



PROPOSED REMEDIAL ACTION PLAN

Site 5-Paint Stain and Site 12-Former Wind Tunnel

NASA Goddard Space Flight Center

Wallops Flight Facility

Wallops Island, Virginia

The Cleanup Proposal

This Proposed Remedial Action Plan (Proposed Plan) has been prepared in accordance with federal law to summarize the proposed cleanup approach for contaminated soil at Site 5-Paint Stain and Site 12-Former Wind Tunnel at the National Aeronautics and Space Administration (NASA) Goddard Space Flight Center (GSFC) Wallops Flight Facility (WFF) located in Accomack County, Virginia. This Proposed Plan describes NASA's proposed remedy for contaminated soil at Sites 5 and 12, which after careful study is **Excavation and Off-Site Disposal of Contaminated Soil/Sediment for Protection of Human Health and the Environment (Alternative 3)**. The scope and role of the proposed remedy is to address an unacceptable risk posed by contamination in soil to ecological receptors and potential future residents at Sites 5 and 12. This Proposed Plan provides the public with information regarding the proposed remedy and describes how the public can become involved in the decision-making process.

Introduction

This Proposed Remedial Action Plan (Proposed Plan) describes remedial alternatives for mitigating threats from contaminated soil posed to human health and the environment at Sites 5 and 12 at the National Aeronautics and Space Administration (NASA) Goddard Space Flight Center (GSFC) Wallops Flight Facility (WFF) located in Accomack County, Virginia. In addition, this Proposed Plan identifies Excavation and Off-Site Disposal as NASA's preferred remedial alternative for contaminated soil and sediment at Sites 5 and 12 and explains the rationale for NASA's preference. In this document Sites 5 and 12 will be referred to as Site or the Site.

NASA is the lead agency for facility activities under the National Oil and Hazardous Substances Pollution

Let us know what you think!
Mark your calendar!



PUBLIC COMMENT PERIOD
March 17, 2010 through April 19, 2010

Written comments on the Proposed Plan will be accepted by NASA during the public comment period. Send written comments postmarked no later than **April 19, 2010** to:

T.J. Meyer
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NASA Wallops Flight Facility
Building F-160, Code 250
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Or email your comments to
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PUBLIC MEETING
March 24, 2010

NASA will hold a public meeting from **4:00 pm to 6:00 pm** to explain the Proposed Plan and the recommendations presented in the Sites 5 and 12 Feasibility Study. Oral and written comments will be accepted at this meeting. The meeting will be held at **NASA WFF Visitor Center**.

For more information, visit the Information Repository listed at the end of this Proposed Plan (Page 15).

Contingency Plan (NCP), 40 C.F.R. Part 300, and is issuing this Proposed Plan to fulfill its public participation requirements under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (CERCLA), 42 U.S.C. §§ 9601 to 9675; Section 300.430(f)(2) of the NCP, and the Administrative Agreement On Consent (AAOC), United States Environmental Protection Agency (EPA) Docket No. RCRA-03-2004-0201TH, entered into between EPA and NASA under Section 7003 of the Resource Conservation and Recovery Act, as amended, (RCRA), 42 U.S.C. Section 6973.

With this document, NASA is soliciting public comment on its preferred remedial alternative for the Site. NASA encourages public participation in the decision-making process. This Proposed Plan summarizes key information from previous reports about Sites 5 and 12. More detailed information about Sites 5 and 12 can be found in the Remedial Investigation (RI) reports and other documents located at the Information Repositories for NASA WFF (locations are listed on page 15). For information on how the public can be involved in the remedy selection process see text box, *Let us know what you think*, on page 1.

Following the public review and comment period for the Proposed Plan, NASA and EPA will notify the public of the remedial action selected jointly by NASA and EPA, with concurrence from Virginia Department of Environmental Quality (VDEQ), in a Record of Decision (ROD). Public comments and information will be summarized in the Responsiveness Summary section of the ROD. The preferred remedial alternative may be modified or another remedial action may be selected based on new information and/or public comments received.

Site Background

Where are Sites 5 and 12?

Sites 5 and 12 are co-located at the western side of Wallops Island, south of the causeway road (see Figure 1, page 3).

What were Sites 5 and 12 used for?

Site 5 consists of an area that was contaminated by paint booth operations that occurred in the area and in Building X-30. The primary source of the contamination was an inadequate exhaust system that allowed a portion of the waste paint chips to be deposited outside of the structure. The ventilation and exhaust system has been replaced by NASA and Virginia Department of Environmental Quality (VDEQ) conducts annual inspections at the facility.

Site History

1994 - 1996: NASA conducted a preliminary assessment (PA) and site investigation (SI) of Sites 5 and 12. Multi-media samples were collected for analyses. Total petroleum hydrocarbons (TPH), polychlorinated biphenyls (PCBs), pesticides, and metals were detected in surface soil at Site 5, and PCBs, pesticides, volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and metals were detected in both surface soil and sediment at Site 12.

1997 – 2000: NASA conducted a Remedial Investigation (RI) at Sites 5 and 12. The Draft RI/FS was published for the sites in December 2001. This investigation identified concentrations of polynuclear aromatic hydrocarbons (PAHs) in surface soil that exceeded human health criteria for commercial/industrial-scenario receptors.

2000 – 2003: NASA conducted a Removal Action at the sites to remove surface soil with PAH concentrations exceeding human health criteria for commercial/industrial-scenario receptors. Soil that exceeded any of the COCs; benzo(a)anthracene at 7,800 micrograms per kilogram (µg/kg), benzo(a)pyrene at 780 µg/kg, benzo(b)fluoranthene at 7,800 µg/kg, dibenzo(a,h)anthracene at 780 µg/kg, and indeno(1,2,3-cd)pyrene at 7,800 µg/kg, was excavated and disposed off facility. A total of 2,936 tons was excavated to a depth of approximately 2 feet and disposed off facility. Pre-Removal Action sampling was performed to determine the horizontal extent of the excavation areas, and post-Removal Action confirmation samples were collected to confirm that all objectives were met.

2003 – 2008: A Supplemental RI was conducted to address data gaps identified in the 2001 RI/FS. The data were used to determine potential impacts from remaining contaminated media in areas that were not included in the 2003 Removal Action.

