UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue, Suite 900
Seattle, Washington 98101-3140

June 19, 2008

Reply to
Attn of: ECL-110

Mr. Todd Slater
Legacy Site Services, LLC
468 Thomas Jones Way
Exton, PA 19341

Re: Arkema CDF Evaluation

Dear Todd,

This letter is to transmit further details on the evaluation of the nearshore Confined Disposal Facility (CDF) alternative through the Arkema EE/CA, per the May 23, 2008 Opalski Dispute Decision. Per that decision, CDF evaluation is not to extend the project schedule put forth in the July 2006 workplan submittal; however, CDF evaluation must be thorough enough to determine whether the CDF is feasible through both the EE/CA (to temporarily site the facility) and the Harborwide RI/FS process (to permanently site the facility). The information provided herein represents issues that should be considered during the evaluation of a CDF; however, this information should not be considered all inclusive, as other criteria may require evaluation as part of the EE/CA. This letter presents a discussion of the following items:

1. Consideration of general design parameters.

2. Potential floodway analysis issues.

3. Considerations for sediment treatment evaluations.

4. Performance standards expectations gleaned from the Terminal 4 Project.

Screening level evaluation of these and other factors must be presented no later than October 15, 2008. This deadline will allow the Arkema and Harborwide processes to keep on schedule, and comply with the May 23rd Dispute Decision. If the CDF is found to be feasible by Arkema's site specific analysis and the Harborwide evaluation of this option in the larger context of the overall cleanup, these factors would be evaluated in further detail for the EE/CA and Harborwide Feasibility Study.

1. Consideration of General Design Parameters for an Arkema CDF

Our understanding of Arkema's CDF disposal alternative is to place dredged contaminated sediments within a permanent CDF that is constructed in the water below the Ordinary High Water Mark of the Willamette River. Basic assumptions for the CDF include:

- The CDF would be designed to permanently isolate the sediments and any impacted groundwater from the surrounding waters even at high flood level flows; and

- The CDF would need to consist of at least a three-sided structure, which would extend from the bank of the existing facility; and

- The CDF would be constructed in a manner that is consistent with (does not impede) upland source control efforts at the Arkema facility and the site-wide sediment remedy at the Portland Harbor site.

The CDF berm and/or wall material requirements will follow those established for the Terminal 4 Project as follows: "Such that the CDF will achieve confinement of all hazardous substances so that the facility does not contribute any discharge and/or release of contaminants above [applicable or relevant and appropriate requirements] ARARs for surface water or sediment in the lower Willamette River. In order to meet this design criteria, the CDF shall be designed such that the quality of groundwater exiting the CDF will meet EPA's national recommended chronic water quality criteria for both aquatic organisms and fish consumption by humans (17.5 g/day), more stringent Oregon water quality standards, Region 9 tapwater PRGs, and MCLs." For a seawall configuration, confinement will be measured by wells at the containment face on the inside of the CDF, unless otherwise agreed by EPA. Should different design parameters be established as part of the Portland Harbor RI/FS, then those alternative parameters may be considered.

Department of State Lands - Access and Use Authorization

If the Oregon Department of State Lands (DSL) owns any portion of the submerged and submersible land under which the proposed CDF would be placed, DSL agreement to provide access and authorize such use is required. This agreement should be obtained well within the evaluation process or the project may not be implementable.

Federal ARARs

Clean Water Act Section 404

The 404(b)(1) guidelines of the Clean Water Act as implemented by the U.S. Army Corps of Engineers (USACE) require a two part analysis of a proposal. First, it is determined whether or not the proposal is a water dependent activity. Water dependent activities are those that must occur on or adjacent to a water body, such as a boat launch or a marine freight terminal. A CDF is not a water dependent activity and therefore would need to comply with the more stringent second part of the analysis.

If an activity is not a water dependent activity, then it must be demonstrated that the proposal that impacts a water of the U.S. is the least environmentally damaging practicable alternative. In other words, all other alternatives must be eliminated on the basis of greater environmental impacts or impracticability from the perspective of cost, logistics, or technology. Some of the potential impacts that would need to be evaluated are listed below.

It should be noted that the environmental impacts analysis is not completed for one alternative, but must include all practicable alternatives.

The 404(b)(1) guidelines set forth the environmental factors and impacts that must be analyzed. Examples include:

- Impacts to in-water habitats and organisms from in-water construction activities such as pile driving, discharge of concrete into the water, turbidity from construction, loss of habitat due to caisson dam, or other structure to isolate the work zone;

- Permanent loss of in-water and nearshore habitats;

- Permanent loss of beach and riparian habitats;

- Changes to the floodplain of the Willamette River and the effects of climate change on future flood events;

- Impacts to fish and wildlife from alteration of nearshore environment and bathymetry such as impacts to fish migration corridors or blockage of fish migration;

- Potential incompatibility with land uses such as the Oregon Statewide Goals;

- Impacts to threatened and endangered salmonid species would need to be addressed both in the 404 (b)(1) analysis as well as through a consultation with the federal services;

- Loss of fishing access;

- Potential impacts to cultural resources;

- Impacts to navigation will also need to be addressed through the 404 (b)(1) analysis;

- Impacts to shoreline erosion and accretion processes from a large permanent in-water structure would need to be analyzed;

- Cost comparisons between construction of a seismically stable in water structure vs. land based structures or locations;

- Cumulative impacts of fill in the Willamette River are likely to be greater than the impacts of fill in an upland location.

Finally, compliance with Section 404 is not concluded until compliance can be shown with a number of other federal laws and policies such as the Endangered Species Act (ESA), the National Historic Preservation Act, the Magnuson-Steven Fishery Conservation and Management Act, Executive Order 11988 Floodplain Management, Executive Order 12898 Environmental Justice, and Section 401 of the Clean Water Act.

Endangered Species Act

The ESA requires federal agencies to consult with the Fish and Wildlife Service (USFWS) and/or the National Marine Fisheries Service (NMFS) as appropriate before undertaking actions with the potential to affect threatened and endangered (T&E) species. In preparation for this consultation, Arkema would need to prepare a Biological Assessment (BA), which compiles all information on existing T&E species and their habitats within the action area. An ESA consultation is a feasibility level issue and a draft BA will be necessary for the EE/CA if evaluation of a CDF should proceed.

In the Willamette River there are a number of T&E species that would need to be considered during the consultation. These include Steelhead (*Oncorhynchus mykiss*), Chinook or King Salmon (*Oncorhynchus tshawytscha)* , Sockeye Salmon (*Oncorhynchus nerka)* , Chum Salmon (*Oncorhynchus keta*), and Coho or Silver Salmon (*Oncorhynchus kisutch*). NMFS would be the primary agency for consultation as they have jurisdiction over these species.

Consultation with NMFS is generally initiated with the preparation and submission of a BA. The formal consultation process often takes a considerable amount of time, often one year or more. For this reason, it is recommended that NMFS be contacted as soon as possible to begin the consultation process. The initial agency contact often provides invaluable guidance regarding the most efficient ways to proceed with this often difficult process. The end result of the formal consultation is the generation of a Biological Opinion by NFMS. The Biological Opinion serves as the agency opinion regarding the acceptability of the proposed actions.

From our experience, the action area for the purposes of the ESA consultation is not the same as the removal action area. The action area for construction-related effects may be much larger if, for example, pile driving is a component of the in-water construction. The underwater noise generated from pile driving can result in action areas of several miles from the construction site. It is also important to understand that the project for consultation is not just the removal of contaminated sediments. The action for consultation also includes any construction or transportation activities associated with disposal and the effects of any permanent structures.

In addition to the T&E species currently listed, other species are of concern due to declining populations in the lower Columbia River and associated waters. These may be proposed for listing in the future. Protection of these species, although not formally required by the ESA, should also be considered since many of the impacts on T&E species will also affect these non-listed taxa. A few examples of other aquatic species that may be adversely affect by project-related actions are presented below.

Columbia River populations of several species of fish and mussels are believed to be declining. These include the Pacific lamprey (*Lampetra tridentata*), Western brook lamprey (*L. richardsoni*), and river lamprey (*L. ayresi*). Each of these is found in the Columbia River Basin. Lampreys are ecologically, economically, and culturally valuable species. Pacific lamprey populations in the Columbia River Basin have declined and the status of Western brook and river lampreys is unknown.

White sturgeon (*Acipenser transmontanus*) populations in the Columbia River are apparently declining, due at least in part to the presence of elevated amounts of toxic and bioaccumulative chemicals including DDT and polychlorinated biphenyls (PCBs). Researchers at Oregon State University have confirmed these chemicals in the tissues of these fish species. The research by Schreck and Feist (Oregon State University) revealed that white sturgeon living in the Columbia River in some areas above Bonneville Dam have high amounts of toxic contaminants in their livers, sex organs, and muscle tissue.

The Western pearlshell mussel (*Margaritifera falcata*) is one of several mussel species of concern for the Columbia River basin. Protection of this and many other mussel species, numbers of which are apparently declining, is of concern to several northwest states.

Potential project-related impacts on T&E aquatic species may include the following. This list is not exhaustive but includes major categories of effects that will need to be considered.

Noise during the Construction Phase

For example, pile driving may have both lethal and non-lethal effects. The non-lethal effects that would need to be addressed through the biological opinion may be wide ranging and include dispersion of aquatic and semi-aquatic biota through avoidance.

Behavioral Changes

This includes changes in migratory patterns due to physical blockage of historic migration corridors. Juvenile salmonids in particular require shallow nearshore habitats to move through and avoid predators. The construction and installation of a significant blockage in the shallow nearshore waters of the Willamette could be a significant impact to salmonids.

Habitat Reduction, Alteration, or Loss

Project actions will result in both the temporary and permanent loss and/or degradation of important shallow shoreline habitats. Also, project-related actions may contribute to changes in shoreline erosion and accretion processes affecting habitats both up and downstream of the project area.

Contaminant Source

The short-term and long-term potential effects of DDT and related contaminants in removed sediments should be considered. Long-term effects include the potential of DDT and related contaminants to affect aquatic life and upper trophic level consumers of aquatic life.

These are significant issues that would need to be addressed through the consultation process and there is not much precedent for predicting what types of reasonable and prudent measures might be appropriate for such a project. When there are significant permanent impacts to habitat and uncertainty about appropriate measures, consultation can become very protracted. It is likely that this would be a formal consultation process and many projects are finding that a formal consultation in the Portland area can take more than six months to conclude.

Section 10 Rivers and Harbors Act

The Willamette River is a navigable water of the U.S. and structures constructed below the Ordinary High Water Mark must also comply with Section 10 of the Rivers and Harbors Act of 1899. This Act addresses the potential to impair navigation. The project site is very close to the edge of the designated navigable channel in the Willamette. The USACE is responsible for maintaining the navigable channel. There would need to be an analysis of the potential for the structure to be affected by channel maintenance activities, for example, if future dredging could affect the integrity of the structure, then the structure would not be allowed in that location or configuration.

The issue of how such a structure would affect shoreline erosion and accretion processes would also be part of this analysis. It is likely that a large solid structure extending out from the river bank would alter the normal pattern of sediment transport downriver. This change in sediment transport could affect the patterns of sediment deposition within the navigable channel, ultimately affecting the need for channel maintenance. These issues would need to be analyzed and resolved with USACE and the Coast Guard before such a structure could be constructed.

Executive Order 11988 Floodplain Management

Executive Order 11988 on Floodplain Management requires federal agencies to document that their actions will not affect floodplain capacity or cause floods to encroach upon new areas. A flood rise study and hydrologic analyses to address the effects to the flood capacity of the lower Willamette will need to be conducted.

The analysis required by E.O. 11988 also requires the federal agency to document that the action conforms to applicable state or local floodplain protection standards and to describe the alternatives considered. Close coordination with FEMA and the NMFS for the Portland Harbor Site will need to occur to evaluate the CDF in the context of other actions that may raise or encroach upon the floodway.

2. Potential Floodway Analysis Issues Related to an Arkema CDF

An initial review of the Willamette River floodway map and Arkema site map indicates that most of the Willamette channel is considered floodway, so most of the likely footprint of a CDF will encroach upon it. An updated floodway analyses will be needed in order to assess the feasibility of siting the CDF at this location. A jurisdictional floodplain, as depicted on the FEMA Flood Insurance Rate Maps (FIRMs), is composed of the floodway and flood fringe. The floodway is defined as that portion of the floodplain that is needed to convey flood flows, and is usually composed of the river channel and a portion of the overbanks.

