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Explanation of Significant Difference for the Record of Decision:

Umatilla Army Depot (Lagoons)
Hermiston, OR
9/30/1997

U.S. ARMY INSTALLATION RESTORATION PROGRAM

EXPLANATION OF SIGNIFICANT DIFFERENCE

UMATILLA DEPOT ACTIVITY
EXPLOSIVES WASHOUT LAGOONS
SOILS OPERABLE UNIT

September 30, 1997

In accordance with Army Regulation 200-2, this document is intended by the Army to comply with the National Environmental Policy Act of 1969 (NEPA).

EXPLANATION OF SIGNIFICANT DIFFERENCE FOR THE EXPLOSIVES WASHOUT LAGOONS SOILS OPERABLE UNIT AT UMATILLA DEPOT ACTIVITY

I. INTRODUCTION

This document presents an Explanation of Significant Difference (ESD) from the Record of Decision (ROD) for the Umatilla Depot Activity (UMDA) Explosives Washout Lagoons Soils Operable Unit issued September 25, 1992. The ROD was signed by the United States Army (U.S. Army), the United States Environmental Protection Agency (EPA), and the Oregon Department of Environmental Quality (ODEQ) pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986. The site name and location are as follows:

U.S. Army, Umatilla Chemical Depot Activity
Explosives Washout Lagoons Soils Operable Unit
Hermiston, Oregon 97838-9544

The U.S. Army, EPA, and ODEQ have approved the need for a significant difference action from the ROD.

This ESD, prepared in accordance with Section 117(c) of CERCLA and 40 CFR 300.435(c)(2)(i), documents the significant differences to the selected remedy outlined in the ROD. In summary, the significant difference from the selected remedy in the ROD is the utilization of the treated soil as the organic component in the re-vegetation of several designated sites on the installation rather than backfilling the former Explosive Washout Lagoons with the compost.

The revision to the selected remedy is based on the following:

- The extremely low remaining concentrations of 2,4,6-Trinitrotoluene (TNT) and Hexahydro-1,3,5-trinitro-1,3,5-triazine (Royal Demolition Explosive-RDX) in the treated soil allow for a more beneficial use of the compost than simple backfill material.

- Utilization of compost for on-site vegetative restoration will result in improved cost performance of remedial technology.

This ESD officially documents the changes to the selected remedy in the ROD. This and other relevant documents will become part of the Administrative Record file pursuant to Section 300.825 (a)(2) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). Copies of this ESD and the Administrative Record are available to the public at the specific information repositories listed below.

BRAC Environmental Coordinator's Office
U.S. Army Chemical Depot Activity
Building 32
Hermiston, Oregon 97838
(541) 564-5294
Hours: Monday - Thursday, 8:00 a.m. - 4:00 p.m.

EPA Oregon Operations Office
811 SW 6th Avenue, 3rd Floor
Portland, Oregon 97204
(503) 326-3600
Hours: Monday - Friday, 8:30 a.m. - 4:30 p.m.

EPA Region 10
Hazardous Waste Division
Record Center
1200 6th Avenue, 7th Floor
Seattle, WA 98101
(206) 553-4494
Hours: Monday - Friday, 8:30 a.m. - 4:30 p.m.

II. SUMMARY OF SITE HISTORY, CONTAMINATION, AND RECORD OF DECISION

Umatilla Depot Activity (UMDA) is a 19,728-acre military facility located in northeastern Oregon, on the border of Morrow and Umatilla counties (Figure 1). It was established as an Army ordnance depot in 1941. Activities at the facility have included the storage of chemical-filled munitions and containerized chemical agents and the disassembly, analysis, modification, re-assembly, re-packing and storage of conventional munitions.

UMDA is currently slated for realignment under the Department of Defense (DoD) Base Realignment and Closure (BRAC) program. If UMDA is approved for closure and the Army vacates the site, the facility could be released to private interests for either light industrial or residential use. Due to the historical activities at the site, environmental investigations (including Preliminary Assessment and Remedial Investigation [RI]) were conducted in order to identify areas of concern; characterize site conditions; and define the nature and extent of contamination (Dames & Moore 1990 and 1992). The environmental investigations identified the Explosives Washout Lagoons Soils Operable Unit at UMDA as an area of concern.

In the 1950s, UMDA operated an explosives washout plant on-site. Munitions were opened and washed with hot water to remove and recover explosives such as TNT. The wash water from the plant, generated during weekly cleanings, drained into two nearby lagoons

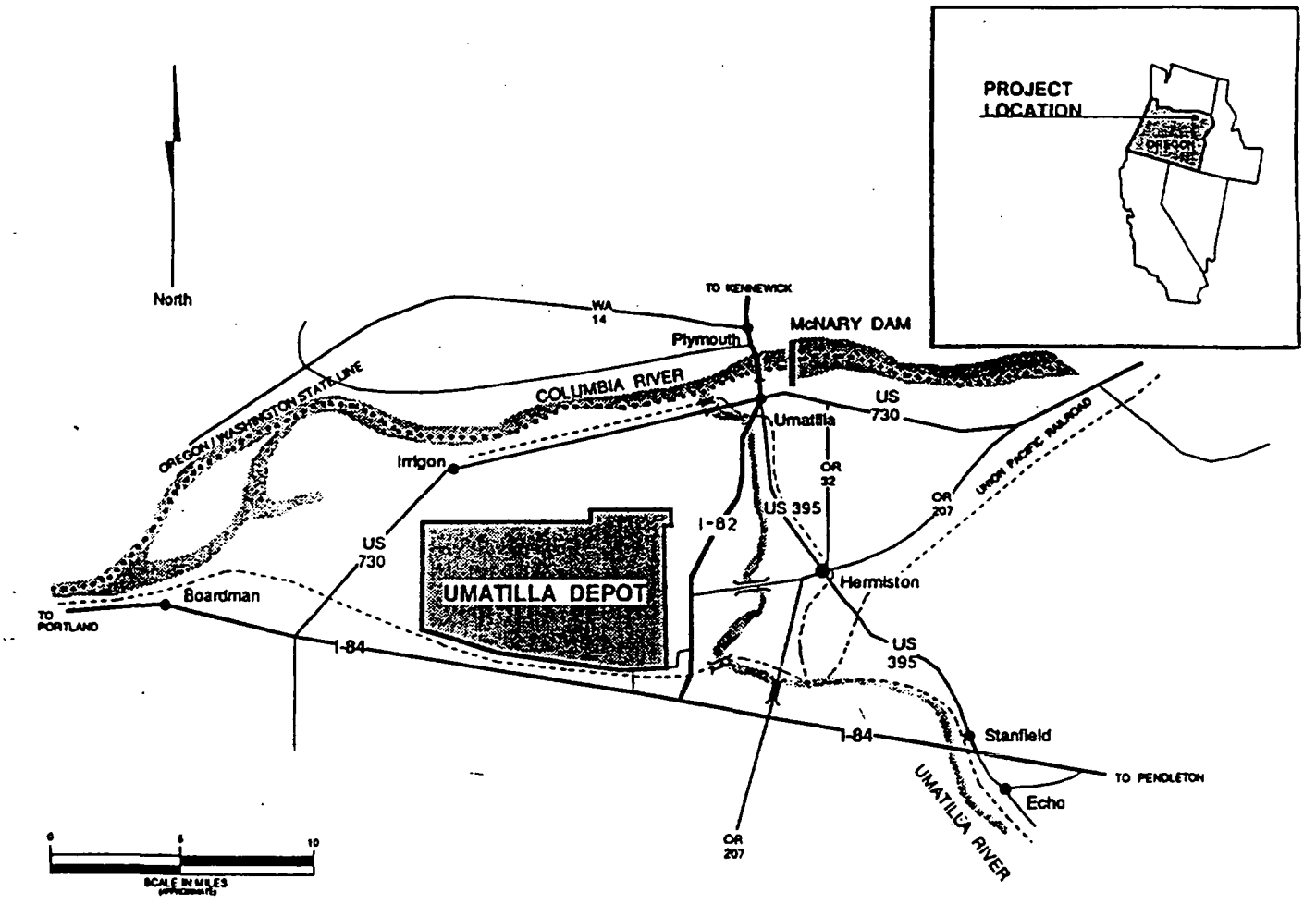

Figure 1. Location of the Umatilla Depot Activity (UMDA)

where it infiltrated into the soil. Prior to remediation, the south and north lagoons were 27 feet and 39 feet wide, respectively. Both lagoons were 80 feet long and 6 feet deep. During the 15 year operation of the washout plant, approximately 85 million gallons of wash water were discharged to the lagoons.

Although lagoon sludge was removed regularly during operation of the plant, explosives contained in the wash water migrated into the soil and groundwater at the site. The groundwater table is encountered approximately 47 feet below the lagoons. Because of the soil and groundwater contamination of the lagoons, the site was placed on EPA's National Priorities List (NPL) in 1987.

The Army initiated a Remedial Investigation (RI) of the lagoons in 1987. The RI was used to identify the types, quantities, and locations of contaminants and to develop ways of addressing this contamination. The results of the RI and supplemental investigations are as follows:

- The sides of the lagoons and the surface and sub-surface soils below the lagoons were contaminated with organic explosives and related compounds. The major contaminants identified as posing potential future health risks were TNT, RDX, and 2,4-dinitrotoluene (DNT). Other contaminants which were detected below levels of concern include the following: 1,3,5-Trinitrobenzene (TNB), 2,6-Dinitrotoluene (2,6-DNT), Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (High Melting Explosive-HMX), and Nitrobenzene (NB).

- Concentrations of explosives in the sides of the lagoons and the 5 feet of soil immediately below the lagoons were 10 to 1,000 times higher than deeper soils. Explosives concentrations are generally very low in the soil layer from 5 to 20 feet below the lagoons. Below 20 feet, concentrations increase slightly by a factor of about 2 (still well below near-surface soils) and remain steady to the groundwater table.

- A groundwater plume of RDX contamination extends at least 1,000 feet away from the lagoons. Other groundwater contaminants are seen in wells closer to the lagoons. The contaminant plume is about 1 mile inside the facility boundary and is being remediated as a separate Operable Unit.

Following the environmental investigation studies, a Human Health Baseline Risk Assessment (Dames & Moore 1992) and Feasibility Study (FS) (CH2M Hill/Morrison Knudsen, 1992) were conducted for the Explosives Washout Lagoons Soils Operable Unit. These evaluations were conducted to define remediation goals and criteria and to identify, evaluate, and provide the basis for selection of remediation alternatives for explosives contamination of the Explosives Washout Plant. Upon review of the RI/FS, the U.S. Army, EPA, and ODEQ selected a cleanup plan for the site utilizing windrow composting as the remedy for explosives contaminated soils.

The major components of the selected remedy for the remediation of the Explosives Washout Lagoons soils as stated in the ROD were as follows:

- Construction of a roadway between the lagoons and the composting facility to transport excavated and treated soils
- Development of the composting facility on-site, including clearing and grubbing, grading, and construction of asphalt pads and erection of storage and treatment buildings
- Excavation of soils exceeding TNT or RDX concentrations of 30 mg/kg, excavation included appropriate hazards monitoring and dust controls
- Mixing contaminated soils with organic amendments (e.g., vegetable waste, straw, manure) as appropriate and forming the mixture into windrows
- Regularly turning the windrows with a windrow machine
- Testing the finished compost for explosives
- Backfilling the excavation with compost, covering with approximately 2 feet of clean soil obtained from either on-site or off-site, grading, and re-vegetating

The completed project resulted in the excavation of 10,969 cubic yards of contaminated soils. After the addition of amendments, the total volume of treated compost was 28,000 cubic yards. The contaminated soil compost was placed in windrows within a treatment building and turned daily. A total of 14 batches were treated with only two compost samples failing to achieve the cleanup goals within 20 days. As of this writing, all of the above actions except the last have been accomplished.

III. DESCRIPTION OF AND BASIS FOR THE SIGNIFICANT DIFFERENCES

The preferred alternative to backfilling the Explosives Washout Lagoons with treated soil, as stated in the ROD, is to utilize the compost for on-site vegetation restoration efforts. Viable on-site areas identified for placement of the treated soil include disturbed areas around the Explosives Washout Lagoons, the Ammunition Demolition Activity area, the Miscellaneous Sites areas, the landfill cap and general facility locations along roads and buildings.

In agreeing on a cleanup plan for the Explosives Washout Lagoons site, the involved parties assumed that soil concentrations of TNT and RDX following composting would achieve the cleanup goal but still be high enough to render the soil unsuitable for other beneficial uses. The cleanup level established in the ROD required reducing the concentration of RDX and TNT in treated soils to 30 mg/kg. This level was established by risk based calculations that assumed exposure to soils would be through dermal contact in a light industrial scenario. However, the post-remediation results suggest that the concentrations of these compounds are

low enough to allow for future residential land use. Table 1 compares the concentrations of the primary contaminants of concern with the risk based residential cleanup values for TNT and RDX associated with a $1x10^{-6}$ excess cancer risk. Values for all results are shown in Appendix A. The percentage of compost samples that contained concentrations of explosives below the Reporting Limits are also shown (Reporting Limits; TNT = 4 mg/kg, RDX = 2 mg/kg).