2007: A Toxic Substance Control Act (TSCA) removal action was conducted northwest of Building X-115 to address PCB-contaminated soil and concrete associated with a former transformer pad. PCB-contaminated soil in this area with concentrations greater than 10 milligram per kilogram (mg/kg) and concrete associated with the pad were excavated and disposed off-site. In addition, debris on the building floor and in the building sump and loose paint on the building interior walls were removed to reduce or eliminate potential future releases of PCBs to the environment. A total of 68 tons of soil and concrete were excavated to a maximum depth of approximately 3 feet and disposed off facility.

2008 – 2009: NASA developed and evaluated potential cleanup alternatives for the remediation of contaminated soil/sediment at Sites 5 and 12 in a Feasibility Study (FS).



Figure 1- Site Location Map for Sites 5 and 12 at NASA WFF

Site 12 is the location of the former wind tunnel, also known as the Pre-Flight Jet Facility. The facility was used to research, develop, and test jet engines from 1948 to 1960. During test operations, jet engines using a variety of fuel sources were tested in a semi-confined outdoor environment. The Site also included power generation, air compression and other support facilities. The above ground testing facility structures were demolished between 1960 and 1990.

What do Sites 5 and 12 look like today?

Sites 5 and 12 include several buildings, paved areas around the buildings, and vegetated soils, see Photo 1. Sites 5 and 12 are mostly level, at an approximate elevation of 5 feet to 7 feet above mean sea level (msl). To the southeast of Sites 5 and 12 are Seawall Road and a field. Sites 5 and 12 are bounded to the southwest, west, and north by wetlands, with an average elevation of approximately 3 feet to 4 feet above msl. The boundary to the northeast is comprised of wetlands, as well as other facility buildings/paved areas. The majority of the boundary between Sites 5 and 12 and the wetland marsh area is a steep graded slope or a retaining wall.

Site Investigations

Since 1994, various environmental investigations and response actions have been conducted at Sites 5 and 12 to characterize the Site and define the nature and extent of contamination. The studies performed included a Site Inspection (SI), a Remedial Investigation (RI), a supplemental RI, Removal Actions, and a Feasibility Study (FS).



Photo 1 – Site 12 looking North

What types of studies were performed at Sites 5 and 12?

During the Site 5 and 12 investigations, sediment, surface and subsurface soil, groundwater, surface water, biological tissue, and wipe samples were collected. In addition, a wetlands delineation, Human Health Risk Assessment (HHRA), and Ecological Risk Assessment (ERA) were conducted. Full details are available for review in the SI, RIs, Removal Action Completion reports, and FS report. Samples were analyzed for organic and inorganic compounds and analytes designated as hazardous substances in 40 C.F.R. Part 302.4(a), which included naturally occurring and man-made volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), inorganic analytes (metals), and total petroleum hydrocarbons (TPH).

What chemicals were found at Sites 5 and 12?

Sample analytical results were evaluated to determine the nature and extent of contamination at Sites 5 and 12. As part of this evaluation, the concentrations of detected contaminants were compared to benchmark concentrations, or screening levels, established by EPA and the VDEQ for each contaminant. This comparison, or screening, was performed to identify contaminants that were present at concentrations that could potentially present a risk to human health or the environment (See Remedial Investigation Report, Sections 4.0 [Nature and Extent of Contamination], 5.0 [Baseline Human Health Risk Assessment], and 8.0 [Baseline Ecological Risk Assessment]).

Groundwater samples indicated low concentrations of metals and sporadic low-level detections of VOCs and SVOCs.

Surface and subsurface soils and sediment samples were found to contain several types of contaminants. Site 5 surface soil contained TPH, PCBs, pesticides, and

metals. Site 12 surface soil and sediment contained PCBs, pesticides, VOCs, SVOCs, and metals.

Chromium, copper, lead, and zinc exceeded human health and/or ecological screening levels in Sites 5 and 12 soil and sediment. PCBs, particularly Aroclor-1260, exceeded human health and ecological screening levels in surface and subsurface soil. A limited number of samples exceeded ecological screening levels in surface soil for 4,4-dichlorodiphenyl- trichloroethane (DDT) and related degradation products. PAHs (benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, dibenzo[a,h]-anthracene, and indeno-[1,2,3-cd]pyrene), exceeded the human health and ecological screening levels in surface and subsurface soil at Sites 5 and 12.

Chromium, copper, lead, zinc, PCBs, PAHs, and DDT and its degradation products were identified as the chemicals of concern (COCs) in soil and sediment at Sites 5 and 12.

Summary of Site Risks

As part of the RI, NASA completed risk assessments to determine the current and future effects of contaminants on human health and the environment. Surface soil, subsurface soil, and groundwater analytical results and the constituents of potential concern (COPCs) identified in the screening process were used to evaluate potential risks in accordance with the most recent EPA and VDEQ guidance. The predicted effects were then considered in the cleanup decision for Sites 5 and 12. See the text box, *What is a Human Health Risk Assessment and How is it Calculated?* on page 11 for an explanation of the HHRA process. It is the current judgment of NASA and EPA, in consultation with VDEQ, that Excavation and Off-Site Disposal of Contaminated Soil/Sediment for Protection of Human Health and the Environment (Alternative 3) identified in this Proposed Remedial Action Plan is necessary to protect public health, welfare, and the environment from actual or threatened releases of COCs at Sites 5 and 12.

Human Health Risks

The HHRA considered the potential carcinogenic and non-carcinogenic risks of exposure to Site 5 and 12 soils and groundwater to current/future commercial/industrial workers (e.g., firemen, current/future groundskeepers, current/future construction workers), and potential future residents (adult and child).

Groundwater data was compared to human health risk criteria maximum contaminant levels (MCLs), established for drinking water and background levels. Groundwater concentrations did not exceed MCLs and groundwater concentrations were similar to background concentrations. No unacceptable Site-related risks associated with potential exposure to groundwater were identified. Therefore, no action for groundwater is required.