FEMA regulations (44 CFR Part 9 Chapter 1 [1999]) and ("*Use Of Flood Insurance Study (FIS) Data As Available Data*" , FEMA Floodplain Management Bulletin 1-98 available at: http://www.fema.gov/plan/prevent/floodplain/fis_data.shtm), require that implementation of a proposed project within a jurisdictional floodplain results in a "zero rise" in the regulatory flood (aka, "base flood") water surface elevation, and generally requires certification by a professional engineer (aka "no rise certification"). The analysis of the proposed CDF must assess encroachments on the floodway and any increases in the base flood elevation. The analyses should also include potential mitigation of any rise in the base flood elevation. Generally, a rise in the base flood elevation within the floodway can be mitigated by increasing the conveyance area of the floodway to compensate for the loss of conveyance area represented by the proposed work. The analyses should address areas of the river in the vicinity of the proposed CDF where additional conveyance is can be obtained. Mitigation feasibility would also need to be addressed during the EE/CA analysis pursuant to the +50/-30 percent cost estimating EE/CA and feasibility study (FS) guidance. The floodplain analysis may need to include the following:

Review and Update FEMA Floodplain Model

To accomplish the EE/CA CDF analysis, requires obtaining the regulatory floodplain model (i.e., effective model) on which the FIRM floodway is based. This can usually be obtained from the local jurisdictional floodplain administrator or FEMA or FEMA's contractor. Because the effective model was completed sometime in the past, the model input data will likely require updating. This may include resurveying the model cross-sections, possibly adjusting roughness coefficients, revising riverine structure (i.e., bridges, diversions, etc.) geometries and incorporating any map revisions that may have occurred on the river since the effective date of the FIRM.

Apply Model to Analyze CDF Impacts

Once the effective model is updated to current conditions, it is called the corrected effective model. The hydraulic characteristics of the proposed work are then incorporated into the corrected effective model to obtain a proposed conditions model. The water surface elevations and floodplain extents of this proposed conditions model are compared to the regulatory model to determine the extent of increases in water surface elevations.

Identify Potential Mitigation Measures

To mitigate the increases in water surface elevations, the analysis must identify potential alternatives that would provide conveyance capacity necessary to offset the impact of the CDF. The model would be modified to reflect these alternatives where an increase in conveyance can occur. Once the additional increase in conveyance in the mitigation area(s) equal the conveyance lost to the proposed work, the engineer can issue a "no rise certification" and the work can proceed.

Obviously, there are a few potential outcomes associated with this analysis:

- If the results of the proposed action increase the risk of flood impacts on human health and the environment, FEMA may not approve the map revision and the proposed project could not proceed.

- If a rise in water surface elevations already occurs in the corrected effective model that has nothing to do with the proposed project, FEMA and the local floodplain administrator have the option to allow the proposed project to proceed, or to compensate for previous work. In areas of on-going development, this is always an issue. Often, the local floodplain administrator will allow the proposed project to proceed as long as the loss of conveyance from that work is compensated for, but this is not always the case.

- If there is no place in the vicinity of the proposed project to increase conveyance to compensate for the rise, a Letter of Map Revision (LOMR) is required. This is often the case in highly developed urban areas, and may be the situation at the Arkema site. The LOMR process is lengthy and difficult, usually requiring multiple reviews by a FEMA contractor, which is paid for by the applicant, and a public input process. If the LOMR is approved, then the FIRM floodplain and/or floodway boundaries are adjusted accordingly.

Changes in flood storage due to floodway encroachment are a further consideration although this is not expected to be as significant an issue as the increase in Base Flood Elevations (BFEs). To predict changes in flood storage will require use the dynamic version of the Hydrologic Engineering Center River Analysis System (HEC-RAS) model to route the Base Flood hydrograph through the CDF reach, rather than a single peak flow as is done with the steady-state version of the model. The unit Base Flood volume at any one cross-section is the area under the hydrograph curve, or integral of the line describing the curve. The change in the flood volume between the corrected effective, or current conditions model, and the proposed conditions model will define the change in flood storage. If not already available from the FEMA Flood Insurance Study (FIS), or another acceptable hydrologic study of the Willamette River watershed upstream of the Arkema site, a flood hydrograph can be developed using the HEC- Hydrologic Modeling System (HEC-HMS) model.

National Historic Preservation Act

Cultural Resources

The project area has been identified as a low probability area for cultural resources and the fill history has been relatively well documented. Prior to proceeding, a geomorphologist would likely need to be engaged to document that the project would not disturb any native soil layers that may exist under the more recent fill layers. It is possible that additional site surveys may be required.

Section 401 Clean Water Act

A 401 water quality certification will be required for the project. This certification will need to address both the construction and dredging activities of the project as well as the long term monitoring and maintenance of the structure to ensure it remains sound.

3. Considerations for Treatment Evaluations of Arkema Contaminated Sediments Using Thermal Desorption

This section discusses treatment evaluations for thermal desorption at the Arkema site. A preliminary evaluation of treatment options was presented in the attachment to EPA's Arkema EE/CA Workplan Dispute memorandum dated April 16, 2008. The following treatment options were discussed therein: biological, dechlorination, soil washing, solvent extraction, solidification/stabilization, incineration, and thermal desorption. Biological, dechlorination, soil washing, and solvent extraction were ruled out for not being well suited to treat sediments with DDx-constituents. Solidification/ stabilization was also evaluated and ruled out as a treatment option. While solidification/ stabilization would be effective at immobilizing the DDx contaminated sediments, it would not satisfy the treatment component of the remedy in that concentrations of DDx would not be reduced to below the Universal Treatment Standard of 0.087 milligrams per kilogram (mg/kg) for DDx. Arkema and EPA agreed that thermal desorption was deemed to be adequately effective, less complex, and more cost effective when compared with incineration. If Arkema wishes to evaluate other treatment options, EPA should be consulted to discuss.

The purpose of this discussion is to outline factors specific to thermal desorption that should be considered during EE/CA planning and preparation. Obtaining information concerning these factors will aid in evaluation of removal action alternatives which include thermal desorption for treatment of DDx-contaminated sediment removed from the Willamette River prior to disposal in a CDF. The information presented in this document expands upon thermal desorption information presented in the above-referenced attachment in EPA's memorandum dated April 16, 2008 regarding the Arkema EE/CA Workplan Dispute.

Evaluation of Thermal Desorption Within the EE/CA

As discussed in *EPA Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA, EPA 540-R-93-057* (EPA 1993), the selection of a removal action alternative should consider the CERCLA preference for treatment over conventional containment or land disposal approaches to address the principal threat at a site. It also states that although CERCLA section 121(b) appears to apply only to remedial actions, the overall strategy scheme leads to the conclusion that this preference is also an appropriate goal for removal actions. Treatment may also be necessary to meet ARARs prior to disposal in a CDF.

The State of Oregon's solid waste regulations (ORS 459.005 *et* seq.; OAR 340-094-0040) and hazardous wastes regulations (ORS 466.005-466.225; OAR Chapter 340-101-0033) are ARARs for this action, and certain analysis, design, monitoring, and other requirements may be identified per state regulations in the future.

The EE/CA process as described in *EPA Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA* (EPA 1993) requires an evaluation of each removal action alternative with respect to short- and long-term aspects of three broad criteria, which are effectiveness, implementability, and cost. Within each of these broad criteria are subcriteria used to demonstrate the ability of the removal action alternatives to meet the broad criteria. These subcriteria are presented below:

Effectiveness

- Long-term effectiveness and permanence
  - Magnitude of risk
  - Adequacy and reliability of controls
- Reduction of toxicity, mobility, or volume through treatment
- Short-term effectiveness
  - Protection of the community
  - Protection of the workers
  - Environmental impacts
  - Time until response objectives are achieved

Implementability

- Technical feasibility
- Administrative feasibility
  - Statutory limits
  - Permits and waivers
- Availability of services and materials
  - Personnel and technology
  - Off-site treatment, storage, and disposal
  - Services and materials
  - Prospective technologies
- State (support agency) acceptance
- Community Acceptance

Cost

- Capital cost
  - Direct capital costs
  - Indirect capital costs
- PRSC cost
- Present worth cost

To document the ability of treatment using thermal desorption to meet these criteria as part of the overall removal action alternative, specific factors related to thermal desorption will need to be identified and evaluated as discussed below.

Factors Affecting Evaluation of Effectiveness, Implementability, and Cost for Thermal Desorption

Factors that may impact the effectiveness, implementability, and cost of these thermal desorption treatment system processes are presented below for consideration during preparation of the EE/CA work plan and ultimately during technology and alternative evaluations within the EE/CA.

Pre-Treatment Considerations for Thermal Desorption

Based on boring logs from the *Phase II Stage 1 & 2 In-River Groundwater and Sediment Investigation Report* (Integral, 2003), the types of sediment likely to be encountered at the site includes, but is not limited to: fine to medium sand, sandy silt, clayey silt, silt, silty clay, very fine sand, and miscellaneous debris. The maximum concentration of DDT found at the site was 4,500,000 micrograms per kilogram (µg/kg) at a depth of 8 to 10 feet below the mudline. The maximum DDT concentration found in surface sediments was 34,000 µg/kg in the top 4.3 feet of sediments (Integral, 2003).

These concentrations were collected from the river bottom and do not necessarily reflect the concentrations that will be observed after dredging and dewatering. Specific physical, chemical, and geotechnical properties of this sediment after dredging have not been determined. Thus it will be necessary to determine the following properties to fully evaluate effectiveness, implementability, and cost impacts during the pre-treatment phase of thermal desorption.

- Sediment Properties
  - Grain size analysis/particle-size distribution (ASTM D422 and D2216).
  - Silt and clay content – high fractions of fine silt or clay can generate fugitive dusts, causing greater dust loading on downstream pollution control equipment.
  - Solid content – contaminated sediment must contain at least 20% solids.
  - Particle size should be less than 1.5 inches or poor processing performance will occur due to caking.

- Physical properties
  - Tightly aggregated particles can result in inadequate volatilization of contaminants.
  - Moisture content should be less than 60% or the treatment process will require additional energy and treatment costs will increase. Moisture content should be analyzed via ASTM D2937. Soils with excessive moisture content must be dewatered. When moisture content is higher than 20 %, impacts on cost become significant (EPA, 1997).
  - Humic content of the sediment - high humic content increases reaction time as a result of binding of contaminants.

– Plasticity of the sediment – plastic soils tend to stick to screens and other equipment, and agglomerate into large clumps. They require higher temperatures for treatment and pretreatment (i.e. shredding or blending with more friable soils).

- Chemical Properties
  – Presence of mercury – boiling point of mercury is close to the operating temperature for the process.
  – Boiling point of DDx constituents – thermal desorption is applicable to any contaminant with boiling points up to 1,000^{o}F.
  – Ideal pH range is 5 to 11; otherwise corrosion could occur within the system.
  – Heavy metals in the sediment could produce a treated solid residue that requires stabilization.
  – Vapor pressure of DDx-constituents – vapor pressure influences the rate of thermal desorption and increases exponentially with an increase in temperature.
  – Heating value of DDx-constituents – soils with heating values >2,000 Btu/lb require blending with cleaner soils.
  – Concentrations of contaminants in sediment.

- Other Considerations Affecting Pre-Treatment
  – ARARs that would affect the action (i.e., LDRs)
  – How the sediment will be dewatered prior to treatment
  – How excavation and treatment will be staged: hot spot removal or mass dredging and mixing of sediments
  – What the flammability of the DDx-constituents is if the system under consideration is direct-heated
  – Where and how often samples will be collected from untreated media, treated media, off gas, condensate, and residual material

Factors Affecting Sediment Treatment Using Thermal Desorption Systems

- Will treatment occur on-site or off-site?

- What is the volume of waste to be treated?

- Is adequate space available for stockpiling treated and untreated materials, dewatering materials, and operating process equipment?

- What substantive requirements of permits and/or offsite permits are necessary for operation and monitoring of the system?

- What temperature is necessary to achieve treatment targets?

- What residence time is necessary to achieve treatment targets?

- What is the removal efficiency of the thermal desorption system?

- What is the heating value for the material?

- Sieve analysis should be conducted to determine the dust loading in the system to properly design and size the air pollution control equipment.

- How will the climate of the area affect system performance?

- What will the contaminant concentrations and particulate levels in the off gas be?

- Monitoring Plan - What will the confirmation sampling process consist of for feed soil and treated soil?

- How will dust from treated media be controlled?

- Are there air discharge requirements that must be met for the off gas?

- Are there noise considerations for the surrounding area that may limit the hours of operation for the system or require mufflers or pre-engineered buildings to house the desorber?

