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Jackson, Randy M.

From: Jackson, Rodger W.
Sent: Wednesday, March 04, 1998 2:50 PM
To: Jackson, Randy M
Subject: Fwd: Risk Assessments at St. Juliens

FROM: **Jackson,Randy M**
(DAVINCI/OUTLOOK/JacksonR00)
TO: JacksoRM
DATE: 3-4-98
TIME: 02:50
SUBJECT: Fwd: Risk Assessments at St. Juliens
PRIORITY:

ATTACHMENTS: HHRA.DOC
SJCBTAG.DOC
TBL1.XLS
TBL2.XLS
TBL3.XLS

Rob, Devlin, and Tim

During our last St. Juliens conference call on 10/27/97 we said we would submit Risk Assessment Assumptions to be used in the Human and Ecological Risks. Here they are. I've also faxed you a copy in case you have problems reading these attachments.

The HHRA.doc has a general discussion of the sites followed by the Human Health Risk Assessment Assumptions. The excel files go with the HHRA. The SJCBTAG.doc is obviously the BTAG assumptions.

I would like to set up a conference call to discuss the Human Health Risk Assessment Assumptions as soon as possible. For the BTAG assumptions, we plan on taking things a little further before setting up a conference call.

I will call you each to see what you and your risk assessors schedule look like.

Thanks - Randy Jackson

HHRA.DOC SJCBTAG.DOC TBL1.XLS TBL2.XLS TBL3.XLS

Draft Risk Assessment Assumptions
RI/FS Studies at St. Juliens Creek Annex, Chesapeake, VA
11/5/97

Introduction

The human health and ecological risk assumptions for the Remedial Investigation and Feasibility Study (RI/FS) of Landfill B (Site 2), Landfill C (Site 3), Landfill D (Site 4), and the Burning Grounds (Site 5) at the St. Juliens Creek Annex, in Chesapeake, Virginia are documented below. The risk assessment assumptions are preceded by a description of the site and a summary of recently completed field investigations activities. Additional detail regarding site background and field investigation activities are provided in the following documents: *Final Work Plan, Landfill B (Site 2) and the Burning Grounds (Site 5), Remedial Investigation and Feasibility Study* and *Final Work Plan, Landfill C (Site 3) and Landfill D (Site 4), Remedial Investigation and Feasibility Study.* The risk assessment for Sites 2, 3, 4, and 5 will proceed upon review and approval of the risk assessment assumptions by the Navy and regulatory agencies. Tables referenced in the text are located at the end of this document.

Site Descriptions

Site 2 is an inactive unlined landfill located at the corner of St. Juliens Drive and Craddock Street in the southwestern section of the facility. Burning and incineration of refuse was conducted at the landfill until 1947. Refuse disposed at Site 2 included garbage, acids, waste ordnance, and blast grit from ship repair operations. Presently, the landfill is grass covered with heavy brush located in the southwestern part of the site. The eastern part of the site is water covered and appears to drain into St. Juliens Creek to the south. The site is bounded to the north by a drainage ditch and to the east by Building 130 and the building's adjacent area. The drainage ditch appears to empty into the eastern (water-covered) portion of the landfill.

Site 3 is located in the northeastern corner of the St. Juliens Creek Annex property boundary and covers approximately 10 acres. The area was originally a mudflat where refuse was dumped and allowed to burn; the ash was then used to fill in the area. Refuse disposed of at Site 3 included solvents, acids, bases, and mixed municipal waste. Two pits reportedly used for disposal of oils and oily sludges as well as for periodic burning, were also located at Site 3. At the present time, the landfill is grass covered with no visible signs of debris or refuse. A communication or radar facility is located in the northeastern area of the landfill. Site 4 and Blows Creek appear to be downgradient of Site 3.

Site 4 covers an estimated 5 acres and is approximately 300 feet south of Site 3. While in operation, the site was an unlined trench and fill landfill. Refuse disposed of at Site 4 included drums of unknown wastes and polychlorinated biphenyls (PCBs). The site is characterized by raised surface features and areas which lack vegetation. A brush line borders the northern edge of the landfill with brush also extending beyond the western and southern edges. Metal and concrete debris piles are dispersed throughout the site.

