AMENDED RECORD OF DECISION
OPERABLE UNIT 1 (SOILS)

SIGMON'S SEPTIC TANK SITE
STATESVILLE, IREDELL COUNTY, NORTH CAROLINA

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA, GEORGIA

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AMENDED RECORD OF DECISION

THE DECLARATION

Site Name and Location

The Sigmon's Septic Tank Superfund site (the "Site") is located at 1268 Eufola Road in Statesville, Iredell County, North Carolina. This location is considered to be a rural area of Iredell, North Carolina. The United States Environmental Protection Agency's (EPA) Identification Number is NCD062555792. The lead agency for the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) regulatory response at the site is EPA. The North Carolina Department of Environment and Natural Resources (NCDENR) is the support agency. The site was placed on the National Priorities List (NPL) on April 27, 2005. The approximate location of the Site is shown on Figure 1.

Statement of Basis and Purpose

A Record of Decision (ROD) Amendment is needed for the Operable Unit (OU) 1 for the Sigmon's Septic Tank Site in order to modify the ROD signed on September 19, 2006. Operable Unit 1 includes soil and a stockpile of soil excavated from onsite lagoons. The Selected Remedy for the soils (including the stockpile) in the 2006 ROD was Excavation, Off-Site Transportation, and Disposal at a Subtitle D Landfill. This amendment to the ROD changes the COCs for soils and reduces the scope of the soil remedy to include only the stockpile.

In 2006, the final Baseline Human Health Risk Assessment (BHHRA) prepared for OU1 determined that vanadium was the contaminant of concern (COC) in soil. Concentrations of vanadium were found in both surface and subsurface soils above 73 milligrams per kilogram (mg/kg), the risk-based cleanup levels for the child resident at a hazard index (HI) of 1. In May 2009, a BHHRA Addendum was prepared for OU 1 to address an update to the toxicity value for vanadium. The BHHRA Addendum provided a revised cleanup level for vanadium in soil. In addition, soil analysis conducted in April 2009, at the Site indicates the presence of vanadium is naturally occurring. Based on this new information, site-specific characterization data indicates vanadium in the soils does not pose an unacceptable risk to human health or the environment.

Additional samples were collected from the stockpile located in the southern portion of the site. In June 2009, a human health risk assessment was conducted for the additional samples collected from the stockpile. The results of the evaluation indicate that remedial action is warranted for arsenic and benzo (a) pyrene in the stockpile. This change to the original Selected Remedy was chosen in accordance with CERCLA, as amended, and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

The State of North Carolina concurs with this amendment to the ROD (See concurrence letter Appendix A).

Rational For Amending the Scope of Work for Soils

Historical records indicated that the Sigmon's Septic Tank Service (SSTS), a wholly owned subsidiary of AAA Enterprises, pumped septic tank wastes and heavy sludge from residential, commercial, and industrial customers; installed and repaired septic tanks; and provided a variety of industrial waste removal services. From 1978 to 1992, SSTS disposed of septic wastes in eight to ten unlined lagoons on the south section of the 15-acre property. The waste was described as septage, grease, and milky white liquid. The lagoon area dimensions (encompassing all the lagoons) are 213 feet by 250 feet, or approximately 1.2 acres. In 1995, the septage and underlying soil from these lagoons were excavated and placed into a stockpile (see Figure 4).

A remedial Investigation (RI) was conducted at the site from October 2002 through February 2005. Results from the RI indicated that vanadium was found to be a COC for human health receptors (e.g., the child resident and the construction worker). Vanadium was found at concentrations above 73 milligrams per kilogram (mg/kg), the site-specific risk-based cleanup levels concentration for the child resident with a hazard index (HI) of 1.

EPA completed a Remedial Investigation/Feasibility Study (RI/FS) for Operable Unit One (OU1). Private wells were sampled extensively in the vicinity of the site. In April 2006, EPA conducted a time-critical removal action and installed filters on the seven residential wells. In September 2007, the Remedial Design for OU1 remedy was completed and a Superfund State Contract was signed. In June 2008, EPA completed

a Remedial Investigation for groundwater (OU2). The ground water is being addressed under a separate ROD for OU 2 and is not modified by this document.

Soil samples were collected for the purpose of establishing a range of concentrations constituting background conditions for vanadium in the vicinity of the site in April 2009. Based on the results of the investigation, background has been determined to range from approximately 50 milligrams per kilogram (mg/kg) to 120 mg/kg. The average background concentration is 85 mg/kg. The background concentration results indicate that previously reported vanadium concentrations in soil are within background ranges.

In May 2009, the BHHRA Addendum prepared for OU 1 revised the cleanup level for vanadium as a result of updated toxicity values. The oral reference dose (RfD) for vanadium was updated from 1×10^{-3} milligrams per kilogram per day (mg/kg/day) to 5×10^{-3} mg/kg/day and the dermal RfD increased from 2.6×10^{-4} mg/kg/day to 1.3×10^{-3} mg/kg/day. The cleanup level for vanadium in surface and subsurface soil for the child resident increased five-fold from 73 mg/kg to 365 mg/kg. As a result, none of the individual concentrations for vanadium in surface and subsurface soil exceeded the revised cleanup level for the child resident. Therefore, vanadium is no longer the COC in surface and subsurface soil.

In April 2009, additional samples were collected from the stockpile located in the southern portion of the site. The results of the sampling indicate that the stockpile contains concentrations that range from 52 micrograms per kilogram (µg/kg) to 642 µg/kg for benzo(a)pyrene equivalent. In June 2009, a Human Health Risk Evaluation was conducted for the additional samples collected from the stockpile. The results of the evaluation indicate that a remedial action is still warranted and needed to address arsenic and benzo (a) pyrene equivalent contamination in the stockpile. Visual observation during the sampling event also revealed evidence that some of the septage/soil material had been removed from the pile. It is possible that this material removed from the pile, which is rich in organics and nutrients, has been used by area residents as an amendment to garden soil or for other purposes, adding uncertainty to the risk evaluation. Finally, remediation of the stockpile will facilitate remediation of the groundwater at the site. The remedy for the stockpile was already selected in the ROD for OU 1, signed in September 2006, and consists of Excavation, Off-Site Transportation and Disposal at a Subtitle D Landfill.

STATUTORY DETERMINATION

Considering the new information that has been developed and the changes that have been made to the Selected Remedy, USEPA believes that the remedy remains protective of human health and the environment and complies with Federal and State requirements that were identified in the September 29, 2006 ROD, as applicable or relevant and appropriate to this remedial action at the time the original ROD was signed. Five-Year Reviews are not required for this Operable Unit.

Franklin E. Hill, Director
Superfund Division

8/24/09
Date

Decision Summary

1.0 SITE NAME, LOCATION, AND DESCRIPTION

1.1 Site Location

The Sigmon's Septic Tank Site (Site) is located at 1268 Eufola Road, approximately 5 miles southwest of Statesville, Iredell County, North Carolina (Figure 1). The Site is located between Eufola Road to the north and Lauren Drive to the south. Private landowners own the properties located east and west of the Site; the Pine Grove Cemetery is also located east of the Site. A landing strip is located about 0.5 miles south of the Site (Figure 2).

The approximately 4,100-cubic yard stockpile is located on the southern portion (Figure 3) of the Sigmon Septic Tank Site property.

1.2 Affected Population

The Site is approximately 15.35 acres in size. It is divided into two properties: the southern parcel, approximately 8.9 acres and the northern parcel, approximately 6.45 acres. A family with children resides in the home onsite on the northern property. Private landowners own properties located east and west of the Site. The southern site property is bordered by a few homes on Lauren Drive to the south. Although public water is currently available, there are a number of private well users in the area. Current and future residents living onsite and offsite may be exposed to contaminants in onsite ground water. Current and future residents living offsite may be exposed to contaminants in offsite potable wells; however, during the December 2008 potable well sampling event, COCs did not exceed preliminary cleanup levels in any potable well sampled.

1.3 Land Use

Land use in the vicinity of the Site is residential, commercial, and industrial. The southern site property is bordered by pastureland to the east and west, and by a few homes on Lauren Drive to the south. A 1.25-acre pond south of the onsite residence is located on the northern property. Soil in the northwest corner of the pond is saturated

and a small portion was inundated up to two inches in depth. Wetland vegetation is located in the northwest corner.

The Site is surrounded by a 4-foot barbed wire fence to the east, west, and south. However, the fence is broken in places on the east and south sides of the Site. Several trailer homes on Mustang Drive are located east of the northern site property and several residences as well as a business, Lambreth Grading, are located west of this property. The southern site property is bordered by pastureland to the east and west. Pine Grove Cemetery is located east of the Site. A landing strip is located approximately 0.5 mile south of the site.

1.4 Natural Resources

The ground water under the Site is designated as Class GA in accordance with North Carolina's ground water classification system and Class IIA under EPA Groundwater Classification Guidelines (December 1986). The Class GA classification means that the ground water is an existing or potential source of drinking water supply for humans as defined in Title 15A, North Carolina Administrative Code, Subchapter 2L (T15A NCAC 2L).

EPA classifies the surficial aquifer as Class IIA since the aquifer is being used as a source of drinking water. The ground water in the bedrock aquifer is in direct contact with the surficial aquifer and is also classified as IIA. For these reasons, the ground water needs to be remediated to a level protective of public health and the environment as specified in federal and state regulations governing the quality and use of drinking water. The ground water is being addressed under a separate ROD for OU 2 and is not modified by this document.