- What equipment will be used for the desorption process? Direct-fired thermal desorbers operating at high temperatures and thermal desorbers equipped with afterburners or other types of oxidizers are considered to be incinerators, and must meet the more stringent RCRA Subpart O incinerator emission requirements rather than RCRA Subpart X requirements for thermal desorbers.

Factors Affecting Sediment After Treatment Using Thermal Desorption Systems

- What are the disposal methods and technologies for treatment residuals (oversize media rejects, condensed contaminants and water, emission gas dust, clean off gas, and spent carbon) and what quantity of residuals is expected to be generated during treatment?

- What is the disposal method for the treated media?

- How will condensed organic material generated from the thermal desorption process be treated?

- How will the water side stream generated during removal and transport of the sediment be treated and where will it be disposed of?

Factors Affecting Cost of Treatment Using Thermal Desorption

Additional factors that could impact costs that should be considered for thermal desorption include, but are not limited to the following:

- Volume and type of waste to be treated – processing rates for the finer, more cohesive silts and clays generally are lower and therefore per unit costs are higher.

- Contaminant concentrations in feed stream and moisture content of sediment - determines the heat input (temperature) and residence time required to dry and treat sediment. Higher moisture contents and contaminant concentrations require higher temperatures and residence times which increases cost.

- Organic content of sediment – high concentrations of organic material can enhance adsorption of certain organic compounds and make the thermal desorption process more difficult which increases cost.

- Treatment targets for DDx-constituents – the degree of treatment required by the system will impact the temperature and residence time of the system.

- Dredging methodology (hot spot removal versus mass dredging and mixing of sediments) could impact the volume of sediment requiring treatment as well as the temperature and residence time in the treatment system.

- Dewatering of sediment - if moisture content of sediments warrant dewatering prior to treatment, pre-treatment costs may be affected.

- Materials handling – the volume of sediment to be treated, need for dewatering, and presence of debris in sediment may affect material handling costs.

- Pre-screening to remove objects greater than 1.5 inches prior to thermal desorption treatment.

- Sediment feed rate, operating temperature, and treatment (residence) time for the thermal desorption system will affect energy and fuel needs to run the system.

- Contaminant concentrations in treated stream will determine whether further treatment of sediment is needed prior to disposal.

- Confirmation Sampling – the sampling density for the feed stream and treated stream (as well as necessary material staging pending results) will affect costs for confirmation sampling.

- The degree of treatment needed for off gas (removal of particulates, condensing of volatile contaminants, etc.) in order to meet disposal or discharge requirements.

- Disposal methods and technologies for treatment residuals (oversize media rejects, condensed contaminants and water, emission gas dust, clean off gas, and spent carbon).

- Energy costs for the region

- Availability of utilities

- Cost of fuel

Applicability of a Site-Specific Treatability Study for Thermal Desorption

Per the *EPA Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA* (EPA 1993), treatability studies may not be necessary for proven technologies such as thermal desorption; however, they are important when it is necessary to assure that treatment targets will be met. The proven effectiveness of a particular system for a site or waste does not ensure that it will be effective at all sites or that treatment efficiencies achieved will be acceptable at other sites. Treatability information can also be referenced in developing the EE/CA and FS cost estimates relative to batch treatment verification, which will be required by EPA before waste placement, and how often the frequency of retreatment of batches will be necessary.

It is recommended that a treatability study be conducted to further evaluate the feasibility of thermal desorption as a treatment option for the Arkema site. Conducting a treatability study will provide some of the answers to the evaluation factors used in determining effectiveness, implementability, and cost for a removal action alternative involving thermal desorption. Treatability studies help to better evaluate technology performance and reduce cost and performance uncertainties. They can indicate whether heating the medium to a specific temperature for a specified residence time will result in attainment of treatment targets for a contaminant (EPA, 1997). Specifically at the Arkema site, these considerations are even more important because of the uncertainty involving the physical and chemical nature of the sediment after dredging and dewatering and the importance of meeting treatment targets for DDx prior to disposal in a CDF.

If the land disposal restrictions codified in 40 CFR Part 268 are determined to be ARARs for the removal action, then the treatment targets would most likely be set at the Universal Treatment Standard (UTS) requirements. According to 40 CFR Part 268, the UTS for DDx constituents are 0.087 mg/kg (EPA, 2008). However, DDx concentrations determined during an ecological risk assessment to be protective of the environment may also be considered as treatment targets. An ecological risk assessment has not been formalized for the site so it is possible that the treatment targets for the site could be lower than the UTS for DDx if based on an ecological risk assessment, such as the use of the Harborwide RI values, when developed.

Treatability Study Planning and Implementation Considerations

Treatability studies generally fall under two categories; bench-scale testing and pilot-scale studies. Bench-scale testing is typically used for remedy selection, but may fall short of providing enough information for remedy selection. Pilot-scale studies are normally used for remedial design, but may be required for remedy selection in some cases due to the complexity of equipment needed for some processes (EPA 1992).

The objective of the treatability study will further define some of the processes used to obtain data for planning purposes. If the main objective is to determine the performance of the system at the maximum site concentration, then sample collection for the treatability study should occur in the "hot spots." If the objective is to examine system performance for a homogenous waste then an "average" sample for the entire site should be collected.

The following factors include some of the topics that should be considered when planning a thermal desorption treatability study, the potential results that can be obtained, and deliverables that would be required.

Pre-Testing Planning

- Goals and objectives of the treatability study
- Data requirements for estimating the cost of the technology
- Information necessary for procurement of equipment and analytical services
- Site information that would affect pilot-test requirements (waste characteristics, power availability, etc.)
- Waste requirements for testing (volumes, pretreatment, etc.)
- Data requirements for technologies to be tested

- Collection of moisture content for sediments
- Collection of heat value for sediments
- Chlorine content of sediments
- Waste sampling plan (feed stream, treated stream, and off gas/condensate)
- Waste characterization
- Determine testing requirements for bench or pilot studies, if required
- Shipment considerations for hazardous materials during testing
- Disposal & adequate documentation of disposal for residuals remaining after testing

Results Typically Obtained

- Destruction and removal efficiency
- Evaluation of technology performance
- Determination of process sizing
- Determination of retention times from test burns
- Combustion-chamber and after-burner temperatures
- Fuel and energy requirements for thermal desorption of waste

Typical Deliverables Needed

- Revised work plans, as necessary, including bench and/or pilot test work plans

- Sampling and Analysis Plan consisting of the Field Sampling Plan and Quality Assurance Project Plan

- Test results and evaluation report documenting results of the testing

Carefully planned treatability studies are essential to ensure the data obtained is useful for evaluating the applicability or performance of a technology. As such, a Work Plan should be prepared detailing the proposed approach for completing the treatability study.

Information to be included in the work plan sections can be found in the *EPA Guide for Conducting Treatability Studies under CERCLA: Thermal Desorption Remedy Selection* (EPA, 1992). The suggested format from this document for a thermal desorption treatability study work plan is summarized below:

- Project Description and Site Background
- Remedial Technology Description
- Test Goals
- Experimental Design
- Equipment and Materials
- Sampling and Analysis
- Data Management
- Data Analysis and Interpretation
- Health and Safety
- Residuals Management
- Community Relations
- Reports
- Schedule

- Management and Staffing
- Budget

Summary of Treatment Considerations

The selection of a removal action alternative should consider the CERCLA preference for treatment over conventional containment or land disposal approaches to address the principal threat at a site. Treatment may also be necessary to meet ARARs prior to disposal in a CDF.

Factors that may impact the effectiveness, implementability, and cost of these thermal desorption treatment system processes are presented above for consideration during preparation of the EE/CA work plan and ultimately during technology and alternative evaluations within the EE/CA.

It is recommended that a treatability study be conducted to further evaluate the feasibility of thermal desorption as a treatment option for the Arkema site. Conducting a treatability study will provide some of the answers to the evaluation factors used in determining effectiveness, implementability, and cost for a removal action alternative involving thermal desorption. Treatability studies help to better evaluate technology performance and reduce cost and performance uncertainties. They can indicate whether heating the medium to a specific temperature for a specified residence time will result in attainment of treatment targets for a contaminant (EPA, 1997). Specifically at the Arkema site, these considerations are even more important because of the uncertainty involving the physical and chemical nature of the sediment after dredging and dewatering and the importance of meeting treatment targets for DDx prior to disposal in a CDF.

4. Performance Standard Expectations from the Terminal 4 Project

The following text outlines EPA's design expectations for a CDF at Terminal 4 (T4) early action site in Portland Harbor. At a minimum, a CDF at the Arkema site will be required to follow similar design expectations as for the T4 site. This information was obtained from Parametrix and was excerpted from a revision of Section 2.2.2 of the T4 Draft Design Analysis Report.

Confined Disposal Facility

Isolate contaminated sediments placed within the CDF from biota and the environment by constructing the CDF in a manner resistant to long-term seismic and erosive forces, and that prevents and minimizes transport of contaminants placed in the CDF in order to protect water and sediment quality outside the CDF. Specifically, the CDF shall meet the following performance standards:

Early Action Construction

- Construct the CDF in a manner that minimizes to the extent practicable water quality exceedances within the construction zone and achieves compliance with water quality criteria/standards at and beyond the specified point of compliance.

- Construct the CDF in a manner that minimizes impacts to fisheries and wildlife by removing fish to the extent practicable from the Slip 1 area before and after berm construction, and by implementing BMPs to minimize wildlife exposures to contaminated sediments within the CDF prior to placement of the CDF cover layers.

- Construct the CDF berm with material that meets requirements established in the December 2003 Technical Plans and Specifications (Ecology and the Environment 2003) for the McCormick & Baxter sediment cap located within the Willamette River. Specifically, the cap material to be used for construction of the sediment cap will be imported clean granular material free of roots, organic material, contaminants, and all other deleterious and objectionable material. Chemical contaminant concentrations in cap material shall be below TEC criteria or other pre-established criteria for chemicals that do not have TEC values.

- Accept only sediments meeting final sediment acceptance criteria as evaluated and documented using the final sediment acceptance evaluation process articulated in the Sediment Acceptance Criteria Technical Memorandum. EPA shall approve all sediment to be disposed of in the CDF.

Long Term

- The CDF berm shall meet the following project-specific criteria: a static safety factor of 1.5 or greater and a seismic safety factor of 1.1 or greater. The design seismic event shall correspond to a10 percent probability of exceedance in 50 years.

- The CDF berm face shall be resistant to erosive forces by the largest of 100-year flood flow, 100-year waves, vessel-induced waves from typical passing vessels, and anticipated propeller wash from vessels that operate in the area.

- The CDF will meet ARARs and final Portland Harbor ROD requirements. Final sediment and surface water cleanup standards will not be established for the Portland Harbor Superfund Site until the ROD is issued. Applicable or Relevant and Appropriate Requirements (ARARs) have been identified for this removal action given current information. To ensure that the CDF meets ARARs and increase the probability that it will meet the future ROD standards, the CDF shall be designed as follows:

  - Such that the CDF can meet ARARs when filled with the specified design volume of sediment meeting the CDF sediment acceptance criteria, considering representative sediment contaminant concentrations and contaminant mobility data obtained from, or estimated for, sediments from T4 and other potential Portland Harbor sites where dredging is a reasonably anticipated remedial action that would generate sediments meeting the CDF sediment acceptance criteria.

  - Such that the final upper surface elevation of contaminated sediment in the CDF will be below the groundwater surface (so that the sediment remains saturated), considering reasonably anticipated seasonal and long-term cyclical groundwater levels, and considering zero recharge from the overlying ground surface.

  - Such that the CDF will achieve confinement of all hazardous substances so that the facility does not contribute any discharge and/or release of contaminants above ARARs for surface water or sediment in the lower Willamette River. In order to meet this design criteria, the CDF shall be designed such that the quality of groundwater exiting the CDF will meet EPA's national recommended chronic water quality criteria for both aquatic organisms and fish consumption by humans (17.5 g/day), more stringent Oregon water quality standards, Region 9 tapwater PRGs, and MCLs.

– Such that the releases of 303(d) listed contaminants will be minimized to the extent practicable.

It would be beneficial to check in on the development of the addendum and the CDF screening before delivery of these documents. Let me know if a telecon the week of July 7th would work, and of course if you have any questions or concerns at (206) 553-1220 or via email at Sheldrake.sean@epa.gov.