The risk assessment identified an unacceptable risk associated with hypothetical future residential exposure to Sites 5 and 12 soils and sediment. The risk assessment evaluated the potential risks assuming that a residence was constructed at Sites 5 and 12. This risk scenario is highly unlikely in that Sites 5 and 12 are not located close to residential areas and WFF plans to retain the areas for future facilities. This risk scenario was developed as a “worst-case” hypothetical future risk scenario and serves as a baseline risk assessment. The risk assessment was further refined to evaluate risks posed by Site-related COPCs. The cancer risks calculated for residential exposure to Sites 5 and 12 soils and sediments over a lifetime was 1.9×10^{-4} . The non cancer risk HI was 1.2 for a child, but organ specific HIs were all less than 1.0. There were no non-cancer risks identified for an adult resident. (See text box, *What is a Human Health Risk Assessment and How is it Calculated?* on page 11.)

Ecological Risks

An Ecological Risk Assessment was performed at the Sites to determine whether adverse ecological impacts are present as a result of exposure to contaminants released to the environment at Sites 5 and 12. Sites 5 and 12 are upland/palustrine habitat, and the receptors evaluated in the ecological risk assessment were sediment dwelling insects and animals, terrestrial/wetland plants, aquatic life, soil invertebrates, birds, mammals, amphibians, and reptiles. The contaminant concentrations, occurrence, distribution, and potential effects data were evaluated to determine whether adverse risks to these receptors were likely from exposure to contaminants identified at Sites 5 and 12. The soil samples and data were collected prior to the 2007 TSCA removal action, during which the majority of the PCB-contaminated soil was removed from the Site.

Groundwater data was compared to ecological risk criteria and background levels. Groundwater concentrations were similar to background and/or screening criteria. No actionable or unacceptable risks associated with potential exposure to groundwater were identified. Therefore, no action for groundwater is required.

Based on the results of the baseline ecological risk assessment (BERA), low to moderate potential risks were identified in soil and sediment for the following receptor groups:

- Sediment dwelling communities
- Mammals
- Amphibians
- Soil invertebrate and microbial communities

The remaining receptors were found to be at no or low potential risk.

Remedial Action Objectives and Cleanup Goals

Based on an evaluation of Site conditions, risks and legal requirements, Remedial Action Objectives (RAOs) were identified for Sites 5 and 12. These RAOs are as follows:

- Protection of human health by preventing residential exposure to contaminated soil
- Protection of ecological receptors from exposure to contaminated soil and sediment

The Sites 5 and 12 chemicals of concern and associated cleanup goals for these RAOs are presented in Table 1 on page 5. In developing the Cleanup Goals, NASA considered both human health and ecological risks. For human health, the Cleanup Goals were established at the concentration that would result in no unacceptable risks to a full time resident. For ecological risks, the Cleanup Goal was established at the concentration that would result in no adverse effects to the most sensitive potential receptor; this is referred to as the No Observed Adverse Effects Concentration or NOEC. In addition, federal and state chemical specific regulations and requirements were considered. The cleanup goals presented in Table 1 are the more stringent of the human health- and ecological-based values. Also presented in Table 1 is the basis for establishing the cleanup goals. In addition to these RAOs, remedial actions should not interfere with NASA's ability to perform its mission at WFF.

Table 1
Cleanup Goals for Contaminated Soil at Sites 5 and 12

COC	Basis for Cleanup Goal	Cleanup Goal (mg/kg)
Chromium	Eco-NOEC	80.3
Copper	Eco-NOEC	48.6
Lead	Eco-NOEC	131
Zinc	Eco-NOEC	378
PCBs (total)	HH/Eco	1.0
Benzo(a)anthracene	HH-10 ⁻⁵	6.2
Benzo(a)pyrene	HH-10 ⁻⁵	0.62
Benzo(b)fluoranthene	HH-10 ⁻⁵	6.2
Dibenzo(a,h)anthracene	HH-10 ⁻⁵	0.62
Indeno(1,2,3-cd)pyrene	HH-10 ⁻⁵	6.2

Eco-NOEC – Protection of ecological receptors at the no observed effects concentration.

HH-10⁻⁵ – Protection of human health at the 1x10⁻⁵ incremental lifetime cancer risk for the potential future resident.

Dichlorodiphenyltrichloroethane (DDT) and its break down products were determined to not be Site-related as the pesticide is present throughout the area. DDT contamination originated from historical mosquito control

operations which took place prior to the pesticide being banned. Risks associated with DDT will be reduced during remedial actions to address PCB and metal contamination.

Summary of Remedial Alternatives

Remedial alternatives to address the potential risks associated with the contaminated soil and sediment at Sites 5 and 12 and to achieve the RAOs were developed. In order to develop these alternatives, possible remedial activities were screened for effectiveness, implementability and cost. Based upon the results of the detailed screening of potential remediation technologies, four remedial alternatives were developed. This section summarizes the remedial alternatives that were developed in the Sites 5 and 12 FS. A detailed analysis of these alternatives is presented in Section 4.0 [Assembly and Detailed Analysis of Remedial Alternatives] of the FS report. Planned activities at Site 5 will continue under an industrial-use scenario (paint facility), whereas future activities at Site 12 will be limited to non-residential use.

Four alternatives were ultimately developed and retained for consideration during the FS. These alternatives were presented as Site Wide alternatives in the FS and are described as follows:

Alternative 1 – No Action. CERCLA requires evaluation of a No Action alternative. Under this alternative, no action would be taken to reduce the potential risks at Sites 5 and 12. The No Action alternative would not meet any of the RAOs for the Sites. Alternative 1 is retained as required by CERCLA for comparison with other alternatives.

Alternative 2 - Excavation and Off-Site Disposal of Ecological Lowest Observed Effects Concentration (LOEC)-Contaminated Soil/Sediment and Land Use Controls to Protect Human Health (Residential Use – 1x10⁻⁵ ILCR). This alternative includes the removal of approximately 760 cubic yards (CY) of contaminated soil over an area of 10,260 square feet (SF) to a depth of 2 feet. The excavation limits would be defined by soil with concentrations that exceed the LOECs described in Section 2 [Remedial Action Objectives and General Response Actions] and Table 2-7 [Preliminary Remediation Goal Development] of the FS. The alternative would also include the collection of verification samples to confirm the removal of soil contamination at concentrations that cause unacceptable ecological risk. Verification samples would be analyzed for PAHs, pesticides, PCBs and metals. This alternative would also include the demolition of Site features including concrete slabs, pads, cradles, roadways, and Building X-115. Upland excavated areas would be backfilled with clean soil and planted with native vegetation. This alternative will involve the

removal of contaminated sediments from a wetland area. Following excavation, the area will be returned to equivalent or improved ecological conditions.