1.5 Site Operational History

SSTS, a wholly owned subsidiary of AAA Enterprises, was owned and operated by the Sigmon family since 1948. In 1970, Henry Sigmon purchased the property at 1268 Eufola Road and moved operations to this location. The business pumped septic tank wastes and heavy sludges from residential, commercial, and industrial customers; installed and repaired septic tanks; and provided a variety of industrial waste removal services. In 1980, a nephew of Henry Sigmon, Mr. Frank Sigmon, stated to North Carolina Department of Human Services that the septic service had pumped from Barnhardt, Clark Equipment, and

Union Glass. In 1996, Henry Sigmon mentioned to the NCDENR that some of the septic wastes came from a medical supply company, Zimmer Industries, and a metal treating business, Ro-Mac Company. Other than those sources mentioned by Mary Sigmon, no other sources of septic waste have been named in the file material.

From 1970 to 1978, the wastewaters were discharged to the City of Statesville sewer. Around 1973 or 1974, the service received permits and land applied sludges to area farmlands. The process of land application appears to have continued until at least 1989, according to septage management applications filed by AAA Enterprises. The file material does not specify on which properties the sludges were applied and whether the farmlands produced food crops. Around 1978 or 1979, the Sigmons dug several lagoons at the SSTS and began placing septic wastes into these lagoons. Henry Sigmon stated that he had received verbal permission from the Iredell County Health Department and the Mooresville Regional Office of NCDENR to construct and use the lagoons for septage disposal. No permits were ever issued for the lagoons.

A waste pile (or stockpile) and former lagoons are located in the southern portion of the Site (Figure 2). The structure of the stockpile consist of the pile proper, pile fingers, and the blanketed area. The pile proper is a small, relatively flat topped hill varying in height from 8 feet to 12 feet above ground level. It is more generally sloped on the north side and is nearly vertical along its southwest edge. There is a small prominent bench on the northwest side approximately 4 feet in height above ground level. The pile fingers extend off from the southwest side of the pile proper for a distance of approximately 90 feet. The height of the tops of each finger is approximately 4 feet above ground level at the southwestern terminus of each finger. The pile fingers are all rounded on top, sloping off to the level of the blanketed area around their edges. The middle finger is lobe-shaped with an irregular border. The middle finger has been recently partially excavated. The blanketed area is characterized by a thin, generally 1 to 2 foot thick layer of brown silky soil. The total volume of the pile proper, pile fingers, and blanketed area is approximately 4,100 cubic yards (yd^3) (SESD, 2009). The Site including the resident on the property is fenced with a 4-foot barbed wire fence, and warning signs are posted on the fence and trees. There are breaks in the fence on the eastern and southern sides of the site.

The number and size of the unlined lagoons which originally existed at the site is unclear after a thorough review of the file material. Eight to ten unlined lagoons were utilized to hold septic wastes. Some references indicate the lagoons were uniform in

size while others depict lagoons differing widely in size. At times, some of the lagoons were connected with piping (referred to as a septic T) to drain water from other lagoons and facilitate the dewatering of the sludges. As of September 1990, eight unlined lagoons were active; six were used for septic waste and the remaining two for dewatering.

It is unknown if the lagoons ever discharged overland to the surface water pathway. Lotic (i.e., flowing) surface water features near the site consist exclusively of ephemeral drainage ditches that collect stormwater and are the discharge points for shallow ground water flow at the site. One unnamed drainage feature exists to the south of the site, and another unnamed drainage feature carries drainage from Sigmon onsite toward the west. The nearest perennial creeks or rivers are about one-half mile west and southwest of the site (i.e., Reeder Creek and the Catawba River). Uncontrolled migration of overland storm water flow may impact several small lentic (i.e., pond) surface water features in the area: Davidson Pond to the south of the site, Sigmon Pond within the site boundaries, and Lambreth and Williams Ponds to the west of the site. Further west of these, Sliwinski Pond lies within the drainage ditch system between the site and the Catawba River, and it could receive storm water flow originating from the site, as well.

1.6 Highlights of Community Participation

This document is based on site-related documents contained in the Administrative Record for the Site including the Remedial Investigation for OU 2 (March, 2008), Vanadium Background Study and Pile Characterization (April, 2009), Baseline Human Health Risk Assessment Addendum for Vanadium in Soil (May, 2009), and Human Health Risk Evaluation of the stockpile (June 2009). The Administrative Record also includes the documents used to support the 2006 ROD for OU 1.

These documents were made available to the public in both the Administrative Record and an information repository maintained at the EPA Superfund Record Center in Region 4 and at the Iredell County Public Library. In addition, over 100 copies of the Proposed Plan were mailed to citizens in neighborhoods adjacent to the site. The notice of availability of the documents was published in the Statesville Observer on June 29, 2009. A public comment period on the documents was held from July 3 to August 3, 2009.

A public meeting was held on July 9, 2009, at the Celeste Henkel School, Statesville, North Carolina. At this meeting, representatives from EPA, NCDENR, Iredell County, and major property owners answered questions about current conditions at the site and the remedial alternatives under consideration. EPA received no comments during the comment period; therefore, no Responsiveness Summary is included in this AROD.

2.0 REASONS FOR ISSUING THE ROD AMENDMENT

Based upon the consideration of the requirements of CERCLA, the NCP, and the regulatory changes at the Site, No Action (NA) is required for vanadium in surface and subsurface soils at the site. The remedy was to address soils, including the stockpiles at the site. However, as discussed previously, subsequent soil analysis indicated the presence of vanadium at concentrations at the site consistent with background concentrations found elsewhere. Also, a change in toxicity values resulted in a revised remedial goal. A review of historical activities at the site does not support a source for vanadium at the site. For these reasons, the ROD is being amended to drop vanadium as a COC for surface and subsurface soil at the Site.

Sampling recently conducted at the Site indicates the stockpile is contaminated with arsenic and CPAHs. Remediation of the stockpile is also justified by uncertainties in the risk assessment, and the fact that removal of this potential source of recontamination is expected to facilitate the remedy for groundwater (see further discussion under 2.3 below). The remedy for the stockpile was already selected in the ROD for OU 1, signed in September 2006, and consists of Excavation, Off-Site Transportation and Disposal at a Subtitle D Landfill. Based on the results of the 2009 human health risk evaluation, approximately 4,100 yd^3 of stockpile will be removed. The stockpile is shown in the photograph on Figure 4.

2.1 Description of the Original Remedy

The major components of the Selected Remedy for OU1 include:

- Excavation of surface and subsurface soil containing vanadium above site-specific remedial goal concentrations.
- Treatment of contaminated soil that fail the Toxicity Characteristic Leaching Procedure (TCLP) to meet applicable treatment standards under 40 CFR 268 using solidification/stabilization (S/S) technologies.

- Offsite transportation and disposal of the treated and/or untreated soil at a RCRA Subtitle D Landfill.
- Backfilling of the excavated area with clean borrow material obtained from a local source.
- Re-vegetation and restoration of site to safe and usable conditions.

Contaminated soils would be excavated, transported and disposed at a Subtitle D landfill. The excavated area will be backfilled with clean borrow material from a local source, and then the Site will be revegetated and restored to safe and usable conditions. The COCs and extent of soil to be addressed have changed based on additional sampling and revised human health risk assessment evaluations. The description of the remedy changes are presented in Table 1.

Sigmon's Pile, Looking south

Figure 4 – Photograph of Stockpile

2.2 Summary of Addendum to the Baseline Human Health Risk Assessment for Vanadium in Soil – OU 1

Introduction

The revised BHHRA completed in May 2009 served as an addendum to the Final BHHRA completed in March 2006, for the Sigmon's Septic Tank Superfund Site, OU 1. Revised site-specific remedial goals for vanadium in soil were calculated.

The Final BHHRA for OU 1 prepared in 2006 evaluated contamination in soil, sediment, surface water, and presented a limited ground water evaluation (Black & Veatch, 2006). Appropriate EPA guidance was used to evaluate the data, characterize potentially exposed populations, assess the toxicity of COPCs, characterize the risk, and calculate the cleanup levels. An addendum was needed to re-evaluate human health exposure to vanadium in soil at OU 1. Vanadium is considered a systemic toxicant or one that causes non-carcinogenic health effects. The oral RfD for vanadium has been recently updated from 1E-03 mg/kg/day to 5E-03 mg/kg/day and the dermal RfD changed from 2.6E-04 mg/kg/day to 1.3E-03 mg/kg/day.

Background

Toxicity criteria used to evaluate potential non-carcinogenic health effects are termed reference doses, or RfDs. In developing RfDs, it is assumed that a threshold dose exists below which there is no potential for human toxicity. The term RfD was developed by the EPA to refer to the daily intake of a chemical to which an individual can be exposed without any expectation of non-carcinogenic effects (e.g., organ damage, biochemical alterations, birth defects) occurring during a given exposure period.

The toxicity values used to evaluate vanadium were obtained from the following hierarchy of sources in accordance with the EPA Office of Superfund Remediation and Technology Innovation (OSRTI) (EPA, 2003):

- Tier 1 - Integrated Risk Information System (IRIS)
- Tier 2 - Provisional Peer-Reviewed Toxicity Values (PPRTV)
- Tier 3 - Other (Peer Reviewed) Values, including: Agency for Toxic Substances Disease Registry (ATSDR) Minimal Risk Levels (MRLs); California Environmental Protection Agency values; and Health Effects Assessment Summary Tables (HEAST)

The IRIS RfD for vanadium peroxide is the basis for the evaluation of vanadium (Tier 1). The previous source of the RfD was the National Center for Environmental Assessment (NCEA) (Tier 3). The current source of the RfD for vanadium is vanadium pentoxide on 1RV with an adjustment by the Regional Screening Levels (RSLs) tables (EPA, 2009), based on molecular weight. The revised Risk Assessment Guidance for Superfund (RAGS) Part D Table 5.1, which includes the updated RfD for vanadium, is included in Appendix B.