Table 1. Comparison of Explosives Levels in Composted Soils to Cleanup Goals

Contaminant of Concern	ROD Cleanup Level	Residential Land Use Cleanup Level	Upper Confidence Level of Explosives in Compost[1]	Percent Non-Detect
TNT	30 mg/kg	20.0 mg/kg	3.84 mg/kg	94.9
RDX	30 mg/kg	6.0 mg/kg	3.78 mg/kg	80.5

The Upper Confidence Level (UCL)[1] estimates that 90% of the data distribution is below the UCL with 95% confidence. Calculation of the UCL resulted in a conservatively high value, that is, one that is likely to overestimate the levels of TNT and RDX and thus lead to management decisions which are protective of human health. First, the data set used to calculate the UCL probably reported higher concentrations of explosives than actually occurred in the compost when the material was removed from the treatment building. Generally, a one to three week time period elapsed between sampling of a batch and the reporting of analytical results. As a result, the reported concentrations of explosives did not account for the continued biotransformation that occurred while samples were analyzed. Second, for samples that were scored "non-detect," that is, for which the true value was less than the reporting limit, one-half of the reporting limit was substituted. This manipulation would tend to cause a high bias to the Upper Confidence Limit. Thus, the conservative upper bound of the compost concentrations of RDX and TNT suggests unrestricted future use would be protective.

The composting method selected does not significantly mineralize RDX and TNT, but reductively biodegrades them into intermediates (such as poly-diamino-nitrotoluenes and nitroso-RDX compounds) which covalently bind to soil organic components such as humus. The reduction in concentrations of TNT and RDX reported following composting should therefore be considered a reduction in the mobile or extractable fraction of the explosives (Thorne and Leggett, 1997).

Low extractable concentrations of explosives are related to the lack of toxicity demonstrated by composted soil. Griest et al. (1994) concluded that the reduction in extractable explosives resulted in both reduced mutagenic activity and reduced toxicity. The mutagenic activity of compost leachate was evaluated with the Ames Test (Ames, et al., 1975) while toxicity to

[1] The Upper Confidence Limit for explosives in compost was calculated using the nonparametric method described by Gilbert (1987, pp. 142). A nonparametric approach was required because the data set did not conform to either a normal or lognormal distribution. Non detect values were transformed to 1/2 the detection limit before calculation of the Upper Confidence Limit.

compost leachate was tested with a bioassay using the freshwater microcrustacean *Ceriodaphnia dubia* in a protocol similar to EPA Method 1002.0 (Weber, et al., 1989). Even untreated contaminated soils containing 10-30 mg/kg of TNT or RDX fail to produce toxic effects in plants (Cataldo, et. al., 1989, Cataldo, et. al., 1990). The concentrations of explosives measured in compost are far lower than this toxicity threshold.

Investigations conducted during pilot scale treatability studies using contaminated soils from the Washout Lagoons Operable Unit have concluded that harmful concentrations of biotransformed explosives should not be released into the environment after composting (Griest, et al., 1994). This is because (as stated in the reference):

- Explosives did not leach during a test simulating 1,000 years of acid rain exposure (EPA Method 1320, the Synthetic Precipitation Leachate Test).
- Explosives did not leach after exposure to UV-irradiation.
- The biotransformation pathway produces a polymeric species that is "of very limited solubility."

Studies conducted for the U.S. Army Biomedical Research and Development Laboratory have documented plant uptake of explosives from soil (Cataldo, et.al., 1989, Cataldo, et. al., 1990). However, there is no current evidence that explosives are available to plants after the biotransformation that occurs during composting. Data provided by the composting contractor, Bioremediation Service, Inc. (BSI), failed to detect explosives or metabolic degradation products in either food or ornamental plants grown in compost treated soil (Appendix B). The difficulty of extracting explosives compounds from plant tissue resulted in high detection limits in the BSI study. These detection limits, ranging up to 10 mg/kg for both TNT and RDX, were too high for direct comparisons with preliminary remediation goals for consumption of home grown vegetables stated in the Remedial Investigation (Dames and Moore, 1992). Currently, studies supported by the U.S. Army Environmental Center are attempting to determine whether plants are capable of accumulating biotransformed explosives from compost. Until this issue is resolved with greater certainty, it is intended that the compost be used only for non-food plants.

Griest et al. (1994) stated that the concentrations of potassium, phosphorus and nitrogen in the Umatilla compost provided significant fertilizer value. Some inhibitory effects were noted in the reduced germination rate of lettuce and clover grown in contaminated soil compost. However, the germination rate in control (uncontaminated compost) plants was also lower than recommended by the test protocol. Despite the reduced germinated rate in microcosm studies, Griest, et al. (1994) concluded that land application of Umatilla compost would allow the re-establishment of plant populations. In addition to potentially improving re-vegetation efforts, the use of compost on disturbed sites has been reported to reduce erosion (W&H Pacific, 1993).

The compost generated at Umatilla has significant fertilizer value; it is also free of pathogens possibly introduced by chicken manure used as a component of the compost. Pathogen testing conducted by BSI demonstrates that the compost passes EPA's 503 Class A pathogen

requirements for biosolids (Appendix C). This testing included assays for parasites (Helminth Ova Assay), enteric viruses, fecal coliform and *Salmonella*.

EPA Region 10 tested the full scale compost residues for leachable explosives in the summer of 1997 using two leaching tests, the Synthetic Precipitation Leach Procedure (SPLP) [EPA SW-846 Method 1312] and the Toxicity Characteristic Leaching Procedure (TCLP) [EPA SW-846 Method 1311]. The SPLP test mimics aqueous leaching in a soil backfill environment while the TCLP test mimics waste leaching in a landfill. The results of these tests showed no detectable explosives constituents in any of the leachate samples analyzed using EPA SW-846 Method 8330 for explosives (Appendix D). Therefore, aqueous explosives leaching from the compost residues is not a concern.

Evaluation of the compost by an independent agronomist confirms its nutritive value to plants but also raises concerns over high concentrations of salts. The salts content of 13.6 lbs per dry ton may inhibit plant growth under the dry climatic conditions of eastern Oregon. For this reason, a moderate application rate of 10 tons/acre was recommended by the agronomist to avoid adverse impacts caused by salts (Appendix E). The compost is better suited to the soil and climate of western Oregon and Washington. Increased moisture and reduced soil pH in western Oregon and Washington would allow an application rate of 40 tons/acre.

The following table summarizes the amount of compost which could be used to re-vegetate UMDA sites excavated during remediation. In addition, compost could be applied over wide areas of the installation to restore plant communities disturbed by past activities. The Ecological Assessment Report for the Depot Activity (Dames and Moore, 1992b) identifies approximately 2,000 acres at the installation as drastically disturbed. Compost applied at 10 tons/acre could help to restore these areas. Restoration could also be enhanced by applying compost at a lower rate in areas that are naturally regenerating. The ecological assessment has identified about 5,600 acres that fit into this category.

Table 2. Compost Quantities

Site Location	Quantity of Compost Required for Re-vegetation (CY)
Explosives Washout Lagoons	120
Ammunition Demolition Activity (15 sites)	1790
Deactivation Furnace	134
Landfill Cap	2500
Miscellaneous Multiple Sites	110
Areas	**Quantity of Compost Consumed in Restoration (CY)**
Drastically Disturbed Areas	10,000
Grass Regeneration Areas	15,000
TOTAL (APPROX.)	**29,654**

Considering an average cost of $15 per cubic yard for compost purchased from local commercial sources, utilizing the treated soil for re-vegetation or restoration of the above sites would present a cost savings of approximately $445,000 over importing compost from off-site. The cost savings associated with on-site beneficial use of the treated soil, coupled with the suitability of the compost for on-site vegetation restoration, support a significant difference from the final burial in the lagoons selected in the ROD. Use of treated soil at designated locations has been coordinated with ODEQ.

Providing the treated soil compost for off-site use was considered, but deemed inappropriate at this time, since food crop uptake of contaminants present in the soil has not been sufficiently characterized to allow for unrestricted distribution of the compost. However, off-site use at other Department of Defense installations in the region may be appropriate. Though stockpiling of treated soil will incur certain costs (geomembrane base, temporary fencing, etc.), the anticipated rapid availability of suitable on-site locations and the more costly alternative of importing soil justify this expense.

A decision matrix to determine future use of compost should include the following considerations:

Table 3. Future Compost Use Considerations

Compost Use	Comment
On-site use for restoring restoration sites or landfill closing	Highly acceptable
On-site use for other landscaping uses (non food crops)	Highly acceptable
Off-site use for landscaping or restoration at other DoD installations	Acceptable
Off-site use for non food crop landscaping (i.e. road sides)	**Unacceptable until plant uptake issues are completed and evaluated.**
On- or off-site use for residential food crops	Unacceptable

Maintenance of the compost in a stockpile may also aid the groundwater treatment effort at the Washout Lagoons site. The infiltration gallery of the groundwater treatment system is located in the excavated Washout Lagoons. Access to the infiltration gallery for maintenance will be easier if the compost is not used to backfill the excavation at this time.

After incorporating the significant differences into the recommended disposal alternative for the treated Explosives Washout Lagoons Soils, the change to the final remedy is an effective remedial alternative which complies with all federal, state, and Army applicable or relevant and appropriate requirements (ARARs). This remedy minimizes the health and safety risks and provides for a more cost effective disposal scenario. The following describes the complete modified remedy agreed on by the U.S. Army, EPA, and ODEQ for use of treated Explosives Washout Lagoons Soils:

- The treated soils will be utilized for surface site restoration and improvement of vegetative plantings at several designated locations at the former UMDA.
- Excess stockpiled soil not used in this vegetative restoration effort will remain on-site until further suitable on-site locations are identified.

IV. AFFIRMATION OF THE STATUTORY DETERMINATIONS

Considering the new information that has been developed and the changes that have been made to the selected remedy, the Army, ODEQ, and EPA believe the remedy remains protective of human health and the environment, complies with federal and state requirements that were identified in the ROD as applicable or relevant and appropriate to this remedial action at the time the original ROD was signed, and is cost-effective. In addition, the revised remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable for this site.

V. PUBLIC PARTICIPATION

Notice has been issued that the contents of the Administrative Record File are available for public review and comment. This ESD will become part of the Administrative Record File (NCP 300.825(a)(2)). The Record of Decision and other supporting information including the Remedial Investigation and Feasibility Study, and the Remedial Design Analysis are available at the information repositories. Although modified from the original ROD, the remedy does not present a fundamental change in scope or purpose of this action. Therefore, a formal comment period will not be conducted.

Consistent with the NCP Section 300.435(c)(2)(i), notice of this ESD has been placed into the following newspapers: the *Hermiston Herald, East Oregonian,* and the *Tri-City Herald*. The public is encouraged to review this ESD and other relevant documents in the Administrative Record and to provide comments to any of the agencies involved. Additional information may be requested within 14 days of the notice of issuance for this ESD by contacting:

Mark Daugherty
U.S. Army Chemical Depot Activity
Building 32
Hermiston, OR 97838-9544
(541) 564-5294

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APPENDIX A.

QUALITY ASSURED RESULTS FROM TESTING OF COMPOSTED SOIL

The batches (indicated as B1, B2, etc) consisted of 27 evenly spaced grids, from which two samples were taken. Table A-1 shows TNT data; table A-2 shows RDX data.

Table A-1. Results of TNT Confirmatory Testing.

All values are in mg/kg dry weight. ND means non-detected at the reporting limit of 2 mg/kg dry weight.

Location	Batch 1		Batch 2		Batch 3		Batch 4		Batch 5		Batch 6		Batch 7		Batch 8		Batch 9		Batch 10		Batch 11		Batch 12		Batch 13		Batch 14	
	Sample 1	Sample 2	Sample 1	Sample 2	Sample 1	Sample 2	Sample 1	Sample 2	Sample 1	Sample 2	Sample 1	Sample 2	Sample 1	Sample 2	Sample 1	Sample 2	Sample 1	Sample 2	Sample 1	Sample 2	Sample 1	Sample 2	Sample 1	Sample 2	Sample 1	Sample 2	Sample 1	Sample 2
Grid 1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	16.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Grid 2	6.5	5.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Grid 3	ND	ND	ND	ND	ND	ND	ND	6.1	ND	ND	ND	ND	4.4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4.1	ND	ND	ND
Grid 4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Grid 5	ND	ND	ND	ND	11.0	ND	ND	ND	ND	ND	ND	ND	6.2	ND	ND	ND	ND	ND	ND	5.2	ND	ND	ND	ND	ND	ND	ND	ND
Grid 6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Grid 7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Grid 8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Grid 9	ND	ND	ND	8.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Grid 10	ND	ND	ND	5.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Grid 11	ND	ND	ND	ND	20.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Grid 12	ND	ND	ND	ND	ND	22.0	ND	ND	ND	ND	ND	ND	15.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Grid 13	ND	ND	ND	7.0	ND	20.0	ND	ND	ND	ND	ND	ND	7.0	ND	ND	ND	ND	ND	8.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
Grid 14	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	18.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Grid 15	ND	ND	ND	ND	ND	4.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Grid 16	ND	ND	ND	ND	ND	ND	ND	19.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
Grid 17	ND	ND	4.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	15.0	ND		
Grid 18	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	12.0	ND	ND	ND	ND	ND		
Grid 19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
Grid 20	ND	39 0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.5	13.0	ND	ND	ND	ND	ND	ND		
Grid 21	ND	ND	18.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4.5	ND		
Grid 22	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	8.6	ND	ND	ND	ND	ND	ND		
Grid 23	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
Grid 24	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
Grid 25	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
Grid 26	22.0	ND	ND	ND	ND	ND	ND	9.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
Grid 27	ND	ND	ND	ND	25.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4.0	ND	ND	ND	ND	ND	ND	ND		

Source: Bioremediation Services, Inc. 1996. Chemical Quality Control Report, Phase II, Contaminated Soil Remediation , Explosives Washout Lagoons, UMDA, Hermiston, OR. Prepared for U.S. Army Corps of Engineers, Seattle District, Seattle WA.

