PCB contaminated transformers from the site.
- July, 1991: Trinity Testing Laboratory - Closure report for removal of three underground storage tanks (USTs) and contaminated soil from the site.
- June, 1992: Trinity Testing Laboratory - Site assessment for soil and groundwater contamination from previously removed USTs.
- July and October, 1992: Trinity Testing Laboratory - Quarterly monitoring reports for monitor wells at the site.
- September, 1993: Clean Environments, Inc. - Phase I Environmental Site Assessment of the site.
- November, 1993: Clean Environments, Inc. - Report on sampling and analysis of waste oil drum contents.
- February 15, 1994: Fugro McClelland (Southwest), Inc. - Preliminary geotechnical study report including discovery of coal ash waste in Boring B-3.
- February 15, 1995: Fugro Environmental, Inc. - Phase II Environmental Site Assessment (ESA) of coal ash waste at the site.
- June 21, 1995: Fugro Environmental, Inc. - Remedial Site Investigation of the coal ash waste, soil and groundwater at the site.

Site Ownership and Planned Use

The site is presently owned by SAHA and was recently purchased to build a warehouse and maintenance facility with offices. The warehouse facility will be used to store materials used by SAHA in maintaining various public housing projects throughout the city of San Antonio. The maintenance facility will be used for equipment repair. Based on the results obtained by Fugro from the Remedial Site Investigation, SAHA has altered previous facility location plans to avoid construction of buildings over the coal ash waste. Current architectural plans have sited an asphalt parking lot for the facility over much of the delineated coal ash waste area. SAHA has purchased this site only for warehouse and storage use and has no plans to develop the site for any public housing projects in the future.

Geologic and Hydrogeologic Setting

A detailed discussion of the geologic and hydrogeologic setting is provided in the Remedial Site Investigation (RSI) report, which is included in this report as Appendix B. In summary, the site lies on the outcrop of Quaternary age Fluvial Terrace Deposits consisting of uncemented, alluvial gravel, sand, silt, and clay. The Fluvial Terrace Deposits overlie the Cretaceous age Navarro Formation, which is composed of clay and marl layers.

The Fluvial Terrace Deposits contain shallow groundwater of varying quality. This aquifer is not used for drinking water in San Antonio. The Navarro is not considered an aquifer, however the upper ten feet of weathered Navarro can contain interconnected fractures which can carry minute amounts of groundwater.

The site is located over the artesian zone of the Edwards Aquifer, which is the sole source of drinking water for the city of San Antonio. The top of the Edwards Aquifer lies approximately 800 feet beneath the shallow groundwater at the site. Two Edwards water wells previously existed on the site, but these were plugged and abandoned by SAHA in October, 1995. Shallow monitor wells in the alluvium at the site show that a perched groundwater table flows east at an approximate gradient of 0.14 feet per foot. A groundwater contour map is presented on Plate 6 of Appendix B. The shallow, perched aquifer is not connected to the deeper Edwards Aquifer.

CHEMICAL CONSTITUENT CHARACTERISTICS

Chemical Type, Concentration, and Affected Media

The results of the RSI showed low concentrations of sixteen regulated semi-volatile organic chemicals, two volatile organic chemicals, and six metals in the coal ash waste and groundwater in contact with the coal ash waste. The maximum concentrations compared with regulatory levels of the organic chemicals from 30 TAC §335, Subchapter S are presented on Table 1. The maximum concentrations compared with regulatory levels of the metals from 30 TAC §335, Subchapter S are presented on Tables 1c and 2b in Appendix B.

The distribution of these chemicals in the soil, coal ash waste, and shallow groundwater is discussed in detail in Section 4.0 of Appendix B. In summary, the detected volatile and semi-volatile hydrocarbons are polycyclic aromatic hydrocarbons typically found in coal. The soil and groundwater sample analyses show that these chemicals are found only within the coal ash waste and in the groundwater in contact with the coal ash waste. These chemicals are not found in shallow soil outside the coal ash waste (B-23, with the exception of fluorene) and are not present in shallow groundwater directly downgradient of the coal ash waste.