The risk of adverse non-carcinogenic effects from chemical exposure is expressed in terms of the hazard quotient (HQ). The HQ is the ratio of the daily intake (DI) that a human receives to the RfD. The RfD is the estimated dose below which it is unlikely for even sensitive populations to experience adverse health effects. The HQ is calculated as follows:

HQ = DI/RfD

where:

HQ = Hazard Quotient (unitless)
DI = Daily Intake (mg/kg/day)
RfD = Reference Dose (mg/kg/day)

All of the HQ values for chemicals within each exposure pathway are summed to yield the HI. Each pathway HI within a land use scenario (i.e., future worker) is summed to yield the total HI for the receptor. If the value of the total HI is less than 1.0, it is interpreted that the risk of non-carcinogenic injury is low. If the total HI is greater than 1.0, it is indicative of some degree of non-carcinogenic risk, or effect, and COCs are selected.

The Final BHHRA completed in 2006 concluded that the hazards for the future construction worker and adult and child residents were above the applicable thresholds (a total HI greater 1) and the results of the addendum support those conclusions.

Risk Characterization

Included in Appendix B, of the risk assessment addendum, are RAGS Part D Tables 7.14 RME and 7.14 RME Revised. Table 7.14 RME is the original non-cancer hazard calculation using the RfD for vanadium obtained from the EPA Region 9 PRG table (NCEA). Table 7.14 RME Revised incorporates the RfD from IRIS. The HQ for vanadium associated with incidental ingestion of soil decreased from 0.6 to 0.1; for dermal contact the HQ decreased from 0.03 to 0.01. The total HQ for vanadium exposure in surface soil decreased from to 0.6 to 0.1.

The BHHRA completed in 2006 concluded that the total Hazard Indices for future construction worker and resident were above applicable thresholds (total HI greater than 1). The revised risk assessment, however; shows that all HI values are less than 1.

Remedial Goal Options

The site-specific exposure assumptions and models were used to develop the cleanup levels for the site. As a result, the risk level for a given chemical is directly proportional to the exposure concentration. The following equation was used to calculate the chemical-specific risk-based RGOs:

Remediation Goal = TR x EC / CR

where:

TR = Target Risk Level (HQ equal to 0.1, 1, and 3 for non-carcinogenic effects and risk level equal to 1E-06, 1E-05, and 1E-04 for carcinogenic effects).
EC = Exposure Point Concentrations in Soil
CR = Calculated Risk Level.

The use of the exposure point concentration for vanadium of 47.95 mg/kg and the total HQ for vanadium calculated in this addendum results in a five-fold increase in the cleanup levels. Appendix B shows the cleanup levels for the child resident that were developed and presented in the BHHRA in 2006 and the revised cleanup levels calculated for the child resident using the updated RfD.

Conclusions

The Final BHHRA prepared for OU 1 in 2006 determined that vanadium was the COC in surface and subsurface soil. Concentrations of vanadium were found in both surface and subsurface soil above the child resident HI of 1. The risk-based RGO calculated for the child resident, the most sensitive receptor was 73 mg/kg (HQ=1).

Toxicity information is subject to revision and is updated once new data becomes available. Such is the case with vanadium, where the RfD was revised upward from 1 x 10^{-3} to 5E-3 mg/kg/day. This five-fold increase has a dramatic effect on the calculated hazard and cleanup levels. The cleanup levels for soil and stockpile for the child resident exposure pathway increased from 73 mg/kg to 365 mg/kg.

It was previously determined that vanadium was the only COC in surface and subsurface soil. However, this BHHRA addendum determined that none of the individual

concentrations for vanadium in soil exceeded the revised child resident cleanup levels of 365 mg/kg. Therefore, vanadium is no longer a COC in surface and subsurface soil. The BHHRA addendum for vanadium in soil is included in Appendix B. However, since the stockpile is contaminated with arsenic and benzo (a) pyrene the 2006 remedy will still be implemented.

2.3 Summary of Human Health Risk Evaluation for the Stockpile

Data obtained from the April 2009 stockpile soil investigation conducted by the Science and Ecosystem Support Division (SESD) was screened according to EPA Region 4 policy. COPCs were identified and exposure point concentrations (EPCs) based on the maximum detected concentration were established. Residential exposure assumptions were applied to the resultant EPCs.

According to EPA Region 4's policy, the target total individual risk resulting from exposures at a Superfund site may range anywhere between 1×10^{-6} and 1×10^{-4}. Thus, remedial alternatives should be capable of reducing total potential carcinogenic risks to levels within this range for individual receptors.

The total estimated cancer risk for the current and future residents (3×10^{-5}) is within the EPA target cancer risk range of $1x10^{-6}$ to $1x10^{-4}$ with arsenic and benzo(a) pyrene being the main contributors. The total hazard index for current and future child resident is 3, which is above the EPA threshold of 1; however, individual target organ HIs do not exceed 1. The hazard quotients for aluminum, antimony, arsenic, iron and thallium were all greater than 0.1 but less than 1. According to EPA OSWER Directive 9355.0-30, site-specific conditions may be used to justify cleanup (EPA, 1991). The stockpile contaminated with arsenic and benzo (a) pyrene is located in the southern portion of the site near residential properties. Disturbance of the stockpile was observed, leading to speculation that contaminated stockpile material may have been taken off site and used in ways that add uncertainty to the risk assessment results, such as use for gardening or topsoil on residential properties. The human health risk evaluation is included as Appendix B.

Even though the cancer risks are within EPA's risk range and there is no individual target organ specific hazard quotient greater than one, a remedial action is planned because of site specific conditions present at the site. The stockpile was originally excavated because of the contamination that was impacting groundwater and the lagoons

contained high concentrations of metals and other contaminants. There is a large degree of uncertainty in sampling a pile in its excavated form and it is known that this pile includes septic waste (including biological contamination) that may or may not show up in sampling data. Also, since groundwater levels exceed drinking water MCLs and/or risk based levels, and the stockpile is a likely source of contaminants, removal of this source should enhance the prospects for success of the groundwater remedy. The soil data has been compared with soil levels that consider leaching to groundwater. Since the soil levels for arsenic exceed the leach-based concentrations, removal or remediation of the soil in the stockpile is justified in helping to protect for health based standards in groundwater.

3.0 DESCRIPTION OF REMEDY CHANGES

Differences between the 2006 ROD and the current ROD Amendment are outlined below:

- In the 2006 ROD, soil and stockpile contaminated with vanadium above 73 mg/kg required excavation, transportation and disposal at a Subtitle D landfill. The excavated area was to be backfilled with clean borrow material from a local source, and then the Site would be revegetated and restored to safe and usable conditions. In this ROD Amendment, only the stockpile with contaminants including arsenic and PAHs will be disposed at a Subtitle D landfill.

- This ROD Amendment documents a decrease in the estimate of contaminated soil to be excavated, evaluated and, if necessary, treated and properly disposed, from 12,000 cubic yards to 4,100 cubic yards.

- This ROD Amendment documents a decrease in the estimated cost of the remedy, from approximately $2,100,000, million to $906,000.

- The 2006 ROD estimated an excavation range of 1 to 2 feet for the soils and 1 to 7 feet for the stockpile to achieve cleanup goals. This ROD Amendment documents that that the stockpile will be removed to six inches below native grade material. Then confirmatory sampling will be conducted.

- The cleanup level required for vanadium in the 2006 ROD was 73 kg/mg. In the ROD Amendment, the cleanup level for arsenic is 3-10 mg/kg and for benzo(a)pyrene equivalent is 60 ug/kg; no cleanup is required for vanadium in soil.