Additionally, this alternative would include the implementation of land use controls (LUCs) over 12,200 square feet of Sites 5 and 12. The LUC limits for Alternative 2 would be defined by soil with PAHs and PCBs concentrations that cause unacceptable human health risks. The LUCs associated with this alternative would include administrative controls to prohibit potential future residential development within the identified areas and annual inspections of the Site to assure the continued use of LUCs, and to evaluate Site conditions. Because contaminants would remain On-Site, Site reviews would be performed every 5 years to evaluate Site status to assess the continued adequacy of these remedial activities, and to determine whether further action is necessary.

Alternative 3 - Excavation and Off-Site Disposal of Ecological No Observed Effects Concentration (NOEC)-Contaminated Soil/Sediment and Excavation and Off-Site Disposal of PAH-Contaminated Soil for Protection of Human Health (Residential Use – 1×10^{-5} ILCR). This alternative would include the removal of approximately 1,400 cubic yards of soil over an area of 18,900 square feet to a depth of 2 feet. The excavation limits for Alternative 3 would be defined by soil with COC concentrations that exceed the Cleanup Goals (NOEC-based) presented in Table 1 of this PRAP and Section 2 [Remedial Action Objectives and General Response Actions] and Table 2-7 [Preliminary Remediation Goal Development] of the FS. The alternative would also include the collection of verification samples to confirm the removal of soil contamination at concentrations that cause unacceptable ecological risk. Verification samples would be analyzed for PCBs, DDT, and metals. This alternative would also include the demolition of Site features including concrete slabs, pads, cradles, roadways, and Building X-115. Upland excavated areas would be backfilled with clean soil and planted with native vegetation. This alternative will involve the removal of contaminated sediments from a wetland area. Following excavation, the area will be returned to equivalent or improved ecological conditions.

Additionally, this alternative would include the removal of approximately 920 cubic yards of soil over an area of 12,200 square feet to a depth of 2 feet. The excavation limits would be defined by soil with COC concentrations that cause unacceptable human health risks under a potential future residential use scenario, PAHs and PCBs, as defined in Section 2 [Remedial Action Objectives and General Response Actions] and Table 2-7 [Preliminary Remediation Goal Development] of the FS. The alternative would also include collection of verification samples to confirm the removal of soil contamination at concentrations that cause unacceptable human health risk. Verification samples would be analyzed for PAHs and PCBs.

Alternative 4 – Excavation and On-Site Consolidation Under a Soil Cover of Ecological NOEC Contaminated Soil/Sediment and Excavation and On-Site Consolidation Under a Soil Cover of Wetland-Vicinity-PAH-Contaminated Soil/Sediment for the Protection of Human Health (Residential Use – 1×10^{-5} ILCR); and LUCs and Long-Term Maintenance of the Soil Cover for the Protection of Human Health (Residential Use – 1×10^{-5} ILCR) and the Environment. This alternative would include the On-Site consolidation of contaminated soil and sediment at Site 12 under a vegetated cover. The contaminated soil and sediment consist of material that exceed Cleanup Goals for ecological receptors (NOEC-Based) and Human Health (1×10^{-5} ILCR). After excavation and consolidation, the contaminated soil and sediments would be covered by a bio-engineered soil cover using clean fill, soil, and native vegetation. This alternative would include verification sampling to confirm the removal limits. In addition, this alternative would include the demolition and off-site disposal of Site features including concrete slabs, pads, cradles, roadways, and Building X-115. This alternative will involve the removal of contaminated sediments from a wetland area. Following excavation, the area will be returned to equivalent or improved ecological conditions.

This alternative would include LUCs to prohibit residential use (1×10^{-5} ILCR) and limit construction activities at Site 12 in the vicinity of the soil cover. Also, the PAH-contaminated soil at Site 5 would remain in place with a vegetated soil cover. This option would also include periodic inspections to confirm soil cover integrity, and protectiveness of the LUCs. The cover would be maintained and repaired as needed in the event that erosion or animal burrows cause damage to the cover. Because contaminants would remain On-Site after the implementation of the alternative, Five-Year Reviews would be conducted to evaluate the protectiveness of the cover and the LUCs.

Evaluation of Alternatives

Nine criteria were used to evaluate the alternatives individually and against each other in order to select an appropriate remedy (See text box, *How are Remedial Alternatives Evaluated?* on page 9). A detailed analysis of alternatives can be found in Section 4.0 [Assembly and Detailed Analysis of Remedial Alternatives] of the FS. A summary of the evaluation of alternatives is provided in Table 2, *Relative Ranking of Alternatives*, on page 10. The nine criteria are distributed between three groups: threshold criteria, primary balancing criteria, and modifying criteria (see *How are Remedial Alternative Evaluated?* on Page 9).

Threshold Criteria

Overall Protection of Human Health and the Environment:

Alternative 1 would not provide protection of human health and the environment because contaminants would remain in soil at the Sites. Adverse effects on ecological receptors would continue, and potential future residential receptors could be exposed to Site contaminants at concentrations greater than the Cleanup Goals. Alternative 1 fails to meet the primary Threshold Criteria; therefore it is not considered further in the evaluation of alternatives.

The implementation of Alternatives 2, 3, and 4 would be protective of human health and the environment. Under Alternative 2, contaminated soil and sediment that is affecting ecological receptors would be removed from the Site and land use controls would be used to protect human health from residual Site contamination. Contaminated soil and sediment that may affect ecological receptors would remain (i.e., those soils with contaminant concentrations between NOECs and LOECs). The land use controls would prohibit residential development at the Site that could result in excess exposure of Site contaminants to potential future human receptors under a residential-use scenario. Under Alternatives 3 and 4, exposure to all of the contaminated soil and sediment that is affecting ecological receptors and potential future human receptors would be addressed. Under Alternative 3, contaminated soil and sediment would be excavated and disposed off-site, whereas under Alternative 4, the contaminated soil and sediment would be consolidated On-Site under a bio-engineered soil cover and LUCs would be implemented to prohibit future residential development.