Site 5, the Burning Grounds, is located off of Craddock Street in the northern part of the facility. Wastes disposed at the burning grounds included ordnance materials such as black powder, smokeless powder, explosive D, Composition A-3, tetryl, TNT, and fuses. Non-ordnance materials included carbon tetrachloride, trichloroethylene (TCE), paint sludges, pesticides, and various types of refuse. In 1977, the surface area was burned with straw, diced, and burned again, in an effort to decontaminate the soil.

Remedial Investigation Data Collection

A summary of recently completed RI field investigation tasks is documented below. Laboratory results from soil, groundwater, surface water, and sediment samples have been validated and will be included in the human health and ecological risk assessments. Data from the Relative *Risk Ranking System Data Collection Report, St. Juliens Creek Annex to the Norfolk Naval Base, Chesapeake, Virginia*, dated April

23, 1996 will be evaluated qualitatively in the risk assessment. The number of samples collected at each site, by media, is presented in Table 1.

Monitoring Well Installation and Sampling

Three shallow and two deep monitoring wells were installed and sampled at both Site 2 and Site 5, while four shallow and two deep monitoring wells were installed at both Site 3 and Site 4. Shallow monitoring wells were designed to sample the uppermost saturated zone encountered, while the deep monitoring wells were designed to sample groundwater in the Yorktown Aquifer. Where they are installed, deep monitoring wells are paired with shallow wells in order to provide an indication of the vertical profile of groundwater quality and an indication of the vertical groundwater flow direction. At each site, one deep and one shallow monitoring well were installed at upgradient locations.

All monitoring wells are constructed of nominal 2-inch diameter PVC well riser and 10-slot, 10-ft long screen. Details of well construction are provided in the Sampling and Analysis Plan (SAP).

All monitoring wells were developed by surging with a surge block assembly and pumping the wells with a submersible pump. Wells were developed until water quality parameters (pH, conductivity, temperature and turbidity) had stabilized.

All wells were sampled in July, 1997 using a decontaminated submersible pump, and clean tubing. Samples were analyzed for TCL organic constituents, TAL metals (filtered and unfiltered), and total phosphorus. One sample each from Site 2 and Site 5 was selected, using field screening techniques for TNT, for nitramine analysis.

Surface Soil Sampling

Surface soil samples were collected at all sites using a stainless steel spoon and bowl following protocols described in the following documents: *Final Work Plan, Landfill B (Site 2) and the Burning Grounds (Site 5), Remedial Investigation and Feasibility Study* and *Final Work Plan, Landfill C (Site 3) and Landfill D (Site 4), Remedial Investigation and Feasibility Study.* The objective of the surface soil sampling was to obtain analytical data for use in the human health and ecological risk assessments. Samples were analyzed for TCL organic constituents, TAL metals, and total phosphorous. One sample was selected, using field screening techniques for TNT, for nitramine analysis. No surface soil samples were analyzed for dioxins.

Ten surface soil samples were collected at Site 2. With the exception of the one "upgradient" sample and one downgradient sample, the samples were collected at locations considered to be potentially within the landfill boundary.

Seven surface soil samples were collected at Site 3. With the exception of the one "upgradient" and one "downgradient" sample, the samples were collected at locations considered to be potentially within the boundaries of the landfill.

Ten surface soil samples were collected at Site 4. One sample was collected north of the Landfill D in an "upgradient location". Another sample was collected outside of the suspected landfill area, downgradient of the site. The remaining samples were collected within the suspected landfilled area.

Nine surface soil samples were collected at Site 5. One sample was collected north of the burning ground area in an "upgradient location". Two samples were collected outside of the area thought to be involved in the burning, in order to demonstrate the western limits of the area of concern. The remaining samples were collected within the area where burning is suspected to have occurred.