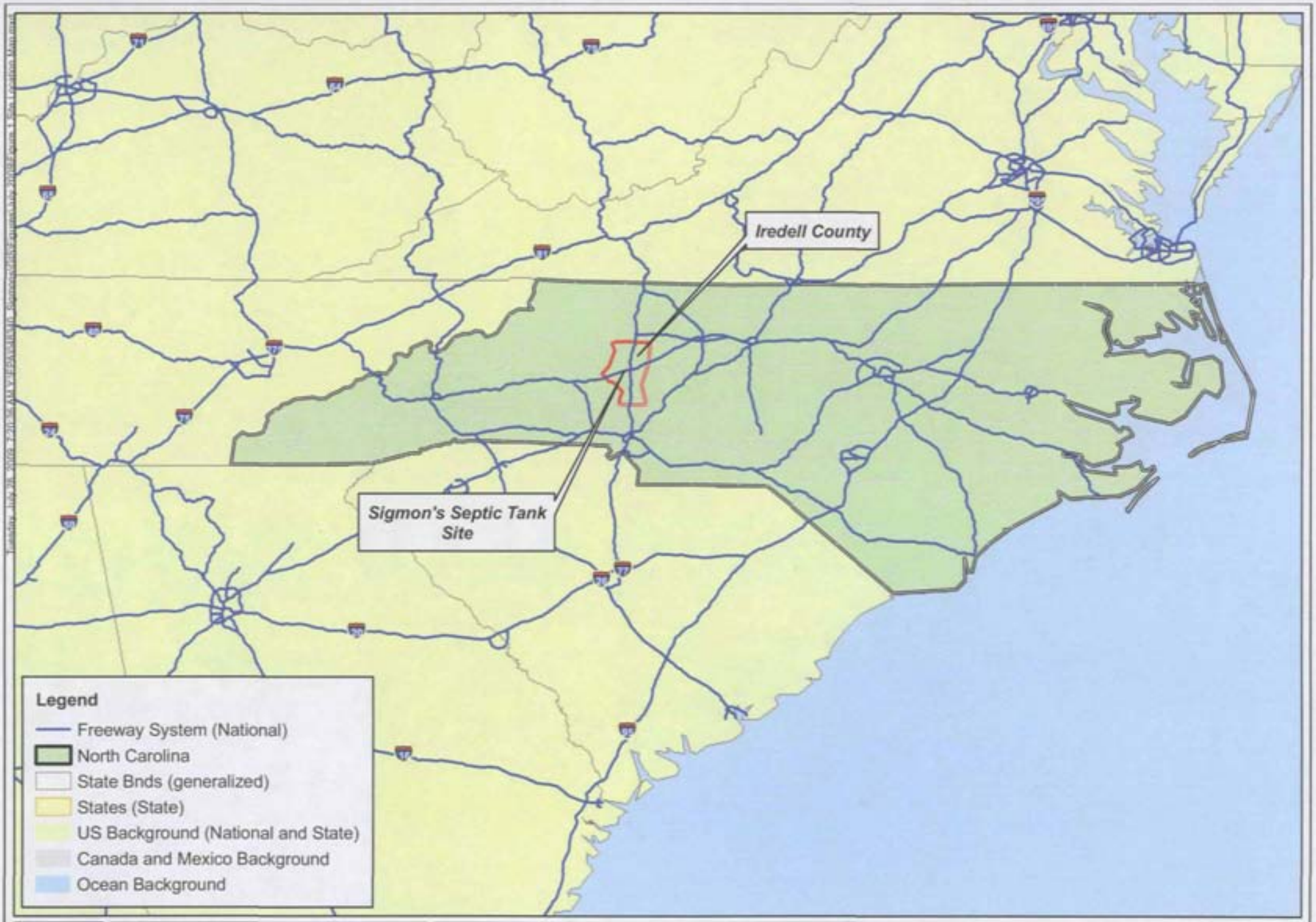
TABLE 1. SUMMARY OF AMENDED RECORD OF DECISION

	2006 Remedy	Revisions in this AROD	Difference
Volume of contaminated soil and stockpile for excavation	12,000 cy	4,100 cy	7,900 cy
Depth of excavation	2 feet for soils and 7 feet for the stockpile	No excavation of soil other than the stockpile 6 inches below native grade materials in the stockpile footprint	No soil excavation required beyond the stockpile
Estimated Area to be Graded	15.3 acres	1 acre	14.3 acres
Soil and stockpile with vanadium concentrations above 73 ppm	Excavation, onsite treatment with solidification/stabilization, and off-site disposal of treated waste at a Subtitle D landfill	Only the stockpile with Arsenic background concentrations which range from 3 - 10ppm and benzo(a) pyrene equivalent above 60 ug/kg will be transported to a Subtitle D landfill	Change from remediation of soils and stockpile to the removal of the stockpile contaminated with arsenic and benzo(a)pyrene equivalent.
Estimated Cost	$2.1 million	$906,000	$1,194,000

4.0 STATUTORY DETERMINATIONS

Under its legal authorities, EPA's primary responsibility at Superfund sites is to select remedial actions that are protective of human health and the environment. In addition, Section 121 of CERCLA established several other statutory requirements and preferences. These specify that when complete, the selected remedial action for a site must comply with applicable or relevant and appropriate environmental standards established under Federal and State environmental laws unless a statutory waiver is granted. The selected remedy must also be cost-effective and utilize permanent treatment technologies or resource recovery technologies to the maximum extent practicable. Finally, the statute includes a preference for remedies that permanently and significantly reduce the volume, toxicity, or mobility of hazardous wastes.

Considering the new information now available and the changes been made to the selected remedy by this ROD amendment, USEPA believes that the excavation remedy will be protective of human health and the environment and complies with federal and state requirements that were identified in the September 2006 ROD as applicable or relevant and appropriate to this remedial action. In addition, the revised remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable for this site.



Site Location Map
Sigmon's Septic Tank Site
Statesville, Iredell County, North Carolina

Figure 1

Site Layout
Sigmon's Septic Tank Site
Statesville, Iredell County, North Carolina

Figure 2

Note: "0 ft" around perimeter of pile and associated features indicates local ground surface. Footage indicated inside pile and features is estimated height, above ground surface, at the indicated location.

Figure 3
Pile Morphology
Sigmon's Septic Tank Superfund Site
Statesville, Iredell County, North Carolina

APPENDIX A

State of North Carolina Concurrence Letter

NCDENR
North Carolina Department of Environment and Natural Resources
Division of Waste Management

Beverly Eaves Perdue
Governor

Dexter R. Matthews
Director

Dee Freeman
Secretary

24 August 2009

Ms. Beverly Stepter
Superfund Branch, Waste Management Division
US EPA Region IV
61 Forsyth Street. SW
Atlanta, Georgia 30303

SUBJECT: Concurrence with Amended Record of Decision
Sigmon's Septic Tank Site Operable Unit 1
Statesville, Iredell County

Dear Ms. Stepter:

The State of North Carolina by and through its Department of Environment and Natural Resources, Division of Waste Management (herein after referred to as "the state"), reviewed the Amended Record of Decision (AROD) received by the Division on 24 August 2009 for the Sigmon's Septic Tank Site Operable Unit 1 Site and concurs with the selected remedy, subject to the following conditions:

1. State concurrence on the AROD for this site is based solely on the information contained in the AROD received by the State on 24 August 2009. Should the State receive new or additional information which significantly affects the conclusions or amended remedy contained in the AROD, it may modify or withdraw this concurrence with written notice to EPA Region IV.

2. State concurrence on this AROD in no way binds the State to concur in future decisions or commits the State to participate, financially or otherwise, in the clean up of the site. The State reserves the right to review, overview comment, and make independent assessment of all future work relating to this site.

3. If, after remediation is complete, the total residual risk level exceeds 10^{-6}, the State may require deed recordation/restriction to document the presence of residual contamination and possibly limit future use of the property as specified in NCGS 130A-310.8

1646 Mail Service Center, Raleigh, North Carolina 27699-1646
Phone: 919-508-8400 \ FAX: 919-715-4061 \ Internet: www.wastenotnc.org

The State of North Carolina appreciates the opportunity to comment on the AROD and looks forward to working with EPA on the remedy for the subject site. If you have any questions or comments, please call Mr. Nile Testerman at 919 508-8482.

Sincerely,

Dexter R. Matthews, Director
Division of Waste Management

cc: Jack Butler, Chief NC Superfund Section
David Lown, NC Superfund
Nile Testerman, NC Superfund

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APPENDIX B

Addendum to the Baseline Human Health Risk Assessment for Operable Unit 1 – Vanadium in Soil

and

Human Health Risk Evaluation for Arsenic and CPAHs in the Stockpile

BLACK & VEATCH

Technical Memorandum

To: Beverly Stepter, EPA Remedial Project Manager

From: Gina Kelly Montgomery, Black & Veatch Project Manager

Re: Addendum to the Baseline Human Health Risk Assessment for Operable Unit 1
Re-evaluation of Vanadium in Soil - Human Health Exposure
Sigmon's Septic Tank Superfund Site
Statesville, Iredell County, North Carolina

Date: May 15, 2009

Introduction

The purpose of this technical memorandum is to serve as an addendum to the Final Baseline Human Health Risk Assessment (BHHRA) completed in March 2006, for the Sigmon's Septic Tank Superfund Site (SSTS), Operable Unit (OU) 1, located in Statesville, Iredell County, North Carolina. This memorandum will also present revised site-specific remediation goal options (RGOs) for vanadium in surface soil.

The Final BHHRA for SSTS OU 1 prepared by Black & Veatch in 2006, addressed contamination in soil, sediment, surface water, and presented a limited ground water evaluation (Black & Veatch, 2006). Black & Veatch used appropriate United States Environmental Protection Agency (EPA) guidance to evaluate the data, characterize potentially exposed populations, assess the toxicity of chemicals of potential concern (COPCs), characterize the risk, and calculate the RGOs. An addendum is needed to re-evaluate human health exposure to vanadium in surface and subsurface soil at SSTS OU 1. Vanadium is considered a systemic toxicant or one that causes non-carcinogenic health effects. The oral reference dose (RfD) for vanadium has been recently updated from 1E-03 milligrams per kilogram per day (mg/kg/day) to 5E-03 mg/kg/day and the dermal RfD changed from 2.6E-04 mg/kg/day to 1.3E-03 mg/kg/day.

Background

Toxicity criteria used to evaluate potential non-carcinogenic health effects are termed reference doses, or RfDs. In developing RfDs, it is assumed that a threshold dose exists below which there is no potential for human toxicity. The term RfD was developed by the EPA to refer to the daily

intake of a chemical to which an individual can be exposed without any expectation of non-carcinogenic effects (e.g., organ damage, biochemical alterations, birth defects) occurring during a given exposure period.