Sincerely,

Sean Sheldrake, RPM

Enclosure: References

Cc:

Audie Huber, Umatilla Tribe *via email only*
Brian Cunninghame, Warm Springs Tribe
Erin Madden, Nez Perce Tribe
Sheila Fleming, Ridolfi
Jennifer Peers, Status Consulting
David Allen, Stratus Consulting
Jeff Baker, GrandeRonde Tribe
Tom Downey, Siletz Tribe
Rob Neely, NOAA
Jeremy Buck, USFW
Greg Smith, USFW
Jim Anderson, DEQ
Matt McClincy, DEQ
Mike Poulsen, DEQ
Jennifer Peterson, DEQ
Rick Kepler, ODFW
Cyril Young, DSL
Lori Cora, EPA
Chip Humphrey, EPA
Eric Blischke, EPA
Kristine Koch, EPA
Rene Fuentes, EPA
Dana Davoli, EPA
Nancy Munn, NOAA-NMFS
Preston Sleeger, USDOI
Claudia Powers, Ater-Wynne
David Livermore, Integral

Enclosure - References

EPA (U.S. Environmental Protection Agency). 2008. Technical Memorandum RE: Arkema EE/CA Workplan Dispute. April 16.

________. 2005, Contaminated Sediment Remediation Guidance for Hazardous Waste Sites, No. EPA-540-R-05-012. December.

________. 1997. *Engineering Forum Issue Paper: Thermal Desorption Implementation Issues*, No. EPA-540-F-95-031. January.

________. 1993. *Guidance on conducting Non-Time-Critical Removal Actions Under CERCLA,* No. EPA-540-R-93-057. August.

________. 1993. *Selecting Remediation Techniques for Contaminated Sediment*, No. EPA-823-B-23-001. June.

________. 1992. *Guide for Conducting Treatability Studies Under CERCLA: Thermal Desorption Remedy Selection,* No. EPA-540-R-92-074A. September.

________. 1988. *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA,* No. EPA-540-G-89-004. October.

Integral Consulting, Inc. 2003. *Phase II Stage 1 & 2 In-River Groundwater and Sediment Investigation Report, Volume 1 – Report and Appendix A,* Prepared for ATOFINA Chemical Inc. December.

Legacy Site Services LLC

July 25, 2008

Mr. Sean Sheldrake
U.S. Environmental Protection Agency Region 10
M/S ECL-110
Suite 900
1200 Sixth Avenue
Seattle, WA 98101-3140

Re: LSS Response to June 19, 2008 Letter re: Arkema CDF Evaluation

Dear Mr. Sheldrake:

This letter responds to EPA's June 19, 2008 letter regarding the evaluation of a Confined Disposal Facility (CDF) as an element of the removal action alternative for the Arkema EE/CA. As you know, pursuant to Mr. Opalski's May 23, 2008 dispute resolution decision, Legacy Site Services LLC (LSS), agent for Arkema Inc., is already moving forward with the evaluation and screening of a CDF, including consultation with agencies regarding the necessary requirements to achieve substantive compliance with applicable or relevant and appropriate requirements (ARARs). This consultation process is necessary for any of the removal action alternative elements (e.g., dredging, capping and/or CDF) presented in the EE/CA work plan schedule. To begin this process, a meeting has been scheduled for August 8, 2008 at the Arkema Portland site. I will be sending additional information to you and the other invitees shortly.

The remainder of this letter addresses areas for which LSS is providing clarifications or additional information in response to EPA's June 19, 2008 letter.

CDF Design

LSS found EPA's comments pertaining to the CDF EE/CA evaluation to be generally informative and useful. However, it appears that EPA has a different understanding of certain elements of the preliminary CDF design concept than was presented by LSS during the dispute resolution process. To facilitate discussion of the conceptual CDF that LSS is considering for the Arkema site, key CDF design concept elements and figures (plan and profile attached) provided by LSS in its April 25, 2008 letter to Dan Opalski are further discussed in the following section.

Legacy Site Services LLC
468 Thomas Jones Way
Exton, PA 19341-2528
Tel: 610 594-4421

CDF Design Configuration

Note that the CDF design presented in the attached figures and discussed below is conceptual in nature only, and is not a draft or final proposal for a CDF at the Arkema site. Conceptually, there are many configurations and design elements that could be considered; however, there are certain common design elements that would likely be considered for a nearshore CDF design at the Arkema site, as summarized below:

The CDF would be designed to contain and manage sediments with the contaminant profile found at the Arkema site (i.e., primarily low-solubility, low-mobility chemicals such as DDx but also including dissolved or liquid phase contaminants such as MCB).

- The CDF would likely be constructed with steel sheet piling or equivalent technology to form an impermeable barrier to the lateral movement of groundwater/surface water and to prevent contaminant migration from the CDF.

The sheet piling would be vertically keyed into low-permeability subsurface deposits, and laterally keyed into the envisioned upland groundwater hydraulic barrier wall in order to hydraulically isolate the CDF sediments.

The CDF could also employ other hydraulic containment features (e.g., an impermeable cap and one or more groundwater extraction wells) to maintain an inward hydraulic gradient for long-term containment. Any extracted water from the CDF could be treated in the upland groundwater treatment system.

In addition to these design elements, LSS' April 25th letter also cited the following potential environmental benefits associated with the above design concept:

A rigid wall CDF would be designed to meet stringent chemical containment standards (i.e., the standards presented for the Port's Terminal 4 site (T4)).

- The placement of the footprint of the CDF around the "higher concentration" DDx material between the docks precludes the need for dredging of the material, which would eliminate the environmental exposure and risks that inevitably occur during dredging and the CDF concept also prevents the generation of highly contaminated dredging residuals which would have to be addressed.
- Dredging of the "lower concentration" DDx material within the remaining footprint of the RAA boundary would accomplish DDx mass removal from river sediments and meet the RAOs for the NTCRA.
- The confinement of sediment containing DDx and other COIs within the CDF could facilitate potential in-situ treatment options. Examples of viable treatment options include the Daramend® process used at the THAN Superfund Site (Montgomery, AL); In-Situ Chemical Oxidation of DDx; and In-Situ Chemical Reduction using EHC® compound. In-situ treatment of the contained sediments would effectively reduce contaminant mass, which ultimately is a preferable and sustainable option especially when compared to the environmental impacts of disposal of contaminated sediment in a landfill hundreds of miles away (i.e., transfer of the contaminant mass from one location to a landfill in another area).

- The "tie-in" of the CDF to the upland hydraulic containment barrier wall would effectively enclose and contain the potential "stranded wedge" of contaminated soil and groundwater that could remain downgradient of the proposed upland slurry wall along the shoreline. Under the CDF concept presented herein, contaminants within the "stranded wedge" could also potentially be addressed as part of an in-situ treatment program, along with the dredged sediments.
- Nearshore CDFs, as described above, are implementable and have proven to be highly effective for containing and treating sediments contaminated by PBTs at other federal (and state) Superfund sites in the country (e.g., Waukegan Harbor, Illinois; Cascade Pole, Washington, New Bedford Harbor, MA).
- The completed CDF would be constructed in a manner that would effectively replace the aging Arkema docks (i.e., with a pier structure) and as a result would have the added benefit of maintaining the required river-dependent site access for this valued industrial location.

Construction elevation of CDF

EPA states in its June 19th letter that it understands the CDF disposal alternative would involve placement of contaminated sediments within a "permanent CDF that is constructed in the water below the Ordinary High Water Mark" (OHWM). While the conceptual design for the CDF configuration to be evaluated in the EE/CA has not yet been fully developed, LSS anticipates that the CDF concept may involve placement of dredged sediment above the OHWM (please refer to the attached conceptual CDF profile figure)

Scope and Schedule of CDF Preliminary Screening Evaluation

For clarification, LSS has adopted the term "preliminary screening evaluation" to refer to the CDF feasibility analyses that has been initiated on a fast track, to keep pace with the overall EE/CA process. LSS is focusing the preliminary screening evaluation on the most critical feasibility issues (i.e., potential fatal flaws), particularly those that will require the longest lead time to adequately address. LSS has identified the following key issues as essential to the "fatal flaw" analysis: floodway analysis, DSL concurrence with CDF concept, substantive compliance requirements, hydraulic containment, and certain structural design considerations. LSS anticipates that the bulk of the CDF preliminary screening evaluation will be completed on or about the time the formal EE/CA process is initiated in 2009. LSS proposes to present the progress of the preliminary screening evaluation at a meeting with EPA and other interested project Stakeholders on or about October 15, 2008.

LSS is confident that, if the CDF option is selected in the EE/CA, agency consultation, plan development, and concurrence on substantive equivalence requirements will be completed with final design. Required documentation and draft reports will be submitted in accordance with the EE/CA work plan schedule assuming concurrence from EPA on the preferred remedial action so that there is no delay in the EE/CA removal action schedule for whichever final removal action alternative is selected.

ARARs Process and Schedule

The following responses and clarifications pertain to the sections of EPA's June 19th letter addressing Department of State Lands – Access and Use Authorization, Federal ARARs, Potential Floodway Analysis Issues Related to an Arkema CDF, Cultural Resources and Section 401 Clean Water Act.

State ARARs

Department of State Lands – Access and Use Authorization

In its June 19th letter, EPA indicates, "If the Oregon Department of State Lands (DSL) owns any portion of the submerged and submersible land under which the proposed CDF would be placed, DSL agreement to provide access and authorize such use is required. This agreement should be obtained well within the evaluation process or the project may not be implementable."

In 2005, Arkema entered into an Access Agreement with DSL. The purpose of this agreement was to provide access so that Arkema could complete the work required under the June 27, 2005 Administrative Order on Consent. LSS' consultant, Integral Consulting (Integral), has been in contact with Cy Young, Division of State Lands, regarding a future access agreement for a selected remedy. The access agreement process and timing are similar regardless of whether dredging, capping, and/or a CDF is selected. Dredging and off-site disposal would require an additional access agreement from DSL. DSL has several recent example projects (Rhodia, GASCO, Terminal 4) of a sediment cap or proposed CDF that will facilitate this process. For the preliminary CDF screening evaluation, LSS will continue consulting with DSL to 1) identify key DSL concerns and conditions that would need to be satisfied to obtain an access agreement, and 2) obtain DSL concurrence to further consider nearshore CDF design concepts during the EE/CA.

Federal ARARs

Information is provided below to clarify LSS objectives in completing the preliminary screening evaluation and/or the final evaluation of federal ARARs for the EE/CA removal action.

Clean Water Action Section 404

LSS understands the 404(b)(1) data and documentation requirements and has reviewed the 404(b)(1) document prepared for Terminal 4. The 404(b)(1) is required regardless of whether dredging, capping, and/or a CDF is selected. Preparation of the 404(b)(1) document will be based on 40 CFR Part 230: Section 404(b)(1) Guidelines for Specification of Disposal Sites for Dredged or Fill Materials subparts A-H.

Endangered Species Act

LSS understands that ESA consultation with NMFS and USFW is an ARAR and has included preparation of a draft BA and final BA in the project time schedule. Integral has been in contact with Nancy Munn, NMFS regarding initiation of this process. NMFS has recent project experience with GASCO, and is currently concluding their consultation on the Terminal 4 removal project, which is scheduled for August 2008. ESA consultation will be required for any remedial action that is selected for the Arkema site.

Section 10 Rivers and Harbors Act

LSS will provide the necessary information to initiate the Section 10 River and Harbors Act review. The required information is similar to the information required in an EE/CA. This evaluation is required for dredging, capping, and/or a CDF and can run concurrently with the 404(b)(1), ESA Consultation and floodplain evaluations.

Executive Order 11988 Floodplain Management

A flood rise study has been included in the project schedule. A flood rise study and hydraulic analysis to evaluate the effects of the selected remedial action on the floodplain capacity of the Willamette River will be required for any remedial action that is selected.

Cultural Resources

The location of native soil layers is already known based on existing site investigation work. The location of native soil is shown on Figure 4-2 of the RI report.

Section 401 Clean Water Act

EPA is the lead agency for this document. All required information will be submitted. A 401 water quality certification is required for any remedial action that is selected for the site.

Potential Floodway Analysis Issues

LSS understands that a floodway analysis is required for whichever remedial action alternative (i.e., dredging, capping, CDF) is selected for the EE/CA. The required modeling and map adjustments are included as tasks for the EE/CA. LSS will complete the analysis and will submit a document that is completed and stamped by a professional engineer for review by the City of Portland. As long as the HEC modeling and analysis shows "no net rise" and is conducted by a registered professional engineer, the additional FEMA consultation steps outlined by EPA in its June 19th letter are not required.

LSS is preparing to conduct a preliminary analysis of the conceptual CDF to ascertain whether the modeling for the final engineered project might be of concern (i.e., a fatal flaw analysis). The HEC modeling will be completed no later than the final design of the selected alternative for the Arkema site.