Beryllium is present in the groundwater within the coal ash waste above regulatory levels but is below detection limits in MW-5 and MW-6 downgradient of the coal ash waste. Beryllium is not present in the soil downgradient of the coal ash waste in boring B-23 (Appendix B, Table 1c).

Chemical Mobility

The polycyclic aromatic hydrocarbons discussed above are naturally present in coal, these chemicals are nearly insoluble in water, and have very low soil mobility potential. The soil mobility of chemicals can be classified by examination of the thermodynamic partitioning of the chemicals in soil, according to Donnelly, et. al., (1994). The soil partition coefficient (K_d) has been estimated on the basis of the quantity of organic carbon present in the soil and the organic carbon partition coefficient (K_{oc}) for each chemical. These relationships are presented on Table 2. The chemicals encountered in the coal ash waste at the site are generally immobile based on this classification and have an extremely low potential for migration. This greatly reduces the potential for migration of the chemicals from the coal ash waste to the adjacent native soil.



Distribution

The two volatile and sixteen semi-volatile hydrocarbon chemicals are only found within the coal ash waste at the site but not in soil outside the coal ash waste. Only the semi-volatile hydrocarbon chemicals are present in the groundwater and only within the deposit of coal ash waste where the groundwater is in direct contact with the coal ash waste. The exposure of these chemicals in the coal ash waste to the groundwater at the site for up to 100 years may be the reason they were present above detectable limits in the groundwater. Chemical analysis of the groundwater in all monitor wells outside and down gradient of the coal ash waste are below detection limits for the two volatile and sixteen semi-volatile hydrocarbon chemicals found in the coal ash waste. The two volatile and sixteen semi-volatile hydrocarbon chemicals will be referred to as the "chemicals of concern" in the remainder of this report.

EXPOSURE PATHWAY EVALUATION

The exposure pathways commonly used in risk assessments were evaluated for the site with respect to food, groundwater, soil, sediment, and surface water. A summary of the potential exposure pathways is presented on Table 3. The result of the pathway evaluation is that soil and sediment are the identified pathways at the site.

The exposure pathway analysis was prepared in consideration of existing architectural plans for development of the site. The current plans exclude building or foundation construction within the area containing coal ash waste and use the area only for paved parking or entry drives. All stormwater will be directed away from this area to a detention pond outside the limits of the coal ash waste. Specific details regarding site development are discussed in the Closure Plan.

Dermal contact, ingestion, and inhalation of soil or ash during construction activities were identified as potential exposure routes. The coal ash waste is currently covered by fill material (soil and rock) at thickness' ranging from 0.5 to 5 feet. Additional fill material will be added to this area to increase the elevation for suitable site grading and paving. Provisions in the closure plan and construction bid documents are made which exclude excavation with the area containing coal ash waste.

Due to these considerations, the potential exposure routes are not retained for additional pathway analysis and no exposure pathways are completed.

TNRCC RISK REDUCTION STANDARDS

In previous sections of this report, the location, chemical constituents of concern, chemical mobility, and the limited extent of the impact from coal ash waste on soil and groundwater at the SAHA site were discussed. The closure of the site under the Risk Reduction Standard No. 3 found in Title 30 of the Texas Administrative Code (TAC), specifically 30 TAC §§335.551-335.599, is discussed in this section. The particular regulatory pathway for closure of this site is discussed below with emphasis on the unique conditions found at the site. The specific sections are discussed in order using the section numbers found in the regulations.

This section presents information on the compliance of the site with the Risk Reduction Standard No. 3. The future plans of SAHA to add an impermeable parking lot and geomembrane above the coal ash waste area, restrict construction activities, deed record the site, and monitor downgradient groundwater quality constitute a corrective measure which will provide additional surety that the chemicals of concern at the site will be controlled in an effective manner.

§335.553(b)(1); Remedial Investigation Report

The remedial investigation report required by this subsection is provided in Appendix B.