The toxicity values used to evaluate vanadium were obtained from the following hierarchy of sources in accordance with the EPA Office of Superfund Remediation and Technology Innovation (OSRTI) (EPA, 2003):

- Tier 1 - Integrated Risk Information System (IRIS)
- Tier 2 - Provisional Peer-Reviewed Toxicity Values (PPRTV)
- Tier 3 - Other (Peer Reviewed) Values, including: Agency for Toxic Substances Disease Registry (ATSDR) Minimal Risk Levels (MRLs); California Environmental Protection Agency values; and Health Effects Assessment Summary Tables (HEAST)

The IRIS RfD for vanadium peroxide is the basis for the evaluation of vanadium (Tier 1). The previous source of the RfD was the EPA National Center for Environmental Assessment (NCEA) (Tier 3). The current source of the RfD for vanadium is EPA IRIS adapted by the Regional Screening Levels (RSLs) tables (Tier 3) (EPA, 2008). There is a higher level of uncertainty associated with these sources, compared to sources considered Tier 1 and Tier 2 values. The revised Risk Assessment Guidance for Superfund (RAGS) Part D Table 5.1, which includes the updated RfD for vanadium, is included in Appendix A.

The risk of adverse non-carcinogenic effects from chemical exposure is expressed in terms of the hazard quotient (HQ). The HQ is the ratio of the daily intake (DI) that a human receives to the RfD, the estimated dose below which it is unlikely for even sensitive populations to experience adverse health effects. The HQ is calculated as follows (EPA, 1989):

$$HQ = DI/RfD$$

Where:

HQ = Hazard Quotient (unitless)
DI = Daily Intake (mg/kg/day)
RfD = Reference Dose (mg/kg/day)

All of the HQ values for chemicals within each exposure pathway are summed to yield the hazard index (HI). Each pathway HI within a land use scenario (i.e., future worker) is summed to yield the

total HI for the receptor. If the value of the total HI is less than 1.0, it is interpreted to mean that the risk of non-carcinogenic injury is low. If the total HI is greater than 1.0, it is indicative of some degree of non-carcinogenic risk, or effect, and chemicals of concern (COCs) are selected (EPA, 2000).

The Final BHHRA completed in 2006 concluded that the hazards for the future construction worker and adult and child residents were above the applicable thresholds (a total HI greater 1) and the results of this addendum support those conclusions.

Risk Characterization

Included in Appendix A are RAGS Part D Tables 7.14 RME and 7.14 RME Revised. Table 7.14 RME is the original non-cancer hazard calculation using the RfD for vanadium obtained from the EPA Region 9 PRG table. Table 7.14 RME Revised incorporates the RfD from the RSLs table. The HQ for vanadium associated with incidental ingestion of soil went from 0.6 to 0.1; for dermal contact the HQ went from 0.03 to 0.01. The total HQ for vanadium exposure in surface soil went from to 0.6 to 0.1.

Remedial Goal Options

The site-specific exposure assumptions and models were used to develop the RGOs the site. This leads to the risk level for a given chemical being directly proportional to the exposure concentration. The following equation was used to calculate the chemical-specific risk-based RGOs:

Remediation Goal = TR x EC / CR

Where:

TR	=	Target Risk Level (HQ equal to 0.1, 1, and 3 for non-carcinogenic effects and risk level equal to 1E-06, 1E-05, and 1E-04 for carcinogenic effects).
EC	=	Exposure Point Concentrations in Soil
CR	=	Calculated Risk Level.

The use of the exposure point concentration for vanadium of 47.95 milligrams per kilogram (mg/kg) and the total HQ for vanadium calculated in this addendum, results in a five-fold increase in the RGOs. Table 1 shows the RGOs for the child resident that were developed and presented in the BHHRA in 2006 and the revised RGOs calculated for the child resident using the updated RfD.

Conclusions

The Final BHHRA prepared for SSTS OU 1 in 2006 determined that vanadium was the COC in soil. Concentrations of vanadium were found in both onsite and off-site soils above the child resident hazard index (HI) of 1. The risk-based RGO calculated for the child resident, the most sensitive receptor was 73 mg/kg (HQ=1).

Toxicity information is subject to revision and is updated once new data becomes available. Such is the case with vanadium, where the RfD was revised upward from 1E-3 to 5E-3 mg/kg/day. This five-fold increase has a dramatic effect on the calculated hazard and RGOs. The RGO for soil for the child resident increased from 73 mg/kg to 365 mg/kg.

It was previously determined that vanadium was the only COC in soil. However, this addendum determined that none of the individual concentrations for vanadium in soil exceeded the revised child resident RGO of 365 mg/kg. Therefore, soil is no longer a media of concern at the SSTS.

References

Black & Veatch, 2006. Black & Veatch Special Projects Corp. *Final Baseline Risk Assessment for Human Health, Sigmon's Septic Tank Site, Iredell County, North Carolina, June.*

EPA, 1989. U.S. Environmental Protection Agency, *Risk Assessment Guidance for Superfund* (RAGS), *Volume I, Human Health Evaluation Manual (Part A)*, Interim Final, Office of Emergency and Remedial Response, Washington, DC, EPA/540/1-89/002, 1989.

EPA, 2000. U.S. Environmental Protection Agency, *Supplemental to RAGS: Region 4 Bulletins Human Health Risk Assessment Bulletins*, EPA Region 4 Originally Published in November 1995: http://www.epa.gov/region4/waste/oftecser/healtbul.htm, 2000.

EPA, 2003. U.S. Environmental Protection Agency, *Human Health Toxicity Values in Superfund Risk Assessments*, Office of Superfund Remediation and Technology Innovation, OSWER Directive 9285.7-53, December 5.

EPA, 2008. U.S. Environmental Protection Agency, *Regional Screening Levels (RSLs)*, September 12. http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/index.htm.

TABLE 1
REMEDIAL GOAL OPTION CALCULATIONS FOR SIGMON'S SEPTIC TANK OU 1 - VANADIUM IN SOIL

Receptor/Analyte	Exposure Point Concentration (mg/kg)	Hazard Totals			Total	Hazard Quotient Level (mg/kg)		
		Ingestion	Inhalation	Dermal	NonCancer	HQ=0.1	HQ=1	HQ=3
Future Child Resident Surface Soil								
2006 Calculation Vanadium	47.95	0.6	--	0.03	0.65	7.3	73	219
2009 Revised Calculation Using Updated RfD Vanadium	47.95	0.1	--	0.01	0.13	37	365	1,096

mg/kg = Milligrams per kilogram

RfD = Reference dose

TABLE 5.1 REVISED
NON-CANCER TOXICITY DATA – ORAL/DERMAL
Sigmon's Septic Tank
Statesville, Iredell County, North Carolina

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD		Oral Absorption Efficiency for Dermal (1)	Absorbed RfD for Dermal (2)		Primary Target Effect	Combined Uncertainty/Modifying Factors	RfD:Target Organ(s)	
		Value	Units		Value	Units			Source(s) (3)	Date(s) (MM/DD/YYYY)
Vanadium	Chronic/Subchronic	5E-03/NA	mg/kg-day	0.26	1.3E-03	mg/kg-day	Decreased Cystine in Hair	N/A	RSL	9/12/2008

N/A - Not Applicable
RSL - EPA Regional Screening Level (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/index.htm)
mg/kg-day - Milligrams per kilograms per day

(1) Refer to RAGS Part E (2004) and text for explanation. Note: Oral to Dermal Adjustment Factors from Exhibit 4-1, RAGS Part E, 2004
(2) See RAGS Part E (2004), Page 4-3. Note: Dermal RfD (mg/kg) = Oral RfD (mg/kg) x Oral to Dermal Adjustment Factor
(3) RSL Table (values obtained date Indicated), based on EPA IRIS.