Alternative 3 would provide more protection to ecological receptors than Alternative 2, because Alternative 3 would remove all of the soil with contaminant concentrations that exceed ecological criteria, whereas Alternative 2 would leave some contaminated soil and sediment that has the potential to affect some ecological receptors. Alternative 3 would also provide more protection of human health than Alternative 2, because Alternative 3 would remove contaminants and Alternative 2 would only include access restrictions. Alternative 3 also would provide more protection to human health and the environment than Alternative 4, because under Alternative 4, contaminated soil and sediment would remain On-Site under a cover, but would require long-term maintenance and LUCs to assure long term protectiveness.

Under Alternatives 2, 3 and 4, excavations would be conducted in wetlands. During the remedy selection process, modification of the excavation areas is being considered to balance long term ecological risks with short term damage to wetlands. Implementation of any of these remedies will require returning the impacted wetlands to equivalent or improved ecological conditions.

Compliance with ARARs:

Location- and action-specific ARARs have not been identified for Alternative 1. Alternatives 2, 3, and 4 would involve excavation in a wetland area to remove contaminated sediments. Alternative 2 and 3 also would include transportation and disposal of contaminated soil and sediment off-site. Wetland ARARs include federal Clean Water Act Section 404 requirements and similar state requirements (Wetlands Policy 9 VAC 25-380 and Water Resources Policy 9 VAC 25-390). Since the actions would involve the removal of contamination from Site wetlands and the wetlands would be restored, all three alternatives would comply. Transportation and disposal of contaminated soil would be conducted in accordance with the federal Resource Conservation and Recovery Act, applicable sections of Virginia Solid Waste and Hazardous Waste Regulations and/or those regulations applicable to the state receiving the waste. In addition, federal TSCA regulations (40 CFR 761.61) governing the management, transportation and disposal of PCB contaminated media has been identified as a chemical specific ARAR. If PCB concentrations exceeding 50 mg/kg are encountered at the Site, the soils would be managed under Alternatives 2, 3 and 4 by excavation and off-site disposal to comply with this ARAR.

Primary Balancing Criteria

Long-Term Effectiveness and Permanence:

Alternative 1 would have very limited long-term effectiveness and permanence because no contaminant removal or reduction would occur through treatment. Although over time some reduction in PAHs would occur through natural attenuation, PCB- and metal-contamination would remain for an extended period of time. Because there would be no LUCs to restrict residential development, unacceptable risk to human and ecological receptors to contamination would remain. There are no current plans for residential development in this area.

Alternatives 2, 3, and 4 would provide long-term effectiveness and permanence. Alternative 3 would remove all the contaminated soil and sediment from the Site. Alternative 4 would minimize or eliminate ecological exposure and limit human exposure to contaminated soil and sediment at the Site, equivalent to Alternative 3, but the contaminated media would be consolidated and remain On-Site, requiring long-term O&M and LUCs to assure protectiveness. Alternative 2 would leave some low-level residual contamination at the Site that may have adverse effects on some ecological receptors. The long-term effectiveness of LUCs for 2 and 4 would depend on the potential for future development at the Site. As long as the property remains under control of the government, the LUCs would be very effective. In the

event the property is transferred, the LUCs may not be as effective. For Alternative 3, the contaminated soil and sediment that presents a potential risk to human health and environment would be removed and encapsulated in an off-site landfill.

Reduction of Toxicity, Mobility, or Volume Through Treatment: None of the alternatives being considered achieve any reduction of toxicity, mobility, or volume of COCs through active treatment. Contaminant concentrations at the Site are lower than the levels at which treatment is typically conducted. All of the alternatives have the potential to achieve irreversible reduction of PAH toxicity and volume through natural attenuation. PCB and metal contamination would remain for an extended period of time.

Short-Term Effectiveness: The implementation of Alternative 1 would not result in risks to Site workers or adversely impact the surrounding community or environment, because no remedial activities would be performed.

Implementation of Alternatives 2, 3, and 4 would include excavation and handling of contaminated soil and sediment, so associated risks to construction workers and the environment are possible. However, these risks of exposure could be effectively controlled using personal protection equipment, compliance with proper Site-specific health and safety procedures, and utilizing proper best management practices to prevent the migration of contamination through sediment transport and dust. Short-term impacts to wetlands under Alternatives 2, 3, and 4 would occur during excavation of contaminated sediment. After the removal is complete, equivalent or better quality wetlands should develop.

Either of Alternatives 2 and 3 would require approximately 2 to 3 months in the field. Alternative 4 would require 3 months in the field. The RAOs would be achieved once the field activities are complete (for Alternative 3) and LUCs are implemented (for Alternatives 2 and 4).

Implementability: Alternative 1 would be easiest to implement because there would be no activities to implement. Both Alternatives 2 and 3 would involve excavation and Off-Site disposal of contaminated soils and sediment. Alternative 4 would involve the same excavation of contaminated sediments and ecologically driven soil as 3, but would consolidate the materials On-Site under a bio-engineered soil cover. Remaining contaminated soil (PAHs) would be addressed through LUCs. The construction activities associated with these alternatives would include conventional construction activities that could be easily implemented. Excavation in the wetland areas may require the substantive portions of a wetland permit be obtained. Since the action would improve the quality of wetlands, this permit should be obtainable. NASA WFF plans to construct new facilities at Sites 5 and

12, which may preclude the On-Site consolidation/long-term soil cover Alternative 4.

Cost: Each alternative was assessed based on capital costs (initial cost to implement) and annual operation and maintenance (O&M) costs. The present value of Alternative 2 is estimated to be \$1,043,000, Alternative 3 is estimated to be \$1,383,000, and Alternative 4 is estimated to be \$1,389,000. See Table 2 on page 10 for additional detail on the cost estimates.

Modifying Criteria

Modifying Criteria are assessed during the selection of the final remedy after the close of the public comment period; see *State/Support Agency Acceptance* and *Community Acceptance* on page 8.