Sediment Treatment

LSS does not believe that the Considerations for Treatment Evaluations provided by EPA in Section 3 of EPA's June 19th letter pertaining to ex-situ treatment of dredged sediment using thermal desorption is appropriate or relevant to its preliminary CDF screening evaluation. However, in order to appropriately respond to this section, LSS must now also address EPA's April 16, 2008 memo sent to Mr. Opalski. In this earlier memo, EPA and/or EPA's contractor (CDM) performed an evaluation of potential sediment treatment options, which concluded that thermal desorption was the favored treatment option for the Arkema EE/CA. In EPA's June 19, 2008 letter, EPA and/or CDM further evaluated thermal desorption for the Arkema EE/CA. The second to last sentence of the first paragraph in Section 3 of EPA's June 19, 2008 letter states that.... "Arkema and EPA agreed that thermal desorption was deemed to be adequately effective, less complex, and more cost effective when compared with incineration." This statement is not correct. LSS has not had any discussions, nor has LSS provided any opinions to EPA, regarding EPA's thermal desorption or incineration evaluation memo. At no time has LSS ever agreed that thermal desorption (or incineration) would be considered as a practicable treatment option for sediment in the proposed CDF being evaluated as part of the Arkema EE/CA.

LSS did not respond in writing to EPA's April 16, 2008 memo at that time. Instead, in the slide presentation given to Dan Opalski on April 17, 2008, LSS presented a technically sound and viable treatment alternatives outline for the Arkema EE/CA, if treatment is necessary. Subsequently, LSS provided more detailed information regarding these viable treatment options to Dan Opalski in a memo dated April 25, 2008. This memo was generated as a direct response to a series of questions asked by Mr. Opalski during the April 21, 2008 teleconference between EPA and LSS. The information provided by LSS demonstrates that enhanced in situ bioremediation and in situ chemical oxidation are effective treatment alternatives for DDx in soil and sediments, if treatment is necessary at the Arkema Site.. See attached copies of the relevant April 17, 2008 slides and April 25, 2008 memo to Mr. Opalski.

LSS cannot agree that EPA's thermal desorption approach is appropriate for the following reasons. From a purely technical standpoint, the information/evaluation performed by EPA/CDM is dated and does not consider the contemporary alternative treatment technologies such as those provided by LSS in our April 25, 2008 memo. It also prematurely assumes that treatment (thermally in this case) is needed prior to placement of sediments into a CDF. EPA's April 16, 2008 memo cites and relies heavily upon work performed in 1992 on the OMC Waukegan Harbor Superfund Site. Based on EPA's technology evaluation in their April 16, 2008 memo and continuing on in EPA's June 19, 2008 letter, the Waukegan Harbor Superfund Site seems to serve as EPA's benchmark for selecting thermal desorption for the Arkema EE/CA. However, in EPA's April 16, 2008 memo, EPA mistakenly reports regarding the Waukegan Harbor Superfund Site that "...PCB was treated by low temperature thermal desorption....". This is incorrect. The SoilTech AOSTRA Taciuk Processor (which was used at the Waukegan Harbor Superfund Site) is a high temperature thermal desorption (HTTD) process with critical operating temperatures ranging from 900F to 1100F in the retort zone. These temperatures, in the anaerobic retort zone, are necessary for driving off (desorption) of PCBs (without creating dioxin and/furans) and are definitely not considered a low temperature thermal desorption (LTTD) process. DDx does not require temperatures of that magnitude to be thermally desorbed. Therefore, a HTTD unit such as the SoilTech AOSTRA Taciuk Processor is neither relevant nor appropriate application when it comes to thermal desorption of DDx[dl7].

An LTTD process also is not relevant and appropriate because of moisture content issues and energy inefficiency. CDM's evaluation concludes that... "The Low Temperature Thermal Aeration Process developed by Canonie Environmental Services Corporation is a good example of an indirect fired system, which has been successfully used to remove DDT family compounds from soil". In the early 1990's, Canonie's LTTA was demonstrated effective for DDx removal in a 1992 SITE Demonstration in Phoenix. See http://www.epa.gov/ORD/SITE/reports/540ar93504/540ar93504.pdf. Also provided in the SITE Report is a listing of the (then current) sites where Canonie's LTTA had been used successfully. While not shown in that SITE Report (but of note concerning the Arkema Site) is that Canonie's LTTA unit was used to treat DDx (full scale) at the THAN Superfund Site in Albany, GA. The LTTA is typically operated at temperatures ranging from 300F to 800F. At the Arizona SITE demonstration and at the THAN Albany, GA Site, the units were operated in the 700F to 750F temperature range. However, these LTTA units typically do not perform as well with soil moisture content in excess of 20%; thus, LTTA is technically impracticable for sediment remediation work. In addition, LTTA (as well as HTTD) is dated and rarely, if ever, used anymore. Instead of these often controversial and extremely energy inefficient technologies, in situ technologies which also meet EPA's preference for green remediation are favored. See http://www.clu-in.org/download/remed/green-remediation-primer.pdf and the LSS April 25, 2008 memo to Dan Opalski. [dl8]

The current concept envisioned for the Arkema Site CDF is to: 1) provide a safe and reliable structure to contain the impacted sediment (without pre-treatment), and 2) if necessary, provide for possible future opportunistic treatment of the dredge sediment within the CDF using relevant and appropriate in situ treatment technologies. In summary, LSS views the CDF design concept primarily as a containment strategy, rather than a treatment strategy. Additionally, other pre-treatment technologies such as stabilization may be considered in conjunction with the CDF design concept, if it is determined that such pre-treatment would provide considerable benefit to the overall performance of the CDF.

Lastly, regarding land disposal restrictions (LDRs) and associated Universal Treatment Standards, LSS does not believe that LDRs apply because dredged sediment would not be a federally designated hazardous waste.

Performance Standard Expectations from the Port's T4 Project

LSS acknowledges that if a nearshore CDF is implemented at the Arkema Portland site, it will be subject to many similar design and performance expectations as established by EPA for the proposed CDF at the Port'sT4 early action site. However, we note that a number of the T4 performance criteria cited by EPA are not relevant or appropriate to the nearshore CDF design concept currently under development for the Arkema site EE/CA (for further information see CDF Design Configuration section above). Specifically, criteria pertaining to the "CDF berm" are not relevant since the Arkema CDF would not rely on a berm for containment of sediment or groundwater. Additionally, the "sediment acceptance criteria" established for T4 is not relevant, since as currently envisioned the Arkema CDF would be designed to accommodate sediment from its site only and LSS does not intend to accept sediment for disposal from other sites.

Please call me at 610-594-4430 if you have any questions or want to meet to discuss any of this information.

Sincerely,

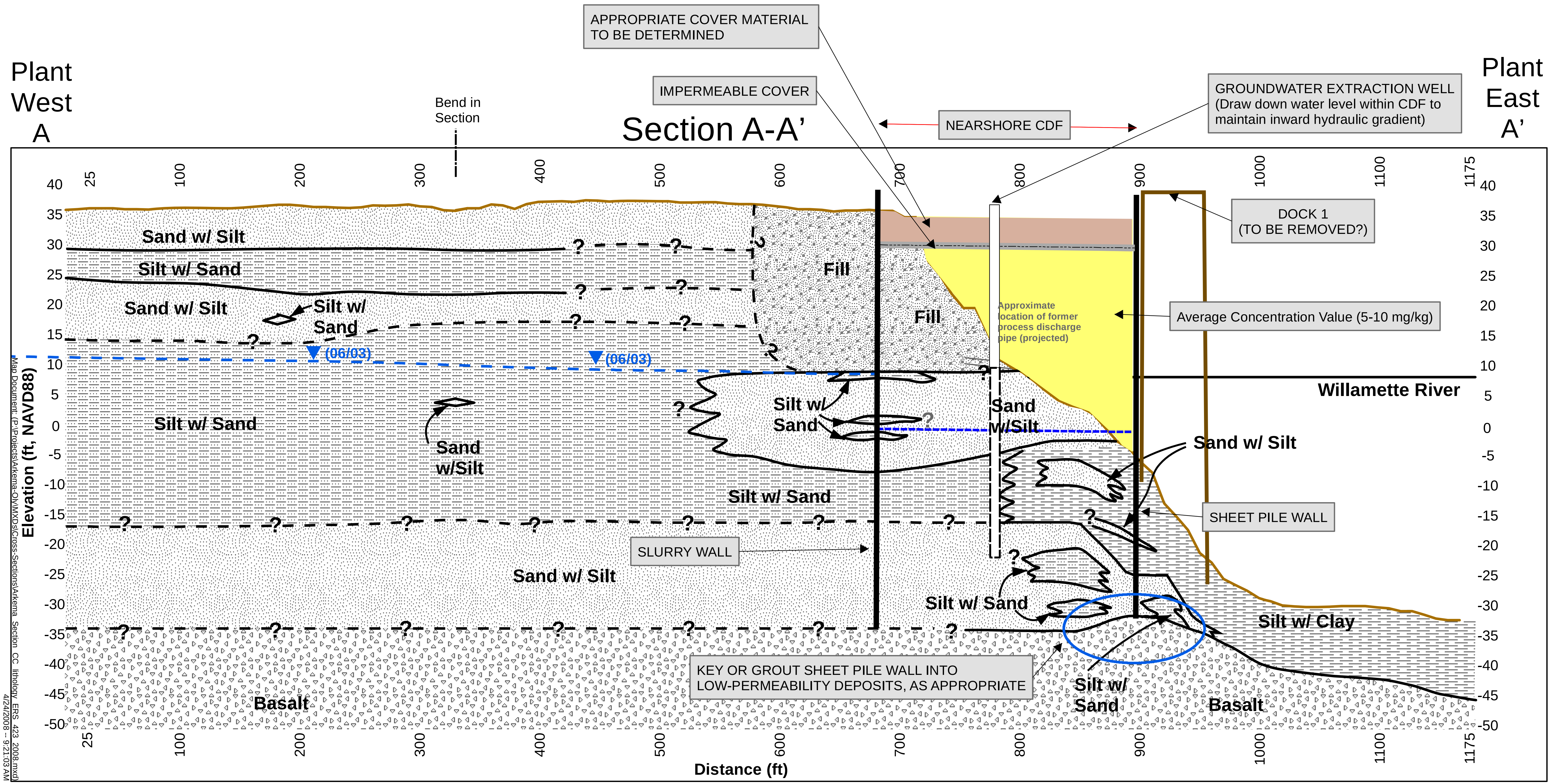
Legacy Site Services LLC

J. Todd Slater
Manager, Environmental Technologies
And Remedial Procurement

cc:
Audie Huber, Umatilla Tribe *via email only*
Brian Cunninghame, Warm Springs Tribe
Erin Madden, Nez Perce Tribe
Sheila Fleming, Ridolfi
Jennifer Peers, Stratus Consulting
David Allen, Stratus Consulting
Jeff Baker, GrandeRonde Tribe
Tom Downey, Siletz Tribe
Rob Neely, NOAA
Jeremy Buck, USFW
Greg Smith, USFW
Jim Anderson, DEQ
Matt McClincy, DEQ

Mike Poulsen, DEQ
Jennifer Peterson, DEQ
Rick Kepler, ODFW
Cyril Young, DSL
Lori Cora, EPA
Chip Humphrey, EPA
Eric Blischke, EPA
Kristine Koch, EPA
Rene Fuentes, EPA
Dana Davoli, EPA
Nancy Munn, NOAA-NMFS
Preston Sleeger, USDOI
Steve Parkinson, Groff Murphy
David Livermore, Integral

Section A-A'