TABLE 7.14 RME 2006

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

Sigmon's Septic Tank

Statesville, Iredell County, North Carolina

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC Value	EPC Units	Cancer Risk Calculations: Intake/Exposure Concentration Value	Intake/Exposure Concentration Units	CFS/Unit Risk Value	CFS/Unit Risk Units	Cancer Risk	Non-Cancer Hazard Calculations: Intake/Exposure Concentration Value	Intake/Exposure Concentration Units	RfD/RfC Value	RfD/RfC Units	Hazard Quotient
Soil/Dry Sediment	Soil/Dry Sediment	face Soil/Dry Sedim Offsite	Ingestion	Aluminum	20549	mg/kg	2.3E-002	mg/kg/day	NA	l/mg/kg/day	NA	2.7E-001	mg/kg/day	1.0E+000	mg/kg/day	0.27
				Arsenic	2.0	mg/kg	2.2E-006	mg/kg/day	1.5E+000	l/mg/kg/day	3.3E-006	2.6E-005	mg/kg/day	3.0E-004	mg/kg/day	0.09
				Chromium	20.04	mg/kg	2.2E-005	mg/kg/day	NA	l/mg/kg/day	NA	2.6E-004	mg/kg/day	3.0E-003	mg/kg/day	0.09
				Iron	19367	mg/kg	2.1E-002	mg/kg/day	NA	l/mg/kg/day	NA	2.5E-001	mg/kg/day	3.0E-001	mg/kg/day	0.84
				Manganese	210	mg/kg	2.3E-004	mg/kg/day	NA	l/mg/kg/day	NA	2.7E-003	mg/kg/day	7.0E-002	mg/kg/day	0.04
				Vanadium	47.95	mg/kg	5.3E-005	mg/kg/day	NA	l/mg/kg/day	NA	6.2E-004	mg/kg/day	1.0E-003	mg/kg/day	0.62
				2,3,7,8-TCDD TEQ	0.0000071	mg/kg	7.8E-012	mg/kg/day	1.5E+005	l/mg/kg/day	1.2E-006	9.2E-011	mg/kg/day	N/A	mg/kg/day	NA
			Exp. Route Total								4E-006					2
			Dermal													
				Aluminum	20549	mg/kg	3.1E-004	mg/kg/day	NA	l/mg/kg/day	NA	3.7E-003	mg/kg/day	1.0E+000	mg/kg/day	0.0037
				Arsenic	2.0	mg/kg	3.0E-006	mg/kg/day	1.4E+000	l/mg/kg/day	4.2E-008	3.6E-007	mg/kg/day	3.0E-004	mg/kg/day	0.0012
				Chromium	20.04	mg/kg	3.0E-007	mg/kg/day	NA	l/mg/kg/day	NA	3.6E-006	mg/kg/day	7.5E-005	mg/kg/day	0.048
				Iron	19367	mg/kg	2.9E-004	mg/kg/day	NA	l/mg/kg/day	NA	3.5E-003	mg/kg/day	3.0E-001	mg/kg/day	0.012
				Manganese	210	mg/kg	3.2E-006	mg/kg/day	NA	l/mg/kg/day	NA	3.8E-005	mg/kg/day	2.8E-003	mg/kg/day	0.014
				Vanadium	47.95	mg/kg	7.2E-007	mg/kg/day	NA	l/mg/kg/day	NA	8.6E-006	mg/kg/day	2.6E-004	mg/kg/day	0.03
				2,3,7,8-TCDD TEQ	0.0000071	mg/kg	1.1E-013	mg/kg/day	1.5E+005	l/mg/kg/day	1.6E-008	1.3E-012	mg/kg/day	NA	mg/kg/day	NA
			Exp. Route Total								6E-008					0.1
		Exposure Point Total									5E-006					2
	Exposure Medium Total										5E-006					2
Soil/Dry Sediment Total											**5E-006**					**2**
Surface Water	Surface Water	Intermittent Stream	Ingestion	Arsenic	0.00094	mg/L	7.1E-008	mg/kg/day	1.5E+000	l/mg/kg/day	1.1E-007	8.3E-007	mg/kg/day	3.0E-004	mg/kg/day	0.0028
				Iron	22	mg/L	1.7E-003	mg/kg/day	NA	l/mg/kg/day	NA	1.9E-002	mg/kg/day	3.0E-001	mg/kg/day	0.0645
				Manganese	1.2	mg/L	9.0E-005	mg/kg/day	NA	l/mg/kg/day	NA	1.1E-003	mg/kg/day	7.0E-002	mg/kg/day	0.0151
				Vanadium	0.0051	mg/L	3.8E-007	mg/kg/day	NA	l/mg/kg/day	NA	4.5E-006	mg/kg/day	1.0E-003	mg/kg/day	0.0045
			Exp. Route Total								NA					0.087
		Exposure Point Total									NA					0.09
	Exposure Medium Total										NA					0.09
Surface Water Total											NA					**0.09**
Groundwater	Groundwater	Groundwater Tap Water	Ingestion	1,4-Dichlorobenzer	0.0074	mg/L	4.1E-005	mg/kg/day	2.4E-002	l/mg/kg/day	9.8E-007	4.7E-004	mg/kg/day	3.0E-002	mg/kg/day	0.02
				Benzene	0.00079	mg/L	4.3E-006	mg/kg/day	5.5E-002	l/mg/kg/day	2.4E-007	5.1E-005	mg/kg/day	4.0E-003	mg/kg/day	0.01
				Chloroform	0.00049	mg/L	2.7E-006	mg/kg/day	1.00E-002	l/mg/kg/day	2.7E-008	3.1E-005	mg/kg/day	1.0E-002	mg/kg/day	0.003
				Trichloroethene (T	0.00024	mg/L	1.3E-006	mg/kg/day	NA	l/mg/kg/day	NA	1.5E-005	mg/kg/day	3.0E-004	mg/kg/day	0.05
				2-Methylnaphthale	0.00071	mg/L	3.9E-006	mg/kg/day	NA	l/mg/kg/day	NA	4.5E-005	mg/kg/day	4.0E-003	mg/kg/day	0.01
				Naphthalene	0.0018	mg/L	9.9E-006	mg/kg/day	NA	l/mg/kg/day	NA	1.2E-004	mg/kg/day	2.0E-002	mg/kg/day	0.01
				Aldrin	0.00003	mg/L	1.7E-007	mg/kg/day	1.7E+001	l/mg/kg/day	2.8E-006	1.9E-006	mg/kg/day	3.0E-005	mg/kg/day	0.06
				alpha-BHC	0.000028	mg/L	1.5E-007	mg/kg/day	6.3E+000	l/mg/kg/day	9.7E-007	1.8E-006	mg/kg/day	8.0E-003	mg/kg/day	0.0002
				beta-BHC	0.000088	mg/L	4.8E-007	mg/kg/day	1.8E+000	l/mg/kg/day	8.7E-007	5.6E-006	mg/kg/day	2.0E-004	mg/kg/day	0.03
				Heptachlor	0.0000395	mg/L	2.2E-007	mg/kg/day	4.50E+000	l/mg/kg/day	9.8E-007	2.5E-006	mg/kg/day	5.0E-004	mg/kg/day	0.01
				Aluminum	9.579	mg/L	5.3E-002	mg/kg/day	NA	l/mg/kg/day	NA	6.1E-001	mg/kg/day	1.0E+000	mg/kg/day	0.61

TABLE 7.14 RME 2006

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

Sigmon's Septic Tank

Statesville, Iredell County, North Carolina

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CFS/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
				Arsenic	0.004	mg/L	2.2E-005	mg/kg/day	1.5E+000	1/mg/kg/day	3.3E-005	2.6E-004	mg/kg/day	3.0E-004	mg/kg/day	0.85
				Barium	1.07	mg/L	5.9E-003	mg/kg/day	NA	1/mg/kg/day	NA	6.8E-002	mg/kg/day	7.0E-002	mg/kg/day	0.98
				Iron	5.8	mg/L	3.2E-002	mg/kg/day	NA	1/mg/kg/day	NA	3.7E-001	mg/kg/day	3.0E-001	mg/kg/day	1.2
				Lead	0.0086	mg/L	4.7E-005	mg/kg/day	NA	1/mg/kg/day	NA	5.5E-004	mg/kg/day	NA	mg/kg/day	NA
				Manganese	15.133	mg/L	8.3E-002	mg/kg/day	NA	1/mg/kg/day	NA	9.7E-001	mg/kg/day	7.0E-002	mg/kg/day	13.8
				Mercury	0.044	mg/L	2.4E-004	mg/kg/day	NA	1/mg/kg/day	NA	2.8E-003	mg/kg/day	3.0E-004	mg/kg/day	9.4
				Vanadium	0.0243	mg/L	1.3E-004	mg/kg/day	NA	1/mg/kg/day	NA	1.6E-003	mg/kg/day	1.0E-003	mg/kg/day	1.6
			Exp. Route Total								4E-005					29
		Exposure Point Total									4E-005					29
	Exposure Medium Total										4E-005					29
Groundwater	Groundwater	Groundwater Tap Water	Inhalation of VOCs while Showering	1,4-Dichlorobenz	0.0074	mg/L	4.1E-005	mg/kg/day	NA	1/mg/kg/day	NA	4.7E-004	mg/kg/day	2.3E-001	mg/kg/day	0.002
				Benzene	0.00079	mg/L	4.3E-006	mg/kg/day	2.7E-002	1/mg/kg/day	1E-007	5.1E-005	mg/kg/day	8.6E-003	mg/kg/day	0.006
				Chloroform	0.00049	mg/L	2.7E-006	mg/kg/day	8.1E-002	1/mg/kg/day	2E-007	3.1E-005	mg/kg/day	NA	mg/kg/day	NA
				Trichloroethene	0.00024	mg/L	1.3E-006	mg/kg/day	NA	1/mg/kg/day	NA	1.5E-005	mg/kg/day	1.0E-002	mg/kg/day	0.002
			Exp. Route Total								3E-007					0.009
		Exposure Point Total									3E-007					0.009
	Exposure Medium Total										3E-007					0.009
Groundwater Total											4E-005					29
										Total of Receptor Risks Across All Media	4E-005			**Total of Receptor Hazards Across All Media**		31

TABLE 7.14 RME REVISED 2009
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
Sigmon's Septic Tank
Statesville, Iredell County, North Carolina

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CFS/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil/Dry Sediment	Soil/Dry Sediment	Surface Soil/Dry Sediment Offsite	Ingestion	Vanadium	47.95	mg/kg	5.3E-005	mg/kg/day	NA	1/mg/kg/day	NA	6.2E-004	mg/kg/day	5.00E-003	mg/kg/day	0.12
			Exp. Route Total													0.12
			Dermal	Vanadium	47.95	mg/kg	7.2E-005	mg/kg/day	NA	1/mg/kg/day	NA	8.4E-006	mg/kg/day	1.30E-003	mg/kg/day	0.01
			Exp. Route Total													0.01
		Exposure Point Total														0.13
	Exposure Medium Total															0.13
Soil/Dry Sediment Total																**0.13**
											Total of Receptor Risks Across All Media				**Total of Receptor Hazards Across All Media**	**0.13**

BLACK & VEATCH

Technical Memorandum

To: Beverly Stepter, EPA Remedial Project Manager

From: Mike Profit, Black & Veatch

Re: Human Health Risk Evaluation
Stockpile Samples
Sigmon's Septic Tank Superfund Site
Statesville, Iredell County, North Carolina

Date: June 12, 2009

Data obtained from the April 2009 stockpile soil investigation conducted by Science and Ecosystem Support Division (SESD) was screened according to Environmental Protection Agency (EPA) Region 4 policies. Chemicals of potential concern (COPCs) were selected and exposure point concentrations based on the maximum detected concentration were established. Residential exposure assumptions were applied to the resultant exposure point concentrations (EPCs).