Table A-2. Results of RDX Confirmatory Testing.

All values are in mg/kg dry weight. N/D means non-detected at the reporting limit of 4 mg/kg dry weight.

Location	Batch 1		Batch 2		Batch 3		Batch 4		Batch 5		Batch 6		Batch 7		Batch 8		Batch 9		Batch 10		Batch 11		Batch 12		Batch 13		Batch 14	
	Sample 1	Sample 2	Sample 1	Sample 2	Sample 1	Sample 2	Sample 1	Sample 2	Sample 1	Sample 2	Sample 1	Sample 2	Sample 1	Sample 2	Sample 1	Sample 2	Sample 1	Sample 2	Sample 1	Sample 2	Sample 1	Sample 2	Sample 1	Sample 2	Sample 1	Sample 2	Sample 1	Sample 2
Grid 1	ND	2.9	2.2	ND	2.0	ND	ND	ND	ND	ND	3.2	2.4	ND	2.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Grid 2	4.7	5.8	ND	3.0	ND	ND	ND	ND	ND	ND	ND	ND	2.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Grid 3	5.1	ND	2.7	2.9	ND	ND	ND	5.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.1	ND	ND	ND	ND	ND	ND
Grid 4	ND	ND	ND	3.1	ND	ND	ND	2.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Grid 5	3.0	ND	ND	ND	13.0	ND	ND	2.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20.0	ND	31.0	ND	ND	ND	ND	ND	ND	ND
Grid 6	ND	ND	3.0	3.1	ND	3.0	2.7	14.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	8.8	23.0	ND	ND	2.7	ND	ND	ND
Grid 7	2.1	ND	2.9	ND	ND	ND	14.0	4.4	ND	ND	2.4	2.1	2.4	ND	ND	ND	ND	ND	ND	2.4	ND	ND	ND	ND	ND	ND	ND	ND
Grid 8	2.7	ND	ND	ND	ND	ND	ND	4.2	ND	ND	ND	3.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Grid 9	ND	ND	ND	3.8	ND	ND	2.5	3.2	ND	ND	ND	ND	2.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Grid 10	ND	ND	ND	7.6	2.5	3.3	2.1	ND	ND	ND	ND	3.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Grid 11	5.6	6.2	ND	ND	12.0	ND	ND	ND	ND	ND	3.7	ND	2.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Grid 12	7.0	ND	ND	ND	4.6	4.1	ND	2.1	ND	ND	ND	ND	6.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Grid 13	ND	2.6	ND	5.0	3.6	5.7	ND	2.1	ND	ND	ND	2.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Grid 14	3.4	ND	ND	ND	2.1	2.1	ND	ND	ND	ND	ND	ND	2.6	ND	ND	ND	ND	ND	2.2	ND	ND	ND	ND	ND	ND	ND	ND	ND
Grid 15	8.6	4.0	ND	ND	3.7	11.0	ND	ND	ND	ND	3.8	ND	ND	ND	ND	ND	ND	ND	2.8	ND	ND	ND	ND	ND	ND	ND	ND	ND
Grid 16	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4.3	3.6	7.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
Grid 17	2.8	7.3	6.7	ND	2.2	2.2	ND	2.2	ND	ND	2.4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
Grid 18	ND	ND	ND	ND	2.2	ND	2.4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	6.5	ND	ND	ND	ND	ND		
Grid 19	9.6	ND	ND	6.5	3.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.9	2.5	ND	ND	ND	ND	ND	ND		
Grid 20	ND	8.9	ND	ND	ND	2.0	ND	ND	ND	ND	3.2	ND	ND	ND	ND	ND	ND	ND	ND	5.4	ND	ND	ND	ND	ND	ND		
Grid 21	ND	ND	31.0	3.7	4.1	ND	3.3	ND	ND	ND	ND	4.0	ND	ND	ND	ND	ND	ND	4.2	ND	ND	ND	ND	ND	ND	ND		
Grid 22	ND	4.4	ND	ND	2.5	2.4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
Grid 23	ND	ND	ND	ND	3.0	2.4	ND	ND	ND	ND	ND	4.7	ND	ND	ND	2.4	ND	ND	2.9	2.4	ND	ND	ND	ND	ND	ND		
Grid 24	ND	ND	ND	2.6	2.6	2.5	ND	2.9	ND	ND	ND	ND	4.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
Grid 25	ND	ND	ND	ND	ND	2.0	4.1	ND	2.1	ND	ND	ND	ND	ND	ND	14.0	ND	ND	ND	ND	ND	ND	ND	4.8	ND	ND		
Grid 26	3.4	ND	3.6	4.7	2.2	6.2	ND	13.0	ND	ND	2.7	5.5	2.3	ND	4.6	ND	ND	ND	ND	4.5	ND	ND	ND	ND	ND	ND		
Grid 27	6.5	ND	5.4	3.3	4.9	ND	ND	4.0	ND	ND	4.7	2.7	ND	ND	ND	ND	ND	ND	2.0	3.3	ND	6.9	ND	ND	ND	ND		

Source: Bioremediation Services, Inc. 1996. Chemical Quality Control Report, Phase II, Contaminated Soil Remediation , Explosives Washout Lagoons, UMDA, Hermiston, OR. Prepared for U.S. Army Corps of Engineers, Seattle District, Seattle WA.

APPENDIX B.

Analytical results of tissue samples from food and ornamental plants grown in compost from the Explosives Washout Lagoons. These chemical tests were commissioned by the composting contractor, Bioremediation Services, Inc.

FILE

1-22-96

Continental
Analytical Services, Inc.

01/18/96

Bioremediation Service, Inc.
Attn: Dave Emery
12130 Ainsworth Cr.Ste220
Portland, OR 97220-9009

Date Received: 11/28/95
CAS File No.: 6404
CAS Order No.: 32453
Project No.: UMDA-Phase II
Your P.O.: UM2-003

Dear Mr. Emery:

Enclosed are the laboratory reports for the following samples:

CAS LAB ID #	SAMPLE DESCRIPTION	DATE SAMPLED
95111617	1A Carrot	11/27/95
95111618	2A Grass Mixture	11/27/95
95111619	3A Sagebrush	11/27/95
95111620	4A Turnip	11/27/95
95111621	5A Sagebrush	11/27/95
95111622	6A Crook Neck Squash	11/27/95
95111623	7A Carnation	11/27/95
95111624	8A Carnation	11/27/95
95111625	9A Marigolds	11/27/95
95111626	10A Marigolds	11/27/95
95111627	11A Mums	11/27/95
95111628	12A Mums	11/27/95
95111629	13A Strawberry	11/27/95

The footnotes contained in the attached laboratory reports are summarized below for your reference.

CAS LAB ID #	TEST NAME	SAMPLE CONC.
95111617	RDX	ND(2.5) L M
	2,4-Dinitrotoluene	ND(2.5) L M
	2,6-Dinitrotoluene	ND(2.5) L M
	TNT	ND(2.5) L M

M - Reporting limit higher than normal due to matrix interferences.
L - Reporting limit higher than normal due to limited sample volume available.

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Continental
Analytical Services, Inc.

01/18/96

CAS LAB ID #	TEST NAME	SAMPLE CONC.
95111618	RDX	ND(2.5) L M
	2,4-Dinitrotoluene	ND(2.5) L M
	2,6-Dinitrotoluene	ND(2.5) L M
	TNT	ND(2.5) L M

M - Reporting limit higher than normal due to matrix interferences.
L - Reporting limit higher than normal due to limited sample volume available.

CAS LAB ID #	TEST NAME	SAMPLE CONC.
95111619	RDX	ND(2.0) L
	2,4-Dinitrotoluene	ND(2.0) L
	2,6-Dinitrotoluene	ND(2.0) L
	TNT	ND(2.0) L

L - Reporting limit higher than normal due to limited sample volume available.

CAS LAB ID #	TEST NAME	SAMPLE CONC.
95111620	RDX	ND(5.0) L
	2,4-Dinitrotoluene	ND(5.0) L
	2,6-Dinitrotoluene	ND(5.0) L
	TNT	ND(5.0) L

L - Reporting limit higher than normal due to limited sample volume available.

CAS LAB ID #	TEST NAME	SAMPLE CONC.
95111621	RDX	ND(5.0) L M
	2,4-Dinitrotoluene	ND(5.0) L M
	2,6-Dinitrotoluene	ND(5.0) L M
	TNT	ND(5.0) L M

M - Reporting limit higher than normal due to matrix interferences.
L - Reporting limit higher than normal due to limited sample volume available.

CAS LAB ID #	TEST NAME	SAMPLE CONC.
95111622	RDX	ND(2.0) L M

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01/18/96

CAS LAB ID #	TEST NAME	SAMPLE CONC.
95111622	2,4-Dinitrotoluene	ND(2.0) L M
	2,6-Dinitrotoluene	ND(2.0) L M
	TNT	ND(2.0) L M

M - Reporting limit higher than normal due to matrix interferences.
L - Reporting limit higher than normal due to limited sample volume available.

CAS LAB ID #	TEST NAME	SAMPLE CONC.
95111623	RDX	ND(1.0) M
	2,4-Dinitrotoluene	ND(1.0) M
	2,6-Dinitrotoluene	ND(1.0) M
	TNT	ND(1.0) M

M - Reporting limit higher than normal due to matrix interferences.

CAS LAB ID #	TEST NAME	SAMPLE CONC.
95111625	RDX	ND(5.0) L M
	2,4-Dinitrotoluene	ND(5.0) L M
	2,6-Dinitrotoluene	ND(5.0) L M
	TNT	ND(5.0) L M

M - Reporting limit higher than normal due to matrix interferences.
L - Reporting limit higher than normal due to limited sample volume available.

CAS LAB ID #	TEST NAME	SAMPLE CONC.
95111626	RDX	ND(2.5) L M
	2,4-Dinitrotoluene	ND(2.5) L M
	2,6-Dinitrotoluene	ND(2.5) L M
	TNT	ND(2.5) L M

M - Reporting limit higher than normal due to matrix interferences.
L - Reporting limit higher than normal due to limited sample volume available.

CAS LAB ID #	TEST NAME	SAMPLE CONC.
95111627	RDX	ND(10) M

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01/18/96

CAS LAB ID #	TEST NAME	SAMPLE CONC.
95111627	2,4-Dinitrotoluene	ND(10) M
	2,6-Dinitrotoluene	ND(10) M
	TNT	ND(10) M

M - Reporting limit higher than normal due to matrix interferences.

CAS LAB ID #	TEST NAME	SAMPLE CONC
95111628	RDX	ND(10) M
	2,4-Dinitrotoluene	ND(10) M
	2,6-Dinitrotoluene	ND(10) M
	TNT	ND(10) M

M - Reporting limit higher than normal due to matrix interferences.

Thank you for choosing CAS for this project. If you have any questions, please contact me at 800-535-3076.

CONTINENTAL ANALYTICAL SERVICES, INC.

Clifford J. Baker

Clifford J. Baker
Project Manager

1804 Glendale Road · Salina, Kansas 67401-6675
913-827-1273 · 800-535-3076 · FAX 913-823-7830

Continental
Analytical Services, Inc.

Client: Bioremediation Service, Inc.
Attn: Dave Emery
12130 Ainsworth Cr.Ste220
Portland, OR 97220-9009

Date Sample Rptd: 01/18/96
Date Sample Recd: 11/28/95
CAS File No: 6404
CAS Order No: 32453
Client P.O.: UMDA-Phase II

Lab Number: 95111617
Sample Description: 1A Carrot

Date Sampled: 11/27/95
Time Sampled:

Analysis	Concentration	Units	Date Analyzed	Book/Page
RDX	ND(2.5) L M	mg/kg	12/13/95	2743/71
2,4-Dinitrotoluene	ND(2.5) L M	mg/kg	12/13/95	2743/71
2,6-Dinitrotoluene	ND(2.5) L M	mg/kg	12/13/95	2743/71
TNT	ND(2.5) L M	mg/kg	12/13/95	2743/71

Analysis	Date Prepared	QC Batch	Analyst	Analytical Method
RDX	12/05/95	951205-1	HSY	8330
2,4-Dinitrotoluene	12/05/95	951205-1	HSY	8330
2,6-Dinitrotoluene	12/05/95	951205-1	HSY	8330
TNT	12/05/95	951205-1	HSY	8330

M - Reporting limit higher than normal due to matrix interferences.

L - Reporting limit higher than normal due to limited sample volume available.