Subsurface Soil Sampling

The investigations at Sites 2 through 5 included the collection of subsurface soil samples for chemical analysis. Samples collected for chemical analysis were obtained using a truck-mounted, hydraulic, direct push technology (DPT) probe. Soil samples were collected using a 4-ft long by 2-inch outside diameter (O.D.) sample barrel equipped with acetate liners. The objective of the soil sampling was to collect soil from just above the water table.

A total of five subsurface soil samples were collected from Site 2. The sampling locations were selected to include one upgradient location as well as samples located around the perimeter of the pond. Samples were analyzed for TCL organic constituents, TAL metals, and total phosphorus. One sample was selected, using field screening techniques for TNT, for nitramine analysis.

A total of seven subsurface soil samples were collected from Site 3. The sampling locations were selected to include one upgradient location, as well as samples throughout the landfilled area. Samples were analyzed for TCL organic constituents, TAL metals, and total phosphorus.

Subsurface soil sampling with the DPT probe was conducted at three locations at Site 4. One location was selected as an upgradient location. The other two samples were collected along the downgradient edge of the landfill adjacent to the patrol road. Samples could not be collected on the landfill due to the density of concrete and other rubble within the landfill. Samples were analyzed for TCL organic constituents, TAL metals, and total phosphorus.

Subsurface soil sampling with the DPT probe was conducted at three distinct areas at Site 5: the burning grounds, the caged pit area, and a former drop tower. One location was selected as an upgradient location. Samples were analyzed for TCL organic constituents, TAL metals, and total phosphorus. One sample was selected, using a field screening technique for TNT, for nitramine analysis. Additionally, five subsurface samples were selected for dioxin analysis at Site 5.

Surface Water and Sediment Sampling

Three sediment and two surface water samples were proposed for both Site 2 and Site 5. Due to dry conditions, only one surface water sample, from Site 2, was collected. Sediment samples were collected with stainless steel bowls and spoons. The surface water sample was collected directly into the sample jar. Sediment and surface water samples were analyzed for TCL organic constituents, TAL metals, total phosphorous, total organic carbon and nitramine.

Four sediment samples were proposed for both Sites 3 and 4. Additionally, four surface water samples were proposed for Site 3 and three surface water samples were proposed for Site 4. Due to dry conditions, only one surface water sample, from Site 4, was collected. Sediment samples were collected with stainless steel bowls and spoons. The surface water sample was collected directly into the sample jar. Sediment and surface water samples were analyzed for TCL organic constituents, TAL metals, total phosphorous, and total organic carbon.

Human Health and Ecological Risk Assessment Assumptions

The baseline human health and ecological risk assumptions are contained in the text below and Tables 2 and 3.

RI Baseline Human Health Risk Assessment (BLRA)

A BLRA will be performed for Sites 2, 3, 4, and 5 to assess the potential human health risks posed by the sites. The risk assessment will evaluate the potential effects of existing site contamination on both current and potential future exposed populations. Future risks will be based on current site conditions, assuming no additional remedial action is conducted at the site. Although the future use of the site is expected to remain industrial, both residential and industrial scenarios will be evaluated.

The risk assessment will be completed in accordance with EPA's *Risk Assessment Guidance for Superfund (RAGS), Volume I - Human Health Evaluation Manual (Part A),* dated December 1989, *RAGS* Parts B and C dated December 1989. The exposure factors in RAGS have been superseded by OSWER Directive 9285.6-03, *Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors,* dated March 1991. EPA Region III risk assessment guidance will also be followed, which includes technical documents such as *Assessing Dermal Exposure From Soil,* dated December 1995; *Use of Monte Carlo Simulation in Risk Assessments,* dated February 1994; *Use of Monitoring Well Data in Risk Assessment,* dated July, 1992; *Selecting Exposure Routes and Contaminants of Concern by Risk-Based Screening,* dated January 1993; *Exposure Point Concentrations in Groundwater,* dated November 1991; and *Chemical Concentration Data Near the Detection Limit,* dated November, 1991. Dermal permeability coefficients will be taken from *EPA's Interim Guidance for Dermal Exposure Assessment,* dated January 1992. Other required exposure factors may be taken from *Exposure Factors Handbook* (EPA, 1989) and the American Industrial Health Council's *Exposure Factors Sourcebook* (AIHC, May 1994).