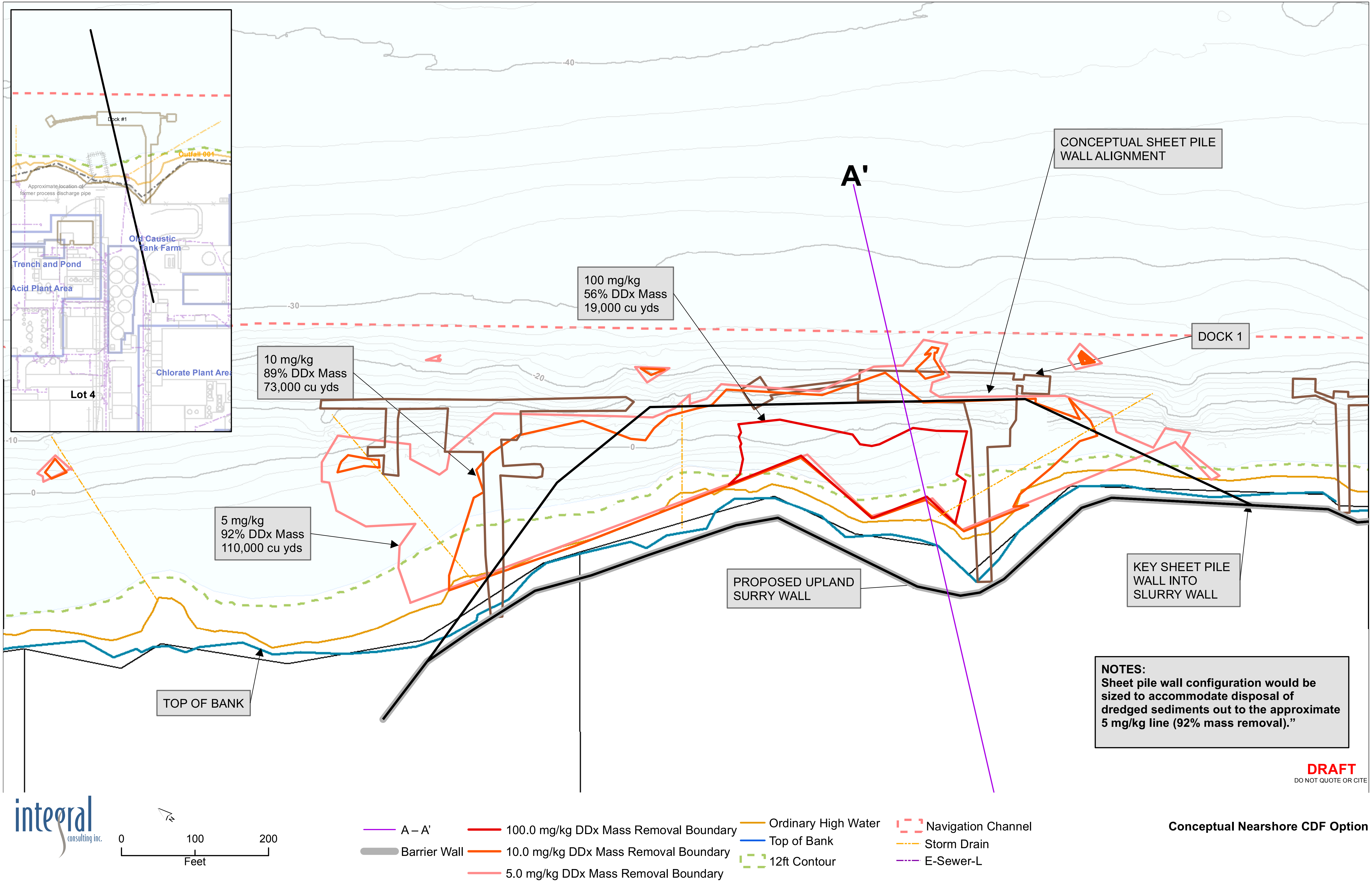
Section View: Vertical Exaggeration: 5X

- Fill
- Sand with varying amounts of silt
- Silt with varying amounts of fine sand
- Silt with some clay and fine sand
- Basalt
- Inferred soil or geologic contact (queried where uncertain)
- Estimated Groundwater Surface Level within CDF
- Shallow-zone groundwater surface (approximate) June 2003; based on monitoring well data only.

0 50 100 200 Feet

integral consulting inc.

Cross-Section A-A'
Conceptual Nearshore CDF Option



Conceptual Nearshore CDF Option

LSS
Legacy Site Services LLC

April 25, 2008

Delivered by Electronic Mail

Mr. Daniel D. Opalski
Director, Office of Environmental Cleanup
U.S. Environmental Protection Agency Region 10
M/S ECL-117
Suite 900
1200 Sixth Avenue
Seattle, WA 98101-3140

Re: LSS Response to Additional EPA Information Requests from April 21, 2008 Dispute Resolution Teleconference
U.S. EPA Region 10 Docket No. CERCLA 10-2005-0191

Dear Mr. Opalski:

Legacy Site Services LLC (LSS), agent for Arkema Inc. (Arkema), submits this letter and supporting attachments in response to your questions and requests for additional information during our April 21, 2008 conference call. To the best of my recollection and understanding, I have repeated your general questions and information requests below in italics followed by LSS's response.

Question 1:

This question arose from our discussion of post dredging residuals. As we discussed, the layer of generated residuals will be approximately equal in concentration to the average concentration within the dredge prism. In Arkema's case, due to the highest concentrations of DDx in sediment at a depth of 10+ feet, higher concentrations (65 ppm) of DDx would be left at the post dredged surface than at the pre-dredged surface (17 ppm). You asked that we provide additional information/documentation regarding the ability to meet SLV's or other potential clean up levels (in the "z axis" or dredge depth) by performing additional dredging (cleanup) passes.

LSS Reply:

Attached as Tab 1 are slides from our April 21, 2008 presentation regarding the residuals issue to provide context for this response. In addition, I have included slides from the "Sediment

Legacy Site Services LLC
468 Thomas Jones Way
Exton, PA 19341-2528
Tel: 610 594-4421

Remediation Course, How do you Select and Design Options" given by USEPA, ODEQ, HSRC, and SMWG on September 5-7, 2007. The slides numbered (in the lower right hand corner) 43, 44, and 45 illustrate that performing additional cleanup passes as a residuals control measure does not necessarily assure that any given cleanup level could be achieved, especially one as low as the proposed SLV. LSS has performed a rough calculation to estimate approximately how many cleanup passes would be necessary to achieve the SLV. This rough calculation, assumes that multiple one-foot cleanup passes are completed and that each cleanup pass generates a four (4) inch layer of generated residual sediment at the average concentration of the layer being dredged. Based on these assumptions, it would take approximately 15 cleanup passes to achieve the SLV. In many areas basalt bedrock would be encountered before 15 cleanup passes could be completed. Even though this calculation is an oversimplification[1], it illustrates the technical impracticability in attempting to achieve a cleanup to the SLV using multiple dredging passes.

At our meeting on April 21, you asked how the volume of generated residual mass would be affected by different dredging methods. I have included a slide regarding generated residual mass from the Sediment Remediation Course. You will note that the generated residual mass ranges from approximately two (2) to nine (9) percent, and that a key factor in the residual mass is the amount of debris encountered.

Finally, I have included a slide from the conclusions given by Mr. Steven Ells of USEPA from the Sediment Remediation Course titled "Conceptual Illustration of Potential Risk Reduction Achieved by Sediment Remedies." This slide illustrates what the potential reduction of risk could be at a site like ours where higher concentrations are buried at depth, using various approaches to sediment remediation. This slide suggests that capping may be most protective remedy in both the short and long terms.

Question 2:

Can you provide a summary of Record of Decision cleanup values for DDx from other sites around the country?

LSS Reply:

Yes. For a hot spot removal action, cleanup levels are typically three (3) or more orders of magnitude higher than final risk-based cleanup levels in accordance with Principal Threat Guidance. Attached as Tab 2 is the summary of the Records of Decision for final risk-based cleanup values for DDx sites that was provided in one of our earlier submissions[2]. As was stated then, the proposed SLVs are in many cases several orders of magnitude lower than the final risk-based cleanup levels at other sites across the country.

Another example of this same concept for PCBs is illustrated on the slide entitled "Change in Surface Sediment Concentrations of PCB's at Dredging Sites" included in Tab 1. The only Site

[1] A more robust modeled estimate of generated residuals would be completed in the EE/CA.

[2] Table 1 from the March 27, 2007 Letter to Sean Sheldrake from J. Todd Slater (discussing response to February 15, 2007 LSS/EPA meeting).

on that slide listed as a "Hot Spot" removal was New Bedford Harbor. The cleanup level was 4,000 ppm for "Hot Spot" removal, which is six orders of magnitude greater than the PCB SLV proposed thus far for our Site of 0.045 ppm.

Question 3:

Regarding the logical breakpoint in the mass to volume relationship (the elbow), can you rerun that calculation using the currently proposed 5 ppm RAA boundary (in the x and y axes) to provide an updated logical breakpoint analysis for the z axis since the original analysis was performed over a larger preliminary area?

LSS Reply:

Yes. Attached as Tab 3 is the revised logical breakpoint in the mass to volume relationship using the currently proposed 5 ppm RAA boundary (in the x and y axes) as the basis for the evaluation. As you may have surmised, by making the analysis area smaller, the percentages of DDx at any given concentration level increase. As shown on the Figure, the new logical breakpoint occurs somewhere between the 25 and 10 ppm concentration range. Dredging to the 10 ppm level would remove greater than 94% of the DDx mass, and dredging to the 5 ppm level would remove greater than 97% of the DDx mass.

Question 4:

Please provide a conceptual layout of the CDF that may be proposed as part of the EECA evaluation of alternatives to dredging. Also, provide a conceptual level discussion of the pros and cons, as well as potential project timing impacts LSS perceives with performing a CDF evaluation in the EECA.

LSS Reply:

Attached as Tab 4 is a very preliminary conceptual layout of a CDF located between our current docks. Note that this design is conceptual in nature only and is not a draft or final proposal for a CDF at the Arkema Portland site. Either an upland and/or nearshore CDF could be considered in the EE/CA. This specific example is for a nearshore CDF that is hydraulically contained and tied into the upland groundwater barrier wall, a concept that has been successfully implemented at other Superfund sites with similar contaminant characteristics and site constraints.

Conceptually, there are many configurations and design elements that could be considered for a nearshore CDF at the Arkema Portland facility; however, there are certain common elements that would most likely be considered for any nearshore design. Common elements of a nearshore CDF (Figure 1) are summarized below:

- The CDF would be designed to contain and manage sediments with the contaminant profile found at the Arkema site (i.e. primarily low-solubility, low-mobility chemicals such as DDx but also including dissolved or liquid phase contaminants such as MCB).

- The CDF would likely be constructed with steel sheet piling or equivalent technology to form an impermeable barrier to the lateral movement of groundwater/surface water and to prevent contaminant migration from the CDF.

- The sheet piling would be vertically keyed into low-permeability subsurface deposits, and laterally keyed into the upland groundwater hydraulic barrier wall in order to hydraulically isolate the CDF sediments.

- The CDF could also employ other hydraulic containment features (e.g., an impermeable cap and one or more groundwater extraction wells) to maintain an inward hydraulic gradient to assure long-term containment. Any extracted water from the CDF could be treated in the upland groundwater treatment system.

Note, the concept of a hydraulically contained CDF would be similarly applied to both upland and nearshore applications at the Arkema site.

While there are certain constraints associated with CDFs that must be considered, there are also potentially significant environmental benefits that deserve consideration in the EE/CA process. Although a detailed evaluation has not yet been undertaken, the following factors provide compelling reasons to believe that a CDF could be an effective and protective element of the final selected remedy for the Arkema NTCRA.

- A rigid wall CDF would be designed to meet stringent chemical containment standards (i.e., the standards presented for the Port's T4 site).
- The placement of the footprint of the CDF around the "hottest" DDx material between the docks precludes the need for dredging of the material, which would eliminate the environmental risks and exposure that would occur during dredging and also prevent the generation of dredging residuals which would have to be addressed if this highest concentration material were to be dredged.
- Dredging of the "lower concentration" DDx material within the RAA boundary would accomplish DDx mass removal from river sediments.
- The confinement of sediment containing DDx and other COIs within the CDF could facilitate possible in-situ treatment options. Examples of viable treatment options included in Tab 4 are the Daramend® process used in the THAN Superfund Site; In-Situ Chemical Oxidation of DDx (graphs of pilot scale demonstration from the uplands portion of the Arkema Portland site); and In-Situ Chemical Reduction using EHC® compound (in Excel spread sheet depicting results of recent bench scale work on another LSS pesticide site in Texas). In-situ treatment of the contained sediments would effectively reduce contaminant mass, which ultimately is a preferable and sustainable option especially when compared to the environmental costs of disposal of contaminated sediment in a landfill hundreds of miles away (i.e., transfer of the contaminant mass from one location to a landfill in another area).

- The "tie-in" of the CDF to the upland hydraulic containment barrier wall would effectively enclose and contain the potential "stranded wedge" of contaminated soil and groundwater that could remain downgradient of the proposed upland slurry wall along the shoreline. This "stranded wedge" represents a potential ongoing source of contamination to the backfill (and sediment that remains) following dredging. Under the CDF concept presented herein, contaminants within this "stranded wedge" could also potentially be addressed as part of an in-situ treatment program, along with the dredged sediments.
- Nearshore CDFs, as described above, are implementable and have proven to be highly effective for containing and treating sediments contaminated by PBTs at other federal (and state) Superfund sites in the country (e.g., Waukegan Harbor, Illinois; Cascade Pole, Washington[3]).
- The completed CDF could be used to replace the aging Arkema docks and as a result would have the added benefit of maintaining the required river-dependent site access for this valued industrial location.
- A technology that provides effective, reliable containment and destroys contaminant mass could have greater public acceptance, relative to dredging-intensive options, especially with the inherent concerns associated with dredging residuals and the environmental footprint and impacts associated with trucking and offsite disposal of large volumes of dredged material.