Conclusion of Lab Number: 95111617

Lab Number: 95111618
Sample Description: 2A Grass Mixture

Date Sampled: 11/27/95
Time Sampled:

Analysis	Concentration	Units	Date Analyzed	Book/Page
RDX	ND(2.5) L M	mg/kg	12/13/95	2743/71
2,4-Dinitrotoluene	ND(2.5) L M	mg/kg	12/13/95	2743/71
2,6-Dinitrotoluene	ND(2.5) L M	mg/kg	12/13/95	2743/71
TNT	ND(2.5) L M	mg/kg	12/13/95	2743/71

Analysis	Date Prepared	QC Batch	Analyst	Analytical Method
RDX	12/05/95	951205-1	HSY	8330
2,4-Dinitrotoluene	12/05/95	951205-1	HSY	8330
2,6-Dinitrotoluene	12/05/95	951205-1	HSY	8330
TNT	12/05/95	951205-1	HSY	8330

-Continued-

CONTINENTAL ANALYTICAL SERVICES, INC.

Client: Bioremediation Service, Inc.
Lab Number: 95111618

Analysis	Concentration	Units	Date Analyzed	Book/Page

M - Reporting limit higher than normal due to matrix interferences.

L - Reporting limit higher than normal due to limited sample volume available.

Conclusion of Lab Number: 95111618

Lab Number: 95111619
Sample Description: 3A Sagebrush

Date Sampled: 11/27/95
Time Sampled:

Analysis	Concentration	Units	Date Analyzed	Book/Page
RDX	ND(2.0) L	mg/kg	12/07/95	2743/69
2,4-Dinitrotoluene	ND(2.0) L	mg/kg	12/07/95	2743/69
2,6-Dinitrotoluene	ND(2.0) L	mg/kg	12/07/95	2743/69
TNT	ND(2.0) L	mg/kg	12/07/95	2743/69

Analysis	Date Prepared	QC Batch	Analyst	Analytical Method
RDX	12/05/95	951205-1	HSY	8330
2,4-Dinitrotoluene	12/05/95	951205-1	HSY	8330
2,6-Dinitrotoluene	12/05/95	951205-1	HSY	8330
TNT	12/05/95	951205-1	HSY	8330

L - Reporting limit higher than normal due to limited sample volume available.

Conclusion of Lab Number: 95111619

Lab Number: 95111620
Sample Description: 4A Turnip

Date Sampled: 11/27/95
Time Sampled:

Analysis	Concentration	Units	Date Analyzed	Book/Page
RDX	ND(5.0) L	mg/kg	12/07/95	2743/69
2,4-Dinitrotoluene	ND(5.0) L	mg/kg	12/07/95	2743/69
2,6-Dinitrotoluene	ND(5.0) L	mg/kg	12/07/95	2743/69
TNT	ND(5.0) L	mg/kg	12/07/95	2743/69

Analysis	Date Prepared	QC Batch	Analyst	Analytical Method
RDX	12/05/95	951205-1	HSY	8330

-Continued-

CONTINENTAL ANALYTICAL SERVICES, INC.

LABORATORY REPORT

Client: Bioremediation Service, Inc.
Lab Number: 95111620

Analysis	Date Prepared	QC Batch	Analyst	Analytical Method
2,4-Dinitrotoluene	12/05/95	951205-1	HSY	8330
2,6-Dinitrotoluene	12/05/95	951205-1	HSY	8330
TNT	12/05/95	951205-1	HSY	8330

L - Reporting limit higher than normal due to limited sample volume available.

Conclusion of Lab Number: 95111620

Lab Number: 95111621
Sample Description: 5A Sagebrush

Date Sampled: 11/27/95
Time Sampled:

Analysis	Concentration	Units	Date Analyzed	Book/Page
RDX	ND(5.0) L M	mg/kg	12/13/95	2743/70
2,4-Dinitrotoluene	ND(5.0) L M	mg/kg	12/13/95	2743/70
2,6-Dinitrotoluene	ND(5.0) L M	mg/kg	12/13/95	2743/70
TNT	ND(5.0) L M	mg/kg	12/13/95	2743/70

Analysis	Date Prepared	QC Batch	Analyst	Analytical Method
RDX	12/05/95	951205-1	HSY	8330
2,4-Dinitrotoluene	12/05/95	951205-1	HSY	8330
2,6-Dinitrotoluene	12/05/95	951205-1	HSY	8330
TNT	12/05/95	951205-1	HSY	8330

M - Reporting limit higher than normal due to matrix interferences.

L - Reporting limit higher than normal due to limited sample volume available.

Conclusion of Lab Number: 95111621

Lab Number: 95111622
Sample Description: 6A Crook Neck Squash

Date Sampled: 11/27/95
Time Sampled:

Analysis	Concentration	Units	Date Analyzed	Book/Page
RDX	ND(2.0) L M	mg/kg	12/13/95	2743/70
2,4-Dinitrotoluene	ND(2.0) L M	mg/kg	12/13/95	2743/70

-Continued-

CONTINENTAL ANALYTICAL SERVICES, INC.

LABORATORY REPORT

Client: Bioremediation Service, Inc.
Lab Number: 95111622

Analysis	Concentration	Units	Date Analyzed	Book/Page
2,6-Dinitrotoluene	ND(2.0) L M	mg/kg	12/13/95	2743/70
TNT	ND(2.0) L M	mg/kg	12/13/95	2743/70

Analysis	Date Prepared	QC Batch	Analyst	Analytical Method
RDX	12/05/95	951205-1	HSY	8330
2,4-Dinitrotoluene	12/05/95	951205-1	HSY	8330
2,6-Dinitrotoluene	12/05/95	951205-1	HSY	8330
TNT	12/05/95	951205-1	HSY	8330

M - Reporting limit higher than normal due to matrix interferences.

L - Reporting limit higher than normal due to limited sample volume available.

Conclusion of Lab Number: 95111622

Lab Number: 95111623
Sample Description: 7A Carnation

Date Sampled: 11/27/95
Time Sampled:

Analysis	Concentration	Units	Date Analyzed	Book/Page
RDX	ND(1.0) M	mg/kg	12/13/95	2743/71
2,4-Dinitrotoluene	ND(1.0) M	mg/kg	12/13/95	2743/71
2,6-Dinitrotoluene	ND(1.0) M	mg/kg	12/13/95	2743/71
TNT	ND(1.0) M	mg/kg	12/13/95	2743/71

Analysis	Date Prepared	QC Batch	Analyst	Analytical Method
RDX	12/05/95	951205-1	HSY	8330
2,4-Dinitrotoluene	12/05/95	951205-1	HSY	8330
2,6-Dinitrotoluene	12/05/95	951205-1	HSY	8330
TNT	12/05/95	951205-1	HSY	8330

M - Reporting limit higher than normal due to matrix interferences.

Conclusion of Lab Number: 95111623

Lab Number: 95111624
Sample Description: 8A Carnation

Date Sampled: 11/27/95
Time Sampled:

Analysis	Concentration	Units	Date Analyzed	Book/Page

-Continued-

CONTINENTAL ANALYTICAL SERVICES, INC.

LABORATORY REPORT

Client: Bioremediation Service, Inc.
Lab Number: 95111624

Analysis	Concentration	Units	Date Analyzed	Book/Page
RDX	ND(0.5)	mg/kg	12/07/95	2743/69
2,4-Dinitrotoluene	ND(0.5)	mg/kg	12/07/95	2743/69
2,6-Dinitrotoluene	ND(0.5)	mg/kg	12/07/95	2743/69
TNT	ND(0.5)	mg/kg	12/07/95	2743/69

Analysis	Date Prepared	QC Batch	Analyst	Analytical Method
RDX	12/05/95	951205-1	HSY	8330
2,4-Dinitrotoluene	12/05/95	951205-1	HSY	8330
2,6-Dinitrotoluene	12/05/95	951205-1	HSY	8330
TNT	12/05/95	951205-1	HSY	8330

Conclusion of Lab Number: 95111624

Lab Number: 95111625
Sample Description: 9A Marigolds

Date Sampled: 11/27/95
Time Sampled:

Analysis	Concentration	Units	Date Analyzed	Book/Page
RDX	ND(5.0) L M	mg/kg	12/13/95	2743/71
2,4-Dinitrotoluene	ND(5.0) L M	mg/kg	12/13/95	2743/71
2,6-Dinitrotoluene	ND(5.0) L M	mg/kg	12/13/95	2743/71
TNT	ND(5.0) L M	mg/kg	12/13/95	2743/71

Analysis	Date Prepared	QC Batch	Analyst	Analytical Method
RDX	12/05/95	951205-1	HSY	8330
2,4-Dinitrotoluene	12/05/95	951205-1	HSY	8330
2,6-Dinitrotoluene	12/05/95	951205-1	HSY	8330
TNT	12/05/95	951205-1	HSY	8330

M - Reporting limit higher than normal due to matrix interferences.

L - Reporting limit higher than normal due to limited sample volume available.

Conclusion of Lab Number: 95111625

Lab Number: 95111626
Sample Description: 10A Marigolds

Date Sampled: 11/27/95
Time Sampled:

Analysis	Concentration	Units	Date Analyzed	Book/Page

-Continued-

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LABORATORY REPORT

Client: Bioremediation Service, Inc.
Lab Number: 95111626

Analysis	Concentration	Units	Date Analyzed	Book/Page
RDX	ND(2.5) L M	mg/kg	12/13/95	2743/70
2,4-Dinitrotoluene	ND(2.5) L M	mg/kg	12/13/95	2743/70
2,6-Dinitrotoluene	ND(2.5) L M	mg/kg	12/13/95	2743/70
TNT	ND(2.5) L M	mg/kg	12/13/95	2743/70

Analysis	Date Prepared	QC Batch	Analyst	Analytical Method
RDX	12/05/95	951205-1	HSY	8330
2,4-Dinitrotoluene	12/05/95	951205-1	HSY	8330
2,6-Dinitrotoluene	12/05/95	951205-1	HSY	8330
TNT	12/05/95	951205-1	HSY	8330

M - Reporting limit higher than normal due to matrix interferences.

L - Reporting limit higher than normal due to limited sample volume available.

Conclusion of Lab Number: 95111626

Lab Number: 95111627
Sample Description: 11A Mums

Date Sampled: 11/27/95
Time Sampled:

Analysis	Concentration	Units	Date Analyzed	Book/Page
RDX	ND(10) M	mg/kg	12/13/95	2743/71
2,4-Dinitrotoluene	ND(10) M	mg/kg	12/13/95	2743/71
2,6-Dinitrotoluene	ND(10) M	mg/kg	12/13/95	2743/71
TNT	ND(10) M	mg/kg	12/13/95	2743/71

Analysis	Date Prepared	QC Batch	Analyst	Analytical Method
RDX	12/05/95	951205-1	HSY	8330
2,4-Dinitrotoluene	12/05/95	951205-1	HSY	8330
2,6-Dinitrotoluene	12/05/95	951205-1	HSY	8330
TNT	12/05/95	951205-1	HSY	8330

M - Reporting limit higher than normal due to matrix interferences.

Conclusion of Lab Number: 95111627

-Continued-

CONTINENTAL ANALYTICAL SERVICES, INC.

Client: Bioremediation Service, Inc.

Lab Number: 95111628
Sample Description: 12A Mums

Date Sampled: 11/27/95
Time Sampled:

Analysis	Concentration	Units	Date Analyzed	Book/Page
RDX	ND(10) M	mg/kg	12/13/95	2743/72
2,4-Dinitrotoluene	ND(10) M	mg/kg	12/13/95	2743/72
2,6-Dinitrotoluene	ND(10) M	mg/kg	12/13/95	2743/72
TNT	ND(10) M	mg/kg	12/13/95	2743/72

Analysis	Date Prepared	QC Batch	Analyst	Analytical Method
RDX	12/05/95	951205-1	HSY	8330
2,4-Dinitrotoluene	12/05/95	951205-1	HSY	8330
2,6-Dinitrotoluene	12/05/95	951205-1	HSY	8330
TNT	12/05/95	951205-1	HSY	8330

M - Reporting limit higher than normal due to matrix interferences.

Conclusion of Lab Number: 95111628

Lab Number: 95111629
Sample Description: 13A Strawberry

Date Sampled: 11/27/95
Time Sampled:

Analysis	Concentration	Units	Date Analyzed	Book/Page
RDX	ND(0.5)	mg/kg	12/07/95	2743/69
2,4-Dinitrotoluene	ND(0.5)	mg/kg	12/07/95	2743/69
2,6-Dinitrotoluene	ND(0.5)	mg/kg	12/07/95	2743/69
TNT	ND(0.5)	mg/kg	12/07/95	2743/69

Analysis	Date Prepared	QC Batch	Analyst	Analytical Method
RDX	12/05/95	951205-1	HSY	8330
2,4-Dinitrotoluene	12/05/95	951205-1	HSY	8330
2,6-Dinitrotoluene	12/05/95	951205-1	HSY	8330
TNT	12/05/95	951205-1	HSY	8330

-Continued-

CONTINENTAL ANALYTICAL SERVICES, INC.