State Acceptance: The Commonwealth of Virginia's acceptance of NASA's preferred remedial alternative will be evaluated after the public comment period and will be described in the ROD.

Community Acceptance: Community acceptance of NASA's preferred remedial alternative will be evaluated after the public comment period ends and will be described in the ROD.

The Preferred Remedial Alternative

NASA has identified Alternative 3, Excavation and Off-Site Disposal of Ecological NOEC-Contaminated Soil/Sediment (Alternative 3) and Excavation and Off-Site Disposal of PAH-Contaminated Soil for Protection of Human Health (Residential Use – 1×10^{-5} ILCR) as the Preferred Alternative (See Figure 2 page 9), and is recommending Alternative 3 because:

- Eliminates all known and potential ecological risks associated with Sites 5 and 12;
- Eliminates all of the soil that causes potential unacceptable risk to the future human receptor;
- Complies with chemical-, location-, and action-specific ARARs and TBCs;
- Provides long-term effectiveness and permanence for ecological receptors and for the removal of potential future human health risks;
- Provides minimal short-term impact concerns to Site workers;
- Is a permanent solution that provides long-term protection;
- Implements with readily available construction equipment, labor, and materials.
- Provides an effective balance of costs.

In particular, NASA and EPA find that Alternative 3 is the more cost-effective remedy because, although the cost is greater than Alternative 2, it will achieve cleanup goals by permanently removing soil that causes potential unacceptable risk to the future human receptor.

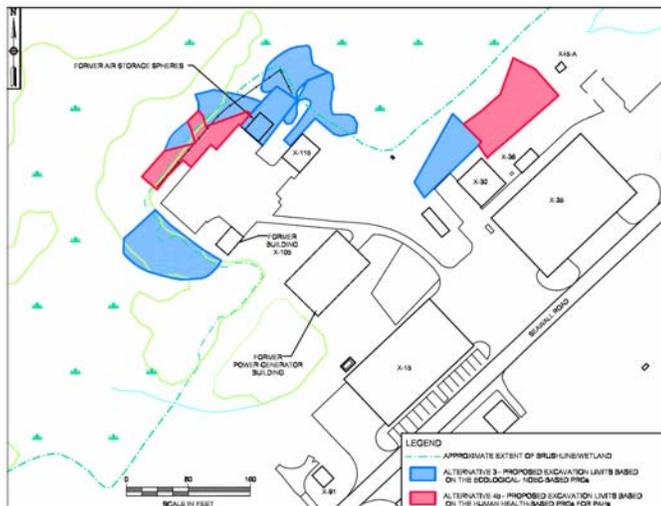


Figure 2- Sites 5 and 12 excavation areas

Based on information currently available, NASA and EPA, in consultation with VDEQ, believe the Preferred Alternative meets the threshold criteria and provides the best balance of tradeoffs among the alternatives with respect to the balancing and modifying criteria. However, the preferred alternative can change in response to public comment or new information.

Community Participation

Public input is important in the decision-making process. Nearby residents and other interested parties are encouraged to use the comment period for questions and concerns about the Proposed Plan for Sites 5 and 12. NASA will summarize and respond to public comments in a Responsiveness Summary that will become part of the official ROD.

NASA has established a community involvement program that includes periodic mailings and announcements. If you are interested in being added to the mailing list, please use the contact information provided on the last page (page 15) of this Proposed Plan.

Public Comment Period

The public comment period for the Proposed Plan offers the public an opportunity to provide input on the appropriate cleanup action for the Site soil. The public comment period will begin **March 17, 2010** and end on **April 19, 2010**. A public meeting will be held on **March 24, 2010 (see page 1 for details)**. The meeting will provide an additional opportunity for the public to submit comments regarding the Proposed Plan. All interested

parties are encouraged to attend the public meeting to learn more about the alternatives developed for Sites 5 and 12.

During the comment period, interested parties may submit written comments. (See text box on page 15, *For More Information*.) Comments on the Proposed Plan for Sites 5 and 12 must be postmarked no later than **April 19, 2010**.

Record of Decision

Following the public review and comment period for this Proposed Plan, NASA and EPA will notify the public of the remedial action(s) agreed upon by NASA and EPA in a ROD. If the remedial action(s) selected by NASA and EPA after consideration of public comments differs significantly from the remedial action(s) recommended in this Proposed Plan, EPA will explain in the ROD the basis for such difference.

How are Remedial Alternatives Evaluated?

The remedial alternatives were analyzed in detail and compared to each other using seven of the nine criteria provided in the National Oil and Hazardous Substance Pollution Contingency Plan (NCP) and the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). These nine criteria are as follows:

Threshold Criteria

- Overall Protection of Human Health and the Environment and
- Compliance with Applicable or Relevant and Appropriate Requirements (ARARs) and To-Be-Considered (TBCs) guidance criteria

Primary Balancing Criteria

- Long-term Effectiveness and Permanence,
- Reduction of Contaminant Toxicity, Mobility, or Volume through Treatment,
- Short-term Effectiveness,
- Implementability, and
- Cost

The remaining two criteria, State Acceptance and Community Acceptance, referred to as Modifying Criteria, are also considered in selecting a remedy. Virginia DEQ has been consulted in identifying the preferred alternative but final State comments will not be submitted until after the community has had an opportunity to participate in the selection process. Community Acceptance is evaluated based on comments received during the public comment period (see text box, *Let Us Know What You Think! on page 1*).

Table 2
Relative Ranking of Alternatives

CRITERION	Alternative 1 - No Action	Alternative 2	Alternative 3	Alternative 4
Overall Protection of Human Health and the Environment	NA	▮	●	●
Compliance with ARARs	NA	●	●	●
Long-term Effectiveness and Permanence	○	▮	●	▮
Reduction of Toxicity, Mobility, or Volume through Treatment	○	○	○	○
Short-term Effectiveness	NA	▮	▮	▮
Implementability	NA	●	●	●
Time to Reach RAO (years)	NA	1 year	1 year	1 year
Cost				
Capital	\$0	\$971,000	\$1,383,000	\$1,141,000
O&M	\$16,500 every 5 years	\$2,900/year \$16,500/ 5 years	\$0	\$14,000/year \$32,000/ 5 years
Present Value	\$36,000	\$1,043,000	1,383,000	\$1,389,000
NA = Not Achieved ○ = Low Ranking ▮ = Moderate Ranking ● = High Ranking				

What is a Human Health Risk Assessment? How is it Calculated?