The risk assessment will contain the following major components:

- Data evaluation and identification of contaminants of potential concern
- Exposure assessment
- Toxicity assessment
- Risk characterization
- Uncertainty analysis

Contaminants of Potential Concern

The first step of the risk assessment will be to select contaminants of potential concern (COPC). The selection criteria in EPA Region III's *Selecting Exposure Routes and Contaminants of Concern by Risk-Based Screening,* January 1993, will be followed to determine which chemicals will be evaluated quantitatively. This methodology includes evaluating data quality, reducing the data set using risk-based concentrations (based on a target cancer risk of 1×10^{-6} and a target hazard index of 0.1), and further reducing the data set according to frequency of detection, and evaluation as human nutrients. Since a background study has not yet been performed at St. Juliens Creek Annex, no comparison of site contaminant levels to background will be performed as part of the COPC screening.

The available data set includes data collected during this investigation as well as data collected as part of the *Relative Risk Ranking System Data Collection Report, St. Juliens Creek Annex to the Norfolk Naval Base, Chesapeake, Virginia* dated April 23, 1996 (Relative Risk data). Data collected during the RI will be evaluated quantitatively. Relative Risk data will be evaluated in a qualitative fashion only.

Upgradient samples were collected from sediment, surface soil, subsurface soil, shallow groundwater and deep groundwater at each site. As upgradient contaminant levels do not necessarily represent site-related conditions, upgradient samples will not be included in the determination of exposure point concentrations but may be considered in the uncertainty discussion of the BLRA.

Exposure Assessment

The second step of the risk assessment will be to identify actual or potential exposure pathways and to determine the probable magnitude of human exposure. Only plausible and complete pathways will be carried through the exposure-quantification section to the risk characterization. A complete pathway contains a source of chemical release, a medium for environmental transport, a point of contact with the contaminated medium, and an exposure route at the point of contact. The pathways that are anticipated to be complete at Sites 2 through 5 are those listed in Table 2.

Quantification of exposure involves determining the exposure concentration and exposure parameters. Where possible, the 95 percent upper confidence limit of the mean (95UCL) will be used as the exposure concentration for soil. The 95UCL calculation depends on the distribution of the data. A W-test will be used to determine if the data are lognormally or normally distributed. If the 95UCL is greater than the maximum detected concentration, the maximum detected concentration will be used as the exposure concentration. Surface soil is the only media for which a sufficient quantity of data exists to perform the 95 UCL calculation. For media other than surface soil, the maximum and arithmetic average of concentrations of each constituent detected will be used for the exposure point concentration. The exposure concentrations will be calculated for each scenario. The exposure concentration for groundwater will be the maximum concentration of each constituent detected in the well or group of wells that are the most contaminated or are located in the center of the plume. The sources that will be consulted for the exposure parameters are discussed above. Table 3 summarizes the exposure parameters for use in the human health risk assessment.

For determining the exposure concentrations for the risk assessment, the following data-handling methodology will be used. When a primary sample and a duplicate sample are collected, the maximum concentration will be used as the sample concentration. Half the sample quantitation limit (SQL) or sample detection limit (DL) will be used for cases where no detectable contaminant quantities were found in that specific sample, but the contaminant was detected in that medium for that group of samples. Data that have been qualified with a "J" (estimated value), "K" (biased high), or "L" (biased low) will be treated as unqualified detected concentrations. Data qualified with an "R" (rejected) will not be used for risk assessment and will not be included in the total count of samples analyzed for a constituent. The assumption will be that the blank-related concentration of a constituent qualified with a "B" is the SQL.