§335.553(b)(2); Baseline Risk Assessment

As presented above and summarized in Table 3, there are no completed pathways at the site, the chemicals of concern have existed at the site for up to 100 years, the chemicals of concern are limited to the immediate coal ash waste area, migration of the chemicals of concern are unlikely given their chemical properties, and the chemicals of concern have not migrated beyond the coal ash waste boundary. Potential adverse effects from the chemicals of concern are very limited based on the current characteristics of the site and the planned future use. A baseline risk assessment using standard or site specific exposure factors is not necessary if there are no completed pathways and therefore no exposures to calculate.



§335.553(b)(3); Remedy Evaluation Factors

The remedy evaluation factors under §335.562 include compliance with other laws and regulations, long-term effectiveness, reduction of mobility, short term effectiveness, implementability, and cost. SAHA will comply with applicable laws and regulations in regard to the management of the coal ash waste at this site. The site development plans by SAHA will be effective in the long term since SAHA provides a significant, long term community function and their presence at the site is assured for the foreseeable future. Since the coal ash waste has existed at the site for up to 100 years at elevations near the surface and probably in contact with shallow groundwater for a significant portion of that time, the effect of adding an impermeable parking lot and geomembrane can only be to reduce the potential for migration of the chemicals of concern by eliminating surface water infiltration. The short term effectiveness of eliminating infiltration of surface water will be to reduce the potential migration of the low mobility chemicals of concern from the coal ash. The site design feature of adding fill material above the coal ash waste and inclusion of strict provisions in the construction contract documents will minimize disturbance of the coal ash waste. The future plans can be implemented by SAHA in the final design plans and bids for construction at the site. The cost of the future development plans has been budgeted by SAHA. The additional cost impact of the geomembrane cover and monitoring proposed in this closure plan will be minimal.

§335.553(b)(3); Corrective Measure Study

The corrective measure study is not required since there are no completed exposure pathways at the site and the future plans for site development coincidentally implement control measures that provide further assurance that the mobility and impact of the chemicals of concern are limited.

§335.553(b)(4); Final Report

A final report documenting the completed site development, groundwater monitoring, and deed recordation will be submitted to the TNRCC after acceptance of this plan by the TNRCC and implementation of the above referenced activities.

§335.563(b), (c) (e); Carcinogens, Systemic Toxicants, & Standard Exposure Factors

The risk of human cancer, deleterious effects from systemic toxicants, and the use of standard exposure factors is not applicable since none of the exposure pathways are completed.



§335.563(f); Air

The chemicals of concern are not exposed at the surface, where uptake through inhalation is possible. The coal ash waste is presently covered by fill and will be covered in the future by a parking lot and geomembrane. Volatile chemicals present at the site are below current standards for Risk Reduction Standard 2 and over 90% of the chemicals are not volatile. Based on this information, the air exposure pathway is not completed.

§335.563(g); Surface Water

The chemicals of concern are not exposed at the surface and will be covered by future development so the surface water exposure pathway is not completed. Facility design plans direct stormwater away from the coal ash waste location to a detention pond on the southeastern corner of the site. Infiltration of surface water will be controlled by the use of impervious surfaces, such as the parking lot and geomembrane.

§335.563(h); Groundwater

The chemicals of concern are not detected in upgradient or downgradient shallow groundwater monitor wells, are nearly insoluble in groundwater, and are only detected within the monitor well installed in the coal ash waste. The apparent low permeability of the clayey gravel alluvium comprising the shallow, perched aquifer and the chemical immobility of the chemicals of concern combine to restrict the migration of the chemicals in the shallow groundwater.

The alternate concentration limits discussed in §335.563(h)(2)(A) and (C) assumes the completion of an exposure pathway and the groundwater exposure pathway is not completed at this site. The shallow groundwater at this site is not used for a drinking water supply, and the shallow groundwater zone beneath the site can be declared exempt from the groundwater cleanup requirements, as discussed below.