Finally, LSS does not believe that the evaluation of a CDF would extend the project schedule. LSS incorporated the CDF evaluation in its July 14, 2006 Revised Draft EE/CA Work Plan project schedule, and would intend to meet that schedule for any CDF evaluation conducted under the final Work Plan.

Question 5:

Please provide more information regarding the Lindane as a recontamination COI issue. Where and what are the discrepancies between EPA and LSS data sets (if any), and interpretations of no detects and the associated impacts as to the assertion that Lindane is or is not a recontamination COI.

LSS Reply:

Attached as Tab 5 is the summary slide from our April 21 presentation. Also included are four (4) figures depicting Lindane (gamma-BHC) in sediment in relation to various JSCS SLV's taken from the LSS July 2006 draft EECA Work Plan Map Folio of over 350 such figures. Lastly, included is a spread sheet (Excel file electronically) of all the Lindane data in the Arkema EE/CA database. In 224 of the 250 samples analyzed,[4] Lindane was not detected. The figures show the undetected ("U") values along with their detection limits. Of the 224 undetected

[3] More detailed information on these sites can be provided if needed and requested.

[4] Note that for some samples, sample replicates were also analyzed. These replicates are included in the total.

results, more than half of the detection limits were below the PEC. Of the 43 samples with the highest detection limits (i.e., exceeding 10x PEC), all but six samples were at stations that are within the currently proposed RAA and would be addressed by the contemplated removal action. Similarly, of the 12 samples with Lindane detected above a PEC, three are upgradient of the RAA, four are within the RAA footprint, and five are located adjacent to the Rhone-Poulenc discharge pipe near the Railroad Bridge. Therefore, LSS maintains EPA has mistakenly included Lindane as a recontamination COI.

CONCLUSION

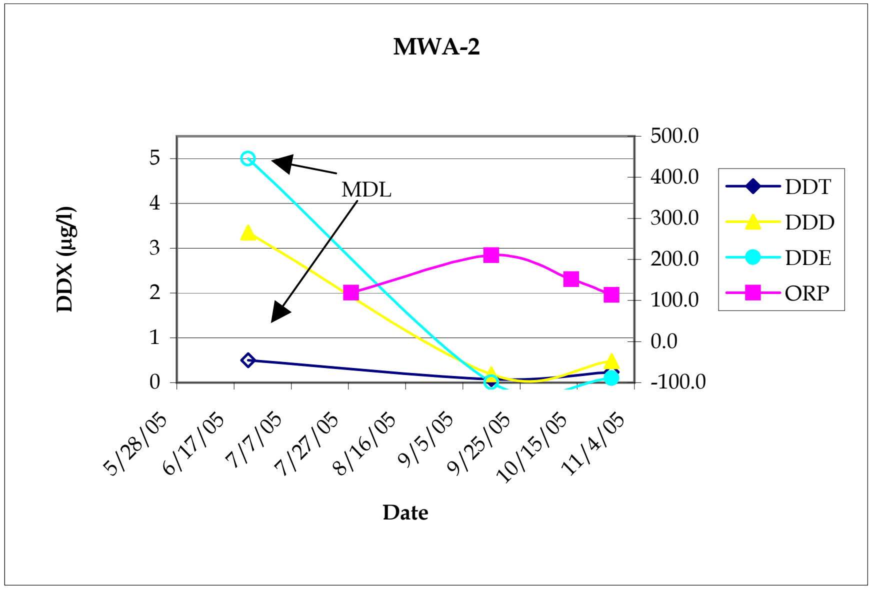
As set forth above, LSS respectfully requests that EPA (1) provide LSS the opportunity to evaluate a CDF option in the EECA Report, (2) confirm that SLVs will not be used as cleanup standards or RAOs at the Arkema site, and (3) determine that the goal of any dredging, if selected as the removal approach, will be to remove ± 90% of the DDx mass. Thank you for consideration of our requests.

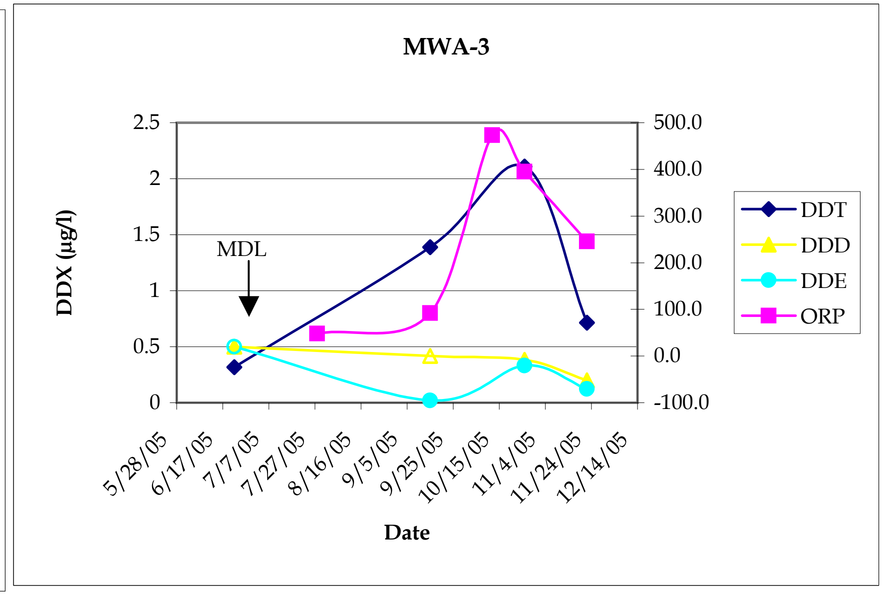
Very truly yours,

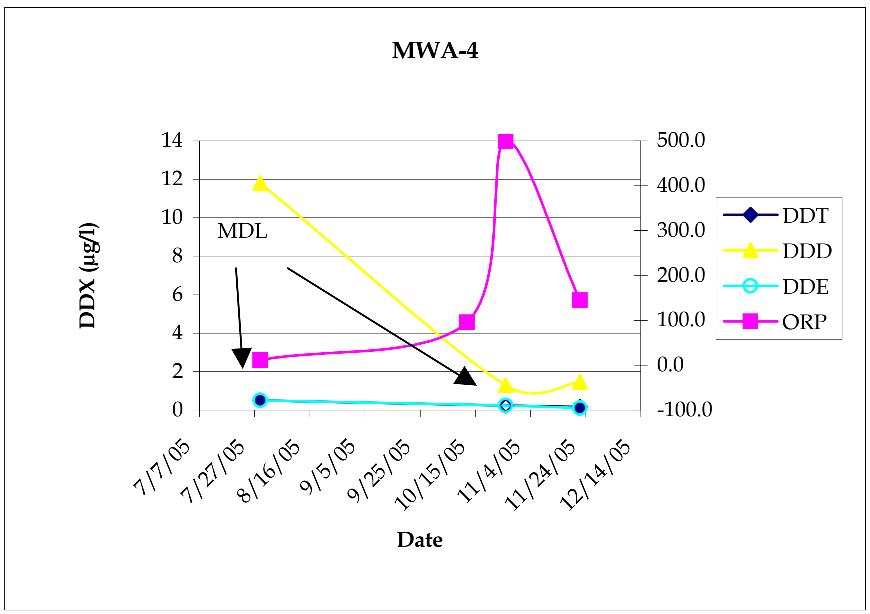
Doug Loutzenhiser
Executive Vice President
Legacy Site Services LLC

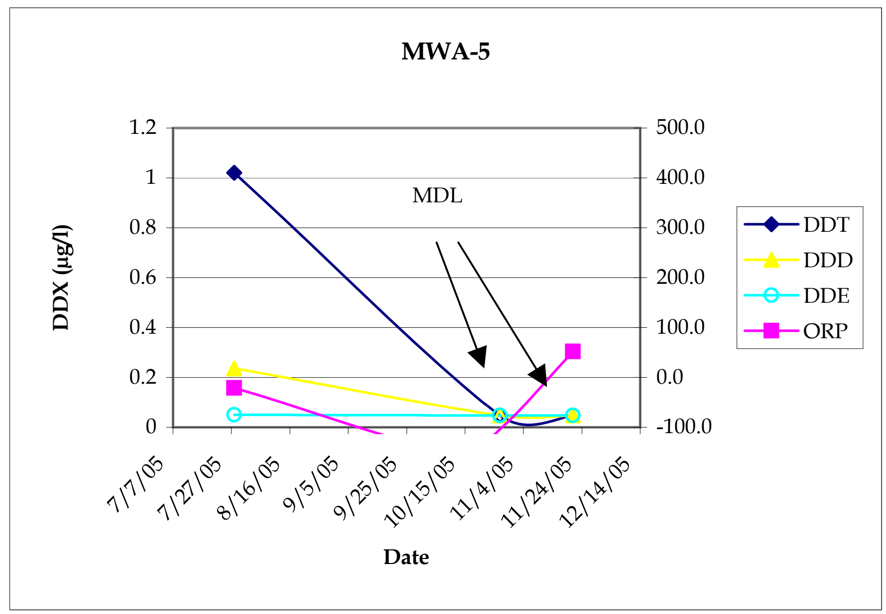
cc: Deb Yamamoto, EPA *via e-mail only*
Lori Cora, EP A
Sean Sheldrake, EPA
Todd Slater, LSS
Claudia K. Powers, Ater Wynne LLP

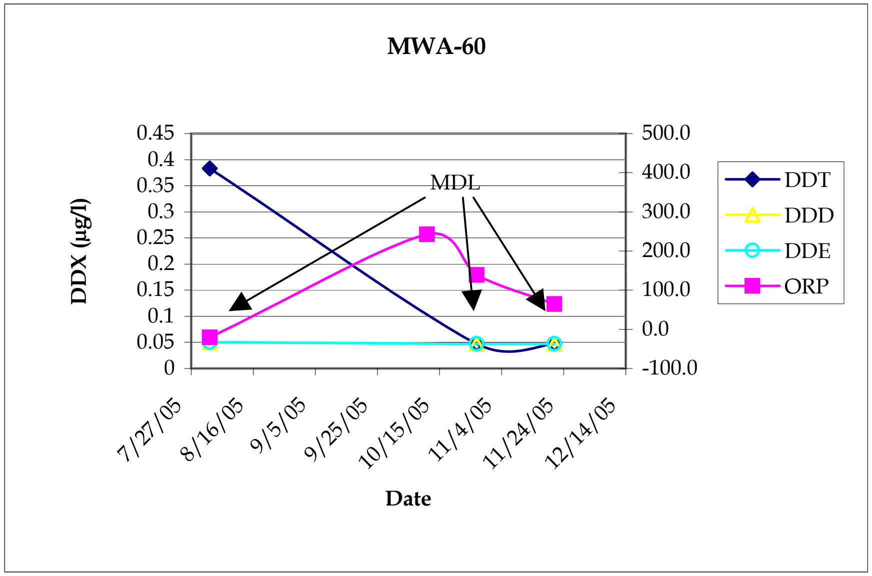
DDT, DDD, and DDE in Shallow Groundwater
Arkema Inc
Portland Oregon