LABORATORY REPORT

Client: Bioremediation Service, Inc.
Lab Number: 95111629

Analysis	Concentration	Units	Date Analyzed	Book/Page

Conclusion of Lab Number: 95111629

Laboratory analyses were performed on samples utilizing procedures published in Title 40 of the Code of Federal Regulations, Parts 136 or 141, or in EPA Publication, SW-846, 3rd edition, September, 1986 and the latest promulgated update. ND(), where noted, indicates none detected with the reporting limit in parentheses. Samples will be retained for thirty days unless otherwise notified.

CONTINENTAL ANALYTICAL SERVICES, INC.

Clifford J. Baker
Laboratory Director

Continental Analytical Services, Inc.

page 1 of 2

Chain-of-Custody Record

CAS
Continental Analytical Services, Inc.
1804 Glendale · Salina, KS 67401
(913) 827-1273 · (800) 535-3076
FAX (913) 823-7830

PROJECT: Phase II
PROJECT NAME: UNDA

SAMPLED BY (SIGNATURE):
SAMPLED BY (PRINTED): Steve Eversmeyer

SAMPLE INFORMATION

DATE	TIME	COMP	GRAB	SAMPLE IDENTIFICATION	# OF CONTAINERS	TNT	RDX	DNT (will identify isomer via phone 11/28)	REMARKS
11/27	a.m.	✓		1A	3				Plant Material
				2A					
				3A					
				4A					
				5A					
				6A					
				7A					
				8A					
				9A					
				10A					
				11A					
				12A					

RELINQUISHED BY (SIGNATURE): RELINQUISHED BY (PRINTED): Steve Eversmeyer DATE/TIME 1170 11/27/95
RECEIVED BY (SIGNATURE): FEDEX RECEIVED BY (PRINTED): DATE/TIME 1170 11/27/95

RELINQUISHED BY (SIGNATURE): RELINQUISHED BY (PRINTED): DATE/TIME
RECEIVED BY (SIGNATURE): RECEIVED BY (PRINTED): DATE/TIME

RECEIVED AT LABORATORY BY (SIGNATURE/PRINTED): Paulette Garman DATE/TIME 11-28-95
SHIPPED VIA: Seal #:

SEND REPORT TO
Attention: Dave Emery / Bioremediation Service, Inc.
Address: 12130 NE Ainsworth Circle Ste. 220 Portland OR 97220-9609
Phone #: 503-253-9579 FAX #: 503-253-9629

SEND INVOICE TO:
Attention: Leslie Wolstad
Address: Same
Phone #
Purchase Order No.
CAS Price Quote No.
FAX #

KUNKEL PRINTING—SALINA, KANSAS White — Laboratory Copy Yellow — Client Copy CAS 13000 (9-1-91)

Chain-of-Custody Record

CAS
Continental Analytical Services, Inc.
1804 Glendale · Salina, KS 67401
(913) 827-1273 · (800) 535-3076
FAX (913) 823-7830

PROJECT # Phase II

PROJECT NAME UMDA

SAMPLED BY (SIGNATURE):

SAMPLED BY (PRINTED): Steve Eversmeyer

DATE	TIME	COMP	GRAB	SAMPLE IDENTIFICATION	# OF CONTAINERS	TNT	RDX	DNT (see note pg 1)	REMARKS
11/27	am	✓		13A	3				

RELINQUISHED BY (SIGNATURE): RELINQUISHED BY (PRINTED): Steve Eversmeyer DATE/TIME 11/29/95 RECEIVED BY (SIGNATURE): FedEx RECEIVED BY (PRINTED): DATE/TIME 11/29/95

RELINQUISHED BY (SIGNATURE): RELINQUISHED BY (PRINTED): DATE/TIME RECEIVED BY (SIGNATURE): RECEIVED BY (PRINTED): DATE/TIME

RECEIVED AT LABORATORY BY (SIGNATURE/PRINTED): Paulette Garnar DATE/TIME 11:20·95 SHIPPED VIA: Sent:

SEND REPORT TO
Attention: Dave Emery
Address: Same as pg 1
Phone # FAX #

SEND INVOICE TO.
Attention
Address:
Phone # FAX #
Purchase Order No.
CAS Price Quote No

FILE

Continental Analytical Services, Inc.

1-25-96
CC: Dave
Pat

01/19/96

Bioremediation Service, Inc.
Attn: Dave Emery
12130 Ainsworth Cr.Ste220
Portland, OR 97220-9009

Re: Continental File Number: 6404
Continental Order Number: 32453
Continental Project Manager: Clifford J. Baker

Dear Mr. Emery:

Enclosed are the following CAS Quality Control Reports for the above referenced order number:

- METHOD BLANK DATA
- LABORATORY CONTROL SAMPLE/LABORATORY CONTROL SAMPLE DUPLICATE
- SURROGATE DATA
- MATRIX SPIKE/MATRIX SPIKE DUPLICATE
- INITIAL CALIBRATION VERIFICATION
- CONTINUING CALIBRATION VERIFICATION

A general description of the information contained in the reports is presented below:

METHOD BLANK DATA
A method blank is a matrix similar to that of the sample which has been prepared and analyzed by the same method as the sample. The method blank is used to assure that the preparation and analysis method has not introduced contamination. The Method Blank Data Report provides the analytical results for all method blanks prepared and analyzed from the same batch as that of the client's samples.

LABORATORY CONTROL SAMPLE/LABORATORY CONTROL SAMPLE DUPLICATE
A Laboratory Control Sample is a matrix similar to that of the sample which has been spiked with known concentrations of analytes and prepared and analyzed by the same method as the sample. The Laboratory Control Sample (LCS) percent recovery is a measure of the accuracy of the preparation and analysis method. The Laboratory Control Sample Duplicate (LCSD) is a duplicate preparation and analysis of the LCS. The LCS and LCSD are used to calculate the relative percent difference, which is a measure of the precision of the preparation and analysis method. The LCS/LCSD Report provides the analytical results for all laboratory control samples prepared and analyzed from the same batch as that of the client's sample.

SURROGATE DATA
A surrogate is a compound that is similar to the compounds of interest, but is not normally found in environmental samples. Surrogates are added to the sample prior to preparation and analysis. The surrogate percent recovery is a measure of the effectiveness of the preparation and analysis method on the individual sample. The Surrogate Data Report provides the surrogate recoveries for each sample that required organic analysis.

MATRIX SPIKE/MATRIX SPIKE DUPLICATE
A Matrix Spike is an aliquot of a sample spiked with compounds of interest and prepared and analyzed by the same method as the sample. The Matrix Spike (MS) percent recovery is a measure of the effectiveness of the preparation and analysis method on the specific sample matrix. The Matrix Spike Duplicate (MSD) is a duplicate preparation and analysis of the MS. The MS and MSD are used to calculate the relative percent difference, which is a measure of the precision of the preparation and analysis method. The MS/MSD Report provides the analytical results for all Matrix Spike and Matrix Spike Duplicate analyses performed either on samples from the client's order or on samples from the same batch as that of the client's sample.

1804 GLENDALE ROAD · SALINA, KANSAS 67401-6675
913-827-1373 · 800-535-3076 · FAX 913-823-7830

01/19/96
Bioremediation Service, Inc.
12130 Ainsworth Cr.Ste220
Portland, OR 97220-9009

INITIAL CALIBRATION VERIFICATION DATA
Before a calibration curve is used, an Initial Calibration Verification (ICV) check standard is analyzed. An ICV check standard is a standard from a source different from that of the instrument calibration standards and is used to verify the accuracy of the calibration curve. The CAS ICV Report provides the percent recovery for each analyte of the ICV check standard and verifies the accuracy of the calibration curve used to quantify the results for samples from the client's order.

CONTINUING CALIBRATION VERIFICATION DATA
To verify continued accuracy of a calibration curve, a Continuing Calibration Verification (CCV) check standard is analyzed. A CCV check standard is a standard of a concentration in the midrange of the calibration curve. A CCV check standard is analyzed at the beginning of each day of analysis, preceding any sample analyses and intermittently throughout the analytical sequence. The CAS CCV Report provides the percent recovery for each analyte of the CCV check standard analyzed both preceding and following the samples from the client's order.

ACCURACY AND PRECISION LIMITS
The accuracy and precision limits are method or laboratory determined limits indicating acceptable accuracy or precision for a given matrix. The accuracy limits are expressed with units of percent recovery. The precision limits are expressed with units of relative percent difference (RPD). Accuracy and precision limits are provided on the CAS LCS/LCSD Report, CAS MS/MSD Report and the CAS Surrogate Report.

QUALITY CONTROL BATCH
Each batch of twenty or fewer samples of the same matrix, prepared and analyzed at CAS, is assigned a Quality Control Batch number. The Quality Control Batch number for each sample is provided on the CAS Laboratory Report. With each batch, a Method Blank and two Laboratory Control Samples are also prepared and analyzed. The analytical results for the Method Blank and the Laboratory Control Samples are provided on the CAS Method Blank Data Report and the CAS LCS/LCSD Report, respectively.

DATE PREPARED
The date prepared is the date the sample was extracted or digested in preparation for analysis. If the extraction or digestion is performed as part of the analysis, "NA" is reported for the date prepared. The date prepared for each sample is provided on the CAS Laboratory Report.

DATE ANALYZED
The date analyzed is the date the analysis was performed on the sample. The date analyzed for each sample is provided on the CAS Laboratory Report.

If you have any questions regarding this data, please contact me or your CAS Project Manager at (800) 535-3076.

CONTINENTAL ANALYTICAL SERVICES, INC.

Clifford J. Baker

Clifford J. Baker
Laboratory Director

Enclosures
JAC/si

Continental Analytical Services, Inc

Continental
Analytical Services, Inc.

QUALITY CONTROL REPORT
LABORATORY CONTROL SAMPLE / LABORATORY CONTROL SAMPLE DUPLICATE

Client: Bioremediation Service, Inc.
Attn: Dave Emery
12130 Ainsworth Cr.Ste220
Portland, OR 97220-9009

Date Sample Rptd: 01/19/96
Date Sample Recd: 11/28/95
CAS File No: 6404
CAS Order No: 32453
Client P.O.: UMDA-Phase II

Lab Number: 951205LCS1

Date Prepared: 12/05/95

Analysis	QC Batch	Spike Level	Units	ACCURACY DATA (% RECOVERY) LCS	LCSD	Avg.	Limits	PRECISION DATA RPD	Limits
2,4-Dinitrotoluene	951205-1	1.0	mg/kg	73.5	82.6	78.1	50-125	12.	40
2,6-Dinitrotoluene	951205-1	1.0	mg/kg	77.8	88.6	83.2	50-125	13.	40
RDX	951205-1	1.0	mg/kg	60.0	69.0	64.5	50-125	14.	40
TNT	951205-1	1.0	mg/kg	73.9	83.7	78.8	50-125	12.	40

Conclusion of Lab Number 951205LCS1

Quality control analyses were performed on samples at time of analysis in accordance with procedures published in Title 40 of the Code of Federal Regulations, Parts 136 or 141, or in EPA publication, SW-846, 3rd edition, Nov. 1986 and the latest promulgated update.

CONTINENTAL ANALYTICAL SERVICES, INC.

Clifford J. Baker
Laboratory Director

Jacqueline Cairo
Quality Assurance Officer

1804 GLENDALE ROAD • SALINA, KANSAS 67401-6675
913-827-1373 • 800-535-3076 • FAX 913-823-7830

Continental
Analytical Services, Inc.

QUALITY CONTROL REPORT
METHOD BLANK DATA

Client: Bioremediation Service, Inc.
Attn: Dave Emery
12130 Ainsworth Cr.Ste220
Portland, OR 97220-9009

Date Sample Rptd: 01/19/96
Date Sample Recd: 11/28/95
CAS File No: 6404
CAS Order No: 32453
Client P.O.: UMDA-Phase II

Lab Number: 951205BLK1

Date Prepared: 12/05/95

Analysis	Concentration	Units	QC Batch	Book/Page
RDX	ND(0.5)	mg/kg	951205-1	2743/68
2,4-Dinitrotoluene	ND(0.5)	mg/kg	951205-1	2743/68
2,6-Dinitrotoluene	ND(0.5)	mg/kg	951205-1	2743/68
TNT	ND(0.5)	mg/kg	951205-1	2743/68

Conclusion of lab number 951205BLK1

Quality control analyses were performed on samples at time of analysis in accordance with procedures published in Title 40 of the Code of Federal Regulations, Parts 136 or 141, or in EPA publication, SW-846, 3rd edition, Nov. 1986 and the latest promulgated update.

CONTINENTAL ANALYTICAL SERVICES, INC.

Clifford J. Baker
Clifford J. Baker
Laboratory Director

Jacqueline Cairo
Jacqueline Cairo
Quality Assurance Officer

1804 GLENDALE ROAD · SALINA, KANSAS 67401-6675

Continental
Analytical Services, Inc.