We request that the executive director of the TNRCC authorize the shallow groundwater zone underlying this site around the coal ash waste to be excluded from the groundwater cleanup requirements of 335.563(h). This request is based on the provisions of §335.563(h)(2)(B), current conditions, future use, and future controls planned at this site, as discussed above. The shallow groundwater zone is not used for water supply due to the limited saturated thickness, low apparent permeability, and the exclusive use by the City of San Antonio of the deep Edwards Aquifer water for drinking water supply.

§335.563(i); Soil

The coal ash waste is not exposed at the surface and future plans will place compacted fill and an impermeable parking lot over the extent of the coal ash waste. The exposure pathway of human ingestion and direct contact with the coal ash waste is not completed and further protection will be provided by the future development plans. The restriction of disturbance of the soil over the coal ash waste during construction and the addition of an impermeable membrane and parking lot above the coal ash waste will preclude future contact with the coal ash waste.

CLOSURE PLAN

The SAHA 10.01 acre site complies with Risk Reduction Standard No. 3 requirements due to the properties of the chemicals of concern, the current site conditions, and the future development plans over the coal ash waste area. To provide further assurance that the exposure pathways from the chemicals of concern in the coal ash waste remain incomplete, SAHA requests that the TNRCC grant closure of the site with the legal controls, site development features, site control features, and groundwater monitoring plan components discussed below.

Legal Controls

SAHA will deed record the presence and location of the coal ash waste, the prohibition on withdrawal of shallow groundwater from the coal ash waste area, and the prohibition of ground disturbance within 25 feet of the coal ash waste area boundary without the written permission of SAHA. This deed recordation will limit the disturbance of the coal ash waste in the future.

Site Development Features

The final site development plans are presented on a map as Appendix C to this report. The coal ash waste area is shown on the map and the presence of an asphaltic concrete parking lot and entryway are shown on the map. The parking lot covers approximately 0.49 acre of the 0.91 acre coal ash landfill. To eliminate stormwater infiltration and prevent erosion of the 0.42 acre portion of the coal ash landfill not covered by the parking lot, SAHA proposes to cover the coal ash with a 20 mil, high density polyethylene (HDPE) membrane. This cover will extend ten feet beyond the outer boundary of the coal ash not covered by the parking lot and entryway. The membrane will also extend at least five feet inside and beneath the parking lot and entryway. The HDPE membrane will be installed according to the manufacturers specifications. The HDPE membrane and parking lot will serve to further isolate the waste, minimize surface water infiltration, limit disturbance of the coal ash waste, and prevent erosion of the soil which now covers the coal ash waste site.

Also shown on the map is a stormwater runoff channel in the coal ash waste area. This channel has been designed to be as shallow as possible and is not expected to intercept the coal ash waste. The excavation and construction of this channel will be monitored and if coal ash waste is encountered, only the amount necessary for construction will be removed, stored on plastic sheeting, and covered by plastic sheeting. Any coal ash waste removed during construction of the channel will be wetted and spread on the surface immediately before placement of the HDPE membrane.

Site Control Features

The site will be surrounded by a gated security fence and the access to the site will be controlled by SAHA personnel on site. All contractors who work on the site will be informed of the presence and location of the coal ash waste and the prohibition on disturbance of the coal ash waste. If a contractor or public utility must disturb the ground surface within 50 feet of the boundary of the coal ash waste, information on the chemicals of concern will be provided to them by SAHA. SAHA will require the contractor or public utility to sign a statement confirming the receipt of information on the coal ash waste chemical contents, boundary and the extent of parking lot/entryway/geomembrane cover as well as their intent to comply with Occupational Safety and Health Administration employee protection requirements. SAHA will also include information on the location and nature of the chemicals of concern in the coal ash waste as part of the routine safety information and training for SAHA personnel at the site.