A human health risk assessment estimates the baseline risk of a site, that is, an estimate of the likelihood of health problems occurring if no cleanup action is taken at the site. To calculate the baseline risk at a site, NASA performs the following four-step process:

Step 1: Identify the Chemicals of Potential Concern

Chemicals of potential concern are chemicals found at the site in concentrations above federal and state risk-screening levels. Chemicals with concentrations above these levels are used in the site-specific risk calculations (i.e., Steps 2 through 4 described below).

Step 2: Conduct an Exposure Assessment

In Step 2, NASA considers the different ways (pathways) that humans might be exposed to the chemicals identified in Step 1, the concentrations that humans might be exposed to, and the potential frequency (how often) and length of exposure. Both residential and non-residential (industrial) pathways are identified. Using this information, NASA calculates a reasonable maximum exposure (RME) scenario that portrays the highest level of human exposure that could possibly be expected to occur for each pathway.

Step 3: Complete a Toxicity Assessment

At this step, potential health risks from exposure to the individual chemicals of potential concern are evaluated. The chemicals are generally separated into two groups: carcinogens (cancer risk) and noncarcinogens (noncancer risk).

For carcinogens, risk estimates are expressed in terms of probability. For example, exposure to a particular carcinogenic chemical may present an increased risk of developing 1 additional case of cancer in 10,000. This incremental risk can also be expressed as 1×10^{-4} , indicating that 1 person out of 10,000 people as a result of exposure to the chemical concentration over a 70 year lifetime may develop cancer.

For noncarcinogens, exposures are first estimated and then compared to a reference dose (RfD). The RfD is developed by EPA scientists to estimate the amount of a chemical a person (including the most sensitive person) could be exposed to over a lifetime without developing adverse (noncancer) health effects. This measure is known as a hazard index (HI).

Step 4: Characterize the Risks

In this step, exposure and toxicity assessment results are combined to estimate overall risks from exposure to site chemicals. The results of Steps 1 through 3 are combined and the total risk presented by contamination at the site are summed by pathway (e.g., ingestion or inhalation) and media (e.g. ingestion of soil or groundwater) and by the potential exposure scenario (current industrial worker, future construction worker, future resident, etc.).

The acceptable range for carcinogens under the NCP is within 1×10^{-6} to 1×10^{-4} (chance of developing an additional case of cancer is 1 in 1,000,000 to 1 in 10,000). A noncarcinogenic HI of 1 or less indicates that no adverse effects are expected. An HI greater than 1 suggests that adverse health effects cannot be ruled out. In general, calculated risk greater than these ranges would require consideration of clean up alternatives.

Glossary of Terms

Administrative Record: An official compilation of Site-related documents, data, reports, and other information that are considered important to the status of and decisions made relative to a Superfund site. The public has access to this material.

Applicable or Relevant and Appropriate Requirements (ARARs): Any standard, requirement, criteria, or limitation under any Federal environmental law, or State law if more stringent, that is applicable or relevant and appropriate to the remedial action. A selected remedy must attain ARARs unless an ARAR is waived pursuant to CERCLA Section 121 (d)(4).

Carcinogenic: A type of risk resulting from exposure to chemicals that may cause cancer in one or more organs.

Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (CERCLA), 42 U.S.C. §§ 9601 to 9675: Commonly referred to as Superfund Law, CERCLA is a federal law which was passed in 1980 and amended in 1986 and again in 2002. CERCLA created a special tax that was placed in a trust fund to investigate and cleanup abandoned or uncontrolled hazardous waste sites that endanger public health and safety or the environment.

Comment Period: A time for the public to review and comment on various documents and actions taken. A minimum of a 30-day comment period is held to allow community members to review the Administrative Record file and review and comment on the Proposed Plan.

Construction Worker (scenario): The potential exposure scenario involving a future adult construction worker who is assumed to work at the Site and who may be involved with any type of excavation activity.

Contaminant: Any physical, biological, chemical or radiological substance or matter that, at a high enough concentration, could be harmful to human health or to the environment.

Contaminant of Concern (COC): A contaminant found through the risk assessment process to present an unacceptable risk.

Contaminant of Potential Concern (COPC): A contaminant found in site-specific media, deemed by the human health assessment estimation calculation rules to be a compound potentially contributing to human health risk. Chemicals are selected to represent Site contamination.

Groundwater: Water beneath the ground surface that fills spaces between materials such as sand, soil or gravel to the point of saturation. In aquifers, groundwater occurs in quantities sufficient enough for drinking water, irrigation and other uses. As groundwater flows towards its point of discharge, it may transport substances that have percolated downward from the ground surface as it flows towards its point of discharge.

Hazard Index (HI): The sum of chemical-specific Hazard Quotients. A Hazard Index of greater than 1 is associated with an increased level of concern about adverse non-cancer health effects.

Industrial Worker (scenario): The potential exposure scenario which is based on the current full-time on-site worker and is an adult who works at the Site year round.

Information Repository: A file containing information, technical reports and reference documents developed for a Site undergoing cleanup. This file is usually maintained in a place with convenient public access, such as a public library.

Institutional Controls (ICs): Non-engineered instruments such as administrative and/or legal controls that minimize potential for human exposure to contamination and protect the integrity of the remedy.

Interim Record of Decision (IROD): An official public document that explains which interim cleanup alternatives was selected. See ROD below.

Lowest Observed Effects Concentration (LOEC): The minimum level of a chemical at which an adverse impact with a studied organism is noted.

Maximum Contaminant Level (MCL): EPA-published (promulgated as law) maximum concentration level for contaminants found in water in a public water supply system.

Metals: Metals are naturally occurring elements in the earth. Arsenic, manganese, iron and silver are examples of metals. Exposure to some metals, such as arsenic, can have toxic effects even at low concentrations. Other metals, such as iron, are essential to metabolism for humans and animals.

Monitoring: Ongoing collection of information about the environment that helps gauge the effectiveness of a cleanup action. This includes the collection of samples with laboratory analysis for the contaminants of interest.