According to EPA Region 4's policy, the target total individual risk resulting from exposures at a Superfund site may range anywhere between 1×10^{-6} and 1×10^{-4} (EPA, 2000). Thus, remedial alternatives should be capable of reducing total potential carcinogenic risks to levels within this range for individual receptors.

The total estimated cancer risk for the current and future residents (3×10^{-5}) is within the EPA target cancer risk range of 1×10^{-6} to 1×10^{-4}. The total hazard index for current and future child residents is 3, which is above the EPA threshold of 1. However, when target organs are evaluated, none exceeds 1. This indicates that noncancer health effects will most likely not occur from residential exposures at the site.

OSWER Directive 9355.0-30, issued on April 22, 1991, provides further insight into the acceptable risk range when it states: "Where the cumulative carcinogenic site risk to an

individual based on reasonable maximum exposure for both current and future land use is less than 1×10^{-4}, and the non-carcinogenic hazard quotient is less than 1, action generally is not warranted unless there are adverse environmental impacts. A risk manager may also decide that a baseline risk level less than 1×10^{-4} is unacceptable due to site-specific reasons and that a remedial action is warranted. The upper boundary of the risk range is not a discrete line at 1×10^{-4}, although EPA generally uses 1×10^{-4} in making risk management decisions. A specific risk estimate around 1×10^{-4} may be considered acceptable if justified based on site-specific conditions."

EPA, 2000. U.S. Environmental Protection Agency, *Supplemental to RAGS: Region 4 Bulletins Human Health Risk Assessment Bulletins,* EPA Region 4 Originally Published in November 1995: http://www.epa.gov/region4/waste/oftecser/healtbul.htm, 2000.

Table 7.1.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Sigmon's Septic Tank Superfund Site

Scenario Timeframe:	Current/Future
Receptor Population:	Resident
Receptor Age:	Lifetime (cancer), Child (noncancer)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
							Intake/ Exposure Concentration		CSF/Unit Risk		Cancer	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Units	Value	Units	Value	Units	Risk	Value	Units	Value	Units	Quotient
Soil	Soil	Stockpile	Ingestion	Aluminum	3.9E+04	mg/kg	6E-02	mg/kg	NA	NA	NA	5.0E-01	mg/kg	1E+00	(mg/kg-day)	0.5
				Antimony	1.3E+01	mg/kg	2E-05	mg/kg	NA	NA	NA	1.7E-04	mg/kg	4E-04	(mg/kg-day)	0.4
				Arsenic	3.4E+00	mg/kg	5E-06	mg/kg	1.5E+00	(mg/kg-day)-1	8E-06	4.3E-05	mg/kg	3E-04	(mg/kg-day)	0.1
				Chromium	2.2E+02	mg/kg	3E-04	mg/kg	NA	NA	NA	2.8E-03	mg/kg	2E+00	(mg/kg-day)	0.0
				Cobalt	1.2E+01	mg/kg	2E-05	mg/kg	NA	NA	NA	1.5E-04	mg/kg	3E-04	(mg/kg-day)	0.5
				Copper	4.3E+02	mg/kg	7E-04	mg/kg	NA	NA	NA	5.5E-03	mg/kg	4E-02	(mg/kg-day)	0.1
				Iron	2.6E+04	mg/kg	4E-02	mg/kg	NA	NA	NA	3.3E-01	mg/kg	7E-01	(mg/kg-day)	0.5
				Manganese	4.4E+02	mg/kg	7E-04	mg/kg	NA	NA	NA	5.6E-03	mg/kg	1E-01	(mg/kg-day)	0.04
				Mercury	1.3E+00	mg/kg	2E-06	mg/kg	NA	NA	NA	1.7E-05	mg/kg	NA	NA	NA
				Nickel	2.3E+02	mg/kg	4E-04	mg/kg	NA	NA	NA	2.9E-03	mg/kg	2E-02	(mg/kg-day)	0.1
				Thallium	7.6E-01	mg/kg	1E-06	mg/kg	NA	NA	NA	9.7E-06	mg/kg	7E-05	(mg/kg-day)	0.1
				4-Chloroaniline	1E+01	mg/kg	2E-05	mg/kg	5.4E-02	(mg/kg-day)-1	9E-07	1.4E-04	mg/kg	4E-03	(mg/kg-day)	0.04
				Benzo(a)Anthracene	1 4E-01	mg/kg	2E-07	mg/kg	7.3E-01	(mg/kg-day)-1	2E-07	1.8E-06	mg/kg	NA	NA	NA
				Benzo(a)Pyrene	3.2E-01	mg/kg	5E-07	mg/kg	7.3E+00	(mg/kg-day)-1	4E-06	4.1E-06	mg/kg	NA	NA	NA
				Benzo(b)Fluoranthene	4 0E-01	mg/kg	6E-07	mg/kg	7.3E-01	(mg/kg-day)-1	5E-07	5.1E-06	mg/kg	NA	NA	NA
				Benzo(k)Fluoranthene	1.9E-01	mg/kg	3E-07	mg/kg	7.3E-02	(mg/kg-day)-1	2E-08	2.4E-06	mg/kg	NA	NA	NA
				Chrysene	2.0E-01	mg/kg	3E-07	mg/kg	7.3E-03	(mg/kg-day)-1	2E-09	2.6E-06	mg/kg	NA	NA	NA
				Dibenzo(a, h)anthracene	2.1E-01	mg/kg	3E-07	mg/kg	7.3E+00	(mg/kg-day)-1	2E-06	2.7E-06	mg/kg	NA	NA	NA
				Indeno(1,2,3-cd)Perylene	6.3E-01	mg/kg	1E-06	mg/kg	7.3E-01	(mg/kg-day)-1	7E-07	8.1E-06	mg/kg	NA	NA	NA
			Exp. Route Total								2E-05					3
Soil	Soil	Stockpile	Dermal	Aluminum	3.9E+04	mg/kg	2E-03	mg/kg	NA	NA	NA	7.0E-03	mg/kg	100%	(mg/kg-day)	0.01
				Antimony	1.3E+01	mg/kg	5E-07	mg/kg	NA	NA	NA	2.3E-06	mg/kg	4.0E-04	(mg/kg-day)	0.01
				Arsenic	3.4E+00	mg/kg	1E-07	mg/kg	5.0E+01	(mg/kg-day)-1	7E-06	6.1E-07	mg/kg	9.0E-06	(mg/kg-day)	0.1
				Chromium	2.2E+02	mg/kg	9E-06	mg/kg	NA	NA	NA	3.9E-05	mg/kg	3.8E-02	(mg/kg-day)	0.00
				Cobalt	1.2E+01	mg/kg	5E-07	mg/kg	NA	NA	NA	2.1E-06	mg/kg	3.0E-04	(mg/kg-day)	0.01
				Copper	4.3E+02	mg/kg	2E-05	mg/kg	NA	NA	NA	7.7E-05	mg/kg	4.0E-02	(mg/kg-day)	0.00
				Iron	2.6E+04	mg/kg	1E-03	mg/kg	NA	NA	NA	4.7E-03	mg/kg	7.0E-01	(mg/kg-day)	0.01
				Manganese	4.4E+02	mg/kg	2E-05	mg/kg	NA	NA	NA	7.9E-05	mg/kg	1.4E-01	(mg/kg-day)	0.00
				Mercury	1.3E+00	mg/kg	5E-08	mg/kg	NA	NA	NA	2.3E-07	mg/kg	NA	NA	NA
				Nickel	2.3E+02	mg/kg	1E-05	mg/kg	NA	NA	NA	4.1E-05	mg/kg	2.0E-02	(mg/kg-day)	0.00
				Thallium	7 6E-01	mg/kg	3E-08	mg/kg	NA	NA	NA	1.4E-07	mg/kg	6.5E-05	(mg/kg-day)	0.002093
				4-Chloroaniline	1E+01	mg/kg	5E-06	mg/kg	5.4E-02	(mg/kg-day)-1	3E-07	2.0E-05	mg/kg	4.0E-03	(mg/kg-day)	0.005
				Benzo(a)Anthracene	1.4E-01	mg/kg	6E-08	mg/kg	7.3E-01	(mg/kg-day)-1	4E-08	2.5E-07	mg/kg	NA	NA	NA
				Benzo(a)Pyrene	3.2E-01	mg/kg	1E-07	mg/kg	7.3E+00	(mg/kg-day)-1	1E-06	5.7E-07	mg/kg	NA	NA	NA
				Benzo(b)Fluoranthene	4.0E-01	mg/kg	2E-07	mg/kg	7.3E-01	(mg/kg-day)-1	1E-07	7.2E-07	mg/kg	NA	NA	NA
				Benzo(k)Fluoranthene	1.9E-01	mg/kg	8E-08	mg/kg	7.3E-02	(mg/kg-day)-1	6E-09	3.4E-07	mg/kg	NA	NA	NA
				Chrysene	2.0E-01	mg/kg	8E-08	mg/kg	7.3E-03	(mg/kg-day)-1	6E-10	3.6E-07	mg/kg	NA	NA	NA
				Dibenzo(a, h)anthracene	2.1E-01	mg/kg	9E-08	mg/kg	7.3E+00	(mg/kg-day)-1	6E-07	3.8E-07	mg/kg	NA	NA	NA
				Indeno(1,2,3-cd)Perylene	6.3E-01	mg/kg	3E-07	mg/kg	7.3E-01	(mg/kg-day)-1	2E-07	1.1E-06	mg/kg	NA	NA	NA
			Exp. Route Total								9E-06					0.1