QUALITY CONTROL REPORT
SURROGATE DATA

Client: Bioremediation Service, Inc.
Attn: Dave Emery
12130 Ainsworth Cr.Ste220
Portland, OR 97220-9009

Date Sample Rptd: 01/19/96
Date Sample Recd: 11/28/95
CAS File No: 6404
CAS Order No: 32453
Client P.O.: UMDA-Phase II

Lab Number: 95111617
Sample Description: 1A Carrot

Surrogate Data	Date Prepared	Date Analyzed	Q.C. Results % Recovered	Units	Acceptable % Recovery Range
Explosives 3,4-DNT (Surrogate)	12/05/95	12/13/95	93.7 at 1.0	mg/kg	57.8 - 115
Explosives 3,4-DNT (Surrogate)	12/05/95	12/13/95	93.7 at 1.0	mg/kg	57.8 - 115
Explosives 3,4-DNT (Surrogate)	12/05/95	12/13/95	93.7 at 1.0	mg/kg	57.8 - 115

Lab Number: 95111618
Sample Description: 2A Grass Mixture

Surrogate Data	Date Prepared	Date Analyzed	Q.C. Results % Recovered	Units	Acceptable % Recovery Range
Explosives 3,4-DNT (Surrogate)	12/05/95	12/13/95	91.1 at 1.0	mg/kg	57.8 - 115
Explosives 3,4-DNT (Surrogate)	12/05/95	12/13/95	91.1 at 1.0	mg/kg	57.8 - 115
Explosives 3,4-DNT (Surrogate)	12/05/95	12/13/95	91.1 at 1.0	mg/kg	57.8 - 115

Lab Number: 95111619
Sample Description: 3A Sagebrush

Surrogate Data	Date Prepared	Date Analyzed	Q.C. Results % Recovered	Units	Acceptable % Recovery Range
Explosives 3,4-DNT (Surrogate)	12/05/95	12/07/95	79.2 at 13	mg/kg	57.8 - 115
Explosives 3,4-DNT (Surrogate)	12/05/95	12/07/95	79.2 at 13	mg/kg	57.8 - 115
Explosives 3,4-DNT (Surrogate)	12/05/95	12/07/95	79.2 at 13	mg/kg	57.8 - 115

-Continued

Client: Bioremediation Service, Inc.
Lab Number: 95111619

Lab Number: 95111620
Sample Description: 4A Turnip

Surrogate Data	Date Prepared	Date Analyzed	Q.C. Results % Recovered	Units	Acceptable % Recovery Range
Explosives 3,4-DNT (Surrogate)	12/05/95	12/07/95	82.4 at 40	mg/kg	57.8 - 115
Explosives 3,4-DNT (Surrogate)	12/05/95	12/07/95	82.4 at 40	mg/kg	57.8 - 115
Explosives 3,4-DNT (Surrogate)	12/05/95	12/07/95	82.4 at 40	mg/kg	57.8 - 115

Lab Number: 95111621
Sample Description: 5A Sagebrush

Surrogate Data	Date Prepared	Date Analyzed	Q.C. Results % Recovered	Units	Acceptable % Recovery Range
Explosives 3,4-DNT (Surrogate)	12/05/95	12/13/95	85.4 at 5.0	mg/kg	57.8 - 115
Explosives 3,4-DNT (Surrogate)	12/05/95	12/13/95	85.4 at 5.0	mg/kg	57.8 - 115
Explosives 3,4-DNT (Surrogate)	12/05/95	12/13/95	85.4 at 5.0	mg/kg	57.8 - 115

Lab Number: 95111622
Sample Description: 6A Crook Neck Squash

Surrogate Data	Date Prepared	Date Analyzed	Q.C. Results % Recovered	Units	Acceptable % Recovery Range
Explosives 3,4-DNT (Surrogate)	12/05/95	12/13/95	104 at 1.0	mg/kg	57.8 - 115
Explosives 3,4-DNT (Surrogate)	12/05/95	12/13/95	104 at 1.0	mg/kg	57.8 - 115
Explosives 3,4-DNT (Surrogate)	12/05/95	12/13/95	104 at 1.0	mg/kg	57.8 - 115

Lab Number: 95111623
Sample Description: 7A Carnation

Surrogate Data	Date Prepared	Date Analyzed	Q.C. Results % Recovered	Units	Acceptable % Recovery Range
Explosives 3,4-DNT (Surrogate)	12/05/95	12/13/95	86.5 at 1.0	mg/kg	57.8 - 115

-Continued-

CONTINENTAL ANALYTICAL SERVICES, INC.

LABORATORY QUALITY CONTROL REPORT

Client: Bioremediation Service, Inc.
Lab Number: 95111623

Surrogate Data	Date Prepared	Date Analyzed	Q.C. Results % Recovered	Units	Acceptable % Recovery Range
Explosives 3,4-DNT (Surrogate)	12/05/95	12/13/95	86.5 at 1.0	mg/kg	57.8 - 115
Explosives 3,4-DNT (Surrogate)	12/05/95	12/13/95	86.5 at 1.0	mg/kg	57.8 - 115

Lab Number: 95111624
Sample Description: 8A Carnation

Surrogate Data	Date Prepared	Date Analyzed	Q.C. Results % Recovered	Units	Acceptable % Recovery Range
Explosives 3,4-DNT (Surrogate)	12/05/95	12/07/95	76.3 at 1.0	mg/kg	57.8 - 115
Explosives 3,4-DNT (Surrogate)	12/05/95	12/07/95	76.3 at 1.0	mg/kg	57.8 - 115
Explosives 3,4-DNT (Surrogate)	12/05/95	12/07/95	76.3 at 1.0	mg/kg	57.8 - 115

Lab Number: 95111625
Sample Description: 9A Marigolds

Surrogate Data	Date Prepared	Date Analyzed	Q.C. Results % Recovered	Units	Acceptable % Recovery Range
Explosives 3,4-DNT (Surrogate)	12/05/95	12/13/95	77.3 at 1.0	mg/kg	57.8 - 115
Explosives 3,4-DNT (Surrogate)	12/05/95	12/13/95	77.3 at 1.0	mg/kg	57.8 - 115
Explosives 3,4-DNT (Surrogate)	12/05/95	12/13/95	77.3 at 1.0	mg/kg	57.8 - 115

Lab Number: 95111626
Sample Description: 10A Marigolds

Surrogate Data	Date Prepared	Date Analyzed	Q.C. Results % Recovered	Units	Acceptable % Recovery Range
Explosives 3,4-DNT (Surrogate)	12/05/95	12/13/95	54.5 at 1.0	mg/kg	57.8 - 115

-Continued-

CONTINENTAL ANALYTICAL SERVICES, INC.

Client: Bioremediation Service, Inc.
Lab Number: 95111626

Surrogate Data	Date Prepared	Date Analyzed	Q.C. Results % Recovered	Units	Acceptable % Recovery Range
Explosives 3,4-DNT (Surrogate)	12/05/95	12/13/95	54.5 at 1.0	mg/kg	57.8 - 115
Explosives 3,4-DNT (Surrogate)	12/05/95	12/13/95	54.5 at 1.0	mg/kg	57.8 - 115

Lab Number: 95111627
Sample Description: 11A Mums

Surrogate Data	Date Prepared	Date Analyzed	Q.C. Results % Recovered	Units	Acceptable % Recovery Range
Explosives 3,4-DNT (Surrogate)	12/05/95	12/13/95	C at 1.0	mg/kg	57.8 - 115
Explosives 3,4-DNT (Surrogate)	12/05/95	12/13/95	C at 1.0	mg/kg	57.8 - 115
Explosives 3,4-DNT (Surrogate)	12/05/95	12/13/95	C at 1.0	mg/kg	57.8 - 115

C - Due to matrix interference(s) and/or high concentration(s) of analyte(s) present in the sample, dilution was required causing the spike level for this analyte to be below the reporting limit.

Lab Number: 95111628
Sample Description: 12A Mums

Surrogate Data	Date Prepared	Date Analyzed	Q.C. Results % Recovered	Units	Acceptable % Recovery Range
Explosives 2,4-Dichlorophenylaceti	12/05/95	12/13/95	C at 1.0	mg/kg	38.5 - 130
Explosives 3,4-DNT (Surrogate)	12/05/95	12/13/95	C at 1.0	mg/kg	57.8 - 115
Explosives 3,4-DNT (Surrogate)	12/05/95	12/13/95	C at 1.0	mg/kg	57.8 - 115

C - Due to matrix interference(s) and/or high concentration(s) of analyte(s) present in the sample, dilution was required causing the spike level for this analyte to be below the reporting limit.

Lab Number: 95111629
Sample Description: 13A Strawberry

Surrogate Data	Date Prepared	Date Analyzed	Q.C. Results % Recovered	Units	Acceptable % Recovery Range
Explosives 3,4-DNT (Surrogate)	12/05/95	12/07/95	63.0 at 1.0	mg/kg	57.8 - 115

-Continued-

CONTINENTAL ANALYTICAL SERVICES, INC.

LABORATORY QUALITY CONTROL REPORT

Client: Bioremediation Service, Inc.
Lab Number: 95111629

Surrogate Data	Date Prepared	Date Analyzed	Q.C. Results % Recovered	Units	Acceptable % Recovery Range
Explosives 3,4-DNT (Surrogate)	12/05/95	12/07/95	63.0 at 1.0	mg/kg	57.8 - 115
Explosives 3,4-DNT (Surrogate)	12/05/95	12/07/95	63.0 at 1.0	mg/kg	57.8 - 115

Quality control analyses were performed on samples at time of analysis in accordance with procedures published in Title 40 of the Code of Federal Regulations, Parts 136 or 141, or in EPA publication, SW-846, 3rd edition, Nov. 1986 and the latest promulgated update.

CONTINENTAL ANALYTICAL SERVICES, INC.

Clifford J. Baker
Laboratory Director

Jacqueline Cairo
Quality Assurance Officer

Continental Analytical Services, Inc.

Continental
Analytical Services. Inc.

QUALITY CONTROL REPORT
SURROGATE DATA

Client: Bioremediation Service, Inc.
Attn: Dave Emery
12130 Ainsworth Cr.Ste220
Portland, OR 97220-9009

Date Sample Rptd: 01/19/96
Date Sample Recd: 11/28/95
CAS File No: 6404
CAS Order No: 32453
Client P.O.: UMDA-Phase II

Lab Number: 951205BLK1

Surrogate Data	Date Prepared	Date Analyzed	Q.C. Results % Recovered	Units	Acceptable % Recovery Range
Explosives 3,4-DNT (Surrogate)	12/05/95	12/07/95	71.5 at 1.0	mg/kg	57.8 - 115
Explosives 3,4-DNT (Surrogate)	12/05/95	12/07/95	71.5 at 1.0	mg/kg	57.8 - 115
Explosives 3,4-DNT (Surrogate)	12/05/95	12/07/95	71.5 at 1.0	mg/kg	57.8 - 115

Quality control analyses were performed on samples at time of analysis in accordance with procedures published in Title 40 of the Code of Federal Regulations, Parts 136 or 141, or in EPA publication, SW-846, 3rd edition, Nov. 1986 and the latest promulgated update.

CONTINENTAL ANALYTICAL SERVICES, INC.

Clifford J. Baker
Clifford J. Baker
Laboratory Director

Jacqueline Cairo
Jacqueline Cairo
Quality Assurance Officer

1804 GLENDALE ROAD · SALINA, KANSAS 67401-6675
913-827-1273 · 800-535-3076 · FAX 913-823-7830

Continental
Analytical Services, Inc.

QUALITY CONTROL REPORT
MATRIX SPIKE / MATRIX SPIKE DUPLICATE

Client: Bioremediation Service, Inc.
Attn: Dave Emery
12130 Ainsworth Cr.Ste220
Portland, OR 97220-9009

Date Sample Rptd: 01/19/96
Date Sample Recd: 11/28/95
CAS File No: 6404
CAS Order No: 32453
Client P.O.: UMDA-Phase II

Lab Number: Matrix Spike Data from Sample Batch

Analysis	QC Batch	Spike Level	Units	ACCURACY DATA (% RECOVERY) MS	MSD	Avg.	Limits	PRECISION DATA RPD	Limits	Laboratory Number
TNT	951205-1	1.0	mg/kg	117	99.9	109	25-125	16.	40	95111624
RDX	951205-1	1.0	mg/kg	89.0	103	96.0	25-125	15.	40	95111624
2,4-Dinitrotoluene	951205-1	1.0	mg/kg	96.0	93.6	94.8	25-125	2.5	40	95111624
2,6-Dinitrotoluene	951205-1	1.0	mg/kg	101	101	101	25-125	0.0	40	95111624

+ - This quality control analysis was performed on a sample from this Continental order number.

Quality control analyses were performed on samples at time of analysis in accordance with procedures published in Title 40 of the Code of Federal Regulations, Parts 136 or 141, or in EPA publication, SW-846, 3rd edition, Nov. 1986 and the latest promulgated update.

CONTINENTAL ANALYTICAL SERVICES, INC.

Clifford J. Baker
Clifford J. Baker
Laboratory Director

Jacqueline Cairo
Jacqueline Cairo
Quality Assurance Officer

Continental
Analytical Services, Inc.