Risks from exposure to lead will be evaluated using EPA's *Integrated Exposure Uptake Biokinetics Model for Lead in Children* (IEUBK). This model uses current information on the uptake of lead following exposure from different routes, the distribution of lead among various internal body compartments, and the excretion of lead, to predict impacts of lead exposure on blood lead levels in young children. The predicted blood lead concentrations can then be compared with target blood lead concentrations associated with subtle neurological effects in children. Because children are thought to be the most susceptible to the adverse effects of lead, protection for this age group is also assumed to protect older individuals.

The Foster and Chrotowski Shower Model will be used to evaluate exposure to volatile organic compounds while showering. The model's default values will be used during the exposure assessment.

Toxicity Assessment

The next step of the risk assessment is the toxicity assessment. The primary source of toxicological data to be used in the analysis will be EPA's Integrated Risk Information System (IRIS) database. If toxicological data for a particular constituent are not available in IRIS, EPA's *Health Effects Assessment Summary Tables* (HEAST) will be consulted. If toxicological data for a particular constituent is not available in IRIS or HEAST, EPA's Environmental Criteria Assessment Office (ECAO) will be contacted. This section will include a brief discussion of the toxicological characteristics of the major site contaminants and the quantitative approach used to assess the potential effects of the carcinogenic and noncarcinogenic effects on human health.

Risk Characterization

Risk characterization is the next step in the baseline human health risk assessment. It combines the results of the exposure assessment with the critical toxicity values in the appropriate media for each COPC. For quantitative risk estimation from carcinogenic chemicals, excess lifetime cancer risks will be estimated. Potential risks from noncarcinogenic chemicals will be presented using the hazard index approach. If estimated risks approach the EPA threshold values, a Monte Carlo risk analysis will be performed according to EPA Region III technical guidance.

Uncertainty

The last section will be a discussion of uncertainty that provides the limits and assumptions for the results of the risk characterization. The discussion will include a qualitative sensitivity analysis of the exposure assumptions.

Results

The results of the BLRA will be documented in the RI report. The risk assessment will be used to help determine whether remediation is necessary and to help develop preliminary remediation goals for the media of concern.

RI Baseline Ecological Risk Assessment

The BERA identifies and evaluates the potential effects of the contamination on biota in the area. BERAs will be performed for the RI of Sites 2, 3, 4, and 5 will be performed in phases. The first phase for each of the BERAs is the screening-level assessment (SLA). In this assessment, preliminary problem formulation, toxicity evaluation, exposure estimation and risk calculation are presented. The characterization of environmental risks will involve identification of potential exposures to ecological receptors and evaluation of the potential adverse effects associated with such exposures. Both current and future risks will be assessed together since future risks will be based on current site conditions. This assumes that no change in site practices and no remedial action is conducted at the sites. The BERA SLAs will be conducted in accordance with *Risk Assessment Guidance for Superfund Volume II: Environmental Evaluation Manual* (EPA, 1989), *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments, Interim Final* (EPA, June 1997), *ECO Update* series (EPA, various dates), Region III EPA risk and Biological Technical Advisory Group (BTAG) assessment guidance.

The BERA SLAs will include the following activities for each of the SLA sections:

Screening-Level Problem Formulation and Ecological Effects Evaluation -

- Collection of existing data to characterize onsite contamination and contaminant fate and transport mechanisms that may exist onsite.
- Identification of habitats in potentially exposed areas through review of reports, aerial photography, contacts with resource agencies having knowledge of environmental resources in the vicinity of the site, and site reconnaissance
- Collection of existing information to determine the presence of ecological resources, including as threatened or endangered species, critical habitats, wetlands, or sport and recreational species
- Determination of contaminants of potential concern (COPCs) for ecological resources using EPA Region III Biological Technical Assistance Group screening criteria to calculate environmental effects quotients. Toxicity characteristics, bioaccumulation potential, and environmental persistence will be considered when no screening criteria value exists.
- Identification of mechanisms of ecotoxicity associated with the COPCs and likely categories of ecological receptors that could be affected
- Complete exposure pathways that may exist at the site
- Identification of assessment and measurement endpoints to screen for ecological risk
- Search for appropriate screening exposure-response ecotoxicity values