Table 7.1.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Sigmon's Septic Tank Superfund Site

Scenario Timeframe:	Current/Future
Receptor Population:	Resident
Receptor Age:	Lifetime (cancer), Child (noncancer)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
							Intake/ Exposure Concentration		CSF/Unit Risk		Cancer	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Units	Value	Units	Value	Units	Risk	Value	Units	Value	Units	Quotient
Soil	Soil	Stockpile	Inhalation	Aluminum	3.9E+04	mg/kg	4E-06	mg/kg	NA	NA	NA	1.8E-05	mg/kg	0%	(mg/kg-day)	0.01
				Antimony	1.3E+01	mg/kg	1.42166E-09	mg/kg	NA	NA	NA	6.1E-09	mg/kg	NA	NA	NA
			Inhalation	Arsenic	3.4E+00	mg/kg	4E-10	mg/kg	1.5E+01	(mg/kg-day)-1	6E-09	1.6E-09	mg/kg	8.6E-06	(mg/kg-day)	0.0002
				Chromium	2.2E+02	mg/kg	2.40589E-08	mg/kg	2.9E+02	(mg/kg-day)-1	7E-06	1.0E-07	mg/kg	2.3E-06	(mg/kg-day)	0.05
				Cobalt	1.2E+01	mg/kg	1.31231E-09	mg/kg	3.2E+01	(mg/kg-day)-1	4E-08	5.6E-09	mg/kg	1.7E-06	(mg/kg-day)	0.00
				Copper	4.3E+02	mg/kg	4.70243E-08	mg/kg	NA	NA	NA	2.0E-07	mg/kg	NA	NA	NA
				Iron	2.6E+04	mg/kg	2.84333E-06	mg/kg	NA	NA	NA	1.2E-05	mg/kg	NA	NA	NA
				Manganese	4.4E+02	mg/kg	4.81179E-08	mg/kg	NA	NA	NA	2.1E-07	mg/kg	1.4E-05	(mg/kg-day)	0.01
				Mercury	1.3E+00	mg/kg	1.42166E-10	mg/kg	NA	NA	NA	6 1E-10	mg/kg	8.6E-05	(mg/kg-day)	0.00
				Nickel	2.3E+02	mg/kg	2.51525E-08	mg/kg	NA	NA	NA	1.1E-07	mg/kg	NA	NA	NA
				Thallium	7.6E-01	mg/kg	8.31127E-11	mg/kg	NA	NA	NA	3 6E-10	mg/kg	NA	NA	NA
				4-Chloroaniline	1.1E+01	mg/kg	1E-09	mg/kg	NA	NA	NA	5.2E-09	mg/kg	NA	NA	NA
				Benzo(a)Anthracene	1.4E-01	mg/kg	2E-11	mg/kg	3.9E-01	(mg/kg-day)-1	6E-12	6.6E-11	mg/kg	NA	NA	NA
				Benzo(a)Pyrene	3.2E-01	mg/kg	3E-11	mg/kg	3.9E+00	(mg/kg-day)-1	1E-10	1.5E-10	mg/kg	NA	NA	NA
				Benzo(b)Fluoranthene	4.0E-01	mg/kg	4E-11	mg/kg	3.9E-01	(mg/kg-day)-1	2E-11	1.9E-10	mg/kg	NA	NA	NA
				Benzo(k)Fluoranthene	1.9E-01	mg/kg	2E-11	mg/kg	3.9E-01	(mg/kg-day)-1	8E-12	8.9E-11	mg/kg	NA	NA	NA
				Chrysene	2.0E-01	mg/kg	2E-11	mg/kg	3.9E-02	(mg/kg-day)-1	8E-13	9.4E-11	mg/kg	NA	NA	NA
				Dibenzo(a, h)anthracene	2.1E-01	mg/kg	2E-11	mg/kg	4.2E+00	(mg/kg-day)-1	1E-10	9.9E-11	mg/kg	NA	NA	NA
				Indeno(1,2,3-cd)Perylene	6.3E-01	mg/kg	7E-11	mg/kg	3.9E-01	(mg/kg-day)-1	3E-11	3.0E-10	mg/kg	NA	NA	NA
			Exp. Route Total								7E-06					0.1
		Exposure Point Total									3E-05					3
	Exposure Medium Total										3E-05					3
Stockpile Total										Total of Receptor Risks	3E-05				Total of Receptor Hazards	3

Table 9.1.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Sigmon's Septic Tank Superfund Site

Scenario Timeframe:	Current/Future
Receptor Population:	Resident
Receptor:	Lifetime (cancer), Child (noncancer)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic-Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal	Inhalation	Exposure Routes Total
Soil	Soil	Stockpile	Aluminum	NA	NA	NA	NA	CNS	0.5	0.01	0.01	0.5
			Antimony	NA	NA	NA	NA	Blood	0.4	0.0	NA	0.4
			Arsenic	8E-06	7E-06	6E-09	2E-05	Skin	0.1	0.1	0.0002	0.2
			Chromium	NA	NA	7E-06	7E-06	NA	0.0	0.001	0.05	0.05
			Cobalt	NA	NA	4E-08	4E-08	NA	0.5	0.01	0.003	0.5
			Copper	NA	NA	NA	NA	NA	0.1	0.002	NA	0.1
			Iron	NA	NA	NA	NA	GI Tract/Liver	0.5	0.01	NA	0.5
			Manganese	NA	NA	NA	NA	CNS	0.0	0.001	0.01	0.1
			Mercury	NA	NA	NA	NA	NA	NA	NA	0.00001	0.00001
			Nickel	NA	NA	NA	NA	Decreased body and organ weights	0.1	0.002	NA	0.1
			Thallium	NA	NA	NA	NA	Liver	0.1	0.002	NA	0.2
			4-Chloroaniline	9E-07	3E-07	NA	1E-06	Spleen	0.04	0.005	NA	0.04
			Benzo(a)Anthracene	2E-07	4E-08	6E-12	2E-07	NA	NA	NA	NA	NA
			Benzo(a)Pyrene	4E-06	1E-06	1E-10	5E-06	NA	NA	NA	NA	NA
			Benzo(b)Fluoranthene	5E-07	1E-07	2E-11	6E-07	NA	NA	NA	NA	NA
			Benzo(k)Fluoranthene	2E-08	6E-09	8E-12	3E-08	NA	NA	NA	NA	NA
			Chrysene	2E-09	6E-10	8E-13	3E-09	NA	NA	NA	NA	NA
			Dibenzo(a, h)anthracene	2E-06	6E-07	1E-10	3E-06	NA	NA	NA	NA	NA
			Indeno(1,2,3-cd)Perylene	7E-07	2E-07	3E-11	9E-07	NA	NA	NA	NA	NA
			Chemical Total	2E-05	9E-06	7E-06	3E-05		3	0.1	0.1	3
		Exposure Point Total					3E-05					3
	Exposure Medium Total						3E-05					3
Stockpile Total							3E-05					3
Receptor Total							3E-05					3

Total Incremental Risk = 3E-05

Total Hazard Index = 3

Total CNS Hazard Index =	0.6
Total Liver Hazard Index =	0.6
Total GI Tract Hazard Index =	0.5
Total Blood Hazard Index =	0.4

APPENDIX C

Summary of Cost Estimate for the Stockpile

IGCE - Detailed Remedy Cost Estimates

(Stockpiles) Excavation, Off-site Transportation, and Disposal at Approved Landfill				PRESENT WORTH COST
Site Name: **Sigmon's Septic Tank Site** Site Location: Statesville, North Carolina				Discount Rate: 7%
Item Description	**Units**	**Quantity**	**Unit Price Dollars**	**Total Cost Dollars**
MOBILIZATION/ DEMOBILIZATION				
Transport Equipment & Staff	each	1	$40,000	$40,000
Temporary Facilities	each	1	$10,000	$10,000
EXCAVATION				
Soil Excavation	cy	4,100	$10	$41,000
Grading & Compacting	acre	1.0	$5,000	$5,000
Seed & Mulch	acre	1.0	$2,000	$2,000
OFF-SITE LANDFILLING				
Truck Transport	Truck-load	195	$700	$136,500
Disposal at Landfill	ton	4,100	$65	$266,500
EQUIPMENT & MATERIALS				
Health & Safety Equipment	each	1	$10,000	$10,000
Subtotal Capital Cost				$511,000
Fuel & Administrative Cost				$10,000
Equipment & Supplies $52,000 – Eq. (Supplies-$20,000)				$72,000
Analytical Laboratory (Dispose Parameters)				$20,000
Labor – $70,000, (Lodging & per diem - $33,000, travel – $8800				$111,800
TOTAL PRESENT WORTH COST				$724,800
Contingency (25% of Subtotal) $181,200				**$906,000**

APPENDIX D

Responsiveness Summary

No Comments Were Received