QUALITY CONTROL REPORT
INITIAL CALIBRATION VERIFICATION DATA

Client: Bioremediation Service, Inc.
Attn: Dave Emery
12130 Ainsworth Cr.Ste220
Portland, OR 97220-9009

Date Sample Rptd: 01/22/96
Date Sample Recd: 11/28/95
CAS File No: 6404
CAS Order No: 32453
Client P.O.: UMDA-Phase II

Analysis	Date of Analysis	Instrument Batch	ID	Amount in Standard	Amount Detected	Units	Percent Recovery
RDX	07/28/95	1	LC2	0.50	0.540	µg/ml	108
2,4-Dinitrotoluene	07/28/95	1	LC2	0.50	0.520	µg/ml	104
2,6-Dinitrotoluene	07/28/95	1	LC2	0.50	0.500	µg/ml	100
TNT	07/28/95	1	LC2	0.50	0.545	µg/ml	109

Conclusion ICV1LC2209:

Conclusion of Initial Calibration Data:

Quality control analyses were performed on samples at time of analysis in accordance with procedures published in Title 40 of the Code of Federal Regulations, Parts 136 or 141, or in EPA publication, SW-846, 3rd edition, Nov. 1986 and the latest promulgated update.

CONTINENTAL ANALYTICAL SERVICES, INC.

Clifford J. Baker
Clifford J. Baker
Laboratory Director

Jacqueline Cairo
Jacqueline Cairo
Quality Assurance Officer

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Continental
Analytical Services. Inc.

QUALITY CONTROL REPORT
CONTINUING CALIBRATION VERIFICATION DATA

Client: Bioremediation Service, Inc.
Attn: Dave Emery
12130 Ainsworth Cr.Ste220
Portland, OR 97220-9009

Date Sample Rptd: 01/19/96
Date Sample Recd: 11/28/95
CAS File No: 6404
CAS Order No: 32453
Client P.O.: UMDA-Phase II

Analysis	Date of Analysis	Instrument Batch	ID	Amount in Standard	Amount Detected	Units	Percent Recovery
RDX	12/07/95	1	LC2	1.0	0.983	µg/ml	98.3

Samples Analyzed after this Continuing Calibration Verification:

Laboratory Number	Sample Description
95111619	3A Sagebrush
95111624	8A Carnation

Conclusion CCV1LC2341

Analysis	Date of Analysis	Instrument Batch	ID	Amount in Standard	Amount Detected	Units	Percent Recovery
RDX	12/08/95	1	LC2	1.0	0.965	µg/ml	96.5

Samples Analyzed after this Continuing Calibration Verification:

Laboratory Number	Sample Description
95111620	4A Turnip
95111629	13A Strawberry

Conclusion CCV1LC2342

Analysis	Date of Analysis	Instrument Batch	ID	Amount in Standard	Amount Detected	Units	Percent Recovery
RDX	12/08/95	2	LC2	1.0	0.976	µg/ml	97.6

Samples Analyzed after this Continuing Calibration Verification:

Laboratory Number	Sample Description
No additional samples run after this CCV.	

Conclusion CCV2LC2342

Analysis	Date of Analysis	Instrument Batch	ID	Amount in Standard	Amount Detected	Units	Percent Recovery
RDX	12/13/95	1	LC2	1.0	0.979	µg/ml	97.9

Samples Analyzed after this Continuing Calibration Verification:

Laboratory Number	Sample Description
95111617	1A Carrot
95111618	2A Grass Mixture
95111621	5A Sagebrush
95111622	6A Crook Neck Squash

-Continued-

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Continental
Analytical Services. Inc.

QUALITY CONTROL REPORT
CONTINUING CALIBRATION VERIFICATION DATA

Client: Bioremediation Service, Inc.
Attn: Dave Emery
12130 Ainsworth Cr.Ste220
Portland, OR 97220-9009

Date Sample Rptd: 01/19/96
Date Sample Recd: 11/28/95
CAS File No: 6404
CAS Order No: 32453
Client P.O.: UMDA-Phase II

95111623	7A Carnation
95111625	9A Marigolds
95111626	10A Marigolds
95111627	11A Mums
95111628	12A Mums

Conclusion CCV1LC2347

Analysis	Date of Analysis	Instrument Batch	ID	Amount in Standard	Amount Detected	Units	Percent Recovery
RDX	12/13/95	2	LC2	1.0	1.13	µg/ml	113

Samples Analyzed after this Continuing Calibration Verification:

Laboratory Number	Sample Description
No additional samples run after this CCV.	

Conclusion CCV2LC2347

Analysis	Date of Analysis	Instrument Batch	ID	Amount in Standard	Amount Detected	Units	Percent Recovery
2,4-Dinitrotoluene	12/07/95	1	LC2	1.0	0.919	µg/ml	91.9

Samples Analyzed after this Continuing Calibration Verification:

Laboratory Number	Sample Description
95111619	3A Sagebrush
95111624	8A Carnation

Conclusion CCV1LC2341

Analysis	Date of Analysis	Instrument Batch	ID	Amount in Standard	Amount Detected	Units	Percent Recovery
2,4-Dinitrotoluene	12/08/95	1	LC2	1.0	0.878	µg/ml	87.8

Samples Analyzed after this Continuing Calibration Verification:

Laboratory Number	Sample Description
95111620	4A Turnip
95111629	13A Strawberry

Conclusion CCV1LC2342

Analysis	Date of Analysis	Instrument Batch	ID	Amount in Standard	Amount Detected	Units	Percent Recovery
2,4-Dinitrotoluene	12/08/95	2	LC2	1.0	0.934	µg/ml	93.4

-Continued-

Continental
Analytical Services. Inc.

QUALITY CONTROL REPORT
CONTINUING CALIBRATION VERIFICATION DATA

Client: Bioremediation Service, Inc.
Attn: Dave Emery
12130 Ainsworth Cr.Ste220
Portland, OR 97220-9009

Date Sample Rptd: 01/19/96
Date Sample Recd: 11/28/95
CAS File No: 6404
CAS Order No: 32453
Client P.O.: UMDA-Phase II

Analysis	Date of Analysis	Instrument Batch	ID	Amount in Standard	Amount Detected	Units	Percent Recovery

Samples Analyzed after this Continuing Calibration Verification:

Laboratory Number	Sample Description
No additional samples run after this CCV.	

Conclusion CCV2LC2342

Analysis	Date of Analysis	Instrument Batch	ID	Amount in Standard	Amount Detected	Units	Percent Recovery
2,4-Dinitrotoluene	12/13/95	1	LC2	1.0	1.08	µg/ml	108

Samples Analyzed after this Continuing Calibration Verification:

Laboratory Number	Sample Description
95111617	1A Carrot
95111618	2A Grass Mixture
95111621	5A Sagebrush
95111622	6A Crook Neck Squash
95111623	7A Carnation
95111625	9A Marigolds
95111626	10A Marigolds
95111627	11A Mums
95111628	12A Mums

Conclusion CCV1LC2347

Analysis	Date of Analysis	Instrument Batch	ID	Amount in Standard	Amount Detected	Units	Percent Recovery
2,4-Dinitrotoluene	12/13/95	2	LC2	1.0	1.11	µg/ml	111

Samples Analyzed after this Continuing Calibration Verification:

Laboratory Number	Sample Description
No additional samples run after this CCV.	

Conclusion CCV2LC2347

Analysis	Date of Analysis	Instrument Batch	ID	Amount in Standard	Amount Detected	Units	Percent Recovery
2,6-Dinitrotoluene	12/07/95	1	LC2	1.0	0.928	µg/ml	92.8

Samples Analyzed after this Continuing Calibration Verification:

Laboratory Number	Sample Description

-Continued-

Continental
Analytical Services, Inc.

QUALITY CONTROL REPORT
CONTINUING CALIBRATION VERIFICATION DATA

Client: Bioremediation Service, Inc.
Attn: Dave Emery
12130 Ainsworth Cr.Ste220
Portland, OR 97220-9009

Date Sample Rptd: 01/19/96
Date Sample Recd: 11/28/95
CAS File No: 6404
CAS Order No: 32453
Client P.O.: UMDA-Phase II

95111619	3A Sagebrush
95111624	8A Carnation

Conclusion CCV1LC2341

Analysis	Date of Analysis	Instrument Batch	ID	Amount in Standard	Amount Detected	Units	Percent Recovery
2,6-Dinitrotoluene	12/08/95	1	LC2	1.0	0.888	µg/ml	88.8

Samples Analyzed after this Continuing Calibration Verification:

Laboratory Number	Sample Description
95111620	4A Turnip
95111629	13A Strawberry

Conclusion CCV1LC2342

Analysis	Date of Analysis	Instrument Batch	ID	Amount in Standard	Amount Detected	Units	Percent Recovery
2,6-Dinitrotoluene	12/08/95	2	LC2	1.0	0.924	µg/ml	92.4

Samples Analyzed after this Continuing Calibration Verification:

Laboratory Number	Sample Description
No additional samples run after this CCV.	

Conclusion CCV2LC2342

Analysis	Date of Analysis	Instrument Batch	ID	Amount in Standard	Amount Detected	Units	Percent Recovery
2,6-Dinitrotoluene	12/13/95	1	LC2	1.0	1.09	µg/ml	109

Samples Analyzed after this Continuing Calibration Verification:

Laboratory Number	Sample Description
95111617	1A Carrot
95111618	2A Grass Mixture
95111621	5A Sagebrush
95111622	6A Crook Neck Squash
95111623	7A Carnation
95111625	9A Marigolds
95111626	10A Marigolds
95111627	11A Mums
95111628	12A Mums

Conclusion CCV1LC2347

Continental
Analytical Services, Inc.

QUALITY CONTROL REPORT
CONTINUING CALIBRATION VERIFICATION DATA

Client: Bioremediation Service, Inc.
Attn: Dave Emery
12130 Ainsworth Cr.Ste220
Portland, OR 97220-9009

Date Sample Rptd: 01/19/96
Date Sample Recd: 11/28/95
CAS File No: 6404
CAS Order No: 32453
Client P.O.: UMDA-Phase II

Analysis	Date of Analysis	Instrument Batch	ID	Amount in Standard	Amount Detected	Units	Percent Recovery
2,6-Dinitrotoluene	12/13/95	2	LC2	1.0	1.07	µg/ml	107

Samples Analyzed after this Continuing Calibration Verification:

Laboratory Number	Sample Description
No additional samples run after this CCV.	

Conclusion CCV2LC2347

Analysis	Date of Analysis	Instrument Batch	ID	Amount in Standard	Amount Detected	Units	Percent Recovery
TNT	12/07/95	1	LC2	1.0	0.934	µg/ml	93.4

Samples Analyzed after this Continuing Calibration Verification:

Laboratory Number	Sample Description
95111619	3A Sagebrush
95111624	8A Carnation

Conclusion CCV1LC2341

Analysis	Date of Analysis	Instrument Batch	ID	Amount in Standard	Amount Detected	Units	Percent Recovery
TNT	12/08/95	1	LC2	1.0	0.904	µg/ml	90.4

Samples Analyzed after this Continuing Calibration Verification:

Laboratory Number	Sample Description
95111620	4A Turnip
95111629	13A Strawberry

Conclusion CCV1LC2342

Analysis	Date of Analysis	Instrument Batch	ID	Amount in Standard	Amount Detected	Units	Percent Recovery
TNT	12/08/95	2	LC2	1.0	0.949	µg/ml	94.9

Samples Analyzed after this Continuing Calibration Verification:

Laboratory Number	Sample Description
No additional samples run after this CCV.	

Conclusion CCV2LC2342

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Continental
Analytical Services, Inc.

QUALITY CONTROL REPORT
CONTINUING CALIBRATION VERIFICATION DATA

Client: Bioremediation Service, Inc.
Attn: Dave Emery
12130 Ainsworth Cr.Ste220
Portland, OR 97220-9009

Date Sample Rptd: 01/19/96
Date Sample Recd: 11/28/95
CAS File No: 6404
CAS Order No: 32453
Client P.O.: UMDA-Phase II

Analysis	Date of Analysis	Instrument Batch	ID	Amount in Standard	Amount Detected	Units	Percent Recovery
TNT	12/13/95	1	LC2	1.0	1.04	µg/ml	104

Samples Analyzed after this Continuing Calibration Verification:

Laboratory Number	Sample Description
95111617	1A Carrot
95111618	2A Grass Mixture
95111621	5A Sagebrush
95111622	6A Crook Neck Squash
95111623	7A Carnation
95111625	9A Marigolds
95111626	10A Marigolds
95111627	11A Mums
95111628	12A Mums

Conclusion CCV1LC2347

Analysis	Date of Analysis	Instrument Batch	ID	Amount in Standard	Amount Detected	Units	Percent Recovery
TNT	12/13/95	2	LC2	1.0	1.15	µg/ml	115

Samples Analyzed after this Continuing Calibration Verification:

Laboratory Number	Sample Description
No additional samples run after this CCV.	

Conclusion CCV2LC2347

Conclusion of Continuing Calibration Data:

ıality control analyses were performed on samples at time of analysis in accordance with :ocedures published in Title 40 of the Code of Federal Regulations, Parts 136 or 141, or in 'A publication, SW-846, 3rd edition, Nov. 1986 and the latest promulgated update.

)NTINENTAL ANALYTICAL SERVICES, INC.

Clifford J. Baker
.iffo d J. Baker
:boratory Director

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APPENDIX C.

PATHOGEN TESTING

Results of pathogen testing conducted on compost that resulted from the remediation of soil from the Explosives Washout Lagoons. The analytical tests were commissioned by the composting contractor, Bioremediation Service, Inc.