Screening-level Exposure Estimate and Risk Calculation -

- Estimation of exposure doses
- Calculate screening-level risk using the hazard quotient/hazard index approach

Communication of results -

- Discussion of uncertainties associated with the assessment and identification of key factors and assumptions used in the assessment
- Definition of issues, exposure pathways, and potential effects that might need to be addressed in future assessments

Ecological Risk Assessment Exposure Assumptions

In the SLAs, August 9, 1995 Revised Region III BTAG Screening Levels will be used as preliminary screening values to determine COPCs at each site. The BTAG screening values are conservative concentrations, which have been determined to cause adverse effects to wildlife. To determine COPCs, maximum detected concentrations will be compared to BTAG values. A contaminant will be considered a COPC when the ratio of maximum contaminant concentrations to BTAG values was 1 or greater, or when no BTAG value existed for the contaminant. Note that COPCs will be determined for surface soil, sediment, and surface water. No COPCs will be determined for groundwater, because it was assumed that ecological receptors would not be exposed directly to groundwater, only groundwater that has discharged as surface water.

A preliminary COPC determination was made for contaminants of site 5 surface soil. Numerous metals, polyaromatic hydrocarbons, pesticides, cyanide, and a polychlorinated biphenyl. It is likely that other media of this and the other sites also contain numerous similar COPCs.

While the list of COPCs for each site and contaminated medium have not yet been determined, it is reasonable to expect that potential ecological receptor species likely to represent sites 2,3,4, and 5 are soil invertebrates, small mammals, and a variety of bird species. Additionally, site 2 also may also possess aquatic species that may represent important receptor species. At this point in time, it has not been determined if endangered, threatened, or rare species exist at any of the sites. The list of receptor species utilized for the *Draft Ecological Risk Assessment of the NM Slag Pile Site (Site 2), Naval Base, Norfolk, Norfolk Virginia* (CH2MHILL, September 1997) appears to be generally appropriate to the St. Juliens Creek sites. The list includes: soil and aquatic invertebrates, deer mouse, robin, short-tailed shrew, great blue heron, red-tailed hawk, fish, woodcock, marsh wren, and the red fox. Of course, all of the receptors would not be appropriate for each of the sites. It is conceivable that only four to five of these receptors would be required for appropriate representation of the ecological conditions at each site.

For soil and aquatic invertebrates, exposure to COPCs will be considered to occur via direct contact with the contaminant in soil/water, ingestion of contaminated soil/water, and ingestion of COPCs through the food chain. Exposure assumptions for all other receptors include exposure to COPCs via soil ingestion and food chain transfer.

It is assumed that a semi-quantitative or quantitative ecological risk assessment will be required for each site because of the contamination from each of the sites could potentially affect ecological receptors. Receptor exposure doses will be determined in these BERA SLAs through the intake model used to model contaminant exposure in *Draft Ecological Risk Assessment of the NM Slag Pile Site (Site 2), Naval Base, Norfolk, Norfolk Virginia* (CH2MHILL, September 1997)(after some modifications made due to changes in receptor species). A biota-to-soil/sediment accumulation factor of one will be assumed for all receptor species modeled when this factor is not readily available from the literature searched.

In order to calculate the screening-level risk to the receptors, appropriate screening exposure-response ecotoxicity values from the literature are required. The preferred chronic ecotoxicity value is the No Observed Effect Levels (NOAELs). However, these values are not always readily available from the literature. Lowest Observed Affect Levels (LOAELs) and acute median lethal doses (LD_{50}s) may be used when appropriate NOAELs are not found. A factor of 10 will be applied to the conversion of a chronic LOAEL to a chronic NOAEL. A factor of 100 will be applied to the conversion of an acute LD_{50} to a chronic NOAEL. No conversion factors will be applied to toxicity data within the same phylogenic order of the receptor species. Toxicity data will not be used to represent the receptor species if the toxicity value is for a species phylogenetically further apart than the class.