Groundwater Monitoring Plan

Of the sixteen semivolatile, organic chemicals detected in groundwater in the coal ash waste (Table 1), only one has an established drinking water standard (benzo[a]pyrene, 0.002 mg/l). Also, only five of the chemicals have a groundwater industrial standard (Table 1). Since the groundwater has been in contact with the coal ash for over 100 years, the alluvium is clayey with an apparent low permeability, and the chemicals of concern are generally immobile, the monitor wells downgradient of the coal ash landfill will be monitored on an annual basis for a period of five years.

The three monitor wells downgradient of the coal ash waste (MW-4, 5, and 6) will be purged, sampled and analyzed for semi-volatile hydrocarbons using EPA SW-846, Method 8270. Monitor wells MW-1, and MW-3 will be removed and plugged and monitoring wells MW-2, MW-4, MW-5, MW-7, and MW-8 will be retained for future groundwater monitoring. The groundwater elevation will also be measured in each monitor well at the site and the elevations contoured to show groundwater gradient and direction.

The annual groundwater monitoring results will be forwarded to the TNRCC upon completion each year. A final request for cessation of groundwater monitoring will be submitted for TNRCC approval following the fifth annual event. The cessation of groundwater monitoring will be initiated after the monitoring results show levels of the sixteen semivolatile organic chemicals of concern are either below the detection limits listed in SW846-Method 8270, below the Groundwater Industrial Standard of TNRCC Risk Reduction Standard No. 2, or are below the Drinking Water Standard, as applicable for each chemical of concern.

CONCLUSIONS

The coal ash waste located within the 10.01 acre site located at 1901 South San Marcos Street can be closed under Risk Reduction Standard No. 3. The items summarized below show that a site closure can be achieved, that incomplete exposure pathways exist, that control measures will provide additional isolation, that the performance of controls discussed above are effective, and that the effectiveness of the controls can be monitored and verified.

- The site is located over a shallow alluvial aquifer not used for drinking water or other purposes and is located in a city which is completely dependent on the deep Edwards Aquifer drinking water supply.
- The shallow groundwater is not connected to the deeper Edwards Aquifer.
- The coal ash waste is limited to a well defined 0.91 acre area within the 10.01 acre site, is presumed to originate from coal fired boilers used at the site between 1890 and circa 1920, and has been present at the site for approximately 100 years.
- The organic chemicals of concern found in the coal ash waste have been determined to exist only in the coal ash waste and groundwater directly in contact with the coal ash waste.
- The organic chemicals of concern are not present outside of the coal ash waste area in the soil and are not detected in three groundwater monitor wells downgradient of the coal ash waste.
- The organic chemicals of concern are immobile in soil, are not volatile, are relatively insoluble in water, and are only detected in the groundwater due to direct contact with the coal ash waste and the length of time in contact with the coal ash waste.
- The only metal of concern, beryllium, is present in the coal ash waste exceeding regulatory levels but is not present in soil or groundwater downgradient of the coal ash waste.
- The only possible exposure pathways at the site are groundwater and soil and both of these pathways are incomplete due to the present conditions and future improvements planned for the site.

- The lack of a completed exposure pathway precludes the necessity for a baseline risk assessment, a corrective measures study, human exposure concerns, and air, surface water, groundwater, and soil cleanup concerns.
- The shallow alluvial aquifer underlying the site is not a present or likely future source of drinking water and the shallow alluvial aquifer zone underlying the site can be declared exempt from the groundwater cleanup requirements by the TNRCC.
- The use of legal controls, site development features, site control features, and downgradient groundwater quality monitoring will assure an effective and verifiable closure of this site.

REFERENCES

DONNELLY, K. C., C. S. ANDERSON, G. C. BARBEE, AND J. J. MANEK, 1994 Soil Toxicology in Basic Environmental Toxicology, CRC Press, Boca Raton, Florida.

EPA Superfund Exposure Assessment Manual, EPA/540/1-88/001, United States Environmental Protection Agency, Office of Remedial Response, Washington, D.C., April, 1988.

EPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part A, EPA/540/1-89/002, United States Environmental Protection Agency, Office of Remedial Response, Washington, D.C., December, 1989.

Texas Administrative Code, Title 30, §§335.551-335.599.