BioVir Laboratories, Inc.

received 1/8/96

685 Stone Road • Benicia, CA 94510 (707) 747-5906 • 1-800-GIARDIA • FAX (707) 747-1751

REPORT OF SAMPLE EVALUATION

REPORT NO.: S951113A

PAGE NO.: 1 of 1

CLIENT ADDRESS: Bio Remediation
12130 N.E. Ainsworth Circle
Portland, OR 97220

CLIENT NO BSI001

SAMPLE INFORMATION:

Name of Sampler:	Pat Faessler	Sample Date:	11/20/95
Sample Source:	Biosolid-Grab	Sample Time:	11:30
Sample Location:	Batch 5	Lab ID#:	UM-002
Sample Volume:	364 grams		
Project Name:	Phase II - Explosive Washout Lagoons		

ASSAY RESULTS:

1. Helminth Ova Assay: <1 viable Helminth Ova / 4 grams total solids.
(EPA 600/1-87/014) DATE BEGUN: 11/30/95 TIME: 10:00 ANALYST INITIAL: MMP

2. Enteric Virus Assay: <1 PFU / 4 grams total solids.
(ASTM D 4994-89) DATE BEGUN: 12/22/95 TIME: NA ANALYST INITIAL: GF

3. Salmonella Assay: <2.2 MPN / 4 grams total solids.
(SM 18th; 9260D.1) DATE BEGUN: 11/22/95 TIME: 15:30 ANALYST INITIAL: KG

4. Fecal Coliform Assay: <2 MPN / gram total solids.
(SM 18th; 9221E.1) DATE BEGUN: 11/22/95 TIME: 16:30 ANALYST INITIAL: KG

5. Total Solids Assay: 16.98%
(SM 18th; 2540B) DATE BEGUN: 11/22/95 TIME: 13:00 ANALYST INITIAL: MMP

SAMPLE EVALUATION PERFORMANCE CITERIA: The precise rates of recovery of organisms from environmental samples cannot be determined. BioVir Laboratories has analyzed your sample(s) in accordance with the method described with each analyte above, however, due to inherent limitations of these methods organisms may avoid detection. For additional information regarding the limitations of the method(s) referred to above please call us at 1-800-GIARDIA.
COMPANY IS NOT AN INSURER: BioVir Laboratories is not an insurer or guarantor of the quality and/or purity of water, wastewater, biosolid or other material from which the sample was taken. BioVir offers no express or implied warranties whatsoever concerning the quality or purity of any water, wastewater, biosolid or other material which is ultimately consumed, distributed, applied or otherwise disposed.

1-3-96
ANALYSIS DATE

John L. Riggs
SIGNATURE/DATE
1-5-96

APPENDIX D

TCLP AND SPLP LEACHATE TEST RESULTS FROM MATURE COMPOST

Explosives were analyzed for using EPA Method 8330 by Black and Veatch, Inc. under contract with EPA Region 10 during the summer of 1997.

Table D-1. TCLP Results from Mature Compost Testing.
All values in µg/l. All samples were analyzed using EPA Method 8330 during August 1997.
(values preceded by < are below the laboratory reporting limit)

Contaminant	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6	Sample 7	Sample 8	Sample 9	Sample 10	Sample 11
HMX	< 8.10	< 8.10	< 8.10	< 8.10	< 8.10	< 8.10	< 8.10	< 8.10	< 8.10	< 8.10	< 8.10
RDX	< 8.03	< 8.03	< 8.03	< 8.03	< 8.03	< 8.03	< 8.03	< 8.03	< 8.03	< 8.03	< 8.03
1,3,5 - TRINITROBENZENE	< 3.99	< 3.99	< 3.99	< 3.99	< 3.99	< 3.99	< 3.99	< 3.99	< 3.99	< 3.99	< 3.99
1,3 - DINITROBENZENE	< 4.00	< 4.00	< 4.00	< 4.00	< 4.00	< 4.00	< 4.00	< 4.00	< 4.00	< 4.00	< 4.00
TETRYL, TOTAL	< 4.62	< 4.62	< 4.62	< 4.62	< 4.62	< 4.62	< 4.62	< 4.62	< 4.62	< 4.62	< 4.62
NITROBENZENE	< 4.50	< 4.50	< 4.50	< 4.50	< 4.50	< 4.50	< 4.50	< 4.50	< 4.50	< 4.50	< 4.50
2,4,5 - TRINITROTOLUENE, TOTAL	< 4.19	< 4.19	< 4.19	< 4.19	< 4.19	< 4.19	< 4.19	< 4.19	< 4.19	< 4.19	< 4.19
4-AMINO-2,6 DINITROBENZENE	< 4.22	< 4.22	< 4.22	< 4.22	< 4.22	< 4.22	< 4.22	< 4.22	< 4.22	< 4.22	< 4.22
2-AMINO-4,6- DINITROTOLUENE	< 4.06	< 4.06	< 4.06	< 4.06	< 4.06	< 4.06	< 4.06	< 4.06	< 4.06	< 4.06	< 4.06
2,6- DINITROTOLUENE	< 3.98	< 3.98	< 3.98	< 3.98	< 3.98	< 3.98	< 3.98	< 3.98	< 3.98	< 3.98	< 3.98
2,4- DINITROTOLUENE	< 3.01	< 3.01	< 3.01	< 3.01	< 3.01	< 3.01	< 3.01	< 3.01	< 3.01	< 3.01	< 3.01
2-NITROLTOLUENE	< 7.89	< 7.89	< 7.89	< 7.89	< 7.89	< 7.89	< 7.89	< 7.89	< 7.89	< 7.89	< 7.89
4-NITROTOLUENE	< 8.00	< 8.00	< 8.00	< 8.00	< 8.00	< 8.00	< 8.00	< 8.00	< 8.00	< 8.00	< 8.00
3-NITROTOLUENE	< 8.69	< 8.69	< 8.69	< 8.69	< 8.69	< 8.69	< 8.69	< 8.69	< 8.69	< 8.69	< 8.69

Source: Black & Veatch. 1997. Chemical Quality Control Report. Contaminated Soil Remediation, Explosives Washout Lagoons, UMDA, Hermiston, OR. Prepared for U. S. Army Corps of Engineers, Seattle District, Seattle, WA.

Table D-2. SPLP Results from Mature Compost Testing.

All values in µg/l. All samples were analyzed using EPA Method 8330 during August, 1997.
(values preceded by < are below the laboratory reporting limit)

Contaminant	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6	Sample 7	Sample 8	Sample 9	Sample 10	Sample 11
HMX	< 8.10	< 8.10	< 8.10	< 8.10	< 8.10	< 8.10	< 8.10	< 8.10	< 8.10	< 8.10	< 8.10
RDX	< 8.03	< 8.03	< 8.03	< 8.03	< 8.03	< 8.03	< 8.03	< 8.03	< 8.03	< 8.03	< 8.03
1,3,5 -TRINITROBENZENE	< 3.99	< 3.99	< 3.99	< 3.99	< 3.99	< 3.99	< 3.99	< 3.99	< 3.99	< 3.99	< 3.99
1,3 - DINITROBENZENE	< 4.00	< 4.00	< 4.00	< 4.00	< 4.00	< 4.00	< 4.00	< 4.00	< 4.00	< 4.00	< 4.00
TETRYL, TOTAL	< 4.62	< 4.62	< 4.62	< 4.62	< 4.62	< 4.62	< 4.62	< 4.62	< 4.62	< 4.62	< 4.62
NITROBENZENE	< 4.50	< 4.50	< 4.50	< 4.50	< 4.50	< 4.50	< 4.50	< 4.50	< 4.50	< 4.50	< 4.50
2,4,5 - TRINITROTOLUENE, TOTAL	< 4.19	< 4.19	< 4.19	< 4.19	< 4.19	< 4.19	< 4.19	< 4.19	< 4.19	< 4.19	< 4.19
4-AMINO-2,6 DINITROBENZENE	< 4.22	< 4.22	< 4.22	< 4.22	< 4.22	< 4.22	< 4.22	< 4.22	< 4.22	< 4.22	< 4.22
2-AMINO-4,6-DINITROTOLUENE	< 4.06	< 4.06	< 4.06	< 4.06	< 4.06	< 4.06	< 4.06	< 4.06	< 4.06	< 4.06	< 4.06
2,6-DINITROTOLUENE	< 3.98	< 3.98	< 3.98	< 3.98	< 3.98	< 3.98	< 3.98	< 3.98	< 3.98	< 3.98	< 3.98
2,4-DINITROTOLUENE	< 3.01	< 3.01	< 3.01	< 3.01	< 3.01	< 3.01	< 3.01	< 3.01	< 3.01	< 3.01	< 3.01
2-NITROLTOLUENE	< 7.89	< 7.89	< 7.89	< 7.89	< 7.89	< 7.89	< 7.89	< 7.89	< 7.89	< 7.89	< 7.89
4-NITROTOLUENE	< 8.00	< 8.00	< 8.00	< 8.00	< 8.00	< 8.00	< 8.00	< 8.00	< 8.00	< 8.00	< 8.00
3-NITROTOLUENE	< 8.69	< 8.69	< 8.69	< 8.69	< 8.69	< 8.69	< 8.69	< 8.69	< 8.69	< 8.69	< 8.69

Source: Black & Veatch. 1997. Chemical Quality Control Report. Contaminated Soil Remediation, Explosives Washout Lagoons, UMDA, Hermiston, OR. Prepared for U. S. Army Corps of Engineers, Seattle District, Seattle, WA.

APPENDIX E

AGRONOMIST'S REPORT

The agronomist report on the fertilizer value of compost generated through the windrow composting of explosives contaminated soil from the Explosives Washout Lagoons Soils Operable Unit. The report was supplied by the compost contractor, Bioremediation Service, Inc.

AGRI CHECK

AGRI - CHECK, INC.
AGRICULTURAL TESTING LABORATORY
CROP SCIENCE CONSULTANTS

323 SIXTH STREET • P.O. BOX 1350 • UMATILLA, OREGON 97882

• PHONE (503) 922-4894

received 6/4/96

LAND APPLICATION OF COMPOST
RECEIVED FROM BIOREMEDIATION SERVICE, INC. ON MAY 30, 1996

These materials would make a more marginal soil amendment for E. Oregon than for W. Oregon because of the high pH and high salt levels. High pH and high salts are less problematic on the acid, high rainfall soil's of the Willamette Valley. The material does have significant fertilizer value for many applications.

pH

pH of this material is relatively high. A soil pH of 8.2 is near native soil pH in most soil's of the Hermiston and Umatilla area. The pH of this material is not high enough to indicate a sodium problem. High pH materials are desirable in the Willamette Valley because soils have a pH less than 6.0 and lime is needed to increase soil pH. This material could be used as a substitute for lime in addition to providing fertilizer and helping soil tilth.

PHOSPHOROUS

Phosphorous levels are moderately high. However, only a fraction of this total P is "plant available" P in the short term. For a one time application P is not limiting. If many applications are anticipated P is the most limiting nutrient to long term applications.

POTASSIUM This material is high in K. The material has 11.8 pounds of K per dry ton of material. Most of this K would be "plant available" The high K level in this material is a large contributing factor to its high salt content.

NITROGEN.

The ammonium and nitrate levels in this material are moderate. They are high enough to indicate that it is a stabilized compost and would not immobilize N. Rather a net N release through mineralization would be expected. This material would release N at a slow rate allowing for uptake by existing vegetation. Amount of N, timing of N released and its fate would depend on seasonality of application, application rate, application method, vegetation, rainfall and other factors. Nitrogen would be released over the next 5-10 years following application. Larger chunks of wood in this material have not yet decomposed but, because of the small surface area they represent, would not temporarily fix much nitrogen. If this material is surface applied during the summer much of the ammonia may volatilize.

The total N content of this material indicates that a dry ton of material contains 8.9 pounds of N. Nitrogen and salt content are the most rate limiting constituents to short term applications. A rough estimate is to assume 50% of the applied N will be available in the first year following application.

SALTS

One of the most limiting factors in compost land application in E. Oregon is salt levels. If this material is applied to an environment where leaching occurs salts are less of a problem in the long term. The salt level of 13.6 is very high for most applications east of the Cascades. At very high rates salts will hinder the growth of many agronomic crops and many native species. If this material is used for landscaping it will need to be leached of some of its salts prior to planting. Used in moderation (5-10 t/a) this material could be used without adverse salt effects to most plants. This material has the potential to be beneficial once salts are minimized. Benefits include increasing soil tilth and providing a form of slow release fertilizer.

Salt hazard is a direct function of rate applied. A safe salt level in soil for most applications is less than 1 mmhos cm^{-1}. Many desert species are much more tolerant to salts while many landscape plants tend to be more sensitive. If this material will be applied at rates greater than 10 dry t/a it would be beneficial to monitor salts after application.

RATE OF APPLICATION

This material is limited by its high pH and its high salt content. The organic matter and fertilizer content would benefit soil tilth if salts were reduced. A nitrogen rate of 100 pounds per acre is suitable, assuming a 25-50% availability in the first year which allows for a total 200-400 pounds of N to be applied. Rates of 5 to 40 dry tons per acre are suitable depending on soil pH, vegetation and salt hazard.

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