No Observed Effects Concentration (NOEC): The maximum level of a chemical at which adverse impacts to studied organisms are not noted.

Non-carcinogenic: A type of risk resulting from the exposure to chemicals that may cause systemic human health effects.

National Contingency Plan; National Oil and Hazardous Substance Pollution Contingency Plan (NCP): The NCP is codified in 40 C.F.R. Part 300. The purpose of the NCP is to provide the organizational structure and procedures for preparing for and responding to discharges of oil and releases of hazardous substances, pollutants or contaminants.

Organic Compounds: These are naturally occurring or man-made chemicals containing carbon. Volatile organics can evaporate more quickly than semivolatile organics. Other organics investigated during RI/FS activities include pesticides and polychlorinated biphenyls (PCBs). Some organic compounds may cause cancer; however, their strength as a cancer-causing agent can vary widely. Other organics may not cause cancer but may be toxic. The concentrations that cause harmful effects can also vary widely.

Polychlorinated Biphenyls (PCBs): Class of chlorinated aromatic organic compounds (formerly used as cooling fluids in electrical devices) which are strongly adsorbed on solid particles.

Polynuclear Aromatic Hydrocarbons (PAHs): Class of organic compounds related to petroleum products.

Proposed Remedial Action Plan (Proposed Plan): A plan which summarizes the preferred cleanup strategy and rationale. It also reviews the alternative(s) presented in detail in the FS. The Proposed Plan may be prepared either as a fact sheet or a separate document. The preparation of a Proposed Plan is a public participation requirement of CERCLA and the National Contingency Plan.

Record of Decision (ROD): An official public document that explains which cleanup alternatives was selected. The ROD is based on information and technical analysis generated during the RI/FS process and considers public comments and community concerns raised upon the issuance of the Proposed Plan. The ROD explains the remedy selection process and is issued following the conclusion of the public comment period.

Remedial Action: The actual construction or implementation phase that follows the remedial design for the selected cleanup alternative at a Site.

Remedial Action Objective (RAO): An objective selected in the FS, against which all potential remedial actions are judged.

Remedial Investigation/Feasibility Study (RI/FS): Investigation and analytical studies usually performed at the same time in an interactive process and together referred to as the "RI/FS." They are intended to gather data needed to determine the type and extent of contamination, establish criteria for cleaning up the Site, identify and screen cleanup alternatives for remedial action and analyze in detail the technology and cost of the alternatives

Resident (scenario): The potential exposure scenario which is based on a future resident and a person who will live in a residence located at or near the Site in a hypothetical future scenario. This receptor occupies a residence as a child (from age 0 - 6 years) and as an adult (for 24 years exposure duration). This receptor is potentially exposed to COPCs in groundwater via tap water ingestion, dermal contact while bathing, and inhalation of VOCs present in vapors generated during showering (adult resident only). In addition, the future resident is potentially exposed via incidental ingestion of, dermal contact with, and particulate dust inhalation of COPCs in surface soil. Inhalation of VOCs from vapor emissions from soil is not considered a significant pathway of exposure because VOCs were detected infrequently and at low concentrations in soil at Sites 5 and 12. Non-cancer risks were estimated separately for child versus adult, whereas, cancer risks were considered cumulative (risks were summed over child and adult periods of exposure). Additionally, potential exposure to disturbed soil that is a mixture of surface and subsurface soils as a result of construction or landscaping activities was addressed.

Resource Conservation and Recovery Act, as amended, (RCRA), 42 U.S.C. §§ 6901-6939(e): A federal law which ensures 1) the proper management of hazardous waste from the point of generation until final disposal and 2) that an owner and operator of a hazardous waste treatment, storage and disposal facility investigates and cleans up and releases necessary to protect human health and the environment.

Responsiveness Summary: A summary of oral and written public comments received during a comment period following issuance of the Proposed Plan and the responses to these. The responsiveness summary is an important part of the ROD, highlighting community concerns for decision makers.

Risk Assessment: This process evaluates and estimates the current and future potential for adverse human health or environmental effects resulting from exposure to contaminants.

Safe Drinking Water Act: 42 U.S.C. §§ 300f to 300j-26: A federal law which governs the treatment and distribution of public drinking water.

Site Inspection (SI): Sampling investigation with the goal of identifying potential sources of contamination, types of contaminants, and potential migration of contaminants. The SI is conducted prior to the RI.

Source Area: The zone of highest soil or groundwater concentrations, or both, of the chemicals of concern. The area considered to be the point of release.

Superfund: Is a term used to reference environmental restoration funds made available by CERCLA.

To Be Considered(s) (TBCs): Non-promulgated advisories or guidance issued by federal or state governments that are not legally binding but may be considered during development of remedial alternatives.



Place Mailing Address Label

For More Information...

CONTACTS

If you have questions or comments about this Proposed Plan, or any other questions, please contact:

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 Paul.Herman@deq.virginia.gov

INFORMATION REPOSITORIES

The Administrative Record (AR) contains all documents related to environmental actions taken under the CERCLA and AAOC programs. Copies of the AR and other documents relating to environmental cleanup activities for the NASA Wallops Flight Facility property are available for public review at the below listed Information Repositories. An appointment to review the original AR may be made by contacting Mr. T.J. Meyer (contact information provided above).

Eastern Shore Public Library
 23610 Front Street
 Accomack, Virginia 23301
 (757)787-3400

Island Library
 4077 Main Street
 Chincoteague, Virginia 23336
 (757)336-3460

Hours: Monday – Wednesday 9:00 a.m. – 6:00 p.m.
 Thursday 9:00 a.m. – 9:00 p.m.
 Friday 9:00 a.m. – 6:00 p.m.
 Saturday 9:00 a.m. – 1:00 p.m.

Hours: Monday 10:00 a.m. – 2:00 p.m.
 Tuesday 10:00 a.m. – 5:00 p.m.
 Wednesday 1:00 p.m. – 5:00 p.m.
 Thursday 4:00 p.m. – 8:00 p.m.
 Friday 1:00 p.m. – 5:00 p.m.
 Saturday 1:00 p.m. – 5:00 p.m.