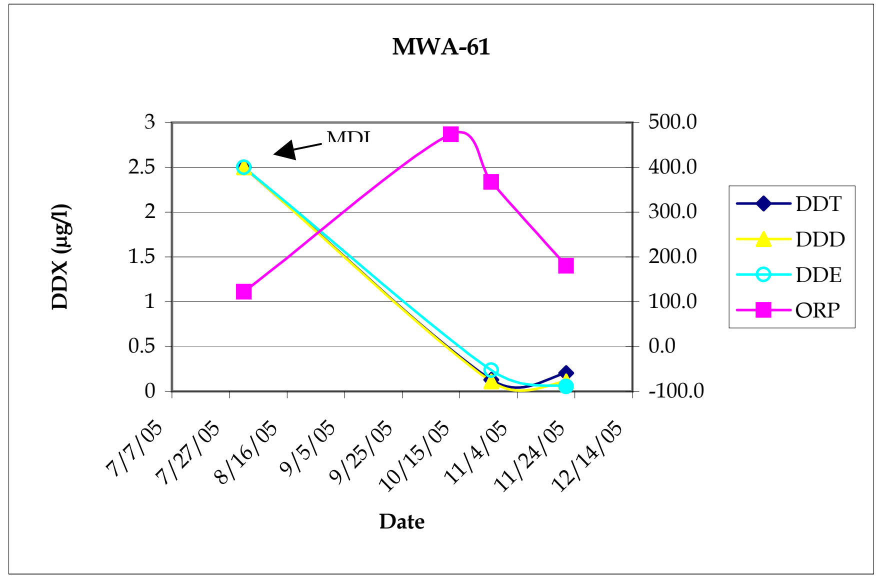


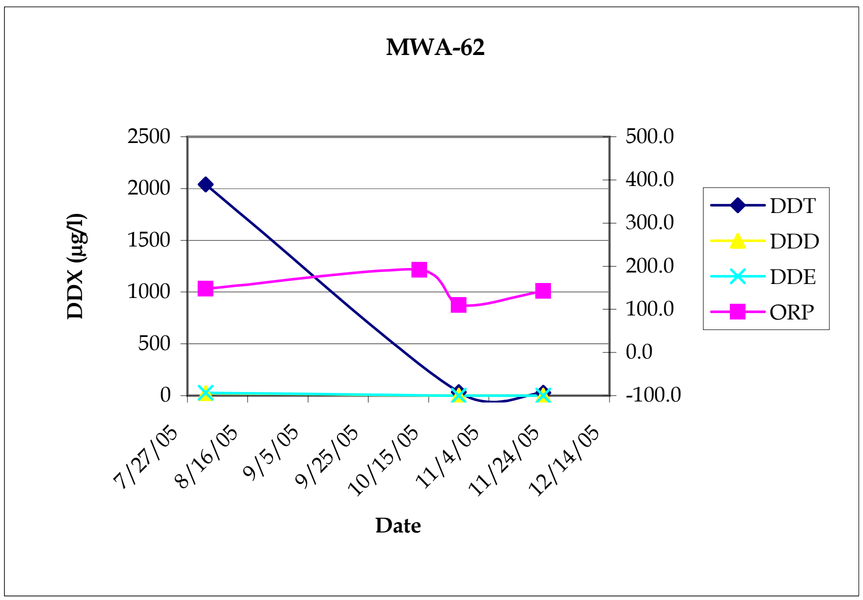


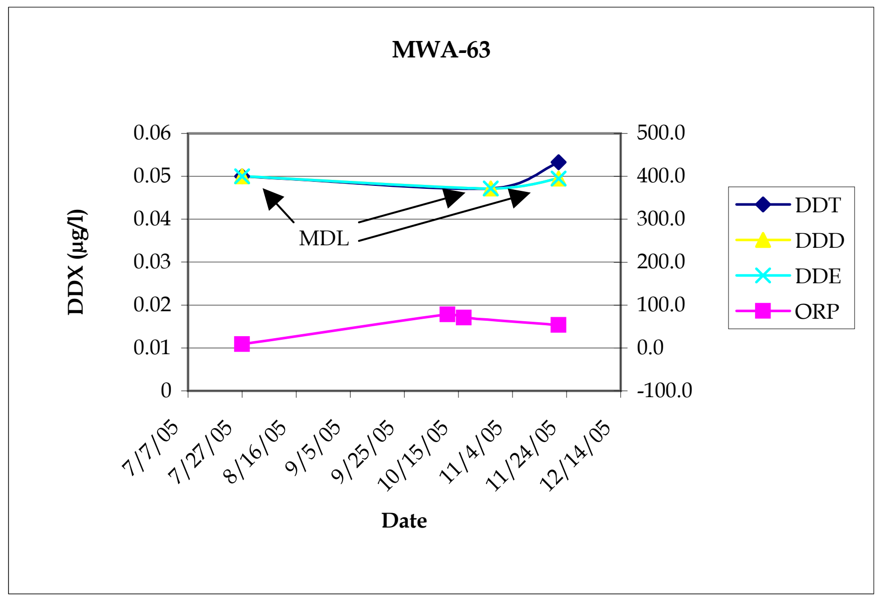


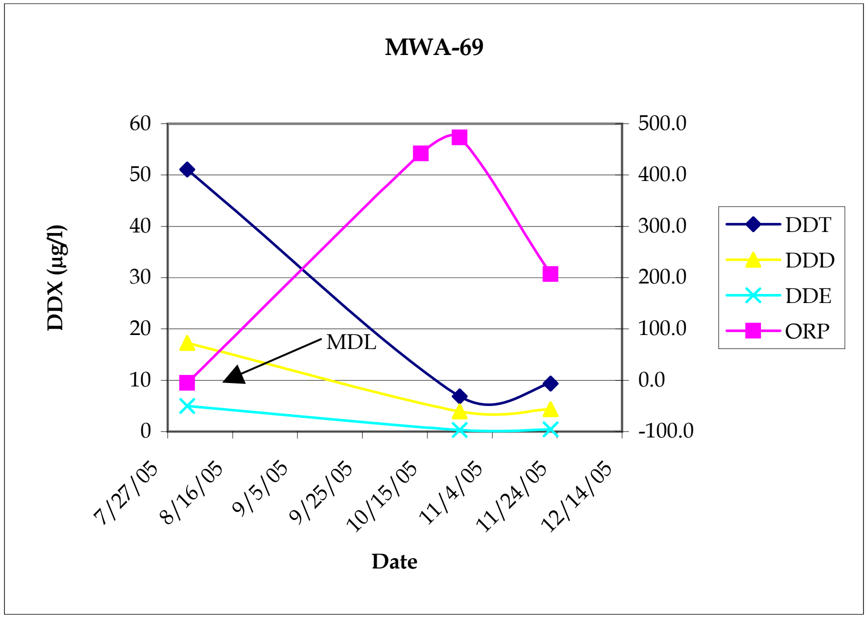


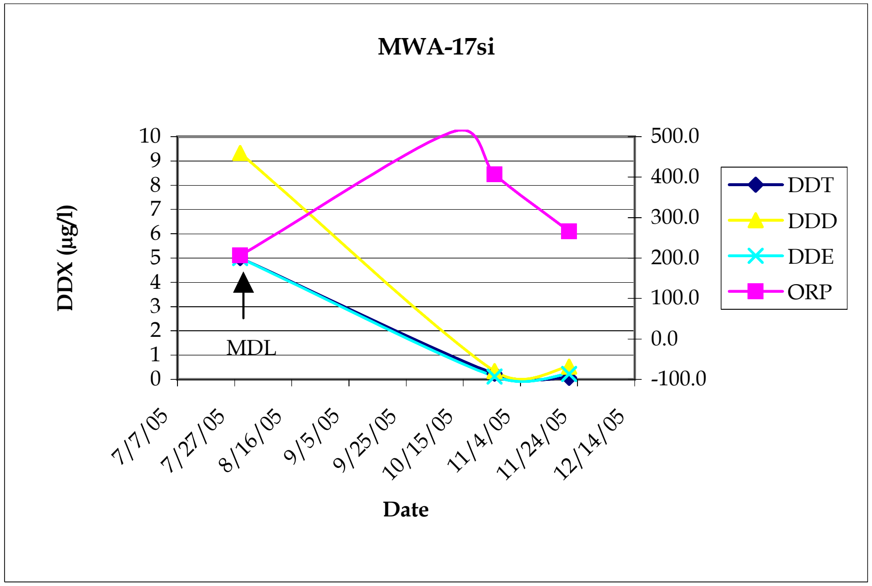

MWA-60
DDX (µg/l)
Date
MDL
DDT
DDD
DDE
ORP

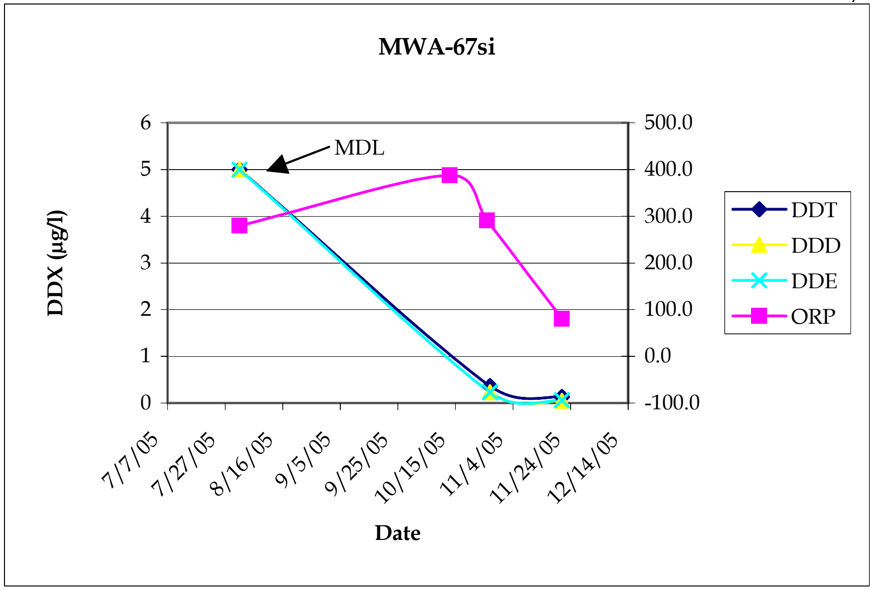

MWA-61
DDX (µg/l)
Date
DDT
DDD
DDE
ORP

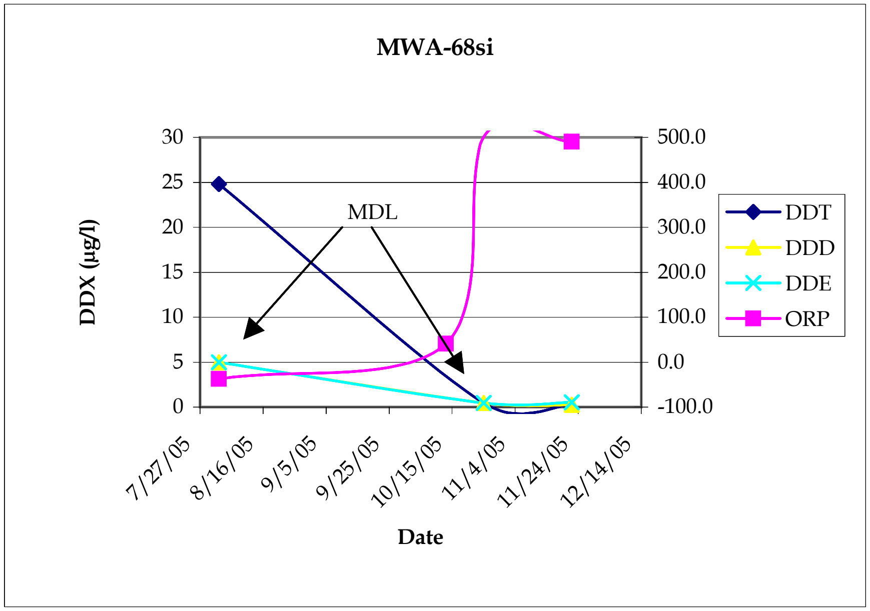

MWA-62
DDX (µg/l)
Date
DDT
DDD
DDE
ORP


MWA-63
DDX (µg/l)
Date
MDL
DDT
DDD
DDE
ORP


MWA-69
DDX (µg/l)
60
50
40
30
20
10
0
500.0
400.0
300.0
200.0
100.0
0.0
-100.0
MDL
7/27/05
8/16/05
9/5/05
9/25/05
10/15/05
11/4/05
11/24/05
12/14/05
Date
DDT
DDD
DDE
ORP


MWA-17si
DDX (µg/l)
10
9
8
7
6
5
4
3
2
1
0
500.0
400.0
300.0
200.0
100.0
0.0
-100.0
MDL
DDT
DDD
DDE
ORP
7/7/05
7/27/05
8/16/05
9/5/05
9/25/05
10/15/05
11/4/05
11/24/05
12/14/05
Date


MWA-67si
DDX (µg/l)
6
5
4
3
2
1
0
500.0
400.0
300.0
200.0
100.0
0.0
-100.0
MDL
DDT
DDD
DDE
ORP
7/7/05
7/27/05
8/16/05
9/5/05
9/25/05
10/15/05
11/4/05
11/24/05
12/14/05
Date


MWA-68si
DDX (µg/l)
30
25
20
15
10
5
0
500.0
400.0
300.0
200.0
100.0
0.0
-100.0
MDL
DDT
DDD
DDE
ORP
7/27/05
8/16/05
9/5/05
9/25/05
10/15/05
11/4/05
11/24/05
12/14/